

Arsenic was identified as a COC requiring action in soil for all current and future site receptors at both sites and benzo(a)pyrene is a COC for a future hypothetical resident within RSA-122NW. The selected CGs by soil depth at both sites is as follows:

Soil Depth Interval (below ground surface)	Arsenic Cleanup Goal (mg/kg)	Basis
0 to 2 feet	15	1) Background screening value for arsenic in surface soil. 2) Cleanup goal is protective of current and future human and ecological receptors. 3) Land-use controls not needed for this soil interval.
2 to 6 feet	46	1) Cleanup goal is protective of groundskeeper and construction worker 2) Land-use controls needed to be protective of hypothetical resident.
Greater than 6 feet	1500	1) Cleanup goal is protective in event of acute exposure by construction worker. 2) Land-use controls needed to be protective of groundskeeper and hypothetical resident.

The development of numerical CGs is not relevant to achieving the CMO for CWM. Since the CMO is related to reducing the hazards associated with potential CA in the relict structures, the selected alternative would ensure the likelihood of encountering CA is negligible.

## 10.0 Description and Comparison of Alternatives \_\_\_\_\_

A technology screening was performed in the corrective measures study (CMS) reports for RSA-122 (APTIM, 2020a) and RSA-183 (APTIM, 2021) to evaluate a number of corrective measures alternatives that are potentially applicable to the contaminated soils, including no action. The alternatives were screened against four RCRA-specific threshold criteria for corrective measures: overall protection of human health and the environment, the attainment of media cleanup standards for arsenic, control of sources of the release, and compliance with ADEM standards for management of wastes (DoD, 2018; EPA, 1994). Additional balancing or modifying criteria were also used in evaluating alternatives including long-term reliability and effectiveness; reduction in the toxicity, mobility, and volume; short-term effectiveness; implementability; regulatory acceptance; public acceptance; and cost.

Below are the corrective measure alternatives that were developed for detailed analysis and subjected to a detailed evaluation of alternatives in the CMS reports:

- **Alternative 1:** No Action. Under the no-action alternative, a corrective measure would not be taken to address contaminated soil posing risks at RSA-122 and 183. Because this alternative would not be protective of human health and the environment, it is not considered a candidate for implementation but presents a

baseline for the comparison of anticipated risk reduction and costs between other retained alternatives.

- **Alternative 2:** Excavation and off-site disposal of contaminated surface soil (0 to 2 feet bgs) where concentrations exceed a CG of 15 mg/kg, subsurface soil 2 to 12 feet bgs where concentrations exceed a CG of 100 mg/kg, and deep subsurface soil (greater than 12 feet bgs) where concentrations exceed a CG of 1500 mg/kg, and LUCs.
- **Alternative 3:** Excavation and off-site disposal of contaminated surface soil (0 to 2 feet bgs) where concentrations exceed a CG of 15 mg/kg, shallow subsurface soil (2 to 6 feet bgs) where concentrations exceed a CG of 46 mg/kg, and deeper subsurface soils (greater than 6 feet bgs) where concentrations exceed a CG of 1500 mg/kg, and LUCs.
- **Alternative 4:** Excavation and off-site disposal of contaminated surface and subsurface soil where concentrations exceed a CG of 1500 mg/kg, and LUCs.
- **Supplemental action for CA-contaminated piping, sumps, pits, and trenches.** Excavation and removal of below-ground process chemical lines, waste transfer lines, and associated sumps, collection pits, and spill collection trenches. Each alternative includes this action. Following removal of relict structures and associated contaminated soil, LUCs will be implemented requiring UXO support during intrusive activities within the CA-rated areas unless a probability assessment is prepared which supports elimination of the need for LUCs requiring this on-site UXO support.

Alternative 3 is the most favorable CMA to address risks to human health and the environment from arsenic-contaminated soils. Because Alternative 3 is an effective technology, will achieve the CG, meets requirements as specified in the Army's guidance for the Defense Environmental Restoration Program (DoD, 2018), and ranks high or moderate in all evaluation criteria compared to the other alternatives, it was recommended as the preferred corrective measure alternative for soil at RSA-122 and RSA-183. Excavation and removal of CA-rated structures associated with the manufacture and disposal of CA would also be performed, thereby allowing for a recommendation for a permanent reduction in the site CA probability rating.

## **11.0 Selected Corrective Measure**

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Alternative 3 was selected as the most appropriate corrective measure alternative to address the contaminated soil at RSA-122 and RSA-183. The major components of the selected corrective measures for both sites include the following:

- Procurement and subcontracting

- Mobilization/demobilization
- Preliminary activities including utility clearance and marking, installation of surface water and erosion controls, vegetation clearing, pre-operational survey, surveying and marking of proposed excavation areas, and protection of monitoring wells located in the vicinity of excavation areas
- Excavation of contaminated soil
- Excavation and removal of relict CA structures
- Confirmation sampling and analysis of the excavated areas
- Waste characterization sampling
- Soil stabilization, if necessary
- Transport and disposal of waste at a licensed disposal facility
- Survey LUC boundary and post signage requiring Army approval for intrusive activities below 2 feet
- Site restoration, including application of backfill and topsoil, and revegetation with approved grass mixtures
- Outline land use restrictions for this site in the RSA Property Master Plan
- Comply with LUC requirements in AAC r. 335-5-1-.02(3)(a)
- Conduct annual routine LUC inspections, sign repairs, and reporting.

Alternative 3 involves excavation of soil at varying depths at various locations to meet the arsenic CGs at both RSA-122 and RSA-183 (Figures 5-3 thru 5-19 in the CMI work plan). Additionally, the relict structures will be excavated and removed. Confirmation sampling will be conducted at all excavated soil and relict structure areas. Soil may require stabilization prior to disposal at an off-site disposal facility. The relict structures will be disposed at the concrete and demolition landfill or another appropriately permitted disposal facility. The excavated areas will be backfilled with clean fill, sloped to drain, and revegetated to minimize erosion. LUCs will be implemented to protect site receptors from exposure to potential CA.

The corrective measures in Alternative 3 address the soil contamination in a manner that is cost-effective and would be protective of the industrial workers during continued Army operations at each site. Alternative 3 implements LUCs to protect site workers from potential CA. This alternative provides the best balance of trade-offs amongst the other corrective measures alternatives with respect to the evaluation criteria. Alternative 3 is consistent with the Army's

intent to continue to use the site as part of its mission at RSA. Alternative 3 meets the four general standards for corrective measures (overall protection of human health and the environment, attainment of media cleanup standards, control of sources of the release, and compliance with standards for management of wastes).

## **12.0 Public Involvement**

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Public participation requirements specified under Alabama Administrative Code r. 335-14-8-.08(6) will be met during the permit modification process for the RSA-122 and RSA-183 corrective measures. In addition, the Army will inform the public of the proposed RSA-122 and RSA-183 corrective measure in a newspaper announcement in local newspapers.

## **13.0 Conclusions**

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This request for permit modification presents the supporting information needed to allow ADEM to modify the Permit, in accordance with Alabama Administrative Code r. 335-14-8-.04(2), with respect to cleanup status at RSA-122 and RSA-183. Currently, both sites are on Table VI.6 in the Permit and listed as requiring corrective measures for soil as part of the site's action.

Groundwater under each site is listed as the responsibility of the groundwater unit (RSA-147 for RSA-122 and RSA-148 for RSA-183). Upon ADEM concurrence of the CMIP for RSA-122 and RSA-183, the Army will request that ADEM move the two sites to Permit Table VIII.1.

## **14.0 References**

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## **APPENDIX C**

### **CORRECTIVE MEASURES IMPLEMENTATION SCHEDULE**



**RSA-122/RSA-183 Corrective Measures Implementation**

**Data Date: 01-Sep-22 / Print Date: 29-Nov-21**

#	Activity Name	OD	RD	Start	Finish	2023												2024									
						S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
1	<b>Total</b>	568	568	01-Nov-22	10-Jun-24																						
2	<b>RSA-122/RSA-183 Corrective Measures Implement</b>	568	568	01-Nov-22	10-Jun-24																						
3	<b>RSA-122/RSA-183 CMI CMI Contracting</b>	105	105	01-Nov-22	21-Feb-23																						
4	Army Request for Bids	30	30	01-Nov-22*	02-Dec-22																						
5	Contractor Proposal Preparation	30	30	03-Dec-22	05-Jan-23																						
6	Army Bid Evaluation	15	15	06-Jan-23	21-Jan-23																						
7	Army Award Contract for CMI	30	30	22-Jan-23	21-Feb-23																						
8	<b>RSA-122/RSA-183 CMI Construction</b>	60	60	22-Feb-23	22-Apr-23																						
9	Notice to Proceed	1	1	22-Feb-23	22-Feb-23																						
10	Stormwater Permit	45	45	22-Feb-23	07-Apr-23																						
11	Job Order Request/Record of Environmental Review	45	45	22-Feb-23	07-Apr-23																						
12	Procurement	60	60	22-Feb-23	22-Apr-23																						
13	<b>RSA-122/RSA-183 CMI Implementation</b>	403	403	23-Apr-23	10-Jun-24																						
14	<b>Establish Site Facilities and Training</b>	59	59	23-Apr-23	21-Jun-23																						
15	Mobilization and Establish Site Facilities	21	21	23-Apr-23	13-May-23																						
16	CA Training	21	21	14-May-23	04-Jun-23																						
17	MACOM Pre-Op Testing	6	6	05-Jun-23	10-Jun-23																						
18	MACOM Recovery	10	10	11-Jun-23	20-Jun-23																						
19	NTP with Intrusive Activities	1	1	21-Jun-23	21-Jun-23																						
20	<b>Mobilization and Site Setup</b>	14	14	22-Jun-23	06-Jul-23																						
21	Surveying and Marking Excavations	10	10	22-Jun-23	01-Jul-23																						
22	Installation of Erosion and Sediment Controls	10	10	22-Jun-23	01-Jul-23																						
23	Tree and Vegetation Clearing	10	10	22-Jun-23	01-Jul-23																						
24	Site Setup	14	14	22-Jun-23	06-Jul-23																						
25	Well Abandonment and Protection	14	14	22-Jun-23	06-Jul-23																						
26	<b>Excavation of Contaminated Soil/Debris</b>	267	267	07-Jul-23	07-Apr-24																						
27	Soil and Relict Structure Removal at RSA-183	138	138	07-Jul-23	26-Nov-23																						
28	Soil and Relict Structure Removal at RSA-122	129	129	27-Nov-23	07-Apr-24																						
29	<b>Confirmation/Waste Sampling and Laboratory Analys</b>	286	286	14-Jul-23	03-May-24																						
30	Soil/Waste Sampling and Analysis	286	286	14-Jul-23	03-May-24																						
31	<b>Loadout and Off-Site Disposal</b>	277	277	06-Aug-23	17-May-24																						
32	Loadout Soil/Concrete and T&D	277	277	06-Aug-23	17-May-24																						
33	<b>Site Restoration and Demobilization</b>	63	63	08-Apr-24	10-Jun-24																						
34	Backfill and Site Restoration	53	53	08-Apr-24	31-May-24																						
35	Demobilization	10	10	01-Jun-24	10-Jun-24																						
36	RSA-122/RSA-183 Complete	0	0		10-Jun-24																						

Remaining Level of Effort
  Remaining Work
  Actual Work
  Critical Remain...



**APPENDIX D**

**QUALITY ASSURANCE PROJECT PLAN**

## **Appendix D**

**Quality Assurance Project Plan  
for the  
Corrective Measures  
RSA-122 and RSA-183  
U.S. Army Garrison-Redstone  
Madison County, Alabama  
U.S. EPA ID No. AL7 210 020 742**

**Contract Number W912DY-17-D-0003  
Delivery Order No. W912DY-19-F-1116**

**Prepared for:**

**U.S. Army Engineering & Support Center  
Army Engineering & Support Center, Huntsville  
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**May 2022**

## **List of Quality Assurance Project Plan Worksheets**

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Worksheet Nos. 1 and 2	Title and Approval Page
Worksheet Nos. 3 and 5	Project Organization and QAPP Distribution
Worksheet Nos. 4, 7, and 8	Personnel Qualifications and Sign-off Sheet
Worksheet No. 6	Communication Pathways and Procedures
Worksheet No. 9	Project Planning Session Summary
Worksheet No. 10	Conceptual Site Model
Worksheet No. 11	Project/Data Quality Objectives
Worksheet No. 12	Measurement Performance Criteria
Worksheet No. 13	Secondary Data Uses and Limitations
Worksheet Nos. 14 and 16	Project Tasks and Schedule
Worksheet No. 15	Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
Worksheet No. 17	Sampling Design and Rationale
Worksheet No. 18	Sampling Locations and Methods
Worksheet No. 19	Sample Containers, Preservation, and Hold Time Requirements
Worksheet No. 20	Field Quality Control (QC) Sample Summary
Worksheet No. 21	Field Standard Operating Procedures (SOP)
Worksheet No. 22	Field Equipment Calibration, Maintenance, Testing, and Inspection
Worksheet No. 23	Analytical SOP References Table - Laboratory
Worksheet No. 24	Analytical Instrument Calibration
Worksheet No. 25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection
Worksheet Nos. 26 and 27	Sample Handling, Custody, and Disposal
Worksheet No. 28	Analytical Quality Control and Corrective Action
Worksheet No. 29	Project Documents and Records
Worksheet No. 30	Analytical Services Table
Worksheet Nos. 31, 32 and 33	Assessments and Corrective Action
Worksheet No. 34	Data Verification and Validation Inputs
Worksheet No. 35	Data Verification Procedures
Worksheet No. 36	Data Validation Procedures
Worksheet No. 37	Data Usability Assessment

## **List of Attachments**

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Attachment D-1 – Army Scoping Session Memorandum for Worksheet No. 9

## **D1.0 Introduction**

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This quality assurance project plan (QAPP) has been prepared to guide the conduct of corrective measures for RSA-122 and RSA-183. This QAPP is an appendix to the corrective measures implementation (CMI) work plan for RSA-122 and RSA-183. This QAPP has been prepared as a site-specific plan under the *Final Revision 4 Installation-Wide Uniform Federal Policy Quality Assurance Program Plan, U.S. Army Garrison-Redstone, Madison County, Alabama*, December 2019 (HydroGeoLogic, Inc., 2019) or most recent version.

Reference: HydroGeoLogic, Inc., 2019, *Final Revision 4 Installation-Wide Quality Assurance Program Plan, U.S. Army Garrison – Redstone, Madison County, Alabama, Volumes I and II*, prepared for U.S. Army Corps of Engineers, Huntsville District, U.S. Army Engineering and Support Center, Huntsville, December.

**Worksheet Nos. 1 and 2: Title and Approval Page**

<b>Site Name/Project Name</b>	Redstone Arsenal, Madison County, Alabama/Huntsville MEGA
<b>Site Location</b>	RSA-122, Dismantled Lewisite Manufacturing Plant Sites and RSA-183, Former Lewisite Manufacturing Plants 1 and 2
<b>Site Number/Code</b>	RSA-122 and RSA-183
<b>Operable Unit (OU)</b>	OU-06 and OU-05
<b>Contractor Name</b>	Aptim Federal Services, LLC (APTIM)
<b>Contract Number</b>	W912DY-17-D-0003
<b>Contract Title</b>	Corrective Measures Implementation at Multiple Sites, Redstone Arsenal
<b>Delivery Order</b>	W912DY-19-F-1116
<b>Guidance used to prepare site-specific plan</b>	<p>Aptim Federal Services, LLC (APTIM), 2021, <i>Corrective Measures Study Report, RSA-183, Former Lewisite Manufacturing Plants 1 and 2 Sites, Operable Unit 05, U.S. Army Garrison-Redstone, Madison County, Alabama</i>, March.</p> <p>Aptim Federal Services, LLC (APTIM), 2020, <i>Corrective Measures Study Report, RSA 122, Dismantled Lewisite Manufacturing Plant Sites, Operable Unit 06, U.S. Army Garrison-Redstone, Madison County, Alabama</i>, December.</p> <p>Intergovernmental Data Quality Task Force, 2005, <i>Uniform Federal Policy for Quality Assurance Project Plans</i>.</p> <p>IT Corporation (IT), 2002, <i>Draft Installation-Wide Work Plan, Revision 2, Redstone Arsenal, Madison County, Alabama</i>, prepared for the U.S. Army Corps of Engineers, Savannah District, June.</p> <p>Shaw Environmental, Inc. (Shaw), 2010, <i>Installation-Wide Work Plan, Final Appendices B, C, D, E, F, Redstone Arsenal, Madison County, Alabama</i>, September.</p> <p>Shaw Environmental, Inc. (Shaw), 2007a, <i>Final Remedial Investigation Report, Baseline Human Health Risk Assessment and Screening-Level Ecological Risk Assessment, RSA-122 Dismantled Lewisite Manufacturing Plant, Operable Unit 6, Redstone Arsenal, Madison County, Alabama</i>, Revision 1, September.</p> <p>Shaw Environmental, Inc. (Shaw), 2007b, <i>Final Remedial Investigation Report, Baseline Human Health Risk Assessment and Screening-Level Ecological Risk Assessment, RSA-183 (Formerly Part of RSA-49), Former Lewisite Plants 1 and 2, Operable Unit 5, Redstone Arsenal, Madison County, Alabama</i>, Revision 1, September.</p> <p>U.S. Army Corps of Engineers, 2015, <i>Technical Guidance for Military Munitions Response Action, Engineer Manual 200-1-15</i>, 30 October.</p>

**Worksheet Nos. 1 and 2: Title and Approval Page**

	<p>U.S. Department of Defense (DoD), 2019, <i>Quality Systems Manual for Environmental Laboratories</i> Version 5.3, May.</p> <p>U.S. Environmental Protection Agency (EPA), 2014, <i>National Functional Guidelines for Superfund Inorganic Data Review</i>, EPA 540-R-013-001, August</p> <p>U.S. Environmental Protection Agency (EPA), 2014, <i>EPA National Functional Guidelines for Superfund Organic Methods Data Review</i>, EPA 540-R-014-002, August.</p>
<b>Regulatory Program</b>	<p>Resource Conservation and Recovery Act (RCRA), ADEM</p> <p>Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), EPA Region 4</p>
<b>Approval Entities</b>	<p>U.S. Army Garrison – Redstone; U.S. Army Engineering and Support Center, Huntsville (CEHNC); Alabama Department of Environmental Management (ADEM)</p>
<b>Work Plan</b>	<p><input checked="" type="checkbox"/> Corrective Measures Implementation                      <input type="checkbox"/> Generic Field Sampling Plan</p>
<b>Dates of Scoping Session</b>	<p>September 28, 2021 (see Attachment D-1)</p>
<b>Dates and Titles of SFSP Documents Written for Previous Site Work (if applicable)</b>	<p>References for documents used to prepare the CMI Work Plan are included in Chapter 7.0 of the CMI Work Plan.</p>
<b>Organizational Partners (stakeholders) and Their Connection with Lead Organization</b>	<p>U.S. Army Garrison-Redstone – Site manager for RSA-122/RSA-183 and point of contact with regulators.</p> <p>CEHNC – Oversees APTIM's performance under this contract.</p> <p>ADEM – State regulator overseeing RSA environmental and remediation activities.</p> <p>EPA, Region 4 – Federal regulator overseeing RSA environmental and remediation activities.</p>
<b>Data Users</b>	<p>CEHNC, Project/Task Leads, Engineering, support personnel, U.S. Army Garrison-Redstone, ADEM, EPA Region 4</p>



### Worksheet Nos. 1 and 2: Title and Approval Page

The below signatures indicate the representatives of the subject organizations have reviewed this RSA-122/RSA-183-specific QAPP and concur with its implementation as written.

Review:

\_\_\_\_\_  
Vicki Graves  
APTIM Project Chemist

\_\_\_\_\_  
Date

Approval:

\_\_\_\_\_  
Don Burton, PE  
APTIM Project Manager

\_\_\_\_\_  
Date

\_\_\_\_\_  
Ashley Roeske  
USACE Project Manager/  
Contracting Officer Representative

\_\_\_\_\_  
Date

### Worksheet Nos. 3 and 5: Project Organization and QAPP Distribution

CMIP Recipients	Title	Organization	Telephone Number	E-mail Address
Ashley E. Roeske	Contracting Officer Representative	U.S. Army Engineering & Support Center, Huntsville	256-895-1429	<a href="mailto:Ashley.E.Roeske@usace.army.mil">Ashley.E.Roeske@usace.army.mil</a>
Clint Howard	Chief Installation Restoration Branch	U.S. Army Garrison - Redstone	256-842-3702	<a href="mailto:joseph.c.howard1.civ@mail.mil">joseph.c.howard1.civ@mail.mil</a>
Robert "Bob" Gorman	Army Site Task Manager	U.S. Army Garrison - Redstone	256-876-3814	<a href="mailto:robert.p.gorman10.civ@mail.mil">robert.p.gorman10.civ@mail.mil</a>
Jojuan Pressley	Lead Remedial Project Manager	ADEM	334-271-7747	<a href="mailto:Jojuan.Pressley@adem.alabama.gov">Jojuan.Pressley@adem.alabama.gov</a>
Dr. Heather McDonald, PE	Technical Manager	U.S. Army Engineering & Support Center, Huntsville	256-895-1892	<a href="mailto:Heather.B.Mcdonald@usace.army.mil">Heather.B.Mcdonald@usace.army.mil</a>
Don Burton, PE	Project Manager	APTIM	865-207-1394	<a href="mailto:Don.burton@aptim.com">Don.burton@aptim.com</a>
Dennis Seymore	Senior Scientist and Site Technical Lead	APTIM	865-414-6073	<a href="mailto:Dennis.seymore@aptim.com">Dennis.seymore@aptim.com</a>
Emily Davis	Regulatory Specialist	APTIM	717-737-1049	<a href="mailto:Emily.davis@aptim.com">Emily.davis@aptim.com</a>
Tricia Felt	Corporate Quality Management Director	APTIM	303-741-7426	<a href="mailto:Tricia.felt@aptim.com">Tricia.felt@aptim.com</a>
Brian Rhodes	Project QA/QC Manager/Quality Control Site Manager (QCSM)	APTIM	256-714-4200	<a href="mailto:Brian.rhodes@aptim.com">Brian.rhodes@aptim.com</a>
Vicki Graves	Project Chemist	APTIM	865-560-7818	<a href="mailto:Vicki.graves@aptim.com">Vicki.graves@aptim.com</a>
Ken Hurley, PE	Project Engineer	APTIM	865-560-7831	<a href="mailto:Kenneth.hurley@aptim.com">Kenneth.hurley@aptim.com</a>

**Notes:**

*Copies of the corrective measures implementation work plan which contains the QAPP will be distributed to the individuals above.*

*One controlled hard copy of the corrective measures implementation work plan which contains the QAPP will be maintained in the field trailer as a reference for field workers. The field team members are required to be familiar with their applicable contents through required reading and the sign-off acknowledgement sheet. The QCSM will be the owner of the field copy and standard operating procedures (SOP) and will be responsible to ensure that it is current and that all field sampling personnel have read the work controlling documents and have signed the acknowledgement form.*

## Worksheet Nos. 3 and 5: Project Organization and QAPP Distribution

### Acknowledgement Form

Project Personnel	Title	Telephone Number	Signature	Date CMI Work Plan Read

*The individuals who sign above are certifying they have read the applicable sections of the Quality Assurance Project Plan and the corrective measures implementation (CMI) work plan. Upon completion, please forward the original signed form, with all columns completed, to the Corporate Quality Management Director.*

### Worksheet Nos. 4, 7, and 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications/Specialized Training/Certifications	Signature/Date
Ashley Roeske	Contracting Officer Representative	CEHNC	Designate environmental coordinators for Contract No. W912DY-17-D-0003, Delivery Order (DO) W912DY-19-F-1116. Represent the Army's interests in the coordination and implementation of the DO for which they are responsible.	Specified by Army Corp of Engineers requirements	
Bob Gorman	Army Site Manager	U.S. Army Garrison - Redstone	Responsible for the coordination and implementation of the site-specific corrective measure tasks associated with RSA-122/RSA-183, including all technical and regulatory issues.	Specified by Army requirements	
Don Burton, PE	Project Manager	APTIM	<p>Primary POC for coordination with Redstone Arsenal leadership, AEC, CEHNC, regulators, and stakeholders. Plans/administers RSA's assigned corrective measures, including IAP/CTC. Develops and oversees execution of the strategic plan.</p> <p>Responsible for performance, cost/schedule control, estimating, quality, safety in accordance with PWS, PMP, contract requirements, and applicable laws/regulation. Approves staff assignments and oversees PMs on DO.</p> <p>Responsible for monthly progress and cost reporting and change management in response to RSA's mission needs.</p>	<p>(1) A college degree in business, engineering, construction management, geology, chemistry, or related field.</p> <p>(2) Professional registration, in their respective field, if appropriate.</p> <p>(3) Fifteen years experience in Program Management for other contracts and programs, with a minimum of 7 years working experience in Environmental Remediation sites for contracts and programs of similar size and complexity, and oversight of project managers and project teams.</p>	

### Worksheet Nos. 4, 7, and 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications/Specialized Training/Certifications	Signature/Date
Dennis Seymore	Senior Scientist and Site Technical Lead	APTIM	Primary POC for technical coordination of Redstone Arsenal Contract No. W912DY-17-D-0003, Delivery Order W912DY-19-F-1116 activities. Oversees the activities of all APTIM personnel; ensures compliance with the scope of work and environmental activities and controls project consistency. Additional responsibilities include review and approval of the CMI Work Plan including the QAPP, Health and Safety Plan, and other project-specific attachment and plans; assignment of duties to project staff, including orientation of staff to project needs and requirements; and evaluation of training needs for the project staff. Provides budget and schedule control; reviews any subcontractor work and approves subcontract invoices; establishes the project record management system; ensures that major project deliverables are reviewed for technical accuracy and completeness before release; and ensures that QAPP requirements are satisfied. Provides the Army with an alternative POC for the RSA Contract No. W912DY-17-D-0003, Delivery Order W912DY-19-F-1116 activities.	(1) A college degree in engineering, construction management, geology, chemistry, or related field.  (2) Professional registration, in their respective field, if appropriate.  (3) Ten years experience in technical leadership for other contracts/programs with a minimum of 7 years working experience in Environmental Remediation sites of similar complexity and scope.	
Ken Hurley, PE	Senior Engineer	APTIM	Provides engineering direction for corrective measures design and provides PE certification of the CMIP.	(1) A college degree in engineering  (2) Professional registration in engineering.  (3) Ten years experience in engineering leadership for other contracts/programs with a minimum of 7 years working experience in Environmental Remediation sites of similar complexity and scope.	

**Worksheet Nos. 4, 7, and 8: Personnel Qualifications and Sign-Off Sheet**

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications/Specialized Training/Certifications	Signature/Date
Emily Davis	Regulatory Specialist	APTIM	Single POC responsible for coordination with Army on regulatory issues. Determines applicable regulatory requirements; ensures compliance; negotiates proposed remedies with regulators; determines ARARs, evaluates alternative cleanup methods; and supports Army in resolving legal, regulatory, and policy concerns.	(1) An advanced college degree in law, engineering, public administration, construction management, geology, chemistry, or related field.  (2) Professional registration, in their respective field, if appropriate.  (3) Ten years experience in regulatory requirements for other contracts/programs with a minimum of 7 years working experience in Environmental Remediation sites, to include innovative approaches to regulatory and technical challenges such as successful experience in developing technical impracticability waivers.	

### Worksheet Nos. 4, 7, and 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications/Specialized Training/Certifications	Signature/Date
Tricia Felt	Corporate Quality Management Director	APTIM	<p>The Corporate Quality Management Director for the RSA Contract No. W912DY-17-D-0003, Delivery Order W912DY-19F-1116 activities is responsible for ensuring the overall project quality. The Corporate Quality Management Director coordinates with the technical managers of the project team to evaluate status, procedures, and nonconformances from a quality program standpoint. Other responsibilities may include the following:</p> <ul style="list-style-type: none"> <li>• The Corporate Quality Management Director gathers and coordinates corporate resources and references in the areas of quality improvement, corrective action (CA) control, and quality systems auditing for the project.</li> <li>• Reviews quality-related tasks in the detailed site-specific plans.</li> <li>• Provides project-specific training in QA/QC matters to contractor personnel, as needed, identified, or requested by the PM.</li> <li>• Acts as the QCSM, if required.</li> </ul>	<p>(1) A college degree in engineering, construction management, geology, chemistry, or related field and professional registration.</p> <p>(2) Professional registration, in their respective field, if appropriate.</p> <p>(3) A minimum of 5 years Quality Assurance/Control experience, with a minimum of 3 years in Environmental Remediation projects.</p>	
Brian Rhodes	QCSM	APTIM	<p>Reports directly to the Corporate Quality Management Director on all matters within the scope of the project QC program and is responsible for the overall management of the QC program on and off site, including field sampling and characterization, construction, and consulting engineering activities. Duties of the QCSM include but are not limited to the following:</p> <ul style="list-style-type: none"> <li>• Serves as primary contact for project quality matters and actively identifies and responds to QA/QC needs. Resolves problems and answers requests for guidance or assistance.</li> <li>• Implements project-specific QAPP.</li> </ul>	BS in environmental science or related field plus 5 years experience in quality assurance	

### Worksheet Nos. 4, 7, and 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications/Specialized Training/Certifications	Signature/Date
Brian Rhodes (Continued)			<ul style="list-style-type: none"> <li>• Actively tracks the progress of quality tasks in the QAPP and consults periodically with the Program Manager and PM on quality-related issues.</li> <li>• Prepares and submits QC reports as required to the PM as well as to the corporate QA management.</li> <li>• Approves field CAs prior to implementation.</li> <li>• Verifies that the subcontractor performs appropriate CAs for all APTIM nonconformances and interfaces with the analytical data coordinator or chemist on all quality issues and concerns associated with the subcontracted laboratory, including subcontractor-performed CAs.</li> <li>• Ensures that performance and system inspections are performed.</li> <li>• Ensures that necessary CAs are taken for incidents of nonconformance.</li> <li>• Assists in the implementation of CAs to prevent recurrence of any problems.</li> <li>• If significant adverse conditions exist, implements a CA Request in accordance with APTIM policies and Corporate Quality Management Director oversight.</li> <li>• Assists on training and orientation of field staff regarding task-specific and IW plans</li> <li>• Conducts performance and systems inspections.</li> <li>• Identifies and reports nonconforming items or activities.</li> <li>• Initiates recommended CA.</li> <li>• Verifies implementation of CA.</li> <li>• Monitors subcontractors on and off site.</li> <li>• Certifies submittal documents.</li> <li>• Prepares all QC reports as required by contract specifications.</li> <li>• Notifies the Corporate Quality Management Director of conditions adverse to quality which cannot be resolved at the project level.</li> </ul>		



### Worksheet Nos. 4, 7, and 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications/Specialized Training/Certifications	Signature/Date
Brian Rhodes	Site-Specific Health and Safety Officer	APTIM	Evaluates the health and safety aspects of the on-site tasks to ensure that activities are performed in a safe manner. Coordinates with Task Managers to complete health and safety work plan addenda for each major task work plan and works with on-site personnel to achieve compliance with the applicable health and safety plans. May have additional duties assigned by the PM.	BS in environmental science or related field plus 5 years experience in safety	
Vicki Graves	Project Chemist	APTIM	<p>Works with the project team in formulating plans and approaches and help to assess sampling, analytical, and QA/QC requirements for each project task. Helps to ensure consistency of approach among the various tasks regarding these areas. Reviews analytical data and assists in the interpretation and use of sampling and analytical QA/QC data.</p> <p>Works together with the laboratory PM, laboratory QA Manager, and APTIM's Corporate Quality Management Director to identify and resolve analytical issues and nonconformances and participates in project and laboratory audits. In addition, the Project Chemist or designee:</p> <ul style="list-style-type: none"> <li>• Interfaces with the laboratory contact to ensure the laboratory is aware of the project data quality objectives, program goals, and analytical QA/QC objectives.</li> <li>• Communicates with the laboratory contact concerning the schedule of sample shipments and the shipment contents, including QC samples. Based on this information, provides status tracking of sample shipments to project management.</li> <li>• Reviews all laboratory data before those data are transferred to permanent storage. Reports to other project participants via electronic deliverable.</li> </ul>	BS/BA in chemistry or equivalent 5 years or more experience that includes QA/QC, environmental investigation design, field sampling, field/laboratory analysis, data review, or data management	

### Worksheet Nos. 4, 7, and 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications/Specialized Training/Certifications	Signature/Date
Vicki Graves (Continued)			<ul style="list-style-type: none"> <li>• Interfaces with the Data Users, Task Managers, Field Sampling Lead, Sample Coordinator, Data Manager, and Laboratory PM for analytical requirements.</li> <li>• Defines methods and procedures used to achieve desired data quality, and ensures the laboratory is aware of the project data quality objectives, program goals, and analytical QA/QC objectives. Monitors laboratory deliverables for completeness and accuracy.</li> <li>• Assists in identifying and resolving any technical or quality issues regarding sample collection and analysis and interfaces with the laboratory QA Manager to resolve any nonconformances or quality issues.</li> <li>• Ensures that all sample planning tables are distributed to the laboratory contact, and the sample collection coordinator.</li> <li>• Communicates with the laboratory contact to schedule bottle and sample shipments between the field and the laboratory, including QC samples.</li> <li>• Provides status tracking of sample shipments to project management.</li> <li>• Reviews and/or validates all data based on data quality indicators.</li> <li>• Ensures data loaded into the database are accurate and complete.</li> <li>• Works with the Sample Coordinator and the analytical laboratory to ensure the complete and accurate transfer of samples and information from the field into the laboratory.</li> <li>• Receives and reviews analytical data and verifies receipt of analytical data from the laboratory in hard copy and electronic formats.</li> </ul>		

### Worksheet Nos. 4, 7, and 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications/Specialized Training/Certifications	Signature/Date
Don Dill	Data Validation Lead	APTIM	Reviews data against method requirements and project acceptance criteria, loads data into the appropriate database as defined in task project requirements, and performs completeness and accuracy checks on flagged data that do not meet performance objectives.	BS in chemistry, environmental science, or related field or AS plus 5 years experience; plus certification in data validation or 2 years experience using/or reviewing data for each method reviewed	
Annette Hough	Data Manager	APTIM	Loads data and information into APTIM's database and checks for errors, requests data corrections, maintains the integrity of the database, and reports data and information as requested from data users. Prepares and submits the electronic database deliverables via the Project Chemist.	AS or BS in computer science plus 2 years experience in database management or 5 years experience in database management. Supervision is required if experience is less than 2 years.	
Brandi Hodges	Geographic Information System Data Manager	APTIM	Oversees GIS efforts for the project, including Web-based GIS product.	A minimum of 5 years GIS database management experience, with a minimum of 3 years in Environmental Remediation projects.	
Becky Vandergriff	Admin Record/ Document Control	APTIM	Ensures that all the Administrative Records are adequately maintained.	A minimum of five (5) years Document Control experience, with a minimum of three (3) years in Environmental Remediation projects.	

Resumes to be located on line and/or in the project files in APTIM's office.

ADEM – Alabama Department of Environmental Management.

AEC – Army Environmental Center.

APTIM – Aptim Federal Services, LLC.

AS – Associate of Science.

BA – Bachelor of Arts.

BS – Bachelor of Science.

CA – Corrective action.

CEHNC – U.S. Army Engineering and Support Center, Huntsville.

CMI – Corrective measures implementation.

CTC – Cost-to-complete.

DO – Delivery order.

EPA – U.S. Environmental Protection Agency.

GIS – Geographic Information System.

IAP – Installation Action Plan.

IW – Installation-wide.

PM – Project manager.

PMP – Project management plan.

POC – Point of contact.

PWS – Performance work statement.

QA/QC – Quality assurance/quality control.

QAPP – Quality Assurance Project Plan.

QCSM – Quality Control Site Manager.

RL – Reporting limit.

RSA – Redstone Arsenal.

## Worksheet No. 6: Communication Pathways and Procedures

Communication Drivers	Responding Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Point of Contact with CEHNC Ashley Roeske	APTIM Project Manager	Don Burton	865-207-1394	All documents and information are forwarded to the CEHNC by the APTIM Project Manager, or designee.
Point of Contact with Army Bob Gorman	APTIM Project Manager	Don Burton	865-207-1394	All documents and information are forwarded to the Army by the APTIM Project Manager, or designee.
Point of Contact with U.S. Environmental Protection Agency (EPA) Robert Pope	APTIM Project Manager	Don Burton	865-207-1394	All documents and information are forwarded to EPA by the APTIM Project Manager, or designee.
Point of Contact with Alabama Department of Environmental Management (ADEM) JoJuan Pressley	APTIM Project Manager	Don Burton	865-207-1394	All documents and information are forwarded to ADEM by the APTIM Project Manager, or designee.
Corporate QA/QC Implementation	APTIM Corporate Quality Management Director	Tricia Felt	303-741-7426	The APTIM Corporate Quality Management Director or designee will review, direct and provide oversight to implement changes or revisions affecting quality following receipt from the QCSM.
Project Management and Technical Issues	APTIM Senior Scientist and Site Technical Lead	Dennis Seymore	865-414-6073	Maintains communication with all project and site technical personnel and communicates with the APTIM Project Manager (PM), at minimum, during the weekly project status meeting and as circumstances require.
Changes to Project Documents and Forms	APTIM Document Control	Becky Vandergriff	865-560-7800	Maintains revision control for all project documents and forms and oversees project documents and records management. All change requests are submitted to Document Control through principal document authors. Documents are issued document revision numbers and uploaded to the Administrative Record for the Project. All document revision slip pages or revised forms are provided to the document/form owner within 10 days following identification of the change.
Changes to quality assurance project plan (QAPP)	APTIM QCSM	Brian Rhodes	256-714-4200	Any field change requests, variance requests, or deviations are communicated to the APTIM Corporate Quality Management Director or designee and the APTIM Project Chemist. The APTIM QCSM or designee is responsible for implementing a tracking system (i.e., Variance Tracking Log, Nonconformance Report [NCR] Tracking Log, Corrective Action [CA] Tracking Log, etc.).
Changes to QAPP	APTIM Project Chemist	Vicki Graves	865-560-7818	If the site-specific QAPP needs modification, the Project Chemist will coordinate with the APTIM QCSM or designee to take appropriate action. If the QAPP is modified, it is submitted for regulatory review and approval.
Field Activities	APTIM QCSM	Brian Rhodes	256-714-4200	Daily field activities are summarized on weekly reports and posted for distribution.

## Worksheet No. 6: Communication Pathways and Procedures

Communication Drivers	Responding Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Temporary Change Requests	APTIM QCSM	Brian Rhodes	256-714-4200	Requests to make temporary changes to field or other procedures are submitted to the APTIM Corporate Quality Management Director, who forwards to the APTIM Technical Lead and appropriate individuals for input and approval.
Data Requests and Reporting	APTIM Data Manager	Annette Hough	865-560-7829	All requests for data are directed to the Project Chemist, who forwards to the Data Manager for processing. The Project Chemist reviews data prior to release.
Data Reporting – Electronic Deliverable	APTIM Data Manager	Annette Hough	865-560-7829	The Data Manager ensures that electronic deliverable submittals are prepared and submitted on a regular basis, if required.
Database Issues	APTIM GIS Manager	Brandi Hodges	865-560-7828	All issues relating to operation or maintenance of the GIS database or equivalent database are directed to the GIS Manager, including requests for access and special reporting formats, such as data to support the GIS.

ADEM – Alabama Department of Environmental Management.  
 CA – Corrective action.  
 CEHNC – U.S. Army Engineering and Support Center, Huntsville.  
 DL – Detection limit.  
 EPA – U.S. Environmental Protection Agency.  
 GIS – Geographic Information System.  
 NCR – Nonconformance report.  
 PM – Project Manager.  
 QA – Quality assurance.  
 QAPP – Quality Assurance Project Plan.  
 QC – Quality control.  
 QCSM – Quality Control Site Manager.  
 SOP – Standard Operating Procedure.

### Worksheet No. 9: Project Planning Session Summary

<b>Project Title:</b> Multiple Sites Corrective Measures		<b>Site Name(s):</b> RSA-122/RSA-183, /Redstone Arsenal		
<b>Project Contract/Delivery Order:</b> <u>W912DY-17-D-0003/W912DY-19-F-1116</u>		<b>Site Location:</b> <u>Madison County, Alabama</u>		
<b>Project Manager:</b> Don Burton, PE				
<b>Date of Session:</b> September 28, 2021				
<b>Scoping Session Purpose:</b> See Attachment D-1				
Name	Title	Affiliation	Phone No.	E-mail Address
Ashley Roeske	Contracting Officer Representative	CEHNC	256-895-1429	<a href="mailto:ashley.e.roeske@usace.army.mil">ashley.e.roeske@usace.army.mil</a>
Dr. Heather McDonald, PE	Technical Manager	CEHNC	256-895-1392	<a href="mailto:Heather.b.mcdonald@usace.army.mil">Heather.b.mcdonald@usace.army.mil</a>
Kenny Jones	Safety Occupational Health Specialist	CEHNC	256-895-1240	<a href="mailto:Kennard.E.Jones@usace.army.mil">Kennard.E.Jones@usace.army.mil</a>
Mike D'Auben	Chemist	CEHNC	256-895-1460	<a href="mailto:Michael.J.D'Auben@usace.army.mil">Michael.J.D'Auben@usace.army.mil</a>
Robert Gorman	Project Manager	U.S. Army Garrison - Redstone	256-876-3814	<a href="mailto:robert.p.gorman10.civ@mail.mil">robert.p.gorman10.civ@mail.mil</a>
JoJuan Pressley	Lead Remedial Project Manager	ADEM	334-271-7747	<a href="mailto:Jojuan.Pressley@adem.alabama.gov">Jojuan.Pressley@adem.alabama.gov</a>
Don Burton	Project Manager	APTIM	865-207-1394	<a href="mailto:don.burton@aptim.com">don.burton@aptim.com</a>
Emily Davis	Technical Lead/Regulatory Specialist	APTIM	717-737-1049	<a href="mailto:Emily.davis@aptim.com">Emily.davis@aptim.com</a>
Dennis Seymore	Senior Scientist and Site Technical Lead	APTIM	865-414-6073	<a href="mailto:dennis.seymore@aptim.com">dennis.seymore@aptim.com</a>
Gail Cooley	Subject Matter Expert	APTIM	865-556-1967	<a href="mailto:gail.cooley@aptim.com">gail.cooley@aptim.com</a>
Ray Clark	Subject Matter Expert	APTIM	865-560-7799	<a href="mailto:ray.clark@aptim.com">ray.clark@aptim.com</a>

ADEM – Alabama Department of Environmental Management.

AEC – U.S. Army Environmental Command.

CEHNC – U.S. Army Engineering and Support Center, Huntsville.

See RSA-122/RSA-183 CMIP Scoping Session Memorandum for the scoping session held on September 28, 2021 in Attachment D-1.

## **Worksheet No. 10: Conceptual Site Model**

Corrective measures are required to address elevated concentrations of arsenic in soil warranting action for one or more industrial receptors (RSA-122 and RSA-183) and the hypothetical resident in all subareas of RSA-122 and the Plants Area and the Sinkhole Areas of RSA-183. Wastes remaining in or beneath underground sumps and pits, or other collection features may pose potential sourcing threats to groundwater. COCs in groundwater under RSA-122 and RSA-183 pose a human health threat, but these chemicals will be addressed as part RSA-147 and RSA-148 groundwater unit corrective measures, respectively. The CMI work plan provides the site description, history, and environmental setting for RSA-122 and RSA-183 in Section 1.2 and 1.3, respectively. Chapter 2.0 and 3.0 presents investigations conducted; investigation results; land use considerations; human health and ecological risk results; and contaminant fate and transport; and the final conceptual site model for RSA-122 and RSA-183; respectively. Background site maps are included in the CMI work plan.

## Worksheet No. 11: Project/Data Quality Objectives

Chapter 4.0 of the corrective measures implementation (CMI) work plan provides the decision summary for the corrective measures at RSA-122/RSA-183, including objectives of the corrective measures, cleanup goals (CG), and the need for the corrective measures. The project quality objectives are presented below.

### Step 1. State the Problem

- The Remedial Investigation and revised human health risk assessment concluded that exposure to elevated levels of arsenic in soil at RSA-122 and RSA-183 was found to pose unacceptable risks to industrial and residential receptors. In addition, both sites have small areas where chemical warfare material (CWM) probabilities are designated as "Occasional" and "Seldom." These problems are a result of former Department of Defense (DoD) activities. It should be noted that arsenic is the only COC identified at RSA-122 and RSA-183 (in soil only) that requires cleanup to CGs.
- The corrective measures will also remove relict structures at both sites where the chemical agent lewisite may be present in the rated CWM areas.
- Since cleanup will be conducted to be protective of the industrial worker only, the sites will not meet residential cleanup goals for unrestricted use.
- COCs in groundwater under RSA-122 and RSA-183 require corrective measures; groundwater cleanup will be the responsibility of RSA-147 and RSA-148 groundwater unit, respectively.

### Step 2. Identify the Goal of the Study

- Elevated concentrations of arsenic present in soil above the CGs have been identified as requiring corrective measures to address the unacceptable risks to current and future receptors. Cleanup to CGs protective of the industrial worker will be conducted and will also reduce further impact to groundwater from this constituent in soil at the sites.
- Removal and disposal of relict structures at the sites contaminated with lewisite will reduce potential exposure to chemical agent, reduce leaching of arsenic to groundwater, and potentially allow a reduction in the UXO construction support for chemical agent.
- Perform soil vapor sampling during the corrective measures at RSA-183 to complete the evaluation of vapor intrusion from volatile organic compounds (VOC) present in shallow groundwater.

### Step 3. Identify Informational Inputs

- Table VI.6 of Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act (AHWMMA) Permit indicates that a CMI work plan is required for RSA-122 and RSA-183 soil and groundwater (groundwater is the responsibility of RSA-147 [RSA-122] and RSA-148 [RSA-183]).
- Review of historical documents indicating that sites were used to produce lewisite and associated chemicals during wartime.
- Results of the existing remedial investigations (Shaw, 2007), initial corrective measures/remedial action confirmation sampling (CB&I, 2013; 2015), and the Work-To-Date Summaries (APTIM, 2019).



## Worksheet No. 11: Project/Data Quality Objectives

- Results of the updated risk assessments performed using results from soil samples currently in place and confirmation samples collected during previous cleanup efforts.
- With ADEM as the lead regulator, this changed the acceptable risk levels from the EPA risk range of 1E-4 to 1E-6 to ADEM risk threshold of 1E-5.
- The conceptual site model (CSM) for RSA-122 and RSA-183.
- Existing quality control (QC) and quality assurance (QA) records of data quality checks.

### Step 4. Define the Boundaries of the Study

- Study boundaries for the COC in soil (arsenic) were defined in the RI and subsequently refined during the initial corrective measures confirmation sampling, which was conducted in accordance with the Department's Alabama Environmental Investigation and Remediation Guidance (AEIRG).
- Study boundaries for VOC hot spots in groundwater were defined in the RI.
- Based on site history and existing data collected, the current site boundary includes historical site features.
- The historical site features have been identified as release points for potential contaminants (arsenic and chemical agent).
- Potential locations where releases of arsenic and chemical agent are present have been defined.
- Corrective measures will be conducted for elevated arsenic concentrations in soil until the confirmatory sample results are less than or equal to the CGs. The CGs have been established in the corrective measures study and summarized in the CMI work plan.
- Because of the high quality of the habitat in the Creek area of RSA-122 and the Sinkhole area of RSA-183, residual risks to human health, which are limited to risks to residential receptors, will be managed with land-use controls (LUC) only.

### Step 5. Develop the Analytic Decision Approach

- The corrective measures will include confirmatory soil sampling in accordance with the Department's AEIRG for analysis of arsenic to determine the effectiveness of the selected alternative.
- If review of the confirmatory soil sampling data indicates the CGs have not been achieved, additional soil removal will be implemented to meet the CGs.
- If review of the confirmatory soil sampling data indicates the CGs have been achieved, no further soil removal will be conducted, as the stated corrective measures objectives will be met.
- Soils determined to be hazardous will undergo stabilization procedures on site prior to retesting and disposal based on the results of the TCLP testing for the stabilized waste.
- The corrective measures will also include LUCs based on cleanup protective of the industrial worker and not protective of a hypothetical resident for unrestricted use. LUCs will also be established for areas of the site retaining elevated CWM probabilities.

## Worksheet No. 11: Project/Data Quality Objectives

- Soil gas samples will be collected near monitoring well E-RS1367 to be used to support a vapor intrusion evaluation

### Step 6. Specify Performance or Acceptance Criteria

- Selected definable features of work and tasks will achieve the performance criteria specified in the CMI work plan and supporting documents.
- Soil samples collected will be analyzed by an Environmental Laboratory Accreditation Program (ELAP) certified subcontracted laboratory for the COCs (arsenic and associated metals required for site to background evaluation).
- Chemical agent will be screened on-site for soil removed in CWM-rated areas and confirmed at CCD-CBC fixed-based laboratory.
- Analytical results generated by off-site laboratories will be evaluated using procedures outlined in the Quality Assurance Project Plan portion of the CMI work plan to ensure they are suitable for final decision making.
- Soil/soil vapor sample results will be reviewed by the APTIM Project Chemist or as delegated and the U.S. Army Engineering and Support Center, Huntsville (CEHNC) Chemist.
- Analytical results from waste characterization samples including post-stabilization samples will be submitted to the off-site disposal facility to meet the applicable waste profile package requirements for disposal.
- Soils from P012 listed waste areas will be disposed of as hazardous waste.

### Step 7. Develop/Optimize the Plan for Obtaining Data

- Only qualified personnel will perform corrective measures activities.
- Requirements of the CMI work plan will be subjected to QC and QA reviews.

ADEM – Alabama Department of Environmental Management

AEIRG - Alabama Environmental Investigation and Remediation Guidance.

AHWMMA - Alabama Hazardous Wastes Management and Minimization Act.

CG – Cleanup goal.

CEHNC – U.S. Army Engineering and Support Center, Huntsville

CMI – Corrective measures implementation.

COC – Chemical of concern.

CSM – Conceptual site model.

CWM – Chemical warfare materiel.

DOD – U.S. Department of Defense.

ELAP - Environmental Laboratory Accreditation Program.

LUC – Land-use control.

QA – Quality assurance.

QC – Quality control

RI – Remedial investigation

TCLP – Toxicity characteristic leaching procedure.

UXO – Unexploded ordnance.

VOC – Volatile organic compound.

**Worksheet 12-1– Measurement Performance Criteria – Volatile Organic Compounds (Soil)**

Matrix	Soil				
Analytical Group	Volatile Organic Compounds (VOCs)				
Concentration Level	Low				
Sampling Procedure SOP	Analytical Method/SOP <sup>1</sup>	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Soil: SOP 6.0	SW8260C / VO004	Overall Precision	RPD ≤ 20% when detected in both samples ≥ sample-specific LOQ	Field Duplicates	S
		Analytical Precision (laboratory)	RPD ≤ 20%	Laboratory Sample Duplicates	A
		Analytical Accuracy/Bias (laboratory)	Analyte-specific (QSM)	Laboratory Control Samples	A
		Analytical Accuracy/Bias (matrix interference)	Analyte-specific (QSM)	Matrix Spike Duplicates	S&A
		Overall accuracy/bias (contamination)	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Equipment Blanks	S
		Sensitivity	Laboratory compliance with DoD QSM 5.3 guidance for updating DL, LOD, and LOQ values	LOQ verification sample (spiked at LOQ)	A
		Completeness	See Worksheet #No. 34	See Worksheet #No.34	

**Worksheet 12-2– Measurement Performance Criteria – Semivolatile Organic Compounds (Soil)**

Matrix	Soil				
Analytical Group	Semi-Volatile Organic Compounds (SVOCs)				
Concentration Level	Low				
Sampling Procedure SOP	Analytical Method/SOP <sup>1</sup>	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Soil: SOP 6.0	SW8270D / 8270 SIM / SV006, SV007	Overall Precision	RPD ≤ 20% when detected in both samples ≥ sample-specific LOQ	Field Duplicates	S
		Analytical Precision (laboratory)	RPD ≤ 20%	Laboratory Sample Duplicates	A
		Analytical Accuracy/Bias (laboratory)	Analyte-specific (QSM)	Laboratory Control Samples	A
		Analytical Accuracy/Bias (matrix interference)	Analyte-specific (QSM)	Matrix Spike Duplicates	S&A
		Overall accuracy/bias (contamination)	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Equipment Blanks	S
		Sensitivity	Laboratory compliance with DoD QSM 5.3 guidance for updating DL, LOD, and LOQ values	LOQ verification sample (spiked at LOQ)	A
		Completeness	See Worksheet #No. 34	See Worksheet #No. 34	

**Worksheet 12-3– Measurement Performance Criteria – Pesticides/PCBs (Soil)**

Matrix	Soil				
Analytical Group	Pesticides / PCBs (SVOCs)				
Concentration Level	Low				
Sampling Procedure SOP	Analytical Method/SOP <sup>1</sup>	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Soil SOP 6.0:	8081B/8082A / SV002, SV004	Overall Precision	RPD ≤ 30% when detected in both samples ≥ sample-specific LOQ	Field Duplicates	S
		Analytical Precision (laboratory)	RPD ≤ 30%	Laboratory Sample Duplicates	A
		Analytical Accuracy/Bias (laboratory)	Analyte-specific (QSM)	Laboratory Control Samples	A
		Analytical Accuracy/Bias (matrix interference)	Analyte-specific (QSM)	Matrix Spike Duplicates	S&A
		Overall accuracy/bias (contamination)	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Equipment Blanks	S
		Sensitivity	Laboratory compliance with DoD QSM 5.3 guidance for updating DL, LOD, and LOQ values	LOQ verification sample (spiked at LOQ)	A
		Completeness	See Worksheet #No. 34	See Worksheet #No. 34	

**Worksheet 12-4– Measurement Performance Criteria – Metals (Soil)**

Matrix	Soil				
Analytical Group	Metals				
Concentration Level	Low				
Sampling Procedure SOP	Analytical Method/SOP <sup>1</sup>	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Soil: 6.0	6010C/7470A/7471B / MT009, MT012	Overall Precision	RPD ≤ 20% when detected in both samples ≥ sample-specific LOQ	Field Duplicates	S
		Analytical Precision (laboratory)	RPD ≤ 20%	Laboratory Sample Duplicates	A
		Analytical Accuracy/Bias (laboratory)	Analyte-specific (QSM)	Laboratory Control Samples	A
		Analytical Accuracy/Bias (matrix interference)	Analyte-specific (QSM)	Matrix Spike Duplicates	S&A
		Overall accuracy/bias (contamination)	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Equipment Blanks	S
		Sensitivity	Laboratory compliance with DoD QSM 5.3 guidance for updating DL, LOD, and LOQ values	LOQ verification sample (spiked at LOQ)	A
		Completeness	See Worksheet # No.34	See Worksheet #No. 34	

**Worksheet 12-5– Measurement Performance Criteria – Volatile Organic Compounds (Air)**

Matrix	Air				
Analytical Group	Volatile Organic Compounds (VOCs)				
Concentration Level	Low				
Sampling Procedure SOP	Analytical Method/SOP <sup>1</sup>	Data Quality Indicators	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Air:	TO-15	Overall Precision	RPD ≤ 20% when detected in both samples ≥ sample-specific LOQ	Field Duplicates	S
		Analytical Precision (laboratory)	RPD ≤ 25%	Laboratory Sample Duplicates	A
		Analytical Accuracy/Bias (laboratory)	Analyte-specific (QSM)	Laboratory Control Samples	A
		Analytical Accuracy/Bias (matrix interference)	Analyte-specific (QSM)	NA	NA
		Overall accuracy/bias (contamination)	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Equipment Blanks	S
		Sensitivity	Laboratory compliance with DoD QSM 5.3 guidance for updating DL, LOD, and LOQ values	LOQ verification sample (spiked at LOQ)	A
		Completeness	See Worksheet #34	See Worksheet #34	

### Worksheet No. 13: Secondary Data Uses and Limitations

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
Data collected during and prior to the RIs (Shaw 2007a, b).	<p>Shaw Environmental, Inc. (Shaw), 2007a, <i>Final Remedial Investigation Report, Baseline Human Health Risk Assessment and Screening-Level Ecological Risk Assessment, RSA-122 Dismantled Lewisite Manufacturing Plant, Operable Unit 6, Redstone Arsenal, Madison County, Alabama</i>, Revision 1, September.</p> <p>Shaw Environmental, Inc. (Shaw), 2007b, <i>Final Remedial Investigation Report, Baseline Human Health Risk Assessment and Screening-Level Ecological Risk Assessment, RSA-183 (Formerly Part of RSA-49), Former Lewisite Plants 1 and 2, Operable Unit 5, Redstone Arsenal, Madison County, Alabama</i>, Revision 1, September.</p>	Refer to Section 2.1 and 3.1 in the CMI Work Plan	Previous data collected for these sites were reviewed in Chapter 3 and Table 3-1 of the RIs for usability in the corrective measures.	All usable data brought forward for the CMI work plan have been validated; therefore, no restrictions on data use have been identified.

**Data Limitations and Actions from Usability:**

After all data evaluations are completed, any limitations on the use of data will be known to the planning team and will be considered during decision making for the corrective measures planning.



## **Worksheet Nos. 14 and 16: Project Tasks and Schedule**

The project tasks are presented in Chapter 5 of the RSA-122/RSA-183 corrective measures implementation work plan and the construction quality assurance plan (Appendix H). Appendix C in the corrective measures implementation plan contains the project schedule.

## Worksheet No. 15 Reference Limits and Evaluation Tables

### SOIL TABLES

### Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-1-1 – Soil Volatile Organic Compounds (VOC)						
Matrix: Soil Analytical Group: VOC - SW8260B Concentration: Low	CAS Number	Soil BSV <sup>b</sup> (mg/kg)	Redstone-Specific Soil PSV <sup>c</sup> ca - $1 \times 10^{-6}$ ; nc - HI = 0.1 (ug/kg)	Laboratory-Specific <sup>a</sup>		
				DL (ug/kg)	LOD (ug/kg)	LOQ (ug/kg)
Analyte						
<b>TCL VOCs</b>						
1,1,1-Trichloroethane (1,1,1-TCA)	71-55-6	---	8.10E+05	16	50	100
1,1,2,2-Tetrachloroethane	79-34-5	---	6.00E+02	21	50	100
1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-113; Freon 113)	76-13-1	---	6.70E+05	30	50	200
1,1,2-Trichloroethane	79-00-5	---	1.50E+02	12	50	100
1,1-Dichloroethane (1,1-DCA)	75-34-3	---	3.60E+03	7	25	50
1,1-Dichloroethene (1,1-DCE)	75-35-4	---	2.30E+04	21	50	100
1,2,4-Trichlorobenzene	120-82-1	---	5.80E+03	17	50	100
1,2-Dichlorobenzene	95-50-1	---	1.80E+05	15	50	100
1,2-Dichloroethane (EDC)	107-06-2	---	4.60E+02	22	50	100
1,2-Dichloropropane	78-87-5	---	1.60E+03	26	50	100
1,3-Dichlorobenzene	541-73-1	---	NSV	14	25	50
1,4-Dichlorobenzene	106-46-7	---	2.60E+03	15	50	100
2-Butanone (Methyl ethyl ketone; MEK)	78-93-3	---	2.70E+06	400	1000	2000
2-Hexanone (Methyl butyl ketone; MBK)	591-78-6	---	2.00E+04	200	500	1000
4-Methyl-2-pentanone (Methyl isobutyl ketone; MIBK)	108-10-1	---	3.30E+06	180	500	1000
Acetone	67-64-1	---	6.10E+06	400	1000	2000
Benzene	71-43-2	---	1.20E+03	11	25	50
Bromodichloromethane (Dichlorobromomethane; DBCM)	75-27-4	---	2.90E+02	14	25	50
Bromoform	75-25-2	---	1.90E+04	60	100	200
Bromomethane	74-83-9	---	6.80E+02	90	200	400
Carbon Disulfide	75-15-0	---	7.70E+04	40	100	200

### Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-1-1 – Soil Volatile Organic Compounds (VOC)						
Matrix: Soil Analytical Group: VOC - SW8260B Concentration: Low	CAS Number	Soil BSV <sup>b</sup> (mg/kg)	Redstone-Specific Soil PSV <sup>c</sup> ca - $1 \times 10^{-6}$ ; nc - HI = 0.1 (ug/kg)	Laboratory-Specific <sup>a</sup>		
				DL (ug/kg)	LOD (ug/kg)	LOQ (ug/kg)
Analyte						
Carbon Tetrachloride	56-23-5	---	6.50E+02	14	25	100
Chlorobenzene	108-90-7	---	2.80E+04	10	25	50
Chloroethane	75-00-3	---	1.40E+06	30	50	100
Chloroform	67-66-3	---	3.20E+02	16	50	100
Chloromethane	74-87-3	---	1.10E+04	30	50	100
cis-1,2-Dichloroethene (cis-1,2-DCE)	156-59-2	---	1.60E+04	27	50	100
cis-1,3-Dichloropropene	10061-01-5	---	1.80E+03	14	25	50
Dibromochloromethane	124-48-1	---	8.30E+03	40	100	200
Dichlorodifluoromethane	75-71-8	---	8.70E+03	50	100	200
Ethylbenzene	100-41-4	---	5.80E+03	11	25	50
Methyl Tertiary Butyl Ether (MTBE)	1634-04-4	---	4.70E+04	16	50	100
Methylene Chloride, or Dichloromethane	75-09-2	---	3.50E+04	60	100	400
Styrene	100-42-5	---	6.00E+05	16	50	100
Tetrachloroethene (PCE; PERC)	127-18-4	---	8.10E+03	11	25	50
Toluene	108-88-3	---	4.90E+05	16	50	100
trans-1,2-Dichloroethene (trans-1,2-DCE)	156-60-5	---	7.0E+03	14	25	50
trans-1,3-Dichloropropene	10061-02-6	---	1.80E+03	40	100	200
Trichloroethene (TCE)	79-01-6	---	4.10E+02	19	50	100
Trichlorofluoromethane	75-69-4	---	2.30E+06	40	100	200
Vinyl Chloride (VC)	75-01-4	---	5.90E+01	19	50	100
Xylenes (Total)	1330-20-7	---	5.80E+04	25	50	100

## Worksheet No. 15 Reference Limits and Evaluation Tables

<sup>a</sup> Detection Limit (DL), Limit of Detection (LOD), and Limit of Quantitation (LOQ) are provided by CT laboratory.

**Bold font** – DL is greater than the selected PSV.

\* LOQ is greater than the selected PSV.

**Bold font** – Chemical is considered to be a chemical of potential analytical concern (COPAC).

To determine preliminary COPACs, an evaluation is performed on whether the DL is above the PSV (ADEM Admin. Code R. 335-14). If the DL for the chemical is greater than the PSV, then the chemical is flagged as a preliminary COPAC. For metals, if PSVs are lower than BSVs, the PSV will equal the BSV. Further evaluation of whether corrective actions for analytical methods are needed will be performed for preliminary COPACs in site-specific field sampling plans. This evaluation, if needed, is presented on Worksheet No. 11.

<sup>b</sup> BSV - Background screening value is the lower of the surface or subsurface soil BSV. Gannett Fleming, Inc. and Shaw Environmental, Inc., 2010, *Final Supplemental Installation-Wide Background Soil Study, Redstone Arsenal, Madison County, Alabama*, Prepared for the U.S. Army Corps of Engineers, Savannah District, September.

<sup>c</sup> The preliminary screening value (PSV) is the most conservative residential soil regional screening level (RSL), adjusted, if necessary, to reflect a cancer risk of 1E-6 or an HI of 0.1 (EPA, 2021, *Regional Screening Levels for Chemical Contaminants at Superfund Sites*, May).

ca – Carcinogen.

nc – Noncarcinogen; HI – Hazard index.

NSV – No screening value. Compounds without screening values are evaluated in site-specific reports semi-quantitatively through a consideration of the frequency and magnitude of any positive detections. Although surrogate toxicity data are not applied directly, chemicals with no screening values will also be evaluated by considering the relative frequency and magnitude of detected results for structurally similar surrogates or chemicals within the same analytical class (e.g., PAHs, or phthalates).

mg/kg - Milligrams per kilogram.

### Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-1-2 – Soil Semivolatile Organic Compounds (SVOC)						
Matrix: Soil Analytical Group: SVOC - SW8270D Concentration: Low	CAS Number	Soil BSV <sup>b</sup> (mg/kg)	Redstone-Specific Soil PSV <sup>c</sup> ca - $1 \times 10^{-6}$ ; nc - HI = 0.1 (ug/kg)	Laboratory-Specific <sup>a</sup>		
				DL (ug/kg)	LOD (ug/kg)	LOQ (ug/kg)
Analyte						
<b>TCL SVOCs</b>						
2,4,5-Trichlorophenol	95-95-4	---	6.30E+05	130	300	600
2,4,6-Trichlorophenol (TCP)	88-06-2	---	6.30E+03	130	300	600
2,4-Dichlorophenol (DCP)	120-83-2	---	1.90E+04	130	300	600
2,4-Dimethylphenol	105-67-9	---	1.30E+05	99	300	600
2,4-Dinitrophenol	51-28-5	---	1.30E+04	270	600	1000
2,4-Dinitrotoluene (DNT)	121-14-2	---	1.70E+03	24	60	120
2,6-Dinitrotoluene	606-20-2	---	3.60E+02	24	60	120
2-Chloronaphthalene	91-58-7	---	4.80E+05	23	60	120
2-Chlorophenol	95-57-8	---	3.90E+04	340	600	2000
2-Methylnaphthalene	91-57-6	---	2.40E+04	25	60	120
2-Methylphenol (o-Cresol)	95-48-7	---	3.20E+05	420	600	2000
2-Nitroaniline	88-74-4	---	6.30E+04	23	60	120
2-Nitrophenol (ONP)	88-75-5	---	NSV	280	300	1000
3,3'-Dichlorobenzidine (DCB)	91-94-1	---	1.20E+03	150	300	500
3-Nitroaniline	99-09-2	---	NSV	22	120	200
4,6-Dinitro-2-methylphenol (DNOC)	534-52-1	---	5.10E+02	270	300	1000
4-Bromophenyl phenyl ether	101-55-3	---	NSV	25	60	120
4-Chloro-3-methylphenol	59-50-7	---	6.30E+05	380	600	2000
4-Chloroaniline	106-47-8	---	2.70E+03	39	60	200
4-Chlorophenyl phenyl ether	7005-72-3	---	NSV	26	60	120
4-Methylphenol (p-Cresol)	106-44-5	---	6.30E+05	650	1080	3600

### Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-1-2 – Soil Semivolatile Organic Compounds (SVOC)						
Matrix: Soil Analytical Group: SVOC - SW8270D Concentration: Low	CAS Number	Soil BSV <sup>b</sup> (mg/kg)	Redstone-Specific Soil PSV <sup>c</sup> ca - $1 \times 10^{-6}$ ; nc - HI = 0.1 (ug/kg)	Laboratory-Specific <sup>a</sup>		
				DL (ug/kg)	LOD (ug/kg)	LOQ (ug/kg)
Analyte						
4-Nitroaniline (PNA)	100-01-6	---	2.50E+04	30	60	120
4-Nitrophenol (PNP)	100-02-7	---	NSV	400	600	2000
Acenaphthene	83-32-9	---	3.60E+03	24	60	120
Acenaphthylene	208-96-8	---	1.80E+05	24	60	120
Anthracene	120-12-7	---	1.80E+06	24	60	120
Benzo(a)anthracene	56-55-3	---	1.10E+03	25	60	120
Benzo(a)pyrene	50-32-8	---	1.10E+02	15	60	120
Benzo(b)fluoranthene	205-99-2	---	1.10E+03	25	60	120
Benzo(g,h,i)perylene	191-24-2	---	1.80E+05	22	60	120
Benzo(k)fluoranthene	207-08-9	---	1.10E+04	25	60	120
bis(2-Chloroethoxy)methane	111-91-1	---	1.90E+04	23	60	120
bis(2-Chloroethyl)ether (BCEE)	111-44-4	---	2.30E+02	25	60	120
Bis(2-chloroisopropyl)ether, or 2,2'-oxybis (1-Chloropropane)	108-60-1	---	3.10E+05	30	60	120
bis(2-Ethylhexyl)phthalate (BEHP)	117-81-7	---	3.90E+04	87	120	400
Butyl benzyl phthalate (BBP)	85-68-7	---	2.90E+05	73	120	400
Carbazole	86-74-8	---	NSV	28	60	120
Chrysene	218-01-9	---	1.10E+05	25	60	120
Dibenz(a,h)anthracene	53-70-3	---	1.10E+02	13	60	120
Dibenzofuran (DBF)	132-64-9	---	7.80E+03	24	60	120
Diethyl phthalate (DEP)	84-66-2	---	5.10E+06	64	120	400
Dimethyl phthalate (DMP)	131-11-3	---	NSV	63	120	400

### Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-1-2 – Soil Semivolatile Organic Compounds (SVOC)						
Matrix: Soil Analytical Group: SVOC - SW8270D Concentration: Low	CAS Number	Soil BSV <sup>b</sup> (mg/kg)	Redstone-Specific Soil PSV <sup>c</sup> ca - $1 \times 10^{-6}$ ; nc - HI = 0.1 (ug/kg)	Laboratory-Specific <sup>a</sup>		
				DL (ug/kg)	LOD (ug/kg)	LOQ (ug/kg)
Analyte						
Di-n-butyl phthalate (DBP)	84-74-2	---	6.30E+05	79	120	400
Di-n-octyl phthalate (DNOP)	117-84-0	---	6.30E+04	59	60	200
Fluoranthene	206-44-0	---	2.40E+05	26	60	120
Fluorene	86-73-7	---	2.40E+05	25	60	120
Hexachlorobenzene (HCB)	118-74-1	---	2.10E+02	28	60	120
Hexachlorobutadiene (HCBd)	87-68-3	---	1.20E+03	62	120	400
Hexachlorocyclopentadiene (HCCPD)	77-47-4	---	1.80E+02	52	120	200
Hexachloroethane (HCE)	67-72-1	---	1.80E+03	33	60	120
Indeno(1,2,3-cd)pyrene	193-39-5	---	1.10E+03	23	60	120
Isophorone	78-59-1	---	5.70E+05	50	60	200
Naphthalene	91-20-3	---	2.00E+03	21	60	120
Nitrobenzene	98-95-3	---	5.10E+03	59	60	200
N-Nitroso-di-n-propylamine (NDPA)	621-64-7	---	7.80E+01	70	120	400
N-Nitrosodiphenylamine (NDPHA)	86-30-6	---	1.10E+05	50	120	240
Pentachlorophenol	87-86-5	---	1.00E+03	240	300	1000
Phenanthrene	85-01-8	---	1.80E+05	26	60	120
Phenol	108-95-2	---	1.90E+06	160	300	600
Pyrene	129-00-0	---	1.80E+05	26	60	120

**NOTE: Detection limits require samples with a minimum of 60% solids – anything less will exceed lowest specified detection limits.**

<sup>a</sup> Detection Limit (DL), Limit of Detection (LOD), and Limit of Quantitation (LOQ) are provided by CT laboratory.

**Bold font** – DL is greater than the selected PSV.



## Worksheet No. 15 Reference Limits and Evaluation Tables

\* LOQ is greater than the selected PSV.

**Bold font** – Chemical is considered to be a chemical of potential analytical concern (COPAC).

To determine preliminary COPACs, an evaluation is performed on whether the DL is above the PSV (ADEM Admin. Code R. 335-14). If the DL for the chemical is greater than the PSV, then the chemical is flagged as a preliminary COPAC. For metals, if PSVs are lower than BSVs, the PSV will equal the BSV. Further evaluation of whether corrective actions for analytical methods are needed will be performed for preliminary COPACs in site-specific field sampling plans. This evaluation, if needed, is presented on Worksheet No. 11.

<sup>b</sup> BSV - Background screening value is the lower of the surface or subsurface soil BSV. Gannett Fleming, Inc. and Shaw Environmental, Inc., 2010, *Final Supplemental Installation-Wide Background Soil Study, Redstone Arsenal, Madison County, Alabama*, Prepared for the U.S. Army Corps of Engineers, Savannah District, September.

<sup>c</sup> The preliminary screening value (PSV) is the most conservative residential soil regional screening level (RSL), adjusted, if necessary, to reflect a cancer risk of 1E-6 or an HI of 0.1 (EPA, 2021 *Regional Screening Levels for Chemical Contaminants at Superfund Sites*, May).

Acenaphthylene, benzo(g,h,i)perylene, and phenanthrene using pyrene as a surrogate.

ca – Carcinogen.

nc – Noncarcinogen; HI – Hazard index.

NSV – No screening value. Compounds without screening values are evaluated in site-specific reports semi-quantitatively through a consideration of the frequency and magnitude of any positive detections. Although surrogate toxicity data are not applied directly, chemicals with no screening values will also be evaluated by considering the relative frequency and magnitude of detected results for structurally similar surrogates or chemicals within the same analytical class (e.g., PAHs, or phthalates).

mg/kg - Milligrams per kilogram.

### Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-1-3 – Soil Organochlorine Pesticides						
Matrix: Soil Analytical Group: Pesticides- SW8081B Concentration: Low	CAS Number	Soil BSV <sup>b</sup> (mg/kg)	Redstone-Specific Soil PSV <sup>c</sup> ca - $1 \times 10^{-6}$ ; nc - HI = 0.1 (ug/kg)	Laboratory-Specific <sup>a</sup>		
				DL (ug/kg)	LOD (ug/kg)	LOQ (ug/kg)
Analyte						
<b>TCL Pesticides</b>						
4,4'-DDD	72-54-8	---	1.90E+02	0.30	1.00	2.00
4,4'-DDE	72-55-9	---	2.00E+03	0.30	1.00	2.00
4,4'-DDT	50-29-3	---	1.90E+03	0.50	1.00	2.00
Aldrin	309-00-2	---	3.90E+01	0.50	1.00	2.00
alpha-BHC (alpha-HCH)	319-84-6	---	8.60E+01	0.60	2.00	4.00
alpha-Chlordane	5103-71-9	---	3.6E+03	0.30	1.00	2.00
beta-BHC (beta-HCH)	319-85-7	---	3.00E+02	0.60	2.00	4.00
delta-BHC (delta-HCH)	319-86-8	---	5.70E+02	0.30	1.00	2.00
Dieldrin	60-57-1	---	3.40E+01	0.30	1.00	2.00
Endosulfan I	959-98-8	---	4.70E+04	0.70	2.00	4.00
Endosulfan II	33213-65-9	---	4.70E+04	0.30	1.00	2.00
Endosulfan sulfate	1031-07-8	---	3.80E+04	0.90	2.00	4.00
Endrin	72-20-8	---	1.90E+03	0.40	1.00	2.00
Endrin aldehyde	7421-93-4	---	1.90E+03	1.10	2.00	4.00
Endrin ketone	53494-70-5	---	1.90E+03	0.80	2.00	4.00
gamma-Chlordane	5103-74-2	---	3.6E+03	0.30	1.00	2.00
Heptachlor	76-44-8	---	1.30E+02	0.40	1.00	2.00
Heptachlor epoxide	1024-57-3	---	7.00E+01	0.50	1.00	2.00
gamma-BHC (Lindane; gamma-HCH)	58-89-9	---	5.70E+02	0.50	1.00	2.00
Methoxychlor	72-43-5	---	3.20E+04	0.70	2.00	4.00

## Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-1-3 – Soil Organochlorine Pesticides						
<b>Matrix: Soil</b> <b>Analytical Group: Pesticides- SW8081B</b> <b>Concentration: Low</b>	CAS Number	Soil BSV <sup>b</sup> (mg/kg)	Redstone-Specific Soil PSV <sup>c</sup> ca - $1 \times 10^{-6}$ ; nc - HI = 0.1 (ug/kg)	Laboratory-Specific <sup>a</sup>		
				DL (ug/kg)	LOD (ug/kg)	LOQ (ug/kg)
Analyte						
Toxaphene	8001-35-2	---	4.90E+02	9	20	40

<sup>a</sup> Detection Limit (DL), Limit of Detection (LOD), and Limit of Quantitation (LOQ) are provided by CT laboratory.

**Bold font** – DL is greater than the selected PSV.

\* LOQ is greater than the selected PSV.

**Bold font** – Chemical is considered to be a chemical of potential analytical concern (COPAC).

To determine preliminary COPACs, an evaluation is performed on whether the DL is above the PSV (ADEM Admin. Code R. 335-14). If the DL for the chemical is greater than the PSV, then the chemical is flagged as a preliminary COPAC. For metals, if PSVs are lower than BSVs, the PSV will equal the BSV. Further evaluation of whether corrective actions for analytical methods are needed will be performed for preliminary COPACs in site-specific field sampling plans. This evaluation, if needed, is presented on Worksheet No. 11.

<sup>b</sup> BSV - Background screening value is the lower of the surface or subsurface soil BSV. Gannett Fleming, Inc. and Shaw Environmental, Inc., 2010, *Final Supplemental Installation-Wide Background Soil Study, Redstone Arsenal, Madison County, Alabama*, Prepared for the U.S. Army Corps of Engineers, Savannah District, September.

<sup>c</sup> The preliminary screening value (PSV) is the most conservative residential soil regional screening level (RSL), adjusted, if necessary, to reflect a cancer risk of 1E-6 or an HI of 0.1 (EPA, 2021, *Regional Screening Levels for Chemical Contaminants at Superfund Sites*, May).

The noncancer RSL for gamma-BHC (Lindane) at an HI of 0.1 is adopted as the PSV for delta-BHC.

The PSV for endosulfan is adopted as the PSV for endosulfan I and endosulfan II.

The PSV for endrin is adopted as the PSV for endrin aldehyde and endrin ketone.

ca – Carcinogen.

nc – Noncarcinogen; HI – Hazard index.

NSV – No screening value. Compounds without screening values are evaluated in site-specific reports semi-quantitatively through a consideration of the frequency and magnitude of any positive detections. Although surrogate toxicity data are not applied directly, chemicals with no screening values will also be evaluated by considering the relative frequency and magnitude of detected results for structurally similar surrogates or chemicals within the same analytical class (e.g., PAHs, or phthalates).

mg/kg - Milligrams per kilogram.

## Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-1-4 - Soil Polychlorinated Biphenyls (PCB)						
<b>Matrix: Soil</b> <b>Analytical Group: PCBs - SW8082A</b> <b>Concentration: Low</b>	CAS Number	Soil BSV <sup>b</sup> (mg/kg)	Redstone-Specific Soil PSV <sup>c</sup> ca - $1 \times 10^{-6}$ ; nc - HI = 0.1 (ug/kg)	Laboratory-Specific <sup>a</sup>		
				DL (ug/kg)	LOD (ug/kg)	LOQ (ug/kg)
Analyte						
<b>TCL PCBs</b>						
Aroclor-1016	12674-11-2	---	4.1E+02	5	20	30
Aroclor-1221	11104-28-2	---	2.0E+02	7	20	30
Aroclor-1232	11141-16-5	---	1.7E+02	9	20	30
Aroclor-1242	53469-21-9	---	2.3E+02	7	20	30
Aroclor-1248	12672-29-6	---	2.3E+02	7	20	30
Aroclor-1254	11097-69-1	---	1.2E+02	9	20	30
Aroclor-1260	11096-82-5	---	2.4E+02	6	20	30

<sup>a</sup> Detection Limit (DL), Limit of Detection (LOD), and Limit of Quantitation (LOQ) are provided by CT laboratory.

**Bold font** – DL is greater than the selected PSV.

\* LOQ is greater than the selected PSV.

**Bold font** – Chemical is considered to be a chemical of potential analytical concern (COPAC).

To determine preliminary COPACs, an evaluation is performed on whether the DL is above the PSV (ADEM Admin. Code R. 335-14). If the DL for the chemical is greater than the PSV, then the chemical is flagged as a preliminary COPAC. For metals, if PSVs are lower than BSVs, the PSV will equal the BSV. Further evaluation of whether corrective actions for analytical methods are needed will be performed for preliminary COPACs in site-specific field sampling plans. This evaluation, if needed, is presented on Worksheet No. 11.

<sup>b</sup> BSV - Background screening value is the lower of the surface or subsurface soil BSV. Gannett Fleming, Inc. and Shaw Environmental, Inc., 2010, *Final Supplemental Installation-Wide Background Soil Study, Redstone Arsenal, Madison County, Alabama*, Prepared for the U.S. Army Corps of Engineers, Savannah District, September.

<sup>c</sup> The preliminary screening value (PSV) is the most conservative residential soil regional screening level (RSL), adjusted, if necessary, to reflect a cancer risk of 1E-6 or an HI of 0.1 (EPA, 2021, *Regional Screening Levels for Chemical Contaminants at Superfund Sites*, May).

ca – Carcinogen.

nc – Noncarcinogen; HI – Hazard index.

NSV – No screening value. Compounds without screening values are evaluated in site-specific reports semi-quantitatively through a consideration of the frequency and magnitude of any positive detections. Although surrogate toxicity data are not applied directly, chemicals with no screening values will also be evaluated by considering the relative frequency and magnitude of detected results for structurally similar surrogates or chemicals within the same analytical class (e.g., PAHs, or phthalates).

mg/kg - Milligrams per kilogram.

### Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-1-5 - Soil Target Analyte List (TAL) Metals						
Matrix: Soil Analytical Group: TAL Metals – 6010C Analytical Group: Mercury - 7470A/7471B Concentration: Low Analyte	CAS Number	Soil BSV <sup>b</sup> (mg/kg)	Redstone-Specific Soil PSV <sup>c</sup> ca - $1 \times 10^{-6}$ ; nc - HI = 0.1 (mg/kg)	Laboratory-Specific <sup>a</sup>		
				DL (mg/kg)	LOD (mg/kg)	LOQ (mg/kg)
<b>TAL Metals</b>						
Aluminum	7429-90-5	40673	7.70E+03	0.04	0.12	0.24
Antimony	7440-36-0	9	3.10E+00	0.13	0.40	0.80
Arsenic	7440-38-2	15	6.80E-01	0.13	0.40	0.80
Barium	7440-39-3	115	1.50E+03	0.009	0.025	0.050
Beryllium	7440-41-7	1	1.60E+01	0.004	0.012	0.040
Cadmium	7440-43-9	1	7.10E+00	0.006	0.020	0.040
Calcium	7440-70-2	3513	Nutrient	0.24	0.70	1.40
Chromium, total	7440-47-3	97	3.00E-01	0.023	0.070	0.140
Cobalt	7440-48-4	14	2.30E+00	0.04	0.12	0.24
Copper	7440-50-8	21	3.10E+02	0.07	0.20	0.40
Iron	7439-89-6	58199	5.50E+03	0.3	0.9	1.8
Lead	7439-92-1	36	4.00E+02	0.04	0.125	0.25
Magnesium	7439-95-4	1581	Nutrient	0.14	0.40	0.80
Manganese	7439-96-5	1254	1.80E+02	0.025	0.075	0.150
Mercury	7439-97-6	0.13	2.30E+00	0.0021	0.0042	0.0083
Nickel	7440-02-0	21	1.50E+02	0.021	0.060	0.120
Potassium	7440-09-7	1510	Nutrient	4	12	24
Selenium	7782-49-2	1	3.90E+01	0.06	0.20	0.40
Silver	7440-22-4	2	3.90E+01	0.017	0.050	0.100
Sodium	7440-23-5	716	Nutrient	0.0021	0.0042	0.0083

## Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-1-5 - Soil Target Analyte List (TAL) Metals						
<b>Matrix: Soil</b> <b>Analytical Group: TAL Metals – 6010C</b> <b>Analytical Group: Mercury - 7470A/7471B</b> <b>Concentration: Low</b>	CAS Number	Soil BSV <sup>b</sup> (mg/kg)	Redstone-Specific Soil PSV <sup>c</sup> ca - $1 \times 10^{-6}$ ; nc - HI = 0.1 (mg/kg)	Laboratory-Specific <sup>a</sup>		
				DL (mg/kg)	LOD (mg/kg)	LOQ (mg/kg)
Analyte						
Thallium	7440-28-0	2	7.80E-02	0.08	0.24	0.48
Vanadium	7440-62-2	131	3.90E+01	0.012	0.040	0.080
Zinc	7440-66-6	123	2.30E+03	0.05	0.15	0.30

<sup>a</sup> Detection Limit (DL), Limit of Detection (LOD), and Limit of Quantitation (LOQ) are provided by CT laboratory.

**Bold font** – DL is greater than the selected PSV.

\* LOQ is greater than the selected PSV.

**Bold font** – Chemical is considered to be a chemical of potential analytical concern (COPAC).

To determine preliminary COPACs, an evaluation is performed on whether the DL is above the PSV (ADEM Admin. Code R. 335-14). If the DL for the chemical is greater than the PSV, then the chemical is flagged as a preliminary COPAC. For metals, if PSVs are lower than BSVs, the PSV will equal the BSV. Further evaluation of whether corrective actions for analytical methods are needed will be performed for preliminary COPACs in site-specific field sampling plans. This evaluation, if needed, is presented on Worksheet No. 11.

<sup>b</sup> BSV - Background screening value is the lower of the surface or subsurface soil BSV. Gannett Fleming, Inc. and Shaw Environmental, Inc., 2010, *Final Supplemental Installation-Wide Background Soil Study, Redstone Arsenal, Madison County, Alabama*, Prepared for the U.S. Army Corps of Engineers, Savannah District, September.

<sup>c</sup> The preliminary screening value (PSV) is the most conservative residential soil regional screening level (RSL), adjusted, if necessary, to reflect a cancer risk of 1E-6 or an HI of 0.1 (EPA, 2021, *Regional Screening Levels for Chemical Contaminants at Superfund Sites*, May).

ca – Carcinogen.

nc – Noncarcinogen; HI – Hazard index.

NSV – No screening value. Compounds without screening values are evaluated in site-specific reports semi-quantitatively through a consideration of the frequency and magnitude of any positive detections. Although surrogate toxicity data are not applied directly, chemicals with no screening values will also be evaluated by considering the relative frequency and magnitude of detected results for structurally similar surrogates or chemicals within the same analytical class (e.g., PAHs, or phthalates).

mg/kg - Milligrams per kilogram.

## Worksheet No. 15 Reference Limits and Evaluation Tables

### SOIL GAS TABLES

### Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-2-1 – Soil Gas Select Parameters					
ANALYTE	CAS No.	Project Vapor Intrusion Level (µg/m <sup>3</sup> )	Laboratory-Specific <sup>a</sup>		
			LOQ	LOD	MDL
Ethylbenzene	100-41-4	37.4	0.54	0.17	0.075
Styrene	100-42-5	34800	0.53	0.32	0.086
Benzyl Chloride	100-44-7	1.91	1.10	0.32	0.12
cis-1,3-Dichloropropene	10061-01-5	NA	0.52	0.17	0.083
trans-1,3-Dichloropropene	10061-02-6	NA	0.53	0.32	0.11
n-Propylbenzene	103-65-1	34800	0.54	0.17	0.077
1,4-Dichlorobenzene	106-46-7	8.51	0.54	0.32	0.082
1,2-Dibromoethane	106-93-4	0.156	0.54	0.17	0.062
1,3-Butadiene	106-99-0	3.12	0.53	0.32	0.088
Acrolein	107-02-8	0.695	1.0	0.31	0.15
3-Chloro-1-propene (Allyl Chloride)	107-05-1	15.6	0.54	0.17	0.072
1,2-Dichloroethane	107-06-2	3.6	0.54	0.17	0.059
Acrylonitrile	107-13-1	1.38	0.53	0.32	0.11
Vinyl Acetate	108-05-4	6950	5.4	2.7	1.2
4-Methyl-2-pentanone	108-10-1	104000	0.53	0.17	0.073
1,3,5-Trimethylbenzene	108-67-8	2090	0.53	0.17	0.077
Toluene	108-88-3	174000	0.54	0.17	0.065
Chlorobenzene	108-90-7	1740	0.54	0.17	0.071
Tetrahydrofuran (THF)	109-99-9	69500	0.55	0.17	0.067
n-Hexane	110-54-3	24300	0.54	0.32	0.11
Cyclohexane	110-82-7	209000	1.1	0.34	0.15
n-Octane	111-65-9	NA	0.54	0.32	0.12
n-Nonane	111-84-2	695	0.54	0.32	0.089
Propene	115-07-1	104000	0.53	0.32	0.13
1,2,4-Trichlorobenzene	120-82-1	69.5	0.54	0.32	0.13
n-Butyl Acetate	123-86-4	NA	0.55	0.17	0.073



### Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-2-1 – Soil Gas Select Parameters					
ANALYTE	CAS No.	Project Vapor Intrusion Level ( $\mu\text{g}/\text{m}^3$ )	Laboratory-Specific <sup>a</sup>		
			LOQ	LOD	MDL
1,4-Dioxane	123-91-1	18.7	0.54	0.17	0.063
Dibromochloromethane	124-48-1	NA	0.54	0.17	0.070
Tetrachloroethene	127-18-4	360	0.52	0.17	0.069
Ethyl Acetate	141-78-6	2430	1.1	0.65	0.28
n-Heptane	142-82-5	13900	0.54	0.32	0.085
cis-1,2-Dichloroethene	156-59-2	NA	0.53	0.17	0.075
trans-1,2-Dichloroethene	156-60-5	NA	0.54	0.17	0.074
Methyl tert-Butyl Ether	1634-04-4	360	0.54	0.17	0.063
m,p-Xylenes	179601-23-1	NA	1.1	0.34	0.14
1,3-Dichlorobenzene	541-73-1	NA	0.54	0.17	0.080
Carbon Tetrachloride	56-23-5	15.6	0.53	0.17	0.074
2-Hexanone	591-78-6	1040	0.54	0.17	0.066
d-Limonene	5989-27-5	NA	0.54	0.32	0.11
4-Ethyltoluene	622-96-8	NA	0.54	0.32	0.085
Ethanol	64-17-5	NA	5.2	0.83	0.37
2-Propanol (Isopropyl Alcohol)	67-63-0	6950	2.1	0.63	0.22
Acetone	67-64-1	1070000	5.3	2.7	1.2
Chloroform	67-66-3	4.07	0.54	0.17	0.071
Benzene	71-43-2	12	0.53	0.17	0.077
1,1,1-Trichloroethane	71-55-6	174000	0.54	0.17	0.066
Bromomethane	74-83-9	174	0.54	0.17	0.074
Chloromethane	74-87-3	3130	0.53	0.32	0.086
Chloroethane	75-00-3	348000	0.54	0.32	0.066
Vinyl Chloride	75-01-4	5.59	0.54	0.17	0.057
Acetonitrile	75-05-8	2090	0.53	0.32	0.13
Methylene Chloride	75-09-2	3380	0.53	0.32	0.15
Carbon Disulfide	75-15-0	24300	1.1	0.54	0.16
Bromoform	75-25-2	85.1	0.54	0.32	0.11

### Worksheet No. 15 Reference Limits and Evaluation Tables

Worksheet #15-2-1 – Soil Gas Select Parameters					
ANALYTE	CAS No.	Project Vapor Intrusion Level ( $\mu\text{g}/\text{m}^3$ )	Laboratory-Specific <sup>a</sup>		
			LOQ	LOD	MDL
Bromodichloromethane	75-27-4	2.53	0.54	0.17	0.077
1,1-Dichloroethane	75-34-3	58.5	0.55	0.33	0.078
1,1-Dichloroethene	75-35-4	6950	0.54	0.17	0.074
Trichlorofluoromethane	75-69-4	NA	0.53	0.32	0.081
Dichlorodifluoromethane (CFC 12)	75-71-8	3480	0.53	0.32	0.087
Trichlorotrifluoroethane	76-13-1	174000	0.54	0.17	0.076
1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	76-14-2	NA	0.53	0.32	0.084
1,2-Dichloropropane	78-87-5	25.3	0.54	0.17	0.066
2-Butanone (MEK)	78-93-3	174000	1.1	0.32	0.11
1,1,2-Trichloroethane	79-00-5	5.85	0.54	0.17	0.054
Trichloroethene	79-01-6	15.9	0.54	0.17	0.072
1,1,2,2-Tetrachloroethane	79-34-5	1.61	0.54	0.17	0.074
alpha-Pinene	80-56-8	NA	0.54	0.32	0.082
Methyl Methacrylate	80-62-6	24300	1.1	0.65	0.19
Hexachlorobutadiene	87-68-3	4.25	0.53	0.32	0.11
Naphthalene	91-20-3	2.75	0.52	0.31	0.13
o-Xylene	95-47-6	3480	0.54	0.17	0.077
1,2-Dichlorobenzene	95-50-1	6950	0.54	0.17	0.079
1,2,4-Trimethylbenzene	95-63-6	2090	0.54	0.17	0.074
1,2-Dibromo-3-chloropropane	96-12-8	0.00563	0.53	0.32	0.10
Cumene	98-82-8	13900	0.54	0.17	0.077

<sup>a</sup> Detection Limit (DL), Limit of Detection (LOD), and Limit of Quantitation (LOQ) are provided by CT laboratory.

## **Worksheet No. 17: Sampling Design and Rationale**

Soil confirmation sampling and rationale for the planned excavations at RSA-122 and RSA-183 are presented in Section 5.5 of the CMI Work Plan. Figure 5-22 and 5-23 present the confirmation sampling approach for excavation sidewalls and excavation floor, respectively. Figures 5-24a through 5-24h present the confirmation sample locations for RSA-122. The confirmation sample locations for RSA-182 are provided on Figures 5-25a through 5-25g. Proposed soil vapor sampling locations at RSA-183 are shown on Figure 5-26.

Worksheet No. 18-1

Sampling Locations and Analytical Requirements, RSA-122  
Redstone Arsenal, Madison County, Alabama

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
<b>RSA-122 Excavation Sample Locations</b>					
<b>Excavation Area A Sample Locations</b>					
122EXA-1-CONF-SW1	122EXA-1-CONF-SW1	-SS- AFC0001 -REG 0-2	122EXA-1-CONF-SW1-SS-AFC0001-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0003 -REG 2-6			Arsenic
122EXA-1-CONF-SW2	122EXA-1-CONF-SW2	-SS- AFC0004 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0005 -REG 2-6			Arsenic
122EXA-1-CONF-SW3	122EXA-1-CONF-SW3	-SS- AFC0006 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0007 -REG 2-6			Arsenic
122EXA-1-CONF-SW4	122EXA-1-CONF-SW4	-SS- AFC0008 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0009 -REG 2-6	122EXA-1-CONF-SW4-DS-AFC0010-FD		Arsenic
122EXA1-CONF-FL1	122EXA1-CONF-FL1	-DS- AFC0011 -REG 6-7			Arsenic
122EXA-2-CONF-SW1	122EXA-2-CONF-SW1	-SS- AFC0012 -REG 0-2		122EXA-2-CONF-SW1-SS-AFC0012-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0013 -REG 2-6			Arsenic
122EXA-2-CONF-SW2	122EXA-2-CONF-SW2	-SS- AFC0014 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0015 -REG 2-6			Arsenic
122EXA-2-CONF-SW3	122EXA-2-CONF-SW3	-SS- AFC0016 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0017 -REG 2-6			Arsenic
122EXA-2-CONF-SW4	122EXA-2-CONF-SW4	-SS- AFC0018 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0019 -REG 2-6	122EXA-2-CONF-SW4-DS-AFC0019-MS/MSD		Arsenic
122EXA-2-CONF-FL1	122EXA-2-CONF-FL1	-DS- AFC0020 -REG 6-7			Arsenic
122EXA-3-CONF-SW1	122EXA-3-CONF-SW1	-SS- AFC0021 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0022 -REG 2-6			Arsenic
122EXA-3-CONF-SW2	122EXA-3-CONF-SW2	-SS- AFC0023 -REG 0-2	122EXA-3-CONF-SW2-SS-AFC0024-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0025 -REG 2-6			Arsenic
122EXA-3-CONF-SW3	122EXA-3-CONF-SW3	-SS- AFC0026 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0027 -REG 2-6			Arsenic
122EXA-3-CONF-SW4	122EXA-3-CONF-SW4	-SS- AFC0028 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0029 -REG 2-6			Arsenic
122EXA-3-CONF-SW5	122EXA-3-CONF-SW5	-SS- AFC0030 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0031 -REG 2-6	122EXA-3-CONF-SW5-DS-AFC0032-FD		Arsenic
122EXA-3-CONF-SW6	122EXA-3-CONF-SW6	-SS- AFC0033 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0034 -REG 2-6			Arsenic
122EXA-3-CONF-SW7	122EXA-3-CONF-SW7	-SS- AFC0035 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0036 -REG 2-6			Arsenic
122EXA-3-CONF-SW8	122EXA-3-CONF-SW8	-SS- AFC0037 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0038 -REG 2-6			Arsenic
122EXA-3-CONF-SW9	122EXA-3-CONF-SW9	-SS- AFC0039 -REG 0-2	122EXA-3-CONF-SW9-SS-AFC0040-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0041 -REG 2-6			Arsenic
122EXA-3-CONF-SW10	122EXA-3-CONF-SW10	-SS- AFC0990 -REG 0-2	122EXA-3-CONF-SW10-SS-AFC0991-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0992 -REG 2-6			Arsenic
122EXA-3-CONF-SW11	122EXA-3-CONF-SW11	-SS- AFC0993 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0994 -REG 2-6	122EXA-3-CONF-SW11-DS-AFC0995-MS/MSD		Arsenic
122EXA-3-CONF-FL1	122EXA-3-CONF-FL1	-DS- AFC0042 -REG 6-7			Arsenic
122EXA-3-CONF-FL2	122EXA-3-CONF-FL2	-DS- AFC0043 -REG 6-7			Arsenic
122EXA-4-CONF-SW1	122EXA-4-CONF-SW1	-SS- AFC0044 -REG 0-2		122EXA-4-CONF-SW1-SS-AFC0044-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0045 -REG 2-6			Arsenic
122EXA-4-CONF-SW2	122EXA-4-CONF-SW2	-SS- AFC0046 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0047 -REG 2-6			Arsenic

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
122EXA-4-CONF-SW3	122EXA-4-CONF-SW3	-SS- AFC0048 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0049 -REG	2-6		Arsenic
122EXA-4-CONF-SW4	122EXA-4-CONF-SW4	-SS- AFC0050 -REG	0-2	122EXA-4-CONF-SW4-SS-AFC0051-FD	Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0052 -REG	2-6		Arsenic
122EXA-4-CONF-FL1	122EXA-4-CONF-FL1	-DS- AFC0053 -REG	6-7		Arsenic
122EXA-5-CONF-SW1	122EXA-5-CONF-SW1	-SS- AFC0054 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0055 -REG	2-6		Arsenic
122EXA-5-CONF-SW2	122EXA-5-CONF-SW2	-SS- AFC0056 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0057 -REG	2-6		Arsenic
122EXA-5-CONF-SW3	122EXA-5-CONF-SW3	-SS- AFC0058 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0059 -REG	2-6		Arsenic
122EXA-5-CONF-SW4	122EXA-5-CONF-SW4	-SS- AFC0060 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0061 -REG	2-6	122EXA-5-CONF-SW4-DS-AFC0062-FD	Arsenic
122EXA-5-CONF-FL1	122EXA-5-CONF-FL1	-DS- AFC0063 -REG	6-7		Arsenic
122EXA-6-CONF-SW1	122EXA-6-CONF-SW1	-SS- AFC0064 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0065 -REG	2-6		Arsenic
122EXA-6-CONF-SW2	122EXA-6-CONF-SW2	-SS- AFC0066 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0067 -REG	2-6	122EXA-6-CONF-SW2-DS-AFC0067-MS/MSD	Arsenic
122EXA-6-CONF-SW3	122EXA-6-CONF-SW3	-SS- AFC0068 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0069 -REG	2-6		Arsenic
122EXA-6-CONF-SW4	122EXA-6-CONF-SW4	-SS- AFC0070 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0071 -REG	2-6		Arsenic
122EXA-6-CONF-FL1	122EXA-6-CONF-FL1	-DS- AFC0072 -REG	6-7		Arsenic
122EXA-7-CONF-SW1	122EXA-7-CONF-SW1	-SS- AFC0073 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0074 -REG	2-6	122EXA-6-CONF-SW3-DS-AFC0075-FD	Arsenic
122EXA-7-CONF-SW2	122EXA-7-CONF-SW2	-SS- AFC0076 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0077 -REG	2-6		Arsenic
122EXA-7-CONF-SW3	122EXA-7-CONF-SW3	-SS- AFC0078 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0079 -REG	2-6		Arsenic
122EXA-7-CONF-SW4	122EXA-7-CONF-SW4	-SS- AFC0080 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0081 -REG	2-6		Arsenic
122EXA-7-CONF-FL1	122EXA-7-CONF-FL1	-DS- AFC0082 -REG	6-7		Arsenic
122EXA-8-CONF-SW1	122EXA-8-CONF-SW1	-SS- AFC0083 -REG	0-2	122EXA-8-CONF-SW1-DS-AFC0083-MS/MSD	Arsenic
122EXA-8-CONF-SW2	122EXA-8-CONF-SW2	-SS- AFC0084 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-8-CONF-SW3	122EXA-8-CONF-SW3	-SS- AFC0085 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-8-CONF-SW4	122EXA-8-CONF-SW4	-SS- AFC0086 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-8-CONF-FL1	122EXA-8-CONF-FL1	-DS- AFC0087 -REG	2-3		Arsenic
122EXA-9-CONF-SW1	122EXA-9-CONF-SW1	-SS- AFC0088 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0089 -REG	2-6	122EXA-9-CONF-SW1-DS-AFC0090-FD	Arsenic
		-DS- AFC0091 -REG	6-11		Arsenic
		-DS- AFC0092 -REG	11-15		Arsenic
122EXA-9-CONF-SW2	122EXA-9-CONF-SW2	-SS- AFC0093 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0094 -REG	2-6		Arsenic
		-DS- AFC0095 -REG	6-11		Arsenic
		-DS- AFC0096 -REG	11-15		Arsenic

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite	
			FD*	MS/MSD*		
122EXA-9-CONF-SW3	122EXA-9-CONF-SW3	-SS- AFC0097 -REG	0-2		122EXA-9-CONF-SW3-SS-AFC0097-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0098 -REG	2-6			Arsenic
		-DS- AFC0099 -REG	6-11			Arsenic
		-DS- AFC0100 -REG	11-15			Arsenic
122EXA-9-CONF-SW4	122EXA-9-CONF-SW4	-SS- AFC0101 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0102 -REG	2-6		122EXA-9-CONF-SW4-DS-AFC0102-MS/MSD	Arsenic
		-DS- AFC0103 -REG	6-11			Arsenic
		-DS- AFC0104 -REG	11-15			Arsenic
122EXA-9-CONF-FL1	122EXA-9-CONF-FL1	-DS- AFC0105 -REG	15-16			Arsenic
122EXA-10-CONF-SW1	122EXA-10-CONF-SW1	-SS- AFC0106 -REG	0-2	122EXA-10-CONF-SW1-SS-AFC0107-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-10-CONF-SW2	122EXA-10-CONF-SW2	-SS- AFC0108 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-10-CONF-SW3	122EXA-10-CONF-SW3	-SS- AFC0109 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-10-CONF-SW4	122EXA-10-CONF-SW4	-SS- AFC0110 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-10-CONF-SW5	122EXA-10-CONF-SW5	-SS- AFC0111 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-10-CONF-FL1	122EXA-10-CONF-FL1	-DS- AFC0112 -REG	2-3			Arsenic
122EXA-11-CONF-SW1	122EXA-11-CONF-SW1	-SS- AFC0113 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0114 -REG	2-6	122EXA-11-CONF-SW1-DS-AFC0115-FD		Arsenic
		-DS- AFC0116 -REG	6-10			Arsenic
122EXA-11-CONF-SW2	122EXA-11-CONF-SW2	-SS- AFC0117 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0118 -REG	2-6			Arsenic
		-DS- AFC0119 -REG	6-10			Arsenic
122EXA-11-CONF-SW3	122EXA-11-CONF-SW3	-SS- AFC0120 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0121 -REG	2-6			Arsenic
		-DS- AFC0122 -REG	6-10			Arsenic
122EXA-11-CONF-SW4	122EXA-11-CONF-SW4	-SS- AFC0123 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
		-DS- AFC0124 -REG	2-6			Arsenic
		-DS- AFC0125 -REG	6-10			Arsenic
122EXA-11-CONF-FL1	122EXA-11-CONF-FL1	-DS- AFC0126 -REG	10-11			Arsenic
122EXA-12-CONF-SW1	122EXA-12-CONF-SW1	-SS- AFC0127 -REG	0-2			Arsenic
122EXA-12-CONF-SW2	122EXA-12-CONF-SW2	-SS- AFC0128 -REG	0-2	122EXA-12-CONF-SW2-SS-AFC0129-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-12-CONF-SW3	122EXA-12-CONF-SW3	-SS- AFC0130 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-12-CONF-SW4	122EXA-12-CONF-SW4	-SS- AFC0131 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-12-CONF-FL1	122EXA-12-CONF-FL1	-DS- AFC0132 -REG	2-3			Arsenic
122EXA-13-CONF-SW1	122EXA-13-CONF-SW1	-DS- AFC0133 -REG	6-11			Arsenic
		-DS- AFC0134 -REG	11-13			Arsenic
122EXA-13-CONF-SW2	122EXA-13-CONF-SW2	-DS- AFC0135 -REG	6-11			Arsenic
		-DS- AFC0136 -REG	11-13			Arsenic
122EXA-13-CONF-SW3	122EXA-13-CONF-SW3	-DS- AFC0137 -REG	6-11	122EXA-13-CONF-SW3-DS-AFC0138-FD		Arsenic
		-DS- AFC0139 -REG	11-13			Arsenic

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
122EXA-13-CONF-SW4	122EXA-13-CONF-SW4	-DS- AFC0140 -REG 6-11			Arsenic
		-DS- AFC0141 -REG 11-13			Arsenic
122EXA-13-CONF-FL1	122EXA-13-CONF-FL1	-DS- AFC0142 -REG 13-14			Arsenic
122EXA-14-CONF-SW1	122EXA-14-CONF-SW1	-SS- AFC0143 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-14-CONF-SW2	122EXA-14-CONF-SW2	-SS- AFC0144 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-14-CONF-SW3	122EXA-14-CONF-SW3	-SS- AFC0145 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-14-CONF-SW4	122EXA-14-CONF-SW4	-SS- AFC0146 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-14-CONF-FL1	122EXA-14-CONF-FL1	-DS- AFC0147 -REG 2-3	122EXA-14-CONF-FL1-DS-AFC0148-FD		Arsenic
122EXA-15-CONF-SW1	122EXA-15-CONF-SW1	-SS- AFC0149 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-15-CONF-SW2	122EXA-15-CONF-SW2	-SS- AFC0150 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-15-CONF-SW3	122EXA-15-CONF-SW3	-SS- AFC0151 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-15-CONF-SW4	122EXA-15-CONF-SW4	-SS- AFC0152 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXA-15-CONF-FL1	122EXA-15-CONF-FL1	-DS- AFC0153 -REG 2-3			Arsenic
<b>Excavation Area B Sample Locations</b>					
122EXB-CONF-SW1	122EXB-CONF-SW1	-SS- AFC0154 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXB-CONF-SW2	122EXB-CONF-SW2	-SS- AFC0155 -REG 0-2	122EXB-CONF-SW2-SS-AFC0156-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXB-CONF-SW3	122EXB-CONF-SW3	-SS- AFC0157 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXB-CONF-SW4	122EXB-CONF-SW4	-SS- AFC0158 -REG 0-2		122EXB-CONF-SW4-SS-AFC0158-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXB-CONF-SW5	122EXB-CONF-SW5	-SS- AFC0159 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXB-CONF-SW6	122EXB-CONF-SW6	-SS- AFC0160 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXB-CONF-SW7	122EXB-CONF-SW7	-SS- AFC0161 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXB-CONF-SW8	122EXB-CONF-SW8	-SS- AFC0162 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXB-CONF-FL1	122EXB-CONF-FL1	-DS- AFC0163 -REG 2-3			Arsenic
122EXB-CONF-FL2	122EXB-CONF-FL2	-DS- AFC0164 -REG 2-3			Arsenic
<b>Excavation Area C Sample Locations</b>					
122EXC-CONF-SW1	122EXC-CONF-SW1	-SS- AFC0165 -REG 0-2		122EXC-CONF-SW1-SS-AFC0165-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXC-CONF-SW2	122EXC-CONF-SW2	-SS- AFC0166 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXC-CONF-SW3	122EXC-CONF-SW3	-SS- AFC0167 -REG 0-2	122EXC-CONF-SW3-SS-AFC0168-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXC-CONF-SW4	122EXC-CONF-SW4	-SS- AFC0169 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
122EXC-CONF-FL1	122EXC-CONF-FL1	-DS- AFC0170 -REG 2-3			Arsenic
<b>Excavation Area D Sample Locations</b>					
122EXD-1-CONF-SW1	122EXD-1-CONF-SW1	-SS- AFC0171 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
	122EXD-1-CONF-SW1	-DS- AFC0172 -REG 2-6			Arsenic
122EXD-1-CONF-SW2	122EXD-1-CONF-SW2	-SS- AFC0173 -REG 0-2	122EXD-1-CONF-SW2-SS-AFC0174-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
	122EXD-1-CONF-SW2	-DS- AFC0175 -REG 2-6			Arsenic
122EXD-1-CONF-SW3	122EXD-1-CONF-SW3	-SS- AFC0176 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
	122EXD-1-CONF-SW3	-DS- AFC0177 -REG 2-6			Arsenic
122EXD-1-CONF-SW4	122EXD-1-CONF-SW4	-SS- AFC0178 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
	122EXD-1-CONF-SW4	-DS- AFC0179 -REG 2-6			Arsenic
122EXD-1-CONF-FL1	122EXD-1-CONF-FL1	-DS- AFC0180 -REG 6-7			Arsenic
122EXD-2-CONF-SW1	122EXD-2-CONF-SW1	-SS- AFC0181 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
	122EXD-2-CONF-SW1	-DS- AFC0182 -REG 2-6			Arsenic
122EXD-2-CONF-SW2	122EXD-2-CONF-SW2	-SS- AFC0183 -REG 0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
	122EXD-2-CONF-SW2	-DS- AFC0184 -REG 2-6			Arsenic

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
122EXD-2-CONF-SW3	122EXD-2-CONF-SW3 -SS- AFC0185 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
	122EXD-2-CONF-SW3 -DS- AFC0186 -REG	2-6			Arsenic
122EXD-2-CONF-SW4	122EXD-2-CONF-SW4 -SS- AFC0187 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
	122EXD-2-CONF-SW4 -DS- AFC0188 -REG	2-6			Arsenic
122EXD-2-CONF-FL1	122EXD-2-CONF-FL1 -DS- AFC0189 -REG	6-7			Arsenic
122EXD-3-CONF-SW1	122EXD-3-CONF-SW1 -SS- AFC0190 -REG	0-2	122EXD-3-CONF-SW1-SS-AFC0191-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-3-CONF-SW1 -DS- AFC0192 -REG	2-6			Arsenic, Lewisite
	122EXD-3-CONF-SW1 -DS- AFC0193 -REG	6-11			Arsenic, Lewisite
	122EXD-3-CONF-SW1 -DS- AFC0194 -REG	11-16			Arsenic, Lewisite
	122EXD-3-CONF-SW1 -DS- AFC0195 -REG	16-17			Arsenic, Lewisite
122EXD-3-CONF-SW2	122EXD-3-CONF-SW2 -SS- AFC0196 -REG	0-2		122EXD-3-CONF-SW1-SS-AFC0196-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-3-CONF-SW2 -DS- AFC0197 -REG	2-6			Arsenic, Lewisite
	122EXD-3-CONF-SW2 -DS- AFC0198 -REG	6-11			Arsenic, Lewisite
	122EXD-3-CONF-SW2 -DS- AFC0199 -REG	11-16			Arsenic, Lewisite
	122EXD-3-CONF-SW2 -DS- AFC0200 -REG	16-17			Arsenic, Lewisite
122EXD-3-CONF-SW3	122EXD-3-CONF-SW3 -SS- AFC0201 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-3-CONF-SW3 -DS- AFC0202 -REG	2-6	122EXD-3-CONF-SW1-SS-AFC0203-FD		Arsenic, Lewisite
	122EXD-3-CONF-SW3 -DS- AFC0204 -REG	6-11			Arsenic, Lewisite
	122EXD-3-CONF-SW3 -DS- AFC0205 -REG	11-16			Arsenic, Lewisite
	122EXD-3-CONF-SW3 -DS- AFC0206 -REG	16-17			Arsenic, Lewisite
122EXD-3-CONF-SW4	122EXD-CONF-SW4 -SS- AFC0207 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-CONF-SW4 -DS- AFC0208 -REG	2-6			Arsenic, Lewisite
	122EXD-CONF-SW4 -DS- AFC0209 -REG	6-11		122EXD-3-CONF-SW4-DS-AFC0209-MS/MSD	Arsenic, Lewisite
	122EXD-CONF-SW4 -DS- AFC0210 -REG	11-16			Arsenic, Lewisite
	122EXD-CONF-SW4 -DS- AFC0211 -REG	16-17			Arsenic, Lewisite
122EXD-3-CONF-FL1	122EXD-3-CONF-FL1 -DS- AFC0212 -REG	17-18			Arsenic, Lewisite
122EXD-4-CONF-SW1	122EXD-4-CONF-SW1 -SS- AFC0213 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-4-CONF-SW1 -DS- AFC0214 -REG	2-6	122EXD-3-CONF-SW1-SS-AFC0215-FD		Arsenic, Lewisite
122EXD-4-CONF-SW2	122EXD-4-CONF-SW2 -SS- AFC0216 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-4-CONF-SW2 -DS- AFC0217 -REG	2-6			Arsenic, Lewisite
122EXD-4-CONF-SW3	122EXD-4-CONF-SW3 -SS- AFC0218 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-4-CONF-SW3 -DS- AFC0219 -REG	2-6			Arsenic, Lewisite
122EXD-4-CONF-SW4	122EXD-4-CONF-SW4 -SS- AFC0220 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-4-CONF-SW4 -DS- AFC0221 -REG	2-6			Arsenic, Lewisite
122EXD-4-CONF-SW5	122EXD-4-CONF-SW5 -SS- AFC0222 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-4-CONF-SW5 -DS- AFC0223 -REG	2-6			Arsenic, Lewisite
122EXD-4-CONF-SW6	122EXD-4-CONF-SW6 -SS- AFC0224 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-4-CONF-SW6 -DS- AFC0225 -REG	2-6			Arsenic, Lewisite
122EXD-4-CONF-FL1	122EXD-4-CONF-FL1 -DS- AFC0226 -REG	6-7	122EXD-3-CONF-SW1-SS-AFC0227-FD		Arsenic, Lewisite
122EXD-4-CONF-FL2	122EXD-4-CONF-FL2 -DS- AFC0228 -REG	6-7			Arsenic, Lewisite



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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
122EXD-5-CONF-SW1	122EXD-5-CONF-SW1 -SS- AFC0229 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-5-CONF-SW1 -DS- AFC0230 -REG	2-6			Arsenic, Lewisite
	122EXD-5-CONF-SW1 -DS- AFC0231 -REG	6-9			Arsenic, Lewisite
122EXD-5-CONF-SW2	122EXD-5-CONF-SW2 -SS- AFC0232 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-5-CONF-SW2 -DS- AFC0233 -REG	2-6			Arsenic, Lewisite
	122EXD-5-CONF-SW2 -DS- AFC0234 -REG	6-9	122EXD-5-CONF-SW2-DS-AFC0234-MS/MSD		Arsenic, Lewisite
122EXD-5-CONF-SW3	122EXD-5-CONF-SW3 -SS- AFC0235 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-5-CONF-SW3 -DS- AFC0236 -REG	2-6			Arsenic, Lewisite
	122EXD-5-CONF-SW3 -DS- AFC0237 -REG	6-9			Arsenic, Lewisite
122EXD-5-CONF-SW4	122EXD-5-CONF-SW4 -SS- AFC0238 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXD-5-CONF-SW4 -DS- AFC0239 -REG	2-6			Arsenic, Lewisite
	122EXD-5-CONF-SW4 -DS- AFC0240 -REG	6-9	122EXD-3-CONF-SW1-SS-AFC0241-FD		Arsenic, Lewisite
122EXD-5-CONF-FL	122EXD-5-CONF-FL1 -DS- AFC0242 -REG	9-10			Arsenic, Lewisite
<b>Excavation Area E Sample Locations</b>					
122EXE-1-CONF-SW1	122EXE-1-CONF-SW1 -SS- AFC0263 -REG	0-2	122EXE-1-CONF-SW1-SS-AFC0264-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122EXE-1-CONF-SW2	122EXE-1-CONF-SW2 -SS- AFC0265 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122EXE-1-CONF-SW3	122EXE-1-CONF-SW3 -SS- AFC0266 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122EXE-1-CONF-SW4	122EXE-1-CONF-SW4 -SS- AFC0267 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122EXE-1-CONF-FL1	122EXE-1-CONF-FL1 -DS- AFC0268 -REG	2-3		122EXE-1-CONF-FL1-DS-AFC0268-MS/MSD	Arsenic, Lewisite
122EXE-2-CONF-SW1	122EXE-2-CONF-SW1 -SS- AFC0269 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXE-2-CONF-SW1 -DS- AFC0270 -REG	2-6			Arsenic, Lewisite
122EXE-2-CONF-SW2	122EXE-2-CONF-SW2 -SS- AFC0271 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXE-2-CONF-SW2 -DS- AFC0272 -REG	2-6			Arsenic, Lewisite
122EXE-2-CONF-SW3	122EXE-2-CONF-SW3 -SS- AFC0273 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXE-2-CONF-SW3 -DS- AFC0274 -REG	2-6			Arsenic, Lewisite
122EXE-2-CONF-SW4	122EXE-2-CONF-SW4 -SS- AFC0275 -REG	0-2	122EXE-2-CONF-SW4-SS-AFC0276-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXE-2-CONF-SW4 -DS- AFC0277 -REG	2-6			Arsenic, Lewisite
122EXE-2-CONF-FL1	122EXE-2-CONF-FL1 -DS- AFC0278 -REG	6-7			Arsenic, Lewisite
122EXE-3-CONF-SW1	122EXE-3-CONF-SW1 -SS- AFC0279 -REG	0-2		122EXE-3-CONF-SW1-SS-AFC0279-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXE-3-CONF-SW1 -DS- AFC0280 -REG	2-6			Arsenic, Lewisite
122EXE-3-CONF-SW2	122EXE-3-CONF-SW2 -SS- AFC0281 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXE-3-CONF-SW2 -DS- AFC0282 -REG	2-6	122EXE-3-CONF-SW2-DS-AFC0283-FD		Arsenic, Lewisite
122EXE-3-CONF-SW3	122EXE-3-CONF-SW3 -SS- AFC0284 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122EXE-3-CONF-SW3 -DS- AFC0285 -REG	2-6			Arsenic, Lewisite
122EXE-3-CONF-SW4	122EXE-3-CONF-SW4 -SS- AFC0286 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite

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Sample Location	Sample Designation					Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
							FD*	MS/MSD*	
	122EXE-3-CONF-SW4	-DS-	AFC0287	-REG	2-6			Arsenic, Lewisite	
122EXE-3-CONF-FL1	122EXE-3-CONF-FL1	-DS-	AFC0288	-REG	6-7			Arsenic, Lewisite	
122EXE-4-CONF-SW1	122EXE-4-CONF-SW1	-SS-	AFC0289	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-4-CONF-SW1	-DS-	AFC0290	-REG	2-6	122EXE-4-CONF-SW1-DS-AFC0291-FD		Arsenic, Lewisite	
122EXE-4-CONF-SW2	122EXE-4-CONF-SW2	-SS-	AFC0292	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-4-CONF-SW2	-DS-	AFC0293	-REG	2-6			Arsenic, Lewisite	
122EXE-4-CONF-SW3	122EXE-4-CONF-SW3	-SS-	AFC0294	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-4-CONF-SW3	-DS-	AFC0295	-REG	2-6			Arsenic, Lewisite	
122EXE-4-CONF-SW4	122EXE-4-CONF-SW4	-SS-	AFC0296	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-4-CONF-SW4	-DS-	AFC0297	-REG	2-6			Arsenic, Lewisite	
122EXE-4-CONF-FL1	122EXE-4-CONF-FL1	-DS-	AFC0298	-REG	6-7			Arsenic, Lewisite	
122EXE-5-CONF-SW1	122EXE-5-CONF-SW1	-SS-	AFC0299	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-5-CONF-SW1	-DS-	AFC0300	-REG	2-6			Arsenic, Lewisite	
	122EXE-5-CONF-SW1	-DS-	AFC0301	-REG	6-11	122EXE-5-CONF-SW1-DS-AFC0302-FD		Arsenic, Lewisite	
	122EXE-5-CONF-SW1	-DS-	AFC0303	-REG	11-16			Arsenic, Lewisite	
122EXE-5-CONF-SW2	122EXE-5-CONF-SW1	-DS-	AFC0304	-REG	16-17			Arsenic, Lewisite	
	122EXE-5-CONF-SW2	-SS-	AFC0305	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-5-CONF-SW2	-DS-	AFC0306	-REG	2-6			Arsenic, Lewisite	
	122EXE-5-CONF-SW2	-DS-	AFC0307	-REG	6-11			Arsenic, Lewisite	
	122EXE-5-CONF-SW2	-DS-	AFC0308	-REG	11-16			Arsenic, Lewisite	
122EXE-5-CONF-SW3	122EXE-5-CONF-SW2	-DS-	AFC0309	-REG	16-17			Arsenic, Lewisite	
	122EXE-5-CONF-SW3	-SS-	AFC0310	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-5-CONF-SW3	-DS-	AFC0311	-REG	2-6			Arsenic, Lewisite	
	122EXE-5-CONF-SW3	-DS-	AFC0312	-REG	6-11			Arsenic, Lewisite	
	122EXE-5-CONF-SW3	-DS-	AFC0313	-REG	11-16			Arsenic, Lewisite	
122EXE-5-CONF-SW4	122EXE-5-CONF-SW3	-DS-	AFC0314	-REG	16-17			Arsenic, Lewisite	
	122EXE-5-CONF-SW4	-SS-	AFC0315	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-5-CONF-SW4	-DS-	AFC0316	-REG	2-6			Arsenic, Lewisite	
	122EXE-5-CONF-SW4	-DS-	AFC0317	-REG	6-11	122EXE-5-CONF-SW4-DS-AFC0318-FD		Arsenic, Lewisite	
	122EXE-5-CONF-SW4	-DS-	AFC0319	-REG	11-16			Arsenic, Lewisite	
122EXE-5-CONF-FL1	122EXE-5-CONF-SW4	-DS-	AFC0320	-REG	16-17			Arsenic, Lewisite	
	122EXE-5-CONF-FL1	-DS-	AFC0321	-REG	17-18			Arsenic, Lewisite	
122EXE-6-CONF-SW1	122EXE-6-CONF-SW1	-SS-	AFC0322	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-6-CONF-SW1	-DS-	AFC0323	-REG	2-6			Arsenic, Lewisite	
122EXE-6-CONF-SW2	122EXE-6-CONF-SW2	-SS-	AFC0324	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-6-CONF-SW2	-DS-	AFC0325	-REG	2-6	122EXE-6-CONF-SW3-DS-AFC0325-MS/MSD		Arsenic, Lewisite	
122EXE-6-CONF-SW3	122EXE-6-CONF-SW3	-SS-	AFC0326	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-6-CONF-SW3	-DS-	AFC0327	-REG	2-6			Arsenic, Lewisite	
122EXE-6-CONF-SW4	122EXE-6-CONF-SW4	-SS-	AFC0328	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	

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Sample Location	Sample Designation					Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
							FD*	MS/MSD*	
	122EXE-6-CONF-SW4	-DS-	AFC0329	-REG	2-6			Arsenic, Lewisite	
122EXE-6-CONF-FL1	122EXE-6-CONF-FL1	-DS-	AFC0330	-REG	6-7			Arsenic, Lewisite	
	122EXE-7-CONF-SW1	-SS-	AFC0331	-REG	0-2		122EXE-7-CONF-SW1-SS-AFC0331-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium	
	122EXE-7-CONF-SW1	-DS-	AFC0332	-REG	2-6			Arsenic	
122EXE-7-CONF-SW2	122EXE-7-CONF-SW2	-SS-	AFC0333	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
	122EXE-7-CONF-SW2	-DS-	AFC0334	-REG	2-6			Arsenic	
	122EXE-7-CONF-SW3	-SS-	AFC0335	-REG	0-2	122EXE-7-CONF-SW3-SS-AFC0336-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium	
	122EXE-7-CONF-SW3	-DS-	AFC0337	-REG	2-6			Arsenic	
	122EXE-7-CONF-SW4	-SS-	AFC0338	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
	122EXE-7-CONF-SW4	-DS-	AFC0339	-REG	2-6			Arsenic	
122EXE-7-CONF-FL1	122EXE-7-CONF-FL1	-DS-	AFC0340	-REG	6-7			Arsenic	
	122EXE-8-CONF-SW1	-SS-	AFC0341	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-8-CONF-SW1	-DS-	AFC0342	-REG	2-6			Arsenic, Lewisite	
	122EXE-8-CONF-SW2	-SS-	AFC0343	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-8-CONF-SW2	-DS-	AFC0344	-REG	2-6	122EXE-8-CONF-SW2-DS-AFC0345-FD		Arsenic, Lewisite	
	122EXE-8-CONF-SW3	-SS-	AFC0346	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-8-CONF-SW3	-DS-	AFC0347	-REG	2-6			Arsenic, Lewisite	
	122EXE-8-CONF-SW4	-SS-	AFC0348	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-8-CONF-SW4	-DS-	AFC0349	-REG	2-6		122EXE-8-CONF-SW4-DS-AFC0349-MS/MSD	Arsenic, Lewisite	
	122EXE-8-CONF-SW5	-SS-	AFC0350	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-8-CONF-SW5	-DS-	AFC0351	-REG	2-6			Arsenic, Lewisite	
	122EXE-8-CONF-SW6	-SS-	AFC0352	-REG	0-2	122EXE-8-CONF-SW6-SS-AFC0353-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122EXE-8-CONF-SW6	-DS-	AFC0354	-REG	2-6			Arsenic, Lewisite	
122EXE-8-CONF-FL1	122EXE-8-CONF-FL1	-DS-	AFC0355	-REG	6-7			Arsenic, Lewisite	
122EXE-8-CONF-FL2	122EXE-8-CONF-FL2	-DS-	AFC0356	-REG	6-7			Arsenic, Lewisite	
<b>Excavation Area F Sample Locations</b>									
122EXF-CONF-SW1	122EXF-CONF-SW1	-SS-	AFC0389	-REG	0-2	122EXF-CONF-SW1-SS-AFC0390-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXF-CONF-SW2	122EXF-CONF-SW2	-SS-	AFC0391	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXF-CONF-SW3	122EXF-CONF-SW3	-SS-	AFC0392	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXF-CONF-SW4	122EXF-CONF-SW4	-SS-	AFC0393	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXF-CONF-SW5	122EXF-CONF-SW5	-SS-	AFC0394	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXF-CONF-SW6	122EXF-CONF-SW6	-SS-	AFC0395	-REG	0-2		122EXF-CONF-SW6-SS-AFC0395-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXF-CONF-SW7	122EXF-CONF-SW7	-SS-	AFC0396	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXF-CONF-FL1	122EXF-CONF-FL1	-DS-	AFC0397	-REG	2-3			Arsenic	
122EXF-CONF-FL2	122EXF-CONF-FL2	-DS-	AFC0398	-REG	2-3			Arsenic	
122EXF-CONF-FL3	122EXF-CONF-FL3	-DS-	AFC0399	-REG	2-3			Arsenic	
	122EXF-CONF-SW8	-SS-	AFC0400	-REG	0-2	122EXF-CONF-SW8-SS-AFC0399-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium	
	122EXF-CONF-SW8	-DS-	AFC0402	-REG	2-6			Arsenic	
	122EXF-CONF-SW9	-SS-	AFC0403	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
	122EXF-CONF-SW9	-DS-	AFC0404	-REG	2-6			Arsenic	
122EXF-CONF-SW10	122EXF-CONF-SW10	-SS-	AFC0405	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
	122EXF-CONF-SW10	-DS-	AFC0406	-REG	2-6			Arsenic	
	122EXF-CONF-SW11	-SS-	AFC0407	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
	122EXF-CONF-SW11	-DS-	AFC0408	-REG	2-6			Arsenic	
122EXF-CONF-FL4	122EXF-CONF-FL4	-DS-	AFC0409	-REG	6-7			Arsenic	

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Sample Location	Sample Designation					Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
							FD*	MS/MSD*	
<b>Excavation Area G Sample Locations</b>									
122EXG-CONF-SW1	122EXG-CONF-SW1	-SS-	AFC0439	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW2	122EXG-CONF-SW2	-SS-	AFC0440	-REG	0-2	122EXG-CONF-SW2-SS-AFC0441-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW3	122EXG-CONF-SW3	-SS-	AFC0442	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW4	122EXG-CONF-SW4	-SS-	AFC0443	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW5	122EXG-CONF-SW5	-SS-	AFC0444	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW6	122EXG-CONF-SW6	-SS-	AFC0445	-REG	0-2		122EXG-CONF-SW6-SS-AFC0445-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW7	122EXG-CONF-SW7	-SS-	AFC0446	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW8	122EXG-CONF-SW8	-SS-	AFC0447	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW9	122EXG-CONF-SW9	-SS-	AFC0448	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW10	122EXG-CONF-SW10	-SS-	AFC0449	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW11	122EXG-CONF-SW11	-SS-	AFC0450	-REG	0-2	122EXG-CONF-SW11-SS-AFC0451-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-SW12	122EXG-CONF-SW12	-SS-	AFC0452	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium	
122EXG-CONF-FL1	122EXG-CONF-SFL1	-DS-	AFC0453	-REG	2-3			Arsenic	
122EXG-CONF-FL2	122EXG-CONF-SFL2	-DS-	AFC0454	-REG	2-3			Arsenic	
122EXG-CONF-FL3	122EXG-CONF-SFL3	-DS-	AFC0455	-REG	2-3			Arsenic	
<b>Piping Area Locations</b>									
122-PIPELN	122-PIPELN	SOLID	AFC0485	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0486	-REG	4-5	122-PIPELN-DS-AFC0487-FD		Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0488	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0489	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0490	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0491	-REG	4-5		122-PIPELN-DS-AFC0491-MS/MSD	Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0492	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0493	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0494	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0495	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0496	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0497	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0498	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0499	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0500	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0501	-REG	4-5	122-PIPELN-DS-AFC0502-FD		Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0503	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0504	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0505	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0506	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0507	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0508	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0509	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0510	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0511	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0512	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0513	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0514	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0515	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0516	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0517	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0518	-REG	4-5			Arsenic, Lewisite	
122-PIPELN	122-PIPELN	SOLID	AFC0519	-REG	NA			Lewisite Headspace	
122-PIPELN	122-PIPELN	-DS-	AFC0520	-REG	4-5	122-PIPELN-DS-AFC0521-FD		Arsenic, Lewisite	

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Sampling Locations and Analytical Requirements, RSA-122  
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Sample Location	Sample Designation			Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
					FD*	MS/MSD*	
122-PIPELN	122-PIPELN	SOLID	AFC0522	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0523	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0524	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0525	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0526	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0527	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0528	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0529	-REG	4-5	122-PIPELN-DS-AFC0529-MS/MSD	Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0530	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0531	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0532	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0533	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0534	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0535	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0536	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0537	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0538	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0539	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0540	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0541	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0542	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0543	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0544	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0545	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0546	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0547	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0548	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0549	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0550	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0551	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0552	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0553	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0554	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0555	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0556	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0557	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0558	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0559	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0560	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0561	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0562	-REG	NA	122-PIPELN-DS-AFC0563-FD	Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0564	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0565	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0566	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	SOLID	AFC0567	-REG	NA		Lewisite Headspace
122-PIPELN	122-PIPELN	-DS-	AFC0568	-REG	4-5		Arsenic, Lewisite
122-PIPELN	122-PIPELN	-DS-	AFC0569	-REG	4-5		Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0570	-REG	4-5	122-PIPELN-DS-AFC0571-FD	Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0572	-REG	4-5		Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0573	-REG	4-5		Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0574	-REG	4-5		Arsenic

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Sample Location	Sample Designation				Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
						FD*	MS/MSD*	
122-PIPELN	122-PIPELN	-DS-	AFC0575	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0576	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0577	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0578	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0579	-REG	4-5	122-PIPELN-DS-AFC0580-FD		Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0581	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0582	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0583	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0584	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0585	-REG	4-5		122-PIPELN-DS-AFC0585-MS/MSD	Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0586	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0587	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0588	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0589	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0590	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0591	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0592	-REG	4-5	122-PIPELN-DS-AFC0593-FD		Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0594	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0595	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0596	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0597	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0598	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0599	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0600	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0601	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0602	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0603	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0604	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0605	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0606	-REG	4-5	122-PIPELN-DS-AFC0607-FD		Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0608	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0609	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0610	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0611	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0612	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0613	-REG	4-5		122-PIPELN-DS-AFC0613-MS/MSD	Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0614	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0615	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0616	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0617	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0618	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0619	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0620	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0621	-REG	4-5	122-PIPELN-DS-AFC0622-FD		Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0623	-REG	4-5			Arsenic
122-PIPELN	122-PIPELN	-DS-	AFC0624	-REG	4-5			Arsenic
<b>Collection Pit Locations</b>								
122-CPIT-CONF-SW1	122-CPIT-CONF-SW1	-SS-	AFC0654	-REG	0-2	122-CPIT-CONF-SW1-SS-AFC0655-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW1	-DS-	AFC0656	-REG	2-6			Arsenic, Lewisite
	122-CPIT-CONF-SW1	-DS-	AFC0657	-REG	6-11			Arsenic, Lewisite

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Sample Location	Sample Designation			Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
					FD*	MS/MSD*	
	122-CPIT-CONF-SW1	-DS-	AFC0658 -REG	11-14			Arsenic, Lewisite
122-CPIT-CONF-SW2	122-CPIT-CONF-SW2	-SS-	AFC0659 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW2	-DS-	AFC0660 -REG	2-6		122-CPIT-CONF-SW2-DS-AFC0660-MS/MSD	Arsenic, Lewisite
	122-CPIT-CONF-SW2	-DS-	AFC0661 -REG	6-11			Arsenic, Lewisite
	122-CPIT-CONF-SW2	-DS-	AFC0662 -REG	11-14			Arsenic, Lewisite
122-CPIT-CONF-SW3	122-CPIT-CONF-SW3	-SS-	AFC0663 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW3	-DS-	AFC0664 -REG	2-6			Arsenic, Lewisite
	122-CPIT-CONF-SW3	-DS-	AFC0665 -REG	6-11	122-CPIT-CONF-SW3-DS-AFC0666-FD		Arsenic, Lewisite
	122-CPIT-CONF-SW3	-DS-	AFC0667 -REG	11-14			Arsenic, Lewisite
122-CPIT-CONF-SW4	122-CPIT-CONF-SW4	-SS-	AFC0668 -REG	0-2		122-CPIT-CONF-SW4-SS-AFC0668-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW4	-DS-	AFC0669 -REG	2-6			Arsenic, Lewisite
	122-CPIT-CONF-SW4	-DS-	AFC0670 -REG	6-11			Arsenic, Lewisite
	122-CPIT-CONF-SW4	-DS-	AFC0671 -REG	11-14			Arsenic, Lewisite
122-CPIT-CONF-SW5	122-CPIT-CONF-SW5	-SS-	AFC0672 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW5	-DS-	AFC0673 -REG	2-6			Arsenic, Lewisite
	122-CPIT-CONF-SW5	-DS-	AFC0674 -REG	6-11			Arsenic, Lewisite
	122-CPIT-CONF-SW5	-DS-	AFC0675 -REG	11-14			Arsenic, Lewisite
122-CPIT-CONF-SW6	122-CPIT-CONF-SW6	-SS-	AFC0676 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW6	-DS-	AFC0677 -REG	2-6			Arsenic, Lewisite
	122-CPIT-CONF-SW6	-DS-	AFC0678 -REG	6-11			Arsenic, Lewisite
	122-CPIT-CONF-SW6	-DS-	AFC0679 -REG	11-14			Arsenic, Lewisite
122-CPIT-CONF-SW7	122-CPIT-CONF-SW7	-SS-	AFC0680 -REG	0-2	122-CPIT-CONF-SW7-SS-AFC0681-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW7	-DS-	AFC0682 -REG	2-6			Arsenic, Lewisite
	122-CPIT-CONF-SW7	-DS-	AFC0683 -REG	6-11			Arsenic, Lewisite
	122-CPIT-CONF-SW7	-DS-	AFC0684 -REG	11-14			Arsenic, Lewisite
122-CPIT-CONF-SW8	122-CPIT-CONF-SW8	-SS-	AFC0685 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW8	-DS-	AFC0686 -REG	2-6		122-CPIT-CONF-SW8-DS-AFC0686-MS/MSD	Arsenic, Lewisite
	122-CPIT-CONF-SW8	-DS-	AFC0687 -REG	6-11			Arsenic, Lewisite
	122-CPIT-CONF-SW8	-DS-	AFC0688 -REG	11-14			Arsenic, Lewisite
122-CPIT-CONF-SW9	122-CPIT-CONF-SW9	-SS-	AFC0689 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW9	-DS-	AFC0690 -REG	2-6	122-CPIT-CONF-SW16-DS-AFC0691-FD		Arsenic, Lewisite
	122-CPIT-CONF-SW9	-DS-	AFC0692 -REG	6-11			Arsenic, Lewisite
	122-CPIT-CONF-SW9	-DS-	AFC0693 -REG	11-14			Arsenic, Lewisite
122-CPIT-CONF-SW10	122-CPIT-CONF-SW10	-SS-	AFC0694 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW10	-DS-	AFC0695 -REG	2-6			Arsenic, Lewisite
	122-CPIT-CONF-SW10	-DS-	AFC0696 -REG	6-11			Arsenic, Lewisite
	122-CPIT-CONF-SW10	-DS-	AFC0697 -REG	11-14			Arsenic, Lewisite
122-CPIT-CONF-SW11	122-CPIT-CONF-SW11	-SS-	AFC0698 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW11	-DS-	AFC0699 -REG	2-6			Arsenic, Lewisite
	122-CPIT-CONF-SW11	-DS-	AFC0700 -REG	6-11			Arsenic, Lewisite
	122-CPIT-CONF-SW11	-DS-	AFC0701 -REG	11-14			Arsenic, Lewisite

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
122-CPIT-CONF-SW12	122-CPIT-CONF-SW12 -SS- AFC0702 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-CPIT-CONF-SW12 -DS- AFC0703 -REG	2-6	122-CPIT-CONF-SW12-DS-AFC0704-FD		Arsenic, Lewisite
	122-CPIT-CONF-SW12 -DS- AFC0705 -REG	6-11			Arsenic, Lewisite
	122-CPIT-CONF-SW12 -DS- AFC0706 -REG	11-14			Arsenic, Lewisite



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Sample Location	Sample Designation					Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
							FD*	MS/MSD*	
122-CPIT-CONF-SW13	122-CPIT-CONF-SW13	-SS-	AFC0707	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122-CPIT-CONF-SW13	-DS-	AFC0708	-REG	2-6		122-CPIT-CONF-SW13-DS-AFC0708-MS/MSD	Arsenic, Lewisite	
	122-CPIT-CONF-SW13	-DS-	AFC0709	-REG	6-11			Arsenic, Lewisite	
	122-CPIT-CONF-SW13	-DS-	AFC0710	-REG	11-14			Arsenic, Lewisite	
122-CPIT-CONF-SW14	122-CPIT-CONF-SW14	-SS-	AFC0711	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122-CPIT-CONF-SW14	-DS-	AFC0712	-REG	2-6			Arsenic, Lewisite	
	122-CPIT-CONF-SW14	-DS-	AFC0713	-REG	6-11	122-CPIT-CONF-SW14-DS-AFC0713-FD		Arsenic, Lewisite	
	122-CPIT-CONF-SW14	-DS-	AFC0718	-REG	11-14			Arsenic, Lewisite	
122-CPIT-CONF-SW15	122-CPIT-CONF-SW15	-SS-	AFC0719	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122-CPIT-CONF-SW15	-DS-	AFC0720	-REG	2-6			Arsenic, Lewisite	
	122-CPIT-CONF-SW15	-DS-	AFC0721	-REG	6-11			Arsenic, Lewisite	
	122-CPIT-CONF-SW15	-DS-	AFC0722	-REG	11-14			Arsenic, Lewisite	
122-CPIT-CONF-SW16	122-CPIT-CONF-SW16	-SS-	AFC0723	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122-CPIT-CONF-SW16	-DS-	AFC0724	-REG	2-6	122-CPIT-CONF-SW16-DS-AFC0724-FD		Arsenic, Lewisite	
	122-CPIT-CONF-SW16	-DS-	AFC0726	-REG	6-11			Arsenic, Lewisite	
	122-CPIT-CONF-SW16	-DS-	AFC0727	-REG	11-14			Arsenic, Lewisite	
122-CPIT-CONF-FL1	122-CPIT-CONF-FL1	-DS-	AFC0728	-REG	14-15			Arsenic, Lewisite	
122-CPIT-CONF-FL2	122-CPIT-CONF-FL2	-DS-	AFC0729	-REG	14-15			Arsenic, Lewisite	
122-CPIT-CONF-FL3	122-CPIT-CONF-FL3	-DS-	AFC0730	-REG	14-15			Arsenic, Lewisite	
122-CPIT-CONF-FL4	122-CPIT-CONF-FL4	-DS-	AFC0731	-REG	14-15			Arsenic, Lewisite	
<b>Blowcase Pit Locations</b>									
122-BPIT-CONF-SW1	122-BPIT-CONF-SW1	-SS-	AFC0761	-REG	0-2		122-BPIT-CONF-SW1-SS-AFC0761-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122-BPIT-CONF-SW1	-DS-	AFC0762	-REG	2-6			Arsenic, Lewisite	
	122-BPIT-CONF-SW1	-DS-	AFC0763	-REG	6-7			Arsenic, Lewisite	
122-BPIT-CONF-SW2	122-BPIT-CONF-SW2	-SS-	AFC0764	-REG	0-2	122-BPIT-CONF-SW2-SS-AFC0764-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122-BPIT-CONF-SW2	-DS-	AFC0766	-REG	2-6			Arsenic, Lewisite	
	122-BPIT-CONF-SW2	-DS-	AFC0767	-REG	6-7			Arsenic, Lewisite	

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
122-BPIT-CONF-SW3	122-BPIT-CONF-SW3 -SS- AFC0768 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW3 -DS- AFC0769 -REG	2-6	122-BPIT-CONF-SW3-DS-AFC0770-FD		Arsenic, Lewisite
	122-BPIT-CONF-SW3 -DS- AFC0771 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW4	122-BPIT-CONF-SW4 -SS- AFC0772 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW4 -DS- AFC0773 -REG	2-6			Arsenic, Lewisite
	122-BPIT-CONF-SW4 -DS- AFC0774 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW5	122-BPIT-CONF-SW5 -SS- AFC0775 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW5 -DS- AFC0776 -REG	2-6	122-BPIT-CONF-SW5-DS-AFC0778-FD		Arsenic, Lewisite
	122-BPIT-CONF-SW5 -DS- AFC0779 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW6	122-BPIT-CONF-SW6 -SS- AFC0780 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW6 -DS- AFC0781 -REG	2-6	122-BPIT-CONF-SW6-DS-AFC0781-MS/MSD		Arsenic, Lewisite
	122-BPIT-CONF-SW6 -DS- AFC0782 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW7	122-BPIT-CONF-SW7 -SS- AFC0783 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW7 -DS- AFC0784 -REG	2-6			Arsenic, Lewisite
	122-BPIT-CONF-SW7 -DS- AFC0785 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW8	122-BPIT-CONF-SW8 -SS- AFC0786 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW8 -DS- AFC0787 -REG	2-6			Arsenic, Lewisite
	122-BPIT-CONF-SW8 -DS- AFC0788 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW9	122-BPIT-CONF-SW9 -SS- AFC0789 -REG	0-2	122-BPIT-CONF-SW9-SS-AFC0790-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW9 -DS- AFC0791 -REG	2-6			Arsenic, Lewisite
	122-BPIT-CONF-SW9 -DS- AFC0792 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW10	122-BPIT-CONF-SW10 -SS- AFC0793 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW10 -DS- AFC0794 -REG	2-6	122-BPIT-CONF-SW10-DS-AFC0794-MS/MSD		Arsenic, Lewisite
	122-BPIT-CONF-SW10 -DS- AFC0795 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW11	122-BPIT-CONF-SW11 -SS- AFC0796 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW11 -DS- AFC0797 -REG	2-6			Arsenic, Lewisite
	122-BPIT-CONF-SW11 -DS- AFC0798 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW12	122-BPIT-CONF-SW12 -SS- AFC0799 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW12 -DS- AFC0800 -REG	2-6	122-BPIT-CONF-SW12-DS-AFC0801-FD		Arsenic, Lewisite
	122-BPIT-CONF-SW12 -DS- AFC0802 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW13	122-BPIT-CONF-SW13 -SS- AFC0803 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW13 -DS- AFC0804 -REG	2-6			Arsenic, Lewisite
	122-BPIT-CONF-SW13 -DS- AFC0805 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW14	122-BPIT-CONF-SW14 -SS- AFC0806 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW14 -DS- AFC0807 -REG	2-6			Arsenic, Lewisite
	122-BPIT-CONF-SW14 -DS- AFC0808 -REG	6-7			Arsenic, Lewisite
122-BPIT-CONF-SW15	122-BPIT-CONF-SW15 -SS- AFC0809 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-BPIT-CONF-SW15 -DS- AFC0810 -REG	2-6			Arsenic, Lewisite

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Sampling Locations and Analytical Requirements, RSA-122  
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Sample Location	Sample Designation					Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
							FD*	MS/MSD*	
	122-BPIT-CONF-SW15	-DS-	AFC0811	-REG	6-7			Arsenic, Lewisite	
122-BPIT-CONF-SW16	122-BPIT-CONF-SW16	-SS-	AFC0812	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122-BPIT-CONF-SW16	-DS-	AFC0813	-REG	2-6	122-BPIT-CONF-SW16-DS-AFC0814-FD		Arsenic, Lewisite	
	122-BPIT-CONF-SW16	-DS-	AFC0815	-REG	6-7			Arsenic, Lewisite	
122-BPIT-CONF-FL1	122-BPIT-CONF-FL1	-DS-	AFC0816	-REG	7-8			Arsenic, Lewisite	
122-BPIT-CONF-FL2	122-BPIT-CONF-FL2	-DS-	AFC0817	-REG	7-8			Arsenic, Lewisite	
122-BPIT-CONF-FL3	122-BPIT-CONF-FL3	-DS-	AFC0818	-REG	7-8			Arsenic, Lewisite	
122-BPIT-CONF-FL4	122-BPIT-CONF-FL4	-DS-	AFC0819	-REG	7-8			Arsenic, Lewisite	
<b>Trench Locations</b>									
122-TRNCH-CONF-SW1	122-TRNCH-CONF-SW1	-SS-	AFC0849	-REG	0-2	122-TRNCH-CONF-SW1-SS-AFC0850-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW2	122-TRNCH-CONF-SW2	-SS-	AFC0851	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW3	122-TRNCH-CONF-SW3	-SS-	AFC0852	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW4	122-TRNCH-CONF-SW4	-SS-	AFC0853	-REG	0-2		122-TRNCH-CONF-SW4-SS-AFC0853-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW5	122-TRNCH-CONF-SW5	-SS-	AFC0854	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW6	122-TRNCH-CONF-SW6	-SS-	AFC0855	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW7	122-TRNCH-CONF-SW7	-SS-	AFC0856	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW8	122-TRNCH-CONF-SW8	-SS-	AFC0857	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW9	122-TRNCH-CONF-SW9	-SS-	AFC0858	-REG	0-2	122-TRNCH-CONF-SW9-SS-AFC0859-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW10	122-TRNCH-CONF-SW10	-SS-	AFC0860	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW11	122-TRNCH-CONF-SW11	-SS-	AFC0861	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW12	122-TRNCH-CONF-SW12	-SS-	AFC0862	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW13	122-TRNCH-CONF-SW13	-SS-	AFC0863	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW14	122-TRNCH-CONF-SW14	-SS-	AFC0864	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW15	122-TRNCH-CONF-SW15	-SS-	AFC0865	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
122-TRNCH-CONF-SW16	122-TRNCH-CONF-SW16	-SS-	AFC0866	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122-TRNCH-CONF-FL1	-DS-	AFC0867	-REG	2-3			Arsenic, Lewisite	
	122-TRNCH-CONF-FL2	-DS-	AFC0868	-REG	2-3			Arsenic, Lewisite	
	122-TRNCH-CONF-FL3	-DS-	AFC0869	-REG	2-3			Arsenic, Lewisite	
	122-TRNCH-CONF-FL4	-DS-	AFC0870	-REG	2-3			Arsenic, Lewisite	
<b>Sump Locations</b>									
122-SUMP-CONF-SW1	122-SUMP-CONF-SW1	-SS-	AFC0900	-REG	0-2	122-SUMP-CONF-SW1-SS-AFC0901-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	122-SUMP-CONF-SW1	-DS-	AFC0902	-REG	2-5			Arsenic, Lewisite	

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
122-SUMP-CONF-SW2	122-SUMP-CONF-SW2 -SS- AFC0903 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	122-SUMP-CONF-SW2 -DS- AFC0904 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW3	322-SUMP-CONF-SW3 -SS- AFC0905 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	322-SUMP-CONF-SW3 -DS- AFC0906 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW4	422-SUMP-CONF-SW4 -SS- AFC0907 -REG	0-2		122-SUMP-CONF-SW4-SS-AFC0907-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	422-SUMP-CONF-SW4 -DS- AFC0908 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW5	522-SUMP-CONF-SW5 -SS- AFC0909 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	522-SUMP-CONF-SW5 -DS- AFC0910 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW6	622-SUMP-CONF-SW6 -SS- AFC0911 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	622-SUMP-CONF-SW6 -DS- AFC0912 -REG	2-5	122-SUMP-CONF-SW6-DS-AFC0913-FD		Arsenic, Lewisite
122-SUMP-CONF-SW7	722-SUMP-CONF-SW7 -SS- AFC0914 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	722-SUMP-CONF-SW7 -DS- AFC0915 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW8	822-SUMP-CONF-SW8 -SS- AFC0916 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	822-SUMP-CONF-SW8 -DS- AFC0917 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW9	922-SUMP-CONF-SW9 -SS- AFC0918 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	922-SUMP-CONF-SW9 -DS- AFC0919 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW10	1022-SUMP-CONF-SW10 -SS- AFC0920 -REG	0-2	122-SUMP-CONF-SW10-SS-AFC0921-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	1022-SUMP-CONF-SW10 -DS- AFC0922 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW11	1122-SUMP-CONF-SW11 -SS- AFC0923 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	1122-SUMP-CONF-SW11 -DS- AFC0924 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW12	1222-SUMP-CONF-SW12 -SS- AFC0925 -REG	0-2		122-SUMP-CONF-SW12-SS-AFC0925-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	1222-SUMP-CONF-SW12 -DS- AFC0926 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW13	1322-SUMP-CONF-SW13 -SS- AFC0927 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	1322-SUMP-CONF-SW13 -DS- AFC0928 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW14	1422-SUMP-CONF-SW14 -SS- AFC0929 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	1422-SUMP-CONF-SW14 -DS- AFC0930 -REG	2-5	122-SUMP-CONF-SW14-DS-AFC0931-FD		Arsenic, Lewisite
122-SUMP-CONF-SW15	1522-SUMP-CONF-SW15 -SS- AFC0932 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	1522-SUMP-CONF-SW15 -DS- AFC0933 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW16	1622-SUMP-CONF-SW16 -SS- AFC0934 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	1622-SUMP-CONF-SW16 -DS- AFC0935 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-SW17	1722-SUMP-CONF-SW17 -SS- AFC0936 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	1722-SUMP-CONF-SW17 -DS- AFC0937 -REG	2-5	122-SUMP-CONF-SW17-DS-AFC0937-MS/MSD		Arsenic, Lewisite
122-SUMP-CONF-SW18	1822-SUMP-CONF-SW18 -SS- AFC0938 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite

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Sampling Locations and Analytical Requirements, RSA-122  
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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
122-SUMP-CONF-SW19	1822-SUMP-CONF-SW18 -DS- AFC0939 -REG	2-5			Arsenic, Lewisite
	1922-SUMP-CONF-SW19 -SS- AFC0940 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW20	1922-SUMP-CONF-SW19 -DS- AFC0941 -REG	2-5			Arsenic, Lewisite
	2022-SUMP-CONF-SW20 -SS- AFC0942 -REG	0-2	122-SUMP-CONF-SW20-SS-AFC0943-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW21	2022-SUMP-CONF-SW20 -DS- AFC0944 -REG	2-5			Arsenic, Lewisite
	2122-SUMP-CONF-SW21 -SS- AFC0945 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW22	2122-SUMP-CONF-SW21 -DS- AFC0946 -REG	2-5			Arsenic, Lewisite
	2222-SUMP-CONF-SW22 -SS- AFC0947 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW23	2222-SUMP-CONF-SW22 -DS- AFC0948 -REG	2-5			Arsenic, Lewisite
	2322-SUMP-CONF-SW23 -SS- AFC0949 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW24	2322-SUMP-CONF-SW23 -DS- AFC0950 -REG	2-5	122-SUMP-CONF-SW23-DS-AFC0951-FD		Arsenic, Lewisite
	2422-SUMP-CONF-SW24 -SS- AFC0952 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW25	2422-SUMP-CONF-SW24 -DS- AFC0953 -REG	2-5			Arsenic, Lewisite
	2522-SUMP-CONF-SW25 -SS- AFC0954 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW26	2522-SUMP-CONF-SW25 -DS- AFC0955 -REG	2-5			Arsenic, Lewisite
	2622-SUMP-CONF-SW26 -SS- AFC0956 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW27	2622-SUMP-CONF-SW26 -DS- AFC0957 -REG	2-5			Arsenic, Lewisite
	2722-SUMP-CONF-SW27 -SS- AFC0958 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW28	2722-SUMP-CONF-SW27 -DS- AFC0959 -REG	2-5	122-SUMP-CONF-SW27-DS-AFC0959-MS/MSD		Arsenic, Lewisite
	2822-SUMP-CONF-SW28 -SS- AFC0960 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW29	2822-SUMP-CONF-SW28 -DS- AFC0961 -REG	2-5			Arsenic, Lewisite
	2922-SUMP-CONF-SW29 -SS- AFC0962 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW30	2922-SUMP-CONF-SW29 -DS- AFC0963 -REG	2-5			Arsenic, Lewisite
	3022-SUMP-CONF-SW30 -SS- AFC0964 -REG	0-2	122-SUMP-CONF-SW30-SS-AFC0965-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW31	3022-SUMP-CONF-SW30 -DS- AFC0965 -REG	2-5			Arsenic, Lewisite
	3122-SUMP-CONF-SW31 -SS- AFC0966 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-SW32	3122-SUMP-CONF-SW31 -DS- AFC0967 -REG	2-5			Arsenic, Lewisite
	3222-SUMP-CONF-SW32 -SS- AFC0968 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
122-SUMP-CONF-FL1	3222-SUMP-CONF-SW32 -DS- AFC0969 -REG	2-5			Arsenic, Lewisite
122-SUMP-CONF-FL2	122-SUMP-CONF-FL1 -DS- AFC0970 -REG	5-6			Arsenic, Lewisite
122-SUMP-CONF-FL3	122-SUMP-CONF-FL2 -DS- AFC0971 -REG	5-6			Arsenic, Lewisite
122-SUMP-CONF-FL4	122-SUMP-CONF-FL3 -DS- AFC0972 -REG	5-6	122-SUMP-CONF-FL4-DS-AFC0973-FD		Arsenic, Lewisite
122-SUMP-CONF-FL5	122-SUMP-CONF-FL4 -DS- AFC0974 -REG	5-6			Arsenic, Lewisite
122-SUMP-CONF-FL6	122-SUMP-CONF-FL5 -DS- AFC0975 -REG	5-6			Arsenic, Lewisite
122-SUMP-CONF-FL7	122-SUMP-CONF-FL6 -DS- AFC0976 -REG	5-6			Arsenic, Lewisite
122-SUMP-CONF-FL7	122-SUMP-CONF-FL7 -DS- AFC0977 -REG	5-6			Arsenic, Lewisite

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Sample Location	Sample Designation				Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
						FD*	MS/MSD*	
122-SUMP-CONF-FL8	122-SUMP-CONF-FL8	-DS-	AFC0978	-REG	5-6			Arsenic, Lewisite
<b>Listed Waste Characterization</b>								
122-LWCHAR	122-LWCHAR	-SO-	AFC9001	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9002	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9003	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9004	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9005	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9006	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9007	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9008	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9009	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9010	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9011	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9012	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9013	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9014	-REG	NA			TCLP Metals
122-LWCHAR	122-LWCHAR	-SO-	AFC9015	-REG	NA			TCLP Metals
<b>Waste Characterization- Possible Backfill</b>								
122-WSTCK	122-WSTCK	-SO-	AFC9035	-REG	NA	122-WSTCK-SO-AFC9036-FD		Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9037	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9038	-REG	NA		122-WSTCK-SO-AFC9038-MS/MSD	Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9039	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9040	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9041	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9042	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9043	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9044	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9045	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9046	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9047	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9049	-REG	NA	122-WSTCK-SO-AFC9048-FD		Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9050	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9051	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9052	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9053	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9054	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9055	-REG	NA			Arsenic, TCLP Metals**
122-WSTCK	122-WSTCK	-SO-	AFC9056	-REG	NA			Arsenic, TCLP Metals**

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Sampling Locations and Analytical Requirements, RSA-122  
Redstone Arsenal, Madison County, Alabama

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Sample Location	Sample Designation					Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
							FD*	MS/MSD*	
<b>Waste Characterization Requiring Stabilization (Contingency)</b>									
122-WSTCK	122-WSTCK	-SO-	AFC9057	-REG	NA			TCLP Metals***	
122-WSTCK	122-WSTCK	-SO-	AFC9058	-REG	NA			TCLP Metals***	
122-WSTCK	122-WSTCK	-SO-	AFC9059	-REG	NA			TCLP Metals***	
122-WSTCK	122-WSTCK	-SO-	AFC9060	-REG	NA			TCLP Metals***	
122-WSTCK	122-WSTCK	-SO-	AFC9061	-REG	NA			TCLP Metals***	
<b>IDW/Standing Water</b>									
122-SITE	122-SITE	-WA-	AFC9062	-REG	NA			Arsenic	
<b>Borrow Source</b>									
122-BORROW1	122-BORROW1	-SO-	AFC9063	-REG	NA	122BORROW1-SO-AFC9064-FD	122BORROW1-SO-AFC9065-MS/MSD	TCL VOC, TCL SVOC, Pesticides, PCBs, TAL Metals, Particle size, Atterberg, Moisture content, Soil classification, Density	

\*The MS/MSD/FD locations are subject to change due to field conditions. Project chemist will be notified and data base updated accordingly.

\*\* - Only analyze for TCLP Metals if arsenic does not meet cleanup goal

\*\*\* - If TCLP Metals fail for Waste Characterization, then stabilize the soil and retest for TCLP Metals

SS - Surface soil.

DS - Subsurface soil.

WA - Waste water

CA - Chemical Agent - Lewisite.

TCLP - Toxicity characteristic leaching potential.

QA - Quality assurance.

QC - Quality control.

MS - Matrix spike.

MSD - Matrix spike duplicate.

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Sampling Locations and Analytical Requirements, RSA-183  
Redstone Arsenal, Madison County, Alabama

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
<b>RSA-183 Excavation Sample Locations</b>					
<b>Excavation Area A Sample Locations</b>					
183EXA-1-CONF-SW1	183EXA-1-CONF-SW1	-SS- ALM0001 -REG	0-2	183EXA-1-CONF-SW1-SS-ALM0002-FD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXA-1-CONF-SW2	183EXA-1-CONF-SW2	-SS- ALM0003 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXA-1-CONF-SW3	183EXA-1-CONF-SW3	-SS- ALM0004 -REG	0-2	183EXA-1-CONF-SW3-SS-ALM0003-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXA-1-CONF-SW4	183EXA-1-CONF-SW4	-SS- ALM0005 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXA-1-CONF-SW5	183EXA-1-CONF-SW5	-SS- ALM0006 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXA-1-CONF-SW6	183EXA-1-CONF-SW6	-SS- ALM0007 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXA-1-CONF-SW7	183EXA-1-CONF-SW7	-SS- ALM0008 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXA-1-CONF-SW8	183EXA-1-CONF-SW8	-SS- ALM0009 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXA-1-CONF-FL1	183EXA-1-CONF-FL1	-DS- ALM0010 -REG	2-3	183EXA-1-CONF-FL1-DS-ALM0011-FD	Arsenic
183EXA-1-CONF-FL2	183EXA-1-CONF-FL2	-DS- ALM0012 -REG	2-3		Arsenic
183EXA-1-CONF-FL3	183EXA-1-CONF-FL3	-DS- ALM0013 -REG	2-3		Arsenic
<b>Excavation Area B Sample Locations</b>					
183EXB-1-CONF-SW1	183EXB-1-CONF-SW1	-SS- ALM0023 -REG	0-2	183EXB-1-CONF-SW1-SS-ALM0024-FD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXB-1-CONF-SW2	183EXB-1-CONF-SW2	-SS- ALM0025 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXB-1-CONF-SW3	183EXB-1-CONF-SW3	-SS- ALM0026 -REG	0-2	183EXB-1-CONF-SW3-SS-ALM0026-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXB-1-CONF-SW4	183EXB-1-CONF-SW4	-SS- ALM0027 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXB-1-CONF-FL1	183EXB-1-CONF-FL1	-DS- ALM0028 -REG	2-3		Arsenic
<b>Excavation Area C Sample Locations</b>					
183EXC-1-CONF-SW1	183EXC-1-CONF-SW1	-SS- ALM0038 -REG	0-2	183EXC-1-CONF-SW1-SS-ALM0039-FD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-1-CONF-SW2	183EXC-1-CONF-SW2	-SS- ALM0040 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-1-CONF-SW3	183EXC-1-CONF-SW3	-SS- ALM0041 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-1-CONF-SW4	183EXC-1-CONF-SW4	-SS- ALM0042 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-1-CONF-FL1	183EXC-1-CONF-FL1	-DS- ALM0043 -REG	2-3		Arsenic
183EXC-2-CONF-SW1	183EXC-2-CONF-SW1	-SS- ALM0044 -REG	0-2	183EXC-2-CONF-SW1-SS-ALM0044-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-2-CONF-SW2	183EXC-2-CONF-SW2	-SS- ALM0045 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-2-CONF-SW3	183EXC-2-CONF-SW3	-SS- ALM0046 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-2-CONF-SW4	183EXC-2-CONF-SW4	-SS- ALM0047 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-2-CONF-FL1	183EXC-2-CONF-FL1	-DS- ALM0048 -REG	2-3		Arsenic
183EXC-3-CONF-SW1	183EXC-3-CONF-SW1	-SS- ALM0049 -REG	0-2	183EXC-3-CONF-SW1-SS-ALM0050-FD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-3-CONF-SW2	183EXC-3-CONF-SW2	-SS- ALM0051 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-3-CONF-SW3	183EXC-3-CONF-SW3	-SS- ALM0052 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-3-CONF-SW4	183EXC-3-CONF-SW4	-SS- ALM0053 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXC-3-CONF-FL1	183EXC-3-CONF-FL1	-DS- ALM0054 -REG	2-3		Arsenic
<b>Excavation Area D Sample Locations</b>					
183EXD-1-CONF-SW1	183EXD-1-CONF-SW1	-SS- ALM0064 -REG	0-2	183EXD-1-CONF-SW1-SS-ALM0065-FD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXD-1-CONF-SW2	183EXD-1-CONF-SW2	-SS- ALM0066 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXD-1-CONF-SW3	183EXD-1-CONF-SW3	-SS- ALM0067 -REG	0-2		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXD-1-CONF-SW4	183EXD-1-CONF-SW4	-SS- ALM0068 -REG	0-2	183EXD-1-CONF-SW4-SS-ALM0068-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXD-1-CONF-FL1	183EXD-1-CONF-FL1	-DS- ALM0069 -REG	2-3		Arsenic
183EXD-2-CONF-SW1	183EXD-2-CONF-SW1	-DS- ALM0070 -REG	6-11		Arsenic, Lewisite
	183EXD-2-CONF-SW1	-DS- ALM0071 -REG	11-14		Arsenic, Lewisite
183EXD-2-CONF-SW2	183EXD-2-CONF-SW2	-DS- ALM0072 -REG	6-11		Arsenic, Lewisite
	183EXD-2-CONF-SW2	-DS- ALM0073 -REG	11-14		Arsenic, Lewisite



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Sampling Locations and Analytical Requirements, RSA-183  
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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
183EXD-2-CONF-SW3	183EXD-2-CONF-SW3 -DS- ALM0074 -REG	6-11			Arsenic, Lewisite
	183EXD-2-CONF-SW3 -DS- ALM0075 -REG	11-14			Arsenic, Lewisite
183EXD-2-CONF-SW4	183EXD-2-CONF-SW4 -DS- ALM0076 -REG	6-11	183EXD-2-CONF-SW4-DS-ALM0077-FD		Arsenic, Lewisite
	183EXD-2-CONF-SW4 -DS- ALM0078 -REG	11-14			Arsenic, Lewisite
183EXD-2-CONF-FL1	183EXD-2-CONF-FL1 -DS- ALM0079 -REG	14-15			Arsenic, Lewisite
183EXD-3-CONF-SW1	183EXD-3-CONF-SW1 -DS- ALM0080 -REG	6-11			Arsenic, Lewisite
	183EXD-3-CONF-SW1 -DS- ALM0081 -REG	11-16			Arsenic, Lewisite
183EXD-3-CONF-SW2	183EXD-3-CONF-SW2 -DS- ALM0082 -REG	6-11	183EXD-3-CONF-SW2-DS-ALM0082-MS/MSD		Arsenic, Lewisite
	183EXD-3-CONF-SW2 -DS- ALM0083 -REG	11-16			Arsenic, Lewisite
183EXD-3-CONF-SW3	183EXD-3-CONF-SW3 -DS- ALM0084 -REG	6-11			Arsenic, Lewisite
	183EXD-3-CONF-SW3 -DS- ALM0085 -REG	11-16			Arsenic, Lewisite
183EXD-3-CONF-SW4	183EXD-3-CONF-SW4 -DS- ALM0086 -REG	6-11			Arsenic, Lewisite
	183EXD-3-CONF-SW4 -DS- ALM0087 -REG	11-16			Arsenic, Lewisite
183EXD-3-CONF-FL1	183EXD-3-CONF-FL1 -DS- ALM0088 -REG	16-17			Arsenic, Lewisite
183EXD-4-CONF-SW1	183EXD-4-CONF-SW1 -SS- ALM0089 -REG	0-2	183EXD-4-CONF-SW1-SS-ALM0090-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXD-4-CONF-SW2	183EXD-4-CONF-SW2 -SS- ALM0091 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXD-4-CONF-SW3	183EXD-4-CONF-SW3 -SS- ALM0092 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXD-4-CONF-SW4	183EXD-4-CONF-SW4 -SS- ALM0093 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXD-4-CONF-FL1	183EXD-4-CONF-FL1 -DS- ALM0094 -REG	2-3			Arsenic
183EXD-5-CONF-SW1	183EXD-5-CONF-SW1 -DS- ALM0095 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW2	183EXD-5-CONF-SW2 -DS- ALM0096 -REG	2-6	183EXD-5-CONF-SW2-DS-ALM0096-MS/MSD		Arsenic, Lewisite
183EXD-5-CONF-SW3	183EXD-5-CONF-SW3 -DS- ALM0097 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW4	183EXD-5-CONF-SW4 -DS- ALM0098 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW5	183EXD-5-CONF-SW5 -DS- ALM0099 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW6	183EXD-5-CONF-SW6 -DS- ALM0100 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW7	183EXD-5-CONF-SW7 -DS- ALM0101 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW8	183EXD-5-CONF-SW8 -DS- ALM0102 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW9	183EXD-5-CONF-SW9 -DS- ALM0103 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW10	183EXD-5-CONF-SW10 -DS- ALM0104 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW11	183EXD-5-CONF-SW11 -DS- ALM0105 -REG	2-6	183EXD-5-CONF-SW11-DS-ALM0106-FD		Arsenic, Lewisite
183EXD-5-CONF-SW12	183EXD-5-CONF-SW12 -DS- ALM0107 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW13	183EXD-5-CONF-SW13 -DS- ALM0108 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW14	183EXD-5-CONF-SW14 -DS- ALM0109 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW15	183EXD-5-CONF-SW15 -DS- ALM0110 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW16	183EXD-5-CONF-SW16 -DS- ALM0111 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-SW17	183EXD-5-CONF-SW17 -DS- ALM0112 -REG	2-6			Arsenic, Lewisite
183EXD-5-CONF-FL1	183EXD-5-CONF-FL1 -DS- ALM0113 -REG	6-7			Arsenic, Lewisite
183EXD-5-CONF-FL2	183EXD-5-CONF-FL2 -DS- ALM0114 -REG	6-7	183EXD-5-CONF-FL2-DS-ALM0115-FD		Arsenic, Lewisite
183EXD-5-CONF-FL3	183EXD-5-CONF-FL3 -DS- ALM0116 -REG	6-7			Arsenic, Lewisite
183EXD-5-CONF-FL4	183EXD-5-CONF-FL4 -DS- ALM0117 -REG	6-7			Arsenic, Lewisite
183EXD-5-CONF-FL5	183EXD-5-CONF-FL5 -DS- ALM0118 -REG	6-7			Arsenic, Lewisite
183EXD-5-CONF-FL6	183EXD-5-CONF-FL6 -DS- ALM0119 -REG	6-7			Arsenic, Lewisite
183EXD-5-CONF-FL7	183EXD-5-CONF-FL7 -DS- ALM0120 -REG	6-7			Arsenic, Lewisite
183EXD-5-CONF-FL8	183EXD-5-CONF-FL8 -DS- ALM0121 -REG	6-7			Arsenic, Lewisite
183EXD-5-CONF-FL9	183EXD-5-CONF-FL9 -DS- ALM0122 -REG	6-7			Arsenic, Lewisite
183EXD-5-CONF-FL10	183EXD-5-CONF-FL10 -DS- ALM0123 -REG	6-7	183EXD-5-CONF-FL10-DS-ALM0124-FD		Arsenic, Lewisite

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Sampling Locations and Analytical Requirements, RSA-183  
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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
183EXD-6-CONF-SW1	183EXD-6-CONF-SW1 -SS- ALM0125 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW2	183EXD-6-CONF-SW2 -SS- ALM0126 -REG	0-2	183EXD-6-CONF-SW2-SS-ALM0127-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW3	183EXD-6-CONF-SW3 -SS- ALM0128 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW4	183EXD-6-CONF-SW4 -SS- ALM0129 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW5	183EXD-6-CONF-SW5 -SS- ALM0130 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW6	183EXD-6-CONF-SW6 -SS- ALM0131 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW7	183EXD-6-CONF-SW7 -SS- ALM0132 -REG	0-2		183EXD-6-CONF-SW7-SS-ALM0132-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW8	183EXD-6-CONF-SW8 -SS- ALM0133 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW9	183EXD-6-CONF-SW9 -SS- ALM0134 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW10	183EXD-6-CONF-SW10 -SS- ALM0135 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW11	183EXD-6-CONF-SW11 -SS- ALM0136 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW12	183EXD-6-CONF-SW12 -SS- ALM0137 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW13	183EXD-6-CONF-SW13 -SS- ALM0138 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW14	183EXD-6-CONF-SW14 -SS- ALM0139 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW15	183EXD-6-CONF-SW15 -SS- ALM0140 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW16	183EXD-6-CONF-SW16 -SS- ALM0141 -REG	0-2	183EXD-6-CONF-SW16-SS-ALM0142-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW17	183EXD-6-CONF-SW17 -SS- ALM0143 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW18	183EXD-6-CONF-SW18 -SS- ALM0144 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW19	183EXD-6-CONF-SW19 -SS- ALM0145 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW20	183EXD-6-CONF-SW20 -SS- ALM0146 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW21	183EXD-6-CONF-SW21 -SS- ALM0147 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW22	183EXD-6-CONF-SW22 -SS- ALM0148 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXD-6-CONF-SW23	183EXD-6-CONF-SW23 -SS- ALM0149 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite

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Sampling Locations and Analytical Requirements, RSA-183  
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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
183EXD-6-CONF-FL1	183EXD-6-CONF-FL1 -DS- ALM0150 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL2	183EXD-6-CONF-FL2 -DS- ALM0151 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL3	183EXD-6-CONF-FL3 -DS- ALM0152 -REG	2-3	183EXD-6-CONF-FL3-DS-ALM0153-FD		Arsenic, Lewisite
183EXD-6-CONF-FL4	183EXD-6-CONF-FL4 -DS- ALM0154 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL5	183EXD-6-CONF-FL5 -DS- ALM0155 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL6	183EXD-6-CONF-FL6 -DS- ALM0156 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL7	183EXD-6-CONF-FL7 -DS- ALM0157 -REG	2-3		183EXD-6-CONF-FL7-DS-ALM0157-MS/MSD	Arsenic, Lewisite
183EXD-6-CONF-FL8	183EXD-6-CONF-FL8 -DS- ALM0158 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL9	183EXD-6-CONF-FL9 -DS- ALM0159 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL10	183EXD-6-CONF-FL10 -DS- ALM0160 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL11	183EXD-6-CONF-FL11 -DS- ALM0161 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL12	183EXD-6-CONF-FL12 -DS- ALM0162 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL13	183EXD-6-CONF-FL13 -DS- ALM0163 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL14	183EXD-6-CONF-FL14 -DS- ALM0164 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL15	183EXD-6-CONF-FL15 -DS- ALM0165 -REG	2-3			Arsenic, Lewisite
183EXD-6-CONF-FL16	183EXD-6-CONF-FL16 -DS- ALM0166 -REG	2-3	183EXD-6-CONF-FL16-DS-ALM0167-FD		Arsenic, Lewisite
<b>Excavation Area E Sample Locations</b>					
183EXE-1-CONF-SW1	183EXE-1-CONF-SW1 -SS- ALM0186 -REG	0-2	183EXE-1-CONF-SW1-SS-ALM0187-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-1-CONF-SW2	183EXE-1-CONF-SW2 -SS- ALM0188 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-1-CONF-SW3	183EXE-1-CONF-SW3 -SS- ALM0189 -REG	0-2		183EXE-1-CONF-SW3-SS-ALM0189-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-1-CONF-SW4	183EXE-1-CONF-SW4 -SS- ALM0190 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-1-CONF-SW5	183EXE-1-CONF-SW5 -SS- ALM0191 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-1-CONF-FL1	183EXE-1-CONF-FL1 -DS- ALM0192 -REG	2-3			Arsenic
183EXE-1-CONF-FL2	183EXE-1-CONF-FL2 -DS- ALM0193 -REG	2-3			Arsenic
183EXE-2-CONF-SW1	183EXE-2-CONF-SW1 -SS- ALM0194 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW2	183EXE-2-CONF-SW2 -SS- ALM0195 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW3	183EXE-2-CONF-SW3 -SS- ALM0196 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW4	183EXE-2-CONF-SW4 -SS- ALM0197 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW5	183EXE-2-CONF-SW5 -SS- ALM0198 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW6	183EXE-2-CONF-SW6 -SS- ALM0199 -REG	0-2	183EXE-2-CONF-SW6-SS-ALM0200-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW7	183EXE-2-CONF-SW7 -SS- ALM0201 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW8	183EXE-2-CONF-SW8 -SS- ALM0202 -REG	0-2		183EXE-2-CONF-SW8-SS-ALM0202-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW9	183EXE-2-CONF-SW9 -SS- ALM0203 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW10	183EXE-2-CONF-SW10 -SS- ALM0204 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW11	183EXE-2-CONF-SW11 -SS- ALM0205 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
183EXE-2-CONF-SW12	183EXE-2-CONF-SW12 -SS- ALM0206 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW13	183EXE-2-CONF-SW13 -SS- ALM0207 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW14	183EXE-2-CONF-SW14 -SS- ALM0208 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW15	183EXE-2-CONF-SW15 -SS- ALM0209 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW16	183EXE-2-CONF-SW16 -SS- ALM0210 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW17	183EXE-2-CONF-SW17 -SS- ALM0211 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-SW18	183EXE-2-CONF-SW18 -SS- ALM0212 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-2-CONF-FL1	183EXE-2-CONF-FL1 -DS- ALM0213 -REG	2-3	183EXE-2-CONF-FL1-DS-ALM0214-FD		Arsenic, Lewisite
183EXE-2-CONF-FL2	183EXE-2-CONF-FL2 -DS- ALM0215 -REG	2-3			Arsenic, Lewisite
183EXE-2-CONF-FL3	183EXE-2-CONF-FL3 -DS- ALM0216 -REG	2-3			Arsenic, Lewisite
183EXE-2-CONF-FL4	183EXE-2-CONF-FL4 -DS- ALM0217 -REG	2-3		183EXE-2-CONF-FL4-DS-ALM0217-MS/MSD	Arsenic, Lewisite
183EXE-2-CONF-FL5	183EXE-2-CONF-FL5 -DS- ALM0218 -REG	2-3			Arsenic, Lewisite
183EXE-2-CONF-FL6	183EXE-2-CONF-FL6 -DS- ALM0219 -REG	2-3			Arsenic, Lewisite
183EXE-2-CONF-FL7	183EXE-2-CONF-FL7 -DS- ALM0220 -REG	2-3			Arsenic, Lewisite
183EXE-2-CONF-FL8	183EXE-2-CONF-FL8 -DS- ALM0221 -REG	2-3			Arsenic, Lewisite
183EXE-2-CONF-FL9	183EXE-2-CONF-FL9 -DS- ALM0222 -REG	2-3			Arsenic, Lewisite
183EXE-2-CONF-FL10	183EXE-2-CONF-FL10 -DS- ALM0223 -REG	2-3	183EXE-2-CONF-FL10-DS-ALM0224-FD		Arsenic, Lewisite
183EXE-2-CONF-FL11	183EXE-2-CONF-FL11 -DS- ALM0225 -REG	2-3			Arsenic, Lewisite
183EXE-2-CONF-FL12	183EXE-2-CONF-FL12 -DS- ALM0226 -REG	2-3			Arsenic, Lewisite
183EXE-3-CONF-SW1	183EXE-3-CONF-SW1 -DS- ALM0227 -REG	2-6			Arsenic, Lewisite
183EXE-3-CONF-SW2	183EXE-3-CONF-SW2 -DS- ALM0228 -REG	2-6			Arsenic, Lewisite
183EXE-3-CONF-SW3	183EXE-3-CONF-SW3 -DS- ALM0229 -REG	2-6			Arsenic, Lewisite
183EXE-3-CONF-SW4	183EXE-3-CONF-SW4 -DS- ALM0230 -REG	2-6			Arsenic, Lewisite
183EXE-3-CONF-SW5	183EXE-3-CONF-SW5 -DS- ALM0231 -REG	2-6			Arsenic, Lewisite
183EXE-3-CONF-SW6	183EXE-3-CONF-SW6 -DS- ALM0232 -REG	2-6			Arsenic, Lewisite
183EXE-3-CONF-SW7	183EXE-3-CONF-SW7 -DS- ALM0233 -REG	2-6			Arsenic, Lewisite
183EXE-3-CONF-FL1	183EXE-3-CONF-FL1 -DS- ALM0234 -REG	6-7		183EXE-3-CONF-FL1-DS-ALM0234-MS/MSD	Arsenic, Lewisite
183EXE-3-CONF-FL2	183EXE-3-CONF-FL2 -DS- ALM0235 -REG	6-7			Arsenic, Lewisite
183EXE-3-CONF-FL3	183EXE-3-CONF-FL3 -DS- ALM0236 -REG	6-7			Arsenic, Lewisite
183EXE-4-CONF-SW1	183EXE-4-CONF-SW1 -SS- ALM0237 -REG	0-2	183EXE-4-CONF-SW1-SS-ALM0238-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-4-CONF-SW2	183EXE-4-CONF-SW2 -SS- ALM0239 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-4-CONF-SW3	183EXE-4-CONF-SW3 -SS- ALM0240 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-4-CONF-SW4	183EXE-4-CONF-SW4 -SS- ALM0241 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-4-CONF-FL1	183EXE-4-CONF-FL1 -DS- ALM0242 -REG	2-3			Arsenic
183EXE-5-CONF-SW1	183EXE-5-CONF-SW1 -SS- ALM0243 -REG	0-2		183EXE-5-CONF-SW1-SS-ALM0243-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-5-CONF-SW2	183EXE-5-CONF-SW2 -SS- ALM0244 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-5-CONF-SW3	183EXE-5-CONF-SW3 -SS- ALM0245 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-5-CONF-SW4	183EXE-5-CONF-SW4 -SS- ALM0246 -REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-5-CONF-FL1	183EXE-5-CONF-FL1 -DS- ALM0247 -REG	2-3			Arsenic

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Sample Location	Sample Designation				Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
						FD*	MS/MSD*	
183EXE-6-CONF-SW1	183EXE-6-CONF-SW1	-SS-	ALM0248	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-6-CONF-SW2	183EXE-6-CONF-SW2	-SS-	ALM0249	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-6-CONF-SW3	183EXE-6-CONF-SW3	-SS-	ALM0250	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-6-CONF-SW4	183EXE-6-CONF-SW4	-SS-	ALM0251	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-6-CONF-FL1	183EXE-6-CONF-FL1	-DS-	ALM0252	-REG	2-3			Arsenic
183EXE-7-CONF-SW1	183EXE-7-CONF-SW1	-SS-	ALM0253	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-7-CONF-SW2	183EXE-7-CONF-SW2	-SS-	ALM0254	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-7-CONF-SW3	183EXE-7-CONF-SW3	-SS-	ALM0255	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-7-CONF-SW4	183EXE-7-CONF-SW4	-SS-	ALM0256	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXE-7-CONF-FL1	183EXE-7-CONF-FL1	-DS-	ALM0257	-REG	2-3			Arsenic
183EXE-8-CONF-SW1	183EXE-8-CONF-SW1	-DS-	ALM0258	-REG	2-6			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-8-CONF-SW2	183EXE-8-CONF-SW2	-DS-	ALM0259	-REG	2-6			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-8-CONF-SW3	183EXE-8-CONF-SW3	-DS-	ALM0260	-REG	2-6			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-8-CONF-SW4	183EXE-8-CONF-SW4	-DS-	ALM0261	-REG	2-6			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183EXE-8-CONF-FL1	183EXE-8-CONF-FL1	-DS-	ALM0262	-REG	6-7	183EXE-8-CONF-FL1-DS-ALM0263-FD		Arsenic, Lewisite
<b>Excavation Area F Sample Locations</b>								
183EXF-1-CONF-SW1	183EXF-1-CONF-SW1	-SS-	ALM0282	-REG	0-2	183EXF-1-CONF-SW1-SS-ALM0283-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-1-CONF-SW2	183EXF-1-CONF-SW2	-SS-	ALM0284	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-1-CONF-SW3	183EXF-1-CONF-SW3	-SS-	ALM0285	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-1-CONF-SW4	183EXF-1-CONF-SW4	-SS-	ALM0286	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-1-CONF-FL1	183EXF-1-CONF-FL1	-DS-	ALM0287	-REG	2-3			Arsenic
183EXF-2-CONF-SW1	183EXF-2-CONF-SW1	-SS-	ALM0288	-REG	0-2	183EXF-2-CONF-SW1-SS-ALM0288-MS/MSD		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-2-CONF-SW2	183EXF-2-CONF-SW2	-SS-	ALM0289	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-2-CONF-SW3	183EXF-2-CONF-SW3	-SS-	ALM0290	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-2-CONF-SW4	183EXF-2-CONF-SW4	-SS-	ALM0291	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-2-CONF-FL1	183EXF-2-CONF-FL1	-DS-	ALM0292	-REG	2-3			Arsenic
183EXF-3-CONF-SW1	183EXF-3-CONF-SW1	-SS-	ALM0293	-REG	0-2	183EXF-3-CONF-SW1-SS-ALM0294-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-3-CONF-SW2	183EXF-3-CONF-SW2	-SS-	ALM0295	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-3-CONF-SW3	183EXF-3-CONF-SW3	-SS-	ALM0296	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-3-CONF-SW4	183EXF-3-CONF-SW4	-SS-	ALM0297	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXF-3-CONF-FL1	183EXF-3-CONF-FL1	-DS-	ALM0298	-REG	2-3			Arsenic
<b>Excavation Area G Sample Locations</b>								
183EXG-1-CONF-SW1	183EXG-1-CONF-SW1	-SS-	ALM0318	-REG	0-2	183EXG-1-CONF-SW1-SS-ALM0319-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXG-1-CONF-SW2	183EXG-1-CONF-SW2	-SS-	ALM0320	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXG-1-CONF-SW3	183EXG-1-CONF-SW3	-SS-	ALM0321	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXG-1-CONF-SW4	183EXG-1-CONF-SW4	-SS-	ALM0322	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXG-1-CONF-FL1	183EXG-1-CONF-FL1	-DS-	ALM0323	-REG	2-3			Arsenic
183EXG-2-CONF-SW1	183EXG-2-CONF-SW1	-SS-	ALM0324	-REG	0-2	183EXG-2-CONF-SW1-SS-ALM0324-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXG-2-CONF-SW2	183EXG-2-CONF-SW2	-SS-	ALM0325	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXG-2-CONF-SW3	183EXG-2-CONF-SW3	-SS-	ALM0326	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXG-2-CONF-SW4	183EXG-2-CONF-SW4	-SS-	ALM0327	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium
183EXG-2-CONF-FL1	183EXG-2-CONF-FL1	-DS-	ALM0328	-REG	2-3			Arsenic

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Sample Location	Sample Designation	Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
			FD*	MS/MSD*	
<b>Piping Area Locations</b>					
183-PIPELN	183-PIPELN	.SOLID ALM0338 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0339 -REG	4-5	183-PIPELN-DS-ALM0340-FD	Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0341 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0342 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0343 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0344 -REG	4-5	183-PIPELN-DS-ALM0344-MS/MSD	Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0345 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0346 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0347 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0348 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0349 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0350 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0351 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0352 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0353 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0354 -REG	4-5	183-PIPELN-DS-ALM0355-FD	Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0356 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0357 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0358 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0359 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0360 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0361 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0362 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0363 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0364 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0365 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0366 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0367 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0368 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0369 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0370 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0371 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0372 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0373 -REG	4-5	183-PIPELN-DS-ALM0374-FD	Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0375 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0376 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0377 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0378 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0379 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0380 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0381 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0382 -REG	4-5	183-PIPELN-DS-ALM0382-MS/MSD	Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0383 -REG	NA		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0384 -REG	4-5		Arsenic, Lewisite
183-PIPELN	183-PIPELN	.SOLID ALM0385 -REG	NA		Lewisite Headspace

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Sample Location	Sample Designation		Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
				FD*	MS/MSD*	
183-PIPELN	183-PIPELN	-DS- ALM0386 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0387 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0388 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0389 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0390 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0391 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0392 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0393 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0394 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0395 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0396 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0397 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0398 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0399 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0400 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0401 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0402 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0403 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0404 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0405 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0406 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0407 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0408 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0409 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0410 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0411 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0412 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0413 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0414 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0415 -REG	NA	183-PIPELN-DS-ALM0416-FD		Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0417 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0418 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0419 -REG	4-5			Arsenic, Lewisite
183-PIPELN	183-PIPELN	-SOLID ALM0420 -REG	NA			Lewisite Headspace
183-PIPELN	183-PIPELN	-DS- ALM0421 -REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0422 -REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0423 -REG	4-5	183-PIPELN-DS-ALM0424-FD		Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0425 -REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0426 -REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0427 -REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0428 -REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0429 -REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0430 -REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0431 -REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0432 -REG	4-5	183-PIPELN-DS-ALM0433-FD		Arsenic
183-PIPELN	183-PIPELN	-DS- ALM0434 -REG	4-5			Arsenic

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Sampling Locations and Analytical Requirements, RSA-183  
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Sample Location	Sample Designation				Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
						FD*	MS/MSD*	
183-PIPELN	183-PIPELN	-DS-	ALM0435	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0436	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0437	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0438	-REG	4-5		183-PIPELN-DS-ALM0438-MS/MSD	Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0439	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0440	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0441	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0442	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0443	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0444	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0445	-REG	4-5	183-PIPELN-DS-ALM0446-FD		Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0447	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0448	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0449	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0450	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0451	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0452	-REG	4-5			Arsenic
183-PIPELN	183-PIPELN	-DS-	ALM0453	-REG	4-5			Arsenic
<b>Collection Pit Locations</b>								
183-CPIT-CONF-SW1	183-CPIT-CONF-SW1	-SS-	ALM0473	-REG	0-2	183-CPIT-CONF-SW1-SS-ALM0474-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-CPIT-CONF-SW1	-DS-	ALM0475	-REG	2-6			Arsenic, Lewisite
	183-CPIT-CONF-SW1	-DS-	ALM0476	-REG	6-11			Arsenic, Lewisite
	183-CPIT-CONF-SW1	-DS-	ALM0477	-REG	11-14			Arsenic, Lewisite
183-CPIT-CONF-SW2	183-CPIT-CONF-SW2	-SS-	ALM0478	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-CPIT-CONF-SW2	-DS-	ALM0479	-REG	2-6	183-CPIT-CONF-SW2-DS-ALM0479-MS/MSD		Arsenic, Lewisite
	183-CPIT-CONF-SW2	-DS-	ALM0480	-REG	6-11			Arsenic, Lewisite
	183-CPIT-CONF-SW2	-DS-	ALM0481	-REG	11-14			Arsenic, Lewisite
183-CPIT-CONF-SW3	183-CPIT-CONF-SW3	-SS-	ALM0482	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-CPIT-CONF-SW3	-DS-	ALM0483	-REG	2-6			Arsenic, Lewisite
	183-CPIT-CONF-SW3	-DS-	ALM0484	-REG	6-11	183-CPIT-CONF-SW3-DS-ALM0485-FD		Arsenic, Lewisite
	183-CPIT-CONF-SW3	-DS-	ALM0486	-REG	11-14			Arsenic, Lewisite
183-CPIT-CONF-SW4	183-CPIT-CONF-SW4	-SS-	ALM0487	-REG	0-2		183-CPIT-CONF-SW4-SS-ALM0487-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-CPIT-CONF-SW4	-DS-	ALM0488	-REG	2-6			Arsenic, Lewisite
	183-CPIT-CONF-SW4	-DS-	ALM0489	-REG	6-11			Arsenic, Lewisite
	183-CPIT-CONF-SW4	-DS-	ALM0490	-REG	11-14			Arsenic, Lewisite
183-CPIT-CONF-SW5	183-CPIT-CONF-SW5	-SS-	ALM0491	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-CPIT-CONF-SW5	-DS-	ALM0492	-REG	2-6			Arsenic, Lewisite
	183-CPIT-CONF-SW5	-DS-	ALM0493	-REG	6-11			Arsenic, Lewisite
	183-CPIT-CONF-SW5	-DS-	ALM0494	-REG	11-14			Arsenic, Lewisite



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Sample Location	Sample Designation				Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
						FD*	MS/MSD*	
183-CPIT-CONF-SW6	183-CPIT-CONF-SW6	-SS-	ALM0495	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-CPIT-CONF-SW6	-DS-	ALM0496	-REG	2-6			Arsenic, Lewisite
	183-CPIT-CONF-SW6	-DS-	ALM0497	-REG	6-11			Arsenic, Lewisite
	183-CPIT-CONF-SW6	-DS-	ALM0498	-REG	11-14			Arsenic, Lewisite
183-CPIT-CONF-SW7	183-CPIT-CONF-SW7	-SS-	ALM0499	-REG	0-2	183-CPIT-CONF-SW7-SS-ALM0500-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-CPIT-CONF-SW7	-DS-	ALM0501	-REG	2-6			Arsenic, Lewisite
	183-CPIT-CONF-SW7	-DS-	ALM0502	-REG	6-11			Arsenic, Lewisite
	183-CPIT-CONF-SW7	-DS-	ALM0503	-REG	11-14			Arsenic, Lewisite
183-CPIT-CONF-SW8	183-CPIT-CONF-SW8	-SS-	ALM0504	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-CPIT-CONF-SW8	-DS-	ALM0505	-REG	2-6	183-CPIT-CONF-SW8-DS-ALM0505-MS/MSD		Arsenic, Lewisite
	183-CPIT-CONF-SW8	-DS-	ALM0506	-REG	6-11			Arsenic, Lewisite
	183-CPIT-CONF-SW8	-DS-	ALM0507	-REG	11-14			Arsenic, Lewisite
183-CPIT-CONF-FL1	183-CPIT-CONF-FL1	-DS-	ALM0508	-REG	14-15	183-CPIT-CONF-FL1-DS-ALM0509-FD		Arsenic, Lewisite
183-CPIT-CONF-FL2	183-CPIT-CONF-FL2	-DS-	ALM0510	-REG	14-15			Arsenic, Lewisite
<b>Blowcase Pit Locations</b>								
183-BPIT-CONF-SW1	183-BPIT-CONF-SW1	-SS-	ALM0520	-REG	0-2		183-BPIT-CONF-SW1-SS-ALM0520-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-BPIT-CONF-SW1	-DS-	ALM0521	-REG	2-6			Arsenic, Lewisite
	183-BPIT-CONF-SW1	-DS-	ALM0522	-REG	6-7			Arsenic, Lewisite
183-BPIT-CONF-SW2	183-BPIT-CONF-SW2	-SS-	ALM0523	-REG	0-2	183-BPIT-CONF-SW2-SS-ALM0524-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-BPIT-CONF-SW2	-DS-	ALM0525	-REG	2-6			Arsenic, Lewisite
	183-BPIT-CONF-SW2	-DS-	ALM0526	-REG	6-7			Arsenic, Lewisite
183-BPIT-CONF-SW3	183-BPIT-CONF-SW3	-SS-	ALM0527	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-BPIT-CONF-SW3	-DS-	ALM0528	-REG	2-6	183-BPIT-CONF-SW3-DS-ALM0529-FD		Arsenic, Lewisite
	183-BPIT-CONF-SW3	-DS-	ALM0530	-REG	6-7			Arsenic, Lewisite
183-BPIT-CONF-SW4	183-BPIT-CONF-SW4	-SS-	ALM0531	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-BPIT-CONF-SW4	-DS-	ALM0532	-REG	2-6			Arsenic, Lewisite
	183-BPIT-CONF-SW4	-DS-	ALM0533	-REG	6-7			Arsenic, Lewisite
183-BPIT-CONF-SW5	183-BPIT-CONF-SW5	-SS-	ALM0534	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-BPIT-CONF-SW5	-DS-	ALM0535	-REG	2-6			Arsenic, Lewisite
	183-BPIT-CONF-SW5	-DS-	ALM0536	-REG	6-7			Arsenic, Lewisite
183-BPIT-CONF-SW6	183-BPIT-CONF-SW6	-SS-	ALM0537	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-BPIT-CONF-SW6	-DS-	ALM0538	-REG	2-6	183-BPIT-CONF-SW6-DS-ALM0538-MS/MSD		Arsenic, Lewisite
	183-BPIT-CONF-SW6	-DS-	ALM0539	-REG	6-7			Arsenic, Lewisite
183-BPIT-CONF-SW7	183-BPIT-CONF-SW7	-SS-	ALM0540	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-BPIT-CONF-SW7	-DS-	ALM0541	-REG	2-6	183-BPIT-CONF-SW7-DS-ALM0542-FD		Arsenic, Lewisite
	183-BPIT-CONF-SW7	-DS-	ALM0543	-REG	6-7			Arsenic, Lewisite

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Sample Location	Sample Designation				Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
						FD*	MS/MSD*	
183-BPIT-CONF-SW8	183-BPIT-CONF-SW8	-SS-	ALM0544	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-BPIT-CONF-SW8	-DS-	ALM0545	-REG	2-6			Arsenic, Lewisite
	183-BPIT-CONF-SW8	-DS-	ALM0546	-REG	6-7			Arsenic, Lewisite
183-BPIT-CONF-FL1	183-BPIT-CONF-FL1	-DS-	ALM0547	-REG	7-8			Arsenic, Lewisite
183-BPIT-CONF-FL2	183-BPIT-CONF-FL2	-DS-	ALM0548	-REG	7-8			Arsenic, Lewisite
<b>Trench Locations</b>								
183-TRNCH-CONF-SW1	183-TRNCH-CONF-SW1	-SS-	ALM0558	-REG	0-2	183-TRNCH-CONF-SW1-SS-ALM0559-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183-TRNCH-CONF-SW2	183-TRNCH-CONF-SW2	-SS-	ALM0560	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183-TRNCH-CONF-SW3	183-TRNCH-CONF-SW3	-SS-	ALM0561	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183-TRNCH-CONF-SW4	183-TRNCH-CONF-SW4	-SS-	ALM0562	-REG	0-2		183-TRNCH-CONF-SW4-SS-ALM0562-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183-TRNCH-CONF-SW5	183-TRNCH-CONF-SW5	-SS-	ALM0563	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183-TRNCH-CONF-SW6	183-TRNCH-CONF-SW6	-SS-	ALM0564	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183-TRNCH-CONF-SW7	183-TRNCH-CONF-SW7	-SS-	ALM0565	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183-TRNCH-CONF-SW8	183-TRNCH-CONF-SW8	-SS-	ALM0566	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
183-TRNCH-CONF-FL1	183-TRNCH-CONF-FL1	-DS-	ALM0567	-REG	2-3			Arsenic, Lewisite
183-TRNCH-CONF-FL2	183-TRNCH-CONF-FL2	-DS-	ALM0568	-REG	2-3			Arsenic, Lewisite
<b>Sump Locations</b>								
183-SUMP-CONF-SW1	183-SUMP-CONF-SW1	-SS-	ALM0588	-REG	0-2	183-SUMP-CONF-SW1-SS-ALM0589-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-SUMP-CONF-SW1	-DS-	ALM0590	-REG	2-5			Arsenic, Lewisite
183-SUMP-CONF-SW2	183-SUMP-CONF-SW2	-SS-	ALM0591	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	183-SUMP-CONF-SW2	-DS-	ALM0592	-REG	2-5			Arsenic, Lewisite
183-SUMP-CONF-SW3	322-SUMP-CONF-SW3	-SS-	ALM0593	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	322-SUMP-CONF-SW3	-DS-	ALM0594	-REG	2-5		183-SUMP-CONF-SW3-DS-ALM0594-MS/MSD	Arsenic, Lewisite
183-SUMP-CONF-SW4	422-SUMP-CONF-SW4	-SS-	ALM0595	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	422-SUMP-CONF-SW4	-DS-	ALM0596	-REG	2-5			Arsenic, Lewisite
183-SUMP-CONF-SW5	522-SUMP-CONF-SW5	-SS-	ALM0597	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	522-SUMP-CONF-SW5	-DS-	ALM0598	-REG	2-5			Arsenic, Lewisite
183-SUMP-CONF-SW6	622-SUMP-CONF-SW6	-SS-	ALM0599	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite
	622-SUMP-CONF-SW6	-DS-	ALM0600	-REG	2-5	183-SUMP-CONF-SW6-DS-ALM0601-FD		Arsenic, Lewisite

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Sample Location	Sample Designation					Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
							FD*	MS/MSD*	
183-SUMP-CONF-SW7	722-SUMP-CONF-SW7	-SS-	ALM0602	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	722-SUMP-CONF-SW7	-DS-	ALM0603	-REG	2-5			Arsenic, Lewisite	
183-SUMP-CONF-SW8	822-SUMP-CONF-SW8	-SS-	ALM0604	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	822-SUMP-CONF-SW8	-DS-	ALM0605	-REG	2-5			Arsenic, Lewisite	
183-SUMP-CONF-SW9	922-SUMP-CONF-SW9	-SS-	ALM0606	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	922-SUMP-CONF-SW9	-DS-	ALM0607	-REG	2-5			Arsenic, Lewisite	
183-SUMP-CONF-SW10	1022-SUMP-CONF-SW10	-SS-	ALM0608	-REG	0-2	183-SUMP-CONF-SW10-SS-ALM0609-FD		Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	1022-SUMP-CONF-SW10	-DS-	ALM0610	-REG	2-5			Arsenic, Lewisite	
183-SUMP-CONF-SW11	1183-SUMP-CONF-SW11	-SS-	ALM0611	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	1183-SUMP-CONF-SW11	-DS-	ALM0612	-REG	2-5			Arsenic, Lewisite	
183-SUMP-CONF-SW12	1832-SUMP-CONF-SW12	-SS-	ALM0613	-REG	0-2		183-SUMP-CONF-SW12-SS-ALM0613-MS/MSD	Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	1832-SUMP-CONF-SW12	-DS-	ALM0614	-REG	2-5			Arsenic, Lewisite	
183-SUMP-CONF-SW13	1322-SUMP-CONF-SW13	-SS-	ALM0615	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	1322-SUMP-CONF-SW13	-DS-	ALM0616	-REG	2-5			Arsenic, Lewisite	
183-SUMP-CONF-SW14	1422-SUMP-CONF-SW14	-SS-	ALM0617	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	1422-SUMP-CONF-SW14	-DS-	ALM0618	-REG	2-5	183-SUMP-CONF-SW14-DS-ALM0619-FD		Arsenic, Lewisite	
183-SUMP-CONF-SW15	1522-SUMP-CONF-SW15	-SS-	ALM0620	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	1522-SUMP-CONF-SW15	-DS-	ALM0621	-REG	2-5			Arsenic, Lewisite	
183-SUMP-CONF-SW16	1622-SUMP-CONF-SW16	-SS-	ALM0622	-REG	0-2			Arsenic, Aluminum, Iron, Manganese, Vanadium, Lewisite	
	1622-SUMP-CONF-SW16	-DS-	ALM0623	-REG	2-5			Arsenic, Lewisite	
183-SUMP-CONF-FL1	183-SUMP-CONF-FL1	-DS-	ALM0624	-REG	5-6			Arsenic, Lewisite	
183-SUMP-CONF-FL2	183-SUMP-CONF-FL2	-DS-	ALM0625	-REG	5-6			Arsenic, Lewisite	
183-SUMP-CONF-FL3	183-SUMP-CONF-FL3	-DS-	ALM0626	-REG	5-6			Arsenic, Lewisite	
183-SUMP-CONF-FL4	183-SUMP-CONF-FL4	-DS-	ALM0627	-REG	5-6			Arsenic, Lewisite	
<b>Soil Vapor</b>									
183-VP001	183-VP001	-AIR-	ALM5001	-REG	NA			VOCs TO-15	
183-VP002	183-VP002	-AIR-	ALM5002	-REG	NA			VOCs TO-15	
<b>Waste Characterization- Possible Backfill</b>									
183-WSTCK	183-WSTCK	-SO-	ALM9001	-REG	NA	183-WSTCK-SO-ALM9002-FD		Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9003	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9004	-REG	NA		183-WSTCK-SO-ALM9004-MS/MSD	Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9005	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9006	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9007	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9008	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9009	-REG	NA			Arsenic, TCLP Metals**	

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Sample Location	Sample Designation					Sample Depth (ft bgs)	QA/QC Sample Designation		Analytical Suite
							FD*	MS/MSD*	
183-WSTCK	183-WSTCK	-SO-	ALM9010	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9011	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9012	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9013	-REG	NA	183-WSTCK-SO-ALM9014-FD		Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9015	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9016	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9017	-REG	NA		183-WSTCK-SO-ALM9017-MS/MSD	Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9018	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9019	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9020	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9021	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9022	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9023	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9024	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9025	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9026	-REG	NA	183-WSTCK-SO-ALM9027-FD		Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9028	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9029	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9030	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9031	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9032	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9033	-REG	NA			Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9034	-REG	NA	183-WSTCK-SO-ALM9035-FD		Arsenic, TCLP Metals**	
183-WSTCK	183-WSTCK	-SO-	ALM9036	-REG	NA			Arsenic, TCLP Metals**	
<b>Waste Characterization Stabilization (Contingency)</b>									
183-WSTCK	183-WSTCK	-SO-	ALM9037	-REG	NA			TCLP Metals***	
183-WSTCK	183-WSTCK	-SO-	ALM9038	-REG	NA			TCLP Metals***	
183-WSTCK	183-WSTCK	-SO-	ALM9039	-REG	NA			TCLP Metals***	
<b>IDW/Standing Water</b>									
183-SITE	183-SITE	-WA-	ALM9046	-REG	NA			Arsenic	

\*The MS/MSD/FD locations are subject to change due to field conditions. Project chemist will be notified and data base updated accordingly.

\*\* - Only analyze for TCLP Metals if arsenic does not meet cleanup goal

\*\*\* - If TCLP Metals fail for Waste Characterization, then stabilize the soil and retest for TCLP Metals

- SS - Surface soil.
- DS - Subsurface soil.
- WA - Waste water
- CA - Chemical Agent - Lewisite.
- TCLP - Toxicity characteristic leaching potential.
- QA - Quality assurance.
- QC - Quality control.
- MS - Matrix spike.
- MSD - Matrix spike duplicate.

## QAPP Worksheet No. 19 – Analytical SOP Requirements Table

### UFP-QAPP Worksheet No. 19. Sample Container, Preservation, and Holding Time Requirements (Continued)

Matrix	Analytical Group	Laboratory Analytical and Preparation Method/SOP	Sample Container Quantity and Type	Sample Volume	Sample Preservation	Sample Holding Time
Soil	Volatiles - VOCs	5035/8260C - VO004	2 40-mL VOC vials		Methanol, Cool 0°C to 6°C	14 days to analysis
Soil	Metals/Mercury	3050/6010C/7471B – MT007, MT009, MT012	1 – 4 oz. plastic container		Cool 0°C to 6°C	180 days ICP/28 days mercury
Soil	SVOC - PCBs	3546/8082A – SV021, SV004	1 4-oz Amber Gl		Cool 0°C to 6°C	14 days to extraction / 40 days to analysis
Soil	SVOC - Pesticides	3546/8081B–SV021, SV002	1 4-oz Amber Gl		Cool 0°C to 6°C	14 days to extraction / 40 days to analysis
Soil	SVOC - SVOCs	3546/8270D – SV021, SV006	1 4-oz Amber Gl		Cool 0°C to 6°C	14 days to extraction / 40 days to analysis
Air	VOCs	To-15 <sup>a</sup>	1-6 Liter Canister	NA	NA	Canisters - 30 Days <sup>b</sup> Tedlar Bags - 72 hours <sup>b</sup> (Method Modification)

<sup>a</sup> See Worksheet Number 23.

<sup>b</sup> Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

ICP = Inductively Coupled Plasma  
 PCB = Polychlorinated Biphenyl  
 SOP = Standard Operating Procedure  
 SVOC = Semivolatile Organic Compound  
 VOC = Volatile Organic Compound

**Worksheet No. 20-1**

**Field Quality Control Summary, RSA-122  
Redstone Arsenal, Madison County, Alabama**

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Parameters	Analytical Method	Matrix	Total Number of Samples	FD	MS	MSD	Equip. Rinsate (1/event)	Trip Blank (1/cooler)	TAT Needed <sup>a</sup>	Sample Container/Preservation Requirements <sup>b</sup>	Holding Time	Total Number of Containers
<b>RSA-122 Excavation Soil Samples</b>												
<b>Excavation Area A</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	64	7	4	4	2	0	5 Days	4-oz jar, 4°C	6 months	81
Arsenic	3040B/6010C	Soil	79	8	4	4	3	0	5 Days	4-oz jar, 4°C	6 months	98
<b>Excavation Area B</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	8	1	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	12
Arsenic	3040B/6010C	Soil	2	0	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	2
<b>Excavation Area C</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	4	1	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	8
Arsenic	3040B/6010C	Soil	1	0	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	1
<b>Excavation Area D</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	22	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	27
Arsenic	3040B/6010C	Soil	44	5	3	3	2	0	5 Days	4-oz jar, 4°C	6 months	57
Lewisite	MT-08 (Lab internal)	Soil	48	5	3	3	3	0	3 days	4-oz jar, 4°C	NA	62
<b>Excavation Area E</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	34	4	2	2	1	0	5 Days	4-oz jar, 4°C	6 months	43
Arsenic	3040B/6010C	Soil	51	5	3	3	2	0	5 Days	4-oz jar, 4°C	6 months	64
Lewisite	MT-08 (Lab internal)	Soil	76	8	4	4	3	0	3 days	4-oz jar, 4°C	NA	95
<b>Excavation Area F</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	11	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	16
Arsenic	3040B/6010C	Soil	8	0	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	8
<b>Excavation Area G</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	12	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	17
Arsenic	3040B/6010C	Soil	3	0	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	3
<b>Pipeline</b>												
Arsenic	3040B/6010C	Soil	70	7	4	4	5	0	5 Days	4-oz jar, 4°C	6 months	90
Lewisite Headspace	MT-08 (Lab internal)	Solid	40	0	0	0	0	0	5 Days	4-oz jar, 4°C	NA	40
Lewisite	MT-08 (Lab internal)	Soil	40	4	2	2	5	0	3 days	4-oz jar, 4°C	NA	53
<b>Collection Pit</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	16	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	21
Arsenic	3040B/6010C	Soil	52	5	3	3	2	0	5 Days	4-oz jar, 4°C	6 months	65
Lewisite	MT-08 (Lab internal)	Soil	68	7	4	4	3	0	3 days	4-oz jar, 4°C	NA	86
<b>Blowcase Pit</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	16	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	21
Arsenic	3040B/6010C	Soil	36	4	2	2	1	0	5 Days	4-oz jar, 4°C	6 months	45
Lewisite	MT-08 (Lab internal)	Soil	52	6	3	3	2	0	3 days	4-oz jar, 4°C	NA	66
<b>Trench</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	16	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	21
Arsenic	3040B/6010C	Soil	4	0	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	4

**Worksheet No. 20-1**

**Field Quality Control Summary, RSA-122  
Redstone Arsenal, Madison County, Alabama**

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Parameters	Analytical Method	Matrix	Total Number of Samples	FD	MS	MSD	Equip. Rinsate (1/event)	Trip Blank (1/cooler)	TAT Needed <sup>a</sup>	Sample Container/Preservation Requirements <sup>b</sup>	Holding Time	Total Number of Containers
Lewisite	MT-08 (Lab internal)	Soil	20	2	1	1	1	0	5 Days	4-oz jar, 4°C	NA	25
<b>Sump</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	32	4	2	2	1	0	5 Days	4-oz jar, 4°C	6 months	41
Arsenic	3040B/6010C	Soil	40	4	2	2	1	0	5 Days	4-oz jar, 4°C	6 months	49
Lewisite	MT-08 (Lab internal)	Soil	72	8	4	4	2	0	3 days	4-oz jar, 4°C	NA	90
<b>Limited Waste Characterization</b>												
TCLP Metals	1311/3005A/6010C/7470A	Soil	15	0	0	0	0	0	Normal	4 oz glass jar, 4°C	6 months from collection to extraction/6 months from extraction to analysis; Mercury - 28 days	15
<b>Waste Characterization- Possible Backfill</b>												
Arsenic	3040B/6010C	Soil	20	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	25
TCLP Metals**	1311/3005A/6010C/7470A	Soil	20	0	0	0	0	0	Normal	4 oz glass jar, 4°C	6 months from collection to extraction/6 months from extraction to analysis; Mercury - 28 days	20
<b>Waste Characterization Requiring Stabilization (Contingency)</b>												
TCLP Metals***	1311/3005A/6010C/7470A	Soil	5	0	0	0	0	0	Normal	4 oz glass jar, 4°C	6 months from collection to extraction/6 months from extraction to analysis; Mercury - 28 days	5
<b>IDW/Standing Water</b>												
Arsenic	3005A/6010C	Water	1	0	0	0	0	0	Normal	1 x 250 ml HPDE HNO <sub>3</sub> to pH<2, 4°C	6 months; Mercury - 28 days	1
<b>Borrow Source</b>												
TCL VOCs	5035/8260C	Soil	1	1	1	1	0	0	Normal	3 Terracores in Methanol/sodium bisulfate, 4°C	14 days	12
TCL SVOCs	3540C/8270D	Soil	1	1	1	1	0	0	Normal	4-oz jar, 4°C	14 days extraction; 40 days analysis	4
Pesticides	3540C/8081B	Soil	1	1	1	1	0	0	Normal	4-oz jar, 4°C	14 days extraction; 40 days analysis	4
PCBs	3540C/8082A	Soil	1	1	1	1	0	0	Normal	4-oz jar, 4°C	14 days extraction; 40 days analysis	4
TAL Metals	3050B/6010C/7471	Soil	1	1	1	1	0	0	Normal	4-oz jar, 4°C	6 months; Mercury - 28 days	4
Atterberg Limits	ASTM D4318	Soil	1	0	0	0	0	0	Normal	Shelby Tube/1 Gallon	NA	1
Particle Size	ASTM D422	Soil	1	0	0	0	0	0	Normal	Shelby Tube/1 Gallon	NA	1
Moisture Content	ASTM D2216	Soil	1	0	0	0	0	0	Normal	Shelby Tube/1 Gallon	NA	1

**Worksheet No. 20-1**

**Field Quality Control Summary, RSA-122  
Redstone Arsenal, Madison County, Alabama**

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Parameters	Analytical Method	Matrix	Total Number of Samples	FD	MS	MSD	Equip. Rinsate (1/event)	Trip Blank (1/cooler)	TAT Needed <sup>a</sup>	Sample Container/Preservation Requirements <sup>b</sup>	Holding Time	Total Number of Containers
Soil Classification	ASTM D2487	Soil	1	0	0	0	0	0	Normal	Shelby Tube/1 Gallon	NA	1
Compaction	ASTM D1557	Soil	1	0	0	0	0	0	Normal	Shelby Tube/1 Gallon	NA	1

<sup>a</sup> Sample deliverables should include a Level IV, CLP-like data package and EDD for all samples with the exception of IDW samples that require certificates of analysis and EDD only.

<sup>b</sup> All samples should be cooled to 4 degrees Celsius in conjunction with preservation requirements noted prior to shipment to the laboratory.

\*\* Only analyze if Arsenic does not meet cleanup goals.

\*\*\* - Only analyze if TCLP waste characterization requires stabilization. Once stabilization complete, analyze TCLP metals

CLP - Contract Laboratory Program.

EDD - Electronic data deliverable.

FD - Field duplicate.

SS - Surface soil.

DS - Subsurface soil.

WA - Waste water

SVOC - Semivolatile organic compound.

VOCs- Volatile organic compounds.

TCL - Target compound listing.

TAL - Target analyte listing.

MS - Matrix spike.

MSD - Matrix spike duplicate.

VOCs- Volatile organic compounds.

TCLP - Toxicity characteristic leaching potential.

QA - Quality assurance.

QC - Quality control.

SOP - Standard operating procedure.



**Worksheet No. 20-2**

**Field Quality Control Summary, RSA-183  
Redstone Arsenal, Madison County, Alabama**

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Parameters	Analytical Method	Matrix	Total Number of Samples	FD	MS	MSD	Equip. Rinsate (1/event)	Trip Blank (1/cooler)	TAT Needed <sup>a</sup>	Sample Container/Preservation Requirements <sup>b</sup>	Holding Time	Total Number of Containers
<b>RSA-183 Excavation Soil Samples</b>												
<b>Excavation Area A</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	8	1	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	12
Arsenic	3040B/6010C	Soil	3	1	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	4
<b>Excavation Area B</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	4	1	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	8
Arsenic	3040B/6010C	Soil	1	0	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	1
<b>Excavation Area C</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	12	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	17
Arsenic	3040B/6010C	Soil	3	0	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	3
<b>Excavation Area D</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	31	4	2	2	1	0	5 Days	4-oz jar, 4°C	6 months	40
Arsenic	3040B/6010C	Soil	59	6	3	3	2	0	5 Days	4-oz jar, 4°C	6 months	73
Lewisite	MT-08 (Lab internal)	Soil	76	8	4	4	3	0	3 days	4-oz jar, 4°C	NA	95
<b>Excavation Area E</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	42	5	3	3	1	0	5 Days	4-oz jar, 4°C	6 months	54
Arsenic	3040B/6010C	Soil	29	3	2	2	2	0	5 Days	4-oz jar, 4°C	6 months	38
Lewisite	MT-08 (Lab internal)	Soil	45	5	3	3	3	0	3 days	4-oz jar, 4°C	NA	59
<b>Excavation Area F</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	12	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	17
Arsenic	3040B/6010C	Soil	1	0	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	1
<b>Excavation Area G</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	8	1	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	12
Arsenic	3040B/6010C	Soil	1	0	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	1
<b>Pipeline</b>												
Arsenic	3040B/6010C	Soil	70	7	3	3	5	0	5 Days	4-oz jar, 4°C	6 months	88
Lewisite Headspace	MT-08 (Lab internal)	Solid	40	0	0	0	0	0	5 Days	4-oz jar, 4°C	NA	40
Lewisite	MT-08 (Lab internal)	Soil	40	4	2	2	3	0	3 days	4-oz jar, 4°C	NA	51
<b>Collection Pit</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	8	1	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	12
Arsenic	3040B/6010C	Soil	26	3	2	2	1	0	5 Days	4-oz jar, 4°C	6 months	34
Lewisite	MT-08 (Lab internal)	Soil	34	4	2	2	1	0	3 days	4-oz jar, 4°C	NA	43
<b>Blowcase Pit</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	8	1	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	12
Arsenic	3040B/6010C	Soil	18	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	23
Lewisite	MT-08 (Lab internal)	Soil	26	3	2	2	1	0	3 days	4-oz jar, 4°C	NA	34
<b>Trench</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	8	1	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	12
Arsenic	3040B/6010C	Soil	2	0	0	0	0	0	5 Days	4-oz jar, 4°C	6 months	2

**Worksheet No. 20-2**

**Field Quality Control Summary, RSA-183  
Redstone Arsenal, Madison County, Alabama**

(Page 2 of 2)

Parameters	Analytical Method	Matrix	Total Number of Samples	FD	MS	MSD	Equip. Rinsate (1/event)	Trip Blank (1/cooler)	TAT Needed <sup>a</sup>	Sample Container/Preservation Requirements <sup>b</sup>	Holding Time	Total Number of Containers
Lewisite	MT-08 (Lab internal)	Soil	10	1	1	1	1	0	5 Days	4-oz jar, 4°C	NA	14
<b>Sump</b>												
As, Al, Fe, Mn, V	3040B/6010C	Soil	16	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	21
Arsenic	3040B/6010C	Soil	20	2	1	1	1	0	5 Days	4-oz jar, 4°C	6 months	25
Lewisite	MT-08 (Lab internal)	Soil	36	4	2	2	1	0	3 days	4-oz jar, 4°C	NA	45
<b>Soil Vapors</b>												
VOC	TO-15	Soil Vapor	2	0	0	0	0	0	Normal	1 6L Summa Canister	30 days	2
<b>Waste Characterization- Possible Backfill</b>												
Arsenic	3040B/6010C	Soil	32	4	2	2	1	0	5 Days	4-oz jar, 4°C	6 months	41
TCLP Metals**	1311/3005A/6010C/7470A	Soil	32	0	0	0	0	0	Normal	4 oz glass jar, 4°C	6 months from collection to extraction/6 months from extraction to analysis; Mercury - 28 days	32
<b>Waste Characterization- Contingency</b>												
TCLP Metals***	1311/3005A/6010C/7470A	Soil	3	0	0	0	0	0	Normal	4 oz glass jar, 4°C	6 months from collection to extraction/6 months from extraction to analysis; Mercury - 28 days	3
<b>IDW/Standing Water</b>												
Arsenic	3005A/6010C	Water	1	0	0	0	0	0	Normal	1 x 250 ml HPDE HNO <sub>3</sub> to pH<2, 4°C	6 months; Mercury - 28 days	1

<sup>a</sup> Sample deliverables should include a Level IV, CLP-like data package and EDD for all samples with the exception of IDW samples that require certificates of analysis and EDD only.

<sup>b</sup> All samples should be cooled to 4 degrees Celsius in conjunction with preservation requirements noted prior to shipment to the laboratory.

\*\* Only analyze if Arsenic does not meet cleanup goals.

\*\*\* - Only analyze if TCLP waste characterization requires stabilization. Once stabilization complete, analyze TCLP metals

CLP - Contract Laboratory Program.

EDD - Electronic data deliverable.

FD - Field duplicate.

SS - Surface soil.

DS - Subsurface soil.

WA - Waste water

VOCs- Volatile organic compounds.

MS - Matrix spike.

MSD - Matrix spike duplicate.

TCLP - Toxicity characteristic leaching potential.

QA - Quality assurance.

QC - Quality control.

SOP - Standard operating procedure.

## Worksheet No. 21: Field Standard Operating Procedures (SOP)

The following SOPs from the IW QAPP will be followed during the conduct of the RSA-122/RSA-183 corrective measures.

Reference Number	Title, Revision Date and/or Number	Equipment Type	Comments
01	Installation-Wide Quality Assurance Program Plan Volume II, Rev. 4 December 2019 (or as updated)	As specified in each SOP	List of the SOPs for field activities is presented in IW-UFP-QAPP Volume II and provided below.
02	EPA SW-846 Update III Method 5035A, Draft Revision 1, July 2002	Terra Core samplers	NA
03	EPA Quartering Method, EISOPQAM, Revised November 2001 (EPA, 2001)	Composite samples only	NA
SOP 1.0	Field Documentation Rev. 4 December 2019	NA	The objective of SOP 1.0 is to establish the minimum documentation requirements for personnel performing field activities at RSA.
SOP 2.0	Collection and Field Screening of Soil Samples Rev. 4 December 2019	Terra Core samplers, hand auger, direct-push sampler	SOP 2.0 establishes guidelines and procedures for use by field personnel in collection and field screening of hand-augered, grab, and sleeve-lined split- spoon soil samples from surface or subsurface soils, or sediments.
SOP 3.0	Field Equipment Decontamination Rev. 4 December 2019	Decon supplies, deionized water, detergent and potable water	The objective of SOP 3.0 is to describe the proper methods for decontaminating downhole and sampling equipment used to perform field investigations.
SOP 4.0	Investigation-Derived Waste Rev. 4 December 2019	NA	SOP 4.0 establishes specific management practices for the in-process handling and subsequent disposition of environmental media generated as a result of investigation and removal actions.
SOP 6.0	Subsurface Soil Sampling Rev. 4 December 2019	Hand augers, Shelby tubes, and split- spoon samplers	The objective of SOP 6.0 is to establish guidelines and procedures for use by field personnel in the collection and documentation of subsurface soil samples for physical and chemical analysis from the unconsolidated zone (at a depth of 1 foot or greater below ground surface). Subsurface soils also include those first soils encountered directly under paved or covered surfaces, such as slabs.
SOP 11.0	Field Generated Records Management Rev. 4 December 2019	NA	SOP 11.0 establishes the methods and responsibilities associated with the management of field-generated program and delivery order records.
SOP 15.0	Non-Hazardous Sample Handling, Packaging, and Shipping Rev. 4 December 2019	NA	SOP 15.0 establishes guidelines and procedures for field personnel to use in the packaging and shipping of environmental samples for chemical and physical analysis. This SOP only applies to the packaging and shipping of low-concentration environmental samples.
SOP 17.0	Monitoring Well Installation	Direct-push rig or drill rig	The soil vapor monitoring points will be installed using the installation of temporary piezometers procedures as documented in SOP 17.0.

**Worksheet No. 21: Field Standard Operating Procedures (SOP)**

Reference Number	Title, Revision Date and/or Number	Equipment Type	Comments
SOP 20.0	Drilling Unconsolidated Materials Rev. 4 December 2019	Hydropunch, hollow-stem auger, or roto-sonic drill rigs	SOP 20.0 establishes guidelines and requirements drilling unconsolidated materials at RSA. Soil borings, piezometers, and monitoring wells are commonly installed at RSA during environmental work. Several drilling techniques are available but only the most commonly used methods are presented in this SOP. The selection of a drilling method is made based on the desired outcome of the drilling and knowledge of site conditions. The most common methods used at RSA include hydropunch, hollow-stem auger, and roto-sonic methods for drilling in unconsolidated materials.
SOP 21.0	Monitoring Well and Borehole Abandonment Rev. 4 December 2019	Casing splitter, grout, tremie pipe	SOP 21.0 establishes guidelines and procedures for field personnel to use in the supervision of borehole or soil boring abandonment and groundwater monitoring well abandonment (destruction) activities. Additional specific borehole and well abandonment procedures and requirements will be provided in the site-specific plan.
SOP 22.0	Description of Geologic Materials Rev. 4 December 2019	Munsell soil color chart, grain size chart, percentage chart, USCS classification chart	SOP 22.0 specifies the requirements for the description of soil and rock encountered during investigations at RSA.
SOP 23.0	Preparation and Control of Procedures Rev. 4 December 2019	NA	SOP 23.0 provides instructions for the development, issuance, and maintenance of field investigative, quality control, and record management SOPs for RSA. This procedure is applicable to all personnel responsible for the development and use of these procedures. The objective of this procedure is to ensure that all SOPs are developed, issued, and maintained in a consistent manner with all required information.
SOP 24.0	Field Equipment Calibration Rev. 4 December 2019	Manufacturers' calibration guides	SOP 24.0 establishes guidelines and procedures for use by field personnel at RSA for the calibration of field equipment. The performance of proper calibration procedures will result in reliable field data. The general guidelines for calibration apply to all mechanical and/or electronic measurement equipment used in the field.
SOP 25.0	Soil Vapor Sampling at Temporary Monitoring Stations	Summa canister	SOP 25.0 describes the method and the manner for the collection of soil vapor gas using a Summa® canister and the sampling train to capture the media.
SOP 28.0	Munitions and Explosives of Concern (MEC) Anomaly Avoidance Support Rev. 4 December 2019	Various geophysical instruments	SOP 28.0 describes surface and subsurface anomaly avoidance procedures and techniques to be used while conducting munitions response and hazardous, toxic or radioactive waste-related activities during investigation, design, and remedial actions.
SOP 29.0	Vegetation Removal Rev. 0 December 2019	Hand operated and mechanical vegetation removal tools and equipment	SOP 29.0 describes the procedures for field personnel to conduct vegetation removal operations.
SOP 34.0	Subsurface Utility Avoidance Rev. 0 December 2019	Utility service location equipment	SOP 34.0 establishes the minimum requirements for avoiding damage to subsurface utilities from unintentional contact with powered equipment.
SOP 39.0	Stop Work Order Notice for Quality Related Issues Rev. 4 December 2019	NA	SOP 39.0 describes the process and responsibilities for issuing, resolving, and verifying acceptable responses/actions for Stop Work Orders associated with quality-related items.

## Worksheet No. 21: Field Standard Operating Procedures (SOP)

Reference Number	Title, Revision Date and/or Number	Equipment Type	Comments
SOP 40.0	Receiving Inspection Rev. 2 December 2019	NA	SOP 40.0 describes the process and responsibilities for the performance and documentation of receipt inspection of quality affecting items.
SOP 41.0	Inspection Rev. 3 December 2019	NA	SOP 41.0 describes the methods and responsibilities for performing and documenting inspections on project work activities and materials to ensure compliance with established requirements.
SOP 42.0	Surveillance Rev. 3 December 2019	NA	SOP 42.0 provides instructions for performing and documenting the surveillance of project activities and functional areas. Surveillance generally includes the observation of real-time activities and/or the review of supporting documentation.
SOP 43.0	Nonconforming Reporting Rev. 3 December 2019	NA	SOP 43.0 establishes the system for initiating, processing, and controlling nonconforming items, services, or activities to include disposition and corrective actions.
SOP 44.0	Corrective Action Rev. 3 December 2019	NA	SOP 44.0 defines the requirements for identifying and processing a Corrective Action Request.
SOP 45.0	Quality Audits Rev. 3 December 2019	NA	SOP 45.0 establishes the requirement for a comprehensive system of planned and documented internal quality audits to verify the effectiveness of the Quality Management Program.

- 1 NA – Not applicable.
- 2 USCS – Unified Soil Classification System.

## Worksheet No. 22: Field Equipment Calibration, Maintenance, Testing, and Inspection

Measurement Quality Objective	Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	Calibration Reference
Ongoing instrument function test	Organic Vapor Monitor or Photoionization Detector	Daily calibration before use with 100 parts per million isobutylene gas	As required by manufacturer specifications	Screen for VOCs.	Check all sensors and battery charge.	At beginning of work activity before use	Within $\pm 10\%$ of calibration gas	If calibration not within $\pm 10\%$ , repeat or tag as "out of calibration – do not use."	APTIM Field Lead	Manufacturer's Instrument Operating and Calibration Manual
Ongoing instrument function test	Lower Explosive Limit Meter/ Oxygen Meter	Daily calibration before use with 100 parts per million methane gas	As required by manufacturer specifications	Screen for combustible gases and oxygen levels.	Check all sensors and battery charge.	At beginning of work activity before use	Within $\pm 10\%$ of calibration gas	If calibration not within $\pm 10\%$ , repeat or tag as "out of calibration – do not use."	APTIM Field Lead	Manufacturer's Instrument Operating and Calibration Manual
Ongoing instrument function test	Hand-Held Metal Detection Instrument	Calibrate in accordance with manufacturer's requirements.  Check sensitivity against surrogate verification strip-surrogates to mimic 75 percent of the metal footprint of a 60-millimeter mortar.	As required by manufacturer specifications	Detection of ferrous MEC anomalies	Check all sensors, cables, and battery charge if applicable. Check for proper instrument response by screening known metal object.	At beginning of work activity before use	Meets specification Instrument must respond to known metal object. Instrument must detect all three surrogates in verification strip.	RCA/CA	UXO Field Lead	Manufacturer's Instrument Operating and Calibration Manual

All equipment used by APTIM requiring regular maintenance and calibration (i.e., measurement and test equipment [M&TE]), will be stored at APTIM's facility. APTIM maintains a sufficient number of backup M&TE, as well as spare parts, if repair is needed to maintain the project schedule. M&TE will be maintained and calibrated in accordance with the manufacturer's specification as noted in the SOPs. M&TE that requires annual off-site calibration will be inspected monthly to ensure that calibration

## **Worksheet No. 22: Field Equipment Calibration, Maintenance, Testing, and Inspection**

does not lapse. All M&TE in which calibration has expired, does not pass required calibration, or suffers damage while in active use will be removed from the inventory and tagged as "out of service" to prevent inadvertent use. The defective M&TE will not be allowed back in service until repaired or recalibrated against nationally recognized standards. The site manager is responsible to assign a person to manage the inventory of all consumables to ensure adequate inventory for the completion of the specific task.

Additional equipment, tools, and supplies required for use during the task-specific activity are provided in detail in the SOPs. Any required tools, equipment, and/or supplies that are not listed in the SOPs will be identified in this worksheet and incorporated in the site-specific task or project work plan. The APTIM site manager or designee will be responsible for assuring that there is an adequate amount of consumable supplies, materials, and spare parts for the completion of the task or will have access to a location in which supplies or materials may be procured in a reasonable period of time so that there will be no adverse effect on the project schedule.

All turnkey subcontractors will be responsible for managing and maintaining adequate supplies of consumables and available inventory of spare parts.

ISO – Industry standard object.

MEC – Munitions and explosives of concern.

M&TE – Measurement and test equipment.

RCA/CA – Root cause analysis/corrective action.

SOP – Standard operating procedure.

UXO – Unexploded ordnance.

VOC – Volatile organic compound.

### QAPP Worksheet No. 23 – Analytical SOP References Table – Laboratory

Lab SOP Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Matrix / Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
MT007 Rev 6.2	Acid Digestion of Waters for Solids and Semi-solids for Total Metals by GFAA and ICP	Definitive	Solids/Metals Prep	Automated sample prep unit	CT Laboratories	N
SV021 Rev 0.4	Microwave Extraction of Semi-Volatiles Solid Samples	Definitive	Soil/Organic Prep	Microwave sample prep unit	CT Laboratories	N
MT009 Rev 5.3	Inductively Coupled Plasma (ICP) Emission – ICP-OES 6000	Definitive	Solids & Water/Metals	ICP	CT Laboratories	N
MT012 Rev 10.1	Mercury Cold Vapor Atomic Absorption (CV)	Definitive	Solids & Water/Metals	CetacM-6000A Mercury Analyzer	CT Laboratories	N
SV002 Rev 9	Organochlorine Pesticides by GC with Extended List	Definitive	Solids & Water/Organics	GC	CT Laboratories	N
SV004 Rev 11	Polychlorinated biphenyls (PCBs) as Aroclors by GC	Definitive	Solids & Water/Organics	GC	CT Laboratories	N
SV006 Rev 0	Semivolatile Organic Compounds by 8270D	Definitive	Solids & Water/Organics	GC-MS	CT Laboratories	N
VO004 Rev 3	Analysis of Volatile Organic Compounds by GC/MS (8260C)	Definitive	Solids & Water/Organics	GC-MS	CT Laboratories	N
VOA-TO15	Determination of Volatile Organic Compounds in Air Samples Collected in Specially Prepared Canisters and Gas Collection Bags and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS); Revision 26, 10/26/2019	Definitive	Air	GC/MS	ALS Environmental - Simi Valley	N



### QAPP Worksheet No. 24 – Analytical Instrument Calibration Table – Laboratory

Instrument	Calibration Procedure*	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC/MS	Tuning	Prior to ICAL and at the beginning of each 12-hour period	Specific ion criteria of BFB or DFTPP from method.	Retune instrument and verify. Rerun affected samples. Flagging criteria are not appropriate.	Analyst/Supervisor	SV006 SV007 VO002 VO004
	ICAL – For all analytes, a minimum of five points must be used for linear regression, six points for second order regression	ICAL prior to sample analysis	Each analyte and surrogate must meet one of the three options below: Option 1: RSD for each analyte ≤15%. Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$ . Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$ (minimum six-point).	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL. Flagging criteria are not appropriate.	Analyst/Supervisor	
	Second Source Calibration Verification (ICV)	Once after each ICAL	All project analytes within ±20% of true value.	Correct problem, then repeat breakdown checks.	Analyst/Supervisor	
	Retention Time Window Position Establishment	Once after each ICAL for each analyte and surrogate	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used	NA	Analyst/Supervisor	
	Evaluation of RRT	With each sample	RRT of each target analyte within ±0.06 RRT units.	Correct problem, then rerun ICAL. Flagging criteria are not appropriate.	Analyst/Supervisor	

**QAPP Worksheet No. 24 – Analytical Instrument Calibration Table – Laboratory**

Instrument	Calibration Procedure*	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
	CCV	Daily prior to sample analysis for 12-hour analysis period; at the end of the analytical batch run	All reported analytes and surrogates $\pm 20\%$ of true value. All reported analytes and surrogates $\pm 50\%$ for end of analytical batch CCV.	If analyte exceeds with a positive bias and is nondetect, results will be qualified. Detected analytes and analytes with negative bias will be requested for qualification/narration with client. If client approval is not received, correct problem, then rerun CCV. If that fails, repeat ICAL. Reanalyze all samples since last acceptable CCV. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.	Analyst/Supervisor	
GC	ICAL	Prior to sample analysis (minimum five-point) and after ICV or CCV failure	Each analyte must meet one of the three options below: Option 1: RSD for each analyte $\leq 20\%$ . Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$ . Option 3: nonlinear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$ (minimum six-point).	Correct problem then repeat ICAL.	Analyst/Supervisor	SV002 SV004

**QAPP Worksheet No. 24 – Analytical Instrument Calibration Table – Laboratory**

Instrument	Calibration Procedure*	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
	ICV	After each ICAL	All analytes within $\pm 20\%$ of the expected value. All reported analytes within established RT windows.	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Analyst/Supervisor	
	CCV	Daily prior to sample analysis for 12-hour analysis period	All reported analytes and surrogates $\leq 20\%$ of true value. All reported analytes and surrogates within established RT windows.	Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyzed all affected samples since the last acceptable CCV.	Analyst/Supervisor	
	Retention Time Window Position Establishment	Once after each ICAL for each analyte and surrogate	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed; on days when ICAL is not performed, the initial CCV is used.	NA	Analyst/Supervisor	
	Retention Time Window Width	At method set-up and after major maintenance	RT width is $\pm 3$ times standard deviation for each analyte RT from the 72-hour study.	NA	Analyst/Supervisor	

### QAPP Worksheet No. 24 – Analytical Instrument Calibration Table – Laboratory

Instrument	Calibration Procedure*	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
ICP-AES	Linear Dynamic Range or High-Level Check Standard	Daily ICAL prior to sample analysis; every 6 months	Within $\pm 10\%$ of true value.	Dilute sample within the calibration range, or re-establish/verify the LDR.	Analyst/Supervisor	MT009 MT012
	ICAL – Minimum one High Standard and a Calibration Blank for all Analytes	Daily ICAL prior to sample analysis	If more than one calibration standard is used, $r^2 \geq 0.990$ .	Correct problem, then repeat ICAL. Flagging criteria are not appropriate.	Analyst/Supervisor	
	Second Source Calibration Verification (ICV)	Once after each ICAL, prior to beginning a sample run	Value of second source for all analytes(s) within $\pm 10\%$ of true value.	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL. Flagging criteria are not appropriate.	Analyst/Supervisor	
	CCV	After every 10 field samples and at the end of the analysis sequence	Within $\pm 10\%$ of true value.	<p>If analyte exceeds with a positive bias and is nondetect, no corrective action will be performed. Detected analytes and analytes with negative bias will be requested for qualification/narration with client.</p> <p>If client approval is not received, correct problem, then rerun CCV. If that fails, repeat ICAL. Reanalyze all samples since last acceptable CCV. If reanalysis cannot be performed, data must be qualified and explained in the case narrative.</p>	Analyst/Supervisor	

**QAPP Worksheet No. 24 – Analytical Instrument Calibration Table – Laboratory**

Instrument	Calibration Procedure*	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
	Low-Level Calibration Check Standard	Daily, after one-point ICAL	Within $\pm 20\%$ of true value.	Correct problem, then reanalyze. Flagging criteria are not appropriate.	Analyst/Supervisor	
	ICB/CCB	Immediately after the ICV and immediately after every CCV. Immediately after the ICV and immediately after every CCV	The absolute values of all analytes must be $< \frac{1}{2}$ LOQ or $< 1/10^{\text{th}}$ the amount measured in any sample.	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.	Analyst/Supervisor	
	ICS	After beginning of the analytical run	ICS-A: Absolute value of concentration for all nonspiked analytes $< \text{LOD}$ . ICS-AB: Within 20% of true value.	Terminate analysis; locate and correct problem; reanalyze ICS, reanalyze all samples. If corrective action fails, qualify all associated analyte results.	Analyst/Supervisor	
GC	ICAL	Prior to sample analysis (minimum five-point) and after ICV or CCV failure	Each analyte must meet one of the three options below: Option 1: RSD for each analyte $\leq 20\%$ . Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$ . Option 3: nonlinear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$ (minimum six-point).	Correct problem then repeat ICAL.	Analyst/Supervisor	SV002 SV004

**QAPP Worksheet No. 24 – Analytical Instrument Calibration Table – Laboratory**

Instrument	Calibration Procedure*	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
	ICV	After each ICAL	All analytes within $\pm 20\%$ of the expected value. All reported analytes within established RT windows.	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat ICAL.	Analyst/Supervisor	
	CCV	Daily prior to sample analysis for 12-hour analysis period	All reported analytes and surrogates $\leq 20\%$ of true value. All reported analytes and surrogates within established RT windows.	Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyzed all affected samples since the last acceptable CCV.	Analyst/Supervisor	
	Retention Time Window Position Establishment	Once after each ICAL for each analyte and surrogate	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed; on days when ICAL is not performed, the initial CCV is used.	NA	Analyst/Supervisor	
	Retention Time Window Width	At method set-up and after major maintenance	RT width is $\pm 3$ times standard deviation for each analyte RT from the 72-hour study.	NA	Analyst/Supervisor	
HRGC/HRMS	Resolving Power	Prior to ICAL and at the beginning and the end of each 12-hour period of analysis	Static resolving power $\geq 10,000$ (10% valley) for identified masses.	Retune instrument and verify. Rerun affected samples.	Analyst/Supervisor	CF-OA-E-02

### QAPP Worksheet No. 24 – Analytical Instrument Calibration Table – Laboratory

Instrument	Calibration Procedure*	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
HPLC / 8330B, LAB SOP	Initial Calibration (ICAL)	At instrument setup and after ICV or CCV failure, prior to sample analysis. Minimum of 5 levels for linear and 6 levels for quadratic.	ICAL must meet one of the three options below: <u>Option 1:</u> RSD for each analyte $\leq$ 15%; <u>Option 2:</u> linear least squares regression for each analyte: $r^2 \geq$ 0.99; <u>Option 3:</u> non-linear least squares regression (quadratic) for each analyte: $r^2 \geq$ 0.99.	Correct problem then repeat ICAL. No samples may be run until ICAL has passed.	Analyst / Supervisor	SV018 Rev 2.1, SV010 Rev 5.0
HPLC / 8330B, LAB SOP	Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analytes and surrogates within $\pm$ 20% of true value.	Correct problem. Rerun ICV. If that fails, repeat ICAL. No samples will be analyzed until the problem has been corrected.	Analyst / Supervisor	SV018 Rev 2.1, SV010 Rev 5.0
HPLC / 8330B, LAB SOP	Continuing Calibration Verification (CCV)	Before sample analysis, after every 10 field samples, and at the end of the analysis sequence.	All reported analytes and surrogates within $\pm$ 20% of the true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	Analyst / Supervisor	SV018 Rev 2.1, SV010 Rev 5.0

### QAPP Worksheet No. 24 – Analytical Instrument Calibration Table – Laboratory

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GCMS	BFB Tuning Verification	Once every 24-hours or analytical batch	Ion abundance criteria as described in Table 3 of Method TO-15	1) Repeat BFB analysis 2) Retune instrument	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15
GCMS	Initial Calibration (ICAL) – minimum of five levels	Initially or if continuing calibration no longer meets criteria	1) <30% RSD with 2 exceptions up to 40% [DoD - The two exceptions up to 40%, allowed by the method, are not allowed.] 2) Area response at each calibration level within 40% of IS mean area response over the ICAL range 3) Retention time for each IS within 20s of the mean retention time over the ICAL range	1) May repeat 1 point 2) Inspect the system for problems and perform required maintenance 3) Repeat initial calibration Problem must be corrected. Samples may not be analyzed until there is a valid ICAL.	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15
GCMS	Initial Calibration Verification (ICV)	Following every ICAL	Percent difference of +/-30%	1) Correct problem and verify second source standard. Rerun second source verification. If that fails, correct problem and repeat initial calibration. Problem must be corrected. Samples may not be analyzed until there is a valid ICV.	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15



### QAPP Worksheet No. 24 – Analytical Instrument Calibration Table – Laboratory

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GCMS	Continuing Calibration Verification (CCV)	Once every 24 hours prior to sample analysis, if an ICAL has not been performed (within the last 24 hours).  [DoD - A CCV standard must be analyzed at the end of the analytical batch]	Percent difference of +/-30%  Note: If CCV is biased high and analyte is ND (not detected) results are acceptable. It will be noted in case narrative	1) Reanalyze CCV  [DoD: Analyze two additional CCVs]  2) Identify and correct problem; re-analyze or if necessary qualify the data.  3) Repeat initial calibration if CCV corrective action is unsuccessful.	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15
GCMS	Internal Standards (IS)	All samples, duplicates, blanks and standards	1) RT must be <20 sec from most recent valid calibration (ICAL midpoint or CCV)  2) Area response +/-40% of IS area response of most recent valid calibration (ICAL midpoint or CCV)	1) Identify and correct the problem  2) Reanalyze the sample unless obvious matrix interference exists.  3) Problem persists, qualify data.	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15
GCMS	Surrogate Standards	All samples, duplicates, blanks and standards	70-130% recovery	1) Identify and correct the problem  2) Reanalyze the sample unless obvious matrix interference exists  3) If problem persists, qualify data	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15
GCMS	Limit of Quantitation (LOQ)	Annual verification.  [DoD: Quarterly verification required]	1) At or above the low standard of the current initial calibration.  2) % recovery for each analyte within laboratory generated control limits.	1) Reanalyze  2) Identify and correct problem; re-analyze.  3) Repeat verification at higher level to set higher LOQ if corrective action is unsuccessful.	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15

### QAPP Worksheet No. 24 – Analytical Instrument Calibration Table – Laboratory

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GCMS	Detection Limit (DL) with Limit of Detection Verification	Initially and verification performed once per 12 month period.  [DoD: Quarterly LOD verification required]	Limit of Detection Verification - Response with a minimum signal to noise ratio of 3:1	1) Repeat detection limit determination and LOD verification at higher concentration <u>or</u> perform and pass two consecutive LOD verifications at a higher concentration and set the LOD at the higher concentration.	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15
GCMS	Retention Time window position establishment	Once per ICAL and at the beginning of the analytical sequence.	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed.  On days when ICAL is not performed, the initial CCV is used.	NA	NA	VOA-TO15
GCMS	Evaluation of Relative Retention Times (RRT)	With each sample.	RRT of each reported analyte within $\pm 0.06$ RRT units of the mean RRT of the calibration standards.  RRTs may be updated based on the daily CCV.	Correct problem, then rerun ICAL.	Dept. Supervisor, however other trained analysts in the team may be responsible.	VOA-TO15

%D = Percent Difference  
 AA = Atomic Absorption  
 AES = Atomic Emission Spectrometry  
 BFB = Bromofluorobenzene  
 CCB = Continuing Calibration Blank  
 CCV = Continuing Calibration Verification  
 DDT = Dichlorodiphenyltrichloroethane  
 DFTPP = Decafluorotriphenylphosphine  
 GC = Gas Chromatography  
 HRGC = High Resolution Gas Chromatography  
 HRMS = High Resolution Mass Spectrometry  
 HxCDD = Hexachlorodibenzo-p-dioxin  
 ICAL = Initial Calibration  
 ICB = Initial Calibration Blank  
 ICP = Inductively Coupled Plasma  
 ICS = Interference Check Solution  
 ICV = Initial Calibration Verification  
 LDR = Linear Dynamic Range

LOD = Limit of Detection  
 LOQ = Limit of Quantitation  
 MS = Mass Spectrometry  
 NA = Not Applicable  
 RF = Response Factor  
 RRT = Relative Retention Time  
 RSD = Relative Standard Deviation  
 RT = Retention Time  
 SOP = Standard Operating Procedure  
 TCDD = Tetrachlorodibenzo-p-dioxin  
 RRT = Relative Retention Time

### QAPP Worksheet No. 25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference <sup>1</sup>
GC/MS	Replace septa, clean injection port, clip column, clip or replace pre-column check auto sampler, clean source	SVOC	Detector, injection port, column, autosampler	As needed	Must meet initial and/or continuing calibration criteria	Repeat maintenance activity or remove from service	Lab Section Supervisor	SV006, SV007
GC/MS	Replace septa, clean injection port, clip column, check auto sampler, clean source	VOC	Detector, injection port, column, autosampler	As needed	Must meet initial and/or continuing calibration criteria	Repeat maintenance activity or remove from service	Lab Section Supervisor	VO004
GC	Replace septa, clean injection port, clip column, clip or replace pre-column, check auto sampler	PCBs	Detector, injection port, column, autosampler	As needed	Must meet initial and/or continuing calibration criteria	Repeat maintenance activity or remove from service	Lab Section Supervisor	SV004
GC	Replace septa, clean injection port, clip column, clip or replace pre-column, check auto sampler	Pesticides	Detector, injection port, column, autosampler	As needed	Must meet initial and/or continuing calibration criteria	Repeat maintenance activity or remove from service	Lab Section Supervisor	SV002
ICP-AES	Clean torch assembly, nebulizer, and spray chamber as needed. Check argon gas, vacuum, waste container, and reagent water levels daily. Replace pump tubing as needed.	Metals	Torch, nebulizer chamber, pump and pump tubing, vacuum source, waste container	Daily prior to calibration	Acceptable calibration	Correct problem and recalibrate	Analyst / Supervisor	MT009
CVAA	Check lamp voltage, check autosampler, make necessary pump tube changes.	Metals	Autosampler, gases, pump tubing.	Daily prior to calibration	Acceptable calibration	Correct problem and recalibrate	Analyst / Supervisor	MT0012

### QAPP Worksheet No. 25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference <sup>1</sup>
GC/MS	Concentrating Trap	Initial Calibration (ICAL) and Continuing Calibration Verification (CCV)	Initial Calibration (ICAL) and Continuing Calibration Verification (CCV)	As needed indicated by calibration and QC difficulties.	Clean blank, sufficient sensitivity, and ICAL meets linearity criteria.	Routine maintenance includes periodic solvent cleaning of Silco steel lines in the valve oven if contamination is suspected. Also, periodic replacement of multi-sorbent or partial replacement of the trap if analyte specific deterioration is detected.	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15
GC/MS	Column performance	Initial Calibration (ICAL) and Continuing Calibration Verification (CCV)	Initial Calibration (ICAL) and Continuing Calibration Verification (CCV)	Monitored by observing both peak shapes and column bleed.	Acceptable resolution and peak shape	Cut or replace column	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15
GC/MS	Vacuum System / Pump Oil	Initial Calibration (ICAL) and Continuing Calibration Verification (CCV)	Initial Calibration (ICAL) and Continuing Calibration Verification (CCV)	Every six months, including changing the pump oil and checking the molecular sieve in the backstreaming trap.	Level of oil and quality is sufficient	Change oil	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15
GC/MS	Mass Selective Detector (MSD) ion source cleaning	Initial Calibration (ICAL) and Continuing Calibration Verification (CCV)	Initial Calibration (ICAL) and Continuing Calibration Verification (CCV)	When tune difficulties or fluctuating internal standard areas are encountered.	Sufficient sensitivity and ICAL meets linearity criteria	Re-clean or replace source parts	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15
GC/MS	Filament	Initial Calibration (ICAL) and Continuing Calibration Verification (CCV)	Initial Calibration (ICAL) and Continuing Calibration Verification (CCV)	As needed.	NA	Replace Filament	Dept. Supervisor, however other trained analysts in the team may be responsible	VOA-TO15

## **QAPP Worksheet No. 25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table**

CCV = Continuing Calibration Verification  
CVAA = Cold Vapor Atomic Absorption  
GC/MS = Gas Chromatography - Mass Spectrometry  
HPLC = High-performance Liquid Chromatography  
ICAL = Initial Calibration  
ICP-AES = Inductively Coupled Plasma – Atomic Emission Spectroscopy  
MSD = Mass Selective Detector  
PCB = Polychlorinated biphenyl  
SOP = Standard Operating Procedure  
SVOC = Semivolatile Organic Compound  
VOC = Volatile Organic Compound

## Worksheet Nos. 26 and 27: Sample Handling, Custody, and Disposal

<b>Sample Collection, Packaging, and Shipment (Field)</b>	
Sample Collection (Personnel/Organization): TBD	
Sample Packaging (Personnel/Organization): TBD	
Coordination of Shipment (Personnel/Organization): Brian Rhodes	
Type of Shipment/Carrier: UPS/FedEx	
<b>SAMPLE RECEIPT AND ANALYSIS</b>	
Sample Receipt (Personnel/Organization):	Jodi Serstad, Elaine Bender/CT Laboratories
Sample Custody and Storage (Personnel/Organization):	Jodi Serstad/CT Laboratories
Sample Preparation (Personnel/Organization):	Organics: Jennifer Hagar, Metals: Brianna Martin-Meise/CT Laboratories
Sample Determinative Analysis (Personnel/Organization):	Organics: Jim Yoder, Raj Nair, Adam Zurfluh, Jill Van Daalwyk; VOCs: Randy Digmann, Teisha Grundahl, Dan Scott; Metals: Nora Lea Henn, Matthew Szymanski/CT Laboratories; John Richards, Craig Smith/Microbac; Heather Patterson,
<b>SAMPLE ARCHIVING</b>	
Field Sample Storage (No. of days from sample collection): 60 days from receipt	
Sample Extract/Digestate Storage (No. of days from extraction/digestion): 3 months from sample digestion/extraction	
<b>SAMPLE DISPOSAL</b>	
Personnel/Organization: Jodi Serstad/CT Laboratories	
Number of Days from Analysis: Minimum 30 days after final report sent to client; unless there is a written request to hold them longer.	

Note: Samples will be collected, shipped and received by the contract laboratory under strict chain-of-custody procedures.  
 TBD – To be determined.

## Worksheet Nos. 26 and 27: Sample Handling, Custody, and Disposal

### **Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):**

Procedures to ensure the custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in field and laboratory records.

APTIM shall maintain chain-of-custody (COC) records for all field and field QC samples. A sample is defined as being under a person's custody if any of the following conditions exist: (1) it is in their possession, (2) it is in their view after being in their possession, (3) it was in their possession and they locked it up, or, (4) it is in a designated secure area.

Samples collected in the field shall be transported to the laboratory or field-testing site as expeditiously as possible. When a 0-6 degrees °C requirement for preserving the sample is indicated, the samples shall be packed in ice or with reusable gel-type ice packs to keep them cool during collection and transportation. Samples shall be placed in coolers for transit, with custody seals attached to document any unauthorized opening of the coolers. Sample jars will not have individual custody seals. During transit, it is not always possible to rigorously control the temperature of the samples. As a general rule, storage at low temperature is the best way to preserve most samples. If the temperature of the samples upon receipt exceeds the temperature requirements, the exceedance shall be documented in laboratory records and discussed with APTIM. The decision regarding the potentially affected samples shall also be documented.

### **Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal):**

Once the samples reach the laboratory, they shall be checked against information on the analysis request (AR)/COC form for anomalies. The condition, temperature, and appropriate preservation of samples shall be checked and documented on the COC form. Checking an aliquot of the sample using pH paper is an acceptable procedure except for volatile organic compounds, where an additional sample is required to check preservation. The occurrence of any anomalies in the received samples and their resolution shall be documented in laboratory records. All sample information shall then be entered into a tracking system, and unique analytical sample identifiers shall be assigned. A copy of this information shall be reviewed by the laboratory for accuracy. Sample holding time tracking begins with the collection of samples and continues until the analysis is complete. Holding times for methods required routinely for this work are specified in Worksheet No. 19. Samples not preserved or analyzed in accordance with these requirements shall be resampled and analyzed at no additional cost to the government. Subcontracted analyses shall be documented with the COC form. Procedures ensuring internal laboratory COC shall also be implemented and documented by the laboratory. Specific instructions concerning the analysis specified for each sample shall be communicated to the analysts. Analytical batches shall be created, and laboratory QC samples shall be introduced into each batch.

While in the laboratory, samples shall be stored in limited-access, temperature-controlled areas. Samples for volatile organics determination shall be stored separately from other samples, standards, and sample extracts. Samples shall be stored after analysis until disposed of in accordance with applicable local, state, and federal regulations. Disposal records shall be maintained by the laboratory.

SOPs describing sample control and custody shall be maintained by the laboratory.

## Worksheet Nos. 26 and 27: Sample Handling, Custody, and Disposal

**Sample Identification Procedures:**

All samples shall be uniquely identified, labeled, and documented in the field at the time of collection in accordance with the SOP 15.0, *Non-Hazardous Sample Handling, Packaging, and Shipping*.

**COC Procedures:**

The following information concerning the sample shall be documented on the COC form:

Unique sample identification

Date and time of sample collection

Source of sample (including name, location, and sample type)

Designation of matrix spike/matrix spike duplicate

Preservative used

Analyses required

Name of collector(s)

Pertinent field data (pH, temperature, etc.)

Serial numbers of custody seals and transportation cases (if used)

Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratory or laboratories

Bill of lading or transporter tracking number (if applicable).

Examples of COC records, sample labels, and custody seals are included in Attachment 2 of the Installation-Wide Quality Assurance Program Plan (HGL, 2019 or most recent).



## Worksheet No. 28: Analytical Quality Control and Corrective Action

**Matrix:** Soil/Aqueous/TCLP  
**Analytical Group:** Organics  
**Analytical Method/SOP:** VOCs 8260C

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific Measurement Performance Criteria
Method Blank (MB)	One per preparatory batch of 20 or fewer samples of similar matrix.	No analytes detected > ½ LOQ or > 1/10 amount measured in any sample or 1/10 the regulatory limit, whichever is greater. Common contaminants must not be detected > LOQ	Correct problem. If required, reprep and reanalyze MB and all samples processed with the contaminated blank	Analyst/Group Leader	Same as QC Acceptance Limits.
Laboratory Control Sample (LCS)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM Version 5.3 LCS limits are used, if available. Otherwise, in-house control limits are used for any compounds not specified in QSM 5.3. In-house control limits may not be greater than ± 3 times the standard deviation of the mean LCS recovery	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available	Analyst/Group Leader	Same as QC Acceptance Limits.
Matrix Spike (MS)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM Version 5.3 LCS limits are used, if available. Otherwise, in-house control limits are used for any compounds not specified in QSM 5.3. In-house control limits may not be greater than ± 3 times the standard deviation of the mean LCS recovery	Examine project-specific requirements. Contact the client as to additional measures to be taken. If MS results are outside the limits, data shall be evaluated to determine source(s) of difference (ie matrix effect or analytical error)	Analyst/Group Leader	Same as QC Acceptance Limits.
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM Version 5.3 LCS limits used for a MSD, if available. Otherwise, in-house control limits used for any compounds not specified in QSM 5.3. In-house control limits may not be greater than ± 3 times standard deviation of the mean LCS recovery	Examine the project-specified requirements. Contact the client as to additional measures to be taken The data shall be evaluated to determine the source of difference	Analyst/Group Leader	Same as QC Acceptance Limits.

### Worksheet No. 28: Analytical Quality Control and Corrective Action

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific Measurement Performance Criteria
		MSD or MD: RPD of all analytes $\leq$ 20% (between MS and MSD or sample and MD)			
Internal Standards (IS)	Every field samples, standard and QC sample	Retention time within $\pm$ 10 seconds from retention time of the midpoint standard in the ICAL; IS areas within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions and correct problem. Reanalysis of samples analyzed while system was malfunctioning is mandatory	Analyst/Group Leader	Same as QC Acceptance Limits.
Surrogates	All field and QC samples.	QC acceptance criteria specified by the project, if available; otherwise DoD QSM Version 5.3 limits are used.	Correct problem, then reprep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst/Group Leader	Same as QC Acceptance Limits.

## Worksheet No. 28: Analytical Quality Control and Corrective Action

**Matrix:** Soil/Aqueous/TCLP  
**Analytical Group:** Organics  
**Analytical Method/SOP:** SVOCs 8270D

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific Measurement Performance Criteria
Method Blank (MB)	One per preparatory batch of 20 or fewer samples of similar matrix.	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 regulatory limit, whichever is greater. Common contaminants must not be detected > LOQ	Correct problem. If required, reprep and reanalyze MB and all samples processed with the contaminated blank.	Analyst/Group Leader	Same as QC Acceptance Limits.
Laboratory Control Sample (LCS)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits used if available. Otherwise, in-house control limits used for compounds not specified in QSM 5.3. In-house control limits may not be > ± 3 times standard deviation of the mean LCS recovery.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst/Group Leader	Same as QC Acceptance Limits.
Matrix Spike (MS)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits used if available. Otherwise, in-house control limits used for compounds not specified in QSM 5.3. In-house control limits may not be > ± 3 times the standard deviation of the mean LCS recovery	Examine the project-specific requirements. Contact client as to additional measures to be taken.  If MS results are outside limits, data shall be evaluated to determine source(s) of difference (ie matrix effect or analytical error)	Analyst/Group Leader	Same as QC Acceptance Limits.
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM Version 5.3 LCS limits used for a MSD, if available. Otherwise, in-house control limits used for any compounds not specified in QSM 5.3. In-house control limits may not be greater than ± 3 times standard deviation of the mean LCS recovery. MSD or MD: RPD of all analytes ≤ 20% (between MS and MSD or sample & MD).	Examine the project-specified requirements. Contact client as to additional measures to be taken.  The data shall be evaluated to determine the source of difference.	Analyst/Group Leader	Same as QC Acceptance Limits.

### Worksheet No. 28: Analytical Quality Control and Corrective Action

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific Measurement Performance Criteria
Internal Standards (IS)	Every field samples, standard and QC sample.	Retention time within $\pm 10$ seconds from retention time of the midpoint standard in the ICAL; IS areas within -50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions and correct problem.  Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst/Group Leader	Same as QC Acceptance Limits.
Surrogates	All field and QC samples.	QC acceptance criteria specified by the project, if available; otherwise DoD QSM Version 5.3 limits are used.	Correct problem, reprep and reanalyze all failed samples for all surrogates in associated preparatory batch, if sufficient material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst/Group Leader	Same as QC Acceptance Limits

## Worksheet No. 28: Analytical Quality Control and Corrective Action

**Matrix:** Soil/Aqueous

**Analytical Group:** Organics

**Analytical Method/SOP:** Pesticides 8081B

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific Measurement Performance Criteria
Method Blank (MB)	One per preparatory batch of 20 or fewer samples of similar matrix.	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, reprep and reanalyze MB and all samples processed with the contaminated blank.	Analyst/Group Leader	Same as QC Acceptance Limits.
Laboratory Control Sample (LCS)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits used if available. Otherwise, in-house control limits used for compounds not specified in QSM 5.3. In-house control limits may not be > ± 3 times the standard deviation of the mean LCS recovery.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst/Group Leader	Same as QC Acceptance Limits.
Matrix Spike (MS)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits used if available. Otherwise, in-house control limits used for compounds not specified in QSM 5.3. In-house control limits may not be > ± 3 times the standard deviation of the mean LCS recovery.	Examine the project-specific requirements. Contact the client as to additional measures to be taken. If MS results are outside limits, data shall be evaluated to determine source(s) of difference (i.e., matrix effect or analytical error).	Analyst/Group Leader	Same as QC Acceptance Limits.
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits are used for MSD, if available. Otherwise, in-house control limits are used for any compounds not specified in QSM 5.3. In-house control limits may not be > ± 3 times the standard deviation of the mean LCS recovery. MSD or MD: RPD of all analytes ≤ 30% (between MS & MSD or sample & MD).	Examine the project-specified requirements. Contact the client as to additional measures to be taken. The data shall be evaluated to determine the source of difference.	Analyst/Group Leader	Same as QC Acceptance Limits.

### Worksheet No. 28: Analytical Quality Control and Corrective Action

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific Measurement Performance Criteria
Surrogates	All field and QC samples.	QC acceptance criteria specified by the project, if available; otherwise DoD QSM Version 5.3 limits are used.	Correct problem, then reprep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst/Group Leader	Same as QC Acceptance Limits.
Confirmation of positive results (second column)	All positive results must be confirmed (except for single column methods such as TPH by Method 8015 where confirmation is not an option or requirement)	Calibration and QC criteria for second column are the same as for initial or primary column analysis. Results between primary and secondary column RPD ≤ 40%.	N/A.	Analyst/Group Leader	Same as QC Acceptance Limits.

### QAPP Worksheet #28 – Laboratory QC Sample Tables

**Matrix:** Soil/Aqueous  
**Analytical Group:** Organics  
**Analytical Method/SOP:** PCBs 8082A

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific Measurement Performance Criteria
Method Blank (MB)	One per preparatory batch of 20 or fewer samples of similar matrix.	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, reprep and reanalyze MB and all samples processed with the contaminated blank.	Analyst/Group Leader	Same as QC Acceptance Limits.
Laboratory Control Sample (LCS)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits used if available. Otherwise, in-house control limits used for compounds not specified in QSM 5.0. In-house control limits may not be > ± 3 times the standard deviation of the mean LCS recovery.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst/Group Leader	Same as QC Acceptance Limits.
Matrix Spike (MS)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits used if available. Otherwise, in-house control limits used for compounds not specified in QSM 5.3. In-house control limits may not be > ± 3 times the standard deviation of the mean LCS recovery.	Examine the project-specific requirements. Contact the client as to additional measures to be taken. If MS results are outside limits, data shall be evaluated to determine source(s) of difference (i.e., matrix effect or analytical error).	Analyst/Group Leader	Same as QC Acceptance Limits.
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits are used for MSD, if available. Otherwise, in-house control limits are used for any compounds not specified in QSM 5.3. In-house control limits may not be > ± 3 times the standard deviation of the mean LCS recovery. MSD or MD: RPD of all analytes ≤ 30% (between MS & MSD or sample & MD).	Examine the project-specified requirements. Contact the client as to additional measures to be taken. The data shall be evaluated to determine the source of difference.	Analyst/Group Leader	Same as QC Acceptance Limits.

### QAPP Worksheet #28 – Laboratory QC Sample Tables

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific Measurement Performance Criteria
Surrogates	All field and QC samples.	QC acceptance criteria specified by the project, if available; otherwise DoD QSM Version 5.3 limits are used.	Correct problem, then reprep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst/Group Leader	Same as QC Acceptance Limits.
Confirmation of positive results (second column)	All positive results must be confirmed (except for single column methods such as TPH by Method 8015 where confirmation is not an option or requirement)	Calibration and QC criteria for second column are the same as for initial or primary column analysis. Results between primary and secondary column RPD ≤ 40%.	N/A.	Analyst/Group Leader	Same as QC Acceptance Limits.



### QAPP Worksheet #28 – Laboratory QC Sample Tables

**Matrix:** Soil/Aqueous/TCLP  
**Analytical Group:** Organics  
**Analytical Method/SOP:** Metals 6010C/7471B

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific Measurement Performance Criteria
Method Blank (MB)	One per preparatory batch of 20 or fewer samples of similar matrix.	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, reprep and reanalyze MB and all samples processed with the contaminated blank.	Analyst/ Supervisor	Same as QC Acceptance Limits.
Laboratory Control Sample (LCS)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits used, if available. Otherwise, in-house control limits used for compounds not specified in QSM 5.3. In-house control limits may not be > ± 3 times the standard deviation of the mean LCS recovery	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst/ Supervisor	Same as QC Acceptance Limits.
Matrix Spike (MS)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits are used, if available. Otherwise, in- house control limits are used for any compounds not specified in QSM 5.3. In-house control limits may not be > ± 3 times the standard deviation of the mean LCS recovery	Examine project-specific requirements. Contact client as to additional measures to be taken. If MS results are outside limits, data shall be evaluated to determine source(s) of difference (ie matrix effect or analytical error)	Analyst/Supervisor	Same as QC Acceptance Limits.
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch of 20 or fewer samples of similar matrix.	DoD QSM LCS limits used for a MSD, if available. Otherwise, in-house control limits used for any compounds not specified in QSM 5.3. In-house control limits may not be > ± 3 times standard deviation of the mean LCS recovery. MSD or MD: RPD of all analytes ≤ 20% (between MS & MSD or sample & MD).	Examine project-specified requirements. Contact client as to additional measures to be taken. The data shall be evaluated to determine the source of difference.	Analyst/Supervisor	Same as QC Acceptance Limits.

### QAPP Worksheet #28 – Laboratory QC Sample Tables

QC Sample	Number/ Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific Measurement Performance Criteria
Dilution Test (Serial Dilution)	One per preparatory batch of 20 or fewer samples of similar matrix if MS or MSD fails.	Five-fold dilution must agree within $\pm 10\%$ of the original measurement.  Only applicable for samples with concentrations $> 50 \times$ LOQ (prior to dilution).	No specific CA, unless required by the project.	Analyst/Supervisor	Same as QC Acceptance Limits.
Post- Digestion Spike (PDS) Addition	Perform if MS/MSD fails. One per preparatory batch (using the same sample as used for the MS/MSD if possible) of 20 or fewer samples of similar matrix.	Recovery within 80-120%.	No specific CA, unless required by the project.	Analyst/Supervisor	Same as QC Acceptance Limits.

### QAPP Worksheet #28 – Laboratory QC Sample Tables

<b>Matrix</b>	Air					
<b>Analytical Group</b>	Volatile Organics					
<b>Analytical Method / SOP Reference</b>	TO-15					
<b>QC Sample:</b>	<b>Frequency / Number</b>	<b>Method / SOP QC Acceptance Limits</b>	<b>Corrective Action</b>	<b>Person(s) Responsible for Corrective Action</b>	<b>Data Quality Indicator (DQI)</b>	<b>Measurement Performance Criteria</b>
Method blank	Once every analytical batch of 20 or fewer samples	No analyte detected equal to or above the method reporting limit (MRL)  [DoD: No analytes > ½ MRL; common lab contaminants none detected > MRL]	1) Reanalyze blank 2) Identify and correct problem 3) Reanalyze blank and affected samples 4) Qualify data.	Dept. Supervisor, however other trained analysts in the team may be responsible	Bias	Per VOA-TO15
Laboratory control sample	Once every analytical batch of 20 or fewer samples  [DoD - LCS Replicate required per each analytical batch]	Percent recovery (%R) within laboratory generated limits.  [DoD: QSM limits depending on client specifications.]	1) Reanalyze 2) Identify and correct problem 3) Qualify data	Dept. Supervisor, however other trained analysts in the team may be responsible	Accuracy	Per VOA-TO15
Laboratory Duplicate (LD)	Once every analytical batch of 20 or fewer samples	Relative percent difference (RPD) within +/-25% for positive hits	1) Analyze third aliquot 2) Flag data if third aliquot unacceptable	Dept. Supervisor, however other trained analysts in the team may be responsible	Precision	Per VOA-TO15

## Worksheet No. 29: Project Documents and Records

The following list represents the anticipated documents and records that will be prepared during the course of corrective measures. This list may not be all inclusive and will be revised with additions and deletions for each document prepared for the site-specific task. At the conclusion of the list, information is provided that describes records management and the procedure for obtaining additional detailed information.

Sample Collection Documents and Records	On-Site Analysis Documents and Records	Off-Site Analysis Documents and Records	Data Assessment Documents and Records	Health and Safety
CMI Work Plan	Field Activity Daily Log	APTIM AR/COC	Data Review Checklist, Metals	Accident Prevention Plan
Field Activity Daily Log	Sample Collection Log	Laboratory SDG Report	QCSR	Project-specific Safety and Health Plan
Sample Collection Log	Air Monitoring Data	Preliminary Data and Draft Analytical Reports	Telephone Logs	Project Environmental Safety and Health Plan and Sign-off Sheet
Sample logging and tracking software	Equipment Calibration Receipt	Sample Receipt Forms	Corrective Action Reports	
AR/COC	Equipment Calibration Logs	Data Validation Reports	Laboratory QA Plan	Munitions and Explosives of Concern Guidance for Environmental and Construction Activities
Drum/Container Sampling Log	Visual Classification – Soil	Final Data Packages and Final Analytical Report	Environmental Laboratory Accreditation Program	Daily Safety Meeting
Drum/Container Inventory Log	Photo Documentation and Tracking Log	Electronic Data Deliverables		Daily Activity Hazard Analysis
Sampling Reports	Daily Construction Log			Equipment Calibration Receipt
Variance Request				Equipment Calibration Logs
				Health and Safety Activity Reports and Documentation
				Training Records
				Accident Reports
				Lessons Learned

### Worksheet No. 29: Project Documents and Records

Administrative	Permits	Quality	Project Management	Technical
Memos Incoming Correspondence Outgoing Correspondence Correspondence from Others Telephone Conversation Logs Meeting Notes – Internal Meeting Notes – External Project Related Emails	Excavation Permits Right-of-Entry Permits Construction Permits Overhead Utility Clearance Permit Underground Utility Clearance Permit Underground Utility Variance	Management Assessment Reports – Internal Independent Assessment Reports – Internal Receipt Inspection Checklist Preparatory Inspection Checklist Initial Inspection Checklist Follow-up Inspection Checklist Nonconformance Report and Tracking Log Variance Report and Tracking Log Site QC Reports	Project Schedule Project Budget Work Breakdown Structure Contract Change Request Project Activity Reports Project Summary/Status Report Invoices Insurance	Corrective Measures Implementation Work Plan Decision Documents Project Reports Surveys Drawings and Checklists/Check Prints As-Built Drawings Corrective Measures Reports Operation and Maintenance Manuals

AR/COC – Analysis Request/Chain of Custody.  
 CMI – Corrective measures implementation.  
 PCB – Polychlorinated biphenyl.  
 QA – Quality assurance.  
 QC – Quality control.  
 QCSR – Quality control summary report.  
 SDG - Sample delivery group.

#### **Record-Keeping, Archival, and Retrieval Requirements**

Record-keeping, archival, and retrieval requirements will be conducted in accordance with APTIM's SOPs.

#### **Field Records Generation**

Field records generation will be in accordance with APTIM's SOPs.

## **Worksheet No. 29: Project Documents and Records**

### **Record Archival and Retrieval Procedures for Field Information**

Record archival and retrieval procedures for field information will be specified in APTIM's SOPs.

### **Location of Study Records, Reports, and Formal Documents**

**Program Repository.** The program repository will be maintained in accordance with APTIM's SOPs and Army contractual requirements.

**Administrative Record.** The Administrative Record will be maintained in accordance with APTIM's SOPs and Army contractual requirements.

### **Record Retention Time Procedures**

At the close of this delivery order, all documents and records will be managed in accordance with contractual requirements which specify that records be transferred to the Army.

Note: The Office of Information Resource Management requirements are not applicable to this project since RSA is not a fund-led site.

### **Additional Record-Keeping, Archival, and Retrieval Procedures for Electronic Data**

Additional record-keeping, archival, and retrieval procedures for electronic data will be conducted in accordance with APTIM's SOPs.

### **Data Handling Equipment and Data Compiling and Analysis**

Laboratory analytical data will be processed in a manner that ensures project requirements are being met. Data handling equipment and data compiling and analysis will be in accordance with APTIM's SOPs.

### **Computer Hardware and Software**

APTIM will provide hardware and software commensurate with contract specifications for this project.

As the data is made available for usability, APTIM will utilize various software packages to determine if the data quality objectives have been met and to map, analyze, and disseminate spatial data.

### **Ensuring Database Accuracy**

APTIM will ensure database accuracy in accordance with the project contract.

### QAPP Worksheet No. 30 – Analytical Services Table

Matrix	Analytical Group	Sample Locations/ ID Numbers <sup>1</sup>	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number) <sup>(4)</sup>	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	Metals - TAL Metals		MT012 Rev 10.1 / MT009 Rev 5.3	21 calendar days	CT Laboratories LLC Eric Korthals, Project Manager 1230 Lange Court Baraboo, WI 53913 608.356.2760	CT Laboratories LLC Ceress Berwanger, President 1230 Lange Court Baraboo, WI 53913 608.356.2760
Soil	Volatiles - VOCs		VO004 Rev 3	21 calendar days	CT Laboratories LLC Eric Korthals, Project Manager 1230 Lange Court Baraboo, WI 53913 608.356.2760	CT Laboratories LLC Ceress Berwanger, President 1230 Lange Court Baraboo, WI 53913 608.356.2760
Soil	SVOC - SVOCs		SV006 Rev 0 / SV007 Rev 1.0	21 calendar days	CT Laboratories LLC Eric Korthals, Project Manager 1230 Lange Court Baraboo, WI 53913 608.356.2760	CT Laboratories LLC Ceress Berwanger, President 1230 Lange Court Baraboo, WI 53913 608.356.2760
Soil	SVOC - Pesticides		SV002 Rev 9	21 calendar days	CT Laboratories LLC Eric Korthals, Project Manager 1230 Lange Court Baraboo, WI 53913 608.356.2760	CT Laboratories LLC Ceress Berwanger, President 1230 Lange Court Baraboo, WI 53913 608.356.2760
Soil	SVOC - PCBs		SV004 Rev 11	21 calendar days	CT Laboratories LLC Eric Korthals, Project Manager 1230 Lange Court Baraboo, WI 53913 608.356.2760	CT Laboratories LLC Ceress Berwanger, President 1230 Lange Court Baraboo, WI 53913 608.356.2760
Air	Volatiles - VOCs		VOA-TO-15 Rev. 26	21 calendar days	ALS Environmental Sue Anderson, Project Manager 3655 Park Center Drive, Suite A Simi Valley, CA 93065	ALS Environmental Kate Kaneko, Project Manager 3655 Park Center Drive, Suite A Simi Valley, CA 93065r

### Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Management Assessments	Based on project management request	Internal	APTIM	Don Burton, Project Manager, APTIM	Don Burton, Project Manager, APTIM	Don Burton, Project Manager, APTIM	Don Burton, Project Manager, APTIM
Independent Assessments	Based on project management request	External	TBD	TBD	Don Burton, Project Manager, APTIM	Don Burton, Project Manager, APTIM	Don Burton, Project Manager, APTIM
Receipt Inspections	As required	Internal	APTIM	Brian Rhodes, Quality Control Site Manager (QCSM), APTIM	Don Burton, Project Manager, APTIM	Don Burton, Project Manager, APTIM	Don Burton, Project Manager, APTIM
Laboratory Audits and Inspections	Every two years (in accordance with U.S. Department of Defense [DoD] Environmental Laboratory Accreditation Program [ELAP] requirements) if determined necessary to confirm DoD ELAP accreditation audits or for other reasons	External	TBD	Don Burton, Project Manager, APTIM or designee	CT Lab Project Manager Eric Korthals	CT Lab Project Manager Eric Korthals	Vicki Graves, Project Chemist, APTIM
Quality Control Summary Report	Each analytical definable feature of work	Internal	APTIM	Vicki Graves, Project Chemist, APTIM	Not applicable (NA)	NA	NA



**Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action**

<b>Assessment Type</b>	<b>Frequency</b>	<b>Internal or External</b>	<b>Organization Performing Assessment</b>	<b>Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)</b>	<b>Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)</b>	<b>Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)</b>	<b>Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)</b>
Field Inspections	Annually	Internal	Army	Bob Gorman, Site Manager, RSA, Dr. Heather McDonald, PE, Technical Manager, CEHNC or designees	Bob Gorman, Site Manager, RSA, Dr. Heather McDonald, PE, Technical Manager, CEHNC or designees	Bob Gorman, Site Manager, RSA, Dr. Heather McDonald, PE, Technical Manager, CEHNC or designees	Bob Gorman, Site Manager, RSA, Dr. Heather McDonald, PE, Technical Manager, CEHNC or designees
Preparatory Inspections/ meetings	Task kick-off	Internal	APTIM/Army	Don Burton, Project Manager, APTIM, Brian Rhodes, QCSM, APTIM, Bob Gorman, Site Manager, RSA, Dr. Heather McDonald, PE, Technical Manager, CEHNC	Don Burton, Project Manager, APTIM	Brian Rhodes, QCSM, APTIM	Don Burton, Project Manager, APTIM
Initial Inspections	Task as required	Internal	APTIM/Army	Don Burton, Project Manager, APTIM, Brian Rhodes, QCSM, APTIM, Bob Gorman, Site Manager, RSA, Dr, Heather McDonald, PE, Technical Manager, CEHNC	Don Burton, Project Manager, APTIM	Brian Rhodes, QCSM, APTIM	Don Burton, Project Manager, APTIM

**Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action**

<b>Assessment Type</b>	<b>Frequency</b>	<b>Internal or External</b>	<b>Organization Performing Assessment</b>	<b>Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)</b>	<b>Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)</b>	<b>Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)</b>	<b>Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)</b>
Follow-Up Inspections	Task as required	Internal	APTIM/Army	Don Burton, Project Manager, APTIM, Brian Rhodes, QCSM, APTIM, Bob Gorman, Site Manager, RSA, Dr. Heather McDonald, PE, Technical Manager, CEHNC	Don Burton, Project Manager, APTIM	Brian Rhodes, QCSM, APTIM	Don Burton, Project Manager, APTIM
Final Inspections	Task completion	Internal	APTIM/Army	Don Burton, Project Manager, APTIM, Brian Rhodes, QCSM, APTIM, Bob Gorman, Site Manager, RSA, Dr. Heather McDonald, PE, Technical Manager, CEHNC	Don Burton, Project Manager, APTIM	Brian Rhodes, QCSM, APTIM	Don Burton, Project Manager, APTIM

TBD – To be determined.

## Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action

Table 31-1 Guidance on Audits and Inspections

### Assessment and Audit Frequency

Technical inspections and assessments shall be conducted during initial stages of fieldwork to identify and correct problems as quickly as possible. Independent assessments will be performed in response to project management requests. Laboratory audits may be conducted by the APTIM personnel every two years in accordance with the frequency required by the U.S. Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) if they are deemed necessary to confirm DoD ELAP accreditation audits. More frequent audits may be deemed necessary based on laboratory data quality performance, reporting, or other related issues that could arise over the course of the contract. The laboratory audit will include all sample analysis procedures that will be performed by the laboratory being audited. The Quality Assurance (QA) Manager or Project Manager (PM) may conduct audits at a greater frequency than indicated in Worksheet No. 31. Successful DoD ELAP audits are needed to demonstrate environmental testing laboratories are compliant with the DoD Quality Systems Manual, Version 5.3 (DoD, 2019) or the most current version.

### Management Assessments and Independent Assessments

Management assessments and independent assessments may be used to review sample collection, handling, analysis, and documentation procedures. Assessment results are used to evaluate a system's ability to produce data that fulfill program objectives and to identify any areas requiring corrective actions (CA). Inspections are routine qualitative reviews of the overall sampling or measurement system or may have a narrow focus, such as a follow-up inspection, while assessments provide an overall examination of the measurement system.

Assessment and inspection records are reviewed by the QA Manager or designated staff to determine whether data will fulfill the program objectives. Additional inspections or reviews for designated methods may be conducted, or additional information may be requested if data quality problems are indicated.

### Management Assessments

Management assessments may be conducted at the request of the Site Operations Manager, PM, or other employees in management authority. Management assessments are informal reviews of work progress, functionality, adherence to policies and procedures, compliance with requirements, or effectiveness of implementation. They provide the basis for follow-up inspections or independent assessments whenever deficiencies are indicated. All observations are documented, and any recommendations or CAs are submitted to the QA Manager for tracking, implementation, additional review (if required) and completion.

### Independent Assessments

Independent assessments may be conducted at the request of the PM or by personnel who have the authority and organizational independence to provide an unbiased review of the system or procedure. When performed, a detailed checklist will be used for each procedure or system reviewed and will contain items that delineate the critical aspects of the procedure under review. All observations are documented, and the checklist is submitted with a written assessment and recommendations to the QA Manager, PM, Army Contracting Officer's Representative (COR), representatives of the audited organization, and others as appropriate. The information and any CA documentation also will be summarized and included in program reports.

## Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action

### Field Inspections

The field inspections are on-site, qualitative reviews of a sampling or analysis system. Inspections are conducted, preferably at the beginning of the sampling task, by the Project Manager or designee, field lead, or a designated qualified technical staff member who has the authority to act independently of the project staff. Critical items for field inspections include:

- Calibration procedures and documentation for field instruments
- Documentation in field logbooks and on sampling data sheets
- Document control
- Equipment decontamination procedures
- Sample collection, storage, and transportation procedures
- Chain-of-custody procedures for sample documentation and for transfer to a laboratory
- Work instructions.

The checklist for each inspection will contain detailed questions regarding the critical items requiring yes/no answers and comments. A debriefing session will be held for all participants to discuss any inspection results and to discuss any required CA. The reviewer then completes the inspection and submits a report, including observations of strengths and deficiencies and any recommendations for improvements. Detailed checklists will be provided for each final version of the site-specific field sampling plans.

### Inspections for Field Activities

Inspections will be performed on materials or services to determine compliance with contractual, planning, and other requirements. Criteria will be established prior to the inspection and will be based on project specifications, requirements, code specifications, and product acceptability and conducted in accordance with the SOPs. Acceptance criteria will be adequate for the activity and will be verified during inspection activities. Inspection may be performed and verified through visual observation, measurement of materials or equipment, examination of documentation/certification, evaluation of performance, or testing. Inspection forms must be developed based on the definable features of work described in the CMI work plan.

Inspections may be performed using the three-phase inspection method. The preparatory inspections will be performed prior to start-up and will examine training, procedures, equipment and materials, work plans and documents, and overall readiness to perform work. Initial inspections will be performed when work begins on a particular feature of work and will include an examination of the quality of workmanship and a review of control testing for compliance with contract and work plan requirements. Follow-up inspections will be performed to verify compliance with procedures and will ensure the continuation of quality and safety standards established during preparatory and initial inspections until completion of the definable work feature. Final follow-up inspections will be conducted at the completion of each task. Participants in this inspection may include QA (U.S. Army Garrison-Redstone and CEHNC) and QC (APTIM). The final follow-up inspection will be performed to ensure that the completed feature of work meets contract requirements. Any deficiencies noted during this inspection will be documented, and a determination will be made as to the CAs that may be necessary to mitigate the deficiency. All significant deficiencies must be corrected prior to turnover.

Records of inspections will be maintained in the project files. At a minimum, inspection files will include inspection reports/checklists, inspection responses, any supporting documents, and applicable client comments.

## Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action

### Receipt Inspections

Standard APTIM procurement procedures will be used to obtain supplies and consumables. These procedures are initiated by the task manager, field coordinator, or other technical lead personnel and then forwarded to project management and procurement personnel for approval and supplier contact. In the request for supplies, the requestor must provide specifications of the material, including any required certifications of purity or QC level. Sample supplies and consumables must be inspected upon receipt to verify that they meet these specifications and that any required manufacturer's documentation is present and retained for the APTIM project files in accordance with the SOPs. Any damaged, unsealed, or used equipment (unless adequately cleaned and returned to service) will not be accepted.

For items that may come in contact with the sampled matrix or sampling device, assurances should be made, through adequate receipt inspection, that such materials are not contaminated. They must remain sealed or be adequately decontaminated before field use. Examples include decontamination water, chemical reagents, in-line water filters, sample bottles and jars, sampling probes/instruments, bailers, soil spoons, or augers.

### Performance and System Audits

Scheduled project/laboratory audits will be performed, as project activities allow, to review and evaluate the adequacy of field activities and laboratory performance and to ascertain if the QAPP is being completely and uniformly implemented. The Project Manager or designee is responsible for requesting and establishing an audit team. Biennial audits may be supplemented by additional audits for one or more of the following reasons:

- Significant changes are made in field or laboratory protocols.
- It is necessary to verify that a CA has been taken on a nonconformance reported in a previous audit.
- Audit is requested by the PM.

The objectives of performance and systems audits are 1) to verify that the QAPP developed for this project is being implemented according to the specified requirements, 2) to assess the effectiveness of the plan, 3) to identify nonconformances, and 4) to verify that identified deficiencies are corrected. Upon discovery of any significant deviation from the QAPP, the Project Chemist and Project Manager or designee shall be informed of the nature and extent of the deviation. A nonconformance will be documented and a CA will be taken to remedy the deviation.

### Assessment Findings and Corrective Action

All observations and assessment findings will be documented, and the checklist will be submitted with a written assessment and recommendations, including any required or recommended CAs to the Project Manager or designee, PM, CEHNC COR, representatives of the audited organization, and others as appropriate. The information and any CA documentation also will be summarized and included in program reports. The U.S. Environmental Protection Agency and other regulatory agencies shall be notified of any significant CAs by the U.S. Army Garrison-Redstone.

### References:

U.S. Department of Defense (DoD), 2019, *Quality Systems Manual for Environmental Laboratories*, Version 5.3 or most current version.

## Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action

**Table 31-1 Guidance on Audits and Inspections (continued)**

### **Nonconformance Documentation**

Complex field investigation, remediation, sampling, and analysis tasks are sometimes subject to nonconformances. A nonconformance is defined as an unplanned deviation that occurs during the implementation of a task that cannot usually be corrected until after it has occurred. Nonconformance activities may include using unapproved methods, not following procedures specified in the QAPP or CMI work plan or substituting unapproved materials or equipment to perform an activity. Nonconforming supplies may also include suspect and counterfeit items. All nonconformance activities and/or material must go through a cycle of being identified, documented, assessed, corrected, and reported in accordance with APTIM's nonconformance procedure. The steps described in APTIM's guidelines are critical in handling nonconformances as they are encountered.

The identification of a nonconformance is the responsibility of every person assigned to the project. This responsibility is incorporated into each person's understanding of his or her tasks, as assigned by the supervisor or task leader, and each person's function on the project. As individuals perform their duties on the project, they must constantly be aware of the scope of the activity and recognize when a deviation from the planned activity has occurred or is occurring. After recognizing the deviation, they must take action by informing the Project Manager and documenting in writing (using the Nonconformance Report [NCR] form) the specifics of what occurred. The site Quality Control (QC) Officer will maintain a status log of open and closed nonconformances. The log will also serve as the basis for numbering each discrepancy and tracking it through closure.

Satisfactory resolution of nonconformances must be verified by the site QC Officer. Nonconformances are not to be closed until the required corrective and preventative actions have been completed to the satisfaction of the site QC Officer or until long-term CAs have been established and implemented. Nonconformances will be monitored until the action is verified as complete and closed as documented on the NCR.

Nonconformances and associated documentation will be documented in the project file and referenced and discussed in the final task report.

### **Variance Documentation**

Variances are similar to nonconformances with respect to how they are defined, resolved, and documented. The primary difference is the timing of the occurrence of the deviation. A variance can be identified prior to implementation of a task, while a nonconformance is generally not identified until the task is in progress or complete. Therefore, with a variance, alternative techniques, modified methods, or a change in task and data quality objectives can be considered. Substitute data, alternate success criteria, or even the deletion of data points may be contemplated after gathering information on the reason for the deviation and examining the intended use of the data as planned. Project variances will be subject to the same stepwise process of identification, documentation, assessment, correction, and reporting as nonconformances.

The project variance ensures key information is recorded by the personnel who identify variances, review the documentation, assess the impact on task objectives, and consider alternative strategies for corrective action.

Variances will be documented in the project file and will be referenced and discussed in the final task report.

**Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action**

<b>Assessment Type</b>	<b>Nature of Deficiencies Documentation</b>	<b>Individual(s) Notified of Findings (Name, Title, Organization)</b>	<b>Time Frame of Notification <sup>1</sup></b>	<b>Nature of Corrective Action Response Documentation</b>	<b>Individual(s) Receiving Corrective Action Response (Name, Title, Organization) <sup>2</sup></b>	<b>Time Frame for Response</b>
Management Assessments	Nonconformance Report (NCR) <sup>3,4</sup>	Steve Moran, Program Manager, APTIM; Don Burton, Project Manager, APTIM; Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM	5 Days	Corrective Action Request (CAR)	Steve Moran, Program Manager, APTIM; Don Burton, Project Manager, APTIM; Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM	30 Days
Independent Assessments	NCR <sup>3,4</sup>	Don Burton, Project Manager, APTIM; Tricia Felt, Corporate Quality Assurance (QA)/Quality Control (QC) Director, APTIM; Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM	5 Days	CAR	Steve Moran, Program Manager, APTIM; Don Burton, Project Manager, APTIM	30 Days
Receipt Inspections	NCR <sup>3,4</sup>	Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM; Brian Rhodes, Quality Control Site Manager (QCSM), APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	Not Applicable (NA)	Item will be rejected and returned to vendor, repaired, or used as-is.	Don Burton, Project Manager, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM; Brian Rhodes, QCSM, APTIM; Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM	NA
Laboratory Audits and Inspections	NCR <sup>3,4</sup>	Steve Moran, Program Manager, APTIM; Don Burton, Project Manager, APTIM	NA	CAR	Don Burton, Project Manager, APTIM; Brian Rhodes, QCSM, APTIM; Vicki Graves, Project Chemist, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	NA
Quality Control Summary Report (QCSR)	QCSR	Vicki Graves, Project Chemist, APTIM; APTIM Data Users	NA	NA	NA	NA

### Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Time Frame of Notification <sup>1</sup>	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Organization) <sup>2</sup>	Time Frame for Response
Field Inspections	NCR <sup>3,4</sup>	Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM; Don Burton, Project Manager, APTIM; Brian Rhodes, QCSM, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	NA	CAR	Don Burton, Project Manager, APTIM; Brian Rhodes, QCSM, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	NA
Preparatory Inspections/ Meetings	NA (Preparatory Inspection is a meeting to determine if all parties are prepared for task)	Don Burton, Project Manager, APTIM; Brian Rhodes, QCSM, APTIM; Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM	NA	NA	NA	NA
Initial Inspection	NCR <sup>3,4</sup>	Don Burton, Project Manager, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM; Brian Rhodes, QCSM, APTIM; Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM	5 days	CAR, based on the severity of the nonconforming action, service, or item.	Steve Moran, Program Manager, APTIM; Don Burton, Project Manager, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	30 days
Follow-up Inspections	NCR <sup>3,4</sup>	Don Burton, Project Manager, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM; Brian Rhodes, QCSM, APTIM; Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM	5 days	CAR, based on the severity of the nonconforming action, service, or item.	Steve Moran, Program Manager, APTIM; Don Burton, Project Manager, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	30 days
Final Inspections	NCR <sup>3,4</sup>	Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM; Don Burton, Project Manager, APTIM; Brian Rhodes, QCSM, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	5 days	CAR, based on the severity of the nonconforming action, service, or item.	Steve Moran, Program Manager, APTIM; Don Burton, Project Manager, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	30 days

<sup>1</sup> If a nonconforming item or activity is of a nature severe enough to affect the project scope, cost, safety, or the environment, project management shall be notified immediately. An NCR shall be issued within 48 hours following the identification.

<sup>2</sup> The name of individuals(s) receiving the corrective action response will be based on the nature of the CAR or severity of the deviation and the availability of the subject matter expert.

Note: EPA and ADEM will be notified of significant corrective actions.



### **Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action**

- <sup>3</sup> Copies of all NCRs need to be directed to the APTIM Project Manager and APTIM Corporate Quality Management Director, depending upon the severity of the nonconforming action or item.
- <sup>4</sup> Nonconformance reporting will be conducted in accordance with APTIM's guidelines which establish the system for initiating, processing, and controlling nonconforming items, services, or activities to include disposition and CAs.

**Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action**

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Field Activity Daily Log	Daily	Daily	Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM or Brian Rhodes, QCSM, APTIM	Tricia Felt, Corporate Quality Management Director or Designee, APTIM
Daily Construction QC Report-Subcontracted	Daily	Daily	Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM or Brian Rhodes, QCSM, APTIM	Tricia Felt, Corporate Quality Management Director or Designee, APTIM
Daily Construction QC Report- Self Performed	Daily	Daily	Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM or Brian Rhodes, QCSM, APTIM	Government entity to be determined for specific sites as described in Document Submission Requirements and Distribution Procedures, Rev. 57
Weekly Construction QC Report	Weekly	Weekly	Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM or Brian Rhodes, QCSM, APTIM	Don Burton, Project Manager, APTIM and other staff as designated by the Project Manager
RSA Small Working Group Teleconference	Weekly	Not applicable	Don Burton, Project Manager, APTIM	Small working group
Laboratory QA Audit Report	Once every two years if determined necessary to confirm DoD ELAP accreditation audits or as required by situation or circumstance	No later than 30 days after the audit	Tricia Felt, Corporate Quality Management Director, APTIM or Designee	Don Burton, Project Manager, APTIM
Laboratory QA Report	When significant plan deviations result from unanticipated circumstances	Immediately	Eric Korthals, CT Laboratories, LLC Project Manager	Vicki Graves, Project Chemist, APTIM; Don Burton, Project Manager, APTIM
Three Phase Inspection Checklist	As needed	As needed	Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM or Brian Rhodes, QCSM, APTIM	Tricia Felt, Corporate Quality Management Director, APTIM; Project Central Files

**Worksheet Nos. 31, 32, and 33: Assessments and Corrective Action**

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Readiness Review checklist	Completed prior to each field effort	A minimum of two weeks prior to start of field work	Don Burton, Project Manager, APTIM or Designee	Tricia Felt, Corporate Quality Management Director, APTIM
Field Variance	As needed	Prior to executing the definable feature of work	Responsible Party Bob Gorman, Army POC Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM; Don Burton, Project Manager, APTIM; Subject Matter Expert as needed	Don Burton, Project Manager, APTIM and other staff as designated by the Project Manager; Tricia Felt, Corporate Quality Management Director, APTIM; Project Central Files
Nonconformance Report	As needed	As needed	Responsible Party Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM Don Burton, Project Manager, APTIM Subject Matter Expert as needed	Don Burton, Project Manager, APTIM and other staff as designated by the Project Manager; Tricia Felt, Corporate Quality Management Director, APTIM; Project Central Files
Corrective Action Implementation Report	As needed	As defined in the report	Responsible Party Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM Don Burton, Project Manager, APTIM Subject Matter Expert as needed	Don Burton, Project Manager, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM; Project Central Files
Internal Audit Reports	As needed	No later than 30 days after the audit	APTIM Auditors	Dennis Seymore, Senior Scientist and Site Technical Lead, APTIM Tricia Felt, Corporate Quality Management Director, APTIM Don Burton, Project Manager, APTIM
Data Quality Assessment (Note: Data quality assessment is performed in the QCSR)	QCSR report results will be included in the Corrective Measures Implementation Report.	See publication date for corrective measures implementation report in the corrective measures implementation work plan schedule.	Vicki Graves, Project Chemist, APTIM or Designee	Don Burton, Project Manager, APTIM; Ashley Roeske, CEHNC COR; Bob Gorman, Army POC

DoD – U.S. Department of Defense.  
 ELAP – Environmental Laboratory Accreditation Program.  
 POC – Point of contact.

QA – Quality assurance.  
 QC – Quality control.  
 QCSM – Quality control site manager.

QCSR – Quality control summary report.

### Worksheet No. 34: Data Verification and Validation Inputs

Verification Input	Description	Internal/External	Responsible for Verification (Name, Organization)
COC and Shipping Forms	Upon receipt of samples, COC forms and shipping documentation will be reviewed by the laboratory for verification against the sample coolers they represent. The COC form will be signed by all parties having custody of samples, with the exception of commercial carriers.	External	Eric Korthals, CT Laboratories, LLC Project Manager
Field Records	All field records, including AR/COC, field activity logs, well development logs, and sample collection logs, will be verified for completeness.	Internal	APTIM Quality Control Site Managers (QCSM) Vicki Graves, APTIM Project Chemist
Laboratory Data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal.	External	Eric Korthals, CT Laboratories, LLC Project Manager
Laboratory Data	All laboratory data packages will be verified for content upon receipt.	Internal	Vicki Graves, APTIM Project Chemist
Data Input/Verification	Verified information will be entered into EQUIS or a similar database.	Internal	Annette Hough, APTIM Data Manager
Data Input/Verification	EDDs will be loaded into EQUIS or a similar database and self-verified, based on input information.	Internal	Annette Hough, APTIM Data Manager
Data Qualifiers and Use Codes	Following entry of automated data review, data validation qualifiers, and Use Codes, a hard copy validation QC table will be printed and verified against the original data validation checklists.	Internal	Don Dill, APTIM Data Validation Lead
Data Completeness Summary	Data validation information will be reviewed and the number of valid data points will be determined.	Internal	Don Dill, APTIM Data Validation Lead

AR – Analysis request.                      EDD – Electronic data deliverable.  
 COC – Chain of custody.                    QC – Quality control.

#### **Data Reduction and Review of Field Activities**

Data collected during the field activities will be reviewed by checking the procedures used and comparing the data to previous measurements. The field coordinator or sampling coordinator will be responsible for checking all field samples to verify that sample collection and field measurement protocols have been observed. These checks will include:

- Use of standard operating project procedures
- Calibration method and frequency
- Quality control bottle lot number
- Data and time sampled
- Preservation method
- Sample team members
- Receiving laboratory
- Chain-of-custody number
- Airbill number.

## Worksheet No. 34: Data Verification and Validation Inputs

### **Data Validation Activities**

Sample data are validated by the APTIM validation team using the Environmental Protection Agency's (EPA) *Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review* (EPA, 2008) and *Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (EPA, 2010) for guidance prior to 2015. Beginning in 2015, validation is performed using the DOD General Validation Guidelines (DOD 2018) and the U.S. Department of Defense QSM, Version 5.3 (U.S. Department of Defense, 2019) or latest revision for analytical specific criteria. EPA Region 3 *Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses* (EPA, 1994) and *Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* (EPA, 1993) are applied during the blank evaluation portion of the validation activities. Specific quality control criteria identified in Quality Assurance Program Plan Worksheets No. 12 and No. 28, respectively; analytical methods and laboratory standard operating procedures are applied to all sample results. For those analytical methods not addressed by the validation guidelines, the evaluation is based on the published method requirements, laboratory-specific standard operating procedures, and technical judgment following the logic of the Contract Laboratory Program validation guidelines for data qualification.

### **References:**

U.S. Department of Defense (DoD), 2019, **Quality Systems Manual for Environmental Laboratories**, Version 5.3, May.

U.S. Department of Defense (DoD), 2018, **General Data Validation Guidelines**, February.

U.S. Environmental Protection Agency (EPA), 2010, **Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review**, EPA/540/R-94/013, January.

U.S. Environmental Protection Agency (EPA), 2008, **Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review**, EPA/540/R-08/01, June.

U.S. Environmental Protection Agency (EPA), 1994, **Region 3 Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses**, September.

U.S. Environmental Protection Agency (EPA), 1993, **Region 3 Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses**, April.

## Worksheet No. 35: Data Verification Procedures

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	Compliance Review	Review all laboratory information against Request for Analysis and determine if all samples were preserved, received, and analyzed within project specifications. Determine if sample delivery group (SDG) is complete.	Level 1 Data Validation – APTIM
IIa, IIb	Organics Level 2 DoD QSM 5.3 or latest version Data Validation	Level 2 (QC review only): Perform first-level data validation review. Complete automated data review report and verify exception list or complete data validation checklist based on EPA National Functional Guidelines (NFG) prior to 2015, DoD QSM V5.3 or latest approved after 2015, and project requirements.	APTIM
IIa, IIb	Inorganics Level 2 DoD QSM 5.3 or latest version Data Validation	Level 2 (QC review only): Perform first-level data validation review. Complete automated data review report and verify exception list or complete data validation checklist based on NFG prior to 2015, DoD QSM V5.3 or latest approved after 2015, and project requirements.	APTIM
IIa, IIb	Organics Level 3 DoD QSM 5.3 or latest version Data Validation (or equivalent)	Level 3 (QC validation or equivalent): Perform first-level data validation review. Complete automated data review report and verify exception list or complete data validation checklist based on NFG prior to 2015, DoD QSM V5.3 or latest approved after 2015, and project requirements.	APTIM
IIa, IIb	Inorganics Level 3 DoD QSM 5.3 or latest version Data Validation (or equivalent)	Level 3 (QC validation or equivalent): Perform first-level data validation review. Complete automated data review report and verify exception list or complete data validation checklist based on NFG prior to 2015, DoD QSM V5.3 or latest approved after 2015, and project requirements.	APTIM
IIb	QC Summary Report	Review data validation results and provide concurrence, determine data usability, and summarize data quality issues.	APTIM Project Chemist Vicki Graves

**Note(s):**

The APTIM Data Validation Group acts independently from field operations. The validators are not responsible for fieldwork or associated with the technical team working on the RSA Project.

Sample data are validated by the APTIM validation team using the DoD General Validation Guidelines (DoD, 2018) and the DoD QSM, Version 5.3 (DoD, 2019). EPA Region 3 *Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Organic Analyses* (EPA, 1994) and *Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses* (EPA, 1993) are applied during the blank evaluation portion of the validation activities. Specific QC criteria identified in the IW QAPP (the most current version), analytical methods, and laboratory standard operating procedures were applied to all sample results. For those analytical methods not addressed by the validation guidelines, the evaluation is based on the published method requirements, laboratory-specific standard operating procedures, and technical judgment following the logic of the Contract Laboratory Program validation guidelines for data qualification.

## **Worksheet No. 35: Data Verification Procedures**

Data validation is based on the DoD General Validation Guidelines and the analytical specifics in the DoD QSM 5.3 or latest version and applies the validation criteria provided in the QAPP (e.g., WS Nos. 12, 28, etc.).

LCS, MS/MSD, and Surrogate Recoveries control limits are presented in Worksheets Nos.12 and 28.

Table 35-1 lists general qualifier guidelines used for the data validation process.

## Worksheet No. 35: Data Verification Procedures

**Table 35-1 – Validator General Flagging Guidelines**

QC Requirement	Criteria	Flag	Flag Applied To
Holding Time	Time exceeded for completion of extraction or analysis	UR for nondetects > 2X hold time, or J for all positive results	All analytes in the sample. In the event that holding time is only marginally exceeded, qualify positive results as J.
LCS	Percent recovery (%R) > upper control limit (UCL)  %R < lower control limit (LCL)  %R < 10%	J for all positive results  J for all positive results UJ for nondetects  J for all positive results UR for nondetects	The specific analyte(s) in all samples in the associated analytical batch
LCSD	RPD > CL	J/UJ for all results	The specific analyte(s) in all samples in the associated analytical batch No qualifiers for non-detect if percent recoveries >100%; positive bias
Method Blank	Analyte(s) detected	UB for the results within 5X the blank concentration  UB for the results within the 10X for common laboratory contaminants	The specific analyte(s) in all samples in the associated analytical batch  Common laboratory contaminants: VOA; methylene chloride, acetone, 2-butanone; and semivolatle organic compounds; phthalates
Equipment Blank	Analyte(s) detected	UB for the results within 5X the blank concentration  UB for the results within the 10X for common laboratory contaminants	The specific analyte(s) in all samples with the same sampling date and sampling equipment as the equipment blank
Field Duplicates	Field duplicates > RLs and RPD outside control limits 20 Water; 50soil	J for all positive results or UJ for nondetects	The specific analyte(s) in all samples collected on the same sampling date by the same sampling crew at the same site
MS/MSD	MS or MSD % R > UCL or MS or MSD % R < LCL or MS or MSD %R < 10%  MS/MSD RPD > CL	J for all positive results  J/UJ for all result  J/UJ(*UR) for all results	Where the concentration in the parent sample is <4 times the spike concentration. Qualify MS/MSD sample only. Use professional judgment to qualify other samples in batch. (*UR nondetects if extremely low (example: <50% of QAPP control limits)



### Worksheet No. 35: Data Verification Procedures

QC Requirement	Criteria	Flag	Flag Applied To
Sample Preservation / Collection	Preservation/collection requirements not met	Professional judgment will be used for validation of samples when standard temperature guidelines are marginally exceeded.	All analytes in the sample
Laboratory Sample Storage	0± 6°C	J for all positive results UJ/R for nondetects	All analytes in the sample

Notes:

CL – Control Limit.

J – Results estimated during data validation.

LCS – Laboratory Control Sample.

LCSD – Laboratory Control Sample Duplicate.

LCL – Lower Control Limit.

MS – Matrix Spike.

MSD – Matrix Spike Duplicate.

%R – Percent Recovery.

R – Rejected (during data validation).

RPD – Relative Percent Difference.

UCL – Upper Control Limit.

UJ – Nondetected results estimated during data validation.

UB – Result determined to be nondetect at reported concentrations during validation due to contamination in an associated blank.

Control limits for criteria listed in this table are found on Worksheet Nos.12 and 28.

## Worksheet No. 35: Data Verification Procedures

**Table 35-2**  
**Guidelines for Reporting Results**

Result	Flag *
LOQ	U
> DL < LOQ	J
≥ LOQ	As needed

\* Example 1: If the DL is 0.04, the LOQ is 0.9, and the result is 0.03, the concentration reported on the tabulated data form would be ND (0.9) (the sample specific LOQ) and the qualifier would be U.

Example 2: If the DL is 0.04, the LOQ is 0.9, and the result is 0.07, the concentration reported on the result form would be 0.07 and the qualifier flag would be J.

Example 3: If the DL is 0.04, the LOQ is 0.9, and the result is 1.2, the concentration reported on the result form would be 1.2 and the qualifier would be any flag needed because of a data quality problem (e.g., R, J, B, etc.).

Notes:

DL- Decision Limit.

J – Estimated results, detected above the detection limit but below the LOQ.

LOQ – Limit of Quantitation.

U – Results not detected.

## Worksheet No. 35: Data Verification Procedures

**Table 35-3 – Validator Flagging Guidelines Specific to Inorganic Methods**

QC Requirement	Criteria	Flag	Flag Applied To
Initial calibration (minimum one standard and a blank for metals or as required by other inorganic methods)	Linearity criterion not met	J/UR	The specific analyte(s) in all samples associated with the initial calibration UR calibration not performed
Initial Calibration Verification	%R>110% %R <90% %R<30%	J J/UJ R (unusable)	The specific analyte(s) in all samples associated with the initial calibration
Low-Level Calibration Check Standard (at or below RL)	CL exceeded	J Positives UJ Nondetects < LCL	The specific analyte(s) in all samples associated with the low-level check standard
Second Source Calibration Verification	CL exceeded	J/UJ	The specific analyte(s) in all samples associated with the second source calibration verification
Interference Check Solution (ICS)	%R >120% %R 50-79% %R<50%	J J/UJ J/UR	The specific analyte(s) in all samples associated with the ICS (Professional Judgment: Qualify data if samples with concentrations of interferents that are comparable to, or greater than, their respective levels in the ICS)
Serial Dilution Test	CL exceeded	J for all positive results	The specific analyte(s) in the sample associated with the serial dilution
MS/MSD	CL exceeded	J Positives if > UCL J/UJ all results if <LCL. However if < 30% see post-digestion spike.	The specific analyte(s) in the sample associated with the spike sample (results <4X spike)
Post-Digestion Spike Addition	If MS/MSD CL exceeded and if post-digestion spike lower CL exceeded (i.e., PDS<80%)	UR for nondetects if <LCL otherwise flag as per MS/MSD	The specific analyte(s) in the sample associated with the spike sample UR if not tuned prior to calibration
Mass Spectrometer Tune	Ion abundance criteria not met	J/UR for all results	All analytes in all samples associated with the tune
Internal Standard (ICP-MS)	%RI <30% or >120%	J/UJ(UR*)	Apply J/UJ to all results for specific analytes associated with the internal standard (UR - if extremely low; example:<50% of LCL (30%) to nondetects)

## Worksheet No. 35: Data Verification Procedures

### NOTES:

CL – Control Limit.

J – Results estimated during data validation.

J/UJ – Results estimated during data validation/nondetected results estimated during data validation.

J/UR – Results estimated during data validation/rejected nondetect.

J/UJ (UR) – Results estimated during data validation/nondetected results estimated during data validation/ Rejected nondetect.

LCL – Lower Control Limit.

MS/MSD – Matrix Spike/Matrix Spike Duplicate.

UCL – Upper Control Limit.

UR – Rejected nondetect.

### Worksheet No. 36: Data Validation Procedures

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIb	Soil	VOC	Low	SW8260C; DoD_QSM_5.3 or latest version	APTIM Data validation group or approved subcontractor
IIb	Soil	SVOC/PAH	Low	SW8270D; DoD_QSM_5.3 or latest version	APTIM Data validation group or approved subcontractor
IIb	Soil	Pesticides	Low	SW8081A/B; DoD_QSM_5.3 or latest version	APTIM Data validation group or approved subcontractor
IIb	Soil	PCBs	Low	SW8082A; DoD_QSM_5.3 or latest version	APTIM Data validation group or approved subcontractor
IIb	Soil	Metals-ICP	Low	SW6010C; DoD_QSM_5.3 or latest version	APTIM Data validation group or approved subcontractor
IIb	Soil	Mercury	Low	SW7471A; DoD_QSM_5.3 or latest version	APTIM Data validation group or approved subcontractor

Note(s):

The APTIM Data Validator Group acts independently from field operations. The validators are not responsible for fieldwork or are associated with the technical team working on RSA.

DOD QSM V 5.3 denotes *U.S. Department of Defense QSM, Version 5.3* (U.S. Department of Defense, 2019).

ICP - Inductively coupled plasma.

PAH - Polynuclear aromatic hydrocarbon.

PCB - Polychlorinated biphenyl.

SVOC - Semivolatile organic compound.

EPA - U.S. Environmental Protection Agency.

VOC - Volatile organic compound.

## Worksheet No. 37: Data Usability Assessment

### **Identify the personnel responsible for performing the usability assessment:**

Field data generated by the field personnel will be initially reviewed, processed, and evaluated on site by the technical lead, task manager, and/or designee. Copies of the original forms will be maintained on site for reference and the originals will then be forwarded to the data coordinator for further review, inclusion into the project database, and final storage in the project Central Files.

The Project Chemist and/or the task lead will perform the usability assessment on analytical data as defined by definition of precision, accuracy, representativeness, completeness, and comparability (PARCC).

### **Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:**

A combination of checklists and/or data validation summaries will be used to document data validation activities. A quality control summary report (QCSR) or similar documentation will be used to assess the performance of the measurement quality objectives (MQO), (which are the PARCC parameters). These indicators of performance are compared against data quality objectives (DQO) to determine the usability of the data. Guidance from QA-G4/QA-G9 is used as a basis for this assessment.

Hard copy and electronic analytical data will be delivered to the data coordinator for initial review, copying, and distribution, with the original hard copy going to project Central Files. If required, data validators will receive a working hard copy to review. Electronic files will be forwarded to the database manager for checking and uploading into the database. APTIM will then issue summary reports and updates, as required, as final data reviews are completed. The final project deliverables may include electronic file copies for stakeholder use. The data usability assessment will be performed by APTIM for data associated with delineation, risk assessment, or confirmatory sampling.

The APTIM Project Chemist will (1) determine if the MQOs have been met and (2) calculate the data completeness for the project. These results will be included in the data package deliverables for each task.

For a given investigative task, a specific list of target constituents will be formulated; and if they cannot be quantified by the methods summarized in the Installation-Wide (IW) Quality Assurance Program Plan (QAPP), they will be addressed in a task-specific plan. All applicable analyses will meet the recommended method guidance found in *Test Methods for Evaluation of Solid Waste, Physical/Chemical Methods, SW-846*, (U.S. Environmental Protection Agency [EPA], 1997) and its subsequent updates. All other requested analyses must conform to their specified method. These may include the *Annual Book of ASTM Standards* (American Society for Testing and Materials, 2002), *Methods for Chemical Analysis of Water and Waste* (EPA, 1993), and similar sources.

## Worksheet No. 37: Data Usability Assessment

Part of the review to determine whether DQOs were met is evaluation of a series of data quality indicators that include measurements of the PARCC and sensitivity parameters. How each of these measurements is to be performed and assessed is discussed in the worksheet. The target acceptance criteria for the results have been developed for a wide variety of anticipated analyses on soil/sediment, surface water, and groundwater matrix samples and are presented in the internal laboratory quality control (QC) validation criteria found in Table 35-1 in Worksheet No. 35. Other data quality indicators may be developed as needed for other sampling media and other analysis programs and presented in their task-specific plans.

### Precision

Precision refers to the reproducibility of measurements and is defined as the measurement of mutual agreement among individual measurements of the same property, usually under “prescribed similar conditions.” Precision is expressed in terms of the relative percent difference (RPD) between duplicate determinations or in terms of the relative standard deviation (RSD) when three or more determinations are made. Various measures of precision exist, depending on the prescribed similar conditions.

Overall sampling and analysis precision will be assessed using RPD for duplicate environmental samples. The RPD for matrix spike (MS)/matrix spike duplicate (MSD) sample results will be used to assess laboratory spike recovery precision. RPD is defined as the difference between two measurements divided by their mean and expressed as a percent as shown in Equation (1):

$$\text{RPD} = \left[ \frac{|D_1 - D_2|}{\left( \frac{D_1 + D_2}{2} \right)} \right] \times 100 \quad (1)$$

where:

1.  $D_1$  = The result from the original determination
2.  $D_2$  = The result from a duplicate measurement.

### Worksheet No. 37: Data Usability Assessment

RSD is the standard deviation of a set of values divided by the average value expressed as a percent as shown in Equation (2):

$$\text{RSD} = \left( \frac{\sigma_{n-1}}{\bar{X}(x_1 \dots x_n)} \right) \times 100 \quad (2)$$

where:

3.  $\sigma_{n-1}$  = The sample standard deviation of the sample data
4.  $n$  = The number of determinations
5.  $\bar{X}(x_1 \dots x_n)$  = The arithmetic mean of the sample data.

#### Accuracy

Accuracy is a measure of the bias in a system or the degree of agreement of a measurement, X (or an average of measurements of the same parameter), against an accepted reference or true value, T. Accuracy is typically expressed as a percent recovery calculated by the ratio of the measurement and accepted true value as shown in Equation (3):

$$\text{Percent Recovery} = \left( \frac{(X - S)}{T} \right) \times 100 \quad (3)$$

where:

6. X = The experimentally determined concentration
7. S = The sample concentration before spiking
8. T = The “true” concentration.

Analytical accuracy is assessed through the analysis of spikes, such as surrogates, MS/MSDs, and laboratory control samples (LCS); audit samples and/or standard reference materials; and calibration check samples. With the surrogates and MS/MSDs that are spiked onto the actual sample matrix and analyzed, these accuracy indicators must take into account the nature of the matrix in question and the native concentration of the analyte spiked. Matrix variability or interferences from high concentrations of native compounds may adversely affect spike recovery and yield less than conclusive data.

Accuracy checks which focus on analytical method and consist of compounds spiked in a “blank” or noninterfering matrix (e.g., LCSs, standard reference



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materials, or calibration check samples) address the accuracy of the method and/or instrumentation at detecting the target analyte(s) at a certain quantification level and are not considered to be subject to matrix effects.

Measuring the bias of the overall sampling program is also difficult, especially with respect to collection of samples for analysis for volatile organic compounds. These organic compounds can be volatilized and lost from collected samples, resulting in a negative bias, or the sample can become contaminated with foreign compounds during sample collection, handling, and preparation, resulting in a positive bias. Using proven sample collection methods that incorporate steps to minimize sample disturbance during collection, providing for the isolation of samples from known sources of contamination, and incorporating the immediate preservation of samples on ice should reduce the potential for bias. Accuracy of the sampling system, emphasizing cross-contamination with volatile compounds, will be assessed by evaluating analytical results for field quality assurance (QA) samples, including field-prepared field blanks, laboratory-prepared trip blanks, equipment rinsate blanks, laboratory storage blanks, and analytical method blanks.

### Representativeness

Representativeness is a qualitative parameter that expresses the degree to which sample data actually represent the matrix conditions. For example, in conducting groundwater monitoring, representativeness requires proper location of wells and the collection of samples under consistent, documented procedures. Wells are located based upon the results of the hydrogeologic study in progress and are designed to provide maximum coverage of the flow conditions. Requirements and procedures for sample collection and handling are designed to maximize sample representativeness. Representativeness can also be monitored by reviewing field documentation and performing field QA audits.

Other sampling approaches in which representativeness is a concern are building composite samples and using an unbiased grid sampling system. In compositing, individual subsamples are collected and combined to represent a greater physical area or cover a particular time period. Often, to characterize a large unknown surface area, a grid sampling pattern is established and then samples are collected at randomized node locations where horizontal and vertical traverse lines intersect. Considerations such as number of samples required and their spatial relationship will affect the degree to which the unbiased grid sample results are representative. In such cases, the sampling objective must be well defined and the intended purpose for the sample data generated must be reviewed to establish through statistical analysis the representativeness of the DQOs. Parameters, such as the number of subsamples composited, the number of samples submitted for analysis, and the sampling interval, can then be specified to increase the confidence interval and improve representativeness when warranted by the performance objective.

### Completeness

Data completeness represents the percentage of valid or usable data collected from a sampling/analytical program or measurement system compared to the amount expected to be obtained under optimal or normal conditions. Completeness is calculated for the aggregation of data for each analyte measured for any particular sampling event or other defined set of samples. Completeness is calculated and reported for each method, matrix, and analyte

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combination. The number of valid results divided by the number of possible individual analyte results and expressed as a percentage determines the completeness of the data set. For completeness requirements, valid results are all results not qualified as rejected in the data review and validation process. The requirement for completeness is 90 percent of all critical field samples requiring chemical or geotechnical analyses. For any instances of samples that could not be analyzed for any reason (holding time violations in which resampling and analysis were not possible, samples spilled or broken, etc.), the numerator of this calculation becomes the number of valid results minus the number of possible results not reported.

The formula for calculating completeness is shown in Equation (4):

$$Completeness = \left( \frac{\text{number of valid (i.e., non-R-flagged) results}}{\text{number of possible results}} \right) \quad (4)$$

Site-specific completeness goals may also be defined in the site-specific sampling and analysis plan.

For statistically based sampling designs, completeness will be dependent upon the number of usable samples that are needed to meet the tolerances for decision errors. The mechanism for determining completeness for statistically based sampling designs will be provided in the site-specific field sampling plans.

### Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability for sampling and analysis tasks is achieved by:

- Specifying well-recognized techniques and accepted standard methods for sampling and analysis using well-trained sampling and analysis technicians to execute the prescribed methods consistently
- Requiring that all involved sampling and analysis personnel produce adequate documentation to record how the prescribed methods were actually executed, noting nonconformances and corrective measures taken.

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The specification of standardized laboratory methods helps to ensure that the data generated for an event are comparable to past and future activities. Periodic field and laboratory audits to assess consistency of method implementation for these prescribed procedures are also critical in determining comparability.

### Sensitivity

Sensitivity is a qualitative parameter that addresses the ability of the analytical method or instrumentation to differentiate between responses that represent concentrations of analytes. Sensitivity is important, as it is the ability to detect the target analytes at the levels of interest so that project-specific goals are met. The requirements of sensitivity include the establishment of various limits such as those for calibration, which include instrument detection limits (DL), and those that are project specific, such as limits of quantitation. The DLs are based on interference-free matrices which do not take into account the matrix effects of environmental samples. Therefore, project-specific LOQs are established to meet project objectives for analytes of interest (these values are provided in Worksheet 15 tables).

The Project Chemist or designee will review all preliminary data for obvious data quality issues, such as sensitivity and QC errors, and will 1) perform a final review of the raw data to ensure that data have been transcribed correctly, 2) review chromatograms and mass spectra to ensure that compounds have been identified correctly, and 3) review QC data to ensure that all data have been qualified correctly. The Project Chemist will not recalculate data from raw data. When required, any recalculations will be performed by the Data Validator. The Data Validator will review a minimum of 10 percent of the raw data against the QC requirements presented in the IW QAPP.

The following guidelines will be considered during evaluation for usability:

- Review the case narratives pertaining to the data packages and establish that corrective actions (CA) were performed.
- Review all qualifier flags based on acceptance criteria.
- Ascertain if the representativeness objective for the project was achieved.
- Be aware of previous investigations for the specific projects and pre-existing data gaps.
- Calculate completeness of sample and analytical data collection to check against the objectives of the project.
- Identify data gaps based on completeness and nonconformance events.

## Worksheet No. 37: Data Usability Assessment

- Identify data that do not meet project-specific sensitivity requirements.
- Determine if the data gaps prevent RSA from making decisions intended in DQOs.
- Document instances where professional judgment should be used; and discuss them with the CEHNC Chemist and, if necessary, the Alabama Department of Environmental Management chemist and/or the EPA Region 4 chemist.
- Document all evaluations, calculation, rejections, and recommendations and provide rationale for all specific validation actions.
- Submit a QCSR.

The following items should be considered when evaluating data usability when acceptance criteria have been exceeded:

- **Holding Times** – Consider the stability of the different analytes when holding times have not been met. Volatile organics are more susceptible to loss over time than semivolatile organic compounds, such as pesticides and dioxins or metals. Samples that are reanalyzed a few days past holding time because the QC results are outside acceptance criteria but also have both passing criteria in the reanalysis and comparable results to the original analyses, should not be rejected with the exception of volatile organics. If the holding time for volatile organics is exceeded, the data will be rejected and there will be no further use of the data.
- **Blanks** – If the concentration of the analyte in the sample is greater than five times the concentration in the blank, do not qualify the sample concentration as “B.” Pay special attention when the result is near the governing criterion.
- **Sample Preservation** – For preservation of all analytes in the sample, if a sample is received at no greater than 10 degrees Celsius, is within 48 hours of collection, there is documentation that the sample was properly preserved with ice at the time of shipment, then qualify the samples as UJ for nondetects for positive results. Adhere to sample preservation criteria whenever possible and reject volatiles samples that are improperly preserved.
- **Surrogates** – Matrix effects may impact surrogate recovery. If surrogates are within acceptance criteria in the LCS and the method blank and the internal standard area counts are acceptable in the sample, evaluate the raw data to see if the results in the sample are acceptable. In multiple surrogate methods, one surrogate may be slightly outside acceptance criteria and the data for that sample may still be usable. The Data Validator should investigate whether the root cause of the poor recoveries was examined by the laboratory and, when necessary, whether the CA was performed before accepting the data. Evaluate the raw data for usability based on DQOs.

## Worksheet No. 37: Data Usability Assessment

- **Surrogates and Matrix Spikes** – Surrogates and MSs with concentrations diluted out cannot be evaluated.
- **Sensitivity** – Where generic action limits are used as action levels, use the lowest achievable laboratory DL to evaluate sensitivity. Where project- or task-specific action levels have been developed, identify sample results that do not meet the expected sensitivity requirements during a preliminary review of the data and determine why the exceedance occurred. If the exceedance is determined to be minor, (i.e., less than 20 percent) evaluate the sample result against the laboratory's detection limits and review similar data collected to determine the extent of the condition. If a systematic error has occurred, determine the overall impact to the data and report the condition to the project/task manager and regulators as needed to determine if additional sampling should be performed. If the results are clearly unusable (i.e., exceedance greater than 20 percent), determine the cause for the exceedance, initiate CA if required, and request reanalysis and/or resampling, as appropriate.

In the event that the Data Validator needs to modify the data qualifiers due to a scenario that is not presented in the IW QAPP, the APTIM Project Chemist will contact the CEHNC chemist for discussion on effects on the data and CA.

### **Describe the evaluative procedures used to assess overall measurement error associated with the project:**

Data verification is defined as "confirmation by examination and provision of objective evidence that specified requirements have been fulfilled." Data validation is defined as "confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use have been fulfilled" (EPA QA/G-5).

The APTIM Project Chemist or designee will review the entire definitive data report package with the field records and apply the final data qualifiers for the definitive data. APTIM will evaluate laboratory data, QC results, and laboratory data qualifiers and apply data validation qualifiers. These qualifiers may be different from those applied by the laboratory. APTIM will use various checklists during the verification process to document all the verification activities. Completed checklists will be available for review upon request; however, these checklists should not be included as part of the data packages. All qualifications must be explained in the Data Validation Report. All qualified data near the governing criteria will be evaluated against project DQOs for fitness for use.

Note that all criteria that are included in the IW QAPP are to be considered target goals. Generally, the data are flagged by the laboratory and a more detailed evaluation of the data is performed. Evaluation of the exceedances by the analytical Data Coordinator, the Laboratory Project Manager, and the Laboratory QA officer will be completed, and a recommendation will be made concerning the usefulness of the data. CA procedures may then be formulated and implemented in the field or laboratory to avoid reoccurrence of the condition. In all cases, the results of the usefulness of the evaluation will be documented and discussed in the project reports.

## Worksheet No. 37: Data Usability Assessment

To determine the precision of an analytical method and/or laboratory analyst, a routine program of duplicate analyses is performed. The results of the duplicate analyses are used to calculate the RPD, which is the governing QC parameter for precision. APTIM will determine the precision of the analyses conducted during this investigation by reviewing the results of field replicate samples and laboratory duplicate samples (where applicable), then, if sufficient data are obtained, the arithmetic mean and standard deviation of a group of results may be calculated.

The accuracy of a method is an estimate of the difference between the true value and the determined mean value. Certain QA parameters, such as LCSs, reagent water spike samples, QC check samples, MS samples, and surrogate spike samples, have known concentrations prior to analysis. By comparing the percent recovery of the analysis of these samples to the true value, it is possible to measure the accuracy of the analysis.

Percent recovery values and control limits or DQOs are reported by the laboratory as a measure of method accuracy and will be compared with the established laboratory limits or the published U.S. Department of Defense (DoD) Quality Systems Manual (QSM) Version 5.3 criteria or latest approved for the accuracy of an individual method. QC data not meeting the established laboratory criteria or DoD QSM Version 5.3 or latest version target criteria for accuracy may be flagged and their usability assessed. Associated field sample data should be considered estimated.

Data completeness will be expressed both as the percentage of total tests conducted that are deemed valid and as the percentage of the total tests required in the scope of work that are deemed valid. Percent completeness is calculated with respect to the purpose of analysis (i.e., chemical, geotechnical, soil classification), as well as type of sample (i.e., field sample or QA/QC sample). The purpose and total number of each type of sample planned in the scope of work will be calculated and tabularized in the task work plan for each specific task. As part of the evaluation of the task completeness performed in the task final report, the actual number of samples collected will be compared to the planned number, and completeness will be discussed in the task-specific report. The completeness goal for all the different types of samples on this project is 90 percent, except for QA/QC samples. Completeness of QA/QC samples will have to be judged on a case-by-case basis in the report documents. Enough QA/QC data must be available to allow a thorough assessment of data quality to be performed.

APTIM will review the QC (laboratory and field) samples and field logs and appropriately flag any of the associated samples identified with the QC samples, as explained in Tables 35-1, 35-2, and 35-3. At minimum, case narratives, calibrations, blanks, spikes, and duplicates will be reviewed. Additionally, raw data, such as chromatograms, mass spectra, and instrument output, will be reviewed for transcription errors. Each MS sample will only be qualified by the laboratory, while APTIM will apply the final qualifying flag for a matrix effect to all samples collected from the same site as the parent sample or all samples showing the same lithologic characteristics as the MS/MSD.

## Worksheet No. 37: Data Usability Assessment

### Definitions for Data Qualifiers:

• Validation	• Definition
“null”	Detected and no qualifications during data validation
U	Not detected
J	Estimated due to data value between RL/LOQ and DL/MDL or due to validation anomaly
UJ	Not detected, estimated due to data validation anomaly
UB	Potential blank contamination
R	Rejected due to data validation anomaly
UR	Not detected; Rejected due to data validation anomaly
X1, X2, X3	Historical data that have been collected in a manner that is now considered to be inconsistent with good scientific practice; these data are considered unusable
X	Sample has been excavated.

### Preliminary Data Use

To meet the goals of the RSA Program Management Contract, it may be necessary to make use of preliminary data, but not for site closure or action level compliance. The data must be released by the APTIM Project Chemist or APTIM Corporate Quality Management Director to the project staff for use. Ideally, the data will have been reviewed against the RSA QC criteria before the data are released to the project team. The team will be made aware that the data has not been completely validated and that they are using the data at risk. Acceptable uses for preliminary data include step-out discussions, additional sampling requirements, etc. Unacceptable uses of preliminary data include public meetings, risk assessment decisions, no further action decisions, and final decision-making purposes.

### References:

American Society for Testing and Materials, 2002, **Annual Book of ASTM Standards**.

U.S. Department of Defense, 2019, **Quality Systems Manual for Environmental Laboratories**, Version 5.3, May.

U.S. Environmental Protection Agency (EPA), 1993, **Methods for Chemical Analysis of Water and Waste**, EPA 600/4-79-020, Revision 2.0.

U.S. Environmental Protection Agency (EPA), 1997, **Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods**, SW-846, Third Edition, Office of Solid Waste, June.

**ATTACHMENT D-1**  
**ARMY SCOPING SESSION MEMORANDUM**



**FINAL  
SYSTEMATIC PROJECT PLANNING  
CMIP SCOPING MEETING MEMORANDUM**

**Corrective Measures Implementation Work Plan  
RSA-122, Dismantled Lewisite Manufacturing Plants Sites and RSA-183, Former Lewisite  
Manufacturing Plants 1 and 2  
Redstone Arsenal, Madison County, Alabama**

**1.0 Introduction**

This document provides a record of the Scoping Meeting for the Corrective Measures Implementation Work Plan (CMIP) for RSA-122, Dismantled Lewisite Manufacturing Plants Sites and RSA-183, Former Lewisite Manufacturing Plants 1 and 2 at the Redstone Arsenal (RSA) in Huntsville, Alabama. This virtual meeting commenced at 2:00 p.m. CST on September 28, 2021 using the Microsoft Teams application and phone in option. The meeting was attended by the Project Team members listed in Table 1.1. Decisions and action items covered during the meeting are summarized in Section 1.2. Meeting materials are listed in Section 2.0 and provided as Attachment A, *Slide Presentation*, and Attachment B, *Data Quality Objectives*.

Table 1.1: RSA-122 and RSA-183 CMIP Scoping Meeting Participants

<b>Participant Information</b>	
CEHNC COR Ashley Roeske	APTIM PM Don Burton
ADEM POC JoJuan Pressley	APTIM SME Gail Cooley
CEHNC Technical Manager Dr. Heather McDonald, PE	APTIM Technical Lead/SME Emily Davis
CEHNC Chemist Mike D'Auben	APTIM SME Dennis Seymore
CEHNC Kenny Jones	APTIM Design Engineer/SME Ray Clark
RSA PM Bob Gorman	

ADEM – Alabama Department of Environmental Management.  
 CEHNC – U.S. Army Engineering and Support Center, Huntsville.  
 COR – Contracting Officer Representative.  
 PM – Project Manager.  
 POC – Point of Contact.  
 RSA – Redstone Arsenal.  
 SME – Subject Matter Expert.

**1.1 Objectives**

The purpose of the meeting was to present the CMIP execution strategy and proposed CMIP activities for RSA-122 and RSA-183 to the Project Team and stakeholders. To support this presentation, a site location/description/history; document status; corrective measures completed, remedial investigations, updated risk results, Corrective Measures Study (CMS), and statement of basis/decision document summaries; CMIP execution strategy, proposed corrective measures

including arsenic soils removal, removal of relic structures, and land use controls; and path forward were presented.

APTIM is performing this project for the CEHNC under Contract No. W912DY-17-D-0003, Delivery Order (DO) No. W912DY19F1116 for the corrective measures at RSA-013, RSA-014, RSA-109, RSA-122, RSA-141-R-01, RSA-183, RSA-221-R-01, RSA-312-R-01, and RSA-313-R-01 at RSA in Huntsville, Alabama.

The objectives for RSA-122 and RSA-183 under this DO are:

- 1) Achieve Department of the Army (DA) approval of the CMS report (complete).
- 2) Achieve DA approval and regulatory concurrence of the CMIP.
- 3) Achieve DA approval of the Statement of Basis/Decision Document.
- 4) Achieve DA approval of the Chemical Safety Submission (CSS).
- 5) Conduct of the Corrective Measures Implementation-Construction activities and the Corrective Measures Report for RSA-122 and RSA-183 are optional tasks that can be exercised by the Army.

## **1.2 Meeting Discussion Topics**

Mr. Burton introduced the Project Team members and then led the team through the initial introductory CMIP Scoping Meeting presentation slides for RSA-122 and RSA-183 (Attachment A). Mr. Seymore presented the specific details of the slides for RSA-122 and RSA-183 including the DQOs (Attachment B). Ms. Davis presented the specific cleanup goals for each site and each depth interval and how they were derived to be protective of specific receptors. The presentation was then opened up for any comments or questions. No one had any comments or questions regarding the slides. Mr. Seymore added that the CSS has already been prepared and completed through Army reviews; this document is a long lead item and is well along toward final signatures/approvals. Mr. Pressley thanked the Army and Aptim team for an excellent presentation for these two complex sites.

- Action Item:
  - 1) APTIM will fix the projected SB/DD date to initial Army review from August 2021 to late October 2021 on Slides 47 and 48. The CMIP scoping meeting date on Slides 1 and 48 will be revised from August 2021 to September 28, 2021.

The meeting was adjourned at approximately 3:30 p.m. CST.

## **2.0 Meeting Materials**

The following meeting materials are provided as an attachment to this memorandum:

- Attachment A: Slide Presentation
- Attachment B: Data Quality Objectives.

**ATTACHMENT A**  
**Slide Presentation**

# SCOPING SESSION CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN FOR FOR RSA-122 AND RSA-183

Redstone Arsenal, Madison County, Alabama

28 September 2021



US Army Corps of Engineers



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# SCOPE OF SERVICES

- › Base Delivery Order Objectives for RSA-122 and RSA-183:
  - Department of Army (DA) approvals of Corrective Measures Study (CMS) reports for each site were received on 3-Sep-20 and 3-Mar-21.
  - Achieve DA and Regulatory approval of Corrective Measures Implementation Plan (CMIP).
  - Achieve DA approval of Statement of Basis/Decision Document (SB/DD).
  - Achieve DA approval of Chemical Safety Submission (CSS) for both sites.
  
- › Optional Delivery Order Objectives for RSA-122 and RSA-183:
  - Achieve DA and Regulatory approvals of the Corrective Measures Implementation-Construction (CMI-C) activities at each site and the Corrective Measures Report (CMR) (complete remediation services and achieve response complete).



# REGULATORY BASIS

- › Resource Conservation and Recovery Act (RCRA) Corrective Action Program
- › Alabama Hazardous Wastes Management and Minimization Act (AHWMMA) Hazardous Storage Facility/Thermal Treatment/Solid Waste Management Unit (SWMU) Corrective Action Permit (ID # AL7210020742)
- › RSA is a federal facility on the National Priorities List and actions are required to meet the substantive requirements of the National Oil and Hazardous Substances Pollution Contingency Plan under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)



# COMPLIANCE REQUIREMENTS

- › RCRA
- › Department of Defense
- › Department of Army
- › US Army Corps of Engineers – Data Item Descriptions (DID)
- › Federal and State Regulations and Guidance to include Interim Guidance (IG)





# AGENDA

- › Site Location
- › Site Description/History
- › Document Status
- › Corrective Measures Completed
- › RI Conclusions with Updated Risk Results
- › CMS Report Summary
- › CMIP Execution Strategy
- › Arsenic Soils Removal
- › Removal of Relict Structures
- › Land Use Controls
- › Schedule Impacts - CMIP
- › SB/DD Summary
- › Path Forward



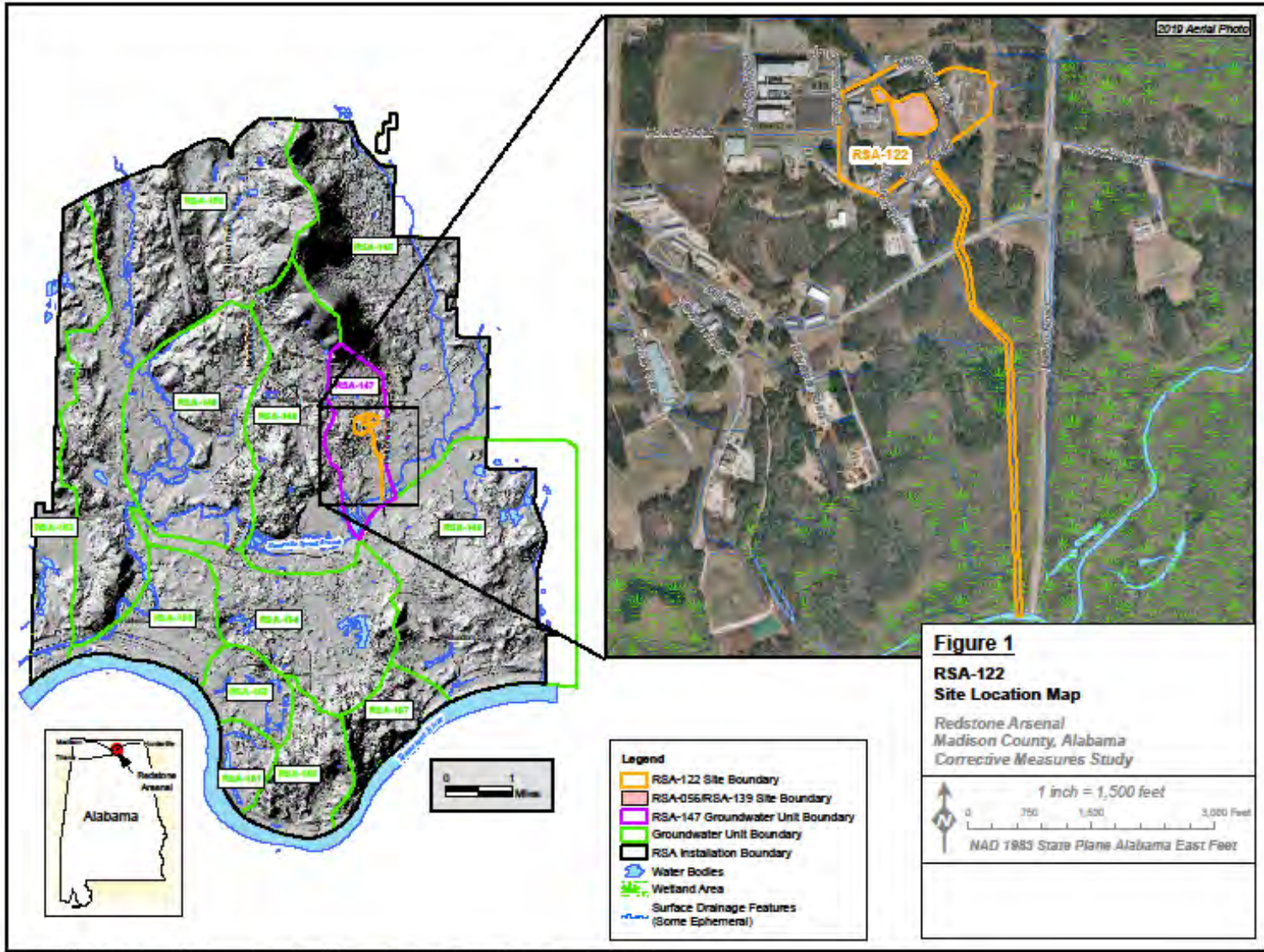
# **RSA-122 – DISMANTLED LEWISITE MANUFACTURING PLANT SITES AND RSA-183 – FORMER LEWISITE MANUFACTURING PLANTS 1 AND 2**



# SITE LOCATION: RSA-122

- › Located in the east-central portion of RSA, just west of Patton Road, north of Viper Road, south of Metrology Drive, and east of Jungerman Road.
- › RSA-122 lies above the RSA-147 groundwater unit.
- › RSA-122 includes areas from former lewisite production and an unnamed creek through the site that discharges to Huntsville Spring Branch.
- › Two capped arsenic waste disposal ponds (RSA-056/RSA-139) lie within RSA-122; these sites have an ADEM-approved CMIP.
- › Four additional sites (RSA-033, RSA-043, RSA-044, and RSA-127) lie within RSA-122; these sites are no further action.





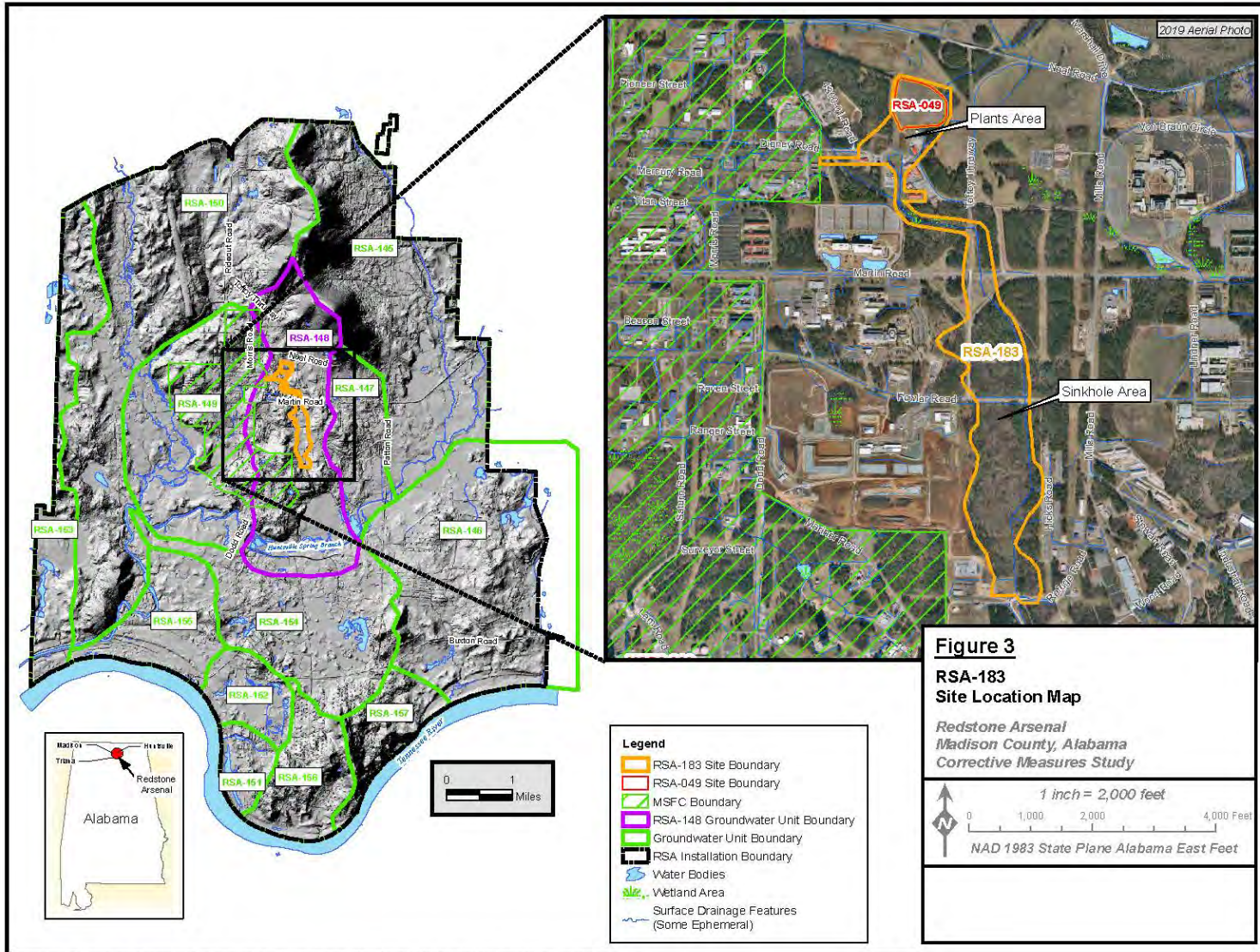
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# SITE LOCATION – RSA-183

- › RSA-183 consists of an area formerly occupied by Lewisite Plants 1 and 2 (Plants Area) and a large sinkhole area (Sinkhole Area) south of the former plants.
- › Located in the central portion of RSA. The Plants Area (Plants 1 and 2) is located west of Toftoy Thruway and north of Digney Road. The Sinkhole Area extends south of the Plants Area along Toftoy Thruway approximately to Refuge Road.
- › RSA-183 lies above the RSA-148 groundwater unit.
- › Two separate sites lie within the Plants Area of RSA-183: RSA-049 (capped arsenic waste ponds) and MSFC-052e (portion of industrial sewer). RSA-049 requires LUC monitoring and MSFC-052e is no further action.





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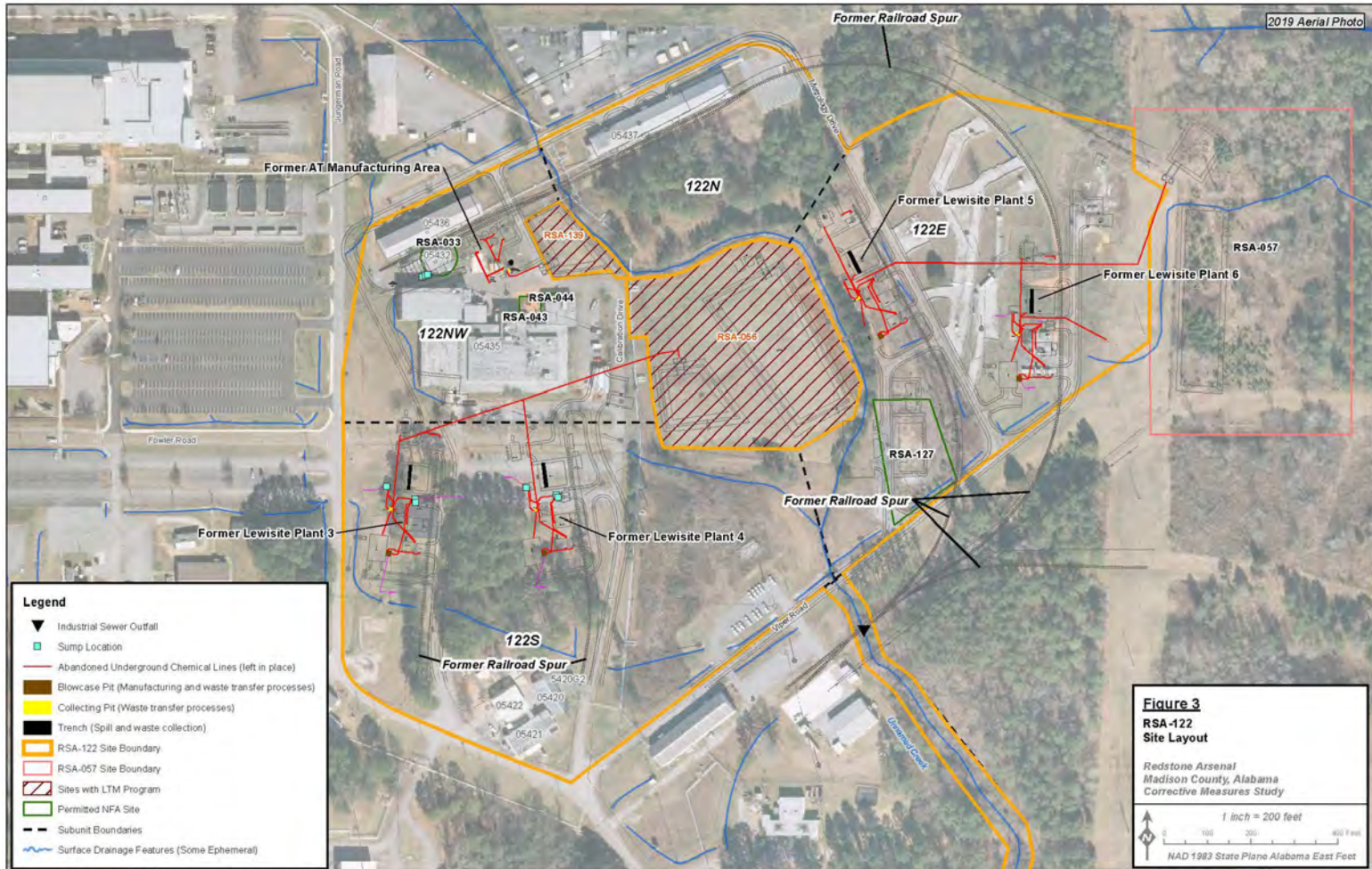
# SITE DESCRIPTION/HISTORY – RSA-122

- › RSA-122 encompasses four former lewisite manufacturing plants (Plants 3 through 6). Lewisite was manufactured by reacting arsenic trichloride (AT) with acetylene in the presence of mercuric chloride as a catalyst. Further distillation of the crude lewisite resulted in distilled lewisite, which was then placed into 2,700-pound containers for transport, possibly by rail, to munitions filling buildings elsewhere at RSA.
- › RSA-122 has a total area of approximately 42 acres and is subdivided into four distinct subsections based on historic land use:
  - **RSA-122N** – former stockpiling area and storm water drainage ditches (approximately 5.5 acres)
  - **RSA-122E** – former Lewisite Plants 5 and 6 (reportedly never brought on-line but Plant 5 reported used for 1-ton container decontamination) and storm water drainage ditches (approximately 12.6 acres)
  - **RSA-122NW** – former sulfur monochloride (SM) and AT production area and storm water drainage ditches (approximately 6.4 acres)
  - **RSA-122S** – former Lewisite Plants 3 and 4 and storm water drainage ditches (approximately 17.4 acres, and 8.3 acre associated with unnamed creek).



# RSA-122

## SITE LAYOUT – DECISION UNITS



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# SITE DESCRIPTION/HISTORY: RSA-122 (CONT)

- › An unnamed north-south-trending perennial creek runs through the site and discharges to Huntsville Spring Branch.
- › Main portion of site lies outside of 100-year and 500-year floodplains. The unnamed creek lies within the 500-year floodplain south of Viper Road, and within the 100-year floodplain south of Mills Road.
- › Few structures remain from the former lewisite plants, and the areas are largely open with maintained lawn grasses with small areas of landscaped trees and shrubs.
- › Although none of the production buildings remain, several drainage ditches, and buried chemical production lines are still present.
- › Current and Future Use: Industrial. Specific land use is designated as Professional.
- › Unexploded ordnance (UXO) probability is “None.”
- › Chemical warfare materiel (CWM) probability is:
  - “Occasional” within 0.1 acre of former Plants 3 and 4
  - “Seldom” within 1.5 acres of former Plants 3 and 4 and a section of piping at former Plant 6
  - “Unlikely” within the remaining 40.4 acres of RSA-122



# RSA-122 SITE LAYOUT AND CWM RATINGS



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# SITE DESCRIPTION/HISTORY: RSA-183

- › RSA-183 was formerly a lewisite production facility from November 1942 to October 1943.
- › RSA-183 has a total area of 157 acres and is subdivided into two distinct areas based on differences in geography, vegetative cover, habitat, and historical activities:
  - Plants Area –
    - Area includes dismantled lewisite Plants 1 and 2 (35 acres) and associated operations features (i.e., chemical piping and discharge areas and waste storage areas).
    - Currently, partly tree covered; and vegetated with grass, briars, and evergreen trees.
    - None of the lewisite production buildings exist today; former roads, several drainage ditches, and buried chemical production lines are still present.
    - A north-south-trending drainage ditch exits the Plants Area.
  - Sinkhole Area –
    - Served as a receiving basin for surface runoff from the Plants Area and surrounding areas (122 acres).
    - Area is primarily forested.

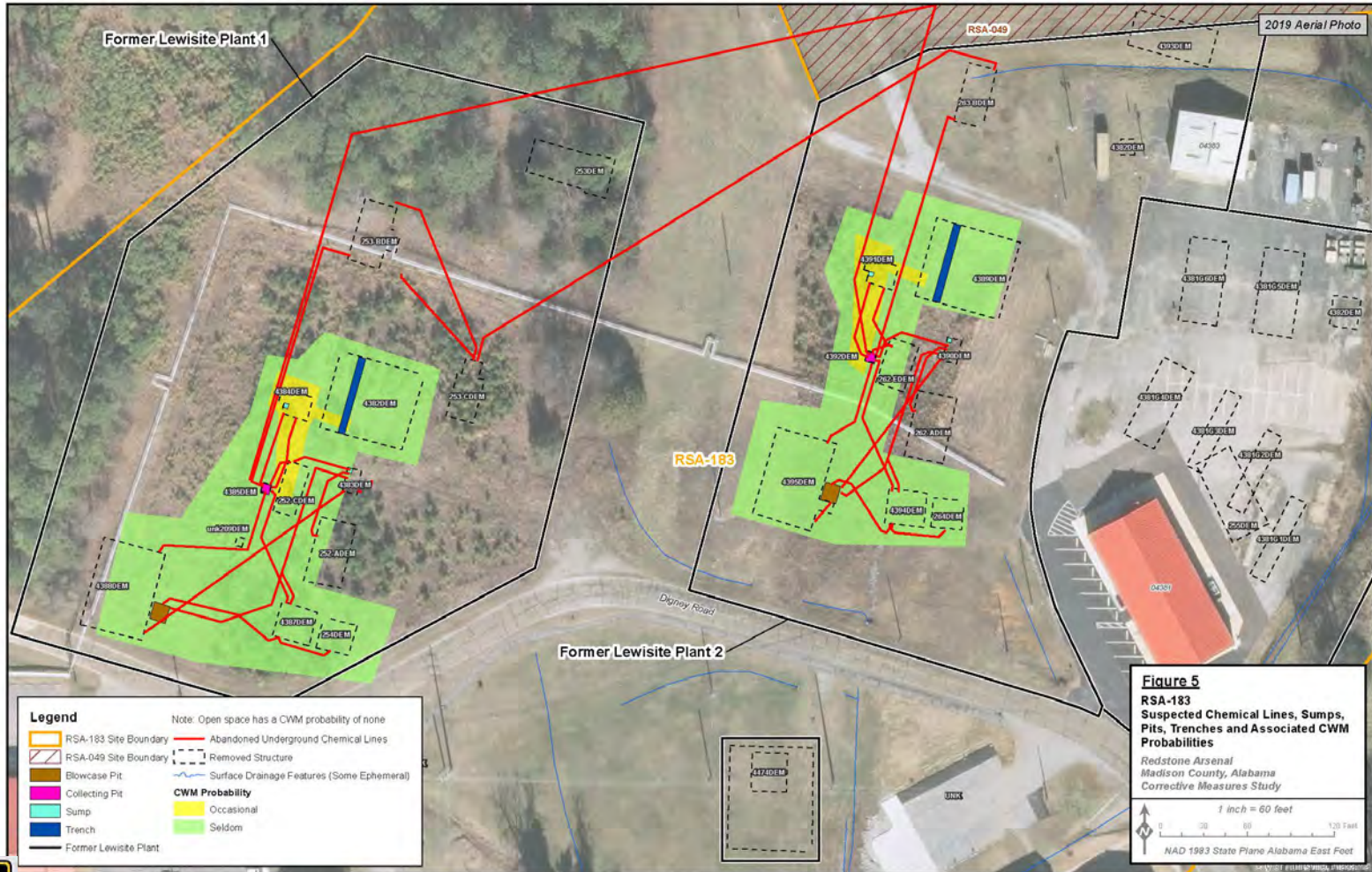


# SITE DESCRIPTION/HISTORY: RSA-183 (CONT)

- › Current and Future Use: Industrial. Specific land use for the Plants Area is designated as Business. Specific land use for the Sinkhole Area is Business, with a portion of the extreme southwest corner as Industrial.
- › UXO probability is “None.”
- › CWM probability is:
  - “Occasional” within two small tracts of the Plants Area (0.1 acre)
  - “Seldom” within the areas surrounding the “Occasional” areas (1.2 acres)
  - “Unlikely” within the remaining 155.7 acres of RSA-183



# RSA-183 LAYOUT AND CWM RATINGS



# SITE DESCRIPTION/HISTORY: RSA-183 (CONT)

- › North-south trending surface water drainage ditch flows through the RSA-183 Plants Area and then along the east portion of the Sinkhole Area.
- › Far southern portion of the Plants Area and all of the Sinkhole Area lie within the 100-year floodplain. Small wetland area lies within RSA-183 property boundaries south of the Plants Area, between Digney Road to the north, Toftoy Thruway to the east, and Martin Road to the south.
- › Although most of the production and associated buildings have been demolished, below-ground process chemical lines, waste transfer lines, and associated sumps, collection pits, and spill collection trenches remain.



# DOCUMENT STATUS: RSA-122 AND RSA-183

- › **Final RI Reports:** Received ADEM and EPA concurrence
  - RSA-122 - ADEM 9/26/2007, EPA 1/23/2008
  - RSA-183 - ADEM 1/24/2008, EPA 8/8/2007
- › **Final FS Reports:** Received ADEM and EPA Concurrence
  - RSA-122 - ADEM 9/25/2009, EPA September 2009
  - RSA-183 - ADEM 6/26/2009, EPA September 2009
- › **Final RODs:** Received ADEM and EPA Concurrence
  - RSA-122 - ADEM 9/25/2009, EPA September 2009
  - RSA-183 - ADEM 9/25/2009, EPA September 2009
- › **Remedial Action Work Plans/CMIPs:**
  - RSA-122 Rev 4 (Slip Pages) Submitted January 2015
  - RSA-183 Rev 7 Submitted November 25, 2014
  - ADEM concurrence not received for either document.
- › **WTDSs:** Received Army Concurrence
  - Work-to-Date Summaries in March 2019 and May 2019 for RSA-122 and RSA-183, respectively.



# DOCUMENT STATUS: RSA-122 AND RSA-183 (CONT)

- › **Corrective Measures Study (CMS) Reports:** Received Army Concurrence on the Final RSA-122 CMS on 29-Dec-20 and on the Final RSA-183 CMS on 3-Mar-21.
- › **CMIP:** Prepare combined document for RSA-122 and RSA-183 and obtain DA and Regulatory Concurrences. Note that a site-specific probability assessment (SSPA) for each site may be used to reduce the current CWM probability ratings.
- › **Chemical Safety Submission (CSS) and Maximum Credible Event Analysis (MCEA):** The CSS and the MCEA have received COR concurrence on 25-Feb-21 and 8-Jul-21, respectively.
- › **SB/DD:** Prepare combined document for RSA-122 and RSA-183 and obtain DA Concurrence.
- › **Optional Work:**
- › **CMI-C:** Conduct corrective measures for RSA-122 and RSA-183 in accordance with approved CMIP.
- › **CMR:** Prepare CMR and obtain DA and Regulatory Concurrences.





# RSA-122 AND RSA-183 CORRECTIVE MEASURES COMPLETED

## › RSA-122

- Conducted from October 2010 through July 2011 and included the following:
  - Soil excavation: The total volume of soil removed from the site was approximately 8,300 tons.
  - Post-excavation confirmation sampling
  - Soil transportation and disposal
  - Backfilling and site restoration
  - Short-term sediment (1 round in 2012) and groundwater sampling. Groundwater results have been included in the RFI for groundwater unit RSA-147/148/149.



# RSA-122 AND RSA-183 CORRECTIVE MEASURES COMPLETED (CONT)

## › RSA-183

- Conducted from July 2010 through November 2010 and included the following:
  - Soil excavation: The total volume of soil removed from the site was approximately 10,334 tons.
  - Post-excavation confirmation sampling
  - Soil transportation and disposal
  - Backfilling and site restoration
  - Short-term sediment (2 rounds in 2011 and 2012) and groundwater sampling. Groundwater results have been included in the RFI for groundwater unit RSA-147/148/149.



# RSA-122 AND RSA-183

## RI CONCLUSIONS WITH UPDATED RISK RESULTS

- › RSA-122 and RSA-183 RI conclusions (as updated following 2010-2011 excavations and revised human health risk assessment [HHRA] presented in the CMS reports):
  - **RSA-122:** Arsenic in soil is identified as a COC warranting action for one or more industrial receptors and the hypothetical resident in all subareas of RSA-122. Benzo(a)pyrene is also a COC warranting action for the hypothetical resident in RSA-122NW.
  - **RSA-183:** Arsenic in soil is identified as a COC warranting action for one or more industrial receptors in the Plants area and for the hypothetical resident in the Plants Area and the Sinkhole Area.
  - **RSA-122 and RSA-183:**
    - Risks in the creek area of RSA-122 and the sinkhole area of RSA-183 were not re-evaluated because no cleanup occurred in these areas. Current risks are considered to be consistent with prior documents including the RODs for these sites.
    - Wastes remaining in or beneath underground sumps and pits, or other collection features appear to pose potential sourcing threats to groundwater based on observed groundwater results.
    - COCs in groundwater under RSA-122 and RSA-183 pose a human health threat, but these chemicals will be addressed as part RSA-147 and RSA-148 groundwater unit corrective measures, respectively.
    - The potential risk from vapor intrusion at RSA-183 will be re-evaluated.



# CMS REPORT SUMMARY – RSA-122

- › Based on information and recommendations provided in the RI report and WTDS, a CMS report and a revised HHRA were prepared to address arsenic-contaminated soil posing unacceptable risks to industrial receptors and potential risks associated with chemical agent (CA) to current and future industrial receptors.
- › Groundwater poses unacceptable risks and will be addressed by the RSA-147 groundwater unit corrective measures.
- › To be protective of the industrial worker, soil excavation and removal of select below-ground relict structures (e.g., chemical lines, waste transfer lines, and associated sumps, collection pits, and spill prevention trenches) will be performed.
- › The corrective measure objectives (CMOs) stated in the RSA-122 CMS Report included:
  - Prevent future residential development (all site areas including the creek area).
  - Protect current or future groundskeeper from exposure to soil contaminated with unacceptably high concentrations of arsenic (RSA-122 NW and RSA-122S only).
  - Protect a current or future construction worker from acute exposure to soil contaminated with arsenic (RSA-122NW and RSA-122S only).
  - Reduce or eliminate the potential for contaminant sourcing to groundwater.
  - Reduce or eliminate the probability of exposure to CA in relict structures at the site.



# CMS REPORT SUMMARY – RSA-183

- › Based on information and recommendations provided in the RI report and WTDS, a CMS report and a revised HHRA were prepared to address arsenic-contaminated soil and the potential risks associated with CA to current and future human receptors.
- › Groundwater poses unacceptable risks and will be addressed by the RSA-148 groundwater unit corrective measures.
- › To be protective of the industrial worker, soil excavation and removal of select below-ground relict structures (e.g., chemical lines, waste transfer lines, and associated sumps, collection pits, and spill prevention trenches) will be performed.
- › The CMOs stated in the RSA-183 CMS Report included:
  - Prevent future residential development for all areas including the sinkhole area.
  - Protect current or future groundskeeper from exposure to soil contaminated with unacceptably high concentrations of arsenic.
  - Protect current or future construction worker from acute exposure to soil contaminated with arsenic at all locations.
  - Reduce or eliminate the potential for contaminant sourcing to groundwater.
  - Reduce or eliminate the probability of exposure to CA in relict structures at the site.



# CMS REPORT SUMMARY – RSA-122 AND RSA-183

- › Selected alternatives evaluated in the RSA-122 and RSA-183 CMS reports included:
  - Alternative 1: No Action
  - Alternative 2: Excavation (CGs of 15, 100, and 1500 mg/kg), Off-Site Disposal, and LUCs
  - Alternative 3: Excavation (CGs of 15, 46, and 1500 mg/kg), Off-Site Disposal, and LUCs
  - Alternative 4: Excavation (CG of 1500 mg/kg), Off-Site Disposal, and LUCs
- › The CMS reports also addressed the removal of relict structures and disposal off-site.
- › Following a detailed analysis of alternatives, Alternative 3 was recommended for both RSA-122 and RSA-183 because this alternative best addresses risks to human health and the environment from arsenic-contaminated soils. The DA has concurred with the recommendation of Alternative 3.



# RSA-122 AND RSA-183

## SUMMARY OF ALTERNATIVE 3 CLEANUP GOALS

Soil Depth	CG For Arsenic (mg/kg)	Rationale
<b>Surface soil (0 to 2 feet bgs)</b>	15	<ul style="list-style-type: none"> <li>CG is protective of current and future human and ecological receptors</li> <li>LUC not needed.</li> </ul>
<b>Very Shallow subsurface soil (2 to 6 feet bgs)</b>	46	<ul style="list-style-type: none"> <li>CG is protective of groundskeeper</li> <li>LUC needed to be protective of hypothetical resident</li> </ul>
<b>Shallow subsurface soil to Deep subsurface soil (greater than 6 feet bgs)</b>	1,500	<ul style="list-style-type: none"> <li>CG is protective in the event of acute exposure by construction workers</li> <li>LUC needed for groundkeeper and hypothetical resident</li> </ul>



# CMS REPORT SUMMARY - RSA-122 AND RSA-183 (CONT)

- › Alternative 3 for RSA-122 and RSA-183 consists of the following:
  - Site preparation, including site clearing, civil surveying, and placement of storm water controls.
  - Excavation and off-site disposal of contaminated surface soil (0 to 2 feet deep) where concentrations exceed the CG of 15 mg/kg
    - RSA-122 soil volume of 311 BCY (hazardous) / 139 BCY (nonhazardous)
    - RSA-183 soil volume of 3,104 BCY (nonhazardous)
  - Excavation and off-site disposal of arsenic-contaminated shallow subsurface soil (2 to 6 feet deep) concentrations exceed the CG of 46 mg/kg.
    - RSA-122 soil volume of 1,204 BCY (hazardous) / 970 BCY (nonhazardous)
    - RSA-183 soil volume of 1,696 BCY (nonhazardous)
  - Excavation and off-site disposal of arsenic-contaminated deeper subsurface soil (greater than 6 feet deep) where concentrations exceed the CG of 1,500 mg/kg.
    - RSA-122 soil volume of 578 BCY (hazardous) / 711 BCY (nonhazardous)
    - RSA-183 soil volume of 311 BCY (nonhazardous)





# CMS REPORT SUMMARY - RSA-122 AND RSA-183 (CONT)

- Collection and analysis of soil confirmation and waste characterization samples.
- Army intends to stabilize the hazardous waste that is determined to be characteristically hazardous.
  - ADEM approved stabilization in the 2010-2011 corrective measures and has approved stabilization at other RSA sites.
  - Stabilizing waste so that lower amounts of hazardous waste are generated is consistent with both Army and ADEM transportation of contaminated soil for final disposal at an approved off-site facility.
- Backfill and grading of the excavated areas.
- Installation of warning signs.
- Site restoration, including revegetation of all disturbed areas.
- Implementation of LUCs to prevent or reduce future human exposure to arsenic concentrations that remain above residential CGs at the site. Additionally, evaluate the need for a LUC for vapor intrusion at RSA-183 as part of the CMIP.
- Annual LUC monitoring and reporting.



# CMIP EXECUTION STRATEGY: RSA-122 AND RSA-183

- › Prepare CMIP to implement the CMS recommended **Alternative 3** at each site and obtain DA and Regulatory approvals.
- › The CMIP will present the following in accordance with ADEM's CMIP Checklist and AEIRG and Attachment G of the PWS:
  - Summaries of site history/description, environmental setting, investigation history, nature and extent of contamination, fate and transport, site risks, and final CSM.
  - Basis for action, including the CMOs, CGs, and selected corrective measures.
  - Planned CMI activities.
  - Contingencies will be discussed for unforeseen but possible events.
  - Files specific to former remedial actions conducted in 2010-2011 will be included in an appendix.
  - Site-specific probability assessments (SSPA) will be prepared for each site using extensive data collected for CA in soil. The SSPAs will be used to adjust the boundaries of the CA-rated areas, if appropriate.
- › Proposed DQOs for RSA-122 and RSA-183 (refer to separate DQO file)



# ARSENIC SOILS REMOVAL

## › Excavation

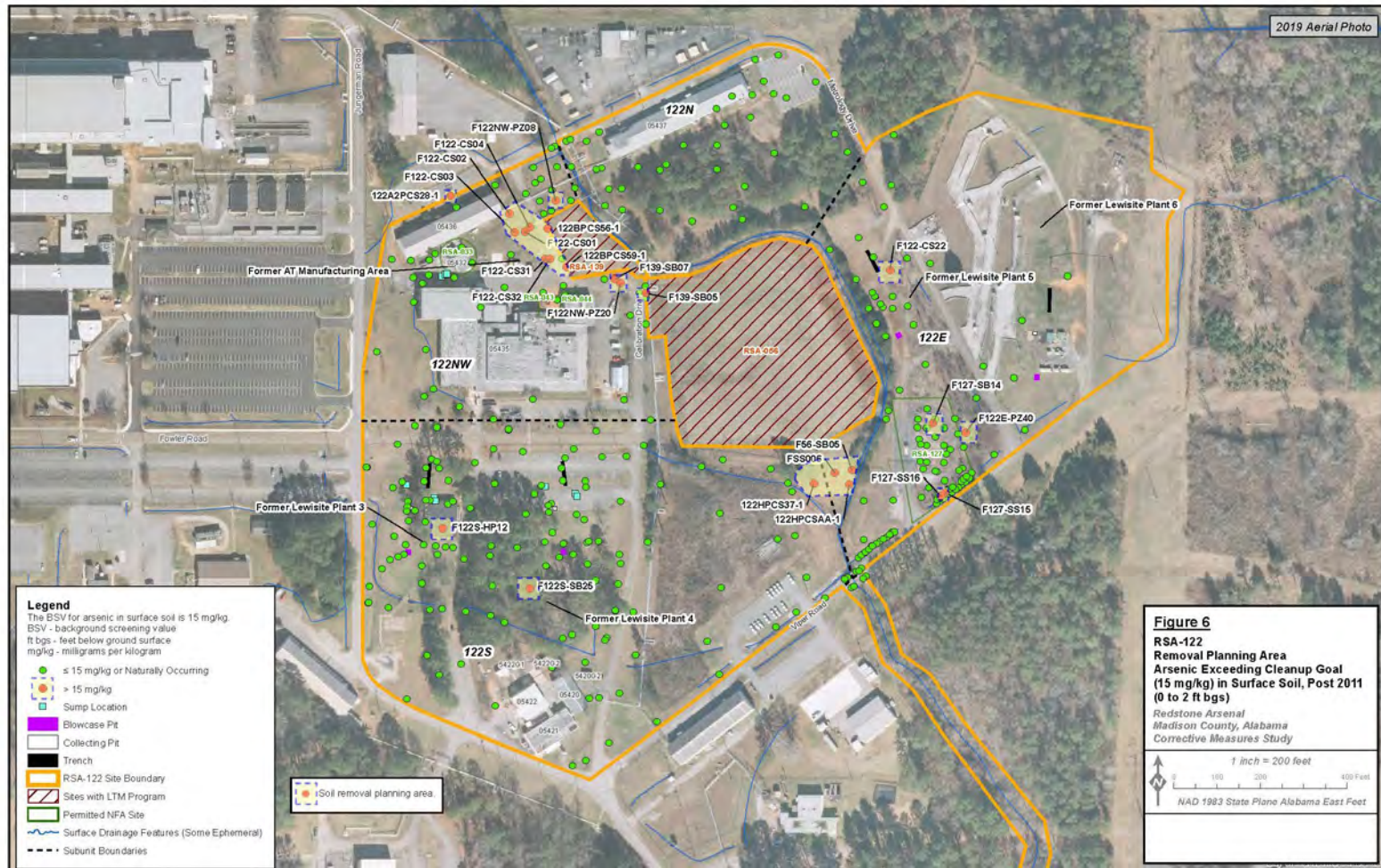
- Surface, shallow subsurface, and deeper subsurface soils with arsenic concentrations exceeding their specific depth CGs will be excavated and disposed.
- Excavated soils will be stockpiled until sample results are obtained for each stockpile.

## › Confirmation Sampling

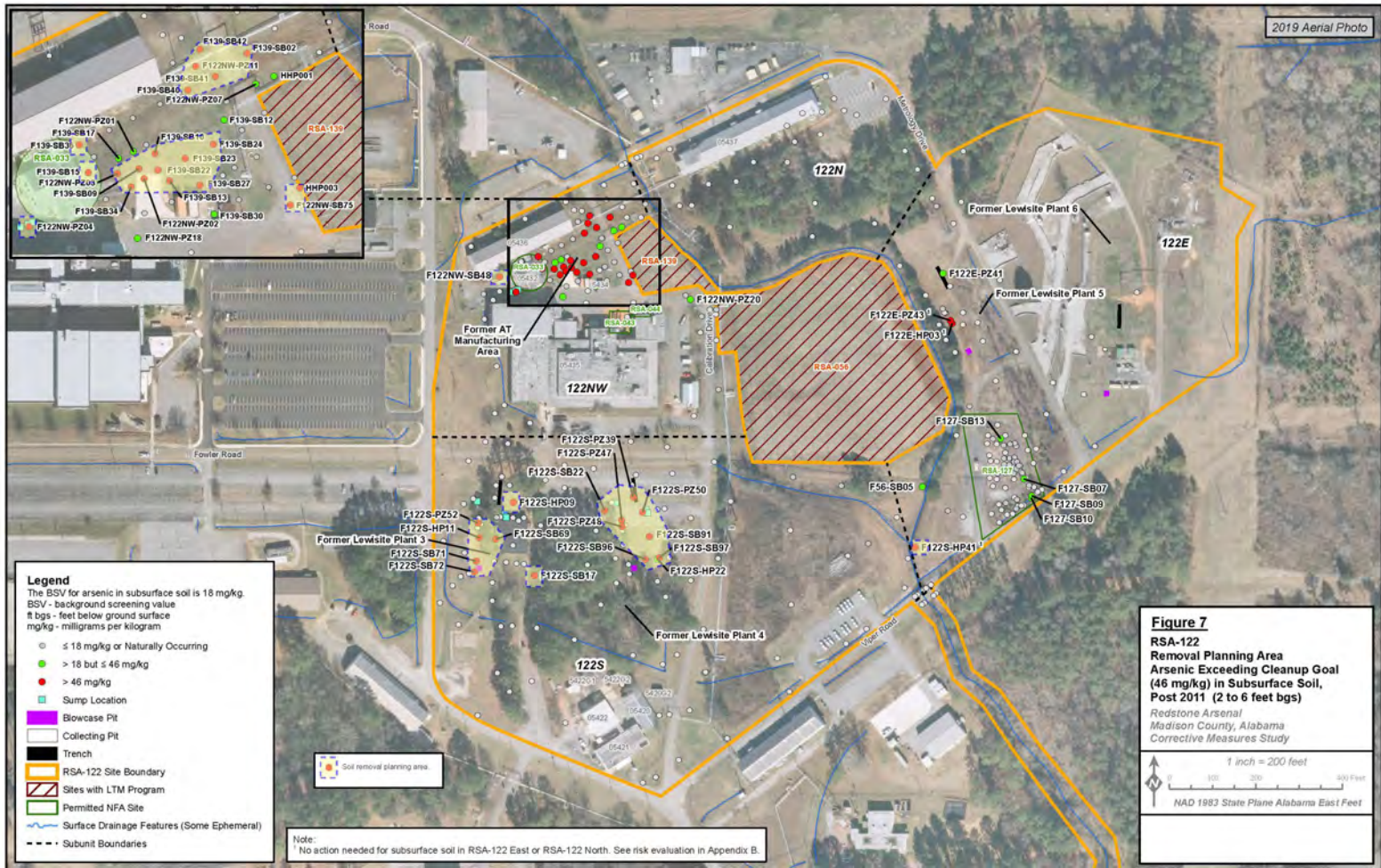
- Confirmation samples to be collected and analyzed for arsenic (and associated metals for geochemical analysis) to confirm CGs have been met:
  - Sidewall samples: 1 sample per 50 linear feet of sidewall, 1 per wall minimum
  - Floor samples: 1 sample per 2,500 square feet for areas where excavation does not extend to the water table
- Confirmation samples collected within “occasional” CA-rated areas will also be screened for chemical analysis (head-space and laboratory analysis).



# RSA-122 REMOVAL PLANNING AREA: 0-2 FT BGS



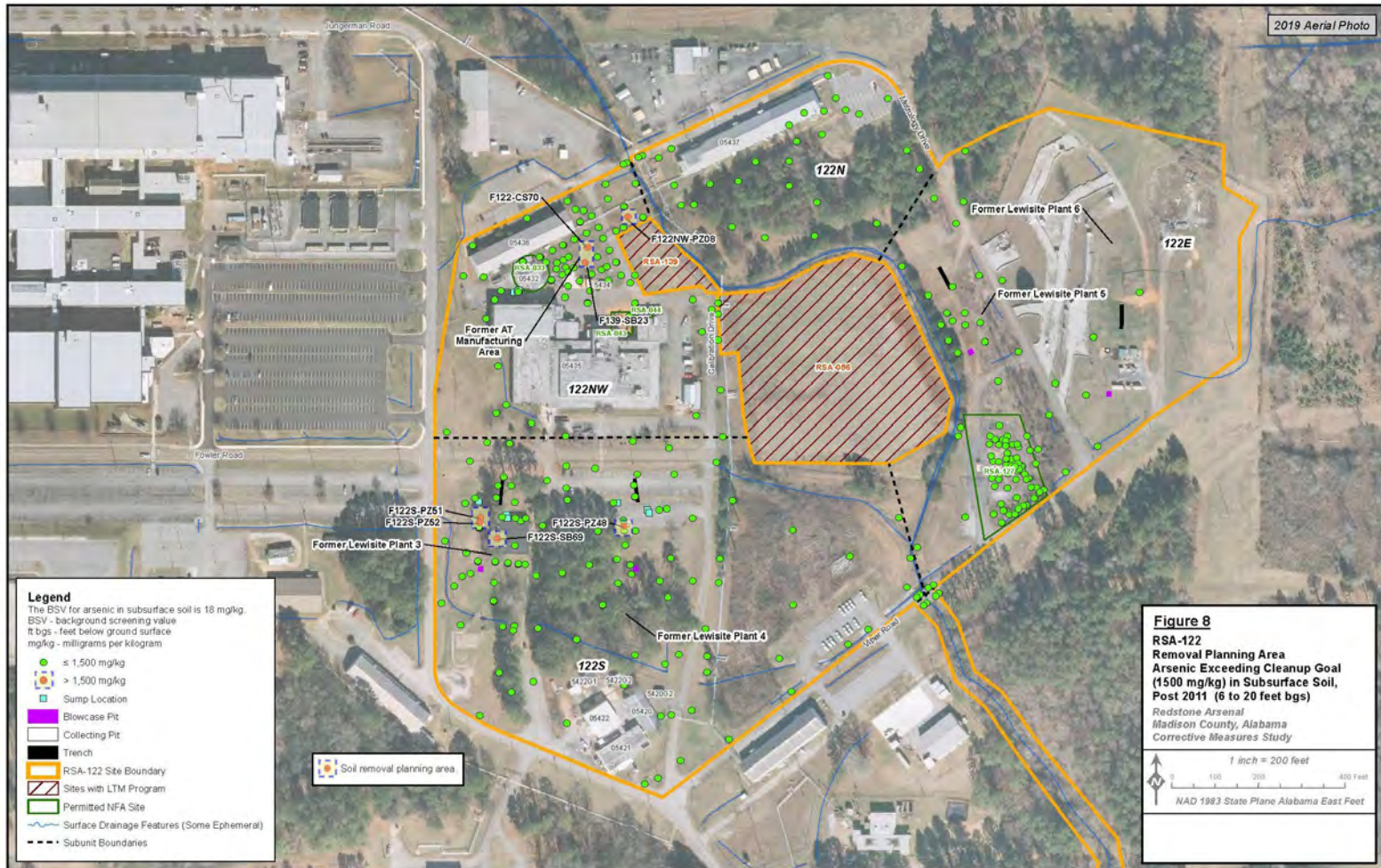
# RSA-122 REMOVAL PLANNING AREA: 2-6 FT BGS



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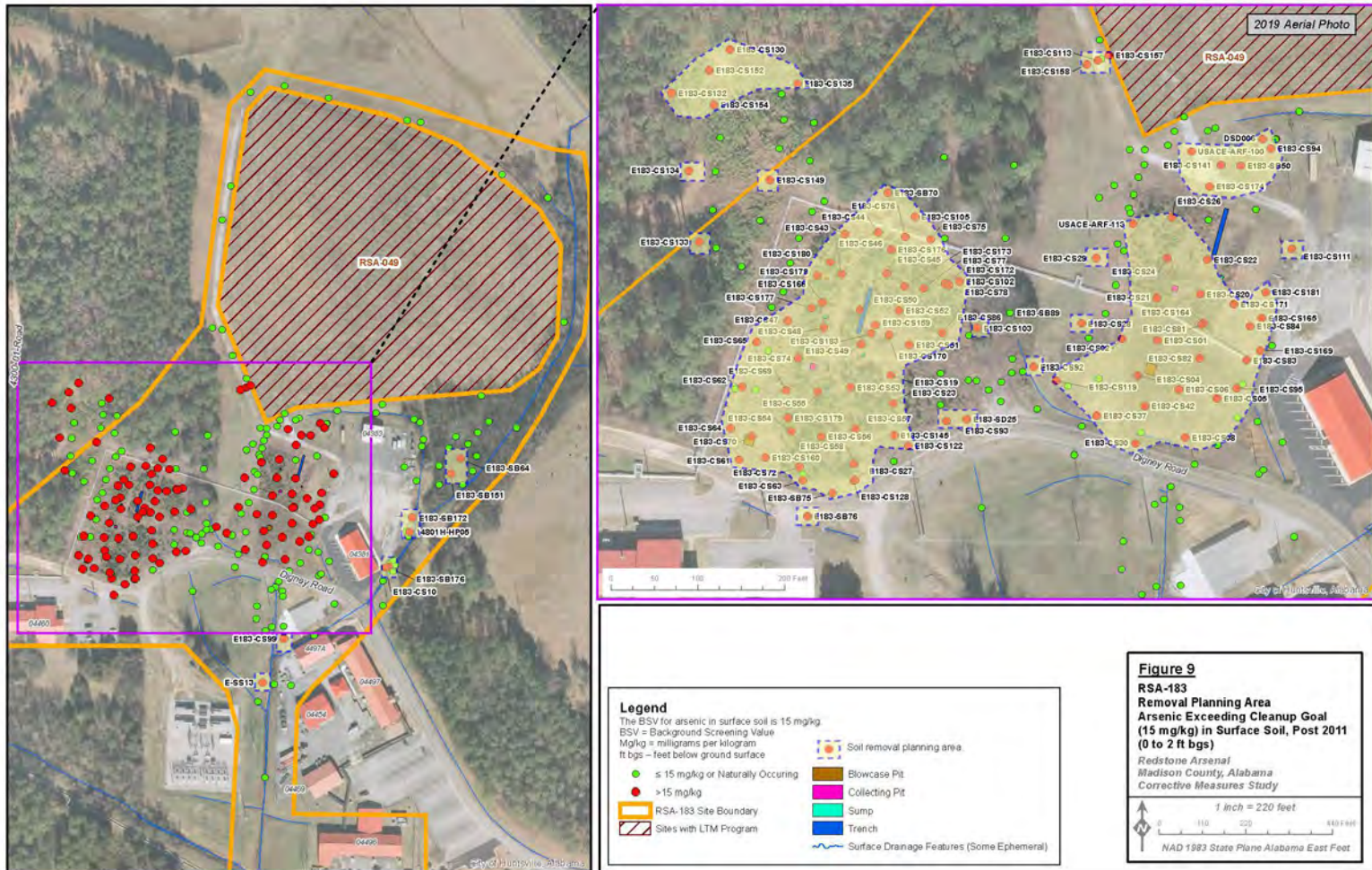
# RSA-122 REMOVAL PLANNING AREA: 6-20 FT BG



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# RSA-183 REMOVAL PLANNING AREA: 0-2 FT BGS



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# RSA-183 REMOVAL PLANNING AREA: 2-6 FT BGS



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# RSA-183 REMOVAL PLANNING AREA: 6-20 FT BGS



# ARSENIC SOILS REMOVAL (CONT)

- › **Soil Stockpiles:** Will be sampled for arsenic at a frequency of 1 sample per 200 cubic yards. The CMIP will present the approach for managing soils from areas with elevated CA ratings that remain after the SSPA.
  
- › **Arsenic Waste Disposal**
  - Nonhazardous soil will be disposed at Subtitle D landfill.
  - Soils that are characteristically hazardous will be stabilized onsite and retested before disposal. Any soils that remain hazardous will be disposed at an ADEM-approved permitted Subtitle C Hazardous Waste facility. Otherwise, disposal will be as nonhazardous soil at a Subtitle D landfill.



# REMOVAL OF RELICT STRUCTURES – RSA-122 AND RSA-183

- › Excavation and removal of network of below-ground process chemical lines; waste transfer lines; and associated sumps, collection pits, and spill collection trenches.
- › Requires development and approval of CSS, field screening for CA and confirmation analysis by CA-capable laboratory, and completion of approved table-top exercises and Huntsville pre-op.
- › Field operational protocols to be based on specific CWM probability area (as updated by the SSPAs).
- › **RSA-122:** CMS Table 5-4 indicates excavation of 106 BCY hazardous and 1,941 BCY nonhazardous soil, respectively. Management of hazardous waste from relict structures will also include stabilization.
- › **RSA-183:** CMS Table 5-4 indicates excavation of 1,200 BCY nonhazardous soil.

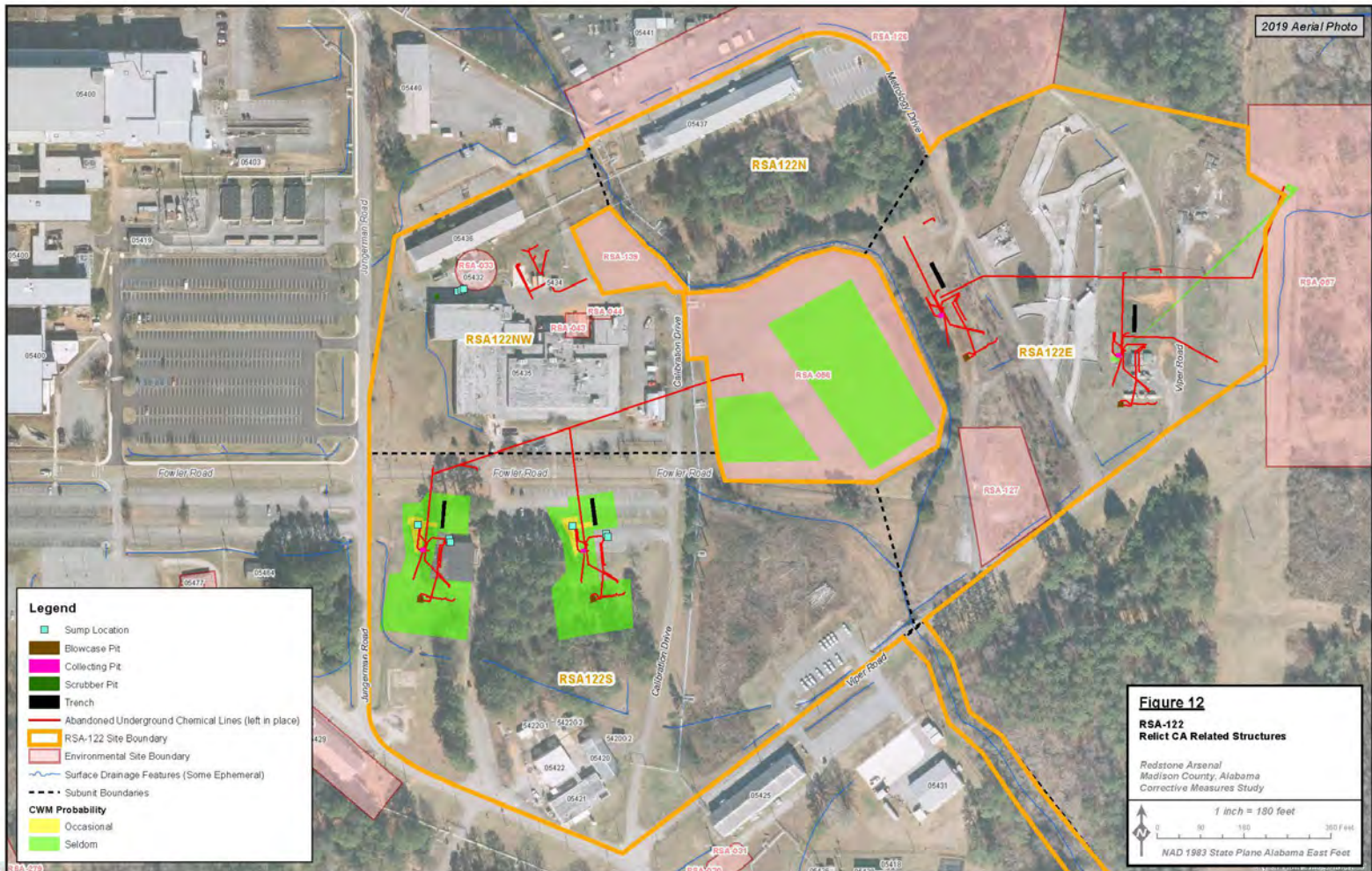


# REMOVAL OF RELICT STRUCTURES (CONT)

- › Relict structures are spread across RSA-122 and RSA-183 and have a combination of “Unlikely,” “Seldom,” and “Occasional” CWM probabilities.
- › Relict structures will be excavated and any recovered non-soil materials (e.g. piping, cultural debris, etc.) will be segregated at the excavation.
- › Soils from relict structure removal will be stockpiled adjacent to source excavation.
- › The piping excavation areas will be sampled at the frequency of one sample per 50 linear feet of pipeline for headspace analysis and one sample per 100 linear feet of pipeline for arsenic analysis and CA (when required). Should a “low gravity” section be encountered where CA collection could potentially have occurred, samples for headspace analysis will be collected in that location.
  - If CA is not present, then excavated soils will be used to backfill excavations if the concentrations of arsenic are below the CG for the corresponding soil depth.
  - If CA is present, then excavated soils and/or materials associated with structures will be handled as CACM and disposed of accordingly.



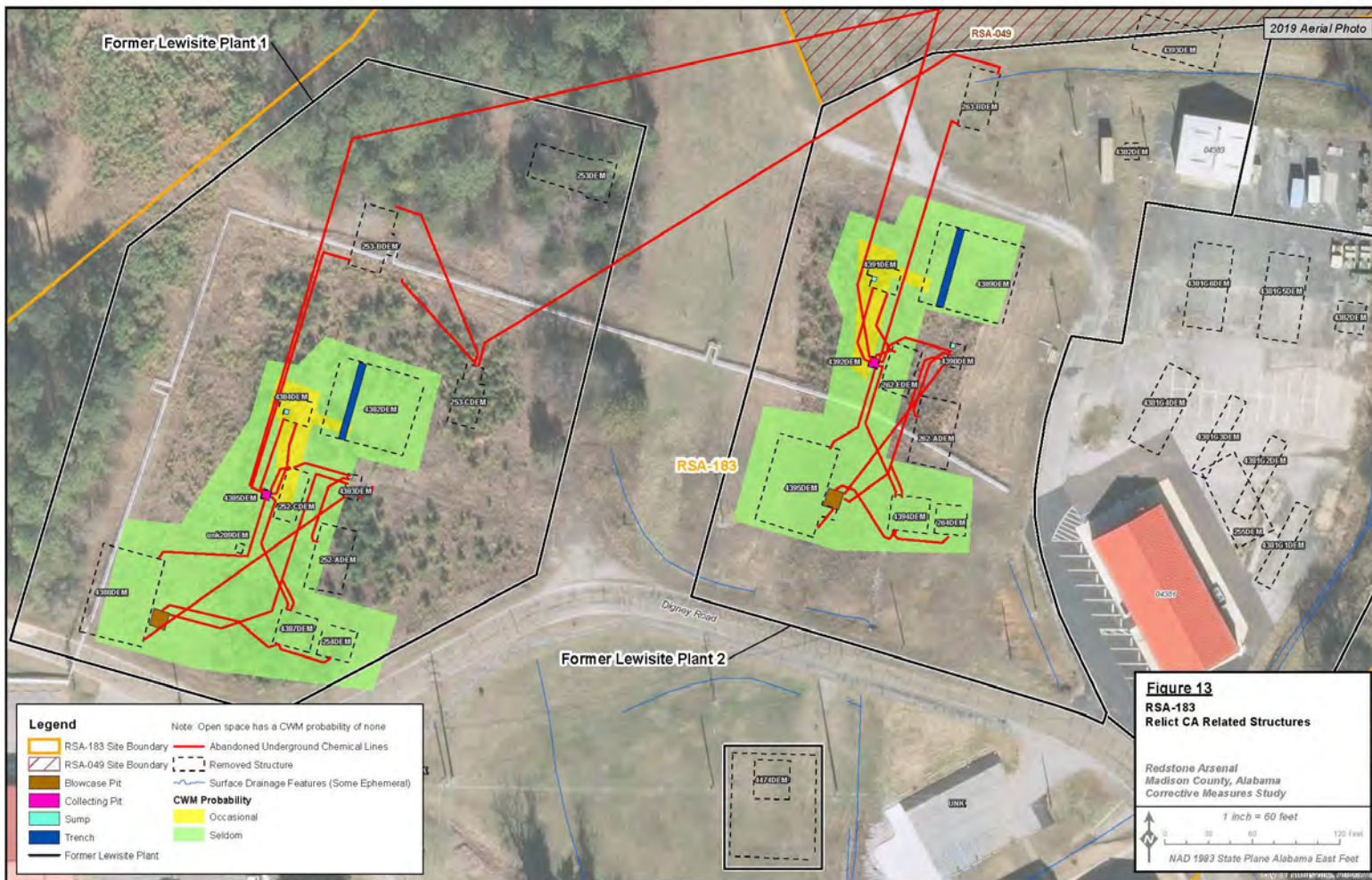
# RELICT CA RELATED STRUCTURES: RSA-122



Document Path: F:\Projects\Redstone\_ERMA\_Small\_Business\GIS\_Documents\Project\_Maps\RSA\_122\CMIP\_July2021\RSA\_122\_Relict\_CA\_Related\_Structures.mxd



# RELICT CA RELATED STRUCTURES: RSA-183



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# LAND USE CONTROLS

- › LUCs will be required at each site, and will consist of:
  - Establishment of surveyed LUC boundaries and posting of warning signs
  - On-call or on-site UXO construction support for any remaining areas with CWM probabilities other than “Unlikely.” This support is not required for UXO concerns based on UXO probabilities of “None” at both sites, but based on UXO personnel training to identify and address potential encounters of chemical agent.
  - Incorporation of LUCs into RSA Master Plan
  - Recording of Notice of Environmental Use Restriction (NEUR) in land records IAW Alabama Administrative Code 335-5-1-.02(3) once the Army and ADEM agree on the NEUR template
  - Annual inspections and monitoring reports.
  - Note: No LUCs will be needed for the 0-2 foot depth since the CG is protective of all receptors. LUCs from 2-6 foot depth are needed to prevent residential site use. LUCs from greater than 6 feet are needed to protect the groundskeeper and resident receptors.

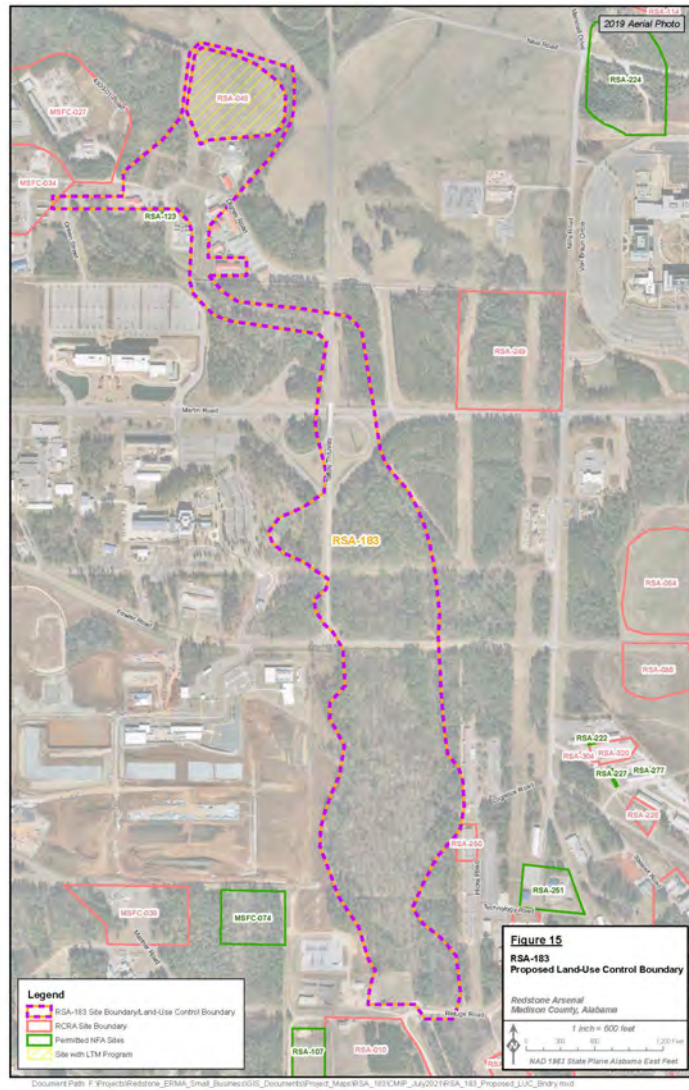


# PROPOSED LUC BOUNDARY – RSA-122





# PROPOSED LUC BOUNDARY – RSA-183



# SCHEDULE IMPACTS TO BE CONSIDERED IN THE CMIP

- › The CMIP will address the following potential schedule impacts to implement the corrective measures:
  - Most field operations to be conducted during daylight hours. However, intrusive operations in some areas may require nighttime work due to locations of adjacent occupied structures/roads.
  - Additional schedule impacts may result from discovery of subsurface contaminant sources or presence of CA; need to dewater any excavations; excavations around utilities, steam lines, and remnant foundations; and work arounds if maintenance/repairs needed in work areas.



# SB/DD: RSA-122 AND RSA-183

- › The SB/DD for RSA-122 and RSA-183 will present the Army's preferred corrective measure alternative in accordance with public participation requirements under RCRA and CERCLA and the Army's Defense Environmental Restoration Program guidance.
- › The SB/DD will consist of a declaration, decision summary, and responsiveness summary as outlined in EPA protocol for proposed plans, RODs, and other decision documents and in format agreed upon by the Army.
- › SB/DD path forward:
  - Advance review SB/DD to be submitted to Army for review in late October 2021 during preparation of the CMIP.
  - Upon Army entity approval, an advertisement will be placed in local newspapers to solicit public review comments on the preferred remedy.
  - Following the conclusion of the 30-day public comment period, the responsiveness summary section of the SB/DD will be revised to incorporate changes based on public comments.
  - AEC will staff the SB/DD through G9 signature delegation.



# PATH FORWARD: RSA-122 AND RSA-183

- › CMIP Scoping Meeting for RSA-122 and RSA-183: 28-Sep-21
- › Minutes and revised scoping slides: To Army within 14 days of meeting and to all participants following Army review and concurrence
- › SB/DD for RSA-122 and RSA-183:
  - To Army Advance Review: October 2021
- › Rev. 0 CMIP for RSA-122 and RSA-183:
  - To Army Advance Review: November 2021
  - To ADEM: April 2022
- › Commence Field Work at RSA-122 and RSA-183 upon ADEM concurrence of CMIP and permit modification:
  - Fall 2022



# ADDITIONAL QUESTIONS/COMMENTS

**Don Burton**

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865 207 1394



**ATTACHMENT B**  
**Data Quality Objectives**

**Proposed DQOs for RSA-122 and RSA-183 CMIP:**

<b>Task Related DQO Planning</b>	
<b>Step 1. State the Problem</b>	<ul style="list-style-type: none"> <li>• The Remedial Investigation and revised human health risk assessment concluded that exposure to elevated levels of arsenic in soil at RSA-122 and RSA-183 was found to pose unacceptable risks to industrial and residential receptors. In addition, both sites have small areas where chemical warfare materiel (CWM) probabilities are designated as “Occasional” and “Seldom.” These problems are a result of former Department of Defense (DoD) activities. It should be noted that arsenic is the only COC identified at RSA-122 and RSA-183 (in soil only) that requires cleanup to CGs.</li> <li>• The corrective measures will also remove relict structures at both sites where the chemical agent lewisite may be present in the rated CWM areas.</li> <li>• Since cleanup will be conducted to be protective of the industrial worker only, the sites will not meet residential cleanup goals for unrestricted use</li> <li>• COCs in groundwater under RSA-122 and RSA-183 require corrective measures; groundwater cleanup will be the responsibility of RSA-147 and RSA-148 groundwater unit, respectively.</li> </ul>
<b>Step 2. Identify the Goal of the Study</b>	<ul style="list-style-type: none"> <li>• Elevated concentrations of arsenic present in soil above the CGs have been identified as requiring corrective measures to address the unacceptable risks to current and future receptors. Cleanup to CGs protective of the industrial worker will be conducted and will also reduce further impact to groundwater from this constituent in soil at the sites.</li> <li>• Removal and disposal of relict structures at the sites contaminated with lewisite will reduce potential exposure to chemical agent, reduce leaching of arsenic to groundwater, and potentially allow a reduction in the UXO construction support for chemical agent.</li> </ul>
<b>Step 3. Identify Informational Inputs</b>	<ul style="list-style-type: none"> <li>• Table VI.6 of Redstone Arsenal’s Alabama Hazardous Wastes Management and Minimization Act (AHWMMA) Permit indicates that a CMI work plan is required for RSA-122 and RSA-183 soil and groundwater (groundwater is the responsibility of RSA-147 [RSA-122] and RSA-148 [RSA-183]).</li> <li>• Review of historical documents indicating that sites were used to produce lewisite and associated chemicals during wartime.</li> <li>• Results of the existing remedial investigations (Shaw, 2007), initial corrective measures/remedial action confirmation sampling (CB&amp;I, 2013; 2015), and the Work-To-Date Summaries (APTIM, 2019).</li> <li>• Results of the updated risk assessments performed using results from soil samples currently in place and confirmation samples collected during previous cleanup efforts.</li> <li>• With ADEM as the lead regulator, this changed the acceptable risk levels from the EPA risk range of 1E-4 to 1E-6 to ADEM risk threshold of 1E-5.</li> <li>• The conceptual site model (CSM) for RSA-122 and RSA-183.</li> <li>• Existing quality control (QC) and quality assurance (QA) records of data quality checks.</li> </ul>

<b>Task Related DQO Planning</b>	
<b>Step 4. Define the Boundaries of the Study</b>	<ul style="list-style-type: none"> <li>• Study boundaries for the COC in soil (arsenic) were defined in the RI and subsequently refined during the initial corrective measures confirmation sampling, which was conducted in accordance with the Department's Alabama Environmental Investigation and Remediation Guidance (AEIRG).</li> <li>• Based on site history and existing data collected, the current site boundary includes historical site features.</li> <li>• The historical site features have been identified as release points for potential contaminants (arsenic and chemical agent).</li> <li>• Potential locations where releases of arsenic and chemical agent are present have been defined.</li> <li>• Corrective measures will be conducted for elevated arsenic concentrations in soil until the confirmatory sample results are less than or equal to the CGs. The CGs have been established in the corrective measures study and summarized in the CMI work plan.</li> <li>• Because of the high quality of the habitat in the Creek area of RSA-122 and the Sinkhole area of RSA-183, residual risks to human health, which are limited to risks to residential receptors, will be managed with LUCs only.</li> </ul>
<b>Step 5. Develop the Analytic Decision Approach</b>	<ul style="list-style-type: none"> <li>• The corrective measures will include confirmatory soil sampling in accordance with the Department's AEIRG for analysis of arsenic to determine the effectiveness of the selected alternative.</li> <li>• If review of the confirmatory soil sampling data indicates the CGs have not been achieved, additional soil removal will be implemented to meet the CGs.</li> <li>• If review of the confirmatory soil sampling data indicates the CGs have been achieved, no further soil removal will be conducted, as the stated corrective measures objectives will be met.</li> <li>• Soils determined to be hazardous will undergo stabilization procedures on site prior to retesting and disposal based on the results of the TCLP testing for the stabilized waste.</li> <li>• The corrective measures will also include land-use controls (LUC) based on cleanup protective of the industrial worker and not protective of a hypothetical resident for unrestricted use. LUCs will also be established for areas of the site retaining elevated CWM probabilities.</li> </ul>
<b>Step 6. Specify Performance or Acceptance Criteria</b>	<ul style="list-style-type: none"> <li>• Selected definable features of work and tasks will achieve the performance criteria specified in the CMI work plan and supporting documents.</li> <li>• Soil samples collected will be analyzed by an Environmental Laboratory Accreditation Program (ELAP) certified subcontracted laboratory for the COCs (arsenic and associated metals required for site to background evaluation).</li> <li>• Chemical agent will be screened on-site for soil removed in CWM-rated areas and confirmed at CCD-CBC fixed-based laboratory.</li> <li>• Analytical results generated by off-site laboratories will be evaluated using procedures outlined in the Quality Assurance Project Plan portion of the CMI work plan to ensure they are suitable for final decision making.</li> <li>• Soil sample results will be reviewed by the APTIM Project Chemist or as delegated and the U.S. Army Engineering and Support Center, Huntsville (CEHNC) Chemist.</li> <li>• Analytical results from waste characterization samples including post-stabilization samples will be submitted to the off-site disposal facility to meet the applicable waste profile package requirements for disposal.</li> <li>• Soils from P012 listed waste areas will be disposed of as hazardous waste.</li> </ul>



**Task Related DQO Planning**

**Step 7.  
Develop/Optimize the  
Plan for Obtaining Data**

- Only qualified personnel will perform corrective measures activities.
- Requirements of the CMI work plan will be subject to QC and QA reviews.

**APPENDIX E**

**SITE-SPECIFIC HEALTH AND SAFETY PLAN**

# **Appendix E**

## **Site-Specific Safety and Health Plan**

### **Corrective Measures Implementation**

**RSA-122, Dismantled Lewisite Manufacturing Plant Sites,  
Operable Unit 06**

**and**

**RSA-183, Former Lewisite Manufacturing Plants 1 and 2 Sites  
Operable Unit 05**

**U.S. Army Garrison-Redstone**

**Madison County, Alabama**

**EPA ID No. AL7 210 020 742**

**Prepared for:**

**U.S. Army Engineering & Support Center, Huntsville  
5021 Bradford Drive East  
Huntsville, Alabama 35805**

**Prepared by:**

**Aptim Federal Services, LLC  
11400 Parkside Drive, Suite 400  
Knoxville, TN 37934**

**Contract No. W912DY-17-D-0003  
Delivery Order No. W912DY19F1116  
APTIM Project No. 501388**

**May 2022**

**Site Safety and Health Plan  
Corrective Measures Implementation, RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

**Contract No. W912DY-17-D-0003**

**Plan Preparer:**

\_\_\_\_\_  
Doug Russell, Program HSE Manager  
Aptim Federal Services, LLC

\_\_\_\_\_  
Date

**Plan Approval:**

\_\_\_\_\_  
Don Burton, Project Manager  
Aptim Federal Services, LLC

\_\_\_\_\_  
Date

## ACKNOWLEDGEMENTS

The approved version of this site-specific safety and health plan (SSHP) for corrective measures implementation of soil at RSA-122/RSA-183 has been provided to the Quality Control Site Manager (QCSM). I acknowledge my responsibility to provide the QCSM with the equipment, materials, and qualified personnel to implement fully all safety requirements in this SSHP. I will formally review this plan with the health and safety staff at least annually until project completion.

---

Don Burton, APTIM Project Manager

---

Date

I acknowledge receipt of this SSHP from the Project Manager and that it is my responsibility to explain its contents to all site personnel and cause these requirements to be fully implemented. Any change in conditions, scope of work, or other change that might affect worker safety requires me to notify the Project Manager and the Health and Safety Field Manager.

---

Brian Rhodes, APTIM QCSM

---

Date



## EMERGENCY CONTACT INFORMATION

In case of emergency or unplanned situation, contact the appropriate responder from the list below.

- In emergency situations, contact the site Point of Contact (POC) who will then contact the appropriate response teams.
- If a serious, life threatening emergency arises, contact emergency personnel before contacting the site POC.

### EMERGENCY TELEPHONE NUMBERS AND PROJECT CONTACTS

Emergency Medical Care		
<b>Hospital:</b> Huntsville Hospital (Emergency/Trauma Center)	911 (256) 265-1000	
<b>Core Health Networks</b>	(877) 347-7429	
Occupational Health Center, Crestwood Family Practice	(256) 721-9916	
Crestwood Workers Care Madison	(256) 830-8930	
Chemical Agent Emergencies (state that you are at Redstone)	911	
<b>National Poison Control Center</b>	(800) 222-1222	
<b>National Response Center</b> Environmental Emergencies	(800) 424-8802	
<b>Federal Occupational Safety and Health Administration (OSHA) Emergency Hotline</b>	(800) 321-6742	
Local Emergency Numbers		
<b>Fire Department</b> Emergency ask for Redstone Arsenal Fire Department	Emergency Nonemergency	911 (256) 876-2117
<b>Law Enforcement</b> Military Police	Emergency Nonemergency	911 (256) 876-2222
<b>Installation Emergency Operations Center</b>	Nonemergency	(256) 313-1043
<b>Installation Operations Center</b>	Nonemergency	(256) 313-1043
<b>Garrison Safety Office</b> Safety Manager Safety & Occupational Health Specialist Munitions and Explosives of Concern (MEC) support	Nonemergency Michael Moore Keith Coates Rusty Brands	(256) 876-2944 (256) 313-3297 (256) 876-3383 (256) 876-3855
USACE and Army		
U.S. Army Engineering and Support Center, Huntsville (CEHNC) Contracting Officer's Representative (COR) and Project Manager (PM)	Ashley Roeske	(256) 895-1933
CEHNC-OEC, Safety Chief	John Lewis	(256) 895-1589 (office) (251) 721-5276 (mobile)

CEHNC-OEC Operations Manager	Wilson Walters	(256) 895-1290 (office) (256) 990-1512 (mobile)
US Army Garrison-Redstone	Clint Howard	(256) 758-7084 (office) (256) 842-3702 (mobile)
Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives Analytical and Remediation Activity	Charles Hendricks	(870) 540-6711
<b>APTIM Contact Information</b>		
Health and Safety Emergency Number		(800) 537-9540 opt. 2
Project Manager	Don Burton	(865) 207-1394
Program HSE Manager	Doug Russell	(865) 414-9545 (cell) (865) 560-7918 (office)
Corporate Quality Management Representative	Tricia Felt	(303) 741-7426
Senior Unexploded Ordnance (UXO) Supervisor	To be determined	
Site Safety & Health Officer	Brian Rhodes	(256) 714-4200
Senior Vice President Health, Safety, Environmental	Jeff Thompson, CSP	(303) 741-7163
Project Certified Industrial Hygienist	Larry Verdier	(513) 378-8021
Occupational Physician	Dr. William Nassetta	(225) 756-2673



## **DIRECTIONS TO THE EMERGENCY MEDICAL CENTER**

The Huntsville Hospital is located at 101 Sivley Road SW, Huntsville, Alabama, 35801 as shown on Figure E-1 (for RSA-122) and Figure E-2 (for RSA-183).

## Redstone Arsenal Gate Hours

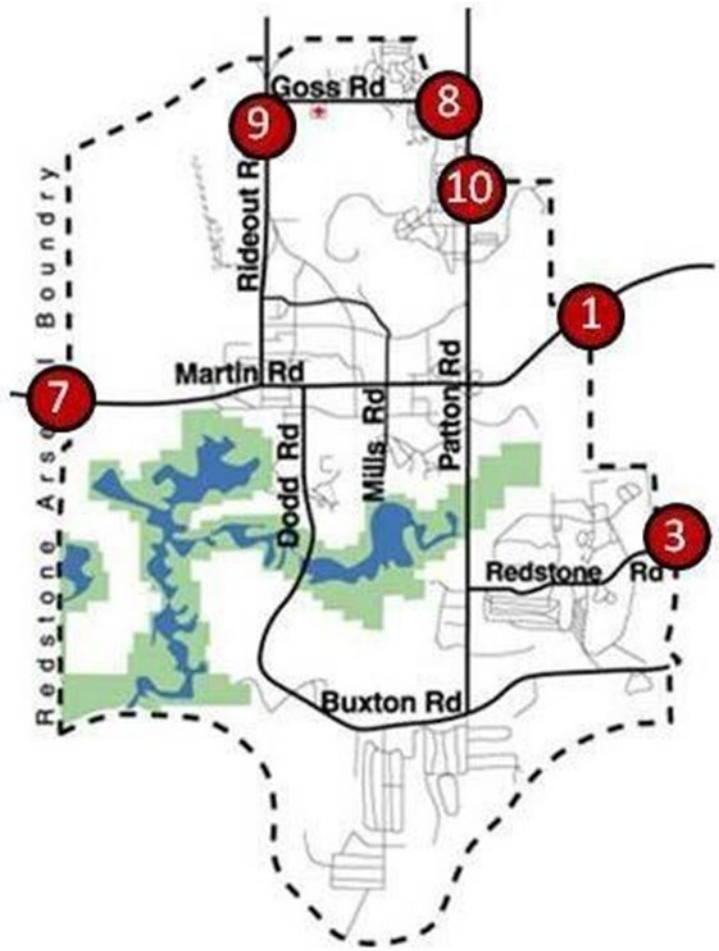
Location	Weekdays	Weekends
Gate 1	0530 - 2100*	Closed
Gate 3	0530 - 1300**	0530 - 1300
Gate 7	0530 - 2100	Closed
Gate 8	0530 - 2100	0530 - 2100
Gate 9	24/7	24/7
Gate 10	Closed	Closed
Visitor Center 1	0600 - 1430	Closed
Visitor Center 9	0600 - 1700	Closed

\* Truck lane at Gate 1 open 0530 - 1300, Monday - Friday

\*\* Gate 3 outbound lanes will remain open until 1800

\*\*\* Gate 7 outbound lanes will remain open until 2100

Gate hours and conditions are subject to change because of homeland defense initiatives; therefore, the point of contact for the current gate operational hours is the Provost Marshall Office at (256) 876-4195.



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## **List of Acronyms and Abbreviations**

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°F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
ADEM	Alabama Department of Environmental Management
AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
APTIM	Aptim Federal Services, LLC
CA	chemical agent
CACM	chemical agent-contaminated media
CAI	chemical agent incident
CB&I	CB&I Federal Services LLC
CBRN	chemical, biological, radiological, and nuclear
CCP	COVID-19 Control Plan
CDHS	Corporate Director of Health and Safety
CEHNC	U.S. Army Engineering Support Center, Huntsville
CFR	Code of Federal Regulations
CMI	corrective measures implementation
COR	Contracting Officer's Representative
COVID-19	Coronavirus Disease 2019
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
CWM	chemical warfare materiel
dBA	A-weighted decibel
DEET	N,N-Diethyl-m-toluamide
ECT	equivalent chill temperature
ELAP	Environmental Laboratory Accreditation Program
EM	engineer manual
EZ	exclusion zone
F-B	flash to bang
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBESL	health-based environmental screening level
HSM	Health and Safety Manager
IAW	in accordance with
IEOC	Garrison Installation Emergency Operations Center
MEC	munitions and explosives of concern

## **List of Acronyms and Abbreviations** (Continued) ---

MSFC	George C. Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PM	Project Manager
PPE	personal protective equipment
PWP	plasticized white phosphorus
RFI	Resource Conservation and Recovery Act facility investigation
RI	remedial investigation
RSA	Redstone Arsenal
SDS	safety data sheet
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SWMU	solid waste management unit
SZ	support zone
TCLP	toxicity characteristic leaching procedure
TLV <sup>®</sup>	threshold limit value
TSM	tailgate safety meeting
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
WBGT	wet bulb globe temperature
WP	white phosphorus

## ***E1.0 Site Descriptions and Contamination Characterization***

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### ***E1.1 Site Description***

Redstone Arsenal (RSA) is located in the southwestern portion of Madison County, which is in the northern portion of Alabama. RSA is bounded by the city of Huntsville on the north and east and the Tennessee River to the south. The city of Madison and the town of Triana are northwest and southwest, respectively, of RSA. Huntsville has a population of nearly 175,000. Madison County has a population of approximately 304,000. Approximately 500 military families reside in the government quarters on RSA, and approximately 26,000 government employees and contractors work on the facility.

RSA is an active U.S. Army facility that comprises approximately 38,182 acres of land, all of which is either owned or controlled by the Army. Development within RSA has largely revolved around the historical production (and later disposal) of conventional and chemical munitions and, more recently, development and testing of missiles and rockets. Chemical wastes have been produced by these processes since operations began in the early 1940s. RSA consists of the U.S. Fish and Wildlife Service's Wheeler National Wildlife Refuge in the central and southern portions; industrial areas in the southeastern portion; facilities at the National Aeronautics and Space Administration's (NASA's) George C. Marshall Space Flight Center (MSFC) for space flight research in the central portion; and training areas, family housing, and commercial, recreational, and medical centers in the northern portion. Missile/rocket test ranges, along with the associated range fans, test area safety fans, and explosive safety-quality distance arcs, are present in the western and southern portions of RSA. Other mission-related land use in the southern portion of RSA includes munitions storage.

The site descriptions for RSA-122, Dismantled Lewisite Manufacturing Plant, and RSA-183, Former Lewisite Plants 1 and 2, are provided in Sections E1.1.1 and E1.1.2, respectively.

#### ***E1.1.1 RSA-122 Site Description***

RSA-122 is included in Operable Unit 6 and consists of an approximately 42-acre area located in the central portion of RSA that was the former site of lewisite manufacturing operations. This area is located just west of Patton Road, north of Viper Road, south of Metrology Drive, and east of Jungerman Road (Figure 1-1 of the corrective measures implementation [CMI] work plan). RSA-122 consists of an area formerly occupied by plants that manufactured the chemical agent (CA) lewisite and its raw materials. RSA-056 and RSA-139 are located within the RSA-122 site boundary and consist of the waste disposal ponds built to contain waste material generated from

the production of lewisite. The present RSA-122 boundary encompasses all the areas where surface media (soil, surface water, and sediments) are known or suspected to be contaminated due to manufacturing operations at the former lewisite plants.

RSA-122 also includes an area formerly used to produce sulfur monochloride and arsenic trichloride, components of the lewisite manufacturing process, and includes areas historically used for materials stockpiling, waste processing, and waste disposal (Shaw Environmental, Inc. [Shaw], 2009). Several of the process areas within the boundaries of RSA-122 have been identified as separate solid waste management units (SWMU) and have completed environmental investigations. These sites, shown on Figure 1-2 of the CMI work plan and listed below, will be directly or indirectly affected by corrective measures conducted at RSA-122.

- RSA-033, Plating Room Floor Drains, Building 5432
- RSA-043, Underground Used Oil Storage Tank, Building 5435A
- RSA-044, Underground Used Oil Storage Tank, Building 5435B
- RSA-056, Closed Arsenic Waste Ponds (South) Area U
- RSA-127, Photo Lab Process Wastewater Sump, Building 5451
- RSA-139, Closed Arsenic Waste Pond (North) Area U.

Investigations are complete at RSA-033 (Shaw, 2004a; Alabama Department of Environmental Management [ADEM], 2008), RSA-043 (A.T. Kearney, Inc., 1989; Geraghty and Miller, Inc., 1991; ADEM, 2008), RSA-044 (Shaw, 2004b; ADEM, 2008), and RSA-127 (Shaw, 2005a,b; ADEM, 2008), and these sites are currently listed in Table VI.3 of the Alabama Hazardous Wastes Management and Minimization Act Permit (hereinafter specified as the Permit) (ADEM, 2021) for RSA as SWMUs requiring no further action. Investigations are also complete at RSA-056 and RSA-139 and interim remedial actions (RA) (e.g., placing soil covers over the waste ponds) were conducted in 1995 and 2001 (Shaw, 2003; 2004c). RSA-056 and RSA-139 are listed on Table VI.6 of the RSA Permit as SWMUs requiring a CMI work plan (ADEM, 2021). The CMI work plan for RSA-056 and RSA-139 (Aptim Federal Services, LLC [APTIM], 2018a) has received ADEM concurrence and was included in the Permit (ADEM, 2021); corrective measure tasks planned at RSA-056/RSA-139 include implementation of land-use controls and long-term groundwater monitoring.

A north-south-trending perennial unnamed creek flows through RSA-122 adjacent to the former waste ponds RSA-056 and RSA-139. Figure 2-1 of the CMI work plan provides a map of the surface drainage features and site topography. The unnamed creek ultimately discharges to Huntsville Spring Branch.

The site encompasses approximately 42 acres of land in the central portion of RSA (Figure 1-1 of the CMI work plan) where the Army manufactured the CA lewisite. Of those 42 acres, approximately 0.1 acre has a chemical warfare materiel (CWM) probability designation of “Occasional,” and 1.5 acres have a CWM probability designation of “Seldom” (Figure 2-13 of the CMI work plan). None of the cleanup actions to date have reduced the CWM probabilities. The unexploded ordnance (UXO) probability for RSA-122 is “None.”

### ***E1.1.2 RSA-183 Site Description***

RSA-183 encompasses approximately 157 acres of land in the central portion of RSA (Figure 1-1 of the CMI work plan). The site has been divided into two areas, the Plants Area (the northern 35 acres), where the Army manufactured the CA lewisite in two plants (Plants 1 and 2), and the Sinkhole Area, which encompasses a large (122 acres) sinkhole south of the Plants Area. In addition to Lewisite Plants 1 and 2, the Plants Area includes a former motor pool (Building 4381, post-lewisite manufacture), a former unit electrical substation, and a former chemical storage facility (Building 4496, post-lewisite manufacture). A north-south-trending drainage ditch exits the Plants Area.

Also within the Plants Area are two separate environmental sites: RSA-049 (Capped Arsenic Waste Lagoons - West, Area F) and MSFC-052e (Portion of Industrial Sewer East of MSFC Property). RSA-049 occupies approximately 12.5 acres within the 35-acre Plants Area (Figure 1-2 of the CMI work plan) and, during the period of lewisite manufacture, was an unlined pond used to dispose of arsenic-contaminated wastes generated from operations at Plants 1 and 2. After lewisite manufacturing ceased, the RSA-049 pond was used for rubble disposal until its closure in 1977. RSA-049 was closed by covering and capping the pond area and seeding the area with grass and trees (Shaw, 2007a). RSA-049 is currently listed on Table VI.6 of the Alabama Hazardous Wastes Management and Minimization Act Permit (ADEM, 2021), indicating that groundwater beneath RSA-049 is to be included with the investigation and/or remediation conducted as part of the RSA-148 groundwater unit. However, no further actions for soil are required for this site. Semiannual groundwater monitoring is ongoing at RSA-049 to confirm that the multilayer cap constructed over RSA-049 continues to perform as designed by minimizing infiltration to groundwater and the potential leaching of contaminants from soil to groundwater within the former landfill (APTIM, 2018b).

MSFC-052e is identified in the NASA Appendix A to the Federal Facilities Agreement Site Management Plan, FY 2017 (NASA, 2017) as the “Portion of Industrial Sewer East of Eastern MSFC/RSA Boundary” that serviced former Lewisite Plants 1 and 2 (RSA-183 Plants Area) (CH2M Hill, 2009). MSFC-052e is currently listed on Table VI.3 of the Permit (ADEM, 2021)

as a SWMU requiring no further action. The site is considered a daughter site to RSA-183, and the Army has accepted responsible for that portion of the industrial sewer beneath RSA-183 (Figure 1-2 of the CMI work plan).

The following sites are adjacent to the RSA-183 Plants Area:

- MSFC-027, Inactive (M-1) Waste Accumulation Area
- MSFC-034, Former Chemical Production Area.

MSFC-027 is a 24-acre site located west of the RSA-183 Plants Area (Figure 1-2 of the CMI work plan). This site was utilized for bulk aboveground storage of fuel oil and ethanol, supporting the production of ethylene gas used in the manufacturing of the CA mustard in 1943. Investigation of MSFC-027 is complete, with Resource Conservation and Recovery Act facility investigation (RFI) concurrence being received from ADEM in August 2014. A CMI work plan (CB&I Federal Services LLC [CB&I], 2016) received ADEM concurrence, and corrective measures for soil were completed in July 2018. The CMI report (APTIM, 2019) received ADEM concurrence in a letter dated August 16, 2019. The site is currently listed in Section VIII.C as no further action required for surface media (i.e., surface soil, subsurface soil, surface water, sediment, spring water, and soil vapor). The groundwater shall be investigated and/or remediated as part of MSFC.

MSFC-034 is a 54-acre former chemical (mustard) production and filling area located west of the RSA-183 Plants Area (Figure 1-2 of the CMI work plan). MSFC-034 facilities were used for mustard agent manufacturing and projectile filling. The site is currently listed on Table VI.2 of the Permit as a SWMU requiring an RFI (ADEM, 2021), which is currently ongoing; the Army is responsible for soil and groundwater cleanup at MSFC-034.

Surface water at the RSA-183 Plants Area flows with topography to constructed ditches in the southern and eastern portions of the site (Shaw, 2007c). These shallow, grass-lined ditches discharge to the main drainage feature flowing to the south, past Fowler Road. The main drainage feature south of the Plants Area coincides with the surface expression of a large, trough-like, north-south-trending sinkhole. The sinkhole, approximately 8 feet in depth, becomes inundated during wetter months and holds water that eventually drains/infiltrates into the subsurface karst features. Several smaller engineered drainage ditches discharge into the main north-south-trending drainage feature.

The RSA-183 site encompasses approximately 157 acres of land in the central portion of RSA (Figure 1-3 of the CMI work plan), a small portion of which (Plants Area) is where the Army

manufacture the CA lewisite. The Plants Area currently includes two small tracts, totaling 0.1 acre, that have a CWM probability designation of “Occasional” and areas surrounding the “Occasional” areas that have a CWM probability designation of “Seldom,” which total approximately 1.2 acres (Figure 2-14 of the CMI work plan). None of the cleanup actions to date have reduced the CWM probabilities. The UXO probability for RSA-183 is “None.”

### ***E1.2 Project Objective***

The U.S. Army is conducting investigation and remediation of known or suspected waste sites at RSA in Madison County, Alabama, under the Resource Conservation and Recovery Act. The Army has contracted APTIM to perform remediation services under the management of the U.S. Army Environmental Command. APTIM, on behalf of the Army, prepared this CMI work plan site-specific safety and health plan (SSHP) for RSA-122, Dismantled Lewisite Manufacturing Plant, and RSA-183, Former Lewisite Plants 1 and 2, located within Operable Units and 6 and 5, respectively (Figure 1-1 of the CMI work plan). This plan incorporates applicable elements of ADEM Hazardous Waste Facility Permit No. AL7 210 020 742 and the most recent edition of the Alabama Environmental Investigation and Remediation Guidance. This plan protects employees’ human health from hazardous constituents at concentrations exceeding applicable limits.

The CMI work plan describes the corrective measures necessary to support implementation of corrective measures at RSA-122/RSA-183. The remedial investigation (RI) report for RSA-122 concluded that the Army’s historical operations have resulted in arsenic concentrations in soil that pose unacceptable risks to human health and the environment. At the request of U.S. Environmental Protection Agency Region 4, mercury was also included as a chemical of concern in soil because of the conceptual site model for RSA-122/RSA-183 and associated sites, although mercury in soil did not pose unacceptable noncancer hazards to any receptor.

Corrective measures for chemicals of concern in groundwater under RSA-122/RSA-183 will be conducted with the RSA-147 and RSA-148 groundwater units corrective measures under a separate contract.

### ***E1.3 Project Tasks***

The following project activities to meet the CMI objectives in support of a soil removal action are detailed in the RSA-122/RSA-183 CMI work plan:

- Mobilization/demobilization
- Utility clearance and marking

- Vegetation clearance
- Protection and/or closure of existing monitoring wells
- On-site UXO support
- Excavation of contaminated soil
- Post-excavation soil confirmation sampling and analysis
- Waste characterization sampling
- Soil stabilization, if necessary
- Transport and disposal of excavated soils contaminated with arsenic to a waste disposal facility
- Site restoration, including application of backfill and topsoil and revegetation with approved grass mixtures
- Implementation of land-use controls.

This SSHP is intended to be used in conjunction with the approved Final Installation-Wide Accident Prevention Plan (APP) for RSA (U.S. Army Engineering and Support Center, Huntsville [CEHNC], 2019), as applicable. All personnel on this site shall have received training, informational programs, and medical surveillance as outlined in the Final Installation-Wide APP (CEHNC, 2019) and be familiar with the requirements of this SSHP.

#### ***E1.4 Contamination Characterization***

Arsenic concentrations in soil at RSA-122/RSA-183 pose unacceptable risks to human health and the environment. The principal source of arsenic is primarily associated with former site activities. A detailed discussion of arsenic at RSA-122/RSA-183 is provided in the CMI work plan. It is extremely unlikely, based on the concentrations of site contaminants, that personnel performing soil disturbance activity will be exposed to industrial chemicals at or above their respective 8-hour or short-term occupational exposure limit.



## **E2.0 Activity Hazard Analysis**

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### **E2.1 Anticipated Hazards**

The nature and extent of contamination at RSA-122/RSA-183 has been characterized. The results of the RSA-122 and RSA-183 RI reports indicated that arsenic in soil poses an unacceptable risk to human health and the environment.

Thus, based on the results from the RI reports for RSA-122/RSA-183 and the work-to-date Summary reports, a corrective measure is required for arsenic in soil at RSA-122/RSA-183 from past Army activities that pose a leaching threat to groundwater. Chemicals of concern in groundwater pose unacceptable risks to receptors who may consume the groundwater; however, installation-wide restrictions are in place to prohibit consumption of groundwater for potable purposes and manage nonpotable uses.

Table E2-1 lists contaminants of interest and potential acute health effects.

**Unexploded Ordnance and Chemical Warfare Materiel Probability.** The UXO probability for RSA-122 is “None.” Approximately 0.1 acre of RSA-122 has a CWM probability designation of “Occasional,” and 1.5 acres have a CWM probability designation of “Seldom.” The Plants Area of RSA-183 includes two small tracts, totaling 0.1 acre, that have a CWM probability designation of “Occasional” and areas surrounding the “Occasional” areas that have a CWM probability designation of “Seldom,” which total approximately 1.2 acres. The UXO probability for RSA-183 is none.

Munitions and explosives of concern (MEC) items are military munitions that may pose unique explosives safety risks, such as UXO, discarded military munitions, or munitions constituents present in high enough concentrations to pose an explosive hazard. Munitions constituents are any materials originating from UXO, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions (10 U.S. Code 2710[e][3]) and 10 U.S. Code 2710[e][2]).

Section E2.4.9 is provided to describe safety measures in the unlikely event that MEC, explosives, CWM, or CA are encountered.

Should any suspicious item be encountered during site activities, protocol as documented in Section 6.7 of the RSA-122/RSA-183 CMI work plan will be followed, which includes but is not limited to stopping all work and notifying appropriate project personnel.

## **E2.2 COVID-19 Virus Hazards**

Coronavirus Disease 2019 (COVID-19) is a respiratory disease caused by the SARS-CoV-2 virus. COVID-19 spread from China to many other countries around the world, including the United States. The COVID-19 pandemic is impacting all aspects of daily life, including travel, trade, tourism, food supplies, and financial markets. Procedures and information for awareness and education, screening methods, contamination prevention and sanitation, and reporting and illness/exposure management are presented in AMS-710-01-FM-04201, *COVID-19 Control Plan (CCP)*.

- A continual assessment of hazards is required to maintain a current awareness of exposures and the effectiveness of current controls. These methods will ensure employees have access to current information on how the pandemic is progressing, known site-specific exposures, site-specific controls and how to effectively implement them, and reporting requirements.
- Employees can be exposed both at the job site and away from the job site. Fever/chills, coughing, shortness of breath/difficulty breathing, fatigue, muscle/body aches, headache, new loss of taste or smell, sore throat, congestion/runny nose, nausea/vomiting, and diarrhea are currently the primary symptoms that may occur between 2 and 14 days from contraction of the virus. It is critical to remind employees to identify any of these symptoms and to quickly isolate employees who are symptomatic from other employees.
- Current medical understanding is that the virus is primarily transmitted via respiratory droplets. The virus can potentially survive on varying surfaces from hours to multiple days. Primary routes of entry include the mouth, eyes and nose. Practices such as “sick employees stay at home,” social distancing, and the use of face masks will be used as prevention measures against the virus spread. Sanitation of work areas, office trailers, and restroom facilities will be performed regularly, including additional attention to personal hygiene and hand washing.
- APTIM has suspended all non-essential business travel. Essential business travel must be approved by APTIM leadership. Anyone approved to travel will be screened prior to reporting back to the jobsite.
- Additional reporting and illness management procedures will also be implemented as a management tool to help understand the virus and prevent its spread. This includes a listing of roles and responsibilities for APTIM’s management team, employees, and medical providers. APTIM expects subcontractors to protect their employees through compliance with APTIM’s CCP or the development and implementation of a CCP

specific to their risks. APTIM and CEHNC leadership must approve subcontractor plans before implementation at the job site.

- Effective 10/7/21 APTIM is enforcing vaccination mandate in accordance with President Biden's Executive Order September 24, 2021. APTIM employees and lower tier subcontractors shall be fully vaccinated by December 8, 2021. APTIM is closely monitoring current regulatory changes and enforcement actions for Federal contractors and Occupational Safety and Health Administration (OSHA) emergency temporary standards.

These requirements are in effect at least for the duration of the pandemic. The APTIM COVID-19 Task Force will amend these requirements or suspend their operation when no longer necessary.

### ***E2.3 Activity Hazard Analyses***

Detailed project-specific hazards and controls for each major definable feature of work/activity will be addressed in task-specific activity hazard analyses (AHA) (Attachment 1).

AHAs have been prepared for the following corrective measures activities at RSA-122/183:

- Mobilization and demobilization
- Visual site inspections and civil surveys
- Site surveys (utility)
- Vegetation clearance or removal
- Excavation and backfilling
- Soil sampling
- Waste management and disposal of investigation-derived waste
- Equipment decontamination
- Pressure washing
- Site restoration
- COVID-19 job site work practices
- Vehicle and fueling operations.

If new operations or tasks are introduced, the Site Safety and Health Officer (SSHO) will perform a hazard analysis. If operations change significantly during the course of this project, the related AHA will be updated to accommodate these changes. The SSHO will approve any changes in personal protective equipment (PPE) or operating procedures before they are implemented. Changes will be communicated to the field team(s) during daily tailgate safety meeting (TSM). The SSHO will be responsible for ensuring that the required controls are being properly implemented for each operation or task.

## **E2.4 Classic Safety Hazards**

### **E2.4.1 Slip, Trip, and Fall Hazards**

#### **Hazard Identification**

Work areas may contain slip, trip, and fall hazards for site workers, such as:

- Holes, pits, or ditches
- Slippery surfaces
- Uneven and rough terrain
- Vegetation and debris such as fallen branches, vines, and roots
- Weather conditions that make surfaces slippery and obscure visibility, and thunderstorms and tornados.

#### **Hazard Mitigation/Prevention**

Site personnel will be instructed to look for these potential safety hazards and immediately inform the SSHO about any encountered or new slip, trip, or fall hazards. If the hazard cannot be immediately removed or mitigated, action will be taken to notify site personnel about the hazard. Slips, trips, and fall hazards will be a daily tailgate safety briefing item. Operations will cease if weather conditions will cause activities to become hazardous.

### **E2.4.2 Motor Vehicles and Heavy Equipment**

#### **Hazard Identification**

Site tasks such as site preparation, brush clearing, excavation, and vehicle and/or heavy equipment operation may present a hazard. Injuries can result from being hit or run over by a moving vehicle; from vehicles overturning; or from being struck, burned, or otherwise injured by moving parts. Vehicles and heavy equipment design and operation will be according to 29 Code of Federal Regulations (CFR) Subpart O, 1926.600 through 1926.602. The types of heavy equipment anticipated to be used on site include earth-moving machinery, pickup trucks, track hoes, utility trailers, flatbed trucks, and dump trucks.

#### **Hazard Mitigation/Prevention**

Before any machinery or mechanized equipment is placed into use, it will be inspected and tested to verify that it is in safe operating condition. Records of tests and inspections will be maintained at the site.

Procedures for mitigation and prevention of hazards associated with motor vehicles are contained in AMS-710-02-PR-02700, *Non-Commercial Motor Vehicle Safety*; AMS-710-02-PR-05700, *Mechanized and Marine Equipment*; and AMS-710-02-PR-03900, *Commercial Motor Vehicle Safety* (Attachment 2). APTIM has also implemented additional protocols for motor vehicle use on RSA. A 360-degree walk-around is required before placing vehicles and equipment in motion that have been parked or temporarily staged. Traffic cones are required at the rear of all parked site trucks to facilitate the 360-degree walk-around. Personnel working at remote areas on site with limited roadway space shall position vehicles in the direction of egress to facilitate quick exit in event of emergency. Additionally, use of cellular phones while driving on RSA is strictly prohibited. Violators are subject to fines and loss of driving privileges on base when cited by Military Police in violation of this regulation.

The following safety procedures will be adhered to on sites using heavy machinery and equipment:

- APTIM will designate a competent person to be responsible for the daily inspection of all machinery and equipment and during use to ensure that it is in safe operating condition. Tests will be made at the beginning of each day during which the equipment is to be used to determine that the brakes and operating systems are in proper working condition. Inspections will be documented on AMS-710-02-FM-05701, *Mechanized and Marine Inspection Report* (Attachment 2).
- Preventive maintenance procedures recommended by the manufacturer will be followed. Any machinery or equipment found to be unsafe will immediately be removed from service and its use prohibited until unsafe conditions have been corrected. A tag indicating that the equipment may not be operated will be placed in a conspicuous location on the equipment. The tag will remain until it is demonstrated to the individual tagging the equipment that it is safe to operate. Where possible, lockout procedures are the preferred method of control to use.
- Only designated personnel will operate machinery and mechanized equipment. Equipment deficiencies that affect safe operation observed at any time will be corrected before continuing operation. Seats and seat belts will be installed and used by operators and passengers of heavy equipment. The only exception to this requirement will be for heavy equipment designed for stand-up operation. Entering or exiting any equipment while it is in motion is prohibited. Machinery or equipment requiring an operator will not be permitted to run unattended. Machinery or equipment will not be operated in a manner that will endanger individuals or property, and safe operating speeds or loads will not be exceeded.
- Equipment operated on the public roads will be equipped with turn signals visible from the front and rear. Mechanized equipment will be shut down prior to and during

fueling operations. Closed systems with automatic shut-off that prevent spillage if connections are broken may be used to fuel diesel-powered equipment left running.

- All towing devices used on any combination of equipment will be structurally adequate for the weight drawn and securely mounted. Persons will not be permitted to go between a towed and towing piece of equipment except to connect the equipment. All equipment with windshields will be equipped with powered wipers. Vehicles that operate under conditions that cause fogging or frosting of windshields will be equipped with operable defogging or defrosting devices.
- Whenever the equipment is parked, the parking brake will be set. Equipment parked on inclines will have the wheels chocked or track mechanism blocked and the parking brake set.
- Personnel will not work or pass underneath the loads handled by lifting or digging equipment.
- Each piece of heavy equipment on site will be equipped with at least one dry chemical or carbon dioxide fire extinguisher.
- A warning device or signal person will be provided where there is danger to nearby workers from moving equipment such as swinging loads, buckets, or booms. Where manual (hand) signals are used, only one person will be designated to give signals to the operator. The signal person will be located to see the load and be clearly visible to the operator. Employees will be required to stay clear of any vehicle being loaded or unloaded to avoid being struck by any spilling or falling materials.
- Loose, ill-fitting clothing and jewelry can become caught in heavy equipment; therefore, jewelry will be removed, and proper fitting clothing will be worn during field activities that involve heavy equipment. Long hair that extends below the hard hat will be tied in a manner to prevent contact with moving equipment parts. PPE will be required of all persons working with or near heavy equipment operations, in accordance with (IAW) this SSHP. Employees exposed to public vehicular traffic will be provided with, and will wear, warning vests or other suitable garments marked with or made of reflective or highly-visible material.

### ***E2.4.3 Underground Utilities***

#### ***Hazard Identification***

The specific hazards include, but are not limited to, utilities such as sewers, telephone, cable, fiber optic, water, fuel, gas, and electrical lines.

#### ***Hazard Mitigation/Prevention***

Before excavating, the existence and location of underground pipe, electrical equipment, and gas lines will be determined. This will be done IAW AMS-710-02-PR-01610, *Utility Contact*

*Prevention* (Attachment 2), by contacting the appropriate RSA representative to mark the location of the lines. Before beginning any intrusive activities, the SSHO/Unexploded Ordnance Safety Officer will obtain a digging clearance if appropriate and document phone calls, correspondence, and confirmation numbers. Site personnel will not enter underground utilities. If the local utility service cannot access all areas of the site where utilities may be located, geophysical instruments or utility locators will be used to scan for buried utilities.

#### **E2.4.4 Trenching and Excavation**

During excavation and trenching, AMS-710-02-PR-01600, *Excavation and Trenching*; AMS-710-02-PR-01610, *Utility Contact Prevention*; and AMS-710-02-PR-05700, *Mechanized and Marine Equipment* (Attachment 2), must be followed. This procedure complies with OSHA Regulations 29 CFR 1926.650 through 29 CFR 1926.652 and Engineer Manual (EM) 385 1-1. No one is anticipated to enter any excavation more than 4 feet deep. If during excavation conditions occur requiring personnel into the excavation, sloping, shoring, or benching shall occur and take into account at a minimum the angle of incline required to prevent a cave-in with differences in such factors as the soil type, environmental conditions of exposure, and application of surcharge loads.

A complete underground utility mark-out will be performed prior to excavation. Should active utilities be identified the nearest shutoff, when applicable, will be identified. All excavation shall be performed from a stable ground position. Daily inspections of the excavation shall be made as needed throughout work shifts and after every rainstorm or other hazard-increasing occurrence by a competent person who has received training and is competent in excavation safety. The competent person shall determine the likelihood of a cave-in, and reasonable actions such as sloping or shoring shall be taken if the walls appear to be unstable. When it is necessary for personnel to be near the excavation for photographic documentation, an excavation-competent person must deem it safe to do so. Otherwise, all photographs of the excavation shall be performed by the excavator operator from within the cab when it is safe to do so.

All spoil shall be located at least 3 feet from the edge of the excavation to prevent loading on the excavation platform. The excavation shall be guarded on all sides by barricades or caution tape at least 10 feet from the edge. Class II protection around excavations within the delineated exclusion zone (EZ) shall be utilized.

Based on manufacturing history at the sites, CWM is not expected to be present at RSA-122 or RSA-183. However, the subject sites have the potential for the presence of chemical agent-contaminated media (CACM). In addition, there is a possibility that CA may be encountered.

Based on current guidance, these are not considered CWM; however, in certain concentrations and under certain site conditions, these media may pose risks to human health and the environment. If any soil or demolition material is suspected to contain CA or if CA has been detected at the excavation or demolition area through air monitoring, it will be handled as CACM.

Removal operations in the “Seldom” CWM probability areas will be conducted under CWM Contingency Operations and in accordance with the *Low Risk Contingency Plan* (CB&I, 2015). The protocols include:

1. Modified Level D with slung masks initial PPE posture
2. CA experienced Down Range Team leaders
3. Emergency personnel decontamination station (PDS) available for intrusive operations (if operating in parallel with Full CWM Protocols can use Staffed PDS in lieu of Emergency PDS).

When the excavation areas have been cleared and the excavation limits have been demarcated, APTIM will begin excavating from the designated areas using a backhoe or excavator. The excavations will extend to a minimum depth of 2 feet and will not exceed 20 feet deep. All excavations will be conducted in accordance with the Safety and Health Regulations for Excavations (OSHA 29 CFR Part 1926 Subpart P) and EM 385-1-1. Excavations over 4 feet deep will be shored, sloped (1½:1, horizontal:vertical), or benched as required. Spoils will be placed a minimum of 3 feet from the edge of the excavation. Loose soil or rocks will be removed from the sides of excavation walls. Personnel will not enter any excavation over 4 feet deep that is not properly sloped, shored or benched.

Although effort will be made to avoid parking lots, roadways, and structures during excavation of contaminated soil; parking lots, etc. may be impacted by the removal of relict structures. Piping under existing buildings or asphalt features will not be removed unless adjacent piping identifies a CA concern. The boundaries of areas with asphalt pavement or concrete surfaces (e.g., roadways or sidewalks) will be sawcut prior to excavation. Concrete debris will be transported to the RSA construction and demolition landfill or another appropriately permitted facility for disposal. Asphalt will be transported to the RSA recycling program’s designated location for recycling.

The excavated material will be temporarily stockpiled or staged prior to waste characterization sampling and off-site disposal. Any discolored soil encountered during excavation activities will



be placed in separate spoils piles to prevent the potential cross-contamination of nonimpacted spoils that may end up being suitable for excavation backfill. The excavated material will be staged on impervious material such as plastic sheeting and covered with waterproof material (i.e., tarpaulin or 10-mil plastic sheeting). Containment will control runoff, leaching, or fugitive dust emissions. Measures will be taken to prevent any surface runoff from entering into or washing away from the stockpile. The excavated areas will be adequately secured from the public and filled as soon as possible.

If necessary, dust outside the EZ will be controlled with water using a water truck with hose and sprayers and mulch such as straw. Dry exposed areas will be misted with water until the surface is wet and repeated as needed. Visual observation will assure that water will be applied at rates so that runoff does not occur. In addition, all other equipment used at the site during operations will be operated in a manner that prevents further migration of contamination. Polymers, tackifiers, stabilizers, or chlorides will not be used for dust control. An action level of one-half the OSHA particulate not otherwise specified threshold respirable fraction (2.5 milligrams per cubic meter) within or directly downwind of the work areas will be used to determine when dust suppression is needed. Dust generated during excavation in the EZ will be maintained below the 1 milligram per cubic meter action level specified in Table E7-1. Dust levels will be monitored using a Data Ram PDR 1000 or equivalent real-time aerosol monitor.

If waste is suspected to contain CA, or CA has been detected through air monitoring, the waste will be segregated and containerized as CACM to prevent waste from contacting surrounding surfaces. All waste thought to be associated with CA will be tested via on-site headspace analysis. If the headspace results are below residential health-based environmental screening levels (HBESL), a sample will be sent for toxicity characteristic leaching procedure (TCLP) analysis to the Environmental Laboratory Accreditation Program (ELAP)-certified laboratory. Liquids suspected of containing CA will not undergo headspace analysis; they will be sampled and sent to a CA-Capable Laboratory to determine whether CA is present and at what concentrations to compare to the HBESLs.

Any CACM confirmed through positive sample results above the residential HBESL will be containerized in suitable drums or roll-off boxes. Any porous CACM will be decontaminated with bleach, certified available chlorine content, on site by APTIM. After sufficient contact time, the bleach will be sampled and analyzed to confirm CA levels are below the hazardous waste control limit. APTIM will decontaminate nonporous CACM followed by hot box monitoring methods which require placing the CACM in an approved sealed container for a minimum of 4 hours at a minimum 70 degree Fahrenheit temperature. Decontaminating and hot boxing will

continue as necessary until the CA air monitoring results are below the accepted disposal level. Large quantities of CA-contaminated concrete will be placed on tarps and covered with visqueen tarps to perform hot box monitoring methods. Upon completion of decontamination or hotboxing activities, samples will be collected from the treated media and subjected to the CA screening process to determine the need for additional decontamination.

After waste has been determined to be below the HBESL, a representative sample will be sent to the ELAP-certified laboratory for TCLP analysis. TCLP results will be reviewed and a hazardous/nonhazardous waste determination will be made at that point in time. Waste will be handled, packaged, and shipped according to local, state, and federal regulations. Hazardous Energy Control

It is crucial to be aware of hazardous energy to prevent accidents. At the sites included in this contract, overhead and underground utilities are a hazardous energy of concern. Additionally, stored energy associated with heavy equipment hydraulics can be released during servicing or maintenance. Accidents can occur when hazardous energy sources are not evaluated. Accidents also occur when equipment is not properly isolated, shut down, and/or de-energized.

Lock-out/tag-out activities shall follow AMS-710-02-PR-01500, *Control of Hazardous Energy* (Attachment 2). APTIM will coordinate lock-out/tag-out with the Department of Public Works in cases where they are required to assist in hazardous energy control and an APTIM employee or subcontractor is not the authorized user.

#### **E2.4.5 Cumulative Trauma Disorder**

##### ***Hazard Identification***

Injuries may occur from hand digging with shovels, clearing and grubbing tools, and hand augers. Workers will be instructed to avoid over-reaching, lifting, and twisting while moving equipment and verify that footing is solid before lifting commences.

##### ***Hazard Mitigation/Prevention***

The following actions will be taken to minimize ergonomic risks:

- Use a hand truck or other mechanical aids to move heavy objects.
- Push rather than pull whenever possible.
- Readjust the load before moving it or change position to avoid twisting or stretching the body to lift the load.

- Consider the size, shape, and weight of the object to be lifted. No individual employee is permitted to lift any object that weighs over 50 pounds. Multiple employees or the use of mechanical lifting devices is required for objects over the 50-pound limit.
- Consider that the safe lifting zone is between the knees and shoulders. If the object is below knee level, bend the knees and lift with the legs. If the load is above the shoulders, use a sturdy step ladder.
- Inspect the anticipated path to the destination for the presence of slip, trip, and fall hazards and clear obstacles before commencing to move the load/object. Place feet far enough apart for good balance and stability (typically shoulder width).
- Get as close to the load as possible. Bend legs at the knees.
- Keep the back as straight as possible and abdominal muscles tightened.
- Avoid twisting motions when performing manual lifts.
- Straighten legs from their bent position to lift the object.
- Take small turning steps without twisting the knees or the back if it is necessary to turn with the load.
- Never carry a load that cannot be seen over or around.

#### ***E2.4.6 Vibration***

##### ***Hazard Identification***

Both hand-held and stationary tools that transmit vibration through a work piece can cause vibration “white fingers” or hand-arm vibration syndrome. The use of these types of tools is not anticipated on this project; however, if they should be required, proper control measures will be used to minimize hand-arm vibration.

##### ***Hazard Mitigation/Prevention***

The control measures may include the following:

- Using anti-vibration tools and/or gloves
- Keeping hands and body warm
- Minimizing the vibration coupling between the hand and the tool
- Participating in the medical surveillance program

- Adhering to the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV<sup>®</sup>) for hand-arm vibration.

#### **E2.4.7 Material Handling and Lifting**

##### **Hazard Identification**

Improper handling and lifting of materials and equipment on site can result in specific injuries to the body, most notably the back.

##### **Hazard Mitigation/Prevention**

Site personnel will exercise care in lifting and handling heavy or bulky items. No site worker will attempt to lift any item in excess of 50 pounds without assistance or use of a mechanical device. Materials being lifted either mechanically or manually will not be moved or suspended over personnel unless precautions have been made to protect the personnel from falling objects. Whenever heavy or bulky material is to be moved manually, the size, shape, and weight of the object and the distance and path of movement must be considered to prevent joint and back injuries. Adhere to the following hierarchy in selecting a means for material handling:

1. Movement of the material by mechanical device (lift truck, earth-moving machinery, and similar)
2. Movement by manual means using mechanical aid (dolly or cart)
3. Movement manually in a planned manner with an adequate number of personnel.

The SSHO will train employees in proper lifting techniques and require that they lift objects properly. The following procedures will be followed:

1. Ensure the hands and object are free of oil, grease, or water that might prevent a firm grip. A firm grip on the object is essential.
2. Keep hands, and especially the fingers, away from any points where pinching or crushing could occur, particularly when setting the object down.
3. Inspect the item for metal slivers, jagged edges, burrs, rough or slippery surfaces, and pinch points, and, if necessary, use gloves to protect the hands.
4. Place the feet far enough apart for good balance and stability.
5. Ensure that solid footing is available before lifting the object. When lifting, remain as close to the load as possible, bending legs at the knees, keeping the back as straight as possible, and lifting the object with the legs while straightening from a bended position.

6. Never carry a load that cannot be seen over or around while carrying it.
7. When setting an object down, keep the stance and position identical to that for lifting, with the back straight and the legs bent at the knees while the object is lowered.
8. When two or more people are required to carry an object, distribute the load uniformly. Each person should face the direction in which the object is being carried as much as possible.

#### **E2.4.8 Explosive Ordnance Hazards**

##### **MEC Hazard Safety**

All site personnel will be given ordnance recognition training prior to working on the site. The training will be verified by signature on the site training form. Personnel should be alert for UXO and munitions debris.

If MEC is encountered or suspected to have been encountered during any phase of work, the Site Manager and the SSHO will be immediately notified. In general, the following MEC safety precautions and protocols will be followed:

- Personnel will follow the 3R's: **Recognize, Retreat, and Report**. The location(s) will be marked, personnel will be kept out of the area, and appropriate personnel will be notified.
- Always remain alert at all times for MEC, UXO, and related scrap or material potentially presenting an explosive hazard.
- Observe the cardinal principle involving ordnance, explosives, ammunition, severe fire hazards, or toxic materials, i.e., to limit the exposure to a minimum number of personnel, for the minimum amount of time, to a minimum amount of hazardous material consistent with a safe and efficient operation.
- Always assume MEC hazards contain a live charge until determined otherwise.
- DO NOT forget that death or injury can occur from MEC/UXO and explosive-related accidents.
- DO NOT forget that the age or condition of a MEC hazard does not decrease the effectiveness. MEC that has been exposed to the elements for an extended period of time can become more sensitive to shock, movement, and friction because the stabilizing agent in the explosives may be degraded.
- Consider MEC that has been exposed to fire as extremely hazardous. Chemical and physical changes to the contents may have occurred that render it more sensitive than it was in its original state.

- DO NOT approach leaking plasticized white phosphorus (PWP) or white phosphorus (WP) munitions. Burning PWP/WP may detonate the explosive burster charge.
- DO NOT touch crusted-over PWP/WP. Handling of crusted-over PWP/WP munitions will be done only at the discretion of the Unexploded Ordnance Safety Officer.
- DO NOT touch, move, or jar any ordnance items regardless of the markings or apparent condition. Under no circumstances will any MEC be handled during avoidance activities or moved in an attempt to make a positive identification.
- DO NOT touch, pick up, kick, or move anything that is unfamiliar or unknown.
- DO NOT roll the item over or scrape the item to identify markings.
- MEC suspected of containing CWM shall not be handled by APTIM or subcontractor personnel. All suspect CWM material shall be handled and managed by chemical, biological, radiological, and nuclear analytical and remediation activity.
- DO NOT approach or enter a munitions site if an electrical storm is occurring or approaching. If a storm approaches during site operations, leave the site immediately and seek shelter.
- DO NOT transmit radios or cellular phones in the vicinity of suspect MEC hazards.
- DO NOT walk across an area where the ground surface cannot be seen and that has not been cleared of MEC hazards by the UXO technician.
- DO NOT rely on color codes for positive identification of ordnance items or their contents.
- DO NOT drive vehicles into a suspected MEC area. Use clearly marked lanes.
- DO NOT carry matches, cigarettes, lighters, or other flame-producing devices into a MEC site.
- DO NOT be misled by markings on the MEC item stating, “practice bomb,” “dummy,” or “inert.” Practice ordnance can have explosive charges that are used to mark and/or spot the point of impact, or the item could be marked incorrectly.
- Post the following warning on site:

— WARNING —

**Removing or taking any munitions, explosive, UXO, or munitions-related debris from the site by any employee is strictly prohibited.**

## **E2.5 Chemical Hazards**

Table E2-1 lists potential contaminants that may have been used at RSA-122/RSA-183 and the potential routes of exposure and symptoms for each contaminant that may be encountered. Other information such as TLVs<sup>®</sup>, Permissible Exposure Limits, Immediately Dangerous to Life or Health values, Worker Protection Limits, and physical properties are also included.

Chemical hazards associated with site activities also includes fuels and oils brought on site for equipment use and maintenance. All site personnel will follow the procedures and precautions outlined in the appropriate Safety Data Sheet (SDS) for the appropriate use and storage of these materials. The SDS binder will be kept in the SSHO site vehicle or office and available to all employees on request.

## **E2.6 Night Operations**

Night operations are not planned for RSA-122/RSA-183. If night operations should become necessary, the lighting requirements are presented in Table E2-2. The SSHO will conduct prescribed light surveys to verify employees working on specific site work areas have adequate lighting IAW EM 385-1-1. During night work, portable light plants or fixtures will be positioned to provide adequate lighting in select site work areas such as:

- Excavation areas
- Loading areas
- Support area.

The lighting will be directed towards the work area and positioned to provide optimum work area illumination. Personnel may also use hand-held portable or body-attached lighting as necessary to provide focused beam lighting. If, at any time, the lighting conditions do not provide a safe work environment, activities will be halted and necessary adjustment to portable lighting made or additional light plants procured.

A Testo 545 Light Meter or equivalent with National Institute of Standards and Technology calibration certificate will be used to measure lighting at the site. Before the light meter is used, it will be calibrated according to the manufacturer recommendations. The light meter units will be set to measure in foot-candles/Lumens/square foot. A light monitoring log will be maintained. All light measurement logs will be turned over to site quality control for the site report. The SSHO or designee will be trained in the use of the light meter.

## **E2.7 Physical Hazards**

### **E2.7.1 Severe Weather**

#### **Hazard Identification**

During the course of field operations, severe weather may be encountered, including thunderstorms, rainstorms, tornados, and other unsafe weather conditions (i.e., high winds).

Criteria indicating that severe weather conditions may exist include:

- High winds (greater than 40 miles per hour – depending on the tree cover and other site-specific conditions)
- Tornado watch or warning in place for the area
- Visible lightning or audible thunder
- Extreme temperatures (e.g., greater than 100 degrees Fahrenheit [°F] or less than 32°F)
- Heavy rainfall or fog that makes footing treacherous and visibility difficult.

#### **Hazard Mitigation/Prevention**

The SSHO will be responsible for checking the weather conditions at least twice a day through the use of local radio and television broadcasts, internet weather sites, or a weather radio. When severe weather threatens, the SSHO will be responsible for deciding if site operations should cease.

If work is suspended, the SSHO will notify the teams and individuals via radio or cellular telephone. These individuals will be responsible for relaying the work suspension to other personnel in their areas. All personnel will cease operations, secure equipment if time permits, and expeditiously move to designated assembly areas for further instruction. Once the severe weather hazard has passed, the SSHO will notify the Site Manager that work may resume.

If a tornado is projected to impact the location of the job site, several measures will be taken. If the tornado's projected path is forecast to move through the area, the site and all equipment will be secured, and personnel will evacuate to a designated safe location, if time allows. If there is not enough time, personnel will immediately evacuate to a designated storm shelter without securing the site or equipment. The specific directions from the site to the closest shelter will be detailed during the site-specific briefing or TSM.



If there is not enough time to get to a shelter, possible actions include:

- Immediately get into a vehicle, buckle the seat belt, and try to drive to the closest sturdy shelter. If hit by flying debris while driving, pull over and park.
- Take cover in a stationary vehicle. Put the seat belt on and cover head with arms and a blanket, coat, or other cushion if possible.
- Lie in an area noticeably lower than the level of the roadway and cover head with arms and a blanket, coat, or other cushion if possible.

In all situations:

- Do not get under an overpass or bridge. Low, flat locations are safer.
- Never try to outrun a tornado in urban or congested areas in a car or truck. Instead, leave the vehicle immediately for safe shelter.
- Watch out for flying debris. Flying debris from tornadoes causes most fatalities and injuries.

## ***E2.7.2 Lightning***

### ***Hazard Identification***

Noting the time from lightning flash to the bang of the associated thunder offers a way to estimate the distance of the lightning to a given person's position. For each 5-second count from flash to bang (F-B), lightning is 1 mile away. Thus, an F-B of 10 means that lightning is 2 miles away and an F-B of 15 means that lightning is 3 miles away, and so on. The lightning safety evacuation plan will be implemented at a count of 50 (10 miles) or as soon as lightning is observed or thunder is heard. This plan will be enacted for a minimum of 30 minutes after the last audible thunder or visible flash of lightning.

### ***Hazard Mitigation/Prevention***

If a lightning storm is observed, all outdoor site activities will cease, and personnel will seek safe shelter. A safe shelter may consist of:

- Fully enclosed metal vehicles with windows up and vehicle radio off
- Enclosed buildings
- Low ground.

Unsafe shelter areas include all nearby outdoor metallic objects such as flagpoles, fences, high mast light poles, gates, etc. Trees, water, and open fields will be avoided, and personnel will avoid using the telephone.

### ***E2.7.3 Hazardous Noise***

#### ***Hazard Identification***

Planned activities may involve the use of noise-producing equipment such as weed trimmers, bobcats, backhoes, and other noise-producing equipment. The unprotected exposure of site workers to this noise during activities can result in noise-induced hearing loss.

A hazardous noise condition exists as a rule of thumb when communication between individuals separated by 3 feet requires shouting.

#### ***Hazard Mitigation/Prevention***

Hearing protection is required any time the noise level reaches 85 a-weighted decibel (dBA) or greater or when communication between individuals separated by 3 feet requires shouting. Double protection is required anytime noise levels exceed 115 dBA. The SSHO will ensure that either earmuffs or disposable foam earplugs are available to, and used by, all personnel near sources of hazardous noise.

Where equipment generates high levels of continuous or impact noise, the SSHO will conduct a noise survey to verify that appropriate PPE is being used.

### ***E2.7.4 Heat and Cold Stress***

A detailed discussion of heat and cold stress symptoms, mitigation, and prevention is provided in Chapter 8.0.

## ***E2.8 Biological Hazards***

Personnel will be made aware of the various biological hazards that may be encountered while working at the sites, including ticks, poisonous insects (for example, fire ants, chiggers, and disease-bearing mosquitoes), poison ivy, and snakes, during the initial site safety orientation. Appropriate preventative measures will be employed to minimize potential exposure to biological hazards, including designating a field member to watch for biological hazards. Table E2-3 shows the biological hazards for the site. Additionally, hazards associated with COVID-19 are discussed in Section E2.2 and associated AHAs (Attachment 1).

The SSHO will be responsible for instructing personnel in avoiding or minimizing exposure to biological hazards. The keys to avoiding biological hazards are awareness of one's surroundings and general knowledge of the habits of various species that may present a threat. In general, the vertebrates will escape to avoid human contact when encountered. Reptiles will often seek out warm, sunny locations in morning hours and during cold weather. A reconnaissance of the site work area should be conducted every morning to identify the presence of potential threat species of plants, insects, and animals. Clearings of vegetation and soil excavation near burrows are activities that potentially disturb reptiles or hornet nests in proximity to personnel. Extra care and caution should be exercised in any work area that disturbs vegetation or soil or when entering any vegetated area where one cannot directly see the ground surface at all times.

The work sites may contain ticks, venomous spiders, and venomous insects. Venomous insects and spiders are generally reclusive, and the greatest potential for exposure arises when personnel are opening containers, structures, buildings, and well casings; handling idle equipment; or moving construction material stockpiles. For example, caution should be taken when opening the casing around monitoring wells or moving material that has been idle on site.

### **E2.8.1 Mosquitoes**

Mosquitoes are bothersome and may carry diseases, such as the West Nile and Zika viruses. They are attracted by heat, sweat, body odor, and carbon dioxide. Site personnel should wear protective clothing and insect repellent containing N,N-Diethyl-m-toluamide (DEET). Insect repellent should be reapplied at least every four hours. The following suggestions should provide some protection from mosquitoes (OSHA, 2016):

- Review the hazards associated with the West Nile virus and Zika virus through exposure to mosquito bites periodically during the TSMs. Zika virus prevention is an important issue because contracting this virus during pregnancy appears to pose a significant risk of neurological birth defects including microcephaly. Infection appears to be much less dangerous for healthy adults. Get regular updates on transmission and controls from the Centers for Disease Control ([nwww.cdc.gov/zika/](http://nwww.cdc.gov/zika/)).
- Document the briefing and the topics covered. Standard tailgate forms can be used as long as the form documents the topics covered. Have all sign attendees sign to verify training on Zika virus has been conducted.
- Apply sunscreen first and then insect repellent.
- Take extra precautions like Thermocell units and head nets (as long as they do not interfere with visual acuity).

- Increase protective measures when working at dawn, dusk, and in the early evening.
- Reduce the area of exposed skin when working outdoors. Long-sleeved shirts with sleeves rolled down are recommended; however, it should be understood that mosquitoes may bite through thin clothing. To avoid mosquitoes, personnel should evaluate the actual Level D clothing worn. For example, heavy long-sleeved work shirts and heavy dungarees/jeans may mitigate mosquito bites. The use of a disposable coverall, such as Tyvek<sup>®</sup>, may further reduce the risk of mosquito bites.
- Use an insect repellent containing approximately 30 percent DEET. Use the repellent according to the manufacturer's directions provided on the container. Frequent reapplication or saturation is not necessary for repellent containing DEET to be effective. Avoid prolonged and excessive use of DEET. (Caution: some individuals may be sensitive to DEET—always read and follow label directions.) After returning from outdoor field activities, wash treated skin with soap and water.
- Use commercially prepared clothing and gear with insect repellants containing 0.5 percent permethrin when additional protection against mosquitoes is necessary. These repellants, such as Repel Permanone™, are available in the sporting goods departments at major retailers. Clothing and gear insect repellants are not for use on skin. Use the repellent according to the manufacturer's recommendations provided on the container.
- Avoid using fragrances.
- Prevent accumulation of water, which can provide breeding grounds for mosquitoes.

The Zika virus is primarily transmitted through mosquitoes but may also be spread via bloodborne (contact) transmissions and sexual transmission (partner to partner). Only one in five infected individuals develops signs and symptoms, which include fever, rash, joint and muscle pain, headaches, and red or pink eyes. Symptoms begin to occur between 2 and 7 days after exposure, are usually mild, and can last up to a week.

### ***E2.8.2 Fire Ants***

Nests should not be allowed to form near structures and areas where personnel will continue to have a need for access. If bitten, personnel should wash the bite area with soap and water, apply cool compress to the area, elevate the area, and apply a paste of baking soda and water for itching.

### ***E2.8.3 Stinging Insects***

Workers should keep alert for bee and wasp activity and avoid wearing bright-colored clothing and scented toiletries when working outside. Be wary of areas around structures where bees and wasps may live. If bee or wasp activity is noted, the area should be avoided if possible. The use

of insect repellants containing DEET is not effective in preventing stings. Anyone can have an allergic reaction to a bee sting, even people who were stung before with no reaction. Allergic reactions to bee stings may include swelling around the lips and eyes, rapid development of a rash, difficulty breathing, or signs of shock (pale skin, rapid pulse, and fainting). If any of these symptoms occur, call 911 immediately. Individuals who have had a previous reaction should notify the SSHO before fieldwork begins and carry a “bee-sting kit,” EpiPen<sup>®</sup>, or Ana-Kit. All personnel will immediately report stings to the SSHO.

Nests should not be allowed to form near structures and areas where personnel will continue to have a need for access. If stung, personnel should wash the bite area with soap and water, apply a cool compress to the area, elevate the area on a pillow, and make a paste of baking soda and water for itching.

Africanized Honey Bees (“killer bees”) are more aggressive and dangerous than other types of bees. If attacked by bees, workers should cover their faces, run away from the hive, and seek shelter in an enclosed area. If stung, the stinger should be removed and first aid sought if necessary.

#### ***E2.8.4 Centipedes***

Centipedes are commonly found throughout Alabama and grow up to 3 inches in length. Centipedes are venomous though rarely fatal; however, if bitten, observe the individual for signs of allergic reaction for a minimum of 30 minutes. If a team member is bitten by a centipede, immediately report the incident to the SSHO to provide first aid treatment.

#### ***E2.8.5 Black, Brown, and Red Widow Spiders***

The widow family of spiders are not usually aggressive unless agitated when the female is guarding her egg sac. They live in a variety of natural and domestic habitats such as under rocks and wooden boards and in dense plant growth. The female widows typically have bulbous, glossy abdomens approximately 1 inch long and marked with a characteristic marking on the underside of the abdomen (red hourglass on black for black widows and yellow hourglass on brown for brown widows, and the red widow is typically red-legged, black abdomen with yellow/red patches). The male is rarely seen and is smaller.

Widow spider venom affects the nervous system. The venom causes pain in the lymph nodes. Other symptoms of a severe bite include nausea, elevated blood pressure, sweating, tremors, and increased white blood cell counts. The wound may appear as a bluish red spot surrounded by a whitish area. Victims of a widow bite may exhibit the following signs or symptoms:

- Sensation of pinprick or minor burning at the time of the bite.
- Appearance of small punctures (sometimes none are visible).
- After 15 to 60 minutes, intense pain is felt at the site of the bite. The pain quickly spreads and is followed by profuse sweating, rigid abdominal muscles, muscle spasms, breathing difficulty, slurred speech, and poor coordination, dilated pupils, and generalized swelling of the face and extremities.

### ***E2.8.6 Brown Recluse Spiders***

Adult brown recluse spiders are soft bodied, yellowish tan to dark brown, and about ¼ to ½ inch long, and have long, delicate grayish to dark brown legs covered with short, dark hairs. The leg span is about the size of a half-dollar.

The spider's most distinguishing characteristic is the existence of three pairs of eyes arranged in a semicircle on the forepart of the head and a dark, violin-shaped marking immediately behind the semicircle of eyes. Normally, all spiders have four pairs of eyes; eight altogether. The neck of the violin points toward the abdomen.

The spider may be found in sheltered corners among debris, in woodpiles, and under loose bark and stones. Hands, underarms, lower abdomen, and the ankles are the areas of the body most likely to be bitten. A bite may go unnoticed for six to eight hours before a reddening, swelling, and blistering area around the wound starts to appear. A severe bite can produce an area of dead skin tissue that may require surgery. Victims of a brown recluse bite may exhibit the following signs or symptoms:

- Blistering at the site of the bite, followed by a local burning at the site 30 to 60 minutes after the bite.
- Formation of a large, red, swollen, pustule lesion with a bulls-eye appearance.
- Systemic affects may include a generalized rash, joint pain, chills, fever, nausea, and vomiting.
- Pain may become severe after eight hours, with the onset of tissue necrosis.

There is no effective first aid treatment for black widow or brown recluse bites. Except for very young, very old, or weak victims, spider bites are not considered to be life threatening. Medical treatment must be sought, however, to reduce the extent of damage caused by the injected toxins. If the spider can be retrieved, it should be taken with the patient to medical treatment. If venomous spiders are suspected or known to be on site, the SSHO will brief the site personnel as to their

identification and avoidance. As with stinging insects, site personnel should report to the SSHO if they locate these spiders on site or notice any type of bite while involved in site activities.

### **E2.8.7 Ticks**

Nearly all work sites on this project may contain ticks. Working in tall grass, especially in or at the edge of wooded areas, increases the potential for ticks to bite workers. Ticks can be particularly numerous in the spring and fall. Ticks are vectors of many different diseases, including Lyme disease. Ticks attach to the skin and feed on blood, creating an opportunity for disease transmission.

The primary symptoms of tick-borne diseases are high fever, head and joint aches, nausea, and vomiting. Additionally, persons develop rashes or experience occasional coughs, chest pain, and severe pneumonia. Lyme disease usually presents a distinctive bull's eye rash at the site of the bite in addition to flu-like symptoms and swollen lymph nodes.

If ticks are prevalent, treat clothing with a permethrin-based product like Permanone™ as directed by the manufacturer. Use an insect repellent containing approximately 30 percent DEET on any bare skin. Insect repellent will be available to personnel. (Caution: some individuals may be sensitive to DEET – always read and follow label directions.) Close pant legs with tape or elastic bands or tuck them into socks. Tuck shirts into pants.

Periodically during the workday, employees should inspect themselves for the presence of ticks. If a tick is discovered, use the following procedure to remove it:

- Use fine-tipped tweezers to detach a tick. Do not try to detach the tick with bare fingers because bacteria from a crushed tick may penetrate even unbroken skin.
- Grip the tick as close to the skin as possible and gently pull it straight away from the skin until it releases its hold.
- Do not twist the tick as it is pulled and do not squeeze its body; this may inject bacteria into the skin.
- Wash hands and the bite area thoroughly with soap and water, and then apply an antiseptic to the bite area.

### **E2.8.8 Venomous Snakes**

Alabama has a variety of snakes; however, the Coral Snake, Eastern Diamondback Rattlesnake, Pygmy Rattlesnake, Timber Rattlesnake, Copperhead, and Cottonmouth (or Water Moccasin) are

the venomous varieties native to the state. All except the Coral Snake are within the venomous pit viper family. The Coral Snake belongs to elapid family.

### ***Coral Snake***

The Coral Snake is typically seldom seen and tends to be nocturnal. They are small snakes, averaging approximately 20 inches in length. Coral Snakes have rings of red, yellow, and black along the length of their bodies. Their noses are always black, with a yellow ring. They do not have long fangs and would need to “chew” on a person in order to inject their venom. Many snakes mimic the Coral Snake; however, the Coral Snake is the only snake that has red and yellow stripes touching.

### ***Eastern Diamondback Rattlesnake***

The Eastern Diamondback Rattlesnake is the largest rattlesnake native to North America, with average lengths reaching 6 feet. They are characterized by their large brown, black, and beige diamond marks on their back. The snake lives in forests near palmetto bushes and makes its home typically in old animal burrows. As a precaution, it is important to note that an Eastern Diamondback Rattlesnake does not always rattle before it strikes.

### ***Pygmy Rattlesnake***

The Pygmy Rattlesnake is a relatively small snake, with a length of 18 to 30 inches. They are gray with brownish round markings along the spine (top). They are typically very aggressive.

### ***Timber Rattlesnakes***

Timber Rattlesnakes are not aggressive and are sometimes reluctant to bite. If this snake is encountered, leave it alone. Its venom is highly toxic and can be fatal. Timber Rattlesnakes range in size between 3 and 5 feet. The coloration of this species is blackish, yellowish, pinkish, or grayish with dark, bent, cross bands aligned along the dorsal length of its body. A reddish dorsal stripe runs between the cross bands, and it has a black tail. Timber Rattlesnakes typically inhabit forest, nearby fields, and swampy areas and may be found throughout Alabama.

### ***Copperhead***

Copperheads are usually not aggressive, and their bite is very rarely lethal. Like most members of the pit viper family, the Copperhead is a heavy-bodied snake. These snakes range between 24 and 36 inches in length and are covered in hourglass-shaped crossbands which vary in coloration among different populations. The crossbands may be copper, pinkish, reddish brown, or orange. Copperheads are found state-wide in forests and sometimes in fields. The tips of the tails of young Copperheads are yellow, and they flick them back and forth in a manner that attracts prey.



## **Cottonmouth**

Cottonmouths are typically found near a water source, mostly in dormant water. Coloration varies according to age and habitat, but typically are black to greenish-brown. Their lengths can span up to 5 feet.

### **E2.8.9 Snake Bite First-Aid Treatment**

If bitten, a person's physical reaction to the venom is aggravated by fear, anxiety, the amount of venom injected, and the speed of absorption of venom into the victim's circulation; the size of the victim; protection provided by clothing (including shoes and gloves); how quickly the victim receives antivenom therapy; and the location of the bite.

It should be noted that the American Red Cross does not advocate the use of snakebite kits for snakebite injuries. Experience has shown that the victim has a better chance of recovery without permanent damage when the site of the wound is immobilized and the victim rushed to the closest emergency medical facility (preferably within 30 minutes).

### **What to Do if Bitten by a Venomous Snake**

1. According to the American Red Cross, take the following steps:
  - a) Wash the bite with soap and water.
  - b) Immobilize the bitten area and keep it lower than the heart.
  - c) Keep the victim as calm as possible.
  - d) Get medical help.
  
2. If a victim is unable to reach medical care within 30 minutes, take the following steps:
  - a) Allow bite to bleed freely for 15 to 30 seconds.
  - b) Cleanse and rapidly disinfect area.
  - c) Wrap leg/arm rapidly with 3- to 6-inch Ace bandage past the knee or elbow joint. Leave fang marks open. Apply suction cup extractor (if available) immediately. Wrap bandage no tighter than one would for a sprain.
  - d) Apply extractor until there is no more drainage from fang marks. The extractor can be left in place 30 minutes or more if necessary. It also aids in keeping the venom from spreading by applying a negative pressure against the tissue where the venom was initially deposited.
  - e) If an extractor is not available, apply direct pressure over the bite using a 4H4-gauze pad folded in half twice. Tape in place with adhesive tape.
  - f) Soak gauze pad in Betadine™ solution if available.
  - g) Strap gauze pad tightly in place with adhesive tape.
  - h) Overwrap dressing above and below bite area with ACE or crepe bandage.

- i) Wrap ACE bandage as tight as one would for a sprain; not too tight.
  - j) Check for pulse above and below elastic wrap; if too tight, unpin and loosen
  - k) Immobilize bitten extremity, use splinting if available.
  - l) Transport victim to nearest hospital or medical facility as soon as possible.
  - m) Try and identify, kill, and bring (ONLY if safe to do so) the offending snake.
3. Do NOT take the following actions if bitten by a venomous snake:
- a) DO NOT permit removal of pressure dressings or ACE bandage until at a facility that is ready and able to administer antivenin. As soon as the dressings are released, the venom will spread. The hospital at this time must be prepared to administer the antidote (antivenin).
  - b) Do not eat or drink anything unless approved by medical sources.
  - c) Do not engage in strenuous physical activity.
  - d) Do not apply oral (mouth) suction to bite.
  - e) Do not cut into or incise bite marks with a blade.
  - f) Do not drink any alcohol or use any medication.
  - g) Do not apply either hot or cold packs.
  - h) Do not apply a narrow, constrictive tourniquet such as a belt, necktie, or cord.

### ***E2.8.10 Protective Measures for Snakes***

1. Learn to identify poisonous snakes. The site-specific safety training will review this information.
2. Observe areas before being seated, placing hands and feet. Observe where to place feet when exiting a vehicle.
3. Avoid rock piles, crevices, and brushy areas. If movement of materials (such as rocks or brush) is necessary, use a remote means to initially relocate the material. Prior to entering an area, look and listen carefully.
4. Do not place hands into holes, crevices, debris, or anyplace that may hide a snake.
5. Never handle snakes that appear to be dead.
6. Do not attempt to capture or kill ANY snakes.

### ***E2.8.11 Allergenic Plants***

A variety of hazardous plants may be encountered on site. The ailments associated with these plants range from mild hay fever to contact dermatitis to carcinogenic effects. The plants that present the greatest degree of risk to site personnel (i.e., potential for contact versus effect produced) are those that produce skin reactions and skin and tissue injury.

Some of the most common and severe allergic reactions resulting from contact with hazardous plants are caused by poison ivy, poison oak, and poison sumac. The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets. In certain seasons, both plants also have greenish-white flowers and berries that grow in clusters.

Poison sumac is a tall shrub or small tree with 6 to 12 leaflets arranged in pairs with a single leaflet at the end. Pictures of poison ivy, poison oak, and poison sumac are shown in Table E2-3.

Contact with the poisonous sap (urushiol) of these plants produces a severe rash characterized by redness, blisters, swelling, and intense burning and itching. Although most cases occur in the spring and summer months, it is important to note that contact dermatitis from poison ivy, poison oak, and poison sumac is prevalent in the winter since the vines and stems of the plants also contain urushiol. In some cases, the victim may develop a high fever and become very ill. Ordinarily, the rash begins within a few hours after exposure, but it may take as long as 24 to 48 hours to appear. The following preventive measures can prove effective for most site personnel:

- Avoid contact with any hazardous plants on site.
- Remove gloves prior to touching face, neck, or other exposed areas of the body.
- Wash hands, face, or other exposed areas at the beginning of each break period and at the end of each workday.
- Keep the skin covered as much as possible (i.e., long pants and long-sleeved shirts) in areas where these plants are known to exist.
- Wash any clothing suspected of being exposed separately in hot water with detergent.
- Be vigilant not to handle tools or equipment suspected of contacting these plants. Clean tools with rubbing alcohol or soap and water. Urushiol can remain active on the surface of objects for several years.

Workers who have come into contact with these plants should do the following:

- Rinse skin immediately with rubbing alcohol, specialized poison plant washes, degreasing soap (such as dishwashing soap) or detergent, and lots of water. Do not use soaps with lotions, they will spread the plant oils. Rinse frequently so that wash solutions do not dry on the skin and further spread the urushiol. Scrub under the fingernails with a brush.
- Apply wet compresses, calamine lotion, or hydrocortisone cream to the skin to reduce itching and blistering.

- Take an antihistamine such as diphenhydramine (Benadryl) to help relieve itching (follow directions).

### **E2.8.12 Bloodborne Pathogens**

Bloodborne pathogens enter the human body and blood circulation system through punctures, cuts, or abrasions of the skin or mucous membranes. They are not usually transmitted through ingestion (swallowing), through the lungs (breathing), or by contact with whole, healthy skin. However, under the principle of universal precautions, all blood will be considered infectious, and all skin and mucous membranes will be considered to have possible points of entry for pathogens.

Potential bloodborne pathogen exposures include:

- Contact with contaminated medical equipment or medical waste or sharps
- Medical emergency response operations such as administering first aid or cardiopulmonary resuscitation (CPR)
- Contact with human wastes such as domestic sewage
- Accidental contact with someone's blood from cuts and scratches incurred during field operations such as brush clearing, excavation, or clearance of munitions debris.

Whenever there is a potential for exposure, personnel will wear the proper PPE (including gloves and masks, when appropriate) to prevent exposure to bloodborne pathogens. If exposure to bloodborne pathogens is suspected, the SSHO will be informed and immediate medical attention will be sought. First aid responders shall follow the guidelines contained in AMS-710-01-PR-00300, *Bloodborne Pathogens* (Attachment 2).

All occupational injuries or illness shall be immediately reported and investigated IAW APTIM Management System procedures. Attachment 3 contains the Incident Reporting Management Procedure.

## **E2.9 Mishap Reporting and Investigation**

### **E2.9.1 Exposure Data (Man-Hours Worked)**

The Project Manager (PM) is responsible for reporting and maintaining records of all exposure and accident experiences incidental to the work, including those of subcontractors. The PM is responsible for ensuring the information is reported to the U.S. Army Corps of Engineers (USACE). At a minimum, these records will include exposure work hours and equivalents as

prescribed by 29 CFR 1904. This exposure data will be provided to USACE using the USACE Prime Contractor Monthly Record of Work-Related Injuries/Illnesses and Exposure Form or equivalent format accepted by the Contracting Officer's Representative (COR).

### **E2.9.2 Accident Investigations, Reports, and Logs**

The Site Manager, SSHO, and PM shall conduct accident/incident investigations in consultation with the Health and Safety Manager (HSM). A report is completed by the Site Manager or SSHO and must be submitted to the HSM and entered in the APTIM Incident Management system. The incident reporting forms are provided in AMS-710-05-FM-02401, *Incident Report* (Attachment 3). The PM shall report all accidents to the U.S. Army Garrison, Chief Installation Restoration Branch, and COR as soon as possible but no more than 24 hours after the incident/accident.

Engineer Form 3394 is required to be prepared and submitted in reporting Lost Work Day cases, accidents where three or more persons are admitted to a hospital, a fatality, permanent totally disabling injury, permanent partial disabling injury, or property damage greater than \$500,000. ENG Form 3394 must be submitted to the COR or authorized representative following the accident IAW EM 385-1-1 as soon as possible but no more than 5 days following the accident. The CEHNC Preliminary Accident Notification form is also to be utilized for collection of information relating to accidents. These forms are included in Attachment 3.

Minor incidents such as near-misses or on-site first-aid injuries shall be included in the daily field quality control reports. These incidents shall also be reported immediately to the HSM and be documented IAW AMS-710-05-PR-02200, *Incident Reporting*.

### **E2.9.3 Immediate Notification Requirements**

Immediate notification and investigation of accidents is an important component of APTIM's accident prevention program. A full report will be provided to the HSM within 24 hours. Accidents involving the following categories shall immediately be reported to the Government Designated Authority or authorized representative; HSM; and APTIM Environmental, Health, and Safety Hotline:

- a. A fatal injury or illness
- b. A permanent total disability injury/illness
- c. A permanent partial disabling injury/illness
- d. Hospitalization of three or more people as inpatients resulting from a single occurrence

- e. Property damage of \$500,000 or more or damage in an amount specified by USACE in current accident reporting regulations
- f. Arc flash incident/accident
- g. Army aircraft destroyed or missing
- h. Three or more individuals ill or with medical condition suspected to be related to a site condition, or a hazardous or toxic agent on the site.

The SSHO will investigate the accident after all emergency actions have been taken. ENG Form 3394 and/or the Preliminary Accident Notification form will be filled out by the SSHO and submitted to the HSM. A verbal notification should be given to the HSM that the forms are being filled out.

IAW 29 CFR 1904.39, the contractor will notify OSHA within eight hours when there is a fatality or the hospitalization (inpatient) of one or more persons as a result of a single occurrence. IAW DID HNC-001.02, HNC-002, the contractor will immediately report to the COR or government designated authority any accident that could bring adverse attention or publicity to the USACE. Other lost-time or OSHA-recordable accidents/incidents will be formally reported (i.e., using a written report) to CEHNC within five working days. An OSHA 300 log of work-related injuries and illnesses will be maintained at the site.

#### ***E2.9.4 Accident Response***

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident as long as the accident scene is safe. The SSHO will be immediately summoned if not already aware of the situation to begin immediate first aid. The SSHO will immediately make contact with other field personnel to alert them of a medical emergency situation and recommended action if required. The SSHO will advise the following information:

- a. Location of the victim at the work site
- b. Nature of the emergency
- c. Whether the victim is conscious
- d. Specific conditions contributing to the injury, if known.

For additional information pertaining to Mishap Reporting, please refer to Section 8.0 of the Installation-wide APP (CEHNC, 2019). Attachment 3 contains the APTIM Incident Notification, Reporting, and Management Procedures and applicable forms IAW EM 385-1-1, Section 01, Paragraph 01.D, sub-Paragraph 01.D.05, as provided in Section 8.0 of the installation-wide APP

(CEHNC, 2019). Engineer Form 3394 and the CEHNC Preliminary Accident Notification form are included in Attachment 3.

## ***E3.0 Staff Organization, Qualifications, and Responsibilities***

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### ***E3.1 Health and Safety Manager***

The HSM, Doug Russell, in coordination with the SSHO, is responsible for the development, implementation, and oversight of the SSHP. The HSM shall be available for emergencies and on-site consultation.

### ***E3.2 Project Manager***

The PM, Don Burton, is ultimately responsible for ensuring that all project activities are completed IAW requirements set forth in this plan. The PM is responsible for conducting at least one on-site safety inspection each month during the project and ensuring all accidents, incidents, and near misses on the project are reported and thoroughly investigated. The PM must approve in writing any addenda or modifications of the APP with the concurrence of the HSM for the project. Other responsibilities include:

- Enforcing the requirements of the SSHP. This includes performing safety inspections of the work site and, at a minimum, one formal site safety inspection each month.
- Stopping work, as required, to ensure personal safety and protection of property, or where life or property-threatening noncompliance with safety requirements is found.
- Working with the SSHO to ensure that all site personnel have received the proper medical clearance, ensuring that all site personnel have met appropriate training requirements and have the appropriate training documentation on site, and monitoring all team members to ensure compliance with the SSHP.

### ***E3.3 Site Safety and Health Officer***

The SSHO, Brian Rhodes, has the ultimate responsibility to stop any operation that threatens the health and safety of the team or surrounding populace or that causes significant adverse impact to the environment. Mr. Rhodes is the designated competent person for planned activities at RSA-122/RSA-183. Attachment 4 contains proof of qualifications and experience. Other responsibilities include but are not limited to:

- Implementing all safety procedures and operations on site
- Observing work crew members for symptoms of on-site exposure or stress
- Upgrading or downgrading, in coordination with the HSM and the PM, the levels of personal protection based upon site observations and monitoring results



- Informing the project HSM of significant changes in the site environment that require equipment or procedure changes
- Arranging for the availability of first aid and on-site emergency medical care, as necessary
- Determining evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation
- Ensuring that all site personnel and visitors have received the proper training and medical clearance prior to entering the site
- Establishing EZs, contamination reduction zones (CRZ), and support zones (SZ)
- Presenting TSMs and maintaining attendance logs and records
- Ensuring that the respiratory protection program is implemented
- Ensuring that decontamination procedures meet established criteria
- Ensuring that there are qualified first-aid persons on site who are trained in universal precautions and the use of PPE
- Coordinating safety activities such as training, identifying site hazards, and establishing controls for all site workers as necessary.

#### ***E3.4 Subcontractors and Suppliers***

The subcontractors for the provided definable features of work/activities (Section E2.3) have not been identified at this time. Subcontractor personnel proof of training and competency and certificates of employee medical surveillance program participation will be provided to the COR and CEHNC safety office for review and approval prior to the start of any activities. A notice to proceed will not be requested by APTIM until training, qualification and medical surveillance records are reviewed and accepted by the safety office. Each subcontractor working on the project site will be required to adhere to the installation-wide APP/SSHP and the requirements presented below.

- All subcontractors performing work on site will be prequalified and screened for safety performance and compliance with federal alcohol and substance abuse requirements prior to being issued any contract. APTIM will utilize AMS-710-02-PR-04400, *Subcontractor Evaluation, Selection, and Monitoring*, to provide a consistent approach to subcontractor procurement, including review of their internal safety programs, plans, and procedures. Subcontractors will comply with the requirements for site safety as outlined in this SSHP. The SSHO will be responsible for oversight of the conduct and control of APTIM subcontractors.

- All subcontractor employees are subject to the same training and medical surveillance requirements as APTIM personnel, which is dependent upon their specific job activity. All activities involving the potential for worker exposure to site-related hazardous materials will require medical and training certification as mandated by 29 CFR 1910.120, *General Industry Regulations HAZWOPER*; 29 CFR 1910.1200, *Hazard Communication*; and EM 385-1-1, *USACE Safety and Health Requirements Manual*.
- All subcontractor personnel will be required to sign in daily and attend a daily meeting discussing operations and safety issues. This includes meeting applicable COVID-19 pre-work screening requirements. All incidents involving subcontractor employees shall be reported immediately to the PM and HSM, and a copy of the subcontractor's and APTIM incident report shall be submitted to the SSHO within 24 hours. Subcontractors are required to read and sign the SSHP and comply with all requirements of this SSHP. Contractors not in compliance will be immediately dismissed from the site.
- Suppliers delivering various materials to the project site or providing equipment and/or equipment maintenance will comply with all APTIM rules and regulations. Supplier personnel will not be permitted into restricted areas unless training and medical surveillance are IAW 29 CFR 1910.120.
- The management organization of each subcontractor is responsible for the compliance of their personnel with the installation-wide APP/SSHP as well as their own health and safety program. The PM and SSHO will ensure subcontractor compliance with this SSHP. Since subcontractors are hired for their specific expertise, they must assume primary responsibility for the safety and health of their personnel. However, APTIM is still responsible for the actions of the subcontractors, which is why subcontractors must abide by the installation-wide APP/SSHP. APTIM may elect to allow subcontractors to follow their own health and safety plan procedures as long as they are more protective of APTIM's or EM 385-1-1 requirements following review and approval by the HSM and client as applicable.

### **E3.5 Stop Work Authority**

All personnel have the right and duty to stop work when conditions are unsafe and to assist in correcting these conditions IAW AMS-710-05-PR-00400, *Stop Work Authority* (Attachment 2). If the SSHO determines that workplace conditions present an immediate uncontrolled risk of injury or illness, immediate resolution with the PM shall be sought. If the PM is unable to correct the unsafe conditions, the PM will consult with the HSM and will be authorized and required to issue a Stop Work Order, which shall be immediately binding on all affected APTIM employees, subcontractors, and operations.

## **E4.0 Training**

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### **E4.1 Initial and Supervisory Training**

All APTIM or subcontractor employees performing work at RSA shall receive initial safety indoctrination training before beginning actual fieldwork. This training will be performed by the competent/qualified Site Manager or SSHO. At a minimum, this initial training shall include but not be limited to the following:

- a. RSA facility-specific health and safety training
- b. Site location and description, including emergency routes, first-aid kit locations, occupational medical clinics, and hospital locations
- c. Statement of the APTIM health and safety policy
- d. Project organization, key personnel, and responsibilities
- e. Chemical, physical, and biological hazards including RSA Explosives Safety Management Program
- f. AHA
- g. Hazard communication program
- h. Heat/cold stress
- i. Hearing conservation
- j. Control of hazardous energy
- k. COVID-19 Control Plan
- l. Sanitation
- m. Buddy system requirements
- n. Fire prevention and protection/hot work
- o. Excavation safety
- p. PPE
- q. Site control measures
- r. Exposure monitoring air sampling
- s. Medical surveillance
- t. Emergency Response and Contingency Plan
- u. Record keeping and data management
- v. Incident and near miss reporting and investigation
- w. Site-specific hazard communication.

## **E4.2 Mandatory Training and Certifications**

IAW 29 CFR 1926.65(e), *Hazardous Waste Operations and Emergency Response* (HAZWOPER); EM 385 1-1, *Safety and Health Requirements Manual*, Section 28; HAZWOPER, EM 385-1-97; and AMS-710-04-PR-00300, *Hazardous Waste Operations* (Attachment 2), mandatory training and certifications applicable to the field personnel at the start of the project and any additional personnel assigned during project execution, and some subcontractors include the following at a minimum:

- a. Installation-Wide APP (CEHNC, 2019)/SSHP training
- b. HAZWOPER 40-hour training
- c. Twenty-four-hour supervised training
- d. Hazardous Waste Site Supervisor training (for HAZWOPER supervisors)
- e. Thirty-hour OSHA Construction Safety Training (for SSHO)
- f. Eight-hour HAZWOPER refresher training
- g. APTIM defensive driver training (APTIM only)
- h. Hazard communication training
- i. CPR and first-aid training for a minimum of two people.

Depending on the nature of work and risk assessment, the above requirements may be altered for certain activities.

Personnel who are designated first-aid and CPR responders shall follow the guidelines contained in AMS-710-01-PR-00300, *Bloodborne Pathogens* (Attachment 2).

## **E4.3 Emergency Response Training**

There are no tasks in the scope of work that require specific emergency response training beyond what is required in Sections E4.1 and E4.2. All APTIM personnel who have completed the APTIM 40-hour HAZWOPER training are qualified as emergency first responder awareness level per 29 CFR 1926.65(q)(6)(i). Site-specific emergency response procedures, including chemical agent incidents (CAI), will be reviewed with all site personnel as applicable to the scope of work as a part of site indoctrination. If unanticipated hazardous material is identified during site work or suspect CWM is encountered in low/seldom probability areas, APTIM will stop work, leave the location, follow procedures in the Low Probability Contingency Plan and notify the PM, SSHO, HSM, and Senior Unexploded Ordnance Specialist as applicable. Determinations will be made if assistance from the RSA Fire Department is warranted in the event CWM is suspected. During work in high-CWM probability areas, if CWM is encountered,

APTIM will follow the procedures in the Emergency Response Plan, Section 14.0 of this safety plan.

#### ***E4.3.1 Tabletop Exercises, Surveys, and Pre-Ops for CWM***

Two sets of assessments will be coordinated, prior to the start of field activities on sites with moderate or high CWM probability prior to the start of intrusive activities. The former consists of the RSA Tabletop Exercise and Field Survey. The latter consists of the CEHNC and Army Pre-Operational Surveys and Tabletop Exercises. Field activities will commence only after the successful completion of the surveys.

#### ***E4.3.2 Tabletop Exercise and Field Survey***

APTIM will coordinate with the RSA Garrison and USACE in accordance with RSA Explosives Safety Management Program. The regulation establishes the policy, responsibilities, and procedures for conducting such training at RSA for operations involving hazardous or potentially hazardous operations and materials, to include CWM and explosives. The major concern is the actions APTIM will take with an item (chemical or conventional) if encountered during environmental activities and the actions APTIM will take with a chemical item if encountered during site investigations and remediation.

The RSA Tabletop Exercise and Field Survey are outlined as follows:

1. Phase I. Documentation and training record review and visual (mechanical) inspection.
2. Phase II. Conduct an Operations Assessment of the process using inert or similar material to perform a detailed audit of the SOP.
3. Phase III. Conduct/observe a live operation using actual production materials (as applicable).

#### ***E4.3.3 CEHNC and Army Pre-Operational Surveys and Tabletop Exercises***

Necessary agencies involved in CWM response or similar activities that involve the recovery and assessment of munitions with an unknown liquid fill or the destruction of recovered CWM will participate in a pre-operational survey. The pre-operational survey will be successfully completed prior to initiating any field activities. The pre-operational survey will be conducted by CEHNC using a team of chemical agent and remediation subject matter experts. The United States Army Technical Center for Explosive Safety will participate in the pre-operational survey as technical advisor to and representative of the Office of the Directory of Army Safety. The pre-operational survey is an evaluation to ascertain that personnel, equipment, and materials required for work activities are on site, that personnel are trained and qualified to perform their work

assignments, and that work procedures and safety controls are appropriate for the tasks, effective in accomplishing the work objectives, and provide for an adequate level of safety. At a minimum, the pre-operational survey will:

- a. Ensure that Department of Defense Explosives Safety Board safety submissions have been approved.
- b. Ensure that the work plan, APP, and SSHP have been completed and approved.
- c. Ensure that safety resources (fire and medical support) are qualified and available.
- d. Include simulated operations that are:
  - Conducted by the field team using dummy or inert material and using all required protective clothing and equipment
  - Demonstrate the proficiency of the operational and support personnel in all phases of the planned operations in compliance with the Chemical Site Plan; applicable federal, state, and local regulations; and approved plans and procedures.

As part of the survey, the findings of the expert review team are provided to the team conducting the work and issues are identified, discussed, and addressed with the corrections documented.

Prior to the official pre-operational survey, CEHNC and APTIM will conduct a preliminary review to confirm the readiness of the project team for the pre-operational survey. A team of experts directed by CEHNC performs a review similar to the team of subject matter experts for the pre-operational survey. If the project team is deemed not ready, the pre-operational survey is postponed to give more time for preparations and correct deficiencies. If the project team is deemed ready, the pre-operational survey will be conducted as scheduled.

Tabletop exercises will be conducted by CEHNC with the participation of other RSA Garrison agencies and local responders (e.g., Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE) Analytical and Remediation Activity [CARA], Combat Capabilities Development Command [CCDC] Chemical Biological Center, medical, security, Installation Emergency Operations Center [IEOC]) involved in and supporting the CWM site work. Tabletop exercises use simulations to conduct drills of responses to differing CWM accident and incident scenarios. Tabletop exercises help ensure the effectiveness of the responses, identify deficiencies or omissions in the emergency response process, and establish continuity and coordination among the response agencies.

## **E4.4 Supervisory and Employee Safety Meetings**

### **E4.4.1 Daily Safety and Tailgate Meetings**

The SSHO will conduct daily TSMs at the start of each work shift for all on-site personnel and require any subcontractors to follow equivalent meeting procedures and participate in the APTIM daily safety meetings. The tailgate meeting is a short training or informative session that provides safety guidelines for the planned work activities for the day. The daily tailgate form includes project name and number; date and time; client; work activities; hospital name, address, and phone number; ambulance; chemical hazards; physical hazards; PPE; new equipment introduced on site; and other safety topics. All attendees shall sign off on the tailgate safety form as well as the competent person conducting the meeting. The SSHO will also provide assistance with delivery of safety topics relevant to the day's activity. Additionally, the SSHO shall employ the use of a daily job safety analysis IAW AMS-710-05-PR-01700, *Work Area Hazard Assessment* (Attachment 2).

Supervisors, safety personnel, and PMs shall participate in regional leadership safety councils chaired by senior management. Safety council participation is mandatory and tracked by the HSM, secretary for the safety council.

### **E4.5 Visitor Training**

All visitors are required to comply with the provisions of this APP and all applicable federal, state, local, and RSA regulations. Visitors to the site shall abide by the following (“visitor” means persons not involved in routine site work activities):

- All visitors must stay outside the EZ and CRZ and remain within the SZ during the extent of their stay. Visitors shall be escorted at all times when observing site operations
- Visitors who observe work within the EZ must wear all appropriate PPE before entry into that zone. If respiratory protective devices are necessary, visitors who wish to enter the EZ must produce evidence that within the past 12 months they have had a complete physical examination and respiratory protection training and have been fit tested for the respirator to be used. Visitors are responsible for providing their own National Institute for Occupational Safety and Health (NIOSH)-approved respirators which coincide with applicable cartridges as applicable to site hazard assessment.
- Visitors must check in at the office, where the purpose of their visit will be evaluated. At a minimum, any visitor planning to access a work area will be briefed on the daily TSM information and sign off attending the safety briefing.

#### **E4.6 UXO Training**

**Non-UXO Personnel.** All non-UXO-trained site personnel will be trained in MEC/CA recognition, hazards, and actions to take in the event that they are encountered.

#### **E4.7 Training Documentation**

Documentation of training requirements is the responsibility of APTIM and the subcontractors. Written documentation verifying compliance with 29 CFR 1926.65 (e)(3), (e)(4) (as applicable), and (e)(8) will be submitted to the SSHO before beginning work at the site. Personnel proof of training and competency will be provided to the COR and CEHNC safety office for Army review and approval prior to commencement of field operations. A notice to proceed will not be requested by APTIM until training, qualification and medical surveillance records are reviewed and accepted by the safety office. Types of training documentation include 40-hour HAZWOPER, 8-hour HAZWOPER refresher, 8-hour supervisor training, 30-hour OSHA construction safety, UXO, bloodborne pathogens, hazard communication, first aid, CPR, current physician's certificate, excavation competent person, and applicable qualified operator certification. Documentation of all workers' current training credentials will be kept on site.



## ***E5.0 Personal Protective Equipment***

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The SSHO will perform daily hazard assessments of work areas and immediately correct any situation where PPE is not being used IAW EM 385-1-1 or this SSHP. The daily assessments will entail compliance with the AHA provided in the SSHP and the job safety analysis, which are the primary forms of hazard evaluation to determine PPE.

APTIM personnel on site will have completed 40-hour HAZWOPER training and annual refresher courses. This training includes when and what type PPE is most protective; how to don, doff, inspect, and wear appropriate PPE; and limitations, care, testing, maintenance, useful life, storage, and proper disposal of PPE.

If APTIM or supervision suspects or is made aware that an employee may not have the proper understanding and skill required of the training, that employee shall be retrained by internal training programs or on site as a daily safety topic associated with pre-shift TSMs and documented as to who received the training and the subjects taught. When new PPE is procured, if previous training was not encompassing specific to the equipment, on-site training will be implemented by competent persons.

AMS-710-02-PR-03000, *Personal Protective Equipment* (Attachment 2), outlines minimum PPE requirements as well as PPE that is provided by APTIM. This procedure, coupled with health and safety management experience, training in proper selection use and maintenance of PPE, site-specific conditions, potential environmental contaminants, physical hazards, and Department of Army guidance documents, will dictate site-specific requirements. Initial protection levels provided in the SSHP have been established for the site work activities based on the anticipated levels of site contaminants, physical hazards, and scope of work. The SSHP and AHAs, in conjunction with AMS-710-02-PR-03000, shall serve as the written certification for use of PPE. All selected PPE shall be used IAW manufacturer's recommendations and best management practices. Once on site, visual inspection of the work activities by the SSHO or PM may indicate the need for changes in PPE level(s). Any significant change in the PPE level will be approved by the program HSM and/or Certified Industrial Hygienist. PPE requirements and procedures for COVID-19 are presented in Section E5.2.

### ***E5.1 PPE Summary***

Hazard and risk assessment is a continuing process to be conducted through the duration of the project. Changes in specific PPE may be made IAW information obtained from actual

implementation of site activities. As a rule, levels of PPE or the incorporation of respiratory protection will need to be reassessed if any of the following occur:

- Appearance of previously unidentified or anticipated chemicals, conditions, or task hazards
- Change in ambient weather conditions that impact the use of assigned PPE
- Introduction of a new task or expansion in scope of a previously assigned and evaluated task.

The SSHO will ensure PPE complies with all applicable OSHA, USACE, and Army regulations. It is the responsibility of each employee to report to work wearing proper attire and inspect the necessary PPE.

Personnel will use the appropriate type of PPE specified in this plan for each individual task. The work activities will begin in the following levels of protection.

<b>Task</b>	<b>Initial Level of PPE</b>
Mobilization and equipment staging	Level D
Utilities identification and locating	Level D
Soil verification sampling	Level D
Construction of erosion controls	Level D
Vegetation clearing and grubbing	Level D
Protection and/or closure of existing wells	Level D
Surveying and marking the proposed excavation areas	Level D
Soil excavation outside occasional CWM areas	Level D
Soil excavation within occasional CWM areas	Modified Level D
Post-excavation confirmation soil sampling and analysis	Level D
Waste characterization sampling	Level D
Soil stabilization, if necessary	Modified Level D
Transport and disposal of excavated soils contaminated with arsenic to disposal facility	Level D
Backfilling	Level D
Heavy equipment decontamination	Modified Level D
Site restoration	Level D

Complete descriptions of Level D and Modified Level D protection follow.

**Level D.** The following equipment will be used for Level D protection:

- Long-sleeved shirt and long pants
- Leather gloves (when handling sharp objects)
- Nitrile gloves (when handling potentially contaminated materials)
- Steel/composite-toed safety boots

- Safety glasses
- Hard hat
- Hearing protection (when working near/adjacent to operating equipment).

**Modified Level D.** The following equipment will be used for Modified Level D protection when performing intrusive work in occasional CWM locations:

- Tychem F, or its equivalent
- Latex boot covers
- Butyl rubber gloves (outer)
- Lightweight nitrile gloves (inner)
- Steel/composite-toed safety boots
- Safety glasses
- Hard hat
- NIOSH-approved chemical, biological, radiological, and nuclear slung respirator for escape
- Hearing protection (when working near/adjacent to operating equipment).

Operators of pressure washing equipment shall wear a face shield, metatarsal guards for the protection of the feet, and leg guards. This will be required in addition to Modified Level D PPE.

**Level C.** Level C protection is not anticipated unless an upgrade in respiratory protection is required based on real-time and near real time CA air monitoring action levels. The equipment to be used for Level C protection will be provided by SSHO as applicable and comply with NIOSH chemical, biological, radiological, and nuclear (CBRN) and Army approved commercial chemical protective equipment.

Table E5-1 and E7-1 provides PPE action levels.

## **E5.2 Special PPE Considerations**

The following considerations will be observed in the selection of PPE:

- During COVID-19 working conditions and when not overruled by any EZ respiratory PPE requirements, each unvaccinated employee shall wear a face mask or other facial covering (as practical) when around other people, especially when social distancing measures (distance of 6 feet in separation) are not practical to maintain. It is also recommended that employees, as practical, wear nitrile gloves at a minimum when working outside the EZ.
- Hard hats will be required when working on any construction site or an overhead hazard exists.

- Where safety or steel-toe boots are not required for an activity, it will be noted in that activity's AHA.
- Safety glasses will be selected that provide site personnel with the best protection from physical hazards, such as flying objects, and adequate splash protection.
- Site tasks should continually be evaluated to identify hazards, and PPE will be provided to ensure the safety and health of site personnel, based on activity they perform.

### ***E5.3 PPE Inspection, Cleaning, Maintenance, And Storage***

All PPE will be inspected before being used to ensure that it is in functional order and that its structural integrity has not been compromised. Reusable PPE (such as safety glasses and hard hats) also will be inspected before being used if it has been in storage for any length of time and following any maintenance. Hard hats will be inspected for expiration dates. Site personnel finding a piece of PPE that is defective will report it to the SSHO, and the defective article will be repaired or replaced.

PPE will be maintained IAW the manufacturer's instructions, and only by personnel who have received proper instruction in the maintenance of the PPE. PPE will be stored in a way that does not compromise the natural shape of the equipment.

### ***E5.4 Respiratory Protection***

The level of respiratory protection selected will be based on real-time air monitoring of the work environment IAW AMS-710-02-PR-03500, *Respiratory Protection Program* (Attachment 2). Based on the primary industrial site contaminants (arsenic) and review of enforceable published exposure standards, respiratory protection is not anticipated. In the event CA is detected during intrusive activities, NIOSH-approved CBRN respirators may be required for escape and additional upgrade in PPE based on action levels presented in the chemical safety submission.

### ***E5.5 Personal Protective Equipment for Visitors***

An adequate supply of hard hats, safety glasses, and other basic PPE will be maintained on site for use by government personnel and other visitors. This does not apply to other government contractors, who must supply their own PPE.

## **E6.0 Medical Surveillance**

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APTIM will utilize the services of a Board-Certified Occupational Medicine physician for the medical surveillance requirements of this project IAW AMS-710-01-PR-05000, *Medical Surveillance Program* (Attachment 2). Dr. William Nassetta (contact information below) will review all APTIM employee medical examinations and will be available for medical consultation on an as-needed basis.

Dr. William Nassetta, MD, MPH  
CORE Health Services  
12091 Bricksome Avenue, Suite B  
Baton Rouge, Louisiana 70816  
(225) 756-2673 (office)  
(225) 295-4846 (fax)

Subcontractors are responsible to provide APTIM medical surveillance documentation reviewed and approved by their licensed occupational physician. The medical clearance shall reference an applicable exam has been performed IAW 29 CFR 1910.120 and 29 CFR 1926.65.

A copy of applicable medical clearance for APTIM and subcontractor personnel shall be maintained on site and furnished to the COR prior to commencement of work

### **E6.1 COVID-19 Virus Control Plan**

AMS-710-01-FM-04201, *COVID-19 Control Plan*, presents the following medical procedures and guidelines that will be followed during the COVID-19 pandemic:

- Medical screening methods and reporting and illness management
- Return to work protocol
- Guidance for potential or known exposures to COVID-19 and employees with COVID-19 symptoms
- Roles and responsibilities for APTIM's preferred Occupational Medical Provider
- Additional resources from the Centers for Disease Control and Prevention.

### **E6.2 Medical Examination**

As required by APTIM, all personnel working hazardous, toxic, and radioactive waste or HAZWOPER projects shall have successfully completed a pre-placement or periodic/updated physical examination. The contents of this examination were determined by the Occupational

Medical Physician. The HSM may consult with the physician and recommend additional testing of employees or subcontractors.

Workers exposed to site hazards, including all employees of APTIM, will participate in a program of medical surveillance of the type specified in 29 CFR 1926.65, the OSHA standard on “Workplace Health and Safety in Hazardous Waste Operations and Emergency Response.” Such workers must present a physician’s statement that they are medically qualified for (1) work in hazardous waste operations and (2) the use of respirators. The SSHO will evaluate all physicians’ letters and refer any questions to the HSM or Corporate Director of Health and Safety (CDHS). Annual or biennial medical certification is required; a physician’s statement must be no older than two years.

### ***E6.3 Pre-Placement Examination***

This examination was designed to meet the requirements of 29 CFR 1926.65 and 29 CFR 1910.120. The APTIM medical surveillance program examination, at a minimum, consists of:

- a. Medical and occupational history questionnaire that includes information on past gastrointestinal, hematologic, renal, cardiovascular, reproductive, immunological, and neurologic problems
- b. Physical examination
- c. Blood pressure measurements
- d. Complete blood count and differential to include hemoglobin and hematocrit determinations, red cell indices, and smear of peripheral morphology
- e. Blood urea nitrogen and serum creatinine
- f. Pulmonary function test (spirometry)
- g. Respiratory protection clearance
- h. Electrocardiogram
- i. Audiogram
- j. Drug screening
- k. Visual acuity.

The employee and his immediate supervisor will be informed of any medical conditions that would result in work restriction or prevent the employee from working at hazardous waste sites.

#### ***E6.4 Annual Examination***

APTIM field employees performing conventional HAZWOPER receive an annual update examination meeting the requirements of 29 CFR 1926.65 and 29 CFR 1910.120. The results of these exams are compared to previous results and the baseline physical to determine if any effects due to exposure have occurred. Appropriate actions are taken as recommended by the physician should the results indicate an exposure; otherwise, employees are cleared for continued work.

The SSHO will note any restrictions stated on a physician's statement and make arrangements to avoid any prohibited activity or condition. In addition, the SSHO will monitor all employees to detect early signs of exhaustion, heat stress, or other conditions that might suggest a lack of fitness for a particular task.

Medical treatment received related to a workplace injury or illness will be managed IAW the OSHA standard referenced in Section E6.2. The SSHO will notify the HSM immediately if such an event occurs.

## ***E7.0 Exposure Air Monitoring and Air Sampling Program***

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The primary contaminant of concern based on review of historical information and analytical data from previous soil sampling activities at RSA-122/RSA-183 is arsenic. Exposure to RSA-122/RSA-183 soils poses an unacceptable risk to human health and the environment. Chemical exposure through skin contact and inhalation during corrective measures is unlikely. The SSHO or qualified field leader will perform air monitoring for total dust during the following activities:

- Site setup and installation of best management practices
- Excavation of contaminated soil
- Soil stabilization, if performed.

A calibrated combustible gas/oxygen analyzer with a photoionization detector (i.e., MSA Sirius or equivalent) will be utilized to monitor the work area for potential flammable and/or oxygen-deficient atmospheres and volatile organic compounds. A DataRam 1000 aerosol monitor or equivalent will be used to determine if airborne material may be present that would necessitate engineering controls such as wetting soils or upgrading of protection level. Action levels for air monitoring are provided in Table E7-1. A conservative action limit for soil is based on maximum concentrations detected. Table E7-2 provides the minimum air monitoring frequency and locations.



## **E8.0 Heat Stress and Cold Stress**

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The potential for heat stress is high due to the physical nature of the work that will be performed during the summer months. Care must be taken to control work schedules and hydration and to observe and respond to symptoms.

### **E8.1 Heat Stress Monitoring Plan**

**Heat Stress.** There is a potential for heat stress for this project because fieldwork may be conducted during the summer months. Team members must realize that extra care must be taken to observe and respond to symptoms as the weather gets warmer and humidity increases. Sweating does not cool the body unless the sweat is evaporated from the body. The use of some PPE (e.g., semipermeable or nonpermeable clothing) can reduce the body's ability to eliminate heat because the evaporation of sweat is hampered. When this occurs, heat stress is a potential for concern. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of potentially hazardous tasks.

#### **Types of Heat Stress**

- **Heat Rash** is a red or pink rash usually found on body areas covered by clothing. It can develop when the sweat ducts become blocked and swell and often leads to discomfort and itching. It is common in hot, humid climates. To help relieve symptoms, start by removing or loosening clothing and moving to a cool, shady spot. Let the skin air-dry instead of using towels. Avoid ointments or other lotions, because they can irritate the skin.
- **Heat Cramps** are painful, brief muscle cramps that occur during or after exercise or work in a hot environment. Muscles may spasm or jerk involuntarily. Cramping may also be delayed and occur a few hours later. Heat cramps are thought to be caused by a deficiency in electrolytes. Heat cramps signs and symptoms are painful muscle spasms usually involving the legs, chest, or abdomen. Rest briefly and cool down. Drink clear juice or an electrolyte-containing sports drink. Practice gentle, range-of-motion stretching and gentle massage of the affected muscle group. Do not resume strenuous activity for several hours or longer after heat cramps go away. Call a doctor if cramps persist after one hour.
- **Heat Exhaustion** occurs when the body gets too hot. Heat exhaustion requires immediate attention because it can progress to heat stroke, a life-threatening illness. The primary treatment for heat exhaustion is to rest in a shady spot or, better, an air-conditioned room, and to drink cool (not icy) fluids. Core body temperature can be lowered by immersion in cold water or spraying with cold water and fanning.

Drinking water is usually enough to reverse dehydration, but drinking a sports drink that contains electrolytes is also helpful.

- **Heat Stroke** occurs when the body's temperature regulatory system has failed. Skin is hot, dry, red, and spotted. These skin color changes may not be readily evident in darker skinned individuals and other signs must be relied upon. The affected person may be mentally confused, delirious, and convulsions may occur. A person exhibiting signs of heat stroke should be removed from the work area to a shaded area immediately. The person should be soaked with water and fanned to promote evaporation. Medical attention must be obtained immediately.

**Early Symptoms of Heat Stress.** Personnel should recognize these early symptoms of heat stress:

- Reduced performance
- Lack of coordination
- Lack of alertness
- Unsteady walk
- Excessive fatigue
- Muscle cramps
- Dizziness.

**Treatment of Heat Stress.** Workers who exhibit heat stress shall seek medical attention. Those employees with more than one heat-related episode in a month will have a doctor's written release prior to returning to exposures in a potential heat stress environment. Table E8-1 provides first-aid steps suggested for victims of heat stress.

**Heat Stress Prevention.** Procedure AMS-710-01-PR-00600, *Heat Stress Prevention and Control*, will be used to establish the minimum requirements for heat stress prevention and control. In hot environments, the following guidelines will be followed to prevent heat-related injury.

- a. Drinking water will be made available to employees, and employees will be encouraged to frequently drink small amounts (for example, 1 cup every 15 to 20 minutes). The water will be kept reasonably cool.
- b. Initial project safety training will include training on the symptoms of heat-related problems, contributing factors to heat-related injuries, and prevention measures. These topics will be repeated during the daily tailgate safety briefing, as needed.
- c. When practical, work will be scheduled for cooler periods during the day.
- d. A buddy system will be established to encourage fluid intake and watch for symptoms of heat-related injury

- e. The SSHO will monitor those individuals who may be more susceptible to heat-related illness. This includes those individuals who have had a previous heat-related illness, are known to be on certain medications that increase the chance for susceptibility to heat injury, or exhibit signs of possibly having consumed large amounts of alcohol in the previous 24 hours.
- f. Breaks will be taken in shaded or air-conditioned areas at intervals to prevent harmful heat stress.
- g. Individuals who are not acclimated will be allowed additional breaks. The period and number should be determined by the SSHO and provided to the supervisor and employee for implementation.
- h. Additional measures will be taken, as needed, to minimize heat stress. These measures may include measures such as pop-up tents over the work area and personal cooling products such as water-retentive bandanas and neck wraps.
- i. Sunscreen should be applied to prevent sunburn. Sunscreen with a sun protection factor of at least 30 will be encouraged, in addition to the use of hats, long-sleeved shirts, sunglasses, or other protective attire.

**Heat Stress Monitoring.** The SSHO will monitor heat stress and adjust heat stress controls to control the hazard to personnel. This monitoring will include visual monitoring of work and work site conditions as well as feedback from work crews.

When conditions at the site exceed 75°F, the SSHO will conduct heat stress monitoring. The preferred method of monitoring is through use of a wet bulb globe temperature (WBGT) heat stress monitor (such as the 3M Questemp QT32 or similar) and the heat stress TLV<sup>®</sup>. The SSHO may also use local reports of heat index or applications such as OSHA's Heat Safety Tool.

The risk of heat-related illness among healthy workers who are acclimated to hot work is low if the WBGT value does not exceed the ACGIH "screening criteria" shown in Table E8-2 (ACGIH, 2019). To use Table E8-2, the SSHO must determine the worker's metabolic heat load (light, moderate, heavy, or very heavy) and determine if a heat stress situation may exist.

It is important to note that Table E8-2 is intended for permeable clothing ensembles only. Nonpermeable ensembles are not anticipated for work at this site; if it is determined that nonpermeable clothing is required, the SSHO will post and implement a similar table for nonpermeable clothing ensembles. Table E8-3 defines the different work loads.

**Note:** These values are intended as an initial screening tool to determine whether a heat stress situation may exist and thus, the values are more protective than the TLV<sup>®</sup>. Because the values are more protective, they are not intended to prescribe work and recovery periods (ACGIH, 2019).

If impermeable clothing such as rain gear is worn in hot environments, additional controls such as cooling vests will be implemented. Physiological monitoring will also be conducted if impermeable clothing is being worn. The following heart rate guidance should be used:

- Count the radial (wrist) pulse during a 30-second period as early as possible in the rest period.
- If the heart rate exceeds 180 beats per minute minus the person's age in years (i.e., 180-age) at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
- If the heart rate still exceeds the calculated heart rate at the next rest period, shorten the following work cycle by an additional one-third and keep the rest period the same.

Additional physiological monitoring, such as continual pulse or core temperature, may be implemented, as needed.

## ***E8.2 Cold Stress Monitoring Plan***

***Cold Stress.*** In addition to the exposure to high temperatures presented in the previous section, exposure to low temperatures presents a risk to employee safety and health through the direct effect of low temperature on the body and collateral effects such as slipping on ice, decreased dexterity, and reduced dependability of equipment. The average low temperature in the winter months at the site can approach 18°F, with January being the coolest month on average. The effects of cold exposure include frostbite and hypothermia, with wind increasing the chances of these effects taking place.

***Types and Symptoms of Cold Stress.*** Hypothermia is a life-threatening condition in which the core body temperature falls below 95°F. Hypothermia can occur at temperatures above freezing, particularly when the skin or clothing becomes wet. During exposure to cold, maximum shivering occurs when the core temperature falls to 95°F. As hypothermia progresses, depression of the central nervous system becomes increasingly more severe (Table E8-4). This accounts for the progressive signs and symptoms ranging from sluggishness and slurred speech to disorientation and eventually unconsciousness.

Frostbite is a term which denotes areas of cold injury on a body. Frostbite rarely occurs unless environmental temperatures are below freezing, usually below 20°F. Injuries from frostbite normally occur on the distal parts of the body (nose, earlobes, hands, and feet) that are subject to intense vasoconstriction when they get cold. The three general categories of frostbite are presented in Table E8-5.

**Cold Stress Prevention.** The potential for cold stress is determined primarily by two variables: the temperature of the air and the speed of the wind. The cooling effects of moving air on exposed flesh can be expressed as an equivalent chill temperature (ECT), which combines temperature and air speed. At a given temperature, calm air is less dangerous.

Table E8-6 shows values of ECT for various temperature and speed combinations. The conditions represented by Zones B and C are extremely dangerous to exposed skin. Continuous exposure of exposed skin should not be permitted if the ECT is 25°F or less. Work under conditions represented by Zone A is much less dangerous to exposed skin. However, workers can suffer frostbite injury in the less severe environment if they develop a false sense of security and fail to take precautions.

At low ECT values, precautions against hypothermia are necessary, even if workers are dressed in well-insulated clothing. The danger of hypothermia is especially severe if immersion in water is possible during the work.

The SSHO will make an assessment of the potential for cold stress before fieldwork begins, primarily through local weather reports but also by using thermometers or wind speed measuring equipment on site as needed. When the wind chill falls below 0°F (-17 degrees Celsius), the air temperature and wind speed will be monitored every 2 hours or more frequently.

Work rules related to the prevention of cold-related injury will be required if conditions of the types represented in Zones A, B, or C in the ECT table are anticipated. Under such conditions, the SSHO will measure temperature and wind speed when work commences each day and at routine intervals (at least every 4 hours) thereafter, unless he/she believes that some other means of hazard assessment is adequate. The CDHS must approve any alternative means of hazard assessment. When work is conducted under conditions represented in Zones A, B, or C, the SSHO will implement the work rules described below to manage the potential hazard.

- Employees will receive training on the dangers and symptoms of cold-related injury and the work rules adopted to prevent it.

- Site workers will be warned that older individuals and people with circulatory problems might be at increased risk for cold-related injury and that added precautions might be necessary to protect them.
- Each employee will be under protective observation by someone else during work (use of the “buddy system” will be required).
- Employees who experience pain in the extremities or are shivering will be removed from exposure to the cold work environment.
- Work must be halted if frostbite cannot be prevented. Continuous skin exposure will not be permitted when the ECT is -25°F or less (Zones B and C on the ECT table).
- Tasks should be scheduled to avoid long periods during which workers must sit or stand still.
- Work expectations for new employees should be adjusted downward for the first few days, to permit acclimatization to the cold conditions.
- Dehydration, which decreases blood flow to the extremities, should be avoided. Employees will be encouraged to replenish water lost to perspiration and respiration. The SSHO will provide soups and warm sweet drinks as appropriate.
- The SSHO will develop procedures that reduce the likelihood of immersion in water or soaking of the clothing by other means during project work. Such precautions should apply to any work with liquids like gasoline, alcohols, solvents, or cleaning fluids.
- The SSHO will plan for any likely scenarios that would lead to wet clothing (through immersion in water, soaking by mist, etc.), and provide for quick changing into dry clothing and treatment for hypothermia.
- Emergency plans will give special attention to the prevention of cold-related injury (hypothermia and freezing of damaged tissues).

If continuous work must be performed at an ECT below 19.4°F, then the SSHO or PM will provide a heated shelter (truck, car, tent, cabin, or similar space) for warming after exposure to the cold environment. Employees should be encouraged to use the shelter at frequent intervals and upon (1) onset of pain or heavy shivering; (2) occurrence of minor frostbite; or (3) onset of feelings of excessive fatigue, drowsiness, irritability, or euphoria. For these conditions, the SSHO will monitor weather and environmental conditions and implement a mandatory work/warming regimen according to Table E8-7.

The rules implemented by the SSHO will require that employees wear adequately insulating dry clothing if conditions of the type represented in Zones A, B, or C in the ECT table are

anticipated. Workers should wear cold-protective clothing appropriate for the environmental conditions and the level of physical activity. The following considerations should guide the selection and use of protective clothing:

- Layered clothing will be used to preserve body heat. An easily removable outer windbreak garment should be worn in windy conditions.
- Inner garments and underwear will be made of fabrics that dry quickly and wick moisture away from the body.
- Outer garments will be made with provisions for easy ventilation to prevent inner layers to be wetted by sweat.
- An employee will not enter or remain in a cold work environment if his or her clothing is wet because of sweating. If clothing is wet, then the employee must change into dry clothing before returning to the cold environment.
- Gloves and/or mittens will be used as necessary to protect the hands, and employees will be warned not to touch very cold objects and surfaces with bare skin.
- Workers will routinely change socks and removable felt insoles to reduce moisture around the feet.
- Eye protection suitable to the type of hazard will be used. Special precautions against ultraviolet light and glare might be necessary in snow-covered terrain.
- Hard hat liners will be used. If work must be done on slippery surfaces, then shoe attachments that enhance traction shall be used.

## ***E9.0 Standard Operating Safety Procedures, Engineering Controls, and Work Practices***

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This chapter outlines the general hazards and safe work practices that all site personnel will follow to eliminate or reduce the risk of exposure to anticipated site hazards. These controls are presented as a guide for site personnel and do not cover all compliance issues. The Site Manager and SSHO will ensure full compliance with applicable regulatory requirements.

### ***E9.1 Site Rules/Prohibitions***

General safe work practices for every job site include the following:

- ***Using the Buddy System.*** Employees will not work alone. Every employee is required to work near someone else who could offer assistance or summon help in the event of an accident or illness. At all times, an employee on a field site must be observable by at least one other person or sufficiently close to at least one other person to communicate by voice.
- ***Reporting Unsafe Conditions.*** Site personnel will immediately stop unsafe work and report to the SSHO any unsafe acts or conditions, including violations of this document or the Installation-Wide APP (CEHNC, 2019).
- ***Reporting Injuries and Illnesses.*** All injuries or illnesses, including the potential harmful effects of the COVID-19 virus and apparently minor ones such as insect bites, will be reported to the SSHO promptly.
- ***Near Miss and Great Catch.*** Within 24 hours, site personnel shall complete the Near Miss/Great Catch Form (AMS-710-05-FM-02301) and ensure the same data are entered into the APTIM Incident Management System. This represents the minimum initial incident data. A Near Miss Incident is where no property was damaged and no personal injury was sustained. However, given a slight shift in time or position, damage to property and/or personal injury could have occurred. A Near Miss differs from a Great Catch due to the fact that there has been a release of energy (i.e., an incident). A Great Catch is a condition identified/observed prior to any incident occurring which may have resulted in property damage or personal injury, but where given a slight shift in time or position, damage to property and/or personal injury could have easily occurred.
- ***Reporting Pre-Existing Medical Conditions.*** Site personnel will inform the SSHO of any known medical conditions that may cause illness in the workplace, aggravate a possible work-related illness, or increase the likelihood of accidents. This includes hypersensitive allergic reactions to stinging and biting insects or to contact with poisonous plants; diabetes; high blood pressure; skin or eye sensitivity to sunlight and ultraviolet radiation; chronic illness; and acute illnesses such as a cold, the flu, or stomach/intestinal disorders. Persons with known hypersensitive allergic



reactions to stinging/biting insects or to toxic plants will carry appropriate emergency medical antidotes on their person at all times when on site.

- **Prohibiting Horseplay.** Site personnel will not engage in horseplay, running, or other irresponsible behavior or harm people, property, or the environment.
- **Avoiding Skin Contact with Poisonous Plants.** Personnel in vegetated or wooded areas will wear long-sleeve shirts with the sleeves rolled down to reduce contact with poisonous plants.
- **Eating, Drinking, and Smoking Restrictions.** Eating, drinking, and smoking will be permitted only in areas designated by the SSHO and at designated break times after employees have washed their hands. Eating, drinking, and smoking will be forbidden in any EZ or nearby decontamination area.
- **Prohibiting Ignition Sources.** Ignition of flammable materials in any work area is prohibited, unless approved in writing by the SSHO. Matches, lighters, or other sources of sparks will not be allowed in any EZ or nearby decontamination area.
- **Limiting Personnel Exposed to Potential Risks.** The number of personnel in any work area will be the minimum number necessary to perform work tasks in a safe and efficient manner.
- **Reporting the Location of Site Personnel.** Site personnel will check in with the SSHO before leaving the site and upon returning to the site.
- **Escorting Site Visitors.** Site visitors are to be escorted by the SSHO, or an appropriate designee, at all times.
- **Qualifying Personnel for Specific Tasks.** Site personnel will perform only those tasks for which they are qualified by training and, when applicable, appropriate certifications. Such certifications will include those required by this document.
- **Limiting Admission to Work Areas.** No one may enter a site work area without the approval of the SSHO. The SSHO will consider the qualifications of each entrant and the risks present in the areas into which entry is desired.
- **Housekeeping.** All work areas will be maintained in a clean, neat, and orderly fashion, free of loose debris and scrap. Any materials and equipment not being used will be stored or discarded properly. All work areas will be supplied with a trash receptacle that includes a lid. The contents of all trash receptacles either will be removed from the site daily or emptied daily into a larger trash storage container that will be tightly closed each night prior to departure of personnel from the sites.

### **E9.2 Work Permit Requirements**

The scope of work for this project does not anticipate work requiring work permits, such as radioactive work, hot work, confined space, etc. Should a work permit be required, AMS-710-02-PR-06400, *Permit to Work* (Attachment 2), will be followed.

### **E9.3 Material Handling Procedures**

Execution of on-site activities will require handling of numerous items. Precautions shall be taken when lifting or handling heavy or bulky items. Back strain or injury may be prevented by using proper lifting techniques. The fundamentals of proper lifting include:

- a. Consider the size, shape, and weight of the object to be lifted. Two persons must lift an object if it cannot be lifted safely alone (e.g., greater than 60 pounds).
- b. The hands and the object should be free of dirt or grease that could prevent a firm grip.
- c. Gloves must be used, and the object inspected for metal slivers, jagged edges, and burrs, rough or slippery surfaces.

### **E9.4 Drum/Container/Tank Handling**

Improper handling of drums and containers can result in severe injuries. These include painful back sprains, smashed toes and fingers, or exposure to potentially hazardous chemicals, if the contents are leaking. Proper work practices can minimize risk of injury, so personnel should use the following recommendations:

- a. Prior to handling the drum, read the label on the drum and look for symbols, words, or other marks that indicate if its contents are hazardous, corrosive, toxic, or flammable. If the drum is not labeled, consider the contents hazardous until they are positively identified.
- b. Look around the drum to see if it is leaking. Before cleaning up any spill, make sure the substance has been identified. Make sure that you have been trained in the hazards of the chemical and have the correct materials for cleaning it up. Find and review the appropriate SDS.
- c. Before moving the drum or barrel, replace missing bungs and/or lids and secure as necessary.
- d. Depending upon the contents of the drum, estimate its weight. Determine whether you can move it yourself or need assistance. A 55-gallon drum can weigh 400 to 800 pounds, depending on content.
- e. Use a forklift or heavy equipment, such as a hand truck or a drum cart that is designed specifically for drum handling.

- f. If the drum can be rolled, stand in front of it and place both hands on the far side of the chime. Pull the drum forward until it balances on the bottom chime. You can now roll the drum on its chime, being careful to keep your hands from crossing over one another. You can also lower the drum to the ground for rolling by shifting your hands to the bottom side of the chime (not where they will be crushed). Then slowly lower the drum to the floor. Keep your back straight and bend at your knees. Then roll the drum with both hands. Do not use your feet or grasp the ends.

### **E9.5 Fatigue Management Plan**

The following workday duration limitations shall be in effect for work at the site:

- Personnel working on site, including those who are operating hoisting equipment or mobile construction equipment, may work up to 12 hours at the site, not including travel time to/from their home/motel or uncompensated lunch breaks. This workday duration is subject to reduction by the other requirements and factors described in the bullets below. The 12-hour limit is primarily because of motor vehicle driving restrictions.
- While on duty, personnel, will not operate motor vehicles after being in a duty status (regardless of their role or function) for more than 12 hours during any 24-hour period without at least 8 consecutive hours of rest. Personnel may work an additional 2 hours at the motel or their home (for a total 14-hour day), though they are still subject to reduction by the other requirements and factors described below. A minimum of 8 consecutive hours will be provided for rest in each 24-hour period.
- Personnel shall not operate motor vehicles after being in a duty status (regardless of their role or function) for more than 12 hours during any 24-hour period without at least 8 consecutive hours of rest. A minimum of 8 consecutive hours shall be provided for rest in each 24-hour period.
- No employee may drive continuously for more than 10 hours in any single, on-duty period (or 24-hour period without at least eight consecutive hours of rest.)

Training provided to personnel in the Safety and Occupational Health Orientation will include symptoms of fatigue, habits and actions the worker may take to avoid fatigue, actions workers should take if they observe fatigue in a co-worker, a discussion of fatigue impacting driving to and from work, and controls in place to prevent fatigue.

The SSHO is responsible for adjusting the workday duration within the limits set above. The following factors will be considered for adjusting the workday duration:

- Time of year (e.g., reduce the workday duration because there is less daylight in winter).

- Temperature/weather (e.g., reduce workday duration when the temperature is very hot or very windy).
- Type of work (e.g., reduce workday duration for personnel involved in physically demanding phases of work).

### ***E9.6 Hearing Conservation***

Equipment and tools generate noise. Hearing loss resulting from occupational exposure to noise can be prevented through the use of hearing protection. Personnel will wear hearing protection when working with or around operating equipment or power tools that generate noise at 85 dBA or above—levels that require a person to raise his/her voice to carry on a conversation at a distance of 3 feet. Warning signs will be posted in areas where noise greater than 85 dBA necessitates the use of hearing protection. The use of headphones for entertainment purposes is prohibited.

### ***E9.7 Fire Prevention Plan***

Any APTIM activities that could cause a spark will be carefully monitored. At least one 10BC rated fire extinguisher will be kept in each site vehicle and maintained on site during operations. The SSHO will ensure that the extinguishers are inspected monthly. The following standard safety measures will also be implemented during site field activities to minimize the risk of fire and/or explosion:

- a. Smoking is permitted on site only in the designated smoke area at least 50 feet from operations with a potential fire hazard.
- b. Good housekeeping procedures will be required on site to keep work areas clear of accumulating combustible scrap and debris.
- c. Material storage methods will be IAW manufacturers' recommendations.
- d. Flammable liquids will be stored in approved portable containers.
- e. All handling or use of flammable and combustible liquids shall be conducted by trained personnel.
- f. Entry and exit pathways and fire lanes shall be kept clear of debris or obstacles.
- g. An APTIM hot work permit is required for all spark- and flame-producing operations, and the RSA Fire Inspector shall be notified in advance of planned hot work.
- h. Work areas will be cleared of excess vegetation and obstructions.

If a fire or explosion occurs, the SSHO will notify the nearest fire department and Emergency Medical Services, contact the PM, and escort the response personnel to the location of the fire or explosion. The SSHO will determine the extent of the fire, use available on-site fire extinguishers (Type 2A:10BC) on incipient stage fires only, and provide emergency first aid as needed. Site personnel will not fight fires containing explosives. The responding fire department personnel will be informed of the nature of the fire and if explosives are present.

### ***E9.8 Hazard Communication***

SDSs for hazardous chemicals that may be required during site operations will be provided on site to all affected employees. The SSHO will manage the SDS file and chemical inventory. AMS-710-01-PR-00400, *Hazard Communication*, will be implemented on site (Attachment 3). Employee hazard communication training occurs on an annual basis as a component of the APTIM 8-hour HAZWOPER refresher course and site-specific training is a component of initial safety orientation training. HAZCOM training provided in the APTIM 8-hour refresher includes the latest requirements under the Globally Harmonized System.

## ***E10.0 Site Control Measures***

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Work zones will be established so that on-site activities do not spread contamination. The site will be set up so that there is a clearly defined EZ and a clearly defined SZ with a CRZ as a transition between the EZ and SZ.

### ***E10.1 Work Zone Access Control and Security***

The SSHO and Site Manager will control access to the site during operations and enforce the restrictions found elsewhere in this document upon site visitors. If difficulties related to access control and site security arise, the SSHO will confer with the HSM to identify corrective action. As applicable, workers and site visitors will be screened for COVID-19 IAW AMS-710-01-FM-04201, *COVID-19 Control Plan*.

### ***E10.2 Work Zones***

**Site Work Zones.** The purpose of establishing work zones and maintaining site control is to minimize potential contamination of workers, protect the public, and prevent unauthorized entry to work areas. Site control involves the physical arrangement of, and controlling access into, established work zones. The Layout Plan will help ensure protection against the hazards presented by confining activities to the appropriate areas.

To reduce the spread of hazardous materials by workers from the contaminated areas to the clean areas, zones will be delineated to aid in controlling the flow of personnel and equipment between the zones. The establishment of the work zones will help ensure that personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency. The work zones allow the use of multiple teams or portions of teams conducting excavations simultaneously. The two work zones, designated the EZ and the SZ, are described in greater detail below.

**Exclusion Zone.** The EZ is the area in which contamination does or could occur. An EZ will be established during site operations to prevent personnel from entering the active work areas without proper PPE. The EZ around a potentially hazardous operation will be determined in each case by the SSHO. The size of the EZ will depend on the activity being performed and the hazards present at the site. For the purpose of the removal action, the EZ shall be the perimeter of the active excavation activities.

APTIM personnel and subcontractors will be properly trained in controlling and minimizing access to the EZ. If an unauthorized person enters the EZ, work will stop and said person will be stopped and escorted out of the EZ and met by the SSHO or Site Superintendent to determine if there is a need for decontamination or medical assistance. Work will not commence again until the unauthorized person has left the EZ. In addition, site control measures will be reevaluated. The unauthorized entry will be recorded in the field notebook.

**Contamination Reduction Zone.** The CRZ is the transition area between the contaminated area and the clean area. If required, the PDS will be located within the CRZ, preferably upwind in the prevailing wind direction. This zone provides an area to prevent or reduce the transfer of hazardous materials that may have been picked up by personnel or equipment leaving the EZ. Personnel exiting the EZ shall doff disposable PPE into appropriate plastic bags. Heavy equipment shall remain in the EZ until excavation is complete and then be cleaned to remove large soil deposits before being released from the site. The SSHO shall verify equipment being released has undergone appropriate cleaning.

**Support Zone.** The SZ is considered a clean area and will be located at a sufficient distance from the intrusive activity to ensure the safety of the SZ personnel. The SZ is separated from the CRZ by the contamination control line. Public access beyond the contamination control line will be prevented during intrusive operations. The SZ contains the command post and other support supplies. Level D PPE is appropriate apparel within this zone. Contaminated clothing and equipment are not permitted in the SZ.

### **E10.3 Site Communications**

Effective on-site and off-site communication will be established prior to initiation of site activities. On-site communication will be used to coordinate site operations, to maintain site control, to convey safety information, and to alert site personnel to emergency situations. Off-site communication will be available to ensure effective coordination with off-site management personnel, the USACE, and emergency response services.

All site personnel will be familiar with the different methods of both on-site and off-site communication. The methods that will be used for on-site and off-site communication will include the following:

- Cellular telephones
- Air horns, bullhorns, sirens, or hand signals, as needed.

Site personnel will use cellular telephones or other supplied communication systems for off-site communication. The SSHO will verify that the 911 service is available and will make appropriate alternative arrangements if it is not available.



## ***E11.0 Personnel Hygiene and Decontamination***

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Sanitary and washing facilities, personnel and Level D decontamination, and waste control plans are discussed below. Additional minimum sanitation requirements presented in AMS-710-01-FM-04201, *COVID-19 Control Plan*, will be implemented due to the COVID-19 pandemic.

### ***E11.1 Sanitary Facilities***

APTIM will ensure toilet facilities are available, with at least one unit for each 15 workers, IAW AMS-710-01-PR-01000, *Sanitation and Potable Water* (Attachment 2), and EM 385-1-1, Section 2 (USACE, 2014).

### ***E11.2 Washing Facilities***

APTIM will provide hand-washing supplies convenient to the work area, including potable washing water and soap IAW AMS-710-01-PR-01000, *Sanitation and Potable Water* (Attachment 2). All hand-washing facilities will be supplied with soap, paper towels, and trash receptacles. All washing facilities or areas will be kept clean and free of trash. For remote locations, hand washing may be accomplished using hand sanitizer or disposal sanitary wipes that meet the requirements of AMS-710-01-FM-04201, *COVID-19 Control Plan*.

All field personnel will wash their hands and faces before eating and drinking and before leaving the site for the day.

### ***E11.3 Personnel Decontamination***

Effective decontamination is not simply removing contaminants; it begins with preventing contamination. Work practice controls limiting direct contact with soil will occur. Employees are always reminded to operate upwind of remedial action operations. For limited soil contact, i.e., sampling, personnel will utilize disposable sampling equipment, minimize direct hand contact with media, and wear nitrile gloves during sample collection activities.

### ***E11.4 Waste Control and Disposal***

Solid trash, paper towels, and other items used in the work areas will be classified as solid waste, containerized, and disposed of appropriately.

## ***E12.0 Equipment Decontamination***

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An equipment decontamination station will be set up in the CRZ for equipment to be decontaminated when exiting the EZ. Due to the COVID-19 pandemic, hand tools and work surfaces will be decontaminated at the equipment decontamination station and not shared with co-workers unless decontamination is completed. Hand tools will be decontaminated at the equipment decontamination station and common work surfaces using soap and water followed by a bleach solution.

For heavy equipment, the operator cab area, including but not limited to equipment controls, will be decontaminated with a mild bleach solution or with a solution that contains at least 60 percent denatured alcohol.

## ***E13.0 Emergency Equipment and First Aid***

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The equipment and personnel required for first aid and CPR will be maintained on site by the SSHO. Emergency equipment required to be on site will have the capacity to respond to project-specific emergencies. Site emergencies may require (but should not be limited to) PPE and equipment to control fires, leaks and spills, or chemical (contaminant or treatment process) exposure.

The emergency equipment listed in Table E13-1 will be on site, stored in the location indicated, and available for use during the operation specified. Emergency equipment assigned to an area or team will be maintained in proper working order by the team, as directed by the team leader. The SSHO will conduct an inspection of all emergency equipment at least weekly to ensure completeness and proper working order.

The size and number of first-aid kits will be sufficient to accommodate the maximum number of people (including government personnel and visitors) on site at any given time.

When required, portable eyewash bottles will be available for immediate use while the injured person is transported to the area where the 15-minute eye flushing station will be available. After flushing, the eyes will be bandaged lightly, and the person will be transported to the appropriate medical facility for further evaluation and treatment, if needed.

Personnel administering first aid and/or CPR will comply with the following:

- Personnel will wear disposable latex gloves if there is any visible body fluid.
- The CPR Pocket Mask will be used when performing CPR and disposed of after use.
- Personnel will immediately change clothing that becomes contaminated with body fluids as a result of performing first aid, or as soon as feasible.
- Personnel will wash their hands immediately after performing first-aid procedures.

## ***E14.0 Emergency Response and Contingency Procedures***

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The frequency and severity of emergency situations can be dramatically reduced through proper implementation of the Installation-Wide APP (CEHNC, 2019). However, if an emergency does occur, quick, decisive action is required. Delays of only minutes can create or escalate life-threatening situations. In an emergency situation, site personnel involved in emergency response and rescue must be prepared to respond immediately. All required equipment must be on hand, in proper working order, and ready to use. To ensure rapid, effective response to a site emergency, the procedures and contingency plans outlined in this section must be implemented before and during any site activities involving exposure to safety and health hazards.

### ***E14.1 Pre-Operational Survey and Tabletop Exercises***

Pre-operational surveys by RSA and by CEHNC and Department of the Army and Tabletop Exercises will be conducted prior to any intrusive operations where a high probability of encountering CWM has been determined. Field activities that practice anomaly avoidance such as analog geophysics, site surveying, and vegetation clearance can be performed prior to successful completion of an installation specific RSA pre-operational survey. The RSA specific pre-operational survey will be coordinated by APTIM and the Garrison safety office. The RSA specific pre-operational survey will be performed after the initial mobilization of key APTIM personnel, contractors, and equipment.

APTIM, in conjunction with the Army, Garrison safety, and RSA Directorate of Emergency Services Operations Branch, will prepare the Pre-Operational Survey Plan, assemble the pre-operational survey team, and conduct the Major Command pre-operational survey (delegated by USACE Headquarters) for the start-up of chemical operations. Local emergency responders and stakeholders will be invited to the Tabletop Exercises, which will evaluate the responses to various emergency scenarios in a meeting room environment.

To ensure that the pre-operational surveys and exercises are a success, all essential APTIM and subcontractor personnel will be mobilized and participate in the exercises. In addition, all personnel who will be involved in the operation, including RSA medical support, CCDC Chemical Biological Center Miniature Continuous Air Monitoring System operators, CARA, security, RSA Fire Department, etc., will be involved. APTIM must pass the pre-operational exercise that shall be undertaken by independent government personnel. The day prior to the actual exercise will culminate with a full-blown internal exercise. All equipment necessary for the exercise will be used and not simulated, although a complete removal of clothing from

personnel during CAI decontamination will not be performed. However, outer PPE will be removed down to undergarments.

Advance planning with all key players inside and outside of APTIM will be performed. Installation security, hospital support, medical teams, Fire Department, environmental branch, etc., who are directly involved in the event of an actual incident will be brought in early and their concerns and requirements seriously addressed and incorporated into the training.

### ***E14.2 Pre-Emergency Planning with Local Emergency Responders***

***Identification of Local Emergency Services.*** APTIM has obtained emergency and non-emergency telephone numbers for emergency services (Emergency Management, Police, or Fire). In the event that evacuation of the general public is required because of either normal site operations or an emergency event, the safety point of contact, PM, or SSHO is responsible for contacting the appropriate local officials who execute and coordinate an evacuation.

Anyone calling for emergency medical services on RSA by dialing 911 with a cellular phone must state that he/she is located on RSA in order for the call to be directed to the proper emergency management office. Any suspect CA exposure requires notification IAW the Explosive Safety Management Program. In the event a medical or MEC emergency occurs, notify the Garrison IEOC at (256) 313-1043 after initial emergency contacts have been completed in order to update IEOC on the situation.

### ***E14.3 Personnel and Lines of Authority for Emergency Situations***

Key personnel roles, lines of authority, and communications plan are detailed in Section 4 of the APP. Emergency response roles are discussed below.

***Personnel On-Scene Incident Commander.*** If an emergency arises, the SSHO assumes the responsibility of the site, with the Site Manager as alternate if the SSHO is unavailable or incapacitated. The SSHO has responsibility for directing all on-site and off-site response personnel and, as soon as possible, advises the PM and HSM of the emergency situation. The SSHO has full responsibility and commensurate authority for responding to any emergency that may occur at the work site until APTIM is relieved by the proper authorities.

***On-Site Emergency Response Services.*** APTIM personnel are trained to provide first-aid treatment for minor injuries. At least two people on site will be trained in first aid and CPR. The SSHO will determine whether any injury requires treatment in addition to first aid.

**Off-Site Emergency Response Services.** Off-site emergency response services that may be needed in the event of a site emergency include medical and law enforcement personnel. All requests for emergency services are accessible via the 911 telephone system. For emergencies, state the location as RSA when contacting 911.

#### ***E14.4 Emergency Recognition and Prevention***

During the development of this SSHP, great attention has been given to identifying potential safety and health hazards associated with conducting site activities. Once identified, these hazards were assessed to determine if they could result in an emergency situation. During an emergency, all active areas will be secured and all work will stop. Field crews will return to predesignated rally points for further direction or the best place of refuge or for evacuation instructions. Emergency alerts will be broadcast on mobile and/or hand-portable field radios. The SSHO will inform the PM of emergencies, security issues, and response actions by telephone as soon as practicable, followed by a written report providing full details. The following potential emergencies may result during site activities:

- Injury or illness
- Fire/explosion
- Inclement weather.

If additional site or task hazard information becomes available during the project, the HSM will assess this information to determine whether the contingency plans in this section need to be updated.

#### ***E14.5 Evacuation Routes and Procedures***

Evacuation routes and procedures are discussed below.

**Evacuation Route.** The established evacuation route will be checked by the SSHO and then reviewed by all site personnel before the start of site activities to become familiar with the route. Emergency meeting points will vary from day to day depending on work location. The planned evacuation route will be discussed with the field crew at the daily tailgate safety briefing.

Emergency evacuation routes will be posted in the field office. All exit routes will be unobstructed and kept free of debris.

**Medical Facilities.** Huntsville Hospital is the designated Emergency/Trauma Center for the project. Contact information for the hospital and other emergency services has been placed at the front of this SSHP. Non-life-threatening occupational injuries/illness beyond on-site first aid

shall be evaluated at the Core Health Networks occupational physician clinic, Crestwood Family Practice, or Crestwood Workers Care Madison.

**Directions to Hospital.** To facilitate the quick retrieval of information in the event of an emergency, a summary that includes emergency contact information has been placed at the front of this SSHP. The routes to the hospital and occupational clinics from RSA-122 and RSA-183 are shown on Figures E-1 and E-2, respectively.

**Medical Evacuation.** Medical evacuation requirements will be determined by the emergency first responder. Personnel requiring additional treatment will be evacuated to the hospital. Any further treatment or evacuation will be arranged by the hospital site personnel who will receive specialized training that will be given by the SSHO and conducted prior to initiating site activities involving safety and health hazards. Training will be documented using the site training log and will include the subjects listed below:

- Emergency chain-of-command communication methods and signals
- Emergency equipment and PPE
- Removal of injured personnel from the site
- Emergency contacts, telephone numbers, and hospital route.

#### **E14.6 Emergency Alerting and Response Procedures**

Emergency response procedures include all steps to be taken for notifying, evaluating, reacting to, documenting, and following up on a given emergency situation. To ensure all necessary elements are covered, implement the procedural steps outlined in this paragraph for each emergency, regardless of its nature.

**Notification.** Once the SSHO has been informed of the emergency, the SSHO will use radio communication to:

- Notify personnel and get their attention
- Stop work activity as required
- Lower noise levels to speed and simplify communication
- Begin emergency or evacuation procedures.

If on-site APTIM personnel or off-site emergency personnel are to enter the site in response to the emergency, the SSHO, to the extent possible, will notify response personnel about:

- What happened and when it happened
- Where on the site the emergency situation occurred
- Who is involved and, if possible, the cause of the emergency
- The extent of damage and what hazards may be involved
- What response actions are required.

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## **TABLES**

**Table E2-1**

**Toxicological and Physical Properties of Chemicals  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

(Page 1 of 6)

Substance [CAS]	IP <sup>a</sup> (eV)	Odor Threshold (ppm)	Route <sup>b</sup>	Symptoms of Exposure	Treatment	TWA <sup>c</sup>	STEL <sup>d</sup>	Source <sup>e</sup>	IDLH (NIOSH) <sup>f</sup>
Arsenic [7440-38-2]	n/a	None	Inh Ing Cont Abs		Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	0.010 mg/m3 0.01 mg As/m3 TWA 0.002 mg/m3		PEL TLV REL	5 mg/m3 as Arsenic
Coal tar pitch volatiles (e.g., pyrene, phenanthrene, chrysene, anthracene, benzo(a)pyrene) [65996-93-2]	?	?	Inh Con	Bronchitis [potential occupational carcinogen]; dermatitis.	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	0.2 mg/m3 0.1 mg/m3		PEL TLV REL	80 mg/m3
Fuel oil (diesel oil, medium)	None	None	Ing Inh Con	Ingestion causes nausea, vomiting, and cramps; depressed central nervous system, headache, coma, death; pulmonary irritation; kidney and liver damage; aspiration causes severe lung irritation, coughing, gagging, dyspnea, substernal stress, pulmonary edema; broncho-pneumonia; excited, then depressed, central nervous system.	Eye: Irrigate promptly Skin: Soap wash Breath: Respiratory support Swallow: Immediate medical attention Aspiration: Immediate medical attention	n/a n/a TWA 100 mg/m3 (as kerosene)		PEL TLV REL	NE

**Table E2-1**

**Toxicological and Physical Properties of Chemicals  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

(Page 2 of 6)

Substance [CAS]	IP <sup>a</sup> (eV)	Odor Threshold (ppm)	Route <sup>b</sup>	Symptoms of Exposure	Treatment	TWA <sup>c</sup>	STEL <sup>d</sup>	Source <sup>e</sup>	IDLH (NIOSH) <sup>f</sup>
<i>Gasoline</i> [8006-61-9]	None	0.3	Inh Ing Con	Intoxication, headaches, blurred vision, dizziness, nausea; eye, nose throat irritation; potential kidney and other cancers. Carcinogenic.	Eye: Irrigate immediately (15 min) Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	300 ppm Ca, lowest feasible conc. (LOQ 15 ppm)	500 ppm	PEL TLV REL	1400 ppm 10% LEL
<i>Hydrogen chloride</i> (hydrochloric acid) [74-90-8]	12.74	0.255-10.6	Inh Ing Con	Inflamed nose, throat, larynx; cough, burns throat, choking; burns eyes, skin; dermatitis; in animals; laryngeal spasm; pulmonary edema.	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	NIOSH REL C 5 ppm (7 mg/m3)  OSHA PEL C 5 ppm (7 mg/m3)	C5 ppm C5 ppm C5 ppm	PEL TLV REL	100 ppm
<i>Isopropyl alcohol</i> (isopropanol) [67-63-0]	10.16	43-200	Inh Ing Con	Mild irritation of the eyes, nose, and throat; drowsiness, dizziness, headache; dry, cracked skin.	Eye: Irrigate immediately Skin: Water flush Breath: Respiratory support Swallow: Immediate medical attention	400 ppm 400 ppm 400 ppm	500 ppm 500 ppm 500 ppm	PEL TLV REL	2,000 ppm

**Table E2-1**

**Toxicological and Physical Properties of Chemicals  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

(Page 3 of 6)

Substance [CAS]	IP <sup>a</sup> (eV)	Odor Threshold (ppm)	Route <sup>b</sup>	Symptoms of Exposure	Treatment	TWA <sup>c</sup>	STEL <sup>d</sup>	Source <sup>e</sup>	IDLH (NIOSH) <sup>f</sup>
Lewisite (Arsenic trichloride)	?	?	Inh Con	Blister agent. Geranium-like odor. Systemic poison causing pulmonary edema, diarrhea, restlessness, subnormal temperature, and low blood pressure.	<p>Eye: Irrigate immediately. Transfer to medical facility</p> <p>Skin: Remove victim from area immediately. Flush skin and clothes with bleach within 1 minute. Cut and remove contaminated clothing, then wash skin again with bleach and then with soap and water. Transfer to medical facility.</p> <p>Breath: Remove from area immediately. Transfer to medical facility</p>		C0.003 mg/m <sup>3</sup>	AEL	

**Table E2-1**

**Toxicological and Physical Properties of Chemicals  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

(Page 4 of 6)

Substance [CAS]	IP <sup>a</sup> (eV)	Odor Threshold (ppm)	Route <sup>b</sup>	Symptoms of Exposure	Treatment	TWA <sup>c</sup>	STEL <sup>d</sup>	Source <sup>e</sup>	IDLH (NIOSH) <sup>f</sup>
Mercury [7439-97-6]	NA	NA	Inh Abs  Ing Con	Irritation of eyes, skin; dizziness, chest pain, bronchitis nausea, Tremor, pneumonitis fatigue; indecision, headache, weakness, GI disorders	Eye: Irrigate immediately Skin: Water flush Breath: Respiratory support Swallow: Immediate medical attention	0.01 mg/m <sup>3</sup> 0.025 mg/m <sup>3</sup> 0.01 mg/m <sup>3</sup>	0.1 mg/m <sup>3</sup>  0.1 mg/m <sup>3</sup>	PEL TLV  REL	2 mg/m <sup>3</sup>
Nitric acid [7697-37-2]	11.95	0.3-1	Inh Ing Con	Irritated eyes, mucous membranes, and skin; delayed pulmonary edema, pneumonitis, bronchitis; dental erosion.	Eye: Irrigate immediately Skin: Water flush promptly Breath: Respiratory support Swallow: Immediate medical attention	2 ppm 2 ppm 2 ppm	4 ppm 4 ppm 4 ppm	PEL TLV REL	100 ppm
<i>Petroleum hydrocarbons (Examples: oils, grease, diesel)</i> [See specific compound and/or product-specific SDS]	Varies	Varies by compound	Inh Ing Con Abs	Irritated skin, eyes, nose, and throat; headache, dizziness; dermatitis; some components of gasoline and diesel exhaust are carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical Attention	Varies by compound	Varies by compound	NA	Varies by compound

**Table E2-1**

**Toxicological and Physical Properties of Chemicals  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

(Page 5 of 6)

Substance [CAS]	IP <sup>a</sup> (eV)	Odor Threshold (ppm)	Route <sup>b</sup>	Symptoms of Exposure	Treatment	TWA <sup>c</sup>	STEL <sup>d</sup>	Source <sup>e</sup>	IDLH (NIOSH) <sup>f</sup>
<i>Portland cement</i>			Inh	Fine gray powder that can be irritating if inhaled or in eyes.	Eye: Irrigate immediately Skin: Soap wash flush Breath: Respiratory support Swallow: Immediate medical attention	10 mg/m <sup>3</sup> 15 mg/m <sup>3</sup> total dust 5 mg/m <sup>3</sup> respirable fraction 10 mg/m <sup>3</sup> /total dust 5 mg/m <sup>3</sup> respirable fraction		TLV PEL REL	NE

Chemical substances italicized represent material that will be used onsite and is not representative of site contaminants.

<sup>a</sup>IP - Ionization potential (electron volts).

<sup>b</sup>Route - Inh, Inhalation; Abs, Skin absorption; Ing, Ingestion; Con, Skin and/or eye contact.

<sup>c</sup>TWA - Time-weighted average. The TWA concentration for a normal work day (usually 8 or 10 hours) and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day without adverse effect.

<sup>d</sup>STEL - Short-term exposure limit. A 15-minute TWA exposure that should not be exceeded at any time during a workday, even if the TWA is not exceeded.

<sup>e</sup>PEL - Occupational Safety and Health Administration (OSHA) permissible exposure limit (29 CFR 1910.1000, Table Z).

AEL - Airborne Exposure Limit.

TLV - American Conference of Governmental Industrial Hygiene (ACGIH) threshold limit value—TWA.

REL - National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit.

<sup>f</sup>IDLH (NIOSH)—Immediately dangerous to life or health (NIOSH). Represents the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.

NE - No evidence could be found for the existence of an IDLH (NIOSH Pocket Guide to Chemical Hazards, Pub. No. 90-117, 2012).

C - Ceiling limit value which should not be exceeded at any time.

Ca - Carcinogen.

NA - Not applicable.

? - Unknown.

LEL - Lower explosive limits.

LC<sub>50</sub> - Lethal concentration for 50 percent of population tested.

LD<sub>50</sub> - Lethal dose for 50 percent of population tested.

NIC - Notice of intended change (ACGIH).

**References:**

American Conference of Governmental Industrial Hygienists Guide to Occupational Exposure Values, 2019, compiled by the American Conference of Governmental Industrial Hygienists.

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## Table E2-1

### Toxicological and Physical Properties of Chemicals RSA-122/RSA-183 Redstone Arsenal, Madison County, Alabama

(Page 6 of 6)

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National Institute for Occupational Safety and Health Pocket Guide to Chemicals, Pub. 1990, No. 90-117, National Institute for Occupational Safety and Health.  
Odor Threshold for Chemicals with Established Occupational Health Standards, American Industrial Hygiene Association, 1989.  
Respirator Selection Guide, 3M Occupational Health and Safety Division, 2020.  
Verschueren, K., Handbook of Environmental Data on Organic Chemicals, Van Nostrand and Reinhold, 1977.  
Warning Properties of Industrial Chemicals—Occupational Health Resource Center, Oregon Lung Association.  
Workplace Environmental Exposure Levels, American Industrial Hygiene Association, 1992.

**Table E2-2**

**Lighting Requirements for Night Operations  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

<b>Location</b>	<b>Illuminance – lx (lumens per square foot)</b>	<b>Monitoring Frequency</b>
Construction areas-general outdoor	33 (3)	Initial shift start/mid-shift
Work areas-general	325 (30)	
Administrative areas (offices, drafting and meeting rooms, etc.)	540 (50)	
Outdoor parking areas	33 (3)	
Visitor areas	215 (20)	
Outdoor storage	33 (3)	

**Table E2-3**

**Biological Hazards  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

(Page 1 of 2)

**Ticks**



**Snakes**



**Coral Snake**



**Copperhead**



**Timber Rattlesnake**



**Eastern Diamondback  
Rattlesnake**

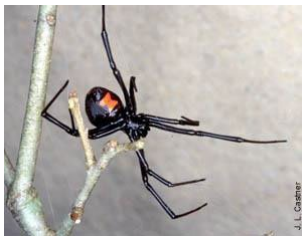


**Pygmy Rattlesnake**



**Cottonmouth (water  
moccasin)**

**Spiders**



**Black Widow**



**Brown Widow**



**Red Widow**










**Brown Recluse**

**Table E2-3**

**Biological Hazards  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

(Page 2 of 2)

<b>Stinging and Biting Insects</b>		
 <p><b>Various Bees and Wasps</b></p>	 <p><b>Mosquitoes</b></p>	
 <p><b>Ants (including Fire Ants)</b></p>	 <p><b>Centipedes</b></p>	
<b>Poisonous Plants</b>		
 <p><b>Poison Ivy</b></p>	 <p><b>Poison Oak</b></p>	 <p><b>Poison Sumac</b></p>

**Table E5-1**  
**PPE Action Levels**  
**Corrective Measures Implementation**  
**RSA-122/RSA-183**  
**Redstone Arsenal, Madison County, Alabama**

Level of Protection	Criteria for Use	Upgrade Criteria
Level D	Initial PPE for all work outside of EZs.	If unanticipated chemical hazards are encountered.
Modified Level D	Initial level of protection for all work in EZ with suspected CAs or CA contamination.	Upgrade to Level C if: <ul style="list-style-type: none"> <li>• Air monitoring detects possible CA (CSS <b>Table 5.1</b>) (unconfirmed) at or above action levels.</li> <li>• Air monitoring detects industrial chemicals at or above action levels.</li> <li>• Presence of strange odor.</li> <li>• Discovery of discolored soils.</li> </ul>
Level C	Initial level of protection when: <ul style="list-style-type: none"> <li>• Air monitoring detects possible CA (<b>Table 5.1</b>) at or above action levels and below 1 x STEL.</li> <li>• No chemical splash hazards.</li> </ul>	Upgrade to Level B if: <ul style="list-style-type: none"> <li>• No chemical splash hazard exists.</li> <li>• Air monitoring detects possible CA (CSS <b>Table 5.1</b>) at or above 1 x STEL.</li> </ul>
Level B	Initial level of protection when: <ul style="list-style-type: none"> <li>• Air monitoring detects CA (<b>Table 5.1</b>) at or above 1 x STEL but less than 10 x STEL.</li> <li>• No chemical splash hazards.</li> </ul>	Upgrade to Level A if: <ul style="list-style-type: none"> <li>• Chemical splash hazard exists.</li> <li>• Air monitoring detects possible CA (CSS <b>Table 5.1</b>) at or above 10 x STEL.</li> </ul>
Level A <sup>1</sup>	Initial level of protection when: <ul style="list-style-type: none"> <li>• Chemical splash hazard exists.</li> <li>• Air monitoring detects possible CA (<b>Table 5.1</b>) at or above 10 x STEL.</li> </ul>	N/A

NOTES:

<sup>1</sup> Level A operations will be performed by CARA only.

EZ – Exclusion zone.

N/A – Not applicable.

PPE – Personal protective equipment.

STEL – Short-term exposure limit.

**Table E7-1**

**VOC Concentrations and PPE Action Levels  
Corrective Measures Implementation  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

When in Level D Modified/D PPE

Analyte	Action Level	Required Action
VOCs	≥ 10 ppm above background in Breathing Zone	Stop activities, suspend work activities for 15 to 30 minutes; if readings are sustained, contact HSM <sup>a</sup> .
Oxygen	≥ 20%, <23%	Normal operations
	< 20%, > 23%	Stop work, evacuate work area; contact HSM <sup>b</sup> .
Flammable vapors	≥ 10% LEL	Stop work, evacuate work area; contact HSM <sup>b</sup> .
	< 10% LEL	Continue operations, monitor for VOCs.
Respirable dust	≥ 1.0 mg/m <sup>3</sup>	Water suppression dust control.

When in Support Zone

Analyte	Action Level	Required Action
VOCs	≥ 1 ppm above background in Breathing Zone	Evacuate support zone and re-establish perimeter of exclusion zone <sup>a</sup> .

<sup>a</sup> Four instantaneous peaks in any 15-minute period or a sustained reading for 5 minutes in excess of the action level will trigger a response. Measurements shall occur in the breathing zone.

<sup>b</sup> Contact with the HSM must be made prior to continuance of work. The HSM may then initiate personal, perimeter integrated air sampling along with additional engineering controls.

**No one is permitted to downgrade levels of PPE without authorization from the HSM.**

- HSM – Health and Safety Manager.
- LEL – Lower explosive limit.
- PPE – Personal protective equipment.
- ppm – Parts per million.
- TLV – Threshold limit value.
- VOC – Volatile organic compound.

**Table E7-2**

**Air Monitoring Frequency and Location  
Corrective Measures Implementation  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

Work Activity	Instrument	Frequency	Location
Excavation	OV Monitor CGI/O <sub>2</sub> /CO Data Ram	Periodically	BZ of employees in excavation area
Confirmation soil sampling	CGI/O <sub>2</sub> /CO OV Monitor	Periodically	BZ of employees

- BZ - Breathing zone.
- CGI - Combustible gas indicator.
- CO carbon monoxide
- ISEB In situ enhanced bioremediation.
- OV - Organic vapor (photoionization detector 10.6-electron volt lamp).
- O<sub>2</sub> - Oxygen.

**Table E8-1**

**Suggested Treatment Actions for Heat Stress  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

<b>Heat Rash</b>	<ul style="list-style-type: none"><li>• Keep the affected area dry.</li><li>• Use dusting powder to increase comfort.</li></ul>
<b>Heat Cramps</b>	<ul style="list-style-type: none"><li>• Stop all activity.</li><li>• Sit in a cool place.</li><li>• Do not return to work for a few hours after the cramps subside – further exertion may lead to heat exhaustion or stroke.</li><li>• Seek medical attention if the worker has heart problems, worker is on a low-sodium diet, or the cramps do not go away in an hour</li></ul>
<b>Heat Exhaustion</b>	<ul style="list-style-type: none"><li>• Move to a cool, shaded (or air-conditioned) area.</li><li>• Loosen any restrictive clothing.</li><li>• Drink plenty of water.</li><li>• Pat skin with a damp rag or sponge.</li></ul>
<b>Heat Stroke</b>	<ul style="list-style-type: none"><li>• <b>CALL 911</b> (or designated emergency number).</li><li>• Move to a cool, shaded location.</li><li>• Cool by soaking clothes with water, spraying or showering them with water, or fanning body.</li></ul>

Adapted from Centers of Disease Control and Prevention Workplace Safety and Health Topics, [www.cdc.gov/niosh/topics/heatstress](http://www.cdc.gov/niosh/topics/heatstress)



**Table E8-2**

**ACGIH Screening Criteria and Action Limit for Heat Stress Exposure  
(WBGT Values in Degrees Celsius/°F)  
RSA-122 and RSA-183  
Redstone Arsenal, Madison County, Alabama**

Work/Recovery Cycle (each hour)	TLV®				Action Limit			
	Light	Moderate	Heavy	Very Heavy	Light	Moderate	Heavy	Very Heavy
75 - 100% work	31/87.8	28/82.4	-	-	28/82.4	25/77	-	-
50 - 75% work	31/87.8	29/82.2	27.5/81.5	-	28.5/83.3	26/78.8	24/75.2	-
25 - 50% work	32/89.6	30/86	29/84.2	28/82.4	29.5/85.1	27/80.6	25.5/77.9	24.5/76.1
0 - 25% work	32.5/90.5	31.5/88.7	30.5/86.9	30/86	30/86	29/79	28/82.4	27/80.6

Values from the current edition of the ACGIH publication Threshold Limit Values (TLV®) and Biological Exposure Indices.

**Proposed Heat Stress Index for working conditions**

APTIM Heat Stress Guideline					
Heat Stress Index					
Danger Category	Heat Index		Heat Syndrome	Resting Time	Water Needed
	°C	°F			
<b>Extreme Danger</b>	<b>55-59</b>	<b>129.3-138.2</b>	<b>Sun stroke imminent without following rest and water intake requirements</b>	<b>15 minutes / hour</b>	<b>250 ml (8.5 oz) / 10 minutes</b>
<b>Danger</b>	<b>46-54</b>	<b>114.8-129.2</b>	<b>Heat Cramps or Heat Exhaustion likely. Heat Stroke possible with prolonged exposure and physical activity.</b>	<b>10 minutes / hour</b>	<b>250 ml (8.5 oz) / 10 minutes</b>
<b>Extreme Caution</b>	<b>38-45</b>	<b>98.7-113</b>	<b>Heat Cramps or Heat Exhaustion possible with prolonged exposure and physical activity.</b>	<b>5 minutes / hour</b>	<b>250 ml (8.5 oz) / 20 minutes</b>
<b>Caution</b>	<b>&lt;37</b>	<b>&lt;98.6</b>	<b>Fatigue possible with prolonged exposure and physical activity.</b>	<b>Normal / Scheduled</b>	<b>250 ml (8.5 oz) / 30 minutes</b>

Do not drink more than 1.5 liters (33.8 oz) per hour (maximum water absorption rate of human body)

Source: APTIM Procedure Number AMS-710-01-PR-0600 Heat Stress Prevention and Control, Attachment 7.1.

°C – degrees Celsius.

°F – degrees Fahrenheit.

oz – ounce.

**Table E8-3**

**Work Load Definitions, Modified ACGIH Table 3, Metabolic Rate Changes  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

<b>Work Load</b>	<b>Examples</b>
Rest	Sitting.
Light	Sitting with light manual work with hands or hands and arms and driving. Standing with some light arm work and occasional walking.
Moderate	Sustained moderate hand and arm work, moderate arm and leg work, moderate arm and trunk work, or light pushing and pulling. Normal walking. Examples: Scrubbing in a standing position. Walking about with moderate lifting or pushing. Walking on level ground at 3.75 miles/hour while carrying a 6-pound load.
Heavy	Intense arm and trunk work, carrying, shoveling, manual sawing, pushing and pulling heavy loads and walking at a fast pace. Examples: Intermittent heavy lifting with pushing or pulling (e.g. pick and shovel work).
Very Heavy	Very intense activity at a fast to maximum pace. Shoveling wet sand.

ACGIH – American Conference of Governmental Industrial Hygienists.

**Table E8-4**

**Symptoms of Hypothermia  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

<b>Core Temperature (°F)</b>	<b>Symptoms</b>
98.6	Normal body temperature
96.8	Person feels cold
95	Shivering
93.2	Clumsy, irrational, confused; may appear drunk
91.4	Muscle stiffness
89.6	Shivering stops, collapse
87.8	Semiconscious
86	Semiconscious; no response to painful stimulus
84.2	Slow pulse and breathing
82.4	Cardiac arrest; no obvious pulse or breathing; pupils dilated

°F – Degrees Fahrenheit.

**Table E8-5**

**Types and Symptoms of Frostbite  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

<b>Condition</b>	<b>Symptoms</b>
<b>Frostnip</b>	Area of skin whitened; slightly burning or painful.
<b>Superficial Frostbite</b>	Waxy, white skin with a firm sensation but with some resiliency. Feels "warm" to the victim with a notable cessation of pain.
<b>Deep Frostbite</b>	Tissue damage deeper than the skin, sometimes down to the bone. Skin is cold, numb, and hard.

**Table E8-6**

**Equivalent Chill Temperature (°F) at Various Air Temperatures and Wind Speeds  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

Estimated Wind Speed (mph)	Actual Temperature Reading (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
>40 has little additional effect	<b>LITTLE DANGER</b> <i>In less than 1 hour with dry skin. Maximum danger is false sense of security.</i>				<b>INCREASING DANGER</b> <i>From freezing of exposed flesh within 1 minute.</i>				<b>GREAT DANGER</b> <i>Flesh may freeze within 30 seconds.</i>			
	<b>Zone A</b>				<b>Zone B</b>				<b>Zone C</b>			
	Trench foot and immersion foot may occur at any point on this chart.											

Notes:

- \* Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.
- \* Equivalent chill temperature requiring dry clothing to maintain core body temperature above 96.80F per ACGIH cold stress TLV.

°F – Degrees Fahrenheit.

**Table E8-7**

**Work/Warming Schedule for a 4-Hour Shift  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

Air Temp. (°F)	Air Speed (mph)				
	Calm	5	10	15	20
-15 to -19	Normal Breaks (1)	Normal Breaks (1)	75 min. max. work period with 2 breaks	55 min. max. work period with 3 breaks	40 min. max. work period with 4 breaks
-20 to -24	Normal Breaks (1)	75 min. max. work period with 2 breaks	55 min. max. work period with 3 breaks	40 min. max. work period with 4 breaks	30 min. max. work period with 5 breaks
-25 to -29	75 min. max. work period with 2 breaks	55 min. max. work period with 3 breaks	40 min. max. work period with 4 breaks	30 min. max. work period with 5 breaks	<p align="center"><b>Nonemergency work should cease.</b> NOTE: The above work/warming regimens are applicable to workers in dry <b>not</b> wet clothing.</p>
-30 to -34	55 min. max. work period with 3 breaks	40 min. max. work period with 4 breaks	30 min. max. work period with 5 breaks		
-35 to -39	40 min. max. work period with 4 breaks	30 min. max. work period with 5 breaks			
-40 to -44	30 min. max. work period with 5 breaks				
-45 and below					

Break period is a 10-minute warmup time in a warm location. Source: ACGIH TLVs and BEIs, Cincinnati, OH, 2015  
Adapted from the Occupational Health and Safety Division, Saskatchewan Department of Labor  
°F – Degrees Fahrenheit.  
mph – Miles per hour.

**Table E13-1**

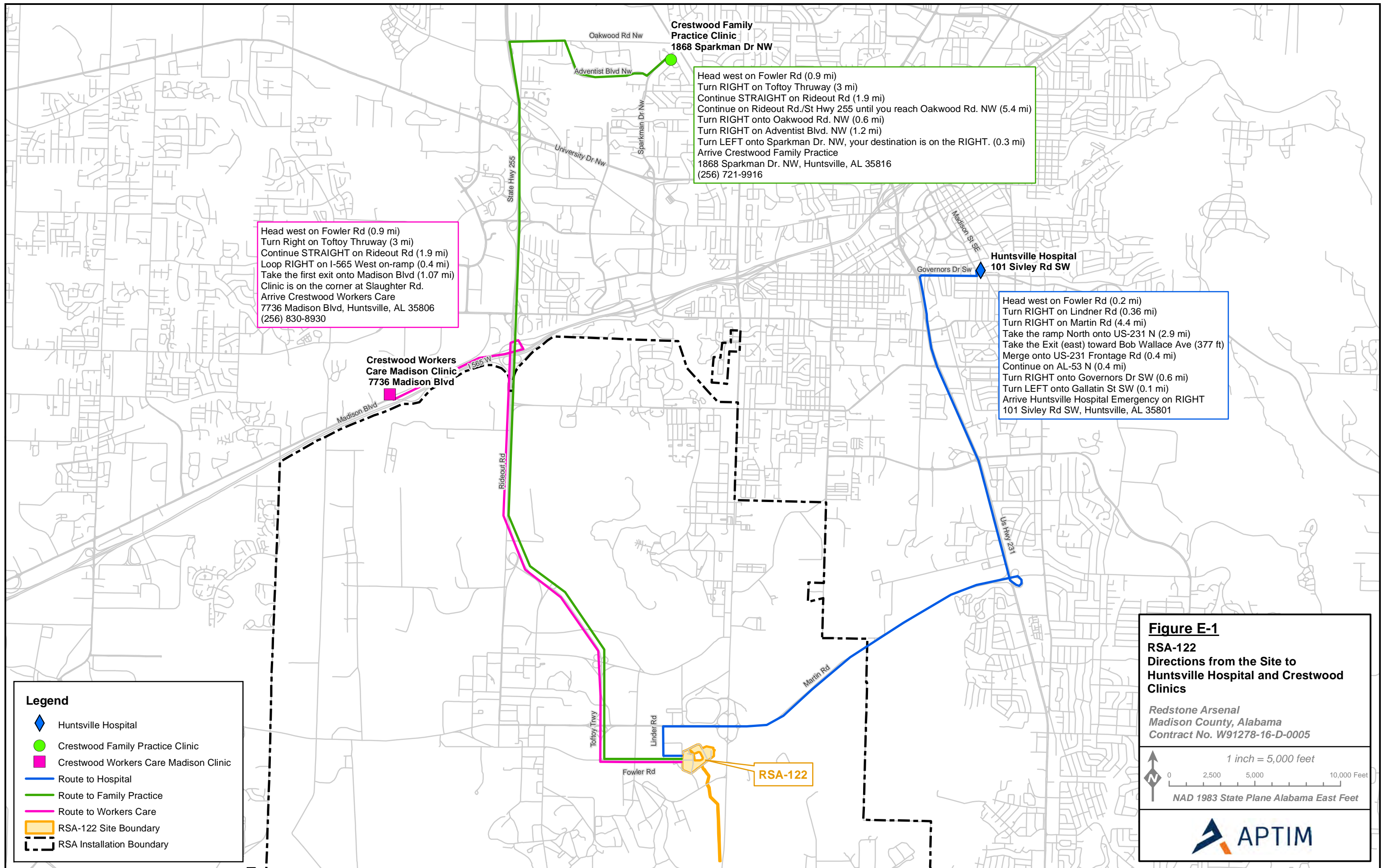
**Emergency Equipment Requirements  
RSA-122/RSA-183  
Redstone Arsenal, Madison County, Alabama**

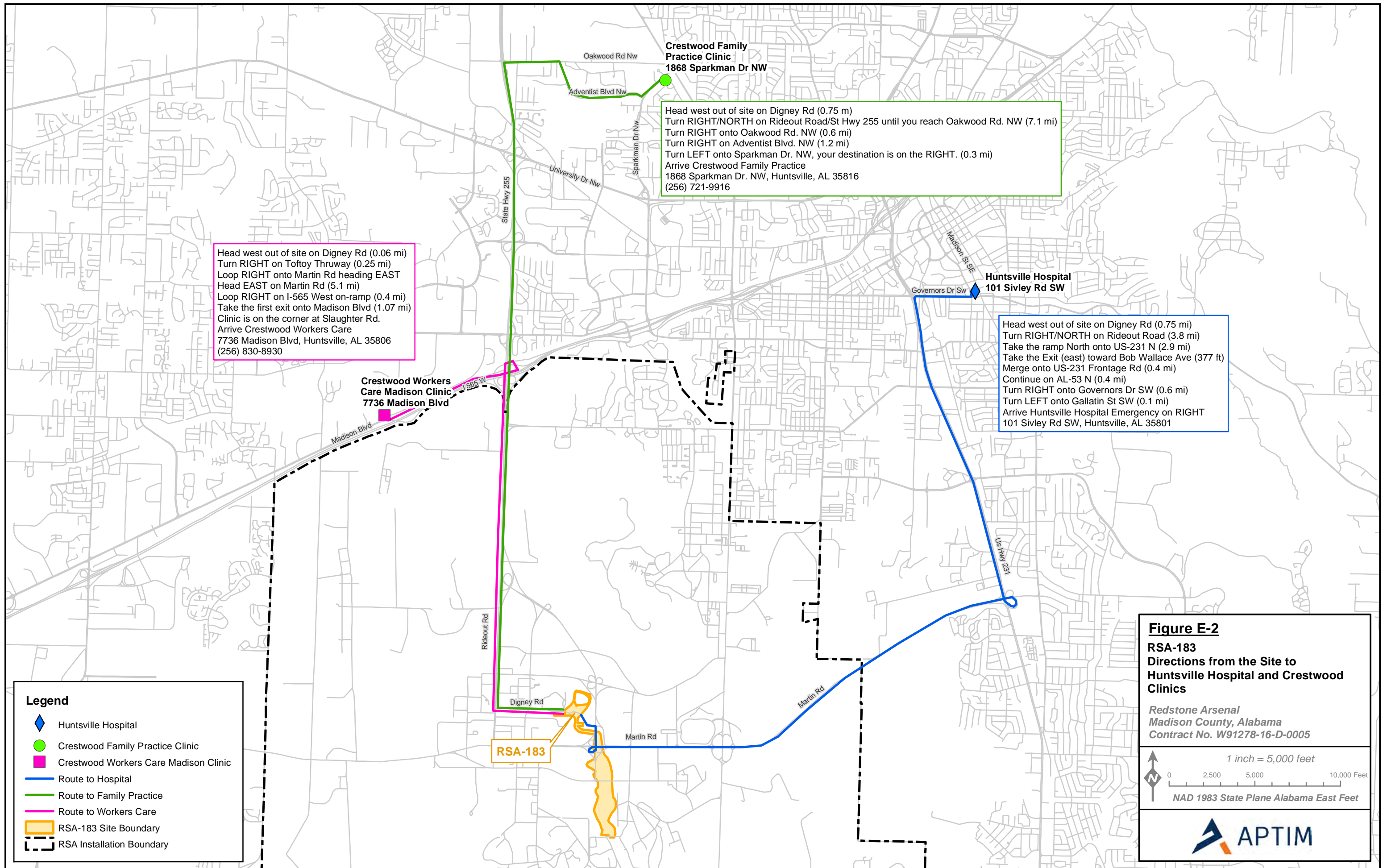
<b>Emergency Equipment</b>	<b>No. Per Location</b>	<b>Area Where Item(s) Will Be Stored</b>	<b>Operation Requiring Specified Equipment</b>
Portable Eye Wash Kit*	2 each	Each vehicle	All operations
First Aid Kit	1 each	On site	All operations
Fire Extinguisher	1 each	Support vehicles, and SZ	All operations
Cellular Telephone/Site Communication	1 each	Site Manager/SSHO and SZ	All operations

\*For use if employees are exposed to corrosives, strong irritants, or toxic chemicals.  
SSHO – Site Safety and Health Officer.  
SZ – Support Zone.

## FIGURES







**ATTACHMENT 1**  
**ACTIVITY HAZARD ANALYSES**

## Activity Hazard Analysis (AHA)

Activity/Work Task: Mobilization (and Demobilization)	Overall Risk Assessment Code (RAC) (Use highest code)	<b>M</b>
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>	
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>
Date Prepared: 03/02/2022		Frequent    Likely    Occasional    Seldom    Unlikely
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	<b>E</b> <b>E</b> <b>H</b> <b>H</b> <b>M</b>
Reviewed by: Doug Russell/HSE Manager	Critical	<b>E</b> <b>H</b> <b>H</b> <b>M</b> <b>L</b>
	Marginal	<b>H</b> <b>M</b> <b>M</b> <b>L</b> <b>L</b>
	Negligible	<b>M</b> <b>L</b> <b>L</b> <b>L</b> <b>L</b>
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment	Step 1: Review each <b>"Hazard"</b> with identified safety <b>"Controls"</b> and determine RAC (See above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	<b>RAC Chart</b>
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	<b>E = Extremely High Risk</b>
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	<b>H = High Risk</b>
		<b>M = Moderate Risk</b>
		<b>L = Low Risk</b>

Job Steps	Hazards	Controls	RAC
Travel at project site.	Vehicle Operation.	See AHA 2.0.	<b>M</b>
Arrival of new personnel at site.	Untrained personnel.	All personnel working on hazardous, toxic, and radioactive waste (HTRW) shall submit HAZWOPER training certificates (40-hour, 8-hour (if applicable), and supervisor (if applicable) to a Site Safety and Health Officer (SSHO). All personnel shall attend a site safety orientation. Other training certifications shall also be made available on site.	<b>L</b>
	Medical qualifications.	All personnel working on HTRW shall submit current physician's certificate stating that employee is participating in an appropriate medical surveillance program meeting 29 Code of Federal Regulation (CFR) 1910.120 and	<b>L</b>
	Allergies.	All personnel should complete the Known Allergies Questionnaire (voluntary only).	<b>L</b>

Job Steps	Hazards	Controls	RAC
Arrival of new personnel at site (continued).	Unfamiliarity with: site, general (chemical, physical, environmental) site hazards, project safety rules and hazard control procedures, chain of command, and emergency procedures.	All personnel shall attend the site orientation training. The site orientation shall include a review of the phone locations, evacuation routes, and any special requests from the manager of the facility. After personnel are trained in the contents of the Accident Prevention Plan (APP), APP Addenda, and they shall sign the APP Acknowledgment Form. Personnel who may participate in intrusive activities shall attend Munitions and Explosives of Concern Awareness Training. All pertinent AHAs shall be reviewed with personnel (as applicable). Post all hazard warning signs, emergency maps, and emergency phone numbers.	L
Unload equipment/prepare site.	Failure to properly plan daily activities.	A Job Safety Analysis (JSA), as required by Aptim shall be prepared by the crew prior to commencing daily activities. The JSA may be used as a component of the morning Tailgate Safety Meeting. The JSA shall be revised at any time throughout the workday when new tasks are initiated, unforeseen circumstances arise, or if working conditions change. Personnel shall implement Hazard Assessment Resolution Program.	L
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 50-pound limit.	L
	Use of mechanical equipment.	Only qualified personnel shall be permitted to operate equipment. Mechanical equipment shall be inspected daily. Deficiencies in equipment shall be noted on the inspection form. Equipment found to be unsafe shall not be used. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts and hearing protection. Ground personnel shall not position themselves between equipment and stationary objects. Personnel are only permitted to approach equipment after a signal from the operator	L
	Hand injuries.	Items to be handled shall be inspected for sharp edges prior to being handled. Personnel shall wear cut resistant gloves when handling sharp materials. Personnel shall be aware of and avoid pinch point hazards.	L
	Electrical.	Ground-fault circuit interrupters shall be used on all power tools and extension cords. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas. Keep extension cords off of roads. Only qualified and authorized electricians will perform electrical installations or maintenance.	L

<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>RAC</b>
Prepare site (continued).	Fire.	Fire extinguishers shall be placed in work areas. The SSHO shall establish smoking areas in compliance with the facility policy. Fire extinguishers will be available in all Aptim work trucks and office facilities. Site personnel shall complete annual fire extinguisher training. Use caution with vehicle exhaust systems in grassy areas. Flammable or combustible liquids will be stored in approved Type 1 or Type 2 safety cans.	L
	Chemical hazards.	The Exclusion Zones and Contamination Reduction Zones shall be set-up and appropriately marked with signage. The Emergency Eyewash station shall be inspected, cleaned, filled, and then placed in service. Notify all personnel of the emergency eyewash station location. Employees shall be instructed to the chemical hazards they may be exposed by instruction from the manufacturers SDS. Any hazardous chemicals procured during the work shall be accompanied by SDS. Contact HSM before procuring hazardous chemicals.	L
Site Set Up or Tear Down, to include install or dismantle – Trailers; Tents; CONEX containers, and storage sheds	Slip, trip, fall and housekeeping.	Worker awareness of potential slippery surfaces and tripping hazards plus inspection and policing of debris. Route and install electrical lines out of foot traffic areas. Maintain adequate waste receptacles for placement of trash and debris. Establish routine daily to maintain housekeeping.	L
	Biological hazards.	Conduct a reconnaissance of the area to be used to ensure there are no biological hazards or endangered flora/fauna species present. The individual conducting the recon must take precautions and be certain that they are wearing a long sleeved shirt and have used the appropriate insect repellent if desired. Move command center and support zone facilities as necessary to avoid hazards. Train personnel on hazardous plan recognition. Use PPE if exposure to poisonous plants is unavoidable. Use barrier creams and wash exposed skin frequently. Inspect yourself and coworkers frequently for ticks. Wear light colored clothing to make ticks easier to detect. Use permethrin on boots, pants and lower clothing and DEET as directed by manufacturer. Inspect work area frequently for stinging/biting insects.	L
	Pinch hazard from assembly and placement of equipment.	Wear leather or impact resistant gloves and place hands on smooth surfaces checking the area on which you are going to place your hands to avoid sharp areas and pinch points.	L
	Vehicle and heavy equipment traffic in area.	Be aware of any vehicles or heavy equipment in area and be certain to wear a hard hat, safety glasses, and a high visibility safety vest when working around heavy equipment. Use spotters when backing equipment and vehicles. Make eye contact with operators of equipment so they know you are there.	L
	Use of hand and power tools.	Use the proper tools for the specific job being performed. Be certain that the tools to be used are serviceable and free of slippery surfaces. Hand and power tool use will be IAW EM 385-1-1, Chapter 13.	L

Job Steps	Hazards	Controls	RAC
Site Set Up or Tear Down, to include install or dismantle – Trailers; Tents; CONEX containers, and storage sheds (continued)	Collapse Hazards.	Secure all locking pins and bracing supports for portable shelters and tents IAW manufacturer’s manual. <b>Do not</b> use “make shift” replacement parts to secure braces or supports. Shelters and tents with missing parts will not be erected until authorized parts are on hand.	L
	Underground Utilities.	The DPW will be contacted to identify the locations of buried utilities before subsurface activities like anchoring trailers and tents are allowed to commence. Hand dig at least 5 feet below grade to help avoid utilities during anchoring.	L
	Electrical Shock.	Ensure that the qualified and authorized electrical contractor or equipment company installs and connects any electrical lines. In the event there is an electrical problem that cannot be corrected by merely un-plugging and re-plugging an item or replacing a blown fuse then an electrician will be contacted to correct the problem. All electrical appliances, equipment not double insulated will have a third prong for proper grounding and all electrical outlets will have three pronged receptacles and meet the requirements of EM 385-1-1, Chapter 11. GFCIs will be used for all outdoor connections and supplying temporary power. Trailers, conex, tents, etc. shall not be placed directly under overhead power lines.	L
	Medical injury.	At least 2 employees onsite will be current in FA/CPR training. Emergency numbers, hospital and occupational clinic route maps shall be posted on the H&S bulletin board. Internal and external incident reporting protocols shall be implemented immediately.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment - Level D:  Hard Hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests  Equipment:  Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon Repel® Permanone I®	Training Requirements:  Site safety orientation Applicable AHAs HAZWOPER 40-Hour Qualified equipment operators Lifting/back safety Fire extinguisher use Emergency procedures Biological hazard identification and control Tornado shelter locations National Lightning Safety Institute Lightning Safety Procedures	Daily site safety inspection CP (SSHO) – Brian Rhodes  Check Known Allergies Questionnaire, training, and medical certifications against personnel roster Mechanized equipment (daily) Overhead and underground utilities Housekeeping (daily) Fire extinguisher (monthly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks

Drinking water Hand tools Weather radio or AM/FM radio		General inspection of assembly area. Equipment will be inspected daily by operator prior to use in accordance with the manufacturer's instructions. If during inspection or during use, equipment fails to function properly, equipment is to be turned in for repair/replacement.
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## Activity Hazard Analysis (AHA)

Activity/Work Task: Visual Site Inspections and Civil Surveys	Overall Risk Assessment Code (RAC) (Use highest code)	<b>M</b>
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>	
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>
Date Prepared: 08/17/21		Frequent      Likely      Occasional      Seldom      Unlikely
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	<b>E</b> <b>E</b> <b>H</b> <b>H</b> <b>M</b>
Reviewed by: Doug Russell/HSE Manager	Critical	<b>E</b> <b>H</b> <b>H</b> <b>M</b> <b>L</b>
	Marginal	<b>H</b> <b>M</b> <b>M</b> <b>L</b> <b>L</b>
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment	Negligible	<b>M</b> <b>L</b> <b>L</b> <b>L</b> <b>L</b>
	Step 1: Review each <b>"Hazard"</b> with identified safety <b>"Controls"</b> and determine RAC (See above)	
	<b>"Probability"</b> is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	<b>RAC Chart</b>
	<b>"Severity"</b> is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	<b>E = Extremely High Risk</b> <b>H = High Risk</b> <b>M = Moderate Risk</b> <b>L = Low Risk</b>
Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.		

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.	01.B.03 01.E.01 28	<b>M</b>
Visual site inspections and surveys.	Poor planning.	Complete Job Safety Analysis for each task. Use Hazard Assessment Resolution Program frequently – for each task to be completed.		<b>M</b>
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 50-pound limit.	14.A.01	<b>M</b>
	Struck-by/against.	Wear reflective warning vests when exposed to vehicular traffic. Personnel working on or near roads and only remain on road long enough to complete work. Personnel walking along roadway shall stay off roadway as far as possible and walk on the side facing traffic.	05.F	<b>M</b>
	Munitions and Explosives of Concern (MEC) / Unexploded Ordnance (UXO).	Personnel shall attend site-specific MEC Awareness (and recognition) Training prior to the commencement of any site activities.	01.B.01 33.A.01	<b>M</b>

<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>EM 385-1-1</b>	<b>RAC</b>
Visual site inspections and surveys (continued).	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from elevated surfaces. Personnel shall use caution when walking on rocky, slippery, or uneven terrain.	14.C.01-10	<b>M</b>
	Hand injuries.	Items to be handled shall be inspected for sharp edges prior to being handled. Personnel shall wear leather gloves when handling sharp materials. Personnel shall be aware of and avoid pinch point hazards.	05.A.08	<b>L</b>
	Insect bites/West Nile virus.	Wear PPE and tape joints to keep insects away from the skin. Use protective insect repellents containing N,N-diethyl-m-toluamide, such as, Deep Woods OFF, 3M Ultrathon™, or equivalent and clothing insecticide preparations containing permethrins (Repel® Permanone® or equivalent) to prevent insect bites. Check limbs/body for insects/insect bites before showering. Notify Site Safety and Health Officer (SSHO) of flu-like symptoms.	06.D.01	<b>L</b>
	Contact dermatitis and poison ivy.	Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plants Remove clothing or Tyvek® coveralls by inside-out method to avoid contact with potentially contaminated outer surfaces.  Avoid unnecessary clearing of plant/vegetation areas.  Cover vegetation with plastic (visqueen) where sampling position raises exposure potential. Apply protective cream / lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers known to contract poison ivy. Follow procedures outlined in the SSHP.	06.D.03	<b>L</b>
	Severe weather.	The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions. The SSHO will identify a suitable tornado shelter at each work location. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. When lightning is observed within a 10 mile radius or upon hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). A waiting period of at least 30 minutes from the last nearby lightning strike will be observed before resuming activities. Follow procedures outlined in the SSHP.	06.1	<b>L</b>
	Hazardous atmospheres.	Personnel shall immediately notify the SSHO if odors are detected.		<b>L</b>
Heat stress and cold stress.	Follow procedures outlined in the SSHP. Use ACGIH guidelines for WBGT TLV values.	06.I	<b>M</b>	

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Visual site inspections and surveys (continued).	Fire.	Smoking shall be permitted in designated areas. Vehicles shall not be parked in tall dry grass. Engines shall be shut off before refueling. A 10-B:C fire extinguisher shall be available when refueling. Site personnel shall complete annual fire extinguisher training. Smoking shall not be permitted near fueling areas. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents.	09.E.01 09.A.06 09.B.08	M

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment - Level D:  Hard hat Safety glasses Safety-toed boots Work gloves ANSI Class 2 reflective warning vests  Equipment:  Survey instrumentation Fire extinguishers Emergency eyewash First aid kit Deep-Woods Off or Ultrathon™ Repel® Permanone® Drinking water Weather radio or AM/FM radio	Competent Person (CP) / Qualified Person (QP):  Brian Rhodes– CP/SSHO TBD– QP/First Aid and CPR  Training Requirements:  Site safety orientation HAZWOPER 40-Hour MEC Awareness Lifting/back safety Fire extinguisher use Emergency procedures Biological hazard identification and control Tornado shelter locations National Lightning Safety Institute Lightning Safety procedures	Daily site safety inspection (SSHO) – Brian Rhodes Daily site safety inspection (QCO) – TBD  Check Known Allergies Questionnaire Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter available Monitor approaching storms

## Activity Hazard Analysis (AHA)

Activity/Work Task: Site Surveys, Utility Clearance and Markings	Overall Risk Assessment Code (RAC)	<b>L</b>				
Project Location: RSA-122/RSA-183 Redstone Arsenal, Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>					
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>				
Date Prepared: 08/17/20		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	<b>E</b>	<b>E</b>	<b>H</b>	<b>H</b>	<b>M</b>
	Critical	<b>E</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>L</b>
Reviewed by: Doug Russell/HSE Manager	Marginal	<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>L</b>
	Negligible	<b>M</b>	<b>L</b>	<b>L</b>	<b>L</b>	<b>L</b>
<b>Notes:</b> (activity description) This AHA serves as the hazard assessment. A licensed subcontractor will conduct a utility survey to locate subsurface drilling hazards using multiple geophysical methods, including electromagnetic induction and ground penetrating radar. Utility lines found in the immediate vicinity of the proposed limits of intrusive activity will be marked using color-coded surveyor paint.	Step 1: Review each “ <b>Hazard</b> ” with identified safety “ <b>Controls</b> ” and determine RAC (See above)					
	“ <b>Probability</b> ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				<b>RAC Chart</b>	
	“ <b>Severity</b> ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				<b>E = Extremely High Risk</b>	
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.				<b>H = High Risk</b>	
				<b>M = Moderate Risk</b>		
				<b>L = Low Risk</b>		

Job Steps	Hazards	Controls	RAC
Walking the Site Lifting Equipment and Materials	Slips, trips, and falls	<ul style="list-style-type: none"> <li>Inspect work areas for washes, potholes, or other surface irregularities that could cause slips, trips or falls.</li> <li>Always establish good footing.</li> <li>Maintain good housekeeping. Keep walkways clear of debris and tools.</li> </ul>	<b>L</b>
	Muscle strains	<ul style="list-style-type: none"> <li>Observe 50 pound individual lifting limit.</li> <li>Do not lift and twist.</li> <li>Get help for loads greater than 50 pounds.</li> <li>Train workers in safe lifting techniques.</li> </ul>	<b>L</b>
Mobile Equipment	Striking workers or equipment	<ul style="list-style-type: none"> <li>Use spotters when backing.</li> <li>Inspect area for overhead and underground hazards.</li> <li>Know the safest route to and from your work area.</li> <li>Use flags, traffic cones to control traffic.</li> </ul>	<b>L</b>
Changed or Unanticipated Conditions	Safety or health hazards that may be derived from changed or unanticipated conditions	<ul style="list-style-type: none"> <li>Modify the AHA as often as necessary to address new or unanticipated hazards. Use “Job Safety Analysis” form to facilitate field documentation.</li> </ul>	<b>NA</b>

<b>Equipment to be Used</b>	<b>Training Requirements/Competent or Qualified Personnel name(s)</b>	<b>Inspection Requirements</b>
<ul style="list-style-type: none"> <li>Level D personal protection: safety boots, Safety eyewear, long pants protection, abrasion resistant gloves</li> </ul>	<ul style="list-style-type: none"> <li>Tailgate safety meeting</li> <li>Worker must be trained in the safe application of task specific tools and materials</li> <li>Brian Rhodes – CP/SSHO</li> </ul>	<ul style="list-style-type: none"> <li>Inspect all equipment at least daily</li> <li>Utility clearance checklist</li> <li>Inspect non-construction equipment and power tools per manufacturer requirements.</li> </ul>

## Activity Hazard Analysis (AHA)

Activity/Work Task: Vegetation Clearance	Overall Risk Assessment Code (RAC) (Use highest code)	<b>M</b>
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>	
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>
Date Prepared: 9/28/21		Frequent      Likely      Occasional      Seldom      Unlikely
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	E      E      H      H      M
Reviewed by: Doug Russell/HSE Manager	Critical	E      H      H      M      L
	Marginal	H      M      M      L      L
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	<b>RAC Chart</b>
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	E = Extremely High Risk
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	H = High Risk M = Moderate Risk L = Low Risk

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.	01.B.03 01.E.01 28	<b>M</b>
Vegetation removal.	Poor planning.	Complete Job Safety Analysis for each task, as specified in "Job Safety Analysis (JSA)." Use Hazard Assessment Resolution Program frequently – for each task to be completed.		<b>M</b>
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 50-pound limit.	14.A.01	<b>M</b>
	Struck-by/Against.	Wear reflective warning vests when exposed to vehicular traffic. Personnel working on or near roads and only remain on road long enough to complete work. Personnel walking along roadway shall stay off roadway as far as possible and walk on the side facing traffic.	05.F	<b>M</b>
	Intrusive activities.	Follow procedure for intrusive activities prior to commencing clearing and grubbing activities. Follow MEC avoidance techniques in accordance with EM 385-1-97 during all vegetation removal.	25.A.01	<b>M</b>
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from elevated surfaces. Personnel shall use caution when walking on rocky, slippery, or uneven terrain.	14.C.01-10	<b>M</b>

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Vegetation removal (continued).	Hand injuries.	Items to be handled shall be inspected for sharp edges prior to being handled. Personnel shall wear leather gloves when handling sharp materials. Personnel shall be aware of and avoid pinch point hazards.	05.A.08	L
	Use of heavy equipment.	Only qualified personnel shall be permitted to operate equipment. Heavy equipment shall be inspected daily after the initial U.S. Army Corps of Engineers inspection (and documented). Do not use unsafe equipment. All equipment shall have backing alarms. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts. Personnel are only permitted to approach equipment after a signal from the operator. Ground personnel, working near heavy equipment, shall wear high visibility conspicuity vests. Ground personnel shall not enter the swing radius of equipment. Ground personnel shall not position themselves between equipment and stationary objects. Personnel shall verify all mechanical guards are in place and functioning properly. Moving equipment shall be equipped with a back-up alarm. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment. Heavy equipment shall be equipped with Falling Object Protective Structure. Ensure everyone is clear of fall radius when using heavy equipment to push over trees.	18.A 18.G 18.B 05.F 18.B.12	M
	Injury from chain saws, wood/falling trees, chips, cuts, and noise.	Chain saw operators shall wear a specially designed helmet system (consisting of head, face, and hearing protection). Use gloves and chaps at all times when using saw. Operators shall wear chain saw protective boots with steel toes. Secure loose fitting clothing with duct tape. Keep other personnel at least two tree lengths away from tree being felled. Operators shall have escape routes planned that are at 45 degrees from the projected direction of the falling tree. Keep escape routes clear of all tools, materials, and wood/brush. Always cut away from the body. Shut off chain saws when walking between work areas. Have spotter assist when falling large or tall trees. Only cut trees, logs, or branches from ground height. Shut off engines before freeing pinched chains. Chain saw operators shall always hold the saw with both hands during cutting operations. Inspect chain saw before each use. Do not use saws in which any safety feature is not functioning. Frequently check and adjust tension on chain. Do not use saws with or dull cutters. Do not increase force used as cutters become dull. The idle speed shall be properly adjusted to prevent the chain from moving when the engine is idling. Keep bar groove clean. Use only new chains or professionally sharpened chains. Replace sprockets, which show signs of wear. Remain alert to kickback hazards and keep a firm, proper grip on chain saw at all times. All chain saws shall be equipped with automatic chain brake and other anti-kickback devices. Use wedges to prevent binding of the chain. Do not cut with the tip (nose) of the bar. Do not use dull chains. Do not overreach with chain saw. Personnel shall not operate	13.F 13.A 31.C	M

Job Steps	Hazards	Controls	EM 385-1-1	RAC
		chain saws above shoulder height. Personnel shall be familiar with cutting techniques.		
Vegetation removal (continued).	Small tree and brush removal/chipping.	Machete use is prohibited. Personnel operating weed whackers shall wear hearing protection and eye/face protection. Steel blade use on weed whackers is prohibited. The procedures outlined in <i>Safety and Health Requirements Manual</i> , Sections 31.C, 31.D and 31.E shall be conveyed to all personnel involved in the operations. Remain clear of feed and discharge chutes on chippers. Small tree (< 3 inch diameter) falling shall consist of pushing over with heavy equipment. No one shall climb trees.	31.C 31.D 31.E	M
	Fatigue.	Chainsaw and equipment operators shall be given ample rest breaks.		M
	Insect bites/West Nile Virus.	Wear personal protective equipment (PPE) and tape joints to keep insects away from the skin. Use protective insect repellents containing N,N-Diethyl-m-toluamide, such as, 3M Ultrathon™ or equivalent and clothing insecticide preparations containing permethrins (Repel® Permanone® or equivalent) to prevent insect bites. Check limbs/body for insects/insect bites before showering. Notify Site Safety and Health Officer (SSHO) of flu-like symptoms.	06.D.01	L
	Contact dermatitis and poison ivy.	Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Remove clothing or Tyvek® coveralls by inside out method to avoid contact with potentially contaminated outer surface. Learn to identify poisonous plants. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic (visqueen) where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contract poison ivy.	06.D.03	L
	Severe weather.	The SSHO will monitor weather conditions each day in order to plan and prepare for hazardous conditions and will use lightning and severe weather detection devices to evaluate potential weather threats. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. When lightning is observed within a 10-mile radius or upon hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). A waiting period of at least 30 minutes from the last nearby lightning strike will be observed before resuming activities. Follow procedures outlined in the SSHP.	06.I	L
	Hazardous atmospheres.	Personnel shall immediately notify the SSHO if odors are detected.		L
	Heat stress and cold stress.	Follow procedures outlined in the SSHP. Use ACGIH guidelines for WBGT TLV values	06.I	M
	Dust.	Dust shall be monitored and controlled. PPE use is required when working in contaminated areas.	28	L



Job Steps	Hazards	Controls	EM 385-1-1	RAC
Vegetation removal (continued).	Fire.	Smoking shall be permitted in designated areas. Vehicles shall not be parked in tall dry grass. Engines shall be shut off before refueling. A 10-pound A:B:C: fire extinguisher shall be available on heavy equipment. Site personnel shall complete annual fire extinguisher training. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents.	09.E.01 09.A.06 09.B.08	L
	Controlled burns	RSA Fire Department will plan controlled burns and manage their activities in relation to a Wildfire Control Plan.	09.K	M

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
<p>Personal Protective Equipment - Level D - Modified:</p> <p>Hard Hat Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Disposable coveralls and protective gloves (when contact with irritating plants possible) Helmet systems for chain saw use Protective chaps for chain saw use Hearing protection</p> <p>Equipment:</p> <p>Magnetometers Geophysics Instruments Excavator or Bush Hog Equipped Skid Steer Rubber or track loader Fire Extinguishers Emergency Eyewash First Aid Kit Deep-Woods Off or Ultrathon™ Repel® Permanone® Drinking water Weather radio or AM/FM radio Chain saws Extra chains Plastic or wood wedges</p>	<p>Competent Person: (SSHO) Brian Rhodes</p> <p>Training Requirements:</p> <p>Site safety orientation UXO Technicians must be qualified IAW DDESB TP 18 Applicable AHAs HAZWOPER 40-Hour MEC Awareness Qualified equipment operators Lifting/back safety Fire extinguisher use Biological hazard identification and control Emergency procedures Tornado shelter locations National Lightning Safety Institute Lightning Safety Procedures</p>	<p>Daily site safety inspection (SSHO) – Brian Rhodes</p> <p>Check Known Allergies Questionnaire Housekeeping (daily) Fire extinguisher (monthly) Vehicle inspection daily Overhead and underground utilities Mechanized equipment (daily) Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Monitor approaching storms</p>

## Activity Hazard Analysis (AHA)

Activity/Work Task: Excavation & Backfill	Overall Risk Assessment Code (RAC) (Use highest code)	<b>M</b>
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>	
Contract/Project Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>
Date Prepared: 2/15/22		Frequent    Likely    Occasional    Seldom    Unlikely
Prepared by (Name/Title): Ray Clark, Engineer Scientist	Catastrophic	<b>E</b> <b>E</b> <b>H</b> <b>H</b> <b>M</b>
	Critical	<b>E</b> <b>H</b> <b>H</b> <b>M</b> <b>L</b>
Reviewed by: Doug Russell/HSE Manager	Marginal	<b>H</b> <b>M</b> <b>M</b> <b>L</b> <b>L</b>
	Negligible	<b>M</b> <b>L</b> <b>L</b> <b>L</b> <b>L</b>
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as certification of hazard assessment.	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	<b>RAC Chart</b>
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	<b>E = Extremely High Risk</b>
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	<b>H = High Risk</b>
		<b>M = Moderate Risk</b>
		<b>L = Low Risk</b>

Job Steps	Hazards	Controls	RAC
Verify overhead and underground utilities locations. Set up equipment for operation. Inspect equipment for use. Inspect work area where equipment is to be used. Isolate work area, as appropriate. Move equipment to work area.	Newly hired personnel and visitors. Unfamiliarity with: site, general (chemical, physical, environmental) site hazards, project safety rules and hazard control procedures, chain of command, and emergency procedures.	All personnel shall attend a site safety orientation.  After personnel are trained in the contents of the Installation-Wide RSA Accident Prevention Plan (APP) and the Site Safety and Health Plan (SSHP), they shall sign the APP Acknowledgment Form and the SSHP Acknowledgment Form.  Review emergency procedures and evacuation plans.	<b>M</b>
	Unqualified operator(s).	Verify operator is qualified and authorized for the equipment being used. Only personnel authorized by employer shall operate equipment.	<b>M</b>
	Failure to properly plan daily activities.	A Job Safety Analysis (JSA) shall be prepared by the crew prior to commencing daily activities. The JSA shall be used as a component of the morning Tailgate Safety Meeting. The JSA shall be revised at any time throughout the workday when new tasks are initiated, unforeseen circumstances arise, or if working conditions change. Personnel shall implement Hazard Assessment Resolution Process and Safety Step Back. Personnel to conduct focused and leading indicator "Target" observations.	<b>M</b>

Job Steps	Hazards	Controls	RAC
Excavation and backfill.	Complacency.	All personnel shall attend the morning safety meetings to re-focus themselves to hazards, emergency procedures and equipment, operational aspects, and change(s) in site/work conditions. Recommended control measures for the hazards shall be part of the discussion.	<b>M</b>
	Fire.	<p>Fire extinguishers shall be available in work areas. A 4-A:60-B:C fire extinguisher shall be available when refueling at the project site. Excavators shall be equipped with a 10-B:C fire extinguisher. Site personnel shall complete annual fire extinguisher training.</p> <p>The SSHO shall establish smoking areas. Smoke only in designated areas. Only discard cigarette butts in proper receptacles – never discard cigarette butts onto the ground. Smoking shall not be permitted within 50 feet of fueling operations.</p> <p>Use caution with vehicle exhaust systems in grassy areas. Do not run vehicles or equipment while parked in dry, grassy areas.</p> <p>Engines shall be shut off and allowed to cool before refueling. Follow AHA for “Fueling Operations.”</p>	<b>M</b>
	Unsafe equipment.	<p>Before excavating equipment is placed in use at the project, it shall be inspected and tested in accordance with the manufacturer’s recommendations and shall be certified in writing by a competent person to meet the manufacturer’s recommendations. Subsequent re-inspections will be conducted at least annually thereafter. These inspections shall be documented on a Checklist for Construction Equipment. All safety deficiencies noted during the inspection shall be corrected prior to the equipment being placed in service at the project.</p> <p>All excavating equipment shall be inspected by the operator prior to use on the project and shall then be inspected on a daily basis. Deficiencies in equipment shall be noted on the inspection form. Do not use equipment that is not in proper operating condition. Attach a “Danger – Do Not Use” tag to inoperable equipment, remove key from equipment, and give key to the supervisor when notifying him/her of the inoperable equipment..</p> <p>Verify all manufacturers' safety guards, features, controls, back-up alarms, horns, and equipment are functioning properly and as intended by the manufacturer.</p> <p>Install and maintain equipment attachments and their operating systems according to manufacturer's specifications.</p> <p>Make frequent visual inspections of quick-disconnect systems (systems for connecting attachments to excavators) especially after changing attachments.</p> <p>Verify controls are properly labels as to equipment function.</p>	<b>M</b>

Job Steps	Hazards	Controls	RAC														
Placing and moving equipment. Excavation and backfill.	Overhead/aboveground hazards and utilities.	<p>Follow AMS-710-02-PR-01610, Utility Contact Prevention.</p> <p>Overhead and aboveground hazards shall be evaluated prior to moving equipment on the project site. Complete a Site Layout Plan prior to mobilizing the equipment. The plan shall identify all overhead and aboveground hazards in the active work area(s) and travel routes - include utilities, pipe racks, structures, restricted areas, pedestrian routes, and equipment/vehicle traffic.</p> <p>Power lines shall be assumed to be energized unless verified to be de-energized and visibly grounded. Operation beneath a power line that has not been verified as de-energized and grounded must maintain clearance distances stated below.</p> <table border="0"> <thead> <tr> <th><u>Nominal System Voltage</u></th> <th><u>Minimum Required Clearance Distance</u></th> </tr> </thead> <tbody> <tr> <td>Up to 50 kV</td> <td>10 feet (3 m)</td> </tr> <tr> <td>Over 50 - 200 kV</td> <td>15 feet (4.6 m)</td> </tr> <tr> <td>Over 200 - 350 kV</td> <td>20 feet (6 m)</td> </tr> <tr> <td>Over 350 - 500 kV</td> <td>25 feet (7.6 m)</td> </tr> <tr> <td>Over 500 – 750 kV</td> <td>35 feet (10.7 m)</td> </tr> <tr> <td>Over 750 – 1,000 kV</td> <td>45 feet (13.7 m)</td> </tr> </tbody> </table> <p>For over 1,000 kV, the minimum required clearance distance will be established by the utility owner/operator or professional engineer who is a qualified person with respect to electrical power transmission and distribution.</p> <p>Identify and provide temporary visual barriers that help prevent encroachment with the lines. In areas where it is not feasible to use barricades, spotters shall be provided; however, the minimum clearance distances from electrical lines must be observed.</p> <p>Each work crew member shall be trained in the electrocution hazards and emergency procedures associated with contacting energized power lines.</p> <p>Post overhead hazard warning signs as necessary.</p>	<u>Nominal System Voltage</u>	<u>Minimum Required Clearance Distance</u>	Up to 50 kV	10 feet (3 m)	Over 50 - 200 kV	15 feet (4.6 m)	Over 200 - 350 kV	20 feet (6 m)	Over 350 - 500 kV	25 feet (7.6 m)	Over 500 – 750 kV	35 feet (10.7 m)	Over 750 – 1,000 kV	45 feet (13.7 m)	<b>M</b>
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Job Steps	Hazards	Controls	RAC
Placing and moving equipment. Excavation and backfill.	Underground utilities and other underground hazards.	<p>Follow AMS-710-02-PR-01610, Utility Contact Prevention. Follow any additional procedures for intrusive activities identified in APP and Work Plan prior to commencing intrusive activities.</p> <p>Utilities shall be located and marked prior to commencing intrusive activities. Contact utility one-call service (811) at least 48 hour but not more than 10 days prior to commencing intrusive activities, excluding weekends or any state or federal holidays. Retain a copy of mark-out ticket for documentation purposes and QC purposes. Documentation of utility mark-out must be completed using the Utility Mark-out Documentation form (EIG-HS-308.03).</p> <p>Evaluate the work areas, ground conditions, and travel paths to identify any sensitive underground structures, unstable areas, dangerous slopes, and existing open excavations.</p> <p>Complete a Site Layout Plan prior to mobilizing the equipment. The plan shall identify all underground utilities and other underground hazards in the active work areas and travel routes.</p> <p>Cease work immediately if unknown utilities or utility markers are uncovered.</p> <p>Use manual excavation within 3 feet of known utilities. Once the line or cable is exposed, heavy equipment can be used but must remain at least 3 feet from the exposed line or cable.</p> <p>Each work crew member shall be trained in electrocution hazards, explosion/fire hazards, and emergency procedures associated with contacting energized power lines and pipelines.</p> <p>Immediately contact Public Works Department in event utilities are encountered that were not previously marked. Notify Public Works in event any damage to utilities occur.</p>	M
	Hand injuries.	<p>Personnel shall wear appropriate leather, heavy cotton or synthetic gloves when handling materials with sharp edges, splinters, burrs, rough surfaces, etc.</p> <p>Items to be handled shall be inspected for sharp edges, splinters, burrs, rough surfaces, etc. prior to being handled.</p> <p>Personnel shall be aware of and avoid pinch point hazards.</p>	M
	Noise.	<p>All personnel shall wear hearing protection when operating noisy equipment.</p> <p>Personnel working in vicinity of noisy equipment shall wear hearing protection.</p> <p>Verify personnel noise exposures are safe by performing noise dosimetry.</p>	L

Job Steps	Hazards	Controls	RAC
Excavation and backfill.	Use of excavators and backhoes.	<p>Only qualified personnel shall be permitted to operate equipment.</p> <p>It is the responsibility of the operator to read and understand the manufacturer's operator manual, the manufacturer's recommendations for each type and model of equipment to be operated, and the requirements of AMS-710-02-PR-05700 prior to operating equipment. Operators must know the capacity and operating characteristics of the equipment to be operated.</p> <p>When mounting or dismounting equipment, clean shoes and hands before climbing. Always use handrails, grab rails, and steps. Maintain a three-point contact/control with steps and handholds. Never jump on or off equipment. Never attempt to mount or dismount a moving machine. Do not use steering wheel or control levers as a handhold. Lower the boom (and loader when equipped) to a safe position with the bucket/attachment on the ground and turn off the excavator before dismounting equipment.</p> <p>The equipment must be attended at all times or attachments must be placed in the "transport lock position" or lowered to the ground.</p> <p>The operator is responsible for keeping the windows clear and keeping cab clean at all times.</p> <p>Equipment operators must wear seat belt at all times and keep body (hands, arms, legs, head, etc.) inside the protected area of the cab. Operations are to be performed only from the operators control station.</p> <p>All equipment shall be operated at safe speeds and in a safe manner.</p> <p>If equipped with such, use the machine stabilizers.</p> <p>Loads must be carried as low as possible to maintain stability of the equipment and operator visibility.</p> <p>Do not operate equipment on grades steeper than those specified by the manufacturer. When operating on a sloped area, always move up or down the slope and not across the slope. Avoid making turns on inclines. If it is necessary, make turns wide and slowly with load carried low. When traveling up or down inclines, do so with loaded buckets facing uphill and empty buckets facing downhill.</p> <p>The operator of equipment shall not use cellular telephone devices or head/earphones for entertainment purposes while operating equipment. The use of cell phones and other communication devices are permitted for job-related communications or emergency situations, when the equipment is not operating.</p>	<b>M</b>

Job Steps	Hazards	Controls	RAC
Excavation and backfill.I	Use of excavators and backhoes (continued).	<p>The operator shall not use attachments for which they were not designed to be used for, e.g., using a bucket to transport telephone poles.</p> <p>Follow the manufacturer's instructions for using positive locks on quick-disconnect equipment.</p> <p>Securely latch attachments such as quick-disconnect buckets before beginning work.</p> <p>Make frequent visual inspections of quick-disconnect systems — especially after changing attachments.</p> <p>The operator is to stay alert and focused at all times when the excavator or backhoe is in operation.</p>	M
	Excavation and trenching.	All excavation and trenching activities will be conducted in accordance with AMS-710-02-PR-01600 <i>Excavation and Trenching</i> and EM-385-1-1 Section 25 Excavation and Trenching as applicable. Excavation from stable ground. Slope side walls if spalling is observed. Keep all personnel, equipment and spoils at least 3 feet from excavation. No one is permitted to enter excavation except those in cabs of heavy equipment.	M
	Struck by and against	<p>Wear PPE with high visibility vests when walking or working near moving equipment or vehicles.</p> <p>Prevent unauthorized workers or bystanders from entering work areas with equipment operations.</p> <p>Verify "<b>DANGER – STAY CLEAR</b>" (or equivalent) warning sign(s) is visibly posted on the equipment.</p> <p>Personnel shall maintain a safe distance from operations. Keep alert for movement of equipment, loads, excavations, piles, and ejected matter.</p> <p>Personnel shall not be permitted in the swing radius of the equipment. Precautions must be implemented to keep personnel out of excavations and at least 10 ft. (3 m) away from the equipment and its maximum boom and/or counterweight swing radius when operating. Accessible areas within the swing radius of the equipment are to be barricaded to prevent personnel from being struck or crushed, as appropriate.</p>	M

Job Steps	Hazards	Controls	RAC
Excavation and backfill.		<p>Do not approach an excavator or backhoe without first establishing communication with the operator or spotter (eye contact and then a signal to proceed after the equipment has been shut down:</p> <ul style="list-style-type: none"> <li>• Excavator bucket planted, powered down, and controls locked.</li> <li>• Backhoe bucket planted, engine shut off.</li> </ul> <p>Don't allow anyone to stand under a suspended load or the boom, arm, or bucket.</p> <p>Operator to stop operations if personnel are observed within the swing radius.</p>	RAC
	Spotter operations.	<p>Use designated spotters as necessary and as determined by the operator or supervisor.</p> <p>Establish communication before starting work – hand signals, whistles, radios, air horn, audible alarm, or other means of effective jobsite communication.</p> <p>When a designated spotter is used, the equipment shall not be moved unless the designated spotter giving signals is in full view of the operator. The spotter must maintain line of site or communication with the equipment operator.</p> <p>For movement of mobile equipment in congested areas, a designated spotter shall be in full view of the operator and shall direct the movement. In some cases, multiple spotters may be required.</p>	
Collecting samples from EMM	Sampling from bucket.	<p>Position the sampling support and collection area on the cab side of the excavator to minimize operator blind spots created by the excavator boom assembly.</p> <p>Verify the operator is aware of your intention to collect samples from the bucket.</p> <p>Prior to sampling, the equipment operator shall fully lower the bucket to the ground, set the safety lockout lever to isolate joystick controls, decelerate the engine to idle level and signal the sample technician it is safe to approach the bucket. For backhoes, the bucket shall be planted on the ground and the engine shut down prior to approaching the bucket to obtain a sample.</p> <p>Keep out from between the excavator bucket and fixed objects, vehicles, or equipment when sampling.</p> <p>The operator should swing the machine to where the boom is at least at a 45-degree angle away from the excavation.</p>	M
Excavation and backfill	Excavation hazards.	Follow the project Excavation/Trenching Plan contained in the APP and CMIP.	M



Job Steps	Hazards	Controls	RAC
Excavation and backfill.	Dust or potential airborne chemical hazards	Control dust by maintaining equipment operation rates. Control dust by applying water when action level 1.0 mg/m <sup>3</sup> is exceeded in occasional CA areas or 2.5 mg/m <sup>3</sup> in low probability areas. Personnel shall stay out of dust and work from upwind when possible. Perform dust monitoring as specified in the SSHP. Real-time and integrated air monitoring will be executed in accordance with SSHP requirements to mitigate potential worker exposure. CA monitoring will be performed per the Air Monitoring plan.	<b>M</b>
Use heavy haul units.	Dump truck operations.	Dump trucks shall be inspected and found to be in safe condition prior to being placed in service at the site. Overhead hazards shall be re-evaluated prior to allowing dump trucks onto the project site. Areas with overhead hazards shall be barricaded with caution tape to prevent dump bed from contacting. In areas where it is not feasible to used barricades, then spotters shall be provided; however, the minimum distances from electrical lines must be observed. Operators shall wear seat belts while trucks are in motion at the project site. Spotters shall assist trucks when backing as necessary. Trucks shall be equipped with audible backup alarms. Cab shall be equipped with elevated bed indicator. Material shall not be loaded over cab of trucks. Personnel shall stay away from trucks when being loaded. Tires shall be inspected for accumulation of debris and cleaned as needed to avoid tracking on roadways.	<b>L</b>
General site activities.	Slips, trips, and falls.	Understand the hazards of slips, trips, and falls – consider the consequences.  Do not jump from equipment or elevated surfaces.  Clean-up work areas throughout the day and at the end of each workday.  Use three-point contact rule for entering/exiting vehicles, trucks, and equipment.  Use hand rails and other stationary objects (door frames, door knobs, steering wheels, walls, etc.) to increase stability.  Use extra caution when walking on wet, muddy, frosty, icy, or snow-covered surfaces. Consider postponing work as necessary and feasible.  Increase your awareness, keep alert, stay focused, and know your environment.  Stay away from slopes, hills, and grades.  Be cautious when using stairs.  Remove snow and ice when possible (shoveling, chipping, and salt application).  Apply traction aids, such as sand, gravels, and straw.  Lower your center of gravity when necessary. Slow down - take smaller steps.	<b>M</b>

Job Steps	Hazards	Controls	RAC
General site activities.	Insect bites and stings.	<p>Review injury and illness potential with workers.</p> <p>Inspect work areas for bee nests and activity prior to commencing work in that area.</p> <p>Wear PPE, such as disposable coveralls, to keep insects away from the skin.</p> <p>Expect to encounter insects when working in warm weather – especially at locations with vegetation present.</p> <p>Use protective insect repellents containing DEET (Deep Woods Off or equivalent) to prevent insect bites, unless individual allergies and sensitivities prevent its use.</p> <p>Consider applying Permethrin (Repel® Permanone® or equivalent) preparations to clothing to repel ticks, chiggers, mosquitoes, and/or spiders.</p> <p>Check limbs/body for insects/ insect bites upon removing PPE and again during showering.</p> <p>Immediately notify supervisor or SSHO of insect bites, stings, irritations, rashes, or flu-like symptoms.</p>	<b>L</b>
	Contact dermatitis from poisonous and irritating plants (poison ivy, poison oak, and poison sumac).	<p>Learn to identify poisonous and irritating plants. Check around work areas to identify if poisonous and irritating plants are present.</p> <p>Identify workers who are known especially sensitive to poisonous and irritating plants and plan work accordingly.</p> <p>Wear Tyvek® coveralls to avoid skin contact with irritating plants.</p> <p>Immediately notify the SSHO if you suspect you contacted an irritating plant.</p> <p>Avoid unnecessary clearing of plant/vegetation areas.</p> <p>Remove clothing or Tyvek® coveralls by inside-out method to avoid contact with potentially contaminated outer surfaces.</p> <p>Follow additional procedures outlined in the APP.</p>	<b>L</b>
	Severe weather.	<p>The SSHO to monitor weather conditions each day in order to plan and prepare for hazardous conditions.</p> <p>The SSHO to identify the nearest suitable storm shelter at each work location.</p> <p>Upon seeing lightning or hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate).</p>	<b>M</b>

Job Steps	Hazards	Controls	RAC
General site activities.	Heat and Cold stress.	Follow procedures outlined in the SSHP. Use ACGIH guidelines for WBGT TLV values.	M
	Struck by material	Personnel shall never place themselves under suspended/overhead loads. Material shall be loaded over the dump bed and not allowed to pass over operator cab. Haul units shall be equipped with adequate Falling Object Protective Structure. All loads are to be covered when traveling on the road weather on base or off base. NO driver operator shall climb into truck or over 6 feet above ground level with out proper fall protection	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
<u>Personal Protective Equipment</u> Hard hat Safety glasses with side shields Safety-toed boots Work gloves Class 2 high visibility vests Hearing protection, as necessary  <u>Other Equipment:</u> Fire Extinguishers Caution tape Excavation perimeter protection First Aid Kit Drinking water Weather radio Insect repellent with DEET (Deep Woods Off™ or equivalent) Repel Permanone™ Communication devices Air monitors per SSHP (PID, aerosol, LEL, CO, O <sub>2</sub> ) Water truck Excavator Dump truck Front end loader	Competent Person (CP) / Qualified Person (QP): CP/SSHO Brian Rhodes _____  Alternate CP/SSHO _____  QP/First Aid and _____  QP/First Aid and CPR Brian Rhodes _____  Training Requirements (as determined by the SSHO):  Site safety orientation Emergency procedures Hearing conservation Applicable AHAs and SDS Lifting/back safety Fire extinguisher use Biological hazard identification and control Storm shelter location Lightning safety procedures Heat stress prevention and heat stroke treatment Cold stress prevention Excavation and trenching  Subcontractor Personnel Proof of Training and Competency and Certifications of Employee Medical Surveillance Program Participation to be provided to the COR and SO prior to the commencement of field operations for review and approval.	Daily site safety inspection (SSHO) Brian Rhodes Daily site safety inspection (QCO) _____  Initial and daily equipment inspections. Overhead utilities and hazards (prior to operating equipment in area) Locate underground utilities (prior to intrusive activities) Excavation (at least daily) Housekeeping (daily) Fire extinguisher (monthly) Equipment and tools inspection (daily and before use) Survey areas for poisonous plants, insects, and animals(each work area) Check body for ticks (each evening during tick season) Identify closest usable storm shelter that is available

## Activity Hazard Analysis (AHA)

Activity/Work Task: Soil Sampling	Overall Risk Assessment Code (RAC) (Use highest code)	<b>M</b>		
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>			
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>		
Date Prepared: 2/15/22		Frequent      Likely      Occasional      Seldom      Unlikely		
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	<b>E</b> <b>E</b> <b>H</b> <b>H</b> <b>M</b>		
Reviewed by: Doug Russell/HSE Manager	Critical	<b>E</b> <b>H</b> <b>H</b> <b>M</b> <b>L</b>		
	Marginal	<b>H</b> <b>M</b> <b>M</b> <b>L</b> <b>L</b>		
	Negligible	<b>M</b> <b>L</b> <b>L</b> <b>L</b> <b>L</b>		
<b>Notes:</b> (Field Notes, Review Comments, etc.)	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)			
This AHA serves as the hazard assessment	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.			
	<b>RAC Chart</b>			
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible			
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.			
	<b>E = Extremely High Risk</b>			
	<b>H = High Risk</b>			
	<b>M = Moderate Risk</b>			
	<b>L = Low Risk</b>			
<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>EM 385-1-1</b>	<b>RAC</b>
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.	01.B.03 01.E.01 28	<b>M</b>
Soil sampling	Poor planning.	Complete Job Safety Analysis for each task. Use Hazard Assessment Resolution Program frequently – for each task to be completed.		<b>M</b>
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 50-pound limit.	14.A.01	<b>M</b>
	Intrusive activities and underground utilities.	Follow procedure for intrusive activities in the CMIP and SSHP prior to commencing activities. Personnel shall not enter excavation > 4 feet for sample collection. Samples can be retrieved from earth-moving machinery.	25.A.01	<b>M</b>
	Overhead hazards/utilities.	Overhead hazards shall be evaluated prior to moving equipment on the project site. Overhead power lines shall be shut-off and locked-out if minimum separation distances cannot be achieved in accordance with EM 385-1-1 Table 11-1. Areas with overhead hazards shall be barricaded with caution tape to warn personnel In areas where it is not feasible to use barricades, spotters shall be provided: however, the minimum distances from energized overhead electrical lines must be observed.	11.F.04	<b>M</b>

<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>EM 385-1-1</b>	<b>RAC</b>
Soil sampling (continued)	Underground utilities and other underground hazards.	<p>Follow any additional procedures for intrusive activities identified in the CMIP prior to commencing intrusive activities.</p> <p>Utilities shall be located and marked prior to commencing intrusive activities. Contact utility one-call service (811) at least 48 hours but not more than 10 days prior to commencing intrusive activities, excluding weekends or any state or federal holidays. Contact RSA Public Works for on-base utility locates. Retain a copy of mark-out ticket for documentation purposes and QC purposes. Follow requirements of AMS-710-02-PR-01600, <i>Excavation and Trenching</i>, and AMS-710-02-PR-01610, <i>Utility Contact Prevention</i>.</p> <p>Evaluate the work areas, ground conditions, and travel paths to identify any sensitive underground structures, unstable areas, dangerous slopes, and existing open excavations.</p> <p>Complete a Site Layout Plan prior to mobilizing the equipment. The plan shall identify all underground utilities and other underground hazards in the active work areas and travel routes.</p>		<b>M</b>
	Underground utilities and other underground hazards. (continued)	<p>Cease work immediately if unknown utilities or utility markers are uncovered.</p> <p>Use manual excavation within 3 feet of known utilities. Once the line or cable is exposed, heavy equipment can be used but must remain at least 3 feet from the exposed line or cable.</p> <p>Each work crew member shall be trained in electrocution hazards, explosion/fire hazards, and emergency procedures associated with contacting energized power lines and pipelines.</p> <p>Immediately contact utility one-call service (811) if an underground utility is damaged, dislocated, or disturbed. On base contact Public Works department.</p>		
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from elevated surfaces. Personnel shall use caution when walking on rocky, slippery, or uneven terrain.	14.C.01-10	<b>M</b>
	Hand injuries.	Items to be handled shall be inspected for sharp edges prior to being handled. Personnel shall wear leather gloves when handling sharp materials. Personnel shall be aware of and avoid pinch point hazards.	05.A.08	<b>L</b>

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Soil sampling (continued).	Use of heavy equipment.	Only qualified personnel shall be permitted to operate equipment. Heavy equipment shall be inspected daily. Do not use unsafe equipment. All equipment shall have backing alarms. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts. Personnel are only permitted to approach equipment after a signal from the operator. Ground personnel, working near heavy equipment, shall wear high visibility conspicuity vests. Ground personnel shall not enter the swing radius of equipment. Ground personnel shall not position themselves between equipment and stationary objects. Personnel shall verify all mechanical guards are in place and functioning properly. Moving equipment shall be equipped with a back-up alarm. Mechanical excavation equipment will only be used within one foot of suspected subsurface target anomalies. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment.	18.A 18.G 18.B 05.F	M
	Insect bites/West Nile Virus.	Wear personal protective equipment (PPE) and tape joints to keep insects away from the skin. Check limbs/body for insects/insect bites before end of shift. Notify SS of flu-like symptoms.	06.D.01	L
	Contact dermatitis and poison ivy.	Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plants. Remove clothing or Tyvek® coveralls by inside-out method to avoid contact with potentially contaminated outer surfaces. Avoid unnecessary clearing of plant/vegetation areas. Cover vegetation with plastic (visqueen) where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contract poison ivy. Follow procedures outlined in the SSHP.	06.D.03	L
	Severe weather.	The Site Supervisor (SS) will monitor weather conditions each day in order to plan and prepare for hazardous conditions and will use lightning and severe weather detection devices to evaluate potential weather threats. Work activities will be suspended prior to weather conditions becoming hazardous so that workers have ample time to seek shelter. When lightning is observed within a 10 mile radius or upon hearing thunder, outdoor activities shall be suspended and personnel shall be evacuated to safe areas (inside vehicles, buildings, or tornado shelters as appropriate). A waiting period of at least 30 minutes from the last nearby lightning strike will be observed before resuming activities. Follow procedures outlined in the SSHP.	06.I	L
	Hazardous atmospheres.	Personnel shall immediately notify the SS if odors are detected.		L

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Soil sampling (continued).	Heat stress and cold stress.	Follow procedures outlined in the SSHP.	06.I	M
	Dust.	All visible dust shall be controlled. PPE use is required when working in contaminated areas. Water will be utilized to keep dust levels low.	28	L
	Fire.	Smoking shall be permitted in designated areas. Vehicles shall not be parked in tall dry grass. Engines shall be shut off before refueling. A 10 pound A:B:C fire extinguisher shall be available in work trucks. Site personnel shall complete annual fire extinguisher training. Smoking shall not be permitted near fueling areas. Gasoline shall be stored in labeled metal Type II red safety cans with flash arrestors and spring-loaded vents. Fire watch shall be stationed to monitor area at least one hour after hot work activities.	09.E.01 09.A.06 09.B.08	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Personal Protective Equipment – Modified Level D: Hard Hat as applicable Safety Glasses Chemical Resistant Boots Work Gloves Permeable Tyvek if needed ANSI Class 2 reflective warning vests Equipment: Fire Extinguishers Emergency Eyewash First Aid Kit Drinking water Weather radio or AM/FM radio Hand tools Heavy equipment Sampling equipment i.e., trowels, hand auger, etc.	Training Requirements: Competent Person (SSHO) Brian Rhodes Site safety orientation HAZWOPER 40-Hour MEC Awareness Qualified equipment operators Lifting/back safety Fire extinguisher use Emergency procedures Biological hazard identification and control Tornado shelter locations National Lightning Safety Institute Lightning Safety Procedures	Daily site safety inspection (SSHO) – Brian Rhodes Vehicle inspection daily Check Known Allergies Questionnaire Housekeeping (daily) Fire extinguisher (monthly) Vehicle inspection daily Overhead and underground utilities Mechanized equipment initial inspection Mechanized equipment (daily) Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter available Monitor approaching storms

## Activity Hazard Analysis (AHA)

Activity/Work Task: Equipment Decontamination		Overall Risk Assessment Code (RAC) (Use highest code)			<b>M</b>		
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL		<b>Risk Assessment Code (RAC) Matrix</b>					
Contract Number: W912DY-17-D-0003		<b>Severity</b>	<b>Probability</b>				
Date Prepared: 08/17/21			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Ray Clark, Engineer		Catastrophic	<b>E</b>	<b>E</b>	<b>H</b>	<b>H</b>	<b>M</b>
Reviewed by: Doug Russell/ HSE Manager		Critical	<b>E</b>	<b>H</b>	<b>H</b>	<b>M</b>	<b>L</b>
		Marginal	<b>H</b>	<b>M</b>	<b>M</b>	<b>L</b>	<b>L</b>
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment		Negligible	<b>M</b>	<b>L</b>	<b>L</b>	<b>L</b>	<b>L</b>
		Step 1: Review each “ <b>Hazard</b> ” with identified safety “ <b>Controls</b> ” and determine RAC (See above)					<b>RAC Chart</b>
“ <b>Probability</b> ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.					<b>E = Extremely High Risk</b>		
“ <b>Severity</b> ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible					<b>H = High Risk</b>		
Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.					<b>M = Moderate Risk</b>		
					<b>L = Low Risk</b>		
<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>			<b>EM 385-1-1</b>	<b>RAC</b>	
Clean equipment.	Failure to properly plan daily activities.	Complete Job Safety Analysis for each task, as specified in, “Job Safety Analysis (JSA).” Use Hazard Assessment Resolution Program frequently – for each task to be completed.				<b>M</b>	
	Exposure to contaminants.	Maintain work zones and decontamination areas. Level D - Modified personal protective equipment shall be worn as required in the Accident Prevention Plan or Site Safety and Health Plan. Personnel shall perform proper decontamination procedures each time when exiting the Exclusion Zone.			28 05.A.01	<b>L</b>	
	Poor lighting.	Additional lighting shall be put in place as necessary. Temporary lighting shall be protected with ground fault circuit interrupters (GFCI).			07.A.01 11.D.05	<b>L</b>	
	Slips, trips, and falls.	Work areas shall be kept organized during work activities. Housekeeping shall be maintained. Personnel shall use caution when walking/working on wet surfaces.			14.C.01-10	<b>M</b>	
	Electrical.	GFCIs shall be used on all power tools and extension cords. Extension cords, power tools, and lighting equipment shall be inspected before each use, protected from damage, and kept out of wet areas.			11.D.05 11.A.03	<b>M</b>	
	Heavy lifting.	No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 50-pound limit.			14.A.01	<b>M</b>	
	Noise.	Personnel shall wear hearing protection when operating pressure washer.			05.C	<b>L</b>	



<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>EM 385-1-1</b>	<b>RAC</b>
Clean equipment (continued).	Liquid splash, eye, face injury	Full body PVC raingear or polyethylene coated coveralls shall be worn by pressure washer operators. Orifice operators shall use a full-face shield. Other crew members shall use a of ANSI Z87.1 compliant safety glasses with side shields, goggles or face shield.		<b>M</b>
	Skin contact with contaminated wash-water	Remove PVC raingear polyethylene coated coveralls by inside-out method to avoid contact with potentially contaminated outer surfaces. Dispose of polyethylene coated coveralls while turned inside-out. Manually decontaminate reusable PVC raingear using trisodium phosphate (TSP) or other approved decontamination solution.		<b>L</b>
	Fire.	Fire extinguishers shall be placed in work areas. Smoking shall only be allowed in designated areas. Site personnel shall complete annual fire extinguisher training.	09.E.01 09.A.06	<b>L</b>
	Heat and Cold stress.	Follow procedures outlined in the SSHP.	06.I 02.C	<b>M</b>
	Use of pressure or steam washer.	The pressure/steam washer shall be inspected before each use. The manufacturer's instruction manual shall be used to guide the inspection process. Personnel shall be trained in the use of the washing equipment. All personnel working in the equipment decontamination area shall be trained in the emergency shut-off procedures for the equipment being used. The minimum amount of steam/pressure that will complete the job should be used. Pressure washers exceeding 3000 psi shall not be used. The spray from such equipment shall only be directed at surfaces to be cleaned and never at body parts or other personnel.  Personnel in the immediate area shall use face shields and metatarsal/shin guards. Personnel shall keep firm grip on wand and not point it at anything that is not being washed. Pressure washer operators must maintain good footing. The trigger on the wand shall never be wired/fixed open. Operators are to take adequate breaks to avoid fatigue.  Hot surfaces shall be avoided. Units shall be shut off and allowed to cool prior to re-fueling (if gas-powered).  Carbon monoxide shall be monitored if gas-powered pressure washers are used in areas with limited ventilation. Carbon monoxide concentrations shall not be allowed to exceed 25 parts per million within any work areas.	13.A.02  13.A.02  09.B.21  13.A.12	<b>L</b>

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Clean equipment (continued).	Spills of decontamination water.	All waste handling activity shall be performed on visqueen (polyethylene sheeting) lined work surfaces. Waste liquids shall be stored with secondary containment. Lids and bungs shall be secured when drums are in storage or are being moved. Spill cleanup equipment shall be readily available when handling wastes. Drums containing waste shall be inspected on a daily basis. Spills shall be immediately reported to the Site Safety and Health Officer.	09.B.18	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Personal Protective Equipment - Level D - Modified: Hard hat Safety glasses Safety-toed boots Face shield Metatarsal and leg protection Work gloves PVC rain-gear or Poly coated Tyvek Protective over-boots Hearing protection  Equipment: GFCI Fire extinguishers Emergency eyewash First aid kit Drinking water Weather radio or AM/FM radio Spill control equipment	Competent Person (CP) / Qualified Person (QP): Brian Rhodes – QP/SSHO Brian Rhodes – QP/First Aid and CPR  Training Requirements: Site safety orientation HAZWOPER 40-Hour Lifting/back safety Fire extinguisher use Emergency procedures National Lightning Safety Institute Lightning Safety procedures	Daily site safety inspection (SSHO) – Brian Rhodes Daily site safety inspection (UXOSO) – TBD  Housekeeping (daily) Fire extinguisher (weekly) Equipment and tools inspection daily and before use Monitor approaching storms

## Activity Hazard Analysis (AHA)

<b>Activity/Work Task:</b> Pressure Washing	Overall Risk Assessment Code (RAC)	<b>M</b>
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>	
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>
Date Prepared: 08/17/21		Frequent    Likely    Occasional    Seldom    Unlikely
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	<b>E</b> <b>E</b> <b>H</b> <b>H</b> <b>M</b>
Reviewed by: Doug Russell, HSE Manager	Critical	<b>E</b> <b>H</b> <b>H</b> <b>M</b> <b>L</b>
	Marginal	<b>H</b> <b>M</b> <b>M</b> <b>L</b> <b>L</b>
	Negligible	<b>M</b> <b>L</b> <b>L</b> <b>L</b> <b>L</b>
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment  Equipment will be decontaminated by washing with pressurized water.	Step 1: Review each <b>"Hazard"</b> with identified safety <b>"Controls"</b> and determine RAC (See above)	
	<b>"Probability"</b> is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.	<b>RAC Chart</b>
	<b>"Severity"</b> is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	<b>E = Extremely High Risk</b>
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	<b>H = High Risk</b>
		<b>M = Moderate Risk</b>
		<b>L = Low Risk</b>

Job Steps	Hazards	Controls	RAC
Preparation for Pressure Washing	Musculoskeletal injury from handling heavy objects	Observe proper lifting techniques Obey sensible lifting limits (50 lbs. Maximum per person manual lifting) Use mechanical lifting equipment ( hand carts, trucks, forklift) to move large loads, awkward loads	<b>M</b>
	Unauthorized access to work area	The work areas shall be defined by barrier tape, rope or other suitable barriers and be marked with warning signs. The perimeter should be outside of the effective range of the water jet wherever possible.	<b>M</b>
	Equipment failure	Inspect equipment according to manufacturer's specifications Ensure all fittings and hoses have the correct pressure rating and in good condition Do not use damaged or defective equipment	<b>M</b>
	Lack of communication	Before starting, the team members shall agree on signals to be used during the operation of the equipment.	<b>M</b>

<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>RAC</b>
Preparation for Pressure Washing (continued)	Improper use of pressure washing equipment	<p>All equipment shall be operated consistent with the manufacturer's instructions.</p> <p>Water jetting equipment shall only be operated by persons who are trained and knowledgeable in the safe operation of the equipment to be used.</p> <p>The orifice operator must always be able to shut down the water jet by releasing pressure on the trigger, switch or foot valve pedal</p> <p>Control devices shall be kept in proper working order and shall not be altered or tampered with.</p> <p>Equipment shall not be repaired or connections tightened when the unit is in operation or the pump is running.</p> <p>All pressurized water cleaning operations shall comply with the Contractor's Pressurized Water Cleaning and Cutting Operations procedures.</p>	<b>M</b>
	Slips, trips, falls	<p>Use proper stance for sound footing while operating pressure washer</p> <p>Clear walkways, platforms, access steps and work areas of equipment, tools, and debris</p> <p>Mark, identify, or barricade tripping hazards</p> <p>Hose shall be arranged so that tripping hazards to not occur.</p>	<b>L</b>
Pressure Washing	Working alone	A minimum of two persons, one at the pump and one at the orifice or gun, shall be employed at all times.	<b>M</b>
	Foot injury from high pressure water jet	Jetting gun operators shall be protected with waterproof boots with steel toecaps, shanks, and metatarsal guards.	<b>M</b>
	Hand injury	Hand protection shall be used where there is a reasonable probability of injury and if required by the original equipment manufacturers' specifications.	<b>M</b>
	Liquid splash, eye, face injury	<p>Full body PVC raingear or polyethylene coated coveralls shall be worn by pressure washer operators.</p> <p>Orifice operators shall use a full face shield.</p> <p>Other crew members shall use a of ANSI Z87.1 compliant safety glasses with side shields, goggles or face shield.</p>	<b>M</b>
	Skin contact with contaminated wash-water	<p>Remove PVC raingear polyethylene coated coveralls by inside-out method to avoid contact with potentially contaminated outer surfaces. Dispose of polyethylene coated coveralls while turned inside-out. Manually decontaminate reusable PVC raingear using trisodium phosphate (TSP) or other approved decontamination solution.</p>	<b>L</b>
	Noise	Pressure water jetting operations may produce high noise levels. Use ear protection.	<b>M</b>

<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>RAC</b>
Pressure Washing (continued)	Heat Stress	Watch workers for symptoms of heat stress Allow for adequate break time Drink plenty of fluids to prevent dehydration	L
Changed or Unanticipated Conditions	Safety or health hazards that may be derived from changed or unanticipated conditions	Modify the AHA as often as necessary to address new or unanticipated hazards. Use "Job Safety Analysis" form to facilitate field documentation	L

<b>Equipment to be Used</b>	<b>Training Requirements/Competent or Qualified Personnel name(s)</b>	<b>Inspection Requirements</b>
Modified Level D: including poly-coated coveralls or PVC raingear, hard hats with attached face shield, Waterproof boots with steel toecaps and shanks and metatarsal guards, hearing protection  Hand Tools Pressure Washer Unit	This AHA  Site-specific orientation  Workers must be trained in the safe operation of all assigned equipment  TBD – CP/SSHO	Inspect all equipment daily prior to use and in accordance with manufacturer's requirements.  Inspect the work area daily for unanticipated hazards.  Inspect non-construction equipment and power tools per manufacturer requirements.

## Activity Hazard Analysis (AHA)

<b>Activity/Work Task:</b> Waste Management	Overall Risk Assessment Code (RAC)	<b>M</b>				
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>					
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>				
Date Prepared: 08/17/21		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by: Doug Russell/HSE Manager	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment	Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.				<b>RAC Chart</b>	
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				<b>E = Extremely High Risk</b>	
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				<b>H = High Risk</b>	
				<b>M = Moderate Risk</b>		
				<b>L = Low Risk</b>		

Job Steps	Hazards	Controls	RAC
Drums Handling	Handling heavy objects	Observe proper lifting techniques. Obey sensible lifting limits (50 lbs. maximum per person manual lifting). Use mechanical lifting equipment (handcarts, trucks, and forklift) to move large loads, awkward loads. Check and secure drum lids before moving.	<b>M</b>
	Caught in/between moving parts/pinch points	Identify and understand parts of equipment, which may cause crushing, pinching, rotating, or similar motions. Remove all jewelry, especially rings, bracelets, watches Watch hand placement and foot placement Assure guards are in place to protect from these parts of equipment during operations. Abrasion resistant work gloves when the possibility of pinching, or other injury may be caused by moving / handling large or heavy objects. Maintain all equipment in a safe condition. Keep all guards in place during use. De-energize and lock-out machinery before maintenance or service.	<b>M</b>

<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>RAC</b>
Drums Handling (continued)	Slips, trips, falls	Clear walkways, platforms, access steps and work areas of equipment, tools, and debris. Mark, identify, or barricade other obstructions. Work areas, platforms, and walkways should be kept free of materials, debris, and obstructions such as ice, grease, or oil that could cause a surface to become slick or otherwise hazardous. Maintain three-point contact when mounting / dismounting heavy equipment. Maintain good housekeeping.	M
	Sharp objects	Wear abrasion resistant work gloves. Inspect hand tools before use. Keep guards in place during use.	M
	Vehicle traffic	Use spotter when backing. Survey route to work locations. Inform crew of hazards. Wear reflective vest when exposed to heavy equipment or traffic.	M
	Struck by/against heavy equipment, protruding objects	Isolate equipment swing area. Require backup alarms on all heavy equipment. Make eye contact with operators before approaching equipment. Understand and review hand signals.	L
	Inhalation and contact with hazardous substances	Review hazardous properties of site contaminants with workers before work begin. Monitor breathing zone pursuant to SSHP. Avoid skin contact with contaminated waste. Avoid inhalation of dust or vapors.	M

<b>Equipment to be Used</b>	<b>Training Requirements/Competent or Qualified Personnel name(s)</b>	<b>Inspection Requirements</b>
<ul style="list-style-type: none"> <li>Level D: hard hat, safety glasses, safety boots, ear protection, abrasion resistant gloves</li> <li>Hand tools</li> <li>Drum dolly</li> <li>Forklift</li> </ul>	<ul style="list-style-type: none"> <li>Tailgate Safety Meeting</li> <li>Site-specific orientation</li> <li>HAZWOPER 40-hr.</li> <li>HAZWOPER 8-hour refresher</li> <li>8-hr Supervisor training</li> <li>Forklift operator training</li> <li>Brian Rhodes – CP/SSHO</li> </ul>	<ul style="list-style-type: none"> <li>Use this AHA as a checklist</li> <li>Inspect all equipment and tools prior to use per manufacturer requirements.</li> </ul>

## Activity Hazard Analysis (AHA)

Activity/Work Task: Fueling Operations	Overall Risk Assessment Code (RAC) (Use highest code)	<b>M</b>				
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>					
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>				
Date Prepared: 08/17/21		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	E	E	H	H	M
Reviewed by: Doug Russell/HSE Manager	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment	Negligible	M	L	L	L	L
	Step 1: Review each <b>"Hazard"</b> with identified safety <b>"Controls"</b> and determine RAC (See above)					
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.				<b>RAC Chart</b>	
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible				<b>E = Extremely High Risk</b>	
Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.				<b>H = High Risk</b>		
				<b>M = Moderate Risk</b>		
				<b>L = Low Risk</b>		

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Fueling operations.	Exposures to fuels.	<p>Personnel shall periodically review the Safety Data Sheets (SDS) for the fuels that are being used at the project.</p> <p>The handling and use of fuels shall be performed in well-ventilated areas – preferably outside of buildings.</p> <p>Personnel shall avoid skin and eye contact with fuels. Safety glasses and disposable nitrile gloves shall be worn while handling fuels. If personnel sustain skin contact with fuels, then the affected area shall be immediately washed with soap and water. If fuel contact with clothing is made, then clothing shall be removed and changed immediately.</p>	<p>06.B.01</p> <p>09.B.07</p> <p>05.B.01 09.B.05</p>	<b>L</b>
	Fire: extinguisher requirements.	<p>10 pound A:B:C fire extinguisher shall be <u>readily</u> available when fueling equipment at any location on site. Trucks with flammable/combustible fuels must be equipped with 20 pound A:B:C fire extinguisher. Personnel who intend to extinguish small fires shall be trained annually in the use of fire extinguishers. Equipment and property are of secondary concern in a fire situation - personnel shall never try to extinguish a fire if there is any doubt that it can be extinguished safely.</p>	<p>09.E.03 09.B.03</p>	



<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>EM 385-1-1</b>	<b>RAC</b>
Fueling operations (continued).	Fire: elimination of ignition sources – hot surfaces.	All vehicles and equipment shall be shut down prior to fueling. Small equipment, such as generators, mowers, pressure washers, etc. shall be allowed to cool prior to re-fueling. Heavy equipment with the fuel cap near the engine or near other hot surfaces shall also be allowed to cool prior to re-fueling.	09.B.21	<b>M</b>
	Fire: elimination of ignition sources – arcs/sparks/open flames.	Smoking shall not be allowed within 50 feet of fueling operations. Personnel shall visually survey the immediate area for open flames and other ignition sources prior to commencing fueling operations. Personnel are prohibited from using cell-phones or two-way radios during all fueling operations.	09.B.02	<b>L</b>
	Fire: elimination of ignition sources – static electricity.	Personnel shall never fill portable fuel cans that are in the bed of a pickup truck or in the trunk of an automobile. Filling fuel containers on plastic pickup truck bed-liners can cause static electric discharges, which may ignite the fuel. The fuel can(s) shall be removed from the truck bed or automobile trunk and placed on the ground before adding fuel.  Electrical continuity shall be maintained between the portable fuel can and the tank being filled. A bonding cable shall be used to maintain continuity between the metal fuel container and the equipment fuel tank. Allowing free-fall of fuel into the tank is prohibited.  Personnel shall not re-enter vehicles while fueling is underway due to the static electric charge generated between clothing and vehicle seats. If you absolutely have to get in your vehicle while the gas is pumping, make sure you get out, close the door touching the metal, before you pull the nozzle out. This way the static from your body will be discharged before you remove the nozzle.	09.B.21	<b>L</b>
	Storage and transportation: five-gallon cans in pick-up trucks.	Gasoline shall be stored and transported in properly marked/labeled five-gallon, or smaller-size safety cans (equipped with self-venting cap and flash arrestor). Gasoline cans shall be secured to prevent movement during transportation.  No more than six - five gallon containers of gasoline may be transported in vehicles (back of pick-up trucks or trailers) at the same time unless all the Department of Transportation (DOT) Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding (as required), and the appropriate HM 126 Training (as well as having been provided emergency response information and training.) The total quantity of hazardous materials may never exceed 440 pounds total. Hazardous materials must be secured prior to transporting.	09.B.08 09.B.11	<b>L</b>
	Communication of hazards.	Drivers must be notified that they are transporting hazardous materials. Drivers shall review SDS for the fuels transported in their vehicle.	01.B.01	<b>L</b>

<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>EM 385-1-1</b>	<b>RAC</b>
Fueling operations (continued).	Storage of fuels on-site.	Portable safety gasoline cans must be stored within a flammable materials storage area, have appropriate warning signs, be posted as "No Smoking", and have a fire extinguisher available in the area.	09.B.02 09.B.18	<b>M</b>
	Spills.	All spills shall be immediately cleaned-up. Spill control equipment shall be readily available. All spills shall be reported to the Site supervisor (SS) and Site Safety and Health Officer (SSHO).	09.B.19	<b>M</b>
	Storage and transportation: safety containers and saddle tanks in pick-up trucks.	Gasoline shall not be transported in portable saddle tanks – only diesel fuel shall be transported in saddle tanks. All portable saddle tanks mounted in pick-up trucks shall be manufactured to meet DOT specifications. Portable saddle tanks shall be securely mounted to the pick-up truck, as recommended by the manufacturer.  Saddle tanks shall be properly marked (see 49 Code of Federal Regulation 172.101) with the proper shipping name and labeled for "No Smoking."  No more than 110 gallons of diesel fuel may be transported in a saddle tank unless all the DOT Hazardous Material Regulations are complied with, such as proper packaging, completing shipping papers, placarding, and the appropriate HM 126 Training (as well as having been provided emergency response information and training.)	09.B.08	<b>L</b>
	Bulk storage of diesel fuel on-site.	Caps on saddle tanks shall be securely closed. Saddle tanks shall be inspected weekly to check for leaks.  Bulk storage tanks shall not be permitted on site without express permission from the Contractor's Project Manager and Health and Safety Manager. Containment measures shall be implemented.		<b>M</b>

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<p>Personal Protective Equipment - Level D:  Hard Hat  Safety Glasses  Safety-Toed Boots  Disposable nitrile gloves  ANSI Class 2 reflective warning vests</p> <p>Equipment:  Fire Extinguishers  Saddle tanks  Bonding cable  Five-gallon safety cans (equipped with self-venting cap and flash arrestor)  Basic spill kit (55-gallon open top drum, shovels, plastic sheeting, sorbent pads and granular material)</p>	<p>Training Requirements:</p> <p>Bonding techniques  Materials of Trade  Hazard communication - Review Material Safety Data Sheet for fuels  Portable fire extinguisher use  Lifting/back safety</p>	<p>Daily site safety inspection (SSHO) – Brian Rhodes  Daily site safety inspection (UXOSO) – TBD</p> <p>Survey area for ignition sources (prior to commencing fueling operations)  Verify SDSs for fuels are available in vehicles transporting fuels  Saddle tanks (daily)  Verify eye wash bottle is readily available  Fire extinguisher (before fueling equipment)</p>

## Activity Hazard Analysis (AHA)

Activity/Work Task: Disposal of Investigative Derived Waste	Overall Risk Assessment Code (RAC) (Use highest code)	<b>M</b>
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>	
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>
Date Prepared: 08/17/21		Frequent    Likely    Occasional    Seldom    Unlikely
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	<b>E</b> <b>E</b> <b>H</b> <b>H</b> <b>M</b>
Reviewed by: Doug Russell/HSE Manager	Critical	<b>E</b> <b>H</b> <b>H</b> <b>M</b> <b>L</b>
	Marginal	<b>H</b> <b>M</b> <b>M</b> <b>L</b> <b>L</b>
	Negligible	<b>M</b> <b>L</b> <b>L</b> <b>L</b> <b>L</b>
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as certification of hazard assessment.	Step 1: Review each <b>"Hazard"</b> with identified safety <b>"Controls"</b> and determine RAC (See above)	
	"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	<b>RAC Chart</b>
	"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	<b>E = Extremely High Risk</b>
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	<b>H = High Risk</b> <b>M = Moderate Risk</b> <b>L = Low Risk</b>

Job Steps	Hazards	Controls	RAC
Investigative waste disposal	Personnel injury, property damage, and/or equipment damage	Use qualified and trained forklift operators. The operator shall not exceed the load capacity rating for the forklift. The load capacity shall be clearly visible on the forklift. Forklift operators shall inform their supervisor of any prescribed medication that they are taking that would impair their judgment.	<b>M</b>
	Cross-contamination and contact with potentially contaminated materials	Loads to be transported shall be inspected for container integrity and secured prior to movement. Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination. Only essential personnel will be in the work area. All personnel will follow good hygiene practices. Proper decontamination procedures will be followed. All liquids and materials used for decontamination will be contained and disposed of in accordance with federal, state, and local regulations.	<b>L</b>
	Heavy lifting	Use proper lifting techniques. Lifts greater than 50 pounds require assistance or mechanical equipment; size up the lift. Avoid sudden or awkward motion. Lift with legs.	<b>L</b>
	Slip, trip and falls	Housekeeping shall be a routine task throughout daily activities.	<b>M</b>

Job Steps	Hazards	Controls	RAC
Investigative waste disposal	Drum handling	Stay upwind when filling a drum (with either soil or water), be careful not to make contact with the contained waste. Conduct air monitoring as specified in the SSHP. Wear appropriate gloves and or splash protection. Make sure lid or bung of drum is secure. If moving a drum unassisted, be sure to leverage properly, use proper lifting techniques, and wear safety glasses and steel-toed boots. When using a drum dolly, make sure straps and lid catch are securely attached. Leverage properly when tilting drum. Be sure toes stay away from drum.	M
	Tripping Hazards	Site Safety and Health Officer (SSHO) will ensure that workers are aware of potential slippery surfaces and tripping hazards. Personnel will inform Site Supervisor (SS) or SSHO of any observed potential slip, trip, or fall hazards.	L
	Manual lifting	Workers will be trained in proper lifting techniques and the potential for injuries due to lifting, to be discussed during site-specific training. No bulky item or items assessed at over 50 lbs will be lifted without assistance or use of a lift assist device (e.g., handcart).	M
	Improper labeling or shipping papers	All generated waste shall be labeled in accordance with Department of Transportation regulations based on waste stream profile and be accompanied by required documentation based on waste characterization criteria per Resource Conservation and Recovery Act and 40 Code of Federal Regulations (CFR). Only personnel with the required training shall characterize and profile waste.	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
Personal Protective Equipment Level D with Nitrile gloves  Equipment: Air monitoring equipment Fire Extinguishers First Aid Kit Trucks Drums Packing materials Drum dolly	Competent Person (CP) / Qualified Person (QP): Brian Rhodes  HAZWOPER 40-Hour Site safety orientation Emergency procedures Hazard communication Hazardous materials shipping Applicable AHAs Fire extinguisher use	Daily site safety inspection (SSHO) – Brian Rhodes Daily site safety inspection (UXOSO) –TBD  Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Inspect shipping containers and labeling

## Activity Hazard Analysis (AHA)

Activity/Work Task: Vehicle Operations	Overall Risk Assessment Code (RAC) (Use highest code)	<b>M</b>		
Project Location: RSA-122/RSA-183 Redstone Arsenal Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>			
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>		
Date Prepared: 08/17/21		Frequent    Likely    Occasional    Seldom    Unlikely		
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	<b>E</b> <b>E</b> <b>H</b> <b>H</b> <b>M</b>		
Reviewed by: Doug Russell, HSE Manager	Critical	<b>E</b> <b>H</b> <b>H</b> <b>M</b> <b>L</b>		
	Marginal	<b>H</b> <b>M</b> <b>M</b> <b>L</b> <b>L</b>		
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment	Step 1: Review each <b>"Hazard"</b> with identified safety <b>"Controls"</b> and determine RAC (See above)			
	<b>"Probability"</b> is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	<b>RAC Chart</b>		
	<b>"Severity"</b> is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	<b>E = Extremely High Risk</b>		
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	<b>H = High Risk</b>		
		<b>M = Moderate Risk</b>		
		<b>L = Low Risk</b>		
<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>EM 385-1-1</b>	<b>RAC</b>
Project vehicle use.	Operation of motor vehicles and trucks-General.	All company owned, leased, or rented vehicle operations shall comply with the requirements of AMS-710-02-PR-02700, <i>Non-Commercial Motor Vehicle Safety</i> , and AMS-710-02-PR-05700 <i>Mechanized and Marine Equipment</i> . All company owned, leased, or rented commercial vehicle operations shall comply with the requirements of AMS-710-02-PR-03900, <i>Commercial Motor Vehicle Safety</i> . Subcontractors operating motor vehicles shall comply with all federal, state, and local traffic regulations. Subcontractors shall only use vehicles that are in good condition and safe to operate. All personnel shall drive defensively and wear seat belts while vehicles are in motion.	18.A.01 18.A.02 18.A.03          18.C.02 18.C.03	<b>M</b>
	Operation of motor vehicles and trucks-Accidents	In the event of an accident: Stop; call for medical assistance; notify police; complete Vehicle Accident Report and submit to your supervisor. If an APTIM employee is injured, the medical forms per Section 8.0 of the Installation-Wide APP (CEHNC, 2019). Attachment 3, must completed at the health clinic or Emergency Room. Refer to "Aptim Federal Services, LLC Incident Notification, Reporting, and Management Procedure" summary in Attachment 3 of the Site Safety and Health Plan (SSHP).	01.D.01	<b>M</b>

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Project vehicle use (continued).	Operation of motor vehicles and trucks-Backing	<p>Back into parking spaces upon arrival, whenever possible.</p> <p>When preparing to move or back vehicles at the project site, walk around the vehicle before backing to identify any new conditions or obstructions.</p> <p>Use a spotter when backing whenever possible, and sound horn prior to backing.</p> <p>Determine and agree upon hand signals (between spotter and driver) before attempting to back vehicle.</p> <p>Check the rear-view and side mirrors prior to backing (Note: All vehicles, other than automobiles, must have small convex mirrors attached to the side mirrors.)</p> <p>Back slowly in areas of obstructed vision.</p> <p>Anticipate others who may be backing out into your pathway and adjust accordingly.</p>	<p>18.C.14 08.B.04</p> <p>08.B.06</p>	L
	Operation of motor vehicles and trucks - Unfamiliar with the vehicle	<p>Familiarize yourself with the vehicle before moving.</p> <p>Review the dashboard controls, steering radius, overhead, and side clearances. Locate windshield wipers and lights.</p> <p>Properly adjust mirrors and seat.</p>		M
	Operation of motor vehicles and trucks-Speed	<p>Obey all posted speed limits.</p> <p>Radar detectors are prohibited in all company owned, leased, or rented vehicles.</p> <p>Reduce travel speed during hazardous conditions (i.e., rain, fog, snow).</p>	<p>08.B.06</p> <p>18.C.04 18.C.05</p>	M
	Operation of motor vehicles and trucks-Spacing/Distance	<p>Identify if your vehicle has Anti-Lock Brakes.</p> <p>Follow the 3-second rule. Increase the 3-second rule as necessary during hazardous travel conditions.</p> <p>Always “leave yourself an out” during travel – this applies to stoplights as well.</p> <p>When stopping, make sure that you leave enough distance between you and the car in front of you (you should be able to see the rear tires of the vehicle in front, when stopped).</p> <p>When at a red light, and it turns green, use the “delayed start” technique, by counting to three before you take your foot off the brake.</p> <p><b>DO NOT TAILGATE!</b></p> <p>Allow extra spacing and braking time for trucks and vehicles towing trailers. Trailers shall be equipped with brakes</p>		M
	Operation of motor vehicles and trucks-Skids	<p>If the vehicle has begun to skid out of control, turn the steering wheel in the direction of the skid and re-adjust the wheel, as necessary.</p> <p>Slow travel speeds during hazardous travel conditions.</p> <p>Use 4-wheel drive, if available, when driving vehicles off road, on steep inclines, muddy conditions, etc.</p> <p>Do not take vehicles “off road” if they cannot be operated safely.</p>	18.C.05	M

<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>EM 385-1-1</b>	<b>RAC</b>
Project vehicle use (continued).	Operation of motor vehicles and trucks-Blind Spots	Become familiar with any blind spots associated with your vehicle. Adjust mirrors properly. Make sure you use your directional signals. Always look over your shoulder to assure the lane is clear when changing lanes.		<b>M</b>
	Operation of motor vehicles and trucks-Cellular phones	Exercise caution when approaching other driver's blind spots. Do not use handheld cellular phones while driving. Pull over to the side of the road when making a call.	18.C.01	<b>M</b>
	Operation of motor vehicles and trucks-Equipment Failure	Perform daily inspections of your vehicle. Any vehicle with mechanical problems that may endanger the safety of the driver, passengers, or the public shall not be used.	18.A.03 18.A.04	<b>M</b>
	Operation of motor vehicles and trucks-Safety Equipment	Ensure safety equipment is in the vehicle. Safety equipment should include a spare tire, jack, first-aid kit, fire extinguisher, and flashlight. Flares and/or reflective triangles shall be available in larger trucks. Verify that the proper documentation is in the vehicle - documentation includes an operations manual for the vehicle, insurance card, vehicle registration, and APTIM Incident forms.	18.A.03	<b>M</b>
	Operation of motor vehicles and trucks- Influenced by drug and alcohol	Never drive under the influence of drugs or alcohol. Disciplinary action, including termination, will be taken against anyone who is convicted of or who pleads no-contest to the charges of driving under the influence in accordance with AMS. Project-assigned hourly employees are not permitted to operate company owned, leased, or rented vehicles after 10:00 p.m. without written authorization from their supervisor.	01.C.02	<b>M</b>
	Operation of motor vehicles and trucks-Driver Attitude/Fatigue	Do not operate any vehicle when abnormally tired, temporarily disabled, or under the influence of drugs or alcohol. Keep an even temper when driving. Do not let the actions of others affect your attitude. Avoid "highway-hypnosis" and "falling asleep at the wheel." Take plenty of breaks when driving long distances. Rotate driving responsibility with your partner. No employee is authorized to operate a company vehicle (including rentals) after having been on-duty for a period of 12-hours. No employee may drive for more than 10-hours in a single on-duty period.	01.C.04	<b>M</b>
	Operation of motor vehicles and trucks-Vehicle Loading	DO NOT OVERLOAD the vehicle. Secure all equipment within the body of the vehicle. Do not block side view mirrors with load. Do not transport Department of Transportation manifested hazardous materials without a commercial driver's license. Dispatch all equipment and personnel with proper forms and identification.	18.C.13 18.C.16	<b>M</b>



<b>Equipment to be Used</b>	<b>Training Requirements/Competent or Qualified Personnel Name(s)</b>	<b>Inspection Requirements</b>
Personal Protective Equipment – N/A:  Equipment: Seatbelt Spare tire and jack First aid kit Fire extinguisher Flashlight Operations manual for the vehicle Insurance card Vehicle registration Accident report forms	Training Requirements:  Site safety orientation Licensed vehicle operators Defensive driving (all APTIM personnel)	Daily site safety inspection (QCSM) –Brian Rhodes  Vehicle inspections (daily) Vehicle inspections (prior to trips greater than 50 miles for APTIM provided vehicles)

## Activity Hazard Analysis (AHA)

Activity/Work Task: Site Restoration	Overall Risk Assessment Code (RAC) (Use highest code)	<b>M</b>
Project Location: RSA-122/RSA-183 Redstone Arsenal, Huntsville AL	<b>Risk Assessment Code (RAC) Matrix</b>	
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>
Date Prepared: 08/17/21		Frequent      Likely      Occasional      Seldom      Unlikely
Prepared by (Name/Title): Ray Clark, Engineer	Catastrophic	<b>E</b> <b>E</b> <b>H</b> <b>H</b> <b>M</b>
Reviewed by: Doug Russell/HSE Manager	Critical	<b>E</b> <b>H</b> <b>H</b> <b>M</b> <b>L</b>
	Marginal	<b>H</b> <b>M</b> <b>M</b> <b>L</b> <b>L</b>
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment	Negligible	<b>M</b> <b>L</b> <b>L</b> <b>L</b> <b>L</b>
	Step 1: Review each “ <b>Hazard</b> ” with identified safety “ <b>Controls</b> ” and determine RAC (See above)	
	“ <b>Probability</b> ” is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	<b>RAC Chart</b>
	“ <b>Severity</b> ” is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	<b>E = Extremely High Risk</b> <b>H = High Risk</b> <b>M = Moderate Risk</b> <b>L = Low Risk</b>
Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each “Hazard” on AHA. Annotate the overall highest RAC at the top of AHA.		

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Arrival of new personnel at site.	Unfamiliarity with: site, general site hazards, project safety rules, chain of command, and emergency procedures.	All personnel shall attend the site orientation training.	01.B.03 01.E.01 28	<b>M</b>
Restore site.	Poor planning.	Complete Job Safety Analysis for each task. Use Hazard Assessment Resolution Program frequently – for each task to be completed.		<b>M</b>
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 50 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 50-pound limit.	14.A.01	<b>M</b>
	Intrusive activities and underground utilities.	Follow procedure for Utility Contact Prevention in Accident Prevention Plan (APP) prior to commencing excavation activities. Utilities shall be located and marked prior to commencing intrusive activities. The Alabama One Call Law must be followed. Contact Digger’s Hotline of Alabama at least 10 days but not less than prior 48 hour to commencing intrusive activities off base, excluding weekends or any state or federal holidays. Retain a copy of mark-out ticket for documentation purposes and QC purposes. On base utilities shall be cleared by the RSA Public Works Department.	25.A.01	<b>M</b>

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Restore site (continued).		<p>Follow requirements of AMS-710-02-PR-01600, <i>Excavation and Trenching</i>, and AMS-710-02-PR-01610, <i>Utility Contact Prevention</i>.</p> <p>Evaluate the work areas, ground conditions, and travel paths to identify any sensitive underground structures, unstable areas, dangerous slopes, and existing open excavations.</p> <p>Use manual excavation within 3 feet of known utilities. Once the line or cable is exposed, heavy equipment can be used but must remain at least 3 feet from the exposed line or cable.</p> <p>Each work crew member shall be trained in electrocution hazards, explosion/fire hazards, and emergency procedures associated with contacting energized power lines and pipelines.</p> <p>Immediately contact utility one-call service (811) if an underground utility is damaged, dislocated, or disturbed.</p>		
	Overhead hazards/utilities.	<p>Before equipment is moved, the travel route shall be surveyed for overhead and terrain hazards. The minimum distances from electrical lines must be observed in accordance with EM-385-1-1 Table 11-1.</p> <p>Power lines shall be assumed to be energized unless verified to be de-energized and visibly grounded. Operation beneath a power line that has not been verified as de-energized and grounded must maintain clearance distances stated above. A high-visibility elevated warning line or barricade shall be erected at the minimum approach distance.</p> <p>Each work crew member shall be trained in the electrocution hazards and emergency procedures associated with energized power lines.</p> <p>RSA public works personnel who may be required to deenergize overhead electric lines shall follow NFPA 70E requirements and be familiar with arc flash protection requirements.</p>	11.F.04	<b>M</b>
	Slips, trips, and falls.	Keep work areas clear and maintain housekeeping. Personnel shall not jump from elevated surfaces. Personnel shall use caution when walking on rocky, slippery, or uneven terrain.	14.C.01-10	<b>M</b>
	Hand injuries.	Items to be handled shall be inspected for sharp edges prior to being handled. Personnel shall wear leather gloves when handling sharp materials. Personnel shall be aware of and avoid pinch point hazards.	05.A.08	<b>L</b>

<b>Job Steps</b>	<b>Hazards</b>	<b>Controls</b>	<b>EM 385-1-1</b>	<b>RAC</b>
Restore site (continued).	Use of heavy equipment.	Only qualified personnel shall be permitted to operate equipment. Heavy equipment shall be inspected daily after the initial U.S. Army Corps of Engineers inspection (and documented). Do not use unsafe equipment. All equipment shall have backing alarms. All equipment shall be operated at safe speeds and in a safe manner. Equipment operators shall wear safety belts. Personnel are only permitted to approach equipment after a signal from the operator. Ground personnel, working near heavy equipment, shall wear high visibility conspicuity vests. Ground personnel shall not enter the swing radius of equipment. Ground personnel shall not position themselves between equipment and stationary objects. Personnel shall verify all mechanical guards are in place and functioning properly. Moving equipment shall be equipped with a back-up alarm. All equipment shall be shut down with energies dissipated prior to performing maintenance activities - lock out/tag out procedures may apply. Only qualified mechanics shall work on or repair heavy equipment.	18.A 18.G 18.B 05.F	<b>M</b>
	Insect bites/West Nile Virus.	Wear PPE and tape joints to keep insects away from the skin. Use protective insect repellents containing N,N-Diethyl-m-toluamide, such as, 3M Ultrathon™ or equivalent and clothing insecticide preparations containing permethrins (Repel® Permanone® or equivalent) to prevent insect bites. Check limbs/body for insects/insect bites before showering. Notify Site Safety and Health Officer (SSHO) of flu-like symptoms.	06.D.01	<b>L</b>
	Contact dermatitis and poison ivy.	Check around work areas to identify if poison ivy is present. Wear long-sleeve shirts/trousers or Tyvek® coveralls to avoid skin contact with plants or other skin irritants. Learn to identify poisonous plants. Remove clothing or Tyvek® coveralls by inside-out method to avoid contact with potentially contaminated outer surfaces.  Avoid unnecessary clearing of plant/vegetation areas.  Cover vegetation with plastic (visqueen) where sampling position raises exposure potential. Apply protective cream/lotion to exposed skin to prevent poison ivy or similar reactions. Identify workers who are known to contract poison ivy.	06.D.03	<b>L</b>
	Severe weather.	Follow procedures outlined in the SSHP.	06.I	<b>L</b>
	Hazardous atmospheres.	Personnel shall immediately notify the SSHO if odors are detected.		<b>L</b>
	Heat stress and cold stress.	Follow procedures outlined in the SSHP. Use ACGIH guidelines for WBGT monitoring and TLVs.	06.I	<b>M</b>
	Dust.	Dust shall be monitored and controlled. Respiratory protection may be required if dust cannot be adequately controlled.		<b>L</b>

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Restore site (continued).	Fire.	Smoking shall be permitted in designated areas. Vehicles shall not be parked in tall dry grass.  Engines shall be shut off before refueling. A 40-B:C fire extinguisher shall be available when refueling. Site personnel shall complete annual fire extinguisher training. Smoking shall not be permitted near fueling areas. Gasoline shall be stored in safety cans with flash arrestors and spring-loaded vents.	09.E.01 09.A.06 09.B.08	L
	Dump truck operations.	Dump trucks shall be inspected and found to be in safe condition prior to being placed in service at site. Overhead hazards shall be re-evaluated prior to allowing dump trucks onto the project site. Areas with overhead hazards shall be barricaded with caution tape to prevent dump bed from contacting. In areas where it is not feasible to use barricades, then spotters shall be provided: however, the minimum distances from electrical lines must be observed (see SSHP). Operators shall wear seat belts while trucks are in motion at the project site. Spotters shall assist trucks when backing is necessary.	18.A.03 18.G.26 11.F	M
	Use of fertilizers.	The material safety data sheet for fertilizers shall be read and understood. Personnel shall avoid contact with fertilizer.	06.B.01	L
	Electrocution.	Only qualified electricians shall perform electrical disconnection activities.	11.A	M

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
Personal Protective Equipment - Level D:  Hard hat Safety glasses Safety-toed boots Work gloves ANSI Class 2 reflective warning vests  Equipment:  Fire extinguishers Emergency eyewash First aid kit Deep-Woods Off or Ultrathon™ Repel® Permanone® Drinking water Weather radio or AM/FM radio	Competent Person (CP) / Qualified Person (QP):  Brian Rhodes – CP/SSHO Brian Rhodes – CP/First Aid and CPR  Training Requirements:  Site safety orientation Applicable AHAs HAZWOPER 40-Hour Qualified equipment operators Lifting/back safety Fire extinguisher use Emergency procedures Biological hazard identification and control Tornado shelter locations National Lightning Safety Institute Lightning Safety procedures	Daily site safety inspection (SSHO) – Brian Rhodes  Check Known Allergies Questionnaire, training, and medical certifications against personnel roster Mechanized equipment (U.S. Army Corps of Engineers form prior to use) Mechanized equipment (daily) Overhead and underground utilities Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Equipment and tools inspection daily and before use Survey areas for poisonous plants, insects, and animals Check body for ticks Verify tornado shelter available

## Activity Hazard Analysis (AHA)

Activity/Work Task: COVID-19 Job Site Practices	Overall Risk Assessment Code (RAC) (Use highest code)	<b>L</b>
Project Location: RSA-122/RSA-183 Redstone Arsenal, Huntsville, AL	<b>Risk Assessment Code (RAC) Matrix</b>	
Contract Number: W912DY-17-D-0003	<b>Severity</b>	<b>Probability</b>
Date Prepared: 08/17/21		Frequent      Likely      Occasional      Seldom      Unlikely
Prepared by (Name/Title): Dennis Seymore	Catastrophic	E      E      H      H      M
	Critical	E      H      H      M      L
Reviewed by (Name/Title): Doug Russell, HSE Manager	Marginal	H      M      M      L      L
	Negligible	M      L      L      L      L
<b>Notes:</b> (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment	Step 1: Review each <b>"Hazard"</b> with identified safety <b>"Controls"</b> and determine RAC (See above)	
	<b>"Probability"</b> is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom, or Unlikely.	<b>RAC Chart</b>
	<b>"Severity"</b> is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible	<b>E = Extremely High Risk</b> <b>H = High Risk</b>
	Step 2: Identify the RAC (Probability/Severity) as E, H, M, or L for each "Hazard" on AHA. Annotate the overall highest RAC at the top of AHA.	<b>M = Moderate Risk</b> <b>L = Low Risk</b>

Job Steps	Hazards	Controls	RAC
Mobilization to site	Inadequate preparation and training that can lead to possible infection	<ul style="list-style-type: none"> <li>Site Safety &amp; Health Officer (SSHO) to identify potential infection sources due to the task, location, and surrounding areas. Include discussion of same in site specific training.</li> <li>SSHO to discuss Coronavirus hazards and controls in the readiness review and initial tailgate safety meeting and include at least the topics listed below. The meeting should be held outdoors or in a space large enough to allow space between participants. SSHO to verify that the necessary equipment and supplies are available and in good condition: gloves, safety glasses, sanitizer.                             <ol style="list-style-type: none"> <li>1. The virus is highly contagious and is probably spread primarily by airborne droplets ejected when infected people cough, sneeze, or possibly just breathe. These droplets settle out of the air within about 6 feet.</li> <li>2. The most frequent symptoms are fever, coughing, shortness of breath.</li> <li>3. Maintain 6-foot separation unless the job task requires working closely. If working closer than 6 feet wear a mask.</li> </ol> </li> <li>All personnel shall follow guidance in AMS-710-01-FM-04201, <i>COVID-19 Control Plan</i>.</li> <li>Check of the APTNet Corona Virus webpage for the latest CDC guidance and update recommendations, as applicable.</li> <li>Site workers are required to report travel to high-risk areas, potential exposure to infected people, and symptoms of illness.</li> <li>Do not share tools, pens, or anything else without disinfecting between uses. Use your own pen.</li> <li>When practical, a single person should be in a vehicle. If 2 or more people are in a vehicle, all should wear masks. Adjust vehicle's air handling system to maximize outside air.</li> </ul>	<b>L</b>

Job Steps	Hazards	Controls	RAC
		<ul style="list-style-type: none"> <li>• Discuss and follow any state and local restrictions on gatherings (# of people that can congregate) and closings. Be aware that stores, restaurants and coffee locations that you may have frequented may be closed. Bring your own food and drinks.</li> <li>• In addition to what is provided in this AHA, subcontractors and Government personnel are directed to follow their Corporate HR policies.</li> <li>• CDC document How It Spreads: <a href="https://www.cdc.gov/coronavirus/2019-ncov/prepare/transmission.html">https://www.cdc.gov/coronavirus/2019-ncov/prepare/transmission.html</a></li> <li>• Avoid air travel if possible. If air travel is necessary, wear a face mask during the flight and maintain as much distance from other passengers as allowed by seating airplane seating arrangements.</li> <li>• If renting a vehicle, request a rental vehicle that has been idle. Three days is best because all or nearly all virus particles on surfaces are inactivated by 72 hours of exposure to air. At least 75% of virus particles are inactivated by 24 hours of exposure to air.</li> <li>• Wipe the steering wheel and other high-contact surfaces of rental vehicles with disinfectant. Any cloth or tissue saturated with disinfectant such as &gt;60% isopropyl alcohol, &gt;120 proof clear liquor (keep sealed or in trunk when in transit), or commercial disinfectant. Concentrated alcohol is flammable so use in well ventilated area away from ignition sources. Any disinfectant product from a reputable supplier (Kimberly-Clark, S. C. Johnson, Lysol, Clorox) should inactivate the virus. See this EPA report on disinfectants for additional information: <a href="https://www.epa.gov/sites/production/files/2020-03/documents/sars-cov-2-list_03-03-2020.pdf">https://www.epa.gov/sites/production/files/2020-03/documents/sars-cov-2-list_03-03-2020.pdf</a></li> <li>• Designate a representative to monitor for signs of illness in the workplace, and if someone is showing symptoms, SSHO shall ask them to leave.</li> <li>• Designate a representative to take employees' temperatures with a digital forehead thermometer that is disinfected appropriately between applications. This should be done PRIOR TO any individual entering the job site. Individuals' temperatures should also be taken when leaving or at the end of their shift. Personnel will be sent home if their temperature exceeds 100.4° F (38.0° C). SSHO shall keep records of temperatures taken and appeared normal. Note that some people with COVID-19 may not have a fever, so this should not be the only means of detection.</li> <li>• Sick employees shall be separated immediately from others. CDC recommends that employees who appear to have acute respiratory illness symptoms (i.e., cough, shortness of breath) upon arrival to work or become sick during the day should be separated from other employees and be sent home immediately. Individuals that have been asked to leave should NOT be allowed to enter any occupied area at any time prior to leaving.</li> <li>• Provide tissues and encourage employees to cover their noses and mouths with a tissue (or elbow or shoulder if a tissue is not available) when coughing or sneezing and disposable hand towels and no-touch trash receptacles.</li> <li>• Limit the exchange/sharing of paper documents by encouraging use of electronic communication whenever possible and do not allow sharing of tools or any multi-user devices and accessories such as iPads, laptops, hand-held radios, computer stations, etc.</li> <li>• Provide soap and water and hand sanitizer with alcohol content between 65% and 90% in the workplace. Ensure that adequate supplies are maintained. Place hand sanitizers in multiple</li> </ul>	

Job Steps	Hazards	Controls	RAC
		<p>locations on the job site, in the office, in or around portable toilets, or in conference rooms to encourage hand hygiene.</p> <ul style="list-style-type: none"> <li>• Provide disposable gloves where appropriate; instruct workers to wash hands after removing gloves.</li> <li>• Communicate key CDC recommendations (and post signage where appropriate) to your staff and tradespeople.</li> </ul>	
Hotel Stays	Infection	<ul style="list-style-type: none"> <li>• Request a room that has been idle. Three days is best because all or nearly all virus particles on surfaces are inactivated by 72 hours of exposure to air. AT least 75% of virus particles are inactivated by 24 hours of exposure to air.</li> <li>• Request no maid service for short stays.</li> <li>• Minimize time spent in common areas like the hotel lobby, exercise facility, or restaurant. Practice social distancing with hotel staff and other guests.</li> <li>• Wipe high-contact areas like doorknobs and countertops with disinfectant. Any cloth or tissue saturated with disinfectant such as &gt;60% isopropyl alcohol, &gt;120 proof clear liquor, or commercial disinfectant spray. Concentrated alcohol is flammable so use in well ventilated area away from ignition sources. Note that any disinfectant from a reputable supplier (Kimberly-Clark, S.C. Johnson, Lysol, Clorox) is likely to be effective on Coronavirus. See this EPA report on disinfectants for additional information: <a href="https://www.epa.gov/sites/production/files/2020-03/documents/sars-cov-2-list_03-03-2020.pdf">https://www.epa.gov/sites/production/files/2020-03/documents/sars-cov-2-list_03-03-2020.pdf</a></li> </ul>	L
Transportation or shipment of disinfectants	<p>Violation of Department of Transportation hazardous materials shipping regulations</p> <p>Spills, leaks, fires</p>	<ul style="list-style-type: none"> <li>• Transport disinfectants in vehicles in compliance with DOT Materials of Trade exception: <ul style="list-style-type: none"> <li>○ Materials in labeled leak-tight containers.</li> <li>○ Containers secured so that they do not move while in transit, driver aware of hazardous materials in vehicle.</li> <li>○ No more than 5 gallons of flammable liquid in any single container.</li> <li>○ If disinfectants must be shipped (for example by FedEx) use ground shipment.</li> </ul> </li> </ul>	L
Site tasks	Infection or spread of infection to other site personnel	<ul style="list-style-type: none"> <li>• Stay at least 6 feet from other personnel unless closer spacing is necessary for the work (and maintain this spacing during breaks and lunch). If unable to maintain 6 feet distance, personnel should wear a surgical mask or face covering. If there are lifts that are greater than 50 lbs, use a mechanical lifting device in order to avoid close proximity to another worker during the lift assist. If unavoidable, both should wear masks.</li> <li>• Also, when the buddy system is employed maintain spacing of at least 6 feet.</li> <li>• Hold tailgate safety meetings outdoors or in a space large enough to allow separation.</li> <li>• To the extent practical, limit time within trailers and office spaces. Each trailer is equipped with its individual HVAC unit that includes a filter.</li> <li>• All Site Worker's temperatures will be monitored at the beginning of each workday by designated personnel.</li> <li>• Personnel will be sent home if their temperature exceeds 100.4° F (38.0° C).</li> <li>• Do not share pens, tools or personal protective equipment (PPE).</li> <li>• Avoid touching high contact surfaces like portable toilet handles, doorknobs, etc. with your bare skin and if you cannot avoid that, wash or disinfect your hands afterward.</li> <li>• Avoid handshakes and hugs.</li> </ul>	L