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US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, REDSTONE
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REPLY TO
ATTENTION OF

04/15/2021

Environmental Management Division

Mr. Stephen A. Cobb
Chief, Land Division
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463

Received
APR 15 2021
Land Division

Reference:

- a. The Installation Restoration Program at Redstone Arsenal, Alabama, AMIM-REP-ER (EPA ID AL7 210 020 742).
- b. Resource Conservation and Recovery Act Corrective Action Program at Redstone Arsenal, Alabama (EPA ID AL7 210 020 742).
- c. Redstone Arsenal's Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/Thermal Treatment/Solid Waste Management Unit Corrective Action (AHWMMA) Permit dated September 30, 2010 including Modification #15 dated 23 September 2020.

Dear Mr. Cobb:

This letter transmits the submittal of the Revision 1 Corrective Measures Implementation Work Plan, RSA-221-R-01, Fuse Storage and Munitions Disposal Area, Operable Unit 15, US Army Garrison-Redstone, Madison County, Alabama for your review.

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Copies of this correspondence are being furnished to Mr. Philip Stroud, Alabama Department of Environmental Management; Mr. Robert Pope, Superfund and

Emergency Management Division USEPA Region 4, Mr. Cesar Zapata, Land,
Chemicals and Redevelopment Division USEPA Region 4.

My point of contact for this request is Mr. Clint Howard, Environmental
Management Division, 256-842-3702 or email joseph.c.howard1.civ@mail.mil.

Sincerely,

Clint Howard

FOR: A. Keith Cook
Chief, Environmental Management
Division

Enclosure

**Revision 1
Corrective Measures Implementation Work Plan
RSA-221-R-01, Fuse Storage and Munitions Disposal Area
Operable Unit 15
U.S. Army Garrison-Redstone
Madison County, Alabama
EPA ID No. AL7 210 020 742**

Prepared for:

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

April 2021

Revision 1
Corrective Measures Implementation Work Plan
RSA-221-R-01, Fuse Storage and Munitions Disposal Area
Operable Unit 15
U.S. Army Garrison-Redstone
Madison County, Alabama
EPA ID No. AL7 210 020 742

Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Kenneth J. Hurley
Kenneth Hurley
Alabama PE No. 25249



4/15/2021
Date

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Executive Summary

Aptim Federal Services, LLC, on behalf of the U.S. Army Garrison–Redstone, has prepared this corrective measures implementation work plan for Redstone Arsenal, Madison County, Alabama, under the management of the U.S. Army Environmental Command. The U.S. Army Engineering and Support Center, Huntsville has contracted Aptim Federal Services, LLC under Contract Number W912DY-17-D-0003 for corrective measures implementation at multiple (nine) sites at Redstone Arsenal under the Resource Conservation and Recovery Act Corrective Action program. This corrective measures implementation work plan has been developed to provide technical guidance for implementing soil corrective measures selected for Solid Waste Management Unit RSA-221-R-01, Fuse Storage and Munitions Disposal Area.

This work plan incorporates applicable elements of Redstone Arsenal’s Hazardous Wastes Management and Minimization Act Hazardous Wastes Storage Facility/Thermal Treatment/Solid Waste Management Unit Corrective Action Permit, Modification No. 15, and the most recent edition of the Alabama Environmental Investigation and Remediation Guidance. This work plan is submitted to fulfill, in part, the requirements listed in Section VI.E of the Permit. As specified in Section VI.E.3 of the Permit, a request for permit modification is included as part of this plan.

The RSA-221-R-01 Resource Conservation and Recovery Act facility investigation defined the nature and extent of contamination and evaluated potential risks to current and future receptors. Approximately 7,767 pounds of wholly inert items were found on the surface and subsurface of the drainage swale on the east side of the site during the investigation and removed. No items identified as munitions and explosives of concern were encountered. All items encountered during the intrusive investigations were either wholly inert items (e.g., empty 155-millimeter illumination projectile bodies that were never loaded and base plates for the aforementioned projectiles that were never installed), componentry (e.g., lifting lugs since they have nothing to do with the item’s intended purpose), or scrap metal (e.g., wire, nails, and bolts). All items were classified as material documented as safe and removed from the site for scrap via an off-post vendor.

Because only a statistically significant number of anomalies detected above the target threshold criteria during the digital geophysical mapping were randomly selected to be intrusively investigated, uninvestigated anomalies above the target threshold still exist in the subsurface. Therefore, there is a statistically derived low probability that munitions and explosives of concern are present at this site. The Hypergeometric Model, which was the statistical sampling program used, indicated that the true rate of unacceptable items is zero per acre, and there is 95

percent confidence that the true rate of unacceptable items is no greater than 0.50 unexploded ordnance per acre present at the site. Due to this uncertainty regarding the potential presence of munitions and explosives of concern in the subsurface, this site does not meet the requirements for unrestricted use as defined in Alabama Administrative Code r. 335-5-1-.03(r). This regulation defines unrestricted use as the “designation of acceptable future use at a property or site where the remediation levels, based on either background or standard exposure factors, shall have been attained in all media to allow the property or site to be used for any purpose.”

In addition, the RSA-221-R-01 Resource Conservation and Recovery Act facility investigation determined that the Army’s historical operations at RSA-221-R-01 have not resulted in the release of hazardous substances to soil which pose an unacceptable risk to human health or the environment or a leaching threat to groundwater. No chemicals of concern requiring action were identified in the groundwater risk assessment for this site and thus, development of cleanup goals and implementation of corrective measures for groundwater under this site are not required.

The Army has elected to impose land-use controls as the final corrective measures for RSA-221-R-01. This corrective measures implementation work plan presents the specific activities necessary to ensure implementation of the corrective measures. These activities include procurement and subcontracting, mobilization, surveying, fence installation, signpost and sign installation, site restoration, implementation of environmental use restrictions in the installation master plan, conducting annual land-use control inspections and preparation of annual reports, and recording of a notice of environmental use restriction in the Madison County property records. Because the unexploded ordnance probability is “Low,” fencing, signs, and signposts will be installed and land-use control inspections conducted using on-call unexploded ordnance support.

The following plans and supporting documentation are included as appendices to this corrective measures implementation work plan:

- Alabama Department of Environmental Management Concurrence Letter for RSA-221-R-01 Resource Conservation and Recovery Act Facility Investigation Report
- Request for Redstone Resource Conservation and Recovery Act Permit Modification
- Corrective Measures Implementation Schedule
- Quality Assurance Project Plan
- Site-Specific Health and Safety Plan

- Waste Management Plan
- Construction Quality Assurance Plan
- Environmental Use Restriction.

1.0 Introduction

Aptim Federal Services, LLC (APTIM), on behalf of the U.S. Army Garrison–Redstone (hereinafter referred to as the Army), has prepared this corrective measures implementation (CMI) work plan for Redstone Arsenal (RSA), Madison County, Alabama, under the management of the U.S. Army Environmental Command. The U.S. Army Engineering and Support Center, Huntsville has contracted APTIM under Contract Number W912DY-17-D-0003 to perform CMI at multiple (nine) sites at RSA under the Resource Conservation and Recovery Act (RCRA) Corrective Action program in accordance with RSA’s Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility/Thermal Treatment/Solid Waste Management Unit (SWMU) Corrective Action Permit, Modification No. 15, dated September 23, 2020 (hereinafter referred to as the Permit) (U.S. Environmental Protection Agency [EPA] ID # AL7 210 020 742) (Alabama Department of Environmental Management [ADEM], 2020). This CMI work plan has been developed to provide technical guidance for implementing the corrective measures selected for SWMU RSA-221-R-01, Fuse Storage and Munitions Disposal Area, in Operable Unit (OU) 15. The official site name in the Permit uses “fuse” and this site naming convention will continue herein; however, the correct spelling of “fuze” in the sense of a detonating device will be used in all discussion of the site background and history in this CMI work plan.

This CMI work plan incorporates applicable elements of the Permit (ADEM, 2020) and the most recent edition of the Alabama Environmental Investigation and Remediation Guidance (AEIRG) (ADEM, 2017a). This CMI work plan is submitted to fulfill in part the requirements listed in Section VI.E of the Permit. As specified in Permit Section VI.E.3, the request for permit modification is included as part of this plan.

1.1 Purpose

The purpose of this CMI work plan is to describe the corrective measures selected for use at RSA-221-R-01 to address the low probability that munitions and explosives of concern (MEC) may be present at the site. Based on the statistical analysis using the Hypergeometric Model during the RCRA facility investigation (RFI), an intrusive investigation was conducted which indicated that the best estimate of the true rate of unacceptable items is zero per acre, and there is a 95 percent confidence that the true unacceptable item rate is no greater than 0.50 unexploded ordnance (UXO) per acre at the site, which is the upper bound on the MEC density at RSA-221-R-01. Since 100 percent of the anomalies were not intrusively investigated, there remains a statistical possibility that a potentially complete pathway exists for MEC in the subsurface.

The nature and extent of contamination was presented in the RFI report (APTIM, 2018) for RSA-221-R-01, which received concurrence from ADEM on October 11, 2018 (Appendix A). An Alabama Risk-Based Corrective Action (ARBCA) evaluation for human health and a screening-level ecological risk assessment (SLERA) were prepared for RSA-221-R-01 as part of the RFI. The ARBCA evaluation concluded that chemicals in soil and groundwater pose no unacceptable human health risks to commercial/industrial or hypothetical future residential receptors and no threat to groundwater due to leaching and migration to the water table. The SLERA determined that chemicals present in surface soil are not expected to pose a potential risk for adverse impacts to terrestrial plant or soil invertebrate communities and food chain receptors are unlikely to be impacted. However, the RFI report concluded that corrective measures are needed to address risks with the potential presence of MEC at the site. Because no chemicals in groundwater pose unacceptable human health risks to commercial/industrial or hypothetical future residential receptors, no chemicals of concern (COC) requiring action were identified in groundwater at this site. Thus, no corrective measures are required for groundwater under RSA-221-R-01.

This CMI work plan has been prepared to describe the technical approach and rationale for the activities that will be part of the selected corrective measures for RSA-221-R-01.

1.2 Site Description

RSA-221-R-01 occupies approximately 13.4 acres in the southeastern portion of RSA, immediately west of Deerberry and Ninebark Roads (Figure 1-1). The site lies above the RSA-146 groundwater unit.

1.2.1 Site History

The site contains six buildings (Buildings 7261 through 7266), which were formerly identified as aboveground storage magazines F-701 through F-706, and a 785-foot-long drainage swale east of Building 7261 (Figures 1-2 and 1-3).

These magazines were constructed in 1943 and are still present at the site. Each building is 1,192 square feet in size. Building uses over time are summarized in the following table.

Time Frame	Building 7261	Building 7262	Building 7263	Building 7264	Building 7265	Building 7266
1943~late 1940s	ROP fuze storage	ROP fuze storage	ROP fuze storage	ROP fuze storage	ROP fuze storage	ROP fuze storage
Early-mid-1950s	RD small component storage*	RD small component storage*	RD small component storage*	RD small component storage*	RD small component storage*	RD small component storage*
1957	Fuze storage	Fuze storage	Fuze storage	Fuze storage	Fuze storage	Fuze storage

Time Frame	Building 7261	Building 7262	Building 7263	Building 7264	Building 7265	Building 7266
1960s	General warehouse storage	General warehouse storage	General warehouse storage	General warehouse storage	General warehouse storage	General warehouse storage
1991	Storage for the Flying Club	General storage	Storage of hay for the Saddle Club	Storage of hay for the Saddle Club	Photographic storage for the audio-visual department	Unassigned
2000	Explosive storage (inspection)	Storage (light display)	Explosive storage (non-inspection)	Storage (non-inspection)	Storage – seed	Furniture storage

RD – Redstone Depot.

ROP – Redstone Ordnance Plant.

* Component” is defined as items used in assembly of end items (e.g., pumps, gauges, panel boards, and recorders) to meet specific mission-related activities.

The buildings were serviced initially by rail and later by road. Each building has a concrete loading and unloading pad on the south end of the building. The 1950 aerial photograph shows the locations of the rail line parallel to Ninebark Road as well as the rail line that ran throughout the entire magazine area (Figure 1-2). The buildings have been used for storage of inert items and non-explosive componentry.

The 785-foot-long swale east of Building 7261 (Figure 1-3) appears to be drainage that was constructed as part of the former railroad line that paralleled Ninebark Road. The drainage swale in the eastern portion of the site was reportedly a disposal area for munitions-related items in late 1940s and 1950s. This swale is approximately 1.5 to 2 feet deep and approximately 6 feet wide on the north side of the railroad bed and less than 1 foot deep and approximately 5 to 6 feet wide on the southern side of the railroad bed. The swale drains to a culvert on the east side of the site within the site boundary. An ephemeral water feature intermittently flows through the site between Buildings 7264 and 7265 and passes beneath Ninebark Road (Figure 1-3).

The UXO probability at this site is “Low” and the chemical warfare materiel (CWM) probability is “Unlikely” (Figure 1-4). The UXO probability of “Low” is due to the site’s location just north of an operational range (RSA-046). RSA-221-R-01 has never been used as a firing point or an impact area.

Based on being identified as a former munitions disposal area, RSA-221-R-01 has been assigned to the U.S. Department of Defense (DoD) Military Munitions Response Program (MMRP) for investigation and cleanup. OU-15 consists of sites, including RSA-221-R-01, within the MMRP.

1.2.2 Site Topography

The topography at RSA-221-R-01 is relatively flat (elevation is approximately 580 feet above mean sea level) with a topographic high of approximately 590 feet above mean sea level just north of the site (Figure 1-3).

1.2.3 Climate

Climate is a primary component in the hydrologic cycle and water budget and an integral element of the hydrogeologic framework of a site. Seasonal and storm-related trends in temperature and rainfall influence surface water and groundwater flow conditions. Average annual rainfall at RSA is 52 inches and rainfall is the principal source of groundwater recharge, either directly through infiltration and percolation through the vadose zone (unsaturated overburden) or as runoff to streams, which may also recharge groundwater. On an annual basis, 75 to 90 percent of rainfall at RSA is lost to evapotranspiration (Shaw Environmental, Inc. [Shaw], 2003). Discounting runoff to surface water, 5 to 13 inches of rainfall remain available to recharge groundwater. Rainfall contributes to groundwater recharge primarily during the winter, when deciduous trees are leafless, reducing overall transpiration. With the onset of the growing season in April, temperatures increase dramatically, and most potential recharge is lost through evaporation and transpiration.

1.2.4 Ecology

The majority of the 13.4-acre site is vegetated by a mixed deciduous/coniferous forest. The areas immediately adjacent to the on-site buildings and on both sides of Ninebark Road are vegetated by mowed grassy areas. Palustrine forested wetland areas are located approximately 260 feet southeast of the site, 330 feet southwest of the site, and 43 feet northwest of the site (Figure 1-1). The entire site lies outside the 100-year floodplain.

A 785-foot long drainage swale is located east of Building 7261 and runs in a west to east direction. The swale terminates in the southeast corner of the site and runs in a southwesterly direction via a culvert under Ninebark Road (Figure 1-3). The swale appears to be drainage that was constructed as part of a former railroad line that paralleled Ninebark Road and was used to service the on-site storage buildings. The drainage swale is approximately 1.5 to 2 feet deep and approximately 6 feet wide on the north side of the railroad bed and less than 1 foot deep and approximately 5 to 6 feet wide on the southern side of the railroad bed. The drainage swale does not support aquatic habitat; therefore, solid-matrix samples collected within the drainage feature were classified as surface soil. No ecologically sensitive areas exist within or near the site boundary, and no threatened or endangered species have been identified within the site.

1.2.5 Geology

Discussions of regional stratigraphic and structural geology, surface and subsurface hydrology, and other physiographic and geographic topics are presented in the RSA-146 RFI report (CB&I Federal Services LLC [CB&I], 2015a) and the installation-wide work plan (IT Corporation, 2002).

Soil. The subsurface geologic setting beneath RSA-221-R-01 and adjacent sites includes overburden consisting of low-permeability, residual red, strong brown, and yellowish-red clay. Intervals of chert and chert fragments increase with depth and represent residual deposits formed by in situ chemical weathering of chert nodules and layers within the limestone bedrock.

The overburden or unconsolidated soil layer across most of RSA is called residuum because it formed from in situ chemical weathering of the underlying karstic limestone bedrock. This overburden layer consists mainly of clay and silty clay. It also includes varying amounts of residual chert fragments which were present within the parent limestone and have resisted chemical weathering because of their siliceous composition. The chert can be found scattered within the clay matrix as nodules or concentrated locally as near-horizontal layers within the soil.

Although there is little compositional variation within the overburden, the residuum does not transmit groundwater uniformly. Groundwater infiltration follows preferred pathways because zones of higher hydraulic conductivity developed during soil-forming processes. Preferred pathways within the overburden directly affect contaminant migration and distribution within the soil column.

Residual clay generally has low horizontal and vertical hydraulic conductivities. At a given location, a layer of chert within the clay may decrease vertical hydraulic conductivity and increase horizontal conductivity, while isolated nodules of chert may increase the vertical conductivity. Preferred groundwater flow pathways in the overburden also include macropores caused by rotting tree roots and burrowing animals.

Additionally, microfractures may be created within the clay during raveling, a process in which the clay slowly subsides as it is eroded and carried away by groundwater in bedrock fractures and conduits. Vertical movement of the soil caused by raveling or sloughing into fractures and conduits results in the development of microfractures in the overlying material. The microfractured clay soils have higher hydraulic conductivities than undisturbed clay and also act as preferred groundwater flow pathways.

Bedrock. The borehole drilling logs indicate depth to bedrock at RSA-221-R-01 ranges from 8 to 12.5 feet below ground surface (bgs). Depth to bedrock across this portion of RSA is variable

over short distances due to solution weathering of the upper bedrock surface (epikarst). Lithological data from bedrock wells installed across this portion of RSA indicate that the shallow bedrock first encountered correlates with middle to upper Tuscumbia Limestone and exhibits well-developed karst features. The Fort Payne Formation, consisting of thinly bedded, fossiliferous limestone interbedded with chert, underlies the Tuscumbia Limestone. The Fort Payne is underlain by the Chattanooga Shale, a dark gray to black, fissile shale.

1.2.6 Hydrogeology

Surface Water. A drainage swale approximately 785 feet long is located just east of Building 7261 and runs east, parallel with the site. This swale terminates in the southeast corner of the site and runs in a southwesterly direction via a culvert under Ninebark Road (Figure 1-3). An ephemeral drainage feature intermittently flows through the west-central portion of the site between Buildings 7264 and 7265. This feature flows south-southeast and passes via a culvert underneath Ninebark Road and discharges south of the site boundary. Neither drainage feature supports aquatic habitat. The entire site lies outside the 100-year floodplain.

Groundwater. Groundwater beneath RSA-221-R-01 occurs in the unconsolidated overburden and the upper portion of the carbonate bedrock. The overburden and upper bedrock comprise a single interconnected, unconfined water table aquifer. At depth, groundwater occurs under semiconfined conditions, flowing along discrete joints and bedding-plane partings. The water table across RSA-221-R-01 slopes downward to the south, generally mimicking the local topography (Figure 1-5).

Based on measurements obtained across all measurement events conducted, depth to water in the immediate vicinity of the site ranged from a minimum of 0.08 feet bgs (221-RS2281) to a maximum of 8.99 feet bgs (221-RS2283), with an overall average depth of approximately 3.30 feet bgs. Groundwater flow direction based on November 2017 and late February 2018 potentiometric surface maps is predominantly towards the south, with flow variations towards the southwest on the western portion and towards the southeast on the eastern portion of RSA-221-R-01.

1.3 Document Organization

This CMI work plan is organized into the following chapters:

- Chapter 1.0 presents the purpose and overview of the document and includes a brief site description, including the topography, climate, ecology, geology, and hydrogeology associated with the site.

- Chapter 2.0 presents additional background information about the site, including investigation history, the nature and extent of contamination, site risks, fate and transport, and the final conceptual site models (CSM).
- Chapter 3.0 describes the basis for the action, including the corrective measure objectives (CMO), the cleanup goals (CG) if appropriate, and a summary of the selected corrective measures.
- Chapter 4.0 describes the activities necessary for implementation of the corrective measures at the site.
- Chapter 5.0 describes the mechanisms to address foreseeable challenges that may arise during execution of the corrective measures described herein.
- Chapter 6.0 provides the references that contributed to the preparation of this CMI work plan.

The following plans and supporting documentation are included as appendices to this CMI work plan:

- Appendix A: ADEM Concurrence Letter for RSA-221-R-01 RFI Report
- Appendix B: Request for Redstone RCRA Permit Modification
- Appendix C: CMI Schedule
- Appendix D: Quality Assurance Project Plan (QAPP)
- Appendix E: Site-Specific Safety and Health Plan (SSHP)
- Appendix F: Remediation-Derived Waste (RDW) Management
- Appendix G: Construction Quality Assurance Plan (CQAP)
- Appendix H: Environmental Use Restriction (EUR).

2.0 Investigation Results

This chapter presents additional background information for RSA-221-R-01, including the investigation history, the nature and extent of contamination, the site risks, fate and transport, and the final CSMs.

2.1 Investigation History

Environmental investigations relevant to RSA-221-R-01 are listed below.

- RSA-146 potential source area investigation (Shaw, 2005)
- RSA Historical Records Review (Malcolm Pirnie, Inc., 2008a)
- RSA Site Inspection (Malcolm Pirnie, Inc., 2008b)
- RSA RCRA Facility Assessment (ADEM, 2008)
- RSA-146 Groundwater Unit RFI (CB&I, 2015a)
- RSA-221-R-01 RFI (APTIM, 2018).

A complete discussion of the previous site investigations is available in the RFI report for RSA-221-R-01 (APTIM, 2018).

During the RFI, the MEC investigation included the following steps:

Detector-Aided Visual Survey (DAVS). A DAVS was conducted in 26 grids at 5-foot line spacing across all accessible areas of the 13.4 acre site (total of 12.2 acres) in 2014 at RSA-221-R-01 to 1) identify potential surface MEC/munitions debris (MD) and disposal features such as disturbed ground, and 2) remove potential MEC/MD and relatively larger scrap metal on the surface that would pose a safety concern or interfere with the subsequent digital geophysical mapping (DGM) data collection and anomaly reacquisition activities.

DGM Survey. Following the DAVS, a DGM survey using an EM61-MK2 was conducted over 9.6 acres of the site in 2015 (e.g., all accessible areas of the site not covered by buildings, roadway, or dense tree stands) using the performance metrics and quality objectives specified in Standard Operating Project Procedure (SOPP) No. 27, *Digital Geophysical Mapping Surveys* (Shaw, 2013). This DGM survey was performed in 56 grids in accordance with the MEC work plan (CB&I, 2014). The MEC work plan, which follows SOPP No. 27.0, includes a discussion of the approach for transect design, target identification, boundary delineation, and geophysical anomaly density mapping. DGM data were collected along full-coverage grids.

Anomaly maps were produced and utilized in the selection of anomalies to be subsequently investigated for single point anomalies (SPA) and test pits for saturated response areas (SRA)

consisting of more dense areas of anomalies. The Hypergeometric Model was used as a statistical testing tool to determine the number of anomalies to intrusively sample which ensured that the results had the required confidence for decision-making at the site.

Anomaly Investigation. The EM61-MK2 was again used for anomaly reacquisition and verification for the intrusive investigation conducted in 2016. The Hypergeometric Model was utilized to statistically select a significant number of the anomalies detected above the target threshold criteria during the DGM survey for intrusive investigation. The result provided a 95 percent confidence and 5 percent error that the randomly selected anomalies investigated are representative of the entire site. A total of 355 of the 4,644 SPAs were chosen for intrusive investigation. An additional 15 “high quality” SPAs were added in the field for biased intrusive investigation which brought the total to 370 SPAs for intrusive investigation. In addition, 10 SRAs identified at the site were chosen for intrusive investigation.

- The intrusive investigation at each SPA was performed using hand tools and mechanized equipment followed by photographing and recording information such as DGM grid identification, anomaly identification number, location coordinates, depth, individual quantity, anomaly type, item description, and item comments.
- Each of the 10 SRAs was partially excavated with test pit methods. A total of 19 test pits were mechanically excavated to lengths varying from 12 to 44 feet, 2 feet wide, and continued in depth until undisturbed or natural soils were reached (2 to 3 feet). Details of excavations included photographs and records of information such as DGM grid identification, anomaly identification number, location coordinates, depth, individual quantity, anomaly type, item description, and item comments (APTIM, 2018).
- At the point of recovery, each item was inspected and identified prior to disposition.

Figures 2-1 and 2-2 show the results of the 2016 intrusive investigation at the SPAs and SRAs. The findings are discussed in detail in Section 2.2.1.

Hazardous and Toxic Waste (HTW)/Munitions Constituents (MC) Investigation. The RFI (APTIM, 2018) evaluated available sample data for usability and defined an appropriate data set for characterizing MCs and HTW constituents at RSA-221-R-01, which consists of analytical results from the following:

- Forty-eight surface soil samples
- Forty-three subsurface soil samples
- Seventeen groundwater samples from overburden monitoring wells.

The samples were analyzed for one or more of the following: volatile organic compounds (VOC), semivolatile organic compounds (SVOC), metals, explosives, perchlorate, and the chemical agent breakdown product thiodiglycol. Figure 2-3 shows the RSA-221-R-01 sampling locations. The RSA-221-R-01 RFI consisted of statistically based MEC characterization and environmental sampling to evaluate potential releases from on-site activities. The nature and extent of contamination in soil and groundwater at RSA-221-R-01 have been defined.

2.2 Nature and Extent of Contamination Summary

This section provides general summary information on the nature and extent of MEC and HTW/MC contamination at RSA-221-R-01. Further discussion of the investigative results is included in the RFI report (APTIM, 2018).

2.2.1 Munitions and Explosives of Concern

No surface MEC was encountered during the 2014 DAVS conducted across the entire site or during the DGM survey performed for the entire site in 2015. During the 2016 intrusive anomaly investigation, no UXO or discarded military munitions were found in the subsurface but various wholly inert items, componentry, and scrap metal were discovered. In addition, MCs were not present in high enough concentrations to pose an explosive hazard in the 2016/2017 environmental sampling. Results of the 2016 intrusive investigation at the SPAs and SRAs are shown on Figures 2-1 and 2-2, and items found during the intrusive investigation are listed in Table 2-1. A summary of the MEC investigation follows:

- **2014 DAVS:** A total of 6,126 pounds of metallic items were found on the surface of the site including 5,914 pounds of wholly inert items and componentry which included numerous empty 155-millimeter (mm) illumination projectile bodies that were never loaded, base plates, and lifting lugs. These wholly inert items and componentry were collected and removed from the drainage swale east of Building 7261 in grids J2, K2, and L2 (Figure 1.4-2 in the RFI report [APTIM, 2018]). All of the recovered items were identified as wholly inert items and componentry not discarded military munitions (DMM) as defined in EM 385-1-97 (Department of the Army, 2008) since they appeared to have never held explosive components or been assembled into complete munitions. No items containing an explosive hazard were encountered. It should be noted that all items encountered at the surface outside of the drainage swale area were miscellaneous debris and scrap metal (e.g., nails and spikes associated with the former rail line through the site).
- **2015 DGM Survey:** A total of 4,644 SPAs and 10 SRAs were identified. Application of the Hypergeometric Model determined that 355 SPAs along with the 10 SRAs would require intrusive investigation to meet the designed statistical confidence level. An additional 15 “high quality” SPAs were added in the field for biased intrusive investigation, making a total of 370 SPAs.

- **2016 Intrusive Investigation:** A total of 370 of 4,644 identified SPAs were intrusively investigated and a total of 10 SRAs were partially excavated using 19 test pits labelled 221-TP001, -TP002, -TP003, -TP004A, -TP004B, -TP004C, -TP004D, -TP005A, -TP005B, -TP005C, -TP006, -TP007A, -TP007B, -TP007C, -TP007D, -TP007E, -TP008, -TP009, and -TP010 (Figure 2-2). Various wholly inert items (e.g., empty 155-mm illumination projectile bodies that were never loaded and base plates for the aforementioned projectiles that were never installed), componentry (e.g., lifting lugs since they have nothing to do with the item's intended purpose), or scrap metal (e.g., wire, nails, and bolts) were recovered from 81 of the SPA excavations and 12 of the test pit excavations within the SRAs. These items are consistent with the site's storage history of wholly inert items and non-explosive componentry and location along a former rail line. Thus, no items were classified as DMM.

As shown on Figure 2-1 in the western portion of the site, wholly inert items and componentry were not found in 13 of the grids (A01, A03, A05, A07, B01-B08, and C01) and only low quantities (less than or equal to 20 pounds) were recovered in the remaining 6 grids (A02, A04, A06, A08, A09, and B09). Overall for the site, 52 percent of grids with 0 pounds of wholly inert items/componentry and 35 percent of grids with 20 pounds or less of wholly inert items/componentry are located in the western portion of the site.

As shown on Figure 2-2 in the central and eastern portions of the site, especially within the drainage swale area, larger quantities of assorted wholly inert items and componentry were uncovered especially within the test pits and removed including empty 155-mm illumination projectile bodies that were never loaded in grids B14 and B15. Grids B14 and B15 in the western portion of the drainage swale are highlighted in red, equating to a total grid weight of wholly inert items/componentry greater than 300 pounds. Grid B17 in the eastern portion of the drainage swale and Grid A26 southeast of the drainage swale are highlighted in pink, signifying a total grid weight of wholly inert items/componentry greater than 100 to 300 pounds. Large quantities of metallic debris items (e.g., nails and spikes) removed from Grids B17 and A26 appear to be associated with the former rail line.

- **Wholly inert items/componentry:** The total weight of wholly inert items and componentry recovered was 1,852.95 pounds (210.45 pounds from SPAs and 1,642.50 pounds from test pits). All items were inspected, classified as material documented as safe, and then removed from the site for scrap recycling via an off-post vendor.
- **Scrap metal and other debris:** Items found during the DAVS and intrusive investigation included bolts, cans, clips, nails, pipes, scrap metal, scrap steel, wire, rebar, hot rocks/soil, and other miscellaneous debris-type items. Approximately 780 pounds of other debris were removed from the site and recycled as scrap via an off-post vendor.
- **MEC:** No MEC was found on the ground surface or in the subsurface during the intrusive anomaly investigation.

The MEC work plan (CB&I, 2014) and SOPP No. 27 (Shaw, 2013) was used to design the DGM and the Hypergeometric Model was used to evaluate and determine the number of anomalies to investigate to meet project objectives of a 95 percent confidence that the true rate of unacceptable items is no greater than 0.50 UXO per acre at the site. Although a large amount of wholly inert items and componentry were recovered from this site, MEC was not found. Uninvestigated anomalies above the target threshold still exist in the subsurface, and thus there is a low probability that MEC is present at this site. It is expected that through erosion, frost heave, flooding, and other natural processes over 60 years, numerous previously buried items would now be at or near the surface.

2.2.2 Hazardous and Toxic Waste/Munitions Constituents

Metals. Mercury was determined to be present in only one surface soil location (221-SS02) at an anomalous concentration that exceeds its background screening value (BSV) and preliminary screening value (PSV) (Figure 2-4). The anomalous mercury concentration is bounded laterally and vertically by surface and subsurface soil samples that are below the BSV and PSV or determined to be naturally occurring in the site-to-background evaluation. All other metals detected in surface and subsurface soil were at concentrations below the PSV and BSV or determined to be naturally occurring. Metals detected in groundwater were considered to be naturally occurring or within the background range.

VOCs. All VOC concentrations detected in soil and groundwater were below the PSVs.

SVOCs. SVOCs were not detected in soil. These compounds were not analyzed for in groundwater samples; SVOCs are not in the CSM for this site.

Explosives. All concentrations of explosive compounds in soil were below PSVs. Six explosive compounds (2-nitrotoluene, 3-nitrotoluene, 1,3-dinitrobenzene, nitrobenzene, nitroglycerin, and RDX) have been detected in groundwater samples at concentrations exceeding their PSVs (Figure 2-5). Explosives exceedances have been delineated laterally and vertically by concentrations less than the PSVs at surrounding wells. Explosive compounds have been detected in groundwater upgradient and sidegradient to RSA-221-R-01, including at sites in the immediate vicinity of RSA-221-R-01 (such as RSA-217 and RSA-219) as well as in many locations within the RSA-146 groundwater unit.

Perchlorate. Perchlorate was not detected in soil. This compound was not analyzed for in groundwater samples; perchlorate is not in the CSM for this site.

2.3 Site Risk Summary

Risks from exposure to potential MEC were identified based on the data quality objectives for the MEC investigation. In addition, an ARBCA human health risk evaluation, which includes a vapor intrusion evaluation, and a SLERA were performed for RSA-221-R-01 (APTIM, 2018). The site risks are summarized in Sections 2.3.1 through 2.3.4. The fate and transport evaluation is summarized in Section 2.3.5.

2.3.1 Munitions and Explosives of Concern Evaluation

No MEC has been discovered at RSA-221-R-01. The DGM was designed using SOPP No. 27.0 (Shaw, 2013). The Hypergeometric Model was used to determine a statistical number of anomalies to investigate to meet desired confidence level. After the analog investigation, intrusive investigation and statistical analysis indicated a 95 percent confidence that the true unacceptable item rate is no greater than 0.50 UXO per acre at the site. Based on this representative evaluation, it was concluded that RSA-221-R-01 has a low probability that MEC is present.

2.3.2 Current and Potential Future Land Use

According to the Installation Master Plan, land use surrounding RSA-221-R-01 is designated as Industrial Zone. RSA-221-R-01 is located in a Land Use District which is classified as the Patton Road (East/South of Redstone/North Buxton) in the southeastern portion of RSA. The primary missions include storage, base operations, and explosive operations (Army, 2013). Where practical, the Army has restricted entry into the RCRA SWMUs by fencing them and/or placing warning signs at key entry points in accordance with the site access control (SAC) program (Army, 2012). RSA's SAC program (Army, 2012) was designed for, but not limited to, SWMUs that have not had a final remedy selection made. A fence line separates the site from an operational range (RSA-046) south of the site but does not provide total enclosure of the site. The site lies within the secure RSA boundary. Site redevelopment may occur in the future consistent with continued industrial use, but residential or daycare facilities are not planned. Hunting is not currently permitted within RSA-221-R-01 or within the igloo area north of the site and hunting is not planned for this site area in the future.

2.3.3 Human Health ARBCA Evaluation

Receptors evaluated under current and future site use of RSA-221-R-01 consisted of a commercial worker and a construction worker (commercial/industrial scenario). A residential receptor was included as a potential hypothetical future receptor. It is not anticipated that RSA-221-R-01 will be developed such that it would be used residentially. Although Army risk regulations, policy, and guidance are to only evaluate those receptors that are actually at a site or could reasonably be anticipated to occur, the risk assessment conducted for RSA-221-R-01 in the

RFI report (APTIM, 2018) included a residential use scenario only to comply with the AEIRG (ADEM, 2017a) and ARBCA guidance (ADEM, 2017b). RSA is legally mandated to comply with the Permit (ADEM, 2020). In the Permit, ADEM requires that these guidance documents including approved risk assessment work plans (IT Corporation, 2002; Shaw, 2010a) be adhered to during environmental investigations and evaluations. At RSA, the residential scenario is included in the risk assessment in order to determine if a site is eligible for unrestricted use as defined in Alabama Administrative Code (AAC) r. 335-5-1-.03(r) (ADEM, 2019) or to support the use of land-use controls (LUC) as a component of the selected remedy. Therefore, risks to a residential site user receptor were assessed in this Risk Management-2 cumulative risk assessment.

The commercial worker, construction worker, and hypothetical residential receptors were evaluated for exposure to soil and groundwater hypothetically developed as a potable source. There is no current potable use of groundwater at RSA-221-R-01. An installation-wide groundwater interim record of decision (IROD) (Shaw, 2007) was instituted to prevent potable use and provide management control over nonpotable uses of all groundwater beneath RSA. The IROD is interim in nature and is not a final remedy. In order to design the final remedy, which may include LUCs, the potable use must be considered.

The ARBCA guidance (ADEM, 2017b) considers an individual excess lifetime cancer risk (IELCR) of $1E-05$ to be the target cumulative risk. The target noncancer threshold is a hazard index (HI) of 1.0. Estimated cumulative risks/hazards at or below these targets do not require additional action.

Mercury was identified as the only COC in total soil. The hypothetical media or data set called total soil was created to simplify the risk evaluation and conservatively evaluates human exposure to surface soil and subsurface soil brought to the surface by excavation during future site development. Barium, six explosive compounds, and four VOCs were identified as COCs in groundwater.

The cumulative IELCR and HI estimates for RSA-221-R-01 are summarized in Table 2-2. The conclusions of the Risk Management 2 human health risk assessment are summarized in Table 2-3. These results are discussed briefly below. Note that there are no COCs requiring action in soils or groundwater.

The cancer risks associated with soil exposure were not estimated, as mercury is not a known or suspected carcinogen (Table 2-2). The noncancer HI estimated for soil for all receptors are below an HI of 1.0. Therefore, no chemicals in soils were identified as COCs requiring action (Table 2-3).

For groundwater, the cumulative IELCR estimates for the commercial worker, the construction worker, and the hypothetical receptor are less than 1E-05 (Table 2-2). The cumulative HI also did not exceed the HI for any receptors. Therefore, no COCs requiring action were identified in groundwater for any receptor (Table 2-3).

A screening-level vapor intrusion evaluation was conducted to determine whether VOCs present in groundwater or soil at RSA-221-R-01 pose an unacceptable risk to occupants of buildings (including residential buildings) from volatilization and migration upward into buildings erected on site in the future. The vapor intrusion evaluation concluded that VOC concentrations in soil and groundwater are unlikely to pose an unacceptable health threat to potential occupants of future buildings (including residential buildings) erected on site.

2.3.4 Screening-Level Ecological Risk Assessment

The SLERA for RSA-221-R-01 (APTIM, 2018) was conducted in accordance with the guidelines set forth in the ADEM AEIRG and ARBCA guidance manuals (ADEM, 2017a,b), the RSA installation-wide work plan (IT Corporation, 2002), and the final SLERA supplements to the installation-wide work plan (Shaw, 2010a). A SLERA was performed in order to determine if the site is eligible for no-further-action status in accordance with ADEM requirements. Note that the SLERA evaluation relies on ecological screening values (ESV) rather than on the human health-based PSVs.

The surface soil data for RSA-221-R-01 were compared to their respective BSVs and ESVs. Constituents with concentrations above their BSVs (if applicable) and ESVs (or with no ESVs) were identified as preliminary chemicals of potential ecological concern (COPEC). Eleven metals, one explosive compound, and one VOC were identified as preliminary COPECs (Table 2-4). Based on the results of the screening evaluation and COPEC refinement, lead, mercury, and zinc warranted further evaluation for potential effects on community-level receptors and food chain receptors. Calcium, magnesium, and carbon disulfide warranted further reevaluation for potential effects on community-level receptors, but not food chain receptors because they are not important bioaccumulative compounds. Other COPECs were found likely to be naturally occurring, background related, or not in the CSM for the site. In addition, nitroguanidine was detected at a frequency of less than 5 percent, and as such, is unlikely to contribute significantly to the overall hazard at the site. Therefore, further evaluation of nitroguanidine was not conducted.

In summary, the results of the SLERA (APTIM, 2018) indicate that COPECs in the surface soil at RSA-221-R-01 are unlikely to pose hazards to ecological receptor communities and/or populations, and further evaluation of ecological hazards is not warranted.

2.3.5 Contaminant Fate and Transport Summary

This section summarizes the fate of contaminants in the environment and their potential transport mechanisms at RSA-221-R-01 (APTIM, 2018). The primary contaminant migration mechanism operating at the RSA-221-R-01 site is the leaching of site-related chemicals from soil to form leachate and the subsequent transport to the water table as a result of the downward percolation of infiltrating rainfall. Overland transport of soil contaminants by wind or water over the majority of the site is unlikely at RSA-221-R-01 because the site is relatively level, fairly well vegetated, and the lack of contaminants of potential concern in site soil.

An evaluation of the potential for soil-to-groundwater migration was provided in the RFI report for non-naturally occurring constituents found to be present in soil (APTIM, 2018). For those constituents that had concentrations above their RSA-specific dilution-attenuation factor 4 soil screening levels, a weight-of-evidence evaluation was conducted considering the presence or absence of the constituent in groundwater, the magnitude of the exceedance in soil, the frequency of exceedances in soil, the vertical distribution of exceedances, and leachability study data. Based on their concentrations above their respective RSA-specific dilution-attenuation factor 4 soil screening levels in soil, two constituents in soil (mercury and RDX) were evaluated for the potential to leach from soil to groundwater and result in adverse impacts to groundwater quality. Anomalous concentrations of mercury were only detected in 3 of 85 soil samples and RDX was only detected in 4 of 69 soil samples at concentrations exceeding the DAF₄ SSL, including low frequencies of detection. Additionally, mercury and RDX were not detected in groundwater samples from monitoring wells located within the site boundary. Thus, using the weight-of-evidence criteria, neither of the constituents evaluated were determined to represent a potential leaching threat to groundwater.

2.4 Site Hazards

Following the DGM, the Hypergeometric Model was used to determine the number of items above the target threshold requiring investigation in order to achieve a 95 percent confidence that the true unacceptable item rate is no greater than 0.50 UXO per acre at this site. This Hypergeometric Model has been used at numerous RSA MMRP sites and has been accepted by ADEM as a fiscally responsible statistical tool for estimating risk with encountering MEC. Based on the following lines of evidence, there is a low probability that MEC is present at this site:

- During the RFI intrusive investigations, a large amount (approximately 7,767 pounds) of wholly inert items were recovered from the site from 12 of 19 the test pits in SRAs and from 81 of 370 of the SPA excavations.

- Uninvestigated anomalies detected above the target threshold still exist in the subsurface since only a statistically significant number of anomalies detected above the target threshold were investigated.
- RSA-221-R-01 is adjacent to active and historical ranges. While RSA-221-R-01 is adjacent to active and historical ranges, the area has always been used for storage of wholly inert items and non-explosive componentry and has never been used as a firing point or impact area(s).

2.4.1 Munitions and Explosives of Concern Hazard Assessment

A MEC hazard assessment is used to evaluate the potential explosive hazard associated with conventional MEC present at a site under a variety of site conditions (EPA, 2008). However, no MEC was found at RSA-221-R-01 and thus, generation of a MEC hazard assessment score was not required.

2.4.2 Munitions Response Site Prioritization Protocol Summary

The Munitions Response Site Prioritization Protocol (MRSPP) is a methodology developed by the DoD to assess the relative risks and assign a relative priority to Munitions Response Sites (MRS) (DoD, 2007). The MRSPP uses three modules to evaluate hazards associated with a site: Explosive Hazard Evaluation (EHE) Module, CWM Hazard Evaluation (CHE) Module, and Health Hazard Evaluation (HHE) Module. The overall MRSPP priority is determined by converting the individual module rating scores to priorities; the highest priority is 1 and the lowest is 8. As summarized from the tables included in the RSA-221-R-01 RFI report (APTIM, 2018), the results of applying this protocol to RSA-221-R-01 are as follows:

- EHE Module: G (lowest rating)
- CHE Module: No Known or Suspected CWM Hazard
- HHE Module: G (lowest rating)
- MRS Priority: 8 (lowest priority).

2.4.3 MEC Fate and Transport

No MEC was found during the intrusive investigation and environmental sampling. The UXO probability designation for RSA-221-R-01 is “Low.” It is expected that through erosion, frost heave, flooding, and other natural processes over 60 years, numerous items previously disposed in the drainage swale were at the surface or could be transported to the surface through future processes. Although MEC has not been found at RSA-221-R-01, it cannot be ruled out.

2.5 Final Conceptual Site Model

A CSM was developed for RSA-221-R-01 based on historical operations, site information, and soil and groundwater data. The CSM includes potential buried MEC and VOCs, polynuclear aromatic hydrocarbons, metals, explosives, perchlorate, and mustard breakdown products from

storage operations and disposal of wholly inert items and componentry in the drainage swale. Figure 2-6 presents a visual representation of the site, including potential contaminant sources, migration pathways, investigated media, chemicals warranting action in site media, and potential receptors. Figures 2-7 and 2-8 present the CSMs for MEC and MC, respectively, and illustrate the source (site and MEC location), interactions (activity and access), and potential receptors.

The final CSMs for MEC, MC, and HTW for RSA-221-R-01 include the following main components:

- During the RFI, a full-coverage DGM survey was performed over 9.6 acres of the 13.4-acre site (100 percent of the accessible areas of the site), followed by an intrusive investigation of all 10 SRAs through the use of 19 test pits and approximately 8 percent (370) of the total SPA anomalies (4,644) that exceeded the threshold criteria. No MEC was found on the surface or within the subsurface of RSA-221-R-01. Intrusive investigation results and statistical analysis (Hypergeometric Model) indicate a 95 percent confidence that the density of UXO at the site is less than 0.50 UXO per acre. Since 100 percent of the anomalies present above the established target threshold were not intrusively investigated, it is statistically possible that a potentially complete pathway exists for MEC at this site as shown in Figure 2-7.
- Potential MC include metals and explosives. Figure 2-8 shows the pathways for MC are incomplete or that the pathway is complete but poses no unacceptable risks to human health or the environment at RSA-221-R-01.
- The most viable contaminant transport pathway is leaching of contaminants from soil to groundwater. An evaluation of contaminant transport revealed that no contaminants in RSA-221-R-01 soil pose a potential leaching threat to groundwater. Anomalies remaining in the subsurface may be transported to the surface soil via erosion.
- Current human receptors are limited to commercial and construction workers. Future potential receptors include all current receptors, plus hypothetical child and adult residents under a land reuse scenario. No COCs for HTW/MC that pose unacceptable risks to any receptor were identified in soils (Figures 2-6 and 2-8).

3.0 Decision Summary

The RSA-221-R-01 RFI report concluded that the Army’s historical operations at this site have not resulted in the release of hazardous chemicals to soil or groundwater that pose an unacceptable risk to human health or the environment or a leaching threat to groundwater. Therefore, no corrective measures are needed for chemicals present in soil or groundwater at RSA-221-R-01. However, because of the site’s “low” probability that MEC may be present, corrective measures are required to ensure the likelihood of current and future human receptors encountering MEC is reduced or eliminated.

Based on these RFI findings, this chapter identifies the CMO and notes that CGs are not applicable at RSA-221-R-01 since CGs are used in remedies (or those parts of remedies) that rely on reduction of chemical concentrations to achieve the CMOs. For MEC, CMOs are defined differently than for chemicals, as there are no established risk-based “values” to use for MEC.

3.1 Basis for the Action

The RFI did not identify any MEC on the ground surface or in the subsurface at RSA-221-R-01. However, because the site has been assigned to the MMRP for investigation and cleanup of historical ranges and the fact that not all anomalies detected above the target threshold were investigated, this site retains a low probability that MEC is present at this site. The RFI report (APTIM, 2018) concluded that corrective measures are required to prevent MEC exposure to current and future human receptors at RSA-221-R-01.

3.2 Corrective Measure Objectives

The CMO for RSA-221-R-01 is as follows:

- Prevent or limit direct human contact with MEC, thereby reducing hazards associated with a “low” probability MEC site consistent with current and future land use.

The Army intends to achieve this CMO for RSA-221-R-01 through implementation of LUCs in accordance with AAC r. 335-5-1-.02(3).

3.2.1 Cleanup Goals for the Corrective Measures

Corrective measures and CGs are developed based on consideration of applicable laws and regulations as well as consideration of concentrations that will achieve an acceptable risk/hazard. As previously indicated, the CMO is related to reducing the hazards associated with a “low” probability MEC designation for the site, where numerical CG values are not applicable.

However, the CMO can be achieved by actions that will ensure that the likelihood of encountering MEC is negligible.

3.2.2 Need for Corrective Measures

RSA-221-R-01 does not meet the requirements for unrestricted use as defined in AAC r. 335-5-1-.03(r). Unrestricted use is defined as the “designation of acceptable future use at a property or site where the remediation levels, based on either background or standard exposure factors, shall have been attained in all media to allow the property or site to be used for any purpose.” The selected corrective measures for RSA-221-R-01 are LUCs including an engineering barrier (e.g., fencing). The LUCs will ensure that all intrusive site activities are managed to ensure that the likelihood of encountering potential MEC is negligible. The fencing will assist in preventing or limiting exposure to any potential hazards present at this site.

3.2.3 Applicable Regulations

Corrective measures must consider applicable federal and state laws and regulations as well as consideration of concentrations that will achieve an acceptable risk/hazard. Potential regulations were reviewed for applicability to the RSA-221-R-01 corrective measures and summarized in Table 3-1. The following regulation is relevant to the selection of LUCs as the corrective measures for RSA-221-R-01:

- Alabama Uniform Environmental Covenants Program, Chapter 335-5 (ADEM, 2019).

This regulation establishes the requirements for an environmental covenant for a site if the site is not being remediated to unrestricted use. AAC r. 335-5-1-.02(3)(a) states, “In lieu of an environmental covenant, a Notice of Environmental Use Restriction (NEUR) for properties or sites owned by the federal government shall be prepared and submitted to ADEM for approval that gives notice of the current and future use of the federal property.”

3.2.4 Scope of the Corrective Measures

The overall strategy for cleanup at RSA has been presented to the regulatory agencies in two cleanup strategy documents, the *Installation-Wide Groundwater Cleanup Strategy* (Shaw, 2009) and the *Installation-Wide Strategy for Cleanup of Impacted Wetlands* (Shaw, 2010b). These strategy documents have been designed to integrate groundwater units, surface media sites, and wetland areas by incorporating strategies (i.e., cleanup of surface media sites) to 1) ensure that the Army provides a systematic and uniform approach to investigating and remediating these areas to reach closure in an expeditious and fiscally responsible manner, and 2) ensure protection of potential receptors (i.e., implementation of the installation-wide groundwater LUCs) until final corrective measures result in COCs meeting the CGs where applicable. The scope of the soil corrective

measures for RSA-221-R-01 is consistent with these strategies. No corrective measures are required for groundwater under RSA-221-R-01.

3.3 Corrective Measures Evaluation and Selection

The following information summarizes the analysis of technologies and alternatives and selection of the corrective measures for this site in the focused corrective measures study report (CB&I, 2017).

3.3.1 Summary of the Corrective Measure Alternatives Evaluation

The site conditions at RSA-221-R-01 met the requirements under EPA guidance for a streamlined or focused corrective measures study (EPA, 1994). Five technologies were screened against the criteria of performance, reliability, safety, implementability, and cost.

The following technology considered in the initial screening was not retained for further development and evaluation.

Complete Geophysical Anomaly Removal. Under this approach, excavation and recovery of all remaining subsurface anomalies within the existing geophysical anomaly data set would be performed. The site has already been cleared of all wholly inert and componentry items, and all areas except for rock outcrops have been geophysically mapped. Excavation of a statistical subset of SPAs and of test pits within saturated areas was performed during the RFI (CB&I, 2017). This technology would consist of excavation of all remaining geophysical anomalies and SRAs already mapped and located in the existing geophysical data set. The RFI verified that there was no evidence of MEC present within the boundaries of the site and no areas with increased probability of MEC occurrence. RSA-221-R-01 has a UXO probability of “low.” However, even the removal of the additional subsurface anomalies in the existing data set is unlikely to eliminate the need for LUCs for the site. Therefore, a complete geophysical anomaly removal was not retained as a feasible alternative for RSA-221-R-01.

No action, dig and sift, and LUCs were retained as feasible technologies and packaged into the following corrective measure alternatives for RSA-221-R-01:

- **Alternative 1: No Action.** Under the no-action alternative, no corrective measures would be taken to address the potential MEC hazards at RSA-221-R-01. Because this alternative may not be protective of human health and the environment, it is not considered a candidate for implementation but presents a baseline for evaluating other retained alternatives.
- **Alternative 2: LUCs.** This alternative provides LUCs to institute site controls due to potential hazards with MEC and includes controls such as fencing, signage, on-call

UXO support for intrusive activities; restricting future land use in the RSA Real Property Master Plan; and annual inspections and reporting.

- **Alternative 3: Dig and Sift MEC Removal.** This alternative is the excavation of soil across the entire site to a specified depth and sifting that soil to ensure that no MEC than a specified size remains at the site. In theory, this would reduce the probability of MEC to a point so low that stakeholders might agree that there would be no need for LUCs of any kind and the property could attain unrestricted land reuse. For this evaluation, the excavation is assumed to address the 12 acres of the site that are not covered by existing buildings or roadway. The excavation is assumed to proceed to a depth of 3.5 feet bgs, which is 0.5 foot deeper than items were found during the RFI. The size of screen for the sifting operation would be established during design. Implementation of dig and sift at RSA-221-R-01 would involve the major steps:
 1. Install site controls for overall access, work zones, and storm water.
 2. Clear vegetation from the site.
 3. Excavate and stockpile the soil to be processed.
 4. Sifting/screening operations.
 5. Backfill and restoration.

The no-action alternative does not meet the CMO to prevent or limit direct contact with MEC. While the implementation of Alternative 3 (Dig and Sift) activities at RSA-221-R-01 would be effective, reliable, and feasible and satisfy the CMO, the cost of implementation is extremely high compared to Alternative 2 (LUCs) and does not provide a significant improvement in protectiveness. In addition, the RSA-221-R-01 corrective measures study report (CB&I, 2017) projected a cost of approximately 8 million dollars for Alternative 3 to remove the remaining 4,274 subsurface SPAs as well as remaining trench and pit features. The Army cannot justify this large additional cost to remove all the identified anomalies and trench and pit features for a site where MEC has not been found, especially since the final CSM for the site supports that only wholly inert items and componentry are present at the site. There is also uncertainty as to whether all stakeholders would find it acceptable to forgo a requirement for LUCs with Alternative 3.

Implementation of Alternative 2 would best prevent or limit receptor exposure to potential MEC and limit impacts to the environment in accordance with the RCRA corrective action process (EPA, 1994) and meet requirements as specified in the Army's guidance for the Defense Environmental Restoration Program (DoD, 2018). Therefore, Alternative 2 was selected as the preferred corrective measure for RSA-221-R-01.

3.3.2 Selected Corrective Measures

The Army selected Alternative 2 as the corrective measure that most appropriately addresses the low probability that MEC may be present at RSA-221-R-01. The LUCs allow the Army to manage this low probability in order to protect human health. The LUCs will ensure that all intrusive activities that may be conducted at the site are safely managed. The major components of this alternative include the following:

- Installation of fencing around geophysical grids A20 through A26, B14 through B20, and C02 through C04
- Installation of signage on the fenced areas and around the remainder of the site
- Availability of on-call UXO construction support for all intrusive activity
- Establishing a LUC boundary around the site boundary with RSA Real Property Master Planning
- Outlining restrictions for this site in the RSA Real Property Master Plan and recording the NEUR with the Madison County Office of Probate
- Complying with AAC r. 335-5-1-.02(3)(a)
- Conduct annual LUC inspections. The inspection details will be reported annually to ADEM.

LUCs were chosen over the other alternatives because they provide the best balance of trade-offs with respect to the evaluation criteria. Because LUCs are needed at this site, it is not eligible for no further action at this time. The Army has determined, in consultation with ADEM, that fencing, signs, and UXO on-call support are appropriate as controls for RSA-221-R-01.

3.4 Request for Permit Modification

The RFI report for RSA-221-R-01 (APTIM, 2018) received concurrence from ADEM on October 11, 2018. A copy of the ADEM concurrence letter for the RFI report is included in Appendix A. The request for permit modification (Appendix B) accompanies this CMI work plan for RSA-221-R-01 and presents the supporting information, including all procedures necessary to implement and monitor the corrective measures for this site in accordance with AAC r. 335-14-8-.04(2). The inclusion of this request for permit modification meets requirements specified in Section VI.E.3 of the Permit.

4.0 Corrective Measures Implementation

This chapter provides an overview of the corrective measures activities for RSA-221-R-01. The general schedule for implementation of corrective measures at RSA-221-R-01 is provided in Appendix C.

4.1 General Scope

The general scope of work includes the following:

- Mobilization/Demobilization
- Locating, Marking, and Surveying of LUC Boundary, Fence Corners, and Signpost Areas
- Utility clearance and marking/obtain dig permit
- Vegetation clearance
- Protection of existing monitoring wells
- On-call UXO support
- Installation of fencing around the drainage swale area
- Posting of signage at the site requiring on-call UXO support and Army approval for intrusive activities
- Site restoration
- Preparation of Corrective Measures Report
- Establishment of LUC boundary
- Outlining of restrictions for this site in the RSA Property Master Plan
- Compliance with EURs in AAC r. 335-5-1-.02(3)(a)
- Annual routine LUC inspections, sign/fence repairs, and reporting

A general schedule for implementation of corrective measures at RSA-221-R-01 is provided in Appendix C. The schedule is approximate. The actual dates of implementation will depend on

document review time, coordination with other sites, and field conditions. The locations of the proposed LUC boundary and new signage and fencing to be installed are shown on Figure 4-1.

Communication and coordination during the CMI between the Army and APTIM and between the Army and ADEM will follow the protocol in the QAPP (Appendix D). RSA's community involvement plan (CB&I, 2015b) provides the basis for communication between the Army and the public. As per the RCRA permitting process, public involvement will occur at least twice, including a public notice to be issued by the Army after the CMI work plan is finalized, and by ADEM in accordance with their permit modification notification requirements.

4.1.1 Procurement and Subcontracting

The following subcontracted services and imported materials may be required for the completion of the project:

- Vegetation clearance
- Protection of existing monitoring wells
- Installation of fencing
- Surveying for LUC boundary and locations of fencing and signage
- Sign and post installation
- Site restoration (seed, fertilizer, and mulch)

Support equipment and materials will be procured through equipment vendors and shipped directly to the site. Support equipment includes portable storage, radios, relief stations, eyewash stations, health and safety supplies and equipment (e.g., personal protective equipment [PPE], air monitoring equipment [e.g., dust monitor and photoionization detector]), and other miscellaneous supplies (e.g., wooden stakes, pin flags, and signpost materials).

4.1.2 Field Personnel

The following field personnel will likely be utilized to complete field remediation activities:

- Site supervisor
- Site safety officer
- Field construction quality control system manager
- Equipment operators
- Laborers.

The number and schedule of personnel will be adjusted during the project as required for completion.

4.1.3 Quality Control Inspections for Field Activities

Inspections will be performed to determine compliance with this CMI work plan. The inspection criteria are included in the field audit checklist in the CQAP (Appendix G) and will be verified during inspection activities. Inspections may be performed and verified through visual observation, measurement of materials or equipment, examination of documentation/certification, evaluation of performance, or testing.

Inspections will be performed using a three-phase inspection method. Participants in the inspections typically include but are not limited to the task subcontractor, the project quality control manager, the regulatory representative, and the project health and safety representative. The preparatory inspection(s) 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 inspection(s) will be performed when work begins on a particular feature of work and include an examination of the quality of workmanship and a review of control testing for compliance with work plan requirements. Follow-up inspection(s) will then be performed to verify compliance with procedures. Follow-up inspections will ensure a continuation of quality and safety standards established during preparatory and initial inspections until completion of the definable work feature. Final follow-up inspection(s) will be conducted at the completion of the activity. The final follow-up inspection will be performed to ensure that the completed feature of work meets the work plan requirements. Any deficiencies noted during this inspection will be documented and a determination will be made as to the corrective actions necessary to mitigate the deficiency. All significant deficiencies will be corrected prior to completion of the activity. Records of inspections will be maintained in the project files. At a minimum, inspection files will include inspection reports/checklists, inspection responses, and any supporting documents, as well as applicable comments.

4.1.4 Daily Reports

The requirements for preparation and submittal of daily project documentation are outlined in the QAPP (Appendix D) and the CQAP (Appendix G). As indicated in the CQAP, the daily reports (including daily construction logs, etc.) will be provided to the Project Manager, or designee, for the CMI contractor during CMI activities. These reports will be submitted weekly to the CEHNC Contracting Officer's Representative/Project Manager and RSA. Variances, inspection forms, survey data including survey plat for the LUC boundary, and dig permits will be included in the project reporting (Section 4.7).

4.1.5 Health and Safety Requirements

All personnel involved in the corrective measures will follow this CMI work plan and abide by the health and safety requirements presented in the SSHP prepared by APTIM for implementing the corrective measures (Appendix E).

4.2 Preliminary Activities

Preliminary activities include mobilization, fulfilling requirements for base access, obtaining digging permits, utility marking, protection of existing wells near fencing to be installed, and surveying. All field personnel will follow this CMI work plan including the attached QAPP (Appendix D), SSHP (Appendix E), and CQAP (Appendix G). All field activities will be conducted using on-call UXO support, which requires initial notification of start date and types of activities.

4.2.1 Mobilization

Upon notice to proceed, mobilization activities will begin, including the deployment of personnel, equipment, subcontractors, and materials that are necessary to commence CMI activities at RSA-221-R-01. Initial activities will include the procurement of subcontractors as well as any equipment and supplies needed. After field mobilization, personnel will attend a preconstruction meeting and safety orientation to review the proposed approach and the sequencing of work to ensure that clear lines of communication are established. All necessary site-specific safety training will be conducted at this time.

4.2.2 Access to Redstone Arsenal

Access to RSA requires registering at RSA Visitor's Center located at Gate 9 on Rideout Road through completion of a badge application form (and a background check) that must be sponsored by the Army Contracting Officer's Representative, or designee. Upon presentation of proper identification at the RSA Visitor's Center, RSA will issue an installation access badge. Temporary passes may be required for some vehicles. Upon registration, personnel may access RSA through any of the gates in operation at RSA.

Military and government personnel will present current military (active, retired, or family) or federal government identification cards and do not require a host RSA organization. For further information, contact the Redstone Arsenal Visitors Center located at Gate 9 at (256) 876-1122 or the Vehicle Registration Office at (256) 876-5770.

4.2.3 Locating, Marking, and Surveying of LUC Boundary, Fencing Corners, and Signpost Areas

The proposed LUC boundary, fencing, and signpost installation locations are shown on Figure 4-1 along with their coordinates. A licensed land surveyor will be subcontracted to survey the LUC

boundary, fence corners, and signpost installation areas. The surveyor will locate these areas based on the coordinates provided on Figure 4-1. The signpost locations will be marked in the field with highly visible wooden stakes, tape, or pin flags. Surveying methods will follow the procedures specified in the CQAP (Appendix G).

4.2.4 Digging Permit and Utility Marking

Prior to conducting any intrusive site activities, the APTIM will coordinate with the appropriate RSA personnel to ensure that any underground utilities in the planned signage and fencing installation areas at RSA-221-R-01 are located and marked prior to beginning intrusive field activities. The procedure requires notification by telephone ([256] 876-9881) requesting a work order for a digging permit within 14 days of intrusive activities.

The known permitting required during CMI activities is a digging permit for excavation on RSA administered by the Directorate of Public Works. As part this permit, RSA will locate and mark underground utilities in the vicinity of fencing and signpost installation areas.

The digging permit must be renewed every 30 days. To avoid temporary shutdown, the CMI contractor will make a request for permit extension at least 1½ weeks prior to digging permit expiration for the extension to be granted.

4.2.5 Site Control

APTIM will use temporary construction fencing materials, barricades, and warning tape, as necessary, to delineate the site work zones in compliance with their SSHP. Warning signs will be posted at conspicuous locations around the perimeter of the construction areas to discourage unauthorized entry. An equipment storage and material laydown area will be designated during mobilization.

4.2.6 Vegetation Clearing

Any brush and other vegetation covering the fencing and signpost installation areas will be cleared. The brush will be cleared using manual and mechanical means (e.g., chainsaw, line trimmer, or heavy equipment). No tree cutting is expected to be required as the work area areas are primarily maintained grass.

Any vegetation cleared will be stockpiled and disposed at the Construction and Demolition Landfill.

4.2.7 Existing Monitoring Well Protection

Four existing monitoring wells (221-RS2281, 221-RS2282, 221-RS2283, and 221-RS2284) are located near the work zones for fencing to be installed or where posts will be installed for the

LUC signage at RSA-221-R-01 (Figure 4-1). The monitoring wells in the work zones will be conspicuously marked in the field for protection during fencing and signpost installation (i.e., temporary safety fencing will be placed around the monitoring wells).

Although every attempt will be made to safeguard the existing monitoring wells, if a monitoring well is inadvertently damaged requiring abandonment, the well will be closed in accordance with an ADEM approved well closure plan (unless closed due to damage); Standard Operating Procedure No. 21, *Monitoring Well and Borehole Abandonment* (HydroGeoLogic, Inc., 2019), and the AEIRG (ADEM, 2017a). Documentation of the well closure activities will be included in the corrective measures report.

If any monitoring wells are inadvertently damaged during fence and signpost installation and have to be abandoned, replacement monitoring well(s) will be installed (if needed) following the completion of the fencing and signpost installation. Replacement wells would be installed in accordance with procedures outlined in Standard Operating Procedure No. 17.0, *Monitoring Well Installation* (HydroGeoLogic, Inc., 2019). Currently, no replacement wells are planned for RSA-221-R-01.

4.2.8 On-Call UXO Support

The probability of encountering UXO has been determined to be low at this site, and on-call UXO support has been determined to provide the appropriate level of protection during the conduct of the corrective measures involving intrusive activities (fencing and signpost installation) (Army, 2018). The on-call explosive ordnance disposal personnel are available 24/7 through the U.S. Army Aviation and Missile Command Safety Office if suspected UXO is encountered. Notification will be provided to the Safety Office prior to the start of the intrusive activities.

4.3 Installation of Fencing

A total of approximately 3,167 feet of high-visibility fencing will be installed around the eastern portion of the site as shown on Figure 4-1. The fencing will encompass this area both north (1,686 feet) and south (1,481 feet) of Ninebark Road. This single-strand fencing will consist of a poly-coated cable with steel posts similar to fencing installed at landfills on RSA (e.g., RSA-060, RSA-056/139). Two locking gates will be present within each of the northern and southern fenced areas. This high-visibility fencing allows easy installation across the drainage swale and streamlines groundskeeping in the area. Attachment G-2 in Appendix G presents the fencing technical specifications.

4.4 Posting of LUC Signage

Twenty-eight LUC signs will be posted around the site boundary at intervals of approximately 300 feet, which will be coincident with the LUC boundary, at the driveway entrance to each building, and just west of the Magazine Road extension (shown in green as locations 1 through 26 on Figure 4-1). These signs will be posted on signposts as shown on Figure 4-2 and will state “No Dig without On-Call UXO Support.” The contact number for the Chief, Installation Restoration Branch within the Environmental Management Division will be on each site to obtain instructions for arranging On-Call UXO support. Two locations as noted in green with an inscribed “x” on Figure 4-1 already have sign posts and a new sign will replace each existing sign.

Eleven additional LUC signs will be placed on fenceposts for the fencing installed around the drainage swale area (shown in yellow as locations 27 through 37 on Figure 4-1). LUC signs will be posted approximately every 300 feet along the fencing. Figure 4-2 shows the proposed fenceposts with sign details noting “Conditional Access Area/No Dig without On-Call UXO Support.” The contact number for the Chief, Installation Restoration Branch within the Environmental Management Division will be on each sign to obtain access permission and instructions for arranging On-Call UXO support.

Minor text adjustments may be made to the signs based on input from RSA’s safety office or other reviews or as needed to conform to the physical layout of the sign. The final verbiage used will be included in the CMI report for this site. The signs and lettering must be visible from a distance of 25 feet and will be placed at spacing of approximately every 100 feet consistent with signage spacing at other RSA sites closed with LUCs.

4.5 Remediation-Derived Waste

RDW generated during the CMI activities at RSA-221-R-01 is expected to include disposable PPE generated during installation of fencing and signage. PPE will be placed in trash bags and disposed as normal household trash in accordance with in Appendix F (Section 5.7.1). Solid materials (e.g., other types of RDW), if generated, will be managed in accordance with Table 2 of Appendix G of the AEIRG (ADEM, 2017a) and Appendix F.

4.6 Site Restoration and Demobilization Activities

4.6.1 Site Restoration

Once the fencing and signposts have been installed, the ground will be restored to grade. Disturbed grassy areas will be seeded and mulched to stimulate revegetation and reduce the potential for soil erosion. Seed and mulch will be applied to all disturbed areas according to the

Best Management Practices handbook from the Alabama Soil and Water Conservation Committee (ASWCC) (ASWCC, 2018).

4.6.2 Demobilization

Personnel, equipment, and subcontractors will be demobilized from the project site after completion of the corrective measure activities. A small crew and minimal equipment will be retained as required to remove surplus materials and clean staging areas.

Demobilization will primarily consist of disassembly, packing, and return of rented equipment to suppliers and travel for personnel back to their home offices.

4.7 Corrective Measures Implementation Reporting

A CMI report will be prepared in accordance with Section VIII.D of the Permit (ADEM, 2020) and AEIRG (ADEM, 2017a). As required by the Permit, variances, inspection forms, survey data including a survey plat for LUC boundaries, and dig permits will be included in the CMI report. If completion of the CMI requires more than 180 days, the Army will submit quarterly CMI progress reports in accordance with Section VIII.D.1 of the Permit.

4.8 Environmental Use Restrictions

An EUR is required when an approved CMI allows a cleanup that will not result in remediation of the property or portions of the property to unrestricted use. The purpose of an EUR is to ensure that risks to human health and/or the environment are properly managed by imposing activity and use restrictions on the applicable portions of the property and including these restrictions into the installation master plan. Section 4.9 and Appendix H present the LUCs that the Army will implement at RSA-221-R-01 for site areas not being restored to unrestricted use. The Army will comply with the AAC r. 335-5-1-.02(3)(a) for the EUR for RSA-221-R-01.

4.9 Implementation of Land-Use Controls

LUCs will be implemented in accordance with AAC r 335-5 (ADEM, 2019) to ensure that future activities conducted at RSA-221-R-01 remain protective of human health due to the potential for MEC. The LUC boundary is shown on Figure 4-1. Figure 4-2 presents the sign and signpost details.

The following controls will be implemented at RSA-221-R-01:

- Implementation of an NEUR in accordance with AAC 335-5-1-.02(3)(a)1.(i) (ADEM, 2019) that will restrict land use within RSA-221-R-01 to commercial/industrial and requires on-call UXO support for any intrusive work. The draft NEUR will be included in the CMI report for this site for ADEM review and approval.

- Incorporation of the NEUR into the facility Master Plan, as required by AAC r. 335-5-1-.02(3)(a)1.(iv) (ADEM, 2019)
- Recording of the NEUR in the land records for the property, as required by AAC r. 335-5-.02(3)(a)1.(iv) (ADEM, 2019).

The requirements of the NEUR are discussed in Section 4.9.2 and Appendix H.

4.9.1 Survey Plat

In accordance with the Permit (ADEM, 2020 and as updated), where land cannot be released for unrestricted use, RSA will submit a survey plat indicating the locations and dimensions of the land area included in the LUC boundary at RSA-221-R-01 in accordance with Section VIII.B.5 of the Permit. The survey plat shall be submitted to the Madison County Probate Judge's Office and to ADEM as part of the NEUR provided in the CMI report. This survey plat must be prepared and certified by a professional land surveyor registered in the state of Alabama and contain a prominently displayed note stating RSA's obligations to limit property to the specified restricted uses. The survey plat shall be maintained as described in the Permit until RSA can demonstrate to ADEM that the levels of hazardous constituents in all contaminated media are within limits appropriate for unrestricted land uses. A preliminary plan showing the areas to which LUCs will be applied is shown on Figure 4-1, with draft survey coordinates presented from the Geographic Information System database (latitude and longitude) of the corners of the LUC boundary.

4.9.2 Notice of Environmental Use Restriction

An NEUR is required when an approved CMI allows a cleanup that will not result in remediation of the property or portions of the property to unrestricted use. The purpose of an NEUR is to ensure that risks to human health and/or the environment are properly managed by imposing activity and use restrictions on the applicable portions of the property and making these restrictions a legal obligation until the NEUR is removed. The Army has determined that restrictions must be enforced because of the potential to encounter MEC at the site. The following restrictions will be imposed and enforced:

- The site must remain for commercial/industrial use only.
- The signs and fencing will be inspected annually as applicable.
- On-call UXO support is required for on-site intrusive activities.
- Access within the fenced drainage swale area additionally requires permission from the Chief, Chief, Installation Restoration Branch within the Environmental Management Division.

A draft NEUR will be provided in the CMI report for this site for ADEM review and approval. ADEM will be notified within 10 days after uses inconsistent with the NEUR are identified. Additionally, notice regarding any observed changes in use, identified proposed changes in use, applications for building permits, or proposals for site work inconsistent with the NEUR will be provided to ADEM as part of the annual monitoring report.

Once the NEUR is approved, ADEM will execute and return the original document to RSA to be filed in the Madison County Probate Judge's Office within 30 days of receipt and no later than the submission of the survey plat. Certification that the NEUR was recorded with the Madison County Probate Judge's Office will be submitted to ADEM. This certification will include a copy of the NEUR and the document in which the notation was placed. RSA will maintain the NEUR until such time in the future that conditions can be demonstrated to ADEM's acceptance that the land can be released for unrestricted use.

RSA will notify ADEM at least 90 days in advance of the proposed closing on any sale or other conveyance of any interest in any or all of the Property. If the property is transferred to an owner that is not the federal government, an environmental covenant will be executed and filed at that time in accordance with AAC r. 335-5 (ADEM, 2019).

4.10 Ongoing Obligations and Responsibilities

4.10.1 Inspections and Repairs

Inspections will be conducted and documented on an annual basis to ensure compliance with AAC 335-5-1-.02(3)(a) as follows:

- Inspection of the signage around the site to determine whether signs are still present and legible.
- Inspection of the fencing around the drainage swale area to ensure it remains in place.
- A team of two UXO technicians will visually inspect the drainage swale east of Building 7261. It is possible that erosion may uncover previously buried items. The items will be inspected in accordance with Army requirements prior to item disposal.
- Repairs/replacements to the warning signs and fencing shall be completed on an as-needed basis and shall be initiated within 10 days of identifying the need for such repairs.
- Ensure that land use remains appropriately restricted to commercial/industrial and appropriate approvals and safety controls are enforced during any intrusive activities (e.g., anomaly avoidance and on-call UXO support).

The Army will document the inspections in accordance with the NEUR. ADEM will be notified within 10 days after uses inconsistent with the NEUR are identified.

4.10.2 Monitoring including Change Monitoring

An annual inspection report will be submitted to ADEM. This report will document the inspections and identify the status of the NEUR and how any deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced previously were communicated in the deed(s), the owners and state and local agencies were notified of the use restrictions, and controls affecting the property and use of the property has conformed with such restrictions and controls. The report will include a copy of the inspection forms, any violations noted, and recommendations for any changes to the NEUR. Annual monitoring of signage will be conducted for visibility, maintenance, and repairs, as necessary, to ensure their long-term effectiveness and protection.

4.10.3 Notices

Notice shall be provided to ADEM in the annual monitoring report regarding any observed changes in use, any identified proposed changes in use, applications for building permits, or proposals for any site work inconsistent with the NEUR. RSA shall notify ADEM at least 90 days in advance of the proposed closing on any sale or other conveyance of any interest in any or all of the Property as cited in RSA's Permit. If the property is transferred to an owner that is not the federal government, an environmental covenant will be executed and filed at that time in accordance with AAC r. 335-5-1-.02(3)(a)1.(i) (ADEM, 2019).

5.0 Contingencies

Available information including historical records and recent environmental sampling data was reviewed with respect to MEC, CWM, or chemical agent potential at RSA-221-R-01. The review indicated that the probability of encountering UXO is low and the probability of encountering CWM is unlikely. Based on this evaluation, it was determined that chemical agent monitoring or on-site UXO construction support will not be required for the conduct of the installation of fencing, signs, and signposts, although on-site UXO construction support will be present during the annual LUC inspections of the drainage swale area. However, in the event any suspicious item is encountered, all work shall stop. The on-call UXO support will be contacted. The notification procedures specified in the RSA Explosive Safety Management Program (Army, 2018) and requirements specified in EM 385-1-97 (Department of the Army, 2008) will be followed. Any suspect MEC encountered during the inspections will be marked for avoidance, documented, and managed in accordance with the RSA Explosive Safety Management Program (Army, 2018).

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ATTACHMENT 1
LIST OF ACRONYMS AND ABBREVIATIONS

List of Abbreviations and Acronyms

Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
µS/cm	microsiemens per centimeter
µg/m ³	micrograms per cubic meter
°C	degrees Celsius
°F	degrees Fahrenheit
%D	percent difference
%R	percent recovery
1,1,2-TCA	1,1,2-trichloroethane
1,1-DCE	1,1-dichloroethene
1,2-DCE	1,2-Dichloroethene
2,4,5-T	2,4,5-trichlorophenoxyacetic acid
2,4,5-TP	2,4,5-trichlorophenoxypropionic acid
2,4-D	2,4-dichlorophenoxyacetic acid
2-ADNT	2-amino-4,6-dinitrotoluene
4-ADNT	4-amino-2,6-dinitrotoluene
AAC	Alabama Administrative Code
AAFES	Army and Air Force Exchange Service
AAP	Army Ammunition Plant
AB	ambient blank
ABLM	adult blood lead model
ABP	agent breakdown products
ABS	dermal absorption factor
ACAD	AutoCadd
ACGIH	American Conference of Governmental Industrial Hygienists
ACM	asbestos-containing material
ACSIM	Assistant Chief of Staff for Installation Management
ADAF	age-dependent adjustment factor
ADEM	Alabama Department of Environmental Management
ADPH	Alabama Department of Public Health
AEC	U.S. Army Environmental Command
AEDA	ammunition, explosives, and other dangerous articles
AEDB	Army Environmental Database
AEIRG	Alabama Environmental Investigation and Remediation Guidance
AEL	airborne exposure limit
AERMOD	American Meteorology Society/Environmental Protection Agency Regulatory Model
AET	apparent effects threshold
AF	soil-to-skin adherence factor
AFFF	Aqueous Fire Fighting Foam
AFS	air filtration system
AGC	advanced geophysical classification
AGS	Alabama Geographic Society
AHA	ammunition holding area
AHWMMA	Alabama Hazardous Wastes Management and Minimization Act
AIPH	Army Institute of U.S. Public Health
AL	Alabama
ALDOT	Alabama Department of Transportation
ALNHP	Alabama Natural Heritage Program
amb.	amber
AMCOM	U.S. Army Aviation and Missile Command
AMRDEC	Aviation and Missile Research, Development, and Engineering Center
amsl	above mean sea level (1988 North American Vertical Datum, NAVD 88)
ANOVA	Analysis of Variance
AOC	area of concern
AOI	area of investigation
AP	armor piercing
APEC	areas of potential ecological concern
APHC	U.S. Army Public Health Center
APT	armor-piercing tracer
APTIM	Aptim Federal Services, LLC
AR	Army Regulation
AR/COC	analysis request/chain of custody
ARAR	applicable or relevant and appropriate requirement
ARBCA	Alabama Risk-Based Corrective Action
AREE	area requiring environmental evaluation
ARFO	ammunition returned from overseas
Army	U.S. Army
AS	air sparging
ASCII	American Standard Code for Information Interchange
ASP	Ammunition Supply Point
ASR	archives search report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
ASV	alternative screening value
ASWCC	Alabama Soil and Water Conservation Committee
AT	averaging time; arsenic trichloride
ATF	Bureau of Alcohol, Tobacco, Firearms and Explosives
atm-m ³ /mol	atmosphere cubic meters per mole
ATS	alternative treatment standard
ATT	Applied and Technical Training
ATSDR	Agency for Toxic Substances and Disease Registry
ATTN	attention
ATV	all-terrain vehicle
AUF	area use factor
AWARE	Associated Water and Air Resources Engineers, Inc.
AWBC	alternative water balance cover
AWQC	ambient water quality criteria

List of Abbreviations and Acronyms

Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
AWQS	ambient water quality standard
B	Analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BAF	bioaccumulation factor
BAF _{soil-to-invert}	soil-to-invertebrate bioaccumulation factor
BaOH	barium hydroxide
BAP	benzo(a)pyrene
BCF	bioconcentration factor
BCT	BRAC Cleanup Team
BCY	bank cubic yards
BDCM	bromodichloromethane
BEHP	bis(2-ethylhexyl)phthalate
BEM	Buried Explosion Module
BERA	baseline ecological risk assessment
BFB	bromofluorobenzene
BFE	base flood elevation
BFM	bonded fiber matrix
BG	Bacillus globigii
bgs	below ground surface
Bhate	Bhate Environmental Associates, Inc.
BHC	hexachlorocyclohexane
BHHRA	baseline human health risk assessment
BIM	basic information map
BIP	blow(n)-in-place
bkg	background
bls	below land surface
BMP	best management practice
BOD	biological oxygen demand
Bp	soil-to-plant biotransfer factors
BR	bedrock
BR-D	deep bedrock
BRAC	Base Realignment and Closure
BSAF	biota-to-sediment accumulation factors
BSC	background screening criterion
BSCRN	bottom of screen
BSV	background screening value
BTAG	Biological Technical Assistance Group
BTEX	benzene, toluene, ethyl benzene, and xylenes
BTOC	below top of casing
BTV	background threshold value
BW	body weight
BZ	breathing zone
C	ceiling limit value
C&D	Construction & Demolition
Ca	carcinogen
CA	chemical agent; corrective action
CAA	Clean Air Act
CAB	chemical warfare agent breakdown products
CACM	Chemical Agent Contaminated Media
CaCO ₃	calcium carbonate
CAIS	chemical agent identification set
CalEPA	California Environmental Protection Agency
CAMU	corrective action management unit
CAP	corrective action plan; Contractor Acquired Property
CAR	corrective action request
CARA	Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE) Analytical and Remediation Activity
CAS	Chemical Abstracts Service
CASNO	Chemical Abstracts Service identification number
CASRN	Chemical Abstracts Service Registry Number
CB	chlorobenzene
CB&I	CB&I Federal Services LLC
CBC	Chemical and Biological Center
CBFM	colloidal borescope flowmeter
CBMPP	construction best management practices plan
CBR	chemical, biological, and radiological
CBRN	chemical, biological, radiological, nuclear
CBRNE	Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives
CBZ	chlorobenzene
CCAL	continuing calibration
CCB	continuing calibration blank
CCC	criterion continuous concentration
CCDC	Combat Capabilities Development Command
CCl ₄	carbon tetrachloride
CCV	continuing calibration verification
CD	compact disk; Consent Decree
CDE	Chemical Defense Equipment
CDI	chronic daily intake
CDTF	Chemical Defense Training Facility
CEHNC	U.S. Army Engineering and Support Center, Huntsville
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CF	conversion factor
CFC	chlorofluorocarbon
CFDP	Center for Domestic Preparedness
CFR	Code of Federal Regulations
cfs	cubic feet per second
C _{fw}	contaminant concentration in fish from surface water
CG	phosgene (carbonyl chloride); cleanup goal
CGI	combustible gas indicator

List of Abbreviations and Acronyms

Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
ch	inorganic clays of high plasticity
CHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
CIH	Certified Industrial Hygienist
cis-1,2-DCE	cis-1,2-Dichloroethene
CK	cyanogen chloride
Cl	chloride, chlorinated
CLIN	contract line item number
ClO ₄ ⁻	perchlorate
CLP	Contract Laboratory Program
CLPILM	EPA CLP's prefix designation for the inorganic metals analysis statement of work
CLP M	EPA CLP's prefix designation for the mercury analysis statement of work
CM	corrective measure
cm	centimeter
cm/hour	centimeters per hour
cm ²	cubic centimeter
cm ² /second	square centimeters per second
cm ³ /g	cubic centimeters per gram
CMA	U.S. Army Chemical Materials Activity; corrective measure alternative
CMC	criterion maximum concentration
CMD	corrective measures design
CMI	corrective measures implementation
CMICR	corrective measures implementation completion report
CMIP	corrective measures implementation work plan
CMO	corrective measure objective
CMS	corrective measures study
CMT	Continuous Multichannel Tubing
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
CO	carbon monoxide
CO ₂	carbon dioxide
Co-60	cobalt-60
CoA	Code of Alabama
COAC	chemical of analytical concern
COC	when discussing chemicals, COC means chemical of concern; when discussing field paperwork, COC means chain of custody
COE	Corps of Engineers
COI	constituent of interest
Con	skin or eye contact
COPAC	chemical of potential analytical concern
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
COR	Contracting Officer's Representative
CP	communication plan; Competent Person
CPFF	cost plus fixed fee
CPOM	coarse particulate organic matter
CPSS	chemicals present in site samples
CPVC	chlorinated polyvinyl chloride
C _{pw}	chemical of potential ecological concern concentration in pore water
CQA	construction quality assurance
CQAP	construction quality assurance plan
CQCSM	Construction Quality Control System Manager
CRA	Conestoga-Rovers and Associates
CRDL	contract-required detection limit
CRL	certified reporting limit
CRP	community relations plan; compliance-related program
CRQL	contract-required quantitation limit
CRSA	Central Redstone Arsenal
CRZ	contamination reduction zone
CS	ortho-chlorobenzylidene-malononitrile
CSA	confirmation sampling activities
CSDWP	Comprehensive Site-Specific Demolition Work Plan
C _{sed}	chemical of potential ecological concern concentration in sediment from groundwater
CSEM	conceptual site exposure model
CSM	conceptual site model
CSP	chemical site plan
CSP	corrugated steel pipe
CSS	chemical safety submission
CT	carbon tetrachloride
CTC	cost to completion
ctr.	container
CVAA	2-chlorovinylarsenous acid
C _w	contaminant concentration in water
CWA	when discussing chemicals, CWA means chemical warfare agent; when discussing laws, CWA means Clean Water Act
CWM	If used in the text of a document this acronym means chemical warfare materiel; if used in an analytical table which summarizes container requirements, this acronym means clear, widemouth container
CWS	Chemical Warfare Service
CX	dichloroformoxime
D	duplicate; duplicate contamination; when used as a validation qualifier, D means dilution
D2PC	Personal Computer Program for Chemical Hazard Prediction
DAD	average dermally absorbed dose
DAVS	detector-aided visual survey
D&I	detection and identification
DA	Department of the Army; diphenylchloroarsine
DA PAM	Department of the Army Pamphlet
DAAMS	Depot Area Air Monitoring System
DA _{event}	dermal dose absorbed per event
DAF	dilution-attenuation factor
DAF4	dilution-attenuation factor 4

List of Abbreviations and Acronyms

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Acronym	Definition
DANC	decontamination agent, non-corrosive
DAP	diammonium phosphate
DASAF	Department of the Army Safety Office
DAVS	detector-aided visual survey
DBA	dibenz(a,h)anthracene
DBCP	1,2-dibromo-3-chloropropane
DBX	depth bomb explosive
DC	District of Columbia
DCA	dichloroethane
DCB	decachlorobiphenyl
DCE	dichloroethene
DCMA	Defense Contract Management Agency
DCQAP	data collection quality assurance plan
DD	Decision Document
DD	Department of Defense (form only)
DDD	dichlorodiphenyldichloroethane (this is an industry standard acronym for this chemical)
DDE	dichlorodiphenyldichloroethene (this is an industry standard acronym for this chemical)
DDESB	Department of Defense Explosives Safety Board
DDT	dichlorodiphenyltrichloroethane
DEH	Directorate of Engineering and Housing
DEHP	bis(2-ethylhexyl)phthalate
DEMIL	Demilitarization Areas
DEP	depositional soil
DERP	Defense Environmental Restoration Program
DES	Directorate of Environment and Safety
DF	dilution factor
DFTPP	decafluorotriphenylphosphine
DFOW	Definable Feature of Work
DGM	digital geophysical mapping
DHC	<i>Dehalococcoides</i> sp.
DI	deionized
DID	data item description
DIMP	di-isopropylmethylphosphonate
DL	detection limit
DLA	Defense Logistics Agency
DM	adamsite
DMBA	dimethylbenz(a)anthracene
DMM	discarded military munitions
DMMP	dimethylmethylphosphonate
DNAPL	dense nonaqueous-phase liquid
DNB	dinitrobenzene
DNBZ	dinitrobenzene
DNOC	4,6-dinitro-2-methylphenol
DNT	dinitrotoluene
DO	dissolved oxygen
DoD	U.S. Department of Defense
DODI	Department of Defense Instruction
DOJ	U.S. Department of Justice
DOT	U.S. Department of Transportation
DP	direct-push
DPDO	Defense Property Disposal Office
DPT	direct-push technology
DQCR	Daily Quality Control Report
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
DSERTS	Defense Site Environmental Restoration Tracking System
DSMOA	Defense and State Memorandum of Agreement
DSN	Defense Switched Network
DSR	demolition and site restoration
DTSC	Department of Toxic Substances Control
DU	decision unit
DUA	data usability assessment
DVD	digital versatile disc or digital video disc
DWEL	drinking water equivalent level
e.g.	for example
E3	Electromagnetic Environmental Effects
EB	equipment blank
EBS	environmental baseline study
EC ₂₀	effects concentration for 20 percent of a test population
EC ₅₀	effects concentration for 50 percent of a test population
EC	Emergency Coordinator
ECBC	Edgewood Chemical and Biological Center
Eco-RGRG	ecological risk-based remedial goal
Eco-SSL	ecological soil screening level
ECM	earth covered magazine
ED	exposure duration
EDD	electronic data deliverable
EDQL	ecological data quality level
EDS	explosive destruction system
EDTA	ethylenediaminetetraacetic acid
EE/CA	engineering evaluation and cost analysis
EEL	estimated exposure level
EF	exposure frequency
EFR	enhanced fluid recovery
Eh	oxidation-reduction potential
ELAP	Environmental Laboratory Accreditation Program

List of Abbreviations and Acronyms

Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
Elev.	elevation
EM(1)	electromagnetic
EM(2)	Engineer Manual
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EMI	electromagnetic induction
Empirical	Empirical Laboratories, LLC
EMS/EL	Environmental Management Services, Inc./Environmental Laboratories
EMT	emergency medical technician
EOC	Emergency Operation Center
EOD	explosive ordnance disposal
EODT	explosive ordnance disposal team; EOD Technology, Inc.
EP	exit pathway
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPDS	Emergency Personnel Decontamination Station
EPIC	Environmental Photographic Interpretation Center
EPP	Environmental Protection Plan
EPRI	Electrical Power Research Institute
EPT	Ephemeroptera, Plecoptera, Trichoptera
EQ	EQ Environmental Quality Company
EQL	estimated quantitation limit
ER	equipment rinsate; USACE Engineer Regulation
ERA	ecological risk assessment
ERH	electrical resistive heating
ERIS	Environmental Restoration Information System
ER-L	effects range-low
ER-M	effects range-medium
ERMA	Environmental Remediation Services Multiple Award
ES	exposed site
ESA	ecologically sensitive area
ESB	Equilibrium Partitioning Sediment Benchmark
ESE	Environmental Science and Engineering, Inc.
ESL	ecological screening level
ESP	explosives site plan
ESMP	Endangered Species Management Plan; Explosives Safety Management Program
ESS	explosives safety submission
ESTCP	Environmental Security Technology Certification Program
ESV	ecological screening value
ET	exposure time
ET _{sw}	exposure time - surface water
EU	exposure unit
EUR	Environmental Use Restriction
EV	event frequency
E-W	east to west
Excel	Excel Geophysical Services
Exp.	Explosives
ExplorTech	ExplorTech, LLC
EXTOXNET	Extension Toxicology Network
Ey	Etowah silty clay loam
EZ	exclusion zone
FA	focus area
FA	fraction absorbed
FAC	facultative wetland
FACU	facultative upland
FACW	facultative wetland
FADL	Field Activity Daily Log
FAE	fuel-air explosive
FAR	Federal Acquisition Regulations
FAV	final acute value
FB	field blank
FBI	Family Biotic Index
FCM	food chain multiplier
FCSV	food chain screening value
FCV	final chronic value
FD	field duplicate
FDA	U.S. Food and Drug Administration
Fe ⁺²	ferrous iron
Fe ⁺³	ferric iron
FEC	fluid electrical conductivity
FedEx	Federal Express, Inc.
FEMA	Federal Emergency Management Agency
FFA	Federal Facilities Agreement
FFCA	Federal Facilities Compliance Act
FFE	field flame expedient
FFP	firm fixed price
FFS	focused feasibility study
FI	fraction of exposure; filtered
FID	flame ionization detector
FIFRA	Federal Insecticide, Fungicide, & Rodenticide Act
FLUTE	Flexible Liner Underground Technologies, Ltd. Co.
FM-ARNGTC	Fort McClellan Army National Guard Training Center
FMDC	Fort McClellan Development Commission
FML	flexible membrane liner
f _{oc}	fraction organic carbon
FOIA	Freedom Of Information Act
FOMRA	Former Ordnance Motor Repair Area
FOST	Finding of Suitability to Transfer
Foster Wheeler	Foster Wheeler Environmental Corporation

List of Abbreviations and Acronyms Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
FR	Federal Register
Frtn	fraction
FS	feasibility study
FSH	Fort Sam Houston
FSP	field sampling plan
FS smoke	sulfur trioxide and chlorosulfonic acid
ft	foot, feet
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
ft ²	square feet
ft ² /day	square feet per day
FTA	Fire Training Area
FUP	fixed unit price
FWV	fieldwork variance
FY	fiscal year
g	gram
G&M	Geraghty and Miller, Inc.
g/cm ³	grams per cubic centimeter
g/m ²	grams per square meter
g/m ³	gram per cubic meter
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
GA	tabun
GAC	granular activated carbon
GAf	General Aniline and Film; gastrointestinal absorption factor
gal	gallon
gal/min	gallons per minute
GB	sarin (isopropyl methylphosphonofluoridate)
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
GCL	geosynthetic clay liner
GCMR	Geophysical Classification for Munitions Response
GCWD	Gulf Chemical Warfare Depot
GCWS	Gulf Chemical Warfare Service
GEAE	Generic Ecological Assessment Endpoint
GED	General Equivalency Diploma
GEDIT	gaseous electron donor injection technology
GFAA	graphite furnace atomic absorption
GIP	geophysical investigation plan
GIS	geographic information system
GNSS	Global Navigation Satellite System
GPCR	gas phase chemical reduction
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GRA	general response action
GRIM	Groundwater Responsibility Information Matrix
GRO	gasoline range organics
GS	ground scar
GSA	when discussing the federal government requirements, GSA means General Services Administration; when discussing geology, GSA means Geologic Survey of Alabama
GSE	Great Southern Engineering
GSR	green and sustainable remediation
GST	ground stain
GSV	geophysical systems verification
GUC	groundwater use control
GW	groundwater
GWDT	Groundwater Design Team
GWMZ	groundwater monitoring well, multizone
GWTR	groundwater monitoring well
H&S	health and safety
H ₂ O ₂	hydrogen peroxide
H ₂ S	hydrogen sulfide
HA	hand auger; hazard assessment
HAL	Health Advisory level
HAMUST56	Huntsville Arsenal Mustard Plant 2, Lines 5 & 6
Harmon	Harmon Engineering Associates, Inc.
HAZMATCAD™	Hazardous Material Chemical Agent Detector
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBESL	health-based environmental screening level
HC	mixture of hexachloroethane, aluminum powder, and zinc oxide (smoke producer)
HCE	hexchloroethane
HCl	hydrochloric acid
HD	distilled mustard (bis-[dichloroethyl]sulfide); hazard division
HDPE	high-density polyethylene
HE	high explosive
HEAST	Health Effects Assessment Summary Tables
HEAT	High Explosive Anti-Tank
HEPA	high-efficiency particulate air
HEGA	high-efficiency gas absorber
Herb.	herbicides
HFD	hazardous fragment distance
HHAWQS	human health Alabama water quality standard
HHRA	human health risk assessment
HHRE	human health risk evaluation
HI	hazard index
HI _{COC}	total hazard index for a given relevant COC, for a given receptor added across all exposure routes for given source medium

List of Abbreviations and Acronyms

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Acronym	Definition
HI _{cum}	cumulative hazard index summed across chemicals and source media
HI _{TO}	total hazard index for a given target organ for a given receptor
Hm	hot measurement
HMW	high molecular weight
HMX	cyclotetramethylenetetranitramine; octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocane
HN	hydrogen mustard
HNC	hydrogen cyanide
HNO ₃	nitric acid
HP	hydropunch
HPLC	high-performance liquid chromatography
HQ	hazard quotient
HQ _{COCi}	hazard quotient for the target organ of interest estimated for the ith COC
'HQ _i	hazard index for a given chemical summed across exposure routes and source media
'HQ _{Ri}	hazard quotient for the given chemical for exposure route i
HQ _{screen}	screening-level hazard quotient
hr	hour
HRR	Historical Records Review
HS	mustard
HSA	hollow-stem auger
HSB	Huntsville Spring Branch
HSDB	Hazardous Substances Data Bank
HSF	historic site feature
HSMR	Huntsville Spring Branch at Martin Road
HT	British Mustard
HTPB	hydroxy-terminated polybutadiene
HTRW	hazardous, toxic, and radioactive waste
HTW	hazardous and toxic waste
HUB	Historically Underutilized Business
HWCL	hazardous waste control limit
HWSA	Hazardous Waste Storage Area
HWSU	hazardous waste storage unit
HY	hydrostratigraphic unit
HYPN	hydropunch
Hz	hertz
I	out of control, data rejected due to low recovery
I-565	Interstate 565
IAP	Installation Action Plan
IATA	International Air Transport Authority
I-AVSS	instrument-aided visual surface sweep
IC	Incident Commander
ICAL	initial calibration
ICAM	improved chemical agent monitor
ICB	initial calibration blank
ICP	inductively coupled plasma
ICS	interference check sample
ICV	initial calibration verification
ID	identification; inside diameter
IDL	instrument detection limit
IDLH	immediately dangerous to life or health
IDM	investigative-derived media
IDQTF	Intergovernmental Data Quality Task Force
IDS	intrusion detection system
IDW	investigation-derived waste; investigative-derived waste
i.e.	that is (in other words)
IELCR	individual excess lifetime cancer risk
IELCR _{occ}	total individual excess lifetime cancer risk for a given relevant chemical of concern, for a given receptor added across all exposure routes for a given source medium
'IELCR _{cum}	cumulative cancer risk for a given receptor summed across chemicals and source media
'IELCR _{Ri}	cancer risk for the given chemical in a given source medium for exposure route i
'IELCR _T	total cancer risk for the given chemical in a given source medium summed across exposure routes
IELCR _(Ti)	total cancer risk for chemical i in a given source medium summed across exposure routes
IEOC	Installation Emergency Operations Center
IERC	Installation Environmental Response Coordinator
IEUBK	Integrated Exposure Uptake Biokinetic
IF	ingestion factor; inhalation factor
IHF	interim holding facility
IIP	intrusive investigation plan
ILCR	incremental lifetime cancer risk
ILM	EPA CLP's prefix designation for the inorganic metals analysis statement of work for EPA contract laboratory program
IM	interim measure; isobutyl methacrylate
IMO	interim measure objective
IMU	inertial measurement unit
IM-AE	isobutyl methacrylate polymer AE
IMPA	isopropylmethyl phosphonic acid
in.	inch
Inc.	Incorporated
Ing	ingestion
Inh	inhalation
INT	interface
IOSC	Installation On-Scene Coordinator
IOU	integrator operable unit
IP	ionization potential
IPS	International Pipe Standard
IR	ingestion rate
IRAO	interim remedial action objective
IRAP-h	Industrial Risk Assessment Program-Human Health
IRDMS	Installation Restoration Data Management Information System

List of Abbreviations and Acronyms Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
IR _f	fish ingestion rate
IR _{so}	ingestion rate
IRFNA	inhibited red fuming nitric acid
IRIS	Integrated Risk Information System
IROD	interim record of decision
IRP	Installation Restoration Program
IRSL	industrial regional screening level
IS	incremental sampling
ISAB	in situ anaerobic bioremediation
ISBN	International Standard Book Number
ISCO	in situ chemical oxidation
ISCR	in situ chemical reduction
ISEB	in situ enhanced bioremediation
ISL	initial screening level
ISO	industry standard object
ISSC	Installation Support Services Contractor
ISTD	in situ thermal destruction
ISTT	in situ thermal treatment
IT	IT Corporation
ITEMS	IT Environmental Management System™
ITRC	Interstate Technology and Regulatory Council
IV	intervention value
IVS	instrument verification strip
IW	installation-wide
IWGW	installation-wide groundwater
IWGWMP	Installation-Wide Groundwater Monitoring Program
IWWP	installation-wide work plan
J	estimated concentration
J&E	Johnson and Ettinger
JD	jurisdictional determination
JOR	job order request
K	conductivity
KAPSDIDS	Kinetically Adjustable Pore Spaaace Dilation Injection Delivery System
K _d	soil-water distribution coefficient
K _{d,ss}	bed sediment-sediment pore water partition coefficient
KeV	kilo electron volt
kg	kilogram
kg/m ³	kilograms per cubic meter
KMnO ₄	potassium permanganate
KO	Contracting Officer
K _{oc}	organic carbon partitioning coefficient
K _{ow}	octanol-water partition coefficient
K _p	permeability coefficient
kPa	kilopascal
kVA	kilovolt-ampere
L	if used as part of the units of measure, the acronym stands for "liter", if used as a chemical name, this acronym stands for lewisite
L/cm ³	liters per cubic centimeter
L/day	liters per day
L/kg/day	liters per kilogram per day
LANL	Los Alamos National Laboratory
lb	pound
LBP	lead-based paint
lbs/year	pounds per year
LC	liquid chromatography
LC ₅₀	lethal concentration for 50 percent population tested
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LD ₅₀	lethal dose for 50 percent population tested
LDD	lost, damage, or destruction
LEL	lower explosive limit
LF	Leaching Factor
LGAC	liquid-phase granular activated carbon
LiDAR	Light Detection and Ranging
LL	low level
LLC	limited liability company
LNAPL	light nonaqueous-phase liquid
LOAEL	lowest-observed-adverse-effects level
LOD	limit of detection
LOEC	lowest-observable-effect-concentration
LOQ	limit of quantitation
LSA	limited site assessment
LSV	leachate screening value
LTO	long-term operation
LTM	long-term management
LTV	leachate threshold value
LUC	land-use control
LUCAP	land-use control assurance plan
LUCER	land-use control effectiveness report
LUCIP	land-use control implementation plan
LWSV	liquid waste screening value
m	meter
m/year	meters per year
m/yr	meters per year
m/second	meters per second
m ³ /hour	cubic meters per hour
m ³ /kg	cubic meters per kilogram
MACOM	Major Command

List of Abbreviations and Acronyms

Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
MADEP	Massachusetts Department of Environmental Protection
MADL	minimum analytical detection limit
MAG	monitoring acceptance goal
MARB	Munitions Assessment Review Board
max	maximum
MB	method blank
MC	munitions constituents
MCDZ	McDonald Creek discharge zone
MCE	Maximum Credible Event
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
MCPA	4-chloro-2-methylphenoxyacetic acid
MCPP	2-(2-methyl-4-chlorophenoxy)propionic acid
MCS	media cleanup standard
MD	munitions debris; Mahalanobis Distance
MDAS	Material Documented as Safe
MDC	maximum detected concentration
MDCC	maximum detected constituent concentration
MDEH	Material Documented as an Explosive Hazard
MDL	method detection limit
MEA	monoethanolamine
MEC	munitions and explosives of concern
MEE	methane, ethane, and ethene
MEP	Multiple Extraction Procedure
MeV	mega electron volt
Mfp	Mississippian Fort Payne
mg	milligrams
mg/cm ²	milligrams per square centimeter
mg/cm ² /day	milligrams per square centimeter per day
mg/cm ² /event	milligrams per square centimeter per event
mg/day	milligrams per day
mg/kg	milligrams per kilogram
mg/kg-day	milligram per kilogram day
mg/kgbw/day	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
mg/m ³	milligrams per cubic meter
mgal	million gallons
MGFD	munition with the greatest fragmentation distance
mh	highly plastic, inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
MI	multi-incremental
MICC	Mission & Installation Contracting Command
MIDAS	Munitions Items Desposition Action System
MIHPT	Membrane Interface Hydraulic Profile Tooling
min	minimum
MIMS	Munitions Information Management System
MINICAMS	miniature continuous air monitoring system
MIS	Management Information System; multiple incremental samples
mL	milliliter
mm	millimeter
MMAS	Mobile Munitions Assessment Systems
MMBtu/hr	million Btu per hour
MMCS	Missile and Munitions Command School
MM-CX	Military Munitions Center of Expertise
MMOA	mutagenic mode of action
MMRP	Military Munitions Response Program
Mn ⁺⁴	manganese
MNA	monitored natural attenuation
MnO ₄ ⁻	permanganate ion
MNR	monitored natural recovery
MOA	Memorandum of Agreement
MOCA	4,4-methylene-bis(2-chloroaniline)
MOGAS	motor vehicle gasoline
MOUT	Military Operations in Urban Terrain
MP	Military Police
MPA	methyl phosphonic acid
MPC	maximum permissible concentration; measurement performance criteria
MPM	most probable munition
MPPEH	Material Potentially Presenting an Explosive Hazard
MPR	4.2-Inch Mortar Proofing Range
SQL	method quantitation limit
MQO	measurement quality objective
MR	molasses residue; munitions response
MRA	munitions response area
MRC	multiple round container
MRL	method reporting limit
MRL	minimal risk level
MRR	Materials Receiving Report
MRS	Munitions Response Site
MRSPP	Munitions Response Site Prioritization Protocol
MS	matrix spike
mS/cm	millisiemens per centimeter
mS/m	millisiemens per meter
MS/MSD	matrix spike/matrix spike duplicate
MSD	when discussing laboratory QC, MSD means matrix spike duplicate; when discussing explosives, MSD means minimum separation distance
MSFC	George C. Marshall Space Flight Center
msl	mean sea level

List of Abbreviations and Acronyms

Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
Mt	Mississippian Tuscumbia Limestone
MTBE	methyl tertiary butyl ether
M&TE	measurement and test equipment
mV	millivolts
MW	monitoring well
Na	sodium
N/A	not applicable
NA	not applicable
NAD	North American Datum
NAD83	North American Datum of 1983
NaMnO ₄	sodium permanganate
NAPL	nonaqueous-phase liquid
NAS	National Academy of Sciences
NASA	National Aeronautics and Space Administration
NAVD 88	North American Vertical Datum, 1988 adjustment
NAVD88	North American Vertical Datum of 1988
NB	nitrobenzene
NBA	Northern Burial Area
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NCR	nonconformance report
NCRP	National Council on Radiation Protection and Measurements
ND	not detected
NDA	Northern Disposal Area
NDMA	n-nitrosodimethylamine
NDPA	n-nitroso-di-n-propylamine
NE	northeast
NELAP	National Environmental Laboratory Accreditation Program
NEPA	National Environmental Protection Act
NEW	net explosive weight
NFA	no further action
NFG	National Functional Guidelines
NFFPA	National Fire Protection Agency
NG	National Guard
ng/L	nanograms per liter
NGB	National Guard Bureau
NGP	National Guardsperson
NGVD	National Geodetic Vertical Datum
Ni	nickel
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NJDEP	New Jersey Department of Protection
NLM	National Library of Medicine
NLT	no later than
NMEA	National Marine Electronics Association
No.	number
NO ₃ ⁻	nitrate
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no-observed-adverse-effects level
NOEC	no-observable-effect concentration
NONEL	non-electric
NP	nitropropyl
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NPW	net present worth
NR	not requested
NRC	National Research Council
NRCC	National Research Council of Canada
NRHP	National Register of Historic Places
NRL	Naval Research Laboratory
NRT	near real time
ns	nanosecond
NS	not surveyed
N-S	north to south
NSA	New South Associates, Inc.
NT	nitrotoluene
nT	nanotesla
nT/m	nanoteslas per meter
NTCRA	Non-Time Critical Removal Action
NTIS	National Technical Information Service
NTU	nephelometric turbidity unit
nv	not validated
NY DOH	New York State Department of Health
O&G	oil and grease
O&M	operation and maintenance
O ₂	oxygen
O ₃	ozone
OB/OD	open burn/open detonation
OBL	obligate
OCDD	octachlorodibenzo-p-dioxin
OD	outside diameter; other (nonmunitions) debris
OE	ordnance and explosives
OEC	Ordnance Explosives Center
OEHHA	Office of Environmental Health Hazard Assessment (of the California Environmental Protection Agency)
OESS	Ordnance and Explosives Safety Specialist
OGMS	Ordnance Guided Missile School
oh	organic clays of medium to high plasticity
OH·	hydroxyl radical

List of Abbreviations and Acronyms

Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
ol	organic silts and organic silty clays of low plasticity
OMEMS	Ordnance Munitions and Electronic Maintenance School
OP	organophosphorus; organochlorine pesticide
ORA	Operational Range Assessment
ORAP	Operational Range Assessment Program
Ord	Ordovician
ORP	oxidation-reduction potential
OSA	Open Storage Area
OSC	On-Scene Coordinator
OSD	overage/shortage/damage
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	operable unit
OVA	organic vapor analyzer
OVB	overburden
OVB-S	shallow overburden
OVMM	organic vapor monitoring
OVMM-PID/FID	organic vapor meter-photoionization detector/flame ionization detector
OVS	oil/water separator
oz	ounce
P&T	pump and treat
PA	preliminary assessment; probability assessment
PA3	Plant Area 3, Incendiaries Manufacturing
PAED	Public Access Exclusion Distance
PAH	polynuclear aromatic hydrocarbon
PAL	preliminary action level
PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
Parsons	Parsons Engineering Science, Inc.
Pb	lead
PBAA	polybutadiene acrylic acid
PBAN	polybutadiene/acrylic acid/acrylonitrile
PBC	performance-based contract
PBMS	performance-based measurement system
PC	permeability coefficient
PCA	tetrachloroethane
PCB	polychlorinated biphenyl
PCDD	polychlorinated dibenzo-p-dioxins
PCDF	polychlorinated dibenzofurans
PCE	tetrachloroethene
PCHL	2,3,4,5,6-pentachlorocyclohexanol
PCMIA	Personal Computer Memory Card International Association
PCP	pentachlorophenol
PCR	polymerase chain reaction
PCWM	Potential Chemical Warfare Materiel
PD	phenyldichloroarsine
PDA	Personal Digital Assistant
PDB	polyethylene diffusive bag sampler
PDF	Portable Document Format
PDS	Personnel Decontamination System; post-digestive spike
PDT	Project Delivery Team
PEC	probable effect concentration
PEF	particulate emission factor
PEL	permissible exposure limit
PELA	P.E. LaMoreaux and Associates, Inc.
PERA	preliminary ecological risk assessment
PERC	perchloroethene
PES	potential explosive site
Pest.	pesticides
PETN	pentaerythritol tetranitrate
PFAS	polyfluoroalkyl substance
PFO	palustrine forested wetland
PFOA	perfluorooctanoic acid
PFOS	perfluorooctyl sulfonate
PFT	portable flamethrower
PG	professional geologist
pg/g	picograms per gram
PgM	program manager
pH	measure of acidity/alkalinity; hydrogen ion activity (negative of the logarithm, base 10)
PHC	principal hazardous constituent
PID	photoionization detector
PIEZ	piezometer
PINS	portable isotopic neutron microscopy
PK	packer
PLS	Professional Land Surveyor
PLS	Professional (licensed) Land Surveyor
PM	project manager
PMC	Program Management Contract
PNMSCM	Product Manager for Non-Stockpile Chemical Materiel
PMP	Project Management Plan
PMTP	Program Management Team Plan
POC	point of contact
POL	petroleum, oils, and lubricants
POTW	publicly owned treatment works
POW	prisoner of war; palustrine open water
Powell	John Powell Chemical Company
PP	Proposed Plan
ppb	parts per billion
ppbv	parts per billion by volume
PPE	personal protective equipment

List of Abbreviations and Acronyms

Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
ppm	parts per million
ppmw	parts per million by weight
PPMP	Print Plant Motor Pool
PPRTV	provisional peer-reviewed toxicity values
ppt	parts per trillion
ppT	parts per thousand
PQL	practical quantitation limit
PR	potential risk
PRA	preliminary risk assessment
PRE	preliminary risk evaluation
PRG	preliminary remediation goal
PRO	petroleum range organics
PS	chloropicrin
PSA	potential source area
PSL	preliminary screening level
PSS	palustrine scrub shrub
PSSC	potential site-specific chemical
PSV	preliminary screening value
pt	peat or other highly organic silts
PT1	an incendiary mixture in munitions
PTFE	Polytetrafluoroethylene (Teflon)
PTMP	program team management plan
PTSM	principal threat source material
PVC	polyvinyl chloride
PWS	performance work statement
PZ	piezometer
QA	quality assurance
QA/QC	quality assurance/quality control
QAM	quality assurance manual
QAO	quality assurance officer
QAPP	quality assurance project plan
QASAS	Quality Assurance Specialist Ammunition Surveillance
QASP	Quality Assurance Surveillance Plan
QC	quality control
QCP	quality control plan
QCSM	Quality Control Site Manager
QCSR	quality control summary report
Q-D	quantity-distance
QL	quantitation limit
QP	Qualified Person
Q-Q	quantile-quantile
QSAR	quantitative structure-activity relationship
QSM	quality systems manual
QST	QST Environmental, Inc.
qty	quantity
Qual	qualifier
QuickSilver	QuickSilver Analytics, Inc.
R	when used as a validation qualifier, R means rejected; when used as a lab qualifier, R means resample; when used in text, R means retardation factor
R&A	relevant and appropriate
R ²	coefficient of determination
RA	remedial action
RAGS	Risk Assessment Guidance for Superfund
RA(O)	remedial action (operations)
RAO	remedial action objective
RAP	recommended action plan
RAR	remedial action report
RARE	Redstone Arsenal Rocket Engine
RASA	Redstone Arsenal Support Activity
RAWP	remedial action work plan
Raytheon	Raytheon Company
RBA	relative bioavailability
RBC	risk-based concentration
RBP	Rapid Bioassessment Protocol
RBRG	risk-based remedial goal
RBSC	risk-based screening concentration
RBSC _i	risk-based screening concentration for industrial soil
RBSC _R	risk-based screening concentration for residential soil
RBSC _T	risk-based screening concentration for tap water
RBTL	risk-based target level
RBTL _{occ}	risk-based target level for a given relevant COC, receptor, and source medium
RC	representative concentration; response complete
RC _{occ}	representative concentration of the relevant COC in the given medium
RCA	root cause analysis
RCMD	Recovered Chemical Materiel Directorate
RCRA	Resource Conservation and Recovery Act
RCRA CA	Resource Conservation and Recovery Act Corrective Action
RCWM	Recovered Chemical Warfare Materiel
RD	remedial design
RDECOM	U.S. Army Research, Development, and Engineering Command
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine; cyclotrimethylenetrinitramine; 1,3,5-trinitro-1,3,5-triazine (cyclonite); Royal Demolition Explosive
REAT	Regional Environmental Acquisition Tools
REG	regular field sample
REL	recommended exposure limit; reference exposure level
RER	Record of Environmental Review
Rev	Revision
RF	response factor
RFA	request for analysis

List of Abbreviations and Acronyms Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
RfC	reference concentration
RfD	reference dose
RfI	RCRA facility investigation
RfQ	request for quotation
RG	remedial goal
RGO	remedial goal option
RI	remedial investigation
RIP	remedy in place
RL	reporting limit
RM	risk management
RM-1	Risk Management-1
RM-2	Risk Management 2
RME	reasonable maximum exposure
RMP	risk management plan
Ro	Robertsville silt loam
ROD	Record of Decision
ROF	report of findings
ROI	radius of influence
ROP	Redstone Ordnance Plant
ROPS	roll over protection system
RPD	relative percent difference
RR	range residue
RRF	relative response factor
RRSE	Relative Risk Site Evaluation
RRSL	residential regional screening level
RS	prefix for groundwater monitoring well at Redstone Arsenal
RSA	Redstone Arsenal
RSD	relative standard deviation
RSL	Regional Screening Level
RSP	Redstone Arsenal spring
RTAP	Real-Time Analytical Platform
RTC	Redstone Test Center
RTECS	Registry of Toxic Effects of Chemical Substances
RTK	real-time kinematic
RTO	regenerative thermal oxidizer
RTOP	Request for Task Order Proposal
RTS	robotic total station
RTTC	Redstone Technical Test Center
Rust	Rust Environment and Infrastructure, Inc.
s/n	signal-to-noise ratio
SA	exposed skin surface area; source area
SAA	satellite accumulation area
SAC	site access control
SACIMS	Site Access Control Information Management System
SACP	Site Access Control Plan
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	sampling and analysis plan
SAR	structure-activity relationship
SARA	Superfund Amendments and Reauthorization Act
SB	soil boring
SC	specific conductance
SCG	storage compatibility group
SCBA	self-contained breathing apparatus
Sch.	schedule
SCM	site conceptual model
SD	sediment
SDG	sample delivery group
SDS	safety data sheet
SDSW	sediment/surface water
SDWA	Safe Drinking Water Act
SDZ	surface danger zone
SED	Software Engineering Directorate
SEE	steam enhanced extraction
SF	cancer slope factor
SFSP	site-specific field sampling plan
SGF	standard grade fuels
Shaw	Shaw Environmental, Inc.
SHP	safety and health plan
SI	site inspection
SIC	sulfur-impregnated carbon
Sil	Silurian
SIM	Selective Ion Monitoring
SIR	secondary investigation report
SL	standing liquid
SLERA	screening-level ecological risk assessment
SLERAP	screening-level ecological risk assessment protocol
SM	sulfur monochloride
SMDP	Scientific Management Decision Point
SMF	smoke munitions filling
SMF 3	Smoke Munitions Filling Plant 3
SMP	site management plan
SNR	signal-to-noise ratio
SO ₄	sulfate
SOD	soil oxidant demand
SOP	standard operating procedure
SOPP	standard operating project procedure
SP	submersible pump

List of Abbreviations and Acronyms

Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
SPA	single point anomaly
SPCC	system performance calibration compound
SPCS	State Plane Coordinate System
SPLP	synthetic precipitation leaching procedure
SPM	sample planning module
SPRG	spring
SQG	sediment quality guideline
SQRT	screening quick reference tables
SRA	streamlined human health risk assessment; saturated response area
SRB	sulfate-reducing bacteria
SRI	supplemental remedial investigation
SRM	standard reference material
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHPP	site-specific safety and health plan
SSL	soil screening level
SSSL	site-specific screening level
SSTL	site-specific target level
SSPA	site-specific probability assessment
STB	supertropical bleach; site to background
STC	source-term concentration
STD	standard deviation
Std. units	standard units
STEL	short-term exposure limit
STP	sewage treatment plant
STL	Severn-Trent Laboratories
STT	sludge thickener tank
SU	sampling unit when used in a grid for incremental sampling; when used as a unit for pH, this acronym stands for standard unit
SUXOS	senior UXO supervisor
SV	screening value
SVE	soil vapor extraction
SVOC	semivolatile organic compound
SW-846	U.S. EPA's <i>Test Methods for Evaluating Solid Waste: Physical/Chemical Methods</i>
SW	surface water
SWCC	State of Alabama Soil and Water Conservation Committee
SWMU	solid waste management unit
SWTR	surface water
SZ	support zone
TA	test area
TAL	target analyte list
TAT	turn around time
TB	trip blank
TBC	to be considered
TBD	to be determined
TC	toxicity characteristic
TCA	trichloroethane
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	tetrachlorodibenzofurans
TCE	trichloroethene
TCH	thermal conductive heating
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TCMX	tetrachloro-m-xylene
TCRA	time critical removal action
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TDS	total dissolved solids
TEA	triethylaluminum
TEC	threshold effect concentration
TeCA	1,1,2,2-tetrachloroethane
TEGDN	triethylene glycol dinitrate
TEGN	triethylene glycol dinitrate
TEMP	temperature
TEMTADS	Time-Domain Electromagnetic Multisensor Tower Array Detection System
TEQ	toxic equivalency quotient
TERC	Total Environmental Restoration Contract
Tetryl	trinitrophenylmethyl nitramine
TEU	Technical Escort Unit
THI	target hazard index
Thiokol	Thiokol Corporation
TIC	tentatively identified compound
TIR	thermal infrared survey
TLV	threshold limit value
TM	Technical Manual
TMP	temperature measuring point
TMPW	temporary groundwater monitoring well
TN	Tennessee
TNB	trinitrobenzene
TNT	trinitrotoluene
TO	task order
TOC	use top of casing when defining the well depth; use total organic carbon when defining a general chemistry parameter
TOI	target of interest
TOW	tube-launched, optically-tracked, wire-guided missile
TP	Technical Paper
TPH	total petroleum hydrocarbon
TPI	three-phase inspection
TPP	Technical Project Planning
TR	target cancer risk

List of Abbreviations and Acronyms Redstone Arsenal, Madison County, Alabama

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Acronym	Definition
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TRS	TRS Group Inc.
TRV	toxicity reference value
TSA	temporary storage area
TSCA	Toxic Substances Control Act
TSCRN	top of screen
TSDF	treatment, storage, and disposal facility
TSLC	target soil leachate concentration
TSS	total suspended solids
TTAP	treatment system tap (port)
TTZ	target treatment zone
Tu	Tupelo silt loam
TVA	Tennessee Valley Authority
TWA	time-weighted average
TXDOT	Texas Department of Transportation
TX-3	small rocket motor used for ballistics testing
U	not detected above reporting limit
U.S.	United States (of America)
UB	potential blank contamination
UCL	upper confidence limit
UCLM	upper confidence limit of the mean
UCR	upper certified range
UDMH	unsymmetrical dimethyl hydrazine
UF	uncertainty factor
UFP	Uniform Federal Policy
UIC	underground injection control
UJ	not detected, estimated due to data validation anomaly
UNEP	United Nations Environment Program
UNO	United Nations Organization
UPL	upper prediction limit; upland
UR	not detected; rejected due to data validation anomaly
URF	unit risk factor
USACE	U.S. Army Corps of Engineers
USACMLS	U.S. Army Chemical School
USAEC	U.S. Army Environmental Command
USAEHA	U.S. Army Environmental Hygiene Agency
USAESCH	U.S. Army Engineering Support Center, Huntsville
USAMPS	U.S. Army Military Police School
USAPHC	U.S. Army Public Health Command
USATCES	U.S. Army Technical Center for Explosive Safety
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USC	United States Code
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UST	underground storage tank
UTL	upper tolerance limit
UTM	Universal Transverse Mercator
UTS	universal treatment standard
UTV	utility terrain vehicle
UXO	unexploded ordnance
UXOSP	unexploded ordnance sweep personnel
UXOQCS	UXO Quality Control Supervisor
UXOSO	UXO safety officer
V	vanadium
VC	vinyl chloride
VGIC	liquid-phase granular activated carbon
VI	vapor intrusion
VISL	vapor intrusion screening level
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VP	soil vapor point
VQ	validation qualifier
vs	versus
VSI	visual site inspection
VSL	vapor screening level
VSP	Visual Sample Plan
VX	nerve agent (O-ethyl-S-[diisopropylaminoethyl]-methylphosphonothiolate)
WAC	Women's Army Corps
WBGIT	wet bulb globe temperature
WDTA	Waste Disposal Trench Area
WNWR	Wheeler National Wildlife Refuge
WOE	weight of evidence
WP	white phosphorus
WPL	worker population limit
WPS	Waste Profile Sheet
WQC	water quality criteria
WRS	Wilcoxon rank sum
WS	watershed
WSA	Watershed Screening Assessment
WTP	water treatment plant
WWI	World War I
WWII	World War II
WWTP	wastewater treatment plant

List of Abbreviations and Acronyms

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Acronym	Definition
X	Data collected in a manner that is now considered to be inconsistent with good scientific practice. These data are considered unusable. However, since these data exist in the database, additional definitive samples may be needed to verify the presence or absence of any positively detected result.
XRF	x-ray fluorescence
yd ³	cubic yards
ZVI	zero-valent iron

TABLES

Table 2-1

**Saturated Response Areas and Single-Point Anomalies Investigation Findings
 RSA-221-R-01 Corrective Measures Implementation Work Plan
 Redstone Arsenal, Madison County, Alabama**

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Date	Anomaly	Work Unit	Depth (inches)	Qty	Item Description	Intact Item?	Item Comments
Saturated Response Area Investigation Findings							
6/21/2016	221-TP001	A14	24	3	Base plate	N	Wholly inert items
6/21/2016	221-TP001	A14	24	1	Lifting lug	N	Componentry
6/21/2016	221-TP002	A15	24	7	Base plate	N	Wholly inert items
6/21/2016	221-TP002	A15	24	2	Lifting lug	N	Componentry
6/21/2016	221-TP002	A15	24	1	Wholly inert item/Componentry	N	
6/10/2016	221-TP003	A17	24	7	Lifting lug	N	Componentry
6/10/2016	221-TP003	A17	24	4	Base plate	N	Wholly inert items
6/9/2016	221-TP004A	B14	24	13	Lifting lug	N	Componentry
6/9/2016	221-TP004A	B14	24	20	Base plate	N	Wholly inert items
6/9/2016	221-TP004B	B15	24	1	Projo, 155mm, unknown	N	Wholly inert item
6/9/2016	221-TP004B	B15	24	12	Lifting lug	N	Componentry
6/9/2016	221-TP004B	B15	24	25	Base plate	N	Wholly inert items
6/28/2016	221-TP004C	B14	24	4	Projo, 155mm, unknown	N	Wholly inert items
6/28/2016	221-TP004C	B14	24	19	Lifting lug	N	Componentry
6/28/2016	221-TP004C	B14	24	20	Base plate	N	Wholly inert items
6/27/2016	221-TP004D	B15	24	1	Projo, 155mm, unknown	N	Wholly inert item
6/27/2016	221-TP004D	B15	24	12	Lifting lug	N	Componentry
6/27/2016	221-TP004D	B15	24	14	Base plate	N	Wholly inert items
6/9/2016	221-TP005A	A19	24	6	Base plate	N	Wholly inert items
6/9/2016	221-TP005A	A19	24	5	Lifting lug	N	Componentry
6/9/2016	221-TP005B	A21	24	12	Lifting lug	N	Componentry
6/9/2016	221-TP005B	A21	24	8	Base plate	N	Wholly inert items
6/9/2016	221-TP005C	A23	24	8	Lifting lug	N	Componentry
6/9/2016	221-TP005C	A23	24	4	Base plate	N	Wholly inert items
6/22/2016	221-TP006	B17	24	5	Projo, 155mm, unknown	N	Wholly inert items
6/22/2016	221-TP006	B17	24	6	Base plate	N	Wholly inert items
6/22/2016	221-TP006	B17	24	5	Lifting lug	N	Componentry
6/9/2016	221-TP007C	A25	24	1	Lifting lug	N	Componentry
6/9/2016	221-TP007C	A25	24	3	Base plate	N	Wholly inert items
6/10/2016	221-TP007D	A26	36	16	Base plate	N	Wholly inert items
6/10/2016	221-TP007D	A26	36	7	Lifting lug	N	Componentry
6/10/2016	221-TP007E	A26	24	1	Lifting lug	N	Componentry
6/22/2016	221-TP010	A22	24	1	Base plate	N	Wholly inert item

Table 2-1

**Saturated Response Areas and Single-Point Anomalies Investigation Findings
 RSA-221-R-01 Corrective Measures Implementation Work Plan
 Redstone Arsenal, Madison County, Alabama**

(Page 2 of 4)

Date	Anomaly	Work Unit	Depth (inches)	Qty	Item Description	Intact Item?	Item Comments
Single Point Anomaly Investigation Findings							
6/21/2016	207	A21	7	1	Wholly inert item/Componentry	N	
6/21/2016	244	A22	3	1	Wholly inert item/Componentry	N	
6/21/2016	248	A20	11	1	Wholly inert item/Componentry	Y	
6/21/2016	265	A21	4	1	Wholly inert item/Componentry	N	
6/21/2016	273	A21	6	1	Wholly inert item/Componentry	N	
6/21/2016	422	A20	2	1	Wholly inert item/Componentry	N	
6/14/2016	679	A17	18	1	Lifting lug	Y	Componentry
6/14/2016	687	A18	3	1	Wholly inert item/Componentry	N	
6/26/2016	750	A16	10	2	Wholly inert items/Componentry	N	
6/22/2016	864	A15	6	1	Base plate	N	Wholly inert item
6/8/2016	1007	A12	2	1	Wholly inert item/Componentry	N	
6/9/2016	1047	A13	6	1	Wholly inert item/Componentry	N	
7/11/2016	1052	B17	5	2	Lifting lug	N	Componentry
6/9/2016	1082	A15	5	1	Wholly inert item/Componentry	N	
6/9/2016	1091	A14	4	1	Wholly inert item/Componentry	N	
6/9/2016	1142	A14	4	1	Wholly inert item/Componentry	N	
6/9/2016	1148	A13	4	1	Wholly inert item/Componentry	N	
6/14/2016	1152	A18	3	1	Wholly inert item/Componentry	N	
6/8/2016	1169	A12	4	1	Wholly inert item/Componentry	N	
6/14/2016	1190	A19	4	4	Wholly inert items/Componentry	Y	
6/8/2016	1196	A12	2	1	Wholly inert item/Componentry	N	
6/8/2016	1206	A11	4	2	Wholly inert items/Componentry	N	
6/8/2016	1303	A11	6	1	Wholly inert item/Componentry	N	
7/7/2016	1320	A18	6	17	Push plate	N	Wholly inert items
7/7/2016	1357	A18	7	6	Push plate	N	Wholly inert items
6/7/2016	1464	A10	8	1	Wholly inert item/Componentry	N	
6/8/2016	1509	A10	9	1	Wholly inert item/Componentry	N	
7/7/2016	1591	A16	11	2	Base plate	N	Wholly inert items
7/7/2016	1591	A16	11	3	Lifting lug	N	Componentry
7/11/2016	1625	A16	8	1	Base plate	N	Wholly inert item
7/11/2016	1625	A16	8	3	Lifting lug	N	Componentry
7/7/2016	1677	A17	10	3	Lifting lug	N	Componentry
6/7/2016	1740	A09	6	1	Wholly inert item/Componentry	N	
7/7/2016	1796	B16	6	2	Lifting lug	N	Componentry
6/9/2016	1807	A15	13	1	Base plate	N	Wholly inert item
6/7/2016	1813	A08	12	13	Wholly inert items/Componentry	N	
6/9/2016	1951	A14	10	2	Wholly inert items/Componentry	N	

Table 2-1

**Saturated Response Areas and Single-Point Anomalies Investigation Findings
 RSA-221-R-01 Corrective Measures Implementation Work Plan
 Redstone Arsenal, Madison County, Alabama**

(Page 3 of 4)

Date	Anomaly	Work Unit	Depth (inches)	Qty	Item Description	Intact Item?	Item Comments
7/7/2016	1953	B26	5	1	Base plate	N	Wholly inert item
7/7/2016	1953	B26	5	1	Lifting lug	N	Componentry
6/21/2016	1971	B14	3	1	Wholly inert item/Componentry	Y	
6/7/2016	2153	A11	5	1	Wholly inert item/Componentry	N	
6/21/2016	2173	B14	4	1	Wholly inert item/Componentry	Y	
6/7/2016	2185	A13	3	1	Wholly inert item/Componentry	N	
6/7/2016	2216	A12	4	1	Wholly inert item/Componentry	N	
6/22/2016	2218	B24	12	2	Lifting lug	N	Componentry
6/22/2016	2218	B24	12	1	Base plate	N	Wholly inert item
6/21/2016	2232	B11	12	3	Lifting lug	N	Componentry
6/21/2016	2232	B11	12	3	Base plate	N	Wholly inert item
6/14/2016	2254	B12	1	1	Wholly inert item/Componentry	N	
6/10/2016	2339	B11	12	1	Base plate	N	Wholly inert item
6/10/2016	2339	B11	12	2	Lifting lug	N	Componentry
6/21/2016	2357	B14	4	1	Wholly inert item/Componentry	Y	
7/7/2016	2475	B15	2	1	Lifting lug	N	Componentry
6/2/2016	2623	A02	6	1	Wholly inert item/Componentry	Y	
6/21/2016	2717	B15	3	1	Wholly inert item/Componentry	Y	
6/21/2016	2763	B14	4	1	Wholly inert item/Componentry	Y	
6/3/2016	3146	A04	5	1	Push plate	Y	Wholly inert item
6/3/2016	3166	A06	3	1	Base plate	Y	Wholly inert item
6/25/2016	3494	B24	8	1	Wholly inert item/Componentry	Y	
6/2/2016	3571	A02	4	1	Push plate	Y	Wholly inert item
6/7/2016	3787	B09	10	1	Primer - MK4 Signal Cartridge	N	Wholly inert item
6/7/2016	4105	A08	10	1	Wholly inert item/Componentry	N	
6/8/2016	4219	A13	3	9	Wholly inert items/Componentry	N	
6/22/2016	4274	A23	6	3	Lifting lug	Y	Componentry
6/21/2016	4423	B11	20	6	Lifting lug	N	Componentry
6/21/2016	4423	B11	20	2	Base plate	N	Wholly inert items
6/22/2016	4524	B24	12	2	Base plate	N	Wholly inert items
6/22/2016	4524	B24	12	9	Lifting lug	N	Componentry
6/22/2016	4527	B24	12	3	Lifting lug	N	Componentry
6/3/2016	4662	A04	6	1	Base plate	Y	Wholly inert item
6/3/2016	4724	A06	6	1	Push plate	Y	Wholly inert item
6/6/2016	4792	A08	6	1	Wholly inert item/Componentry	N	
6/6/2016	4793	A08	6	2	Wholly inert items/Componentry	N	
6/6/2016	4808	A08	7	1	Wholly inert item/Componentry	N	
6/8/2016	4912	A10	5	4	Wholly inert items/Componentry	N	

Table 2-1

**Saturated Response Areas and Single-Point Anomalies Investigation Findings
 RSA-221-R-01 Corrective Measures Implementation Work Plan
 Redstone Arsenal, Madison County, Alabama**

(Page 4 of 4)

Date	Anomaly	Work Unit	Depth (inches)	Qty	Item Description	Intact Item?	Item Comments
6/8/2016	4934	A11	7	2	Wholly inert items/Componentry	N	
6/8/2016	4962	A12	3	1	Wholly inert item/Componentry	N	
6/8/2016	4968	A12	2	1	Wholly inert item/Componentry	N	
6/7/2016	5030	A13	9	10	Wholly inert items/Componentry	N	
6/9/2016	5073	A15	4	1	Wholly inert item/Componentry	N	
6/26/2016	5147	A18	5	1	Wholly inert item/Componentry	N	
7/11/2016	5238	A20	4	2	Wholly inert items/Componentry	N	
6/21/2016	5243	A20	3	1	Wholly inert item/Componentry	N	
6/21/2016	5256	A21	6	1	Wholly inert item/Componentry	N	
6/21/2016	5260	A21	3	1	Wholly inert item/Componentry	N	
6/9/2016	5407	B11	5	1	Wholly inert item/Componentry	N	
6/14/2016	5429	B12	3	1	Wholly inert item/Componentry	N	
6/21/2016	5455	B15	4	2	Wholly inert items/Componentry	Y	
6/7/2016	5492	B21	10	1	Wholly inert item/Componentry	N	
6/22/2016	5515	B24	14	2	Base plate	N	Wholly inert items
6/22/2016	5515	B24	14	6	Lifting lug	N	Componentry

Table 2-2

**Summary of Receptor Cancer Risk and Noncancer Hazard for Chemicals of Concern
Reasonable Maximum Exposure
RSA-221-R-01 Corrective Measures Implementation Work Plan
Redstone Arsenal, Madison County, Alabama**

CANCER RISK				
Receptors	Total Soil IELCR	Groundwater IELCR	CUMULATIVE RISK SOIL	CUMULATIVE RISK SOIL AND GROUNDWATER
Industrial Receptors:				
Commercial Worker	NA	1.5E-06	NA	1.5E-06
Construction Worker	NA	6.6E-08	NA	6.6E-08
Hypothetical Residential Receptors:				
Child Resident ^a	NA	1.2E-06	NA	1.2E-06
Adult Resident ^a	NA	2.5E-06	NA	2.5E-06
Lifetime Resident ^a	NA	3.7E-06	NA	3.7E-06
NONCANCER HAZARD				
Receptors	Total Soil HI	Groundwater HI	CUMULATIVE HI SOIL	CUMULATIVE HI SOIL AND GROUNDWATER
Industrial Receptors:				
Commercial Worker	0.0016	0.24	0.0016	0.25
Construction Worker	0.0017	0.27	0.0017	0.27
Hypothetical Residential Receptors:				
Child Resident ^a	0.026	0.83	0.026	0.85

^a Risk associated with the hypothetical residential receptor; child and adult resident risk are summed to estimate the cancer risk for the lifetime resident.

Noncancer hazard estimates are based on the hypothetical child resident only.

HI - Hazard index.

IELCR - Individual excess lifetime cancer risk.

NA - Not applicable.

Table 2-3

**Conclusions of the ARBCA RM-2 Evaluation
 RSA-221-R-01 Corrective Measures Implementation Work Plan
 Redstone Arsenal, Madison County, Alabama**

Receptors	Exposure to Soil ^a	Relevant COCs in Soil	Exposure to Soil and Groundwater ^a	Relevant COCs for Exposure to Groundwater ^b
Commercial Worker	✓	None	✓	None
Construction Worker	✓	None	✓	None
Hypothetical Resident	✓	None	✓	None

Notes:

- ✓ Cumulative cancer risk and noncancer hazard were found to be acceptable.
- ✗ Cumulative cancer risk and/or noncancer hazard were found to be unacceptable.

^a Risk conclusions exclude inorganics found to be naturally occurring.

^b Chemicals with maximum detected concentrations below their maximum contaminant levels are not included as relevant COCs from exposure to groundwater.

ARBCA - Alabama Risk-Based Corrective Action.

COC - Chemical of concern.

RM-2 - Risk Management-2.

Table 2-4

**Summary of Screening-Level Ecological Risk Assessment Results, Surface Soil
RSA-221-R-01 Corrective Measures Implementation Work Plan
Redstone Arsenal, Madison County, Alabama**

Detected Chemical	Preliminary COPEC?	Refined COPEC?	Community-Level Assessment Results		Food Chain Assessment Results		Final COEC?
			RSA Plant Communities	RSA Invertebrate Communities	RSA Populations		
Inorganics :							
Aluminum	No		NO FURTHER ACTION REQUIRED				
Arsenic	No		NO FURTHER ACTION REQUIRED				
Barium	No		NO FURTHER ACTION REQUIRED				
Beryllium	No		NO FURTHER ACTION REQUIRED				
Cadmium	Yes	No (1)					
Calcium	Yes	Yes	√	√	NA	No	
Chromium	Yes	No (1)					
Cobalt	Yes	No (1)					
Copper	No		NO FURTHER ACTION REQUIRED				
Iron	No		NO FURTHER ACTION REQUIRED				
Lead	Yes	Yes	√	√	√	No	
Magnesium	Yes	Yes	√	√	NA	No	
Manganese	Yes	No (1)					
Mercury	Yes	Yes	√	√	√	No	
Nickel	Yes	No (1)					
Potassium	No		NO FURTHER ACTION REQUIRED				
Selenium	Yes	No (1)					
Silver	No		NO FURTHER ACTION REQUIRED				
Sodium	No		NO FURTHER ACTION REQUIRED				
Thallium	No		NO FURTHER ACTION REQUIRED				
Vanadium	No		NO FURTHER ACTION REQUIRED				
Zinc	Yes	Yes	√	√	√	No	
Explosives :							
2-Amino-4,6-dinitrotoluene	No		NO FURTHER ACTION REQUIRED				
Nitroguanidine	Yes	No (2)					
RDX	No		NO FURTHER ACTION REQUIRED				
Tetryl	No		NO FURTHER ACTION REQUIRED				
Volatile Organic Compounds :							
2-Butanone	No		NO FURTHER ACTION REQUIRED				
Acetone	No		NO FURTHER ACTION REQUIRED				
Benzene	No		NO FURTHER ACTION REQUIRED				
Bromomethane	No		NO FURTHER ACTION REQUIRED				
Carbon Disulfide	Yes	Yes	√	√	NA	No	
Toluene	No		NO FURTHER ACTION REQUIRED				
Xylene, total	No		NO FURTHER ACTION REQUIRED				

Notes :

COPEC - Chemical of potential ecological concern.

COEC - Chemical of ecological concern.

NA - Not a COPEC for this pathway.

√ - No impacts to communities/populations.

Rationale for exclusion as a refined COPEC or final COEC:

- 1 - Naturally occurring and/or background related based on site-to-background comparisons.
- 2 - Frequency of detection is < 5 percent; therefore, contribution to overall site risk is minimal.

Table 3-1

**Applicable Federal and State Regulations Applicable to Corrective Measures
 RSA-221-R-01 Corrective Measures Implementation Work Plan
 Redstone Arsenal, Madison County, Alabama**

Standard, Requirement, or Criterion	Requirement	Applicability	Comments
Federal			
RCRA Act, 40 CFR Part 266 Subpart M (Military Munitions Rule)	Regulates storage and transportation of recovered military munitions in accordance with U.S. Department of Defense Explosive Safety Board standards.	Applicable	This rule is applicable for long-term management of this site.
State			
Alabama Solid Waste Act, Code of Alabama, Title 22, Chapter 27	Establishes sitewide program to provide for the safe management of nonhazardous wastes.	Applicable	This rule is applicable for long-term management of this site.
Alabama Solid Waste Management Regulations, ADEM 335-13-1 through 335-13-8	Establishes minimum criteria for the processing, recycling, transportation, and disposal of solid wastes and the design, location, and operation of solid waste disposal facilities.	Applicable	This rule is applicable for long-term management of this site.
Alabama Wellhead Protection Program, ADEM 335-7-12	Establishes requirements for the closure or abandonment of groundwater monitoring or extraction wells	Potentially applicable	Although no monitoring wells are planned for abandonment as part of the corrective measures, if a well is damaged during the site activities then abandonment/replacement may potentially be required.
Alabama Uniform Environmental Covenants Program, ADEM 335-5	Establishes the requirements for environmental use restrictions on federal facility property.	Applicable	Environmental use restrictions are part of the corrective measures at the site.

Notes:

ADEM - Alabama Department of Environmental Management.

CFR – Code of Federal Regulations.

RCRA – Resource Conservation and Recovery Act.

FIGURES

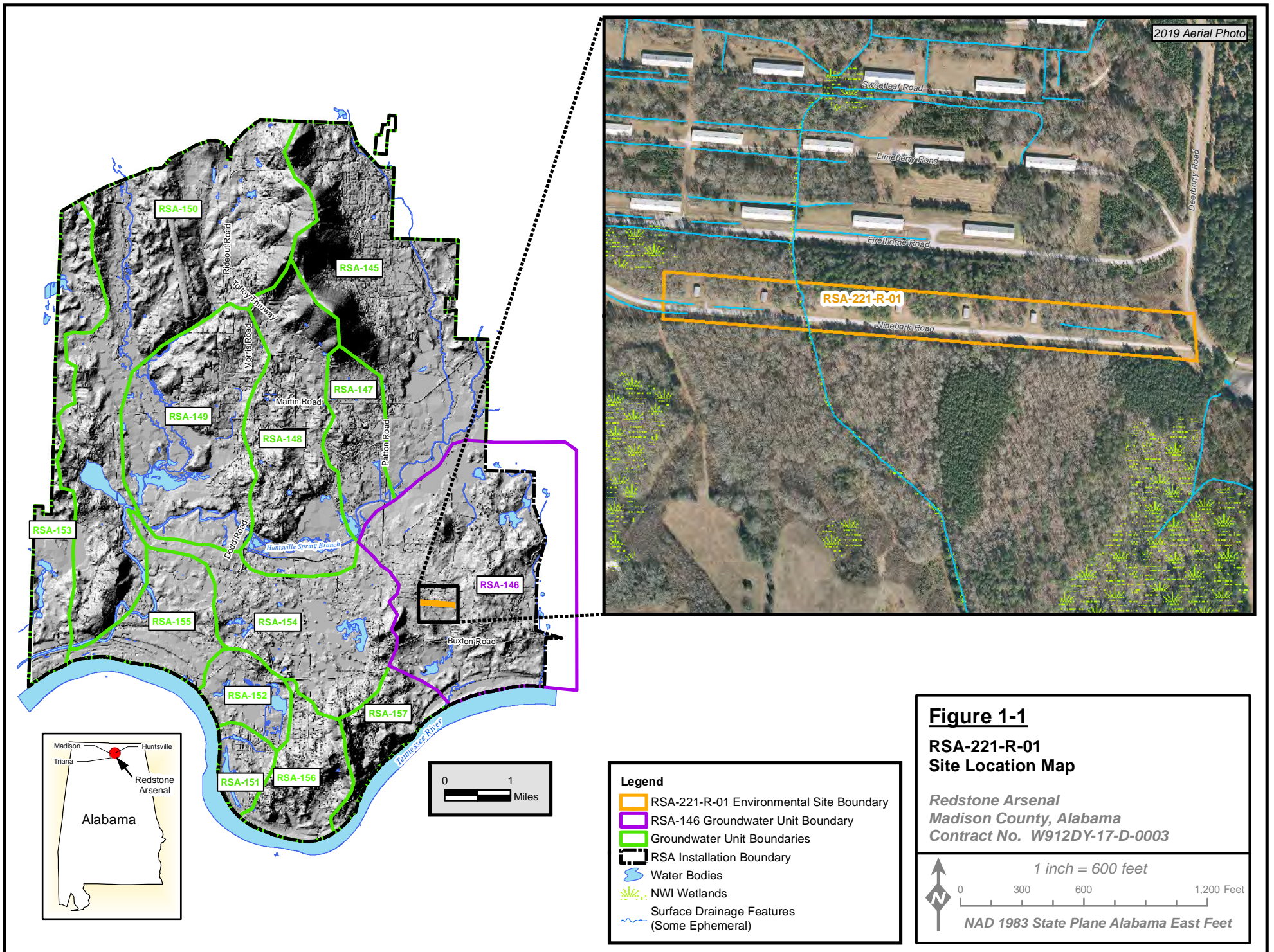
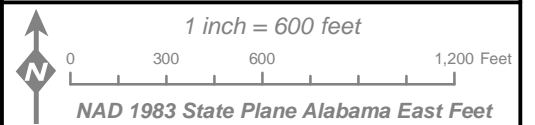


Figure 1-1

**RSA-221-R-01
Site Location Map**

*Redstone Arsenal
Madison County, Alabama
Contract No. W912DY-17-D-0003*





Legend

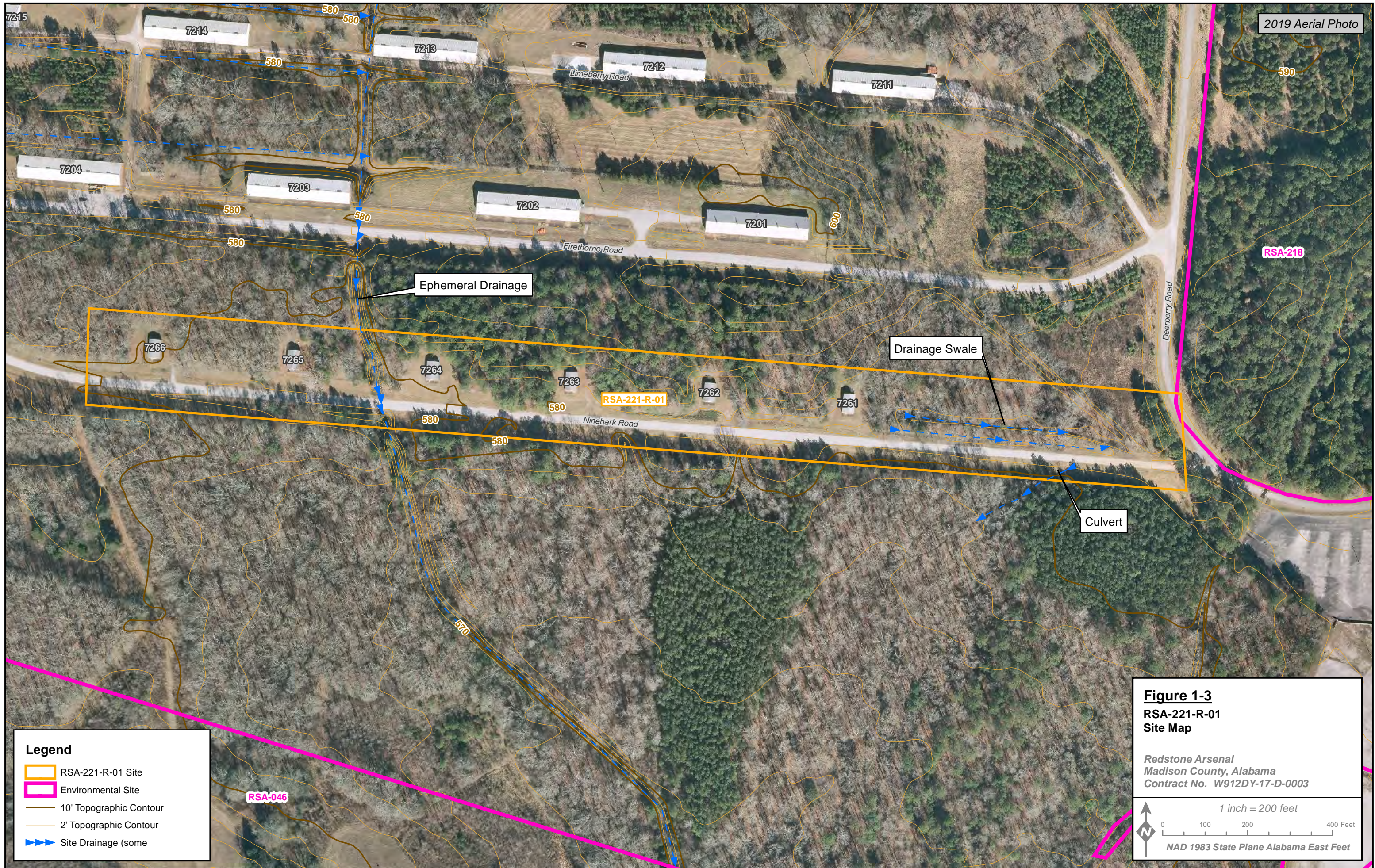
- RSA-221-R-01 Site Boundary
- Historical Railroad

Figure 1-2
RSA-221
1950 and 2019 Aerial Photo Series
 Redstone Arsenal
 Madison County, Alabama
 Contract No. W912DY-17-D-0003

1 inch = 500 feet

0 250 500 1,000 Feet

NAD 1983 State Plane Alabama East Feet



2019 Aerial Photo

Ephemeral Drainage

Drainage Swale

Culvert

Legend

- RSA-221-R-01 Site
- Environmental Site
- 10' Topographic Contour
- 2' Topographic Contour
- ▶▶▶ Site Drainage (some)

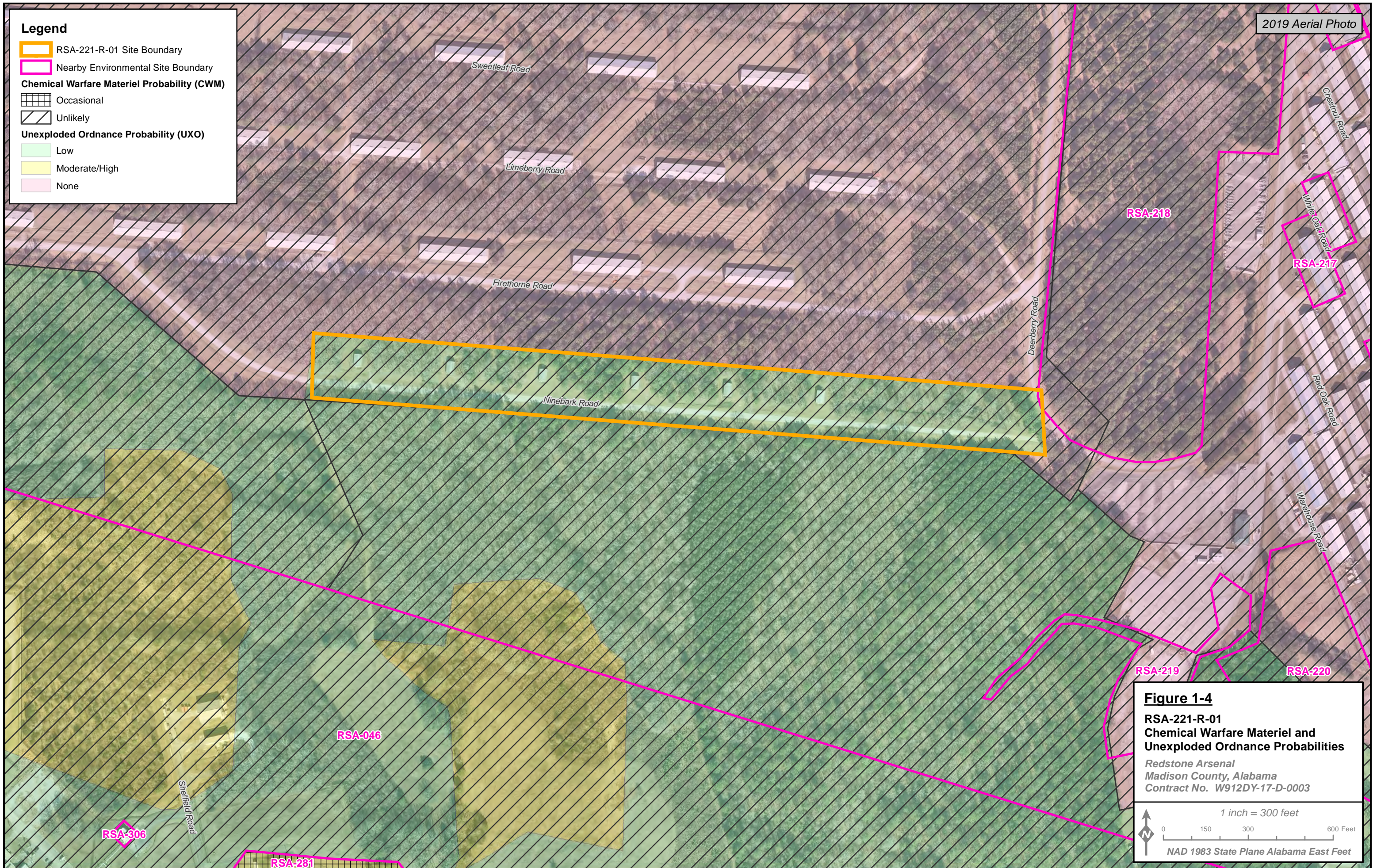
Figure 1-3
RSA-221-R-01
Site Map

Redstone Arsenal
 Madison County, Alabama
 Contract No. W912DY-17-D-0003

1 inch = 200 feet

0 100 200 400 Feet

NAD 1983 State Plane Alabama East Feet



Legend

- RSA-221-R-01 Site Boundary
- Nearby Environmental Site Boundary

Chemical Warfare Materiel Probability (CWM)

- Occasional
- Unlikely

Unexploded Ordnance Probability (UXO)

- Low
- Moderate/High
- None

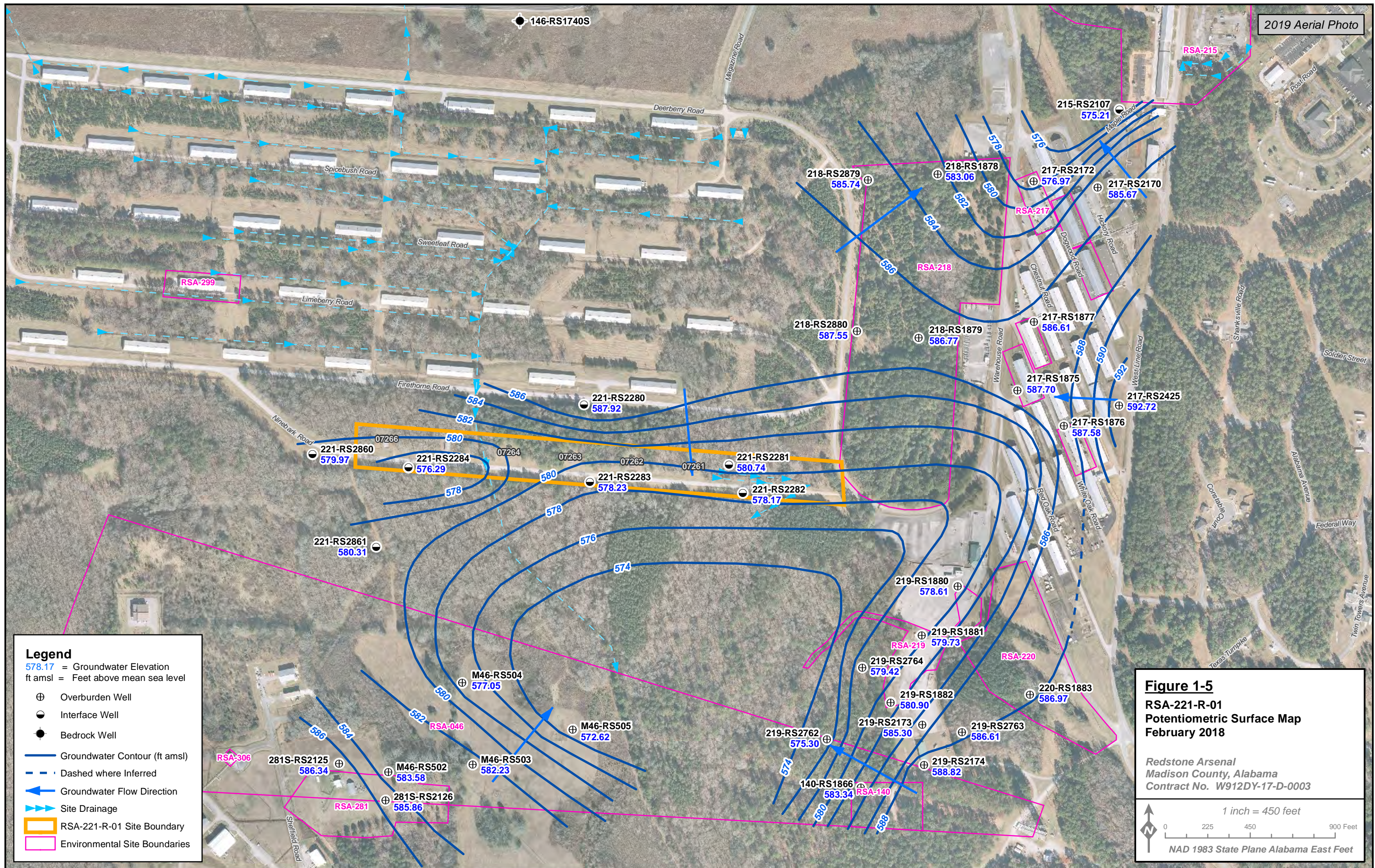
2019 Aerial Photo

Figure 1-4
RSA-221-R-01
Chemical Warfare Materiel and
Unexploded Ordnance Probabilities
 Redstone Arsenal
 Madison County, Alabama
 Contract No. W912DY-17-D-0003

1 inch = 300 feet

0 150 300 600 Feet

NAD 1983 State Plane Alabama East Feet



2019 Aerial Photo

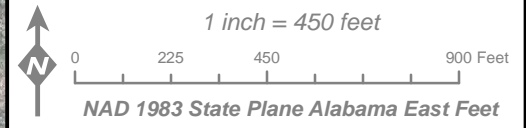
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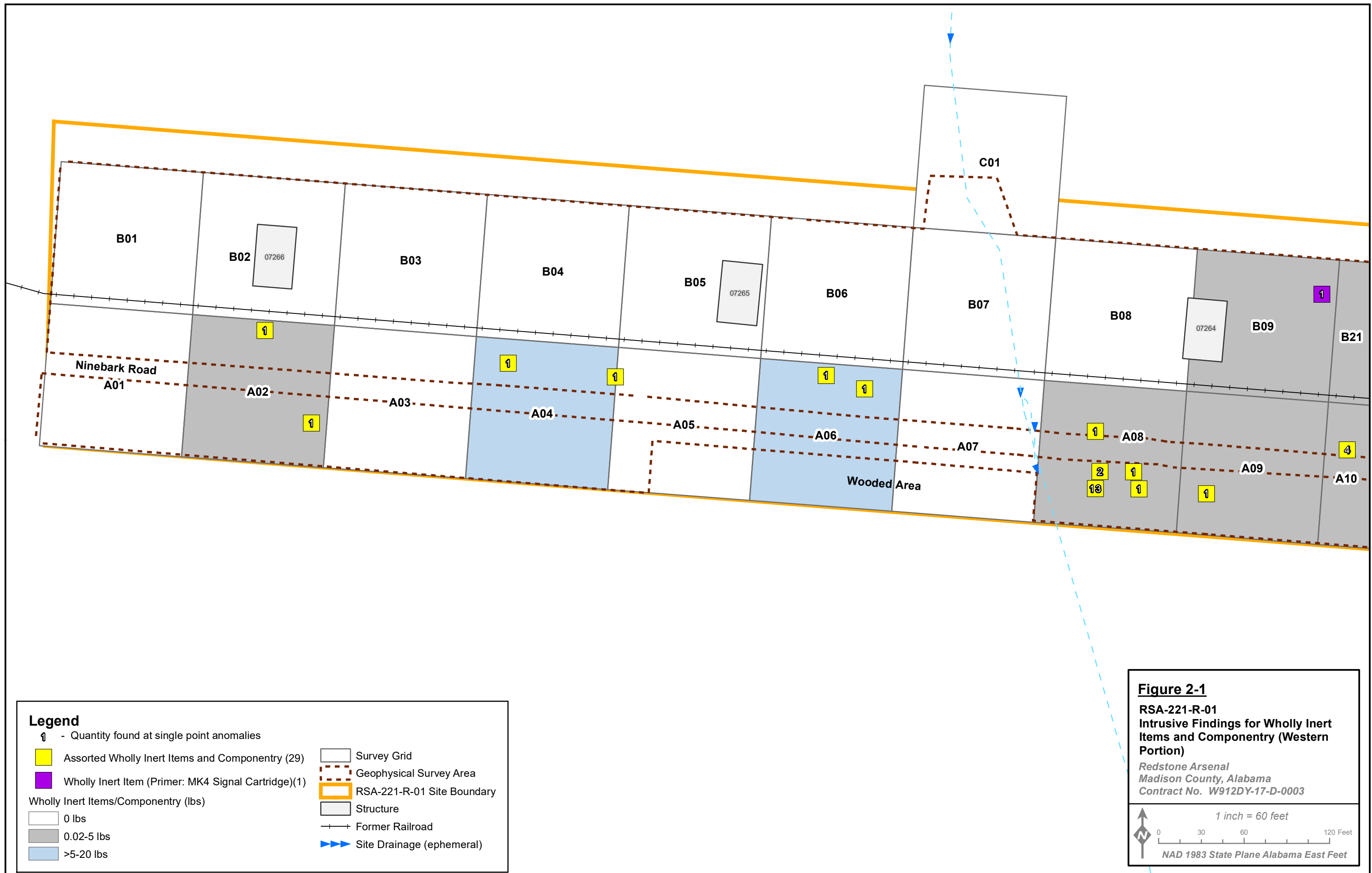
578.17 = Groundwater Elevation
ft amsl = Feet above mean sea level

- ⊕ Overburden Well
- Interface Well
- Bedrock Well
- Groundwater Contour (ft amsl)
- - - Dashed where Inferred
- ➔ Groundwater Flow Direction
- ➔ Site Drainage
- ▭ RSA-221-R-01 Site Boundary
- ▭ Environmental Site Boundaries

Figure 1-5
RSA-221-R-01
Potentiometric Surface Map
February 2018

Redstone Arsenal
 Madison County, Alabama
 Contract No. W912DY-17-D-0003





Legend

- 1 - Quantity found at single point anomalies
- Assorted Wholly Inert Items and Componentry (29)
- Wholly Inert Item (Primer: MK4 Signal Cartridge)(1)

Wholly Inert Items/Componentry (lbs)

- 0 lbs
- 0.02-5 lbs
- >5-20 lbs

- Survey Grid
- Geophysical Survey Area
- RSA-221-R-01 Site Boundary
- Structure
- Former Railroad
- Site Drainage (ephemeral)

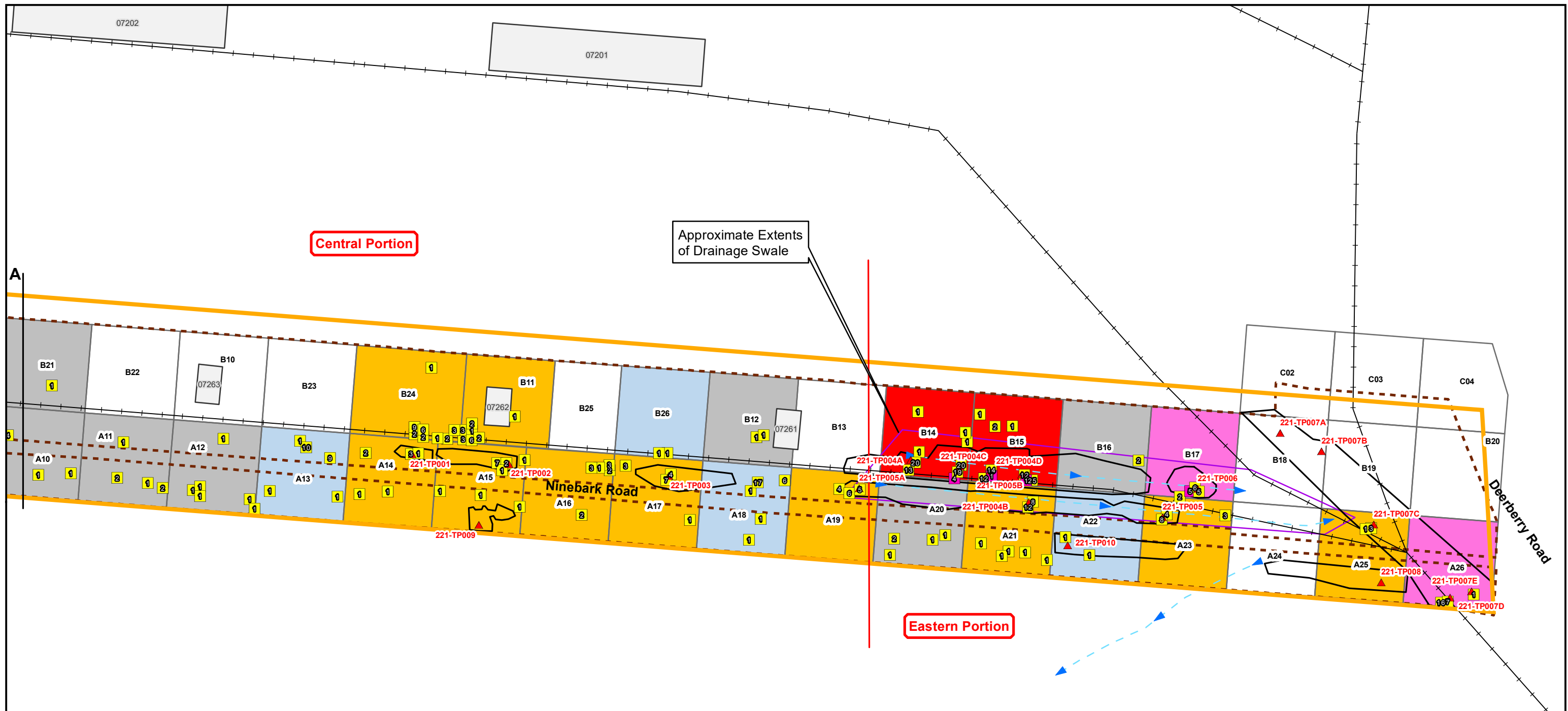
Figure 2-1
RSA-221-R-01
Intrusive Findings for Wholly Inert
Items and Componentry (Western
Portion)

Redstone Arsenal
Madison County, Alabama
Contract No. W912DY-17-D-0003

1 inch = 60 feet

0 30 60 120 Feet

NAD 1983 State Plane Alabama East Feet



Legend

- 1 - Quantity found at single point anomalies or test pits
- ▲ Test Pit (Mid Point)
- Wholly Inert Item (155 mm Projectile) (11)
- Assorted Wholly Inert Items and Componentry (410)

Wholly Inert Items/Componentry (lbs)

- 0 lbs
- 0.02-5 lbs
- >5-20 lbs
- >20-100 lbs
- >100 - 300 lbs
- >300 lbs

- Geophysical Survey Area
- Saturated response areas with test pit(s). All other identified items outside of test pits were single point anomalies.
- Survey Grid
- RSA-221-R-01 Site Boundary
- Structure
- ▬ Site Drainage (ephemeral)
- +— Former Railroad

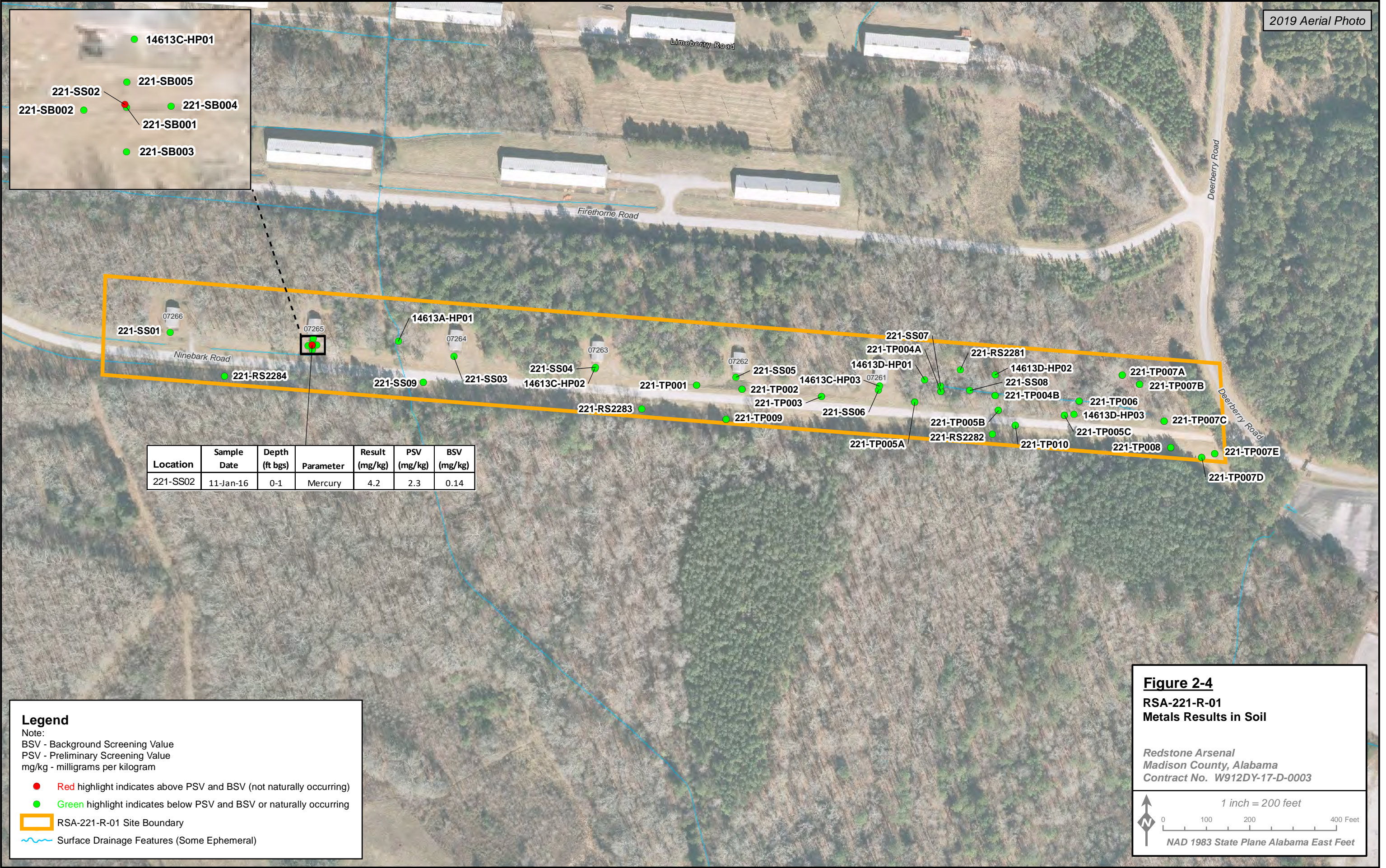
Figure 2-2
RSA-221-R-01
Intrusive Findings for Wholly Inert Items and Componentry in Central and Eastern Portions of the Site
 Redstone Arsenal
 Madison County, Alabama
 Contract No. W912DY-17-D-0003

1 inch = 110 feet

0 55 110 220 Feet

NAD 1983 State Plane Alabama East Feet





Location	Sample Date	Depth (ft bgs)	Parameter	Result (mg/kg)	PSV (mg/kg)	BSV (mg/kg)
221-SS02	11-Jan-16	0-1	Mercury	4.2	2.3	0.14

Legend

Note:
 BSV - Background Screening Value
 PSV - Preliminary Screening Value
 mg/kg - milligrams per kilogram

- Red highlight indicates above PSV and BSV (not naturally occurring)
- Green highlight indicates below PSV and BSV or naturally occurring
- RSA-221-R-01 Site Boundary
- ~~~~~ Surface Drainage Features (Some Ephemeral)

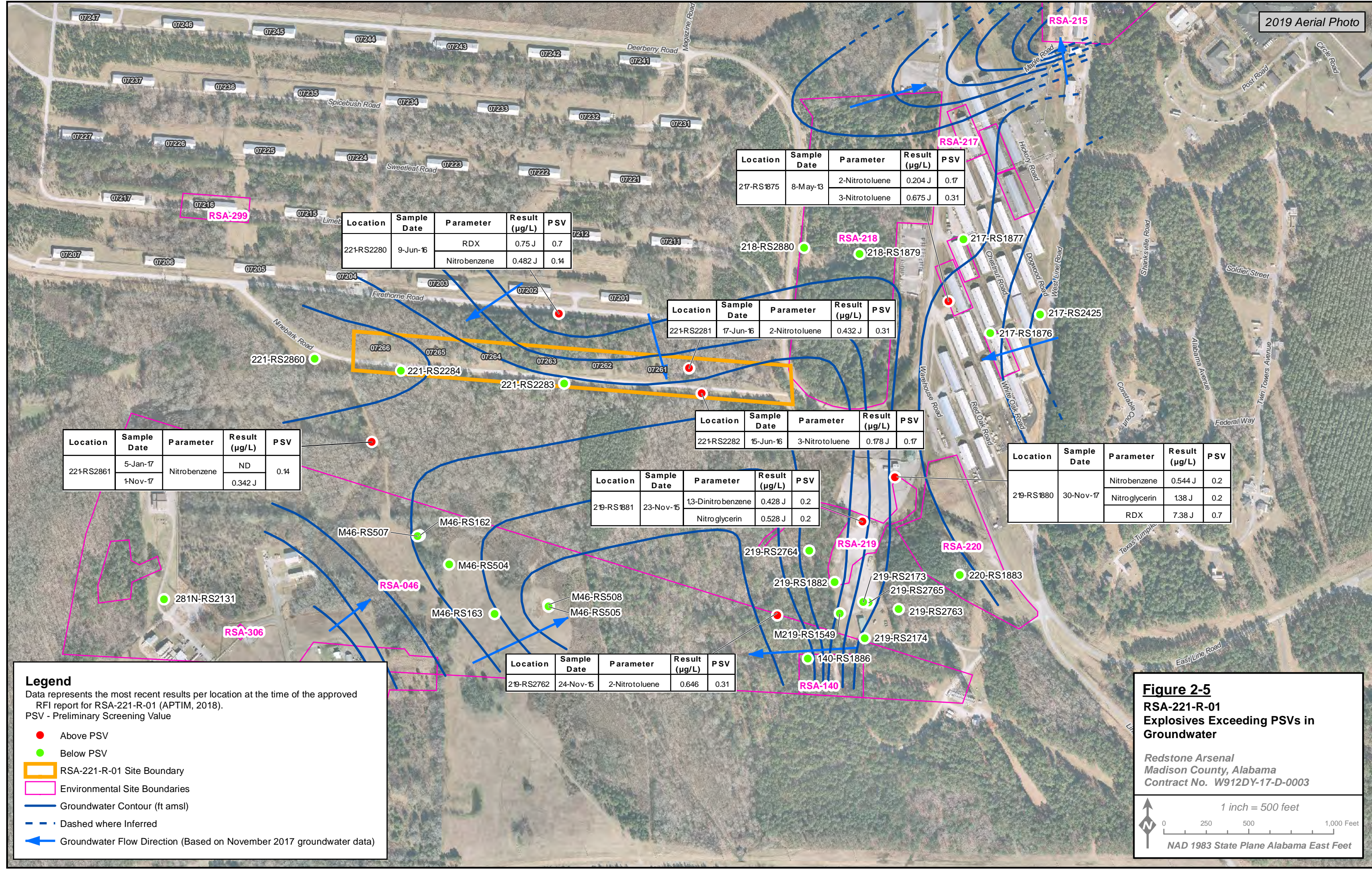
Figure 2-4
RSA-221-R-01
Metals Results in Soil

Redstone Arsenal
 Madison County, Alabama
 Contract No. W912DY-17-D-0003

1 inch = 200 feet

0 100 200 400 Feet

NAD 1983 State Plane Alabama East Feet



Location	Sample Date	Parameter	Result (µg/L)	PSV
217-RS1875	8-May-13	2-Nitrotoluene	0.204 J	0.17
		3-Nitrotoluene	0.675 J	0.31

Location	Sample Date	Parameter	Result (µg/L)	PSV
221-RS2280	9-Jun-16	RDX	0.75 J	0.7
		Nitrobenzene	0.482 J	0.14

Location	Sample Date	Parameter	Result (µg/L)	PSV
221-RS2281	17-Jun-16	2-Nitrotoluene	0.432 J	0.31

Location	Sample Date	Parameter	Result (µg/L)	PSV
221-RS2282	15-Jun-16	3-Nitrotoluene	0.178 J	0.17

Location	Sample Date	Parameter	Result (µg/L)	PSV
219-RS1880	30-Nov-17	Nitrobenzene	0.544 J	0.2
		Nitroglycerin	138 J	0.2
		RDX	7.38 J	0.7

Location	Sample Date	Parameter	Result (µg/L)	PSV
219-RS1881	23-Nov-15	1,3-Dinitrobenzene	0.428 J	0.2
		Nitroglycerin	0.528 J	0.2

Location	Sample Date	Parameter	Result (µg/L)	PSV
219-RS2762	24-Nov-15	2-Nitrotoluene	0.646	0.31

Location	Sample Date	Parameter	Result (µg/L)	PSV
221-RS2861	5-Jan-17	Nitrobenzene	ND	0.14
	1-Nov-17		0.342 J	

Legend

Data represents the most recent results per location at the time of the approved RFI report for RSA-221-R-01 (APTIM, 2018).
PSV - Preliminary Screening Value

- Above PSV
- Below PSV
- ▭ RSA-221-R-01 Site Boundary
- ▭ Environmental Site Boundaries
- Groundwater Contour (ft amsl)
- - - Dashed where Inferred
- ← Groundwater Flow Direction (Based on November 2017 groundwater data)

Figure 2-5
RSA-221-R-01
Explosives Exceeding PSVs in Groundwater

Redstone Arsenal
Madison County, Alabama
Contract No. W912DY-17-D-0003

1 inch = 500 feet

0 250 500 1,000 Feet

NAD 1983 State Plane Alabama East Feet

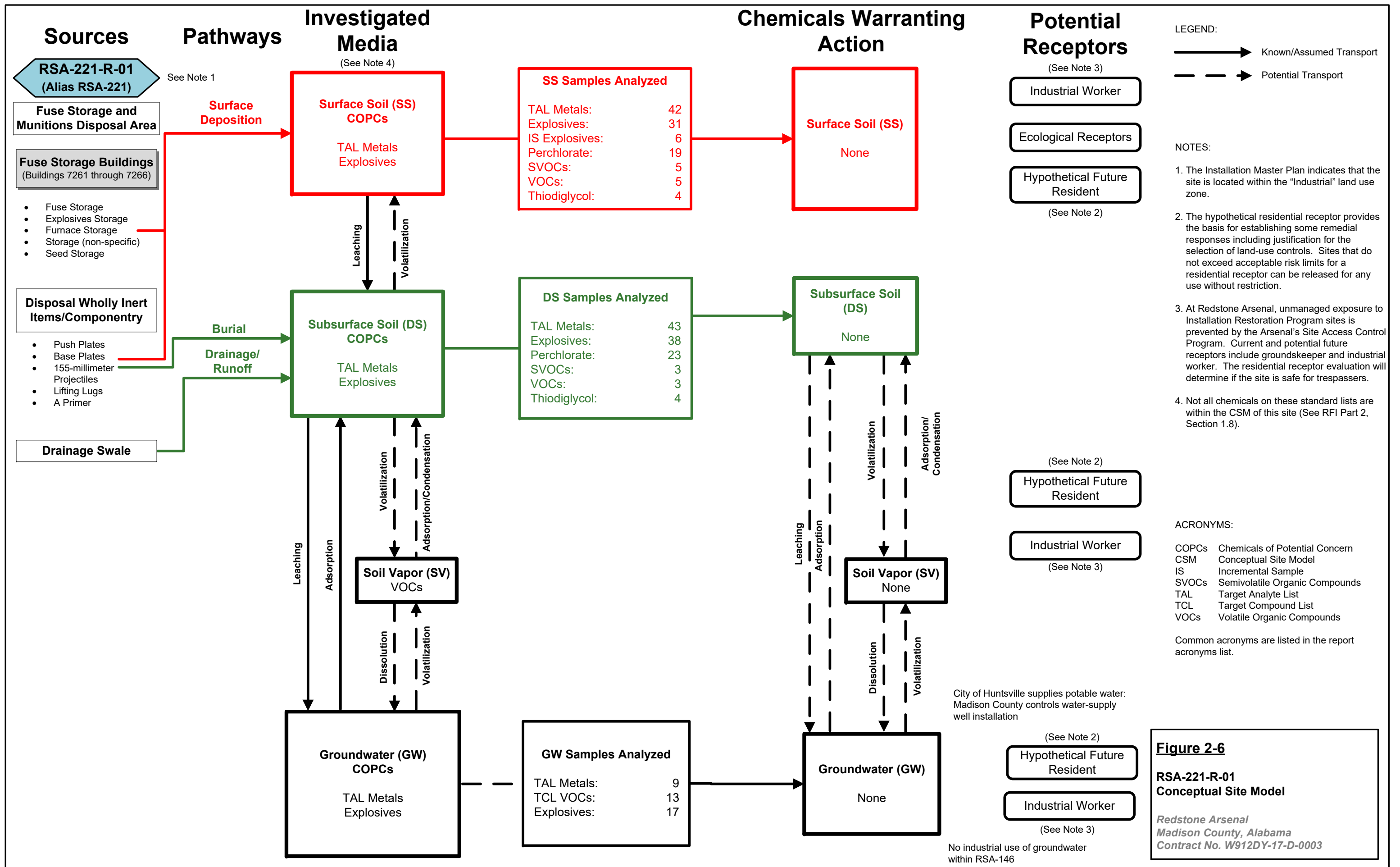
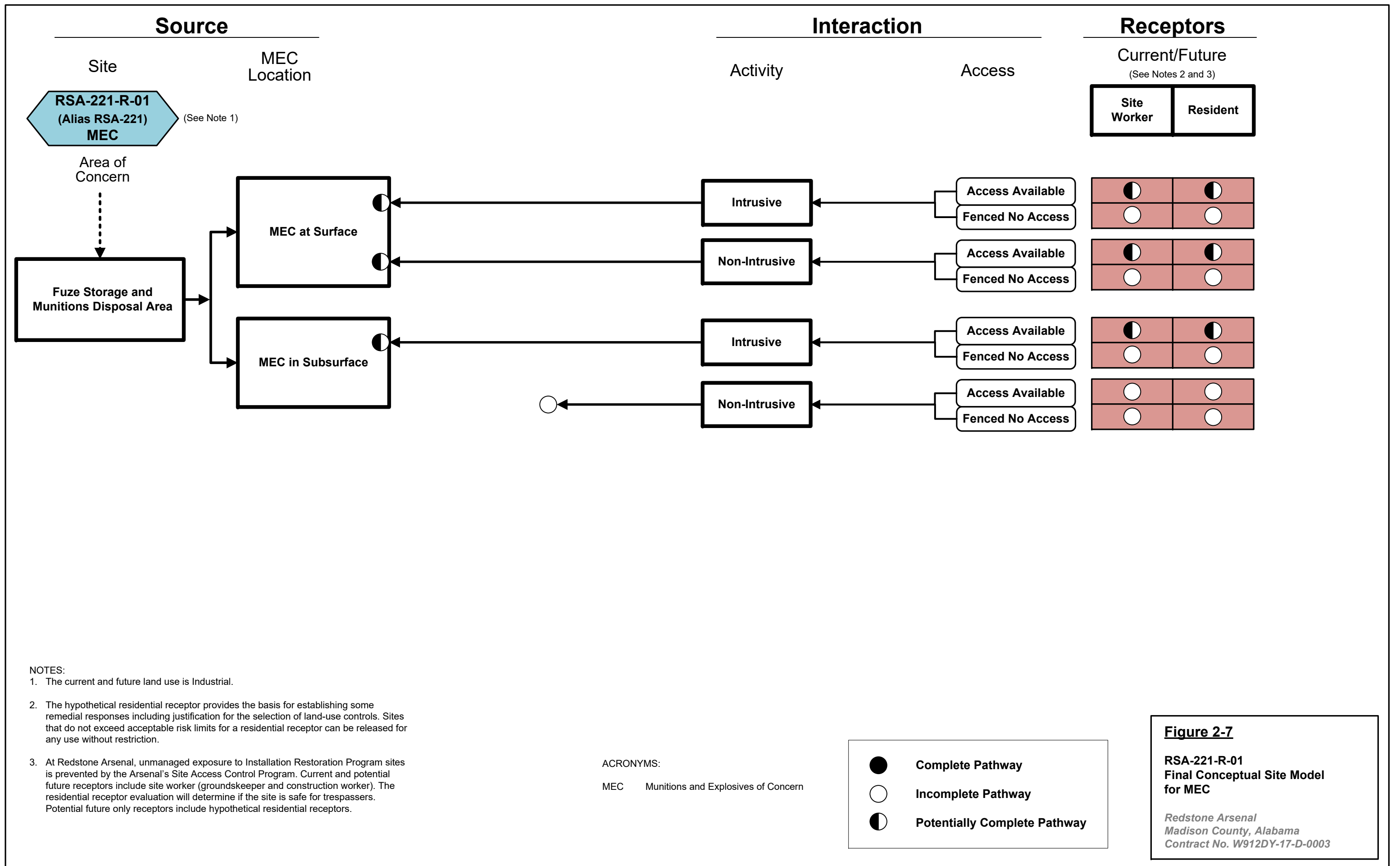
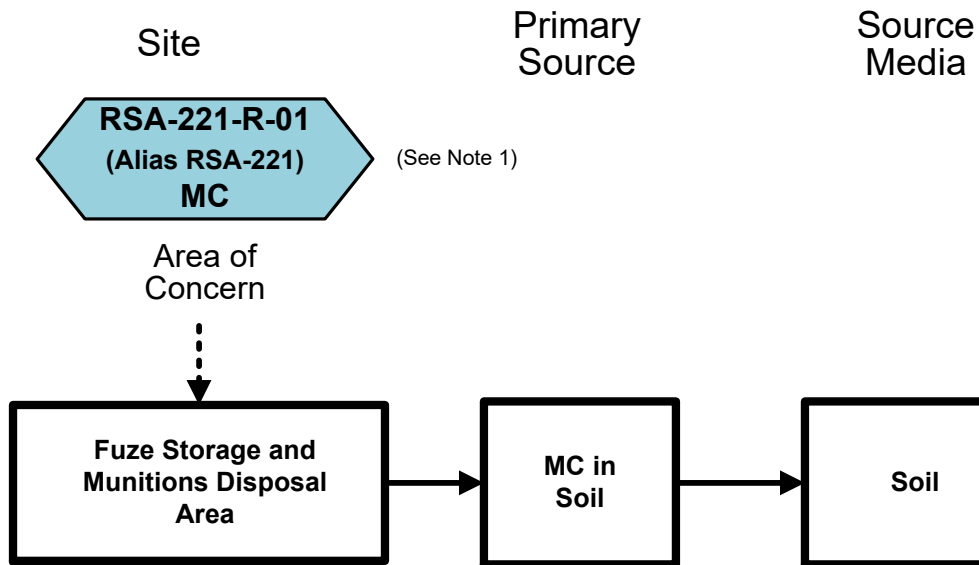


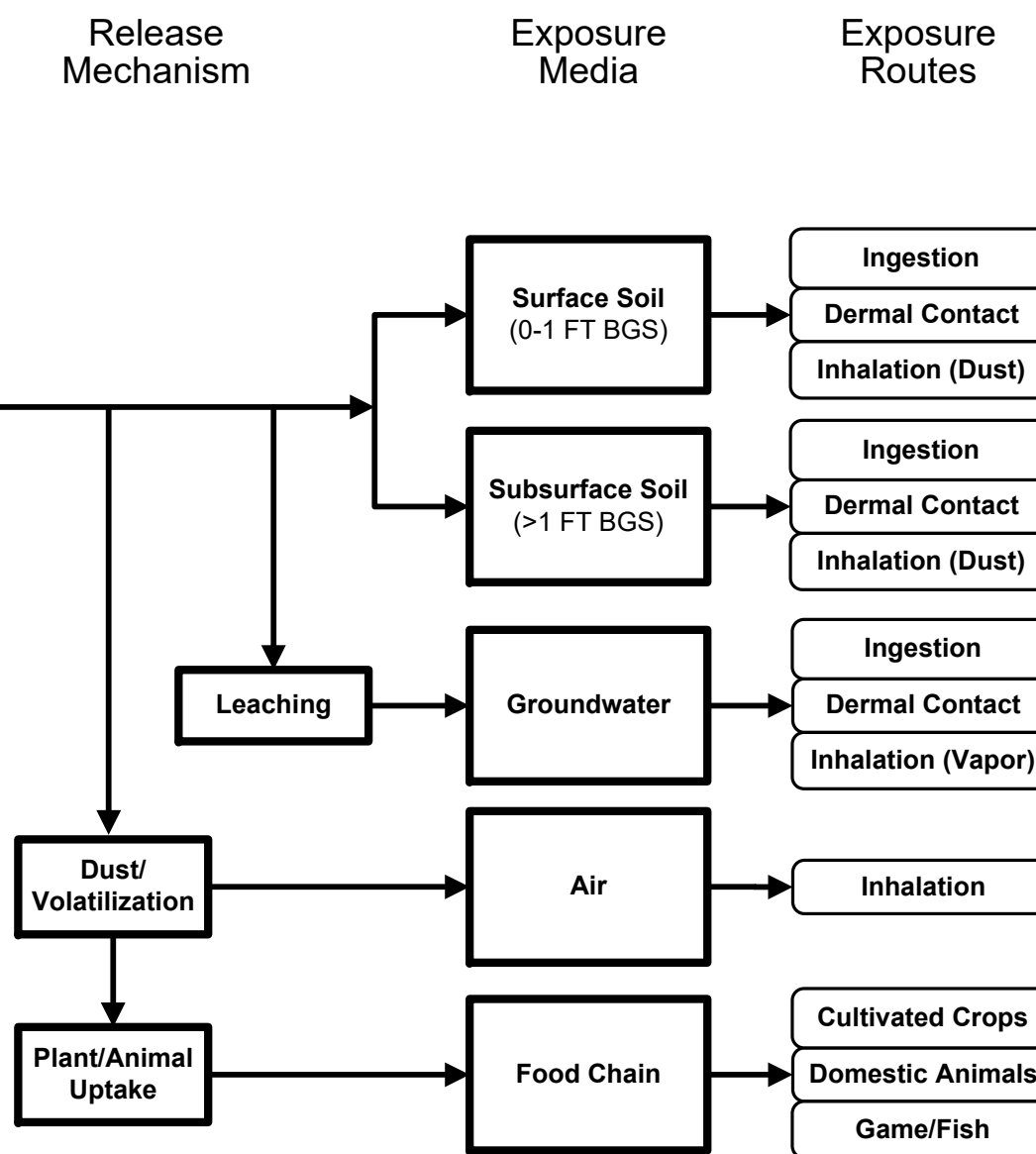
Figure 2-6
RSA-221-R-01
Conceptual Site Model
 Redstone Arsenal
 Madison County, Alabama
 Contract No. W912DY-17-D-0003



Sources



Interaction



Receptors

Current/Future

(See Notes 2, 3, and 4)

Site Worker	Biota	Future Resident
○	○	○
○	○	○
○	○	○
○	○	○
○	○	○
○	○	○
○	○	○
○	○	○
○	○	○
○	○	○
○	○	○

NOTES:

1. The Installation Master Plan indicates that the site is located within the "Industrial" land use zone.
2. The hypothetical residential receptor provides the basis for establishing some remedial responses including justification for the selection of land-use controls. Sites that do not exceed acceptable risk limits for a residential receptor can be released for any use without restriction.
3. At Redstone Arsenal, unmanaged exposure to Installation Restoration Program sites is prevented by the Arsenal's Site Access Control Program. Current and potential future receptors include site worker (groundskeeper and construction worker). The residential receptor evaluation will determine if the site is safe for trespassers. Potential future only receptors include recreational user and hypothetical residential receptors.
4. Based on the 2019 Installation Master Plan, RSA-221-R-01 is within an area designated as restricted for hunting /recreational use. Based on this designation, exposure for a recreational user to site media is considered incomplete.

ACRONYMS:

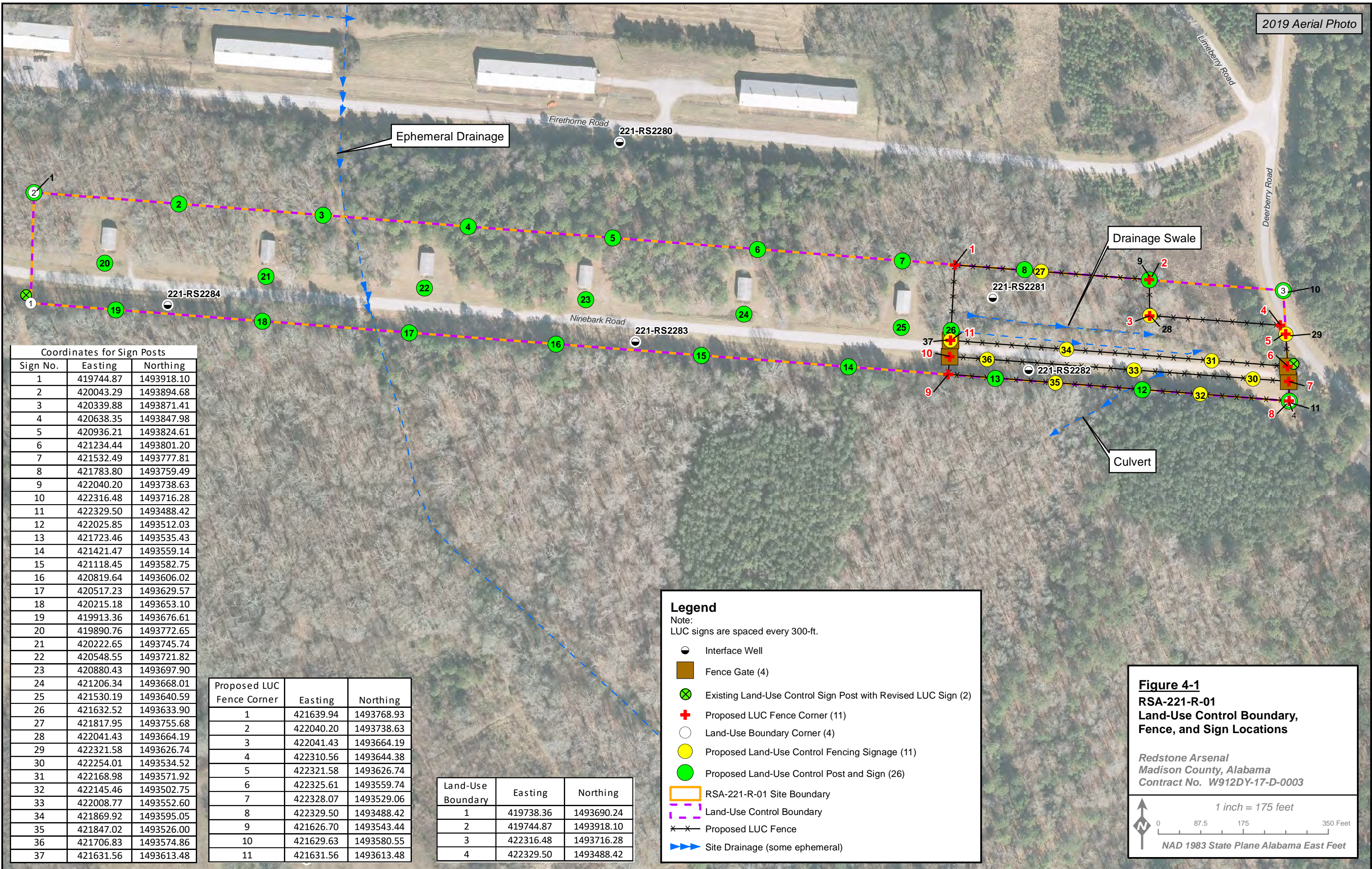
> Greater Than
 FT BGS Feet Below Ground Surface
 MC Munitions Constituents

- Complete Pathway
- Incomplete Pathway or Complete Pathway but Poses No Unacceptable Risks
- ◐ Potentially Complete Pathway

Figure 2-8

RSA-221-R-01
Final Conceptual Site Model
for MC

Redstone Arsenal
Madison County, Alabama
Contract No. W912DY-17-D-0003



Coordinates for Sign Posts

Sign No.	Easting	Northing
1	419744.87	1493918.10
2	420043.29	1493894.68
3	420339.88	1493871.41
4	420638.35	1493847.98
5	420936.21	1493824.61
6	421234.44	1493801.20
7	421532.49	1493777.81
8	421783.80	1493759.49
9	422040.20	1493738.63
10	422316.48	1493716.28
11	422329.50	1493488.42
12	422025.85	1493512.03
13	421723.46	1493535.43
14	421421.47	1493559.14
15	421118.45	1493582.75
16	420819.64	1493606.02
17	420517.23	1493629.57
18	420215.18	1493653.10
19	419913.36	1493676.61
20	419890.76	1493772.65
21	420222.65	1493745.74
22	420548.55	1493721.82
23	420880.43	1493697.90
24	421206.34	1493668.01
25	421530.19	1493640.59
26	421632.52	1493633.90
27	421817.95	1493755.68
28	422041.43	1493664.19
29	422321.58	1493626.74
30	422254.01	1493534.52
31	422168.98	1493571.92
32	422145.46	1493502.75
33	422008.77	1493552.60
34	421869.92	1493595.05
35	421847.02	1493526.00
36	421706.83	1493574.86
37	421631.56	1493613.48

Proposed LUC Fence Corner	Easting	Northing
1	421639.94	1493768.93
2	422040.20	1493738.63
3	422041.43	1493664.19
4	422310.56	1493644.38
5	422321.58	1493626.74
6	422325.61	1493559.74
7	422328.07	1493529.06
8	422329.50	1493488.42
9	421626.70	1493543.44
10	421629.63	1493580.55
11	421631.56	1493613.48

Land-Use Boundary	Easting	Northing
1	419738.36	1493690.24
2	419744.87	1493918.10
3	422316.48	1493716.28
4	422329.50	1493488.42

Legend

Note:
LUC signs are spaced every 300-ft.

- Interface Well
- Fence Gate (4)
- ⊗ Existing Land-Use Control Sign Post with Revised LUC Sign (2)
- ⊕ Proposed LUC Fence Corner (11)
- Land-Use Boundary Corner (4)
- Proposed Land-Use Control Fencing Signage (11)
- Proposed Land-Use Control Post and Sign (26)
- ▭ RSA-221-R-01 Site Boundary
- ⋯ Land-Use Control Boundary
- × × Proposed LUC Fence
- ▶▶ Site Drainage (some ephemeral)

Figure 4-1
RSA-221-R-01
Land-Use Control Boundary, Fence, and Sign Locations

Redstone Arsenal
 Madison County, Alabama
 Contract No. W912DY-17-D-0003

1 inch = 175 feet

0 87.5 175 350 Feet

NAD 1983 State Plane Alabama East Feet

APPENDIX A

ADEM CONCURRENCE LETTER FOR RSA-221-R-01 RFI REPORT



Alabama Department of Environmental Management
adem.alabama.gov

1400 Coliseum Blvd. 36110-2400 ■ Post Office Box 301463
Montgomery, Alabama 36130-1463
(334) 271-7700 ■ FAX (334) 271-7950

October 11, 2018

CERTIFIED MAIL # 91 7199 9991 7038 0640 6488

Ms. Terry de la Paz, Division Chief
Department of the Army
Installation Management Command
Directorate of Environmental Management
Installation Restoration Division
(IMRE-PWE-IR) - Bldg. 4488
Redstone Arsenal, AL 35898

RE: ADEM Review and Concurrence: *Revision 1 Resource Conservation and Recovery Act Facility Investigation (RFI) Report, RSA-221-R-01, Fuse Storage and Munitions Disposal Area, Operable Unit 15*, dated September 21, 2018
Redstone Arsenal (RSA) DSMOA Environmental Restoration Program
U.S. EPA I.D. No. AL 7 210 020 742

Dear Ms. Terry de la Paz:

The Alabama Department of Environmental Management (ADEM or the Department) has reviewed the Army's *Revision 1 Resource Conservation and Recovery Act Facility Investigation (RFI) Report, RSA-221-R-01, Fuse Storage and Munitions Disposal Area, Operable Unit 15*, dated September 21, 2018. Based on this review, the Department has determined that all comments on the Revision 0 version of this document have been adequately resolved and concurs with the Revision 1 RFI Report for RSA-221-R-01 and concurs with the recommendation for corrective measures implementation requiring an action to prevent munitions and explosives of concern (MEC) exposure to current and future human receptors.

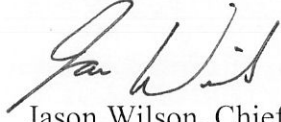
Since the findings of this RFI Report indicate action is needed to prevent MEC exposure to current and future human receptors a Corrective Measures Implementation (CMI) Plan to address this action is required.

In accordance with Permit Condition VI.E.2, the CMI Plan must be completed within 120 calendar days following notification from the Department that a CMI Plan is required. Therefore, the Army should submit a CMI Plan within 120 calendar days of receipt of this letter. The Department will move RSA-221-R-01 from Table VI.2 to Table VI.6 (Sites requiring a corrective measures implementation work plan) in the facility's Alabama Hazardous Wastes Management and Minimization Act (AHWMA) permit as part of the next permit modification.



If you have any questions on this matter, please contact Philip Stroud of the Facilities Engineering Section at 334-270-5684 or via e-mail at pns@adem.alabama.gov.

Sincerely,



Jason Wilson, Chief
Governmental Hazardous Waste Branch
Land Division

JW/RDA/PNS/tp

cc: Michelle P. Thornton, US EPA Region IV (via email)
Robert Morris, US EPA Region IV (via email)
Clint Howard, Redstone Arsenal
Angelique Ortiz, CCI (via email)
Brian Roberson, NASA MSFC
Daniel Arthur, ADEM
Ashley T. Mastin, ADEM
Bob Barnwell, ADEM (via email)
Kelley Hartley, ADEM (via email)

APPENDIX B

REQUEST FOR REDSTONE RCRA PERMIT MODIFICATION

**REQUEST FOR REDSTONE RCRA PERMIT MODIFICATION
RSA-221-R-01, FUSE STORAGE AND MUNITIONS DISPOSAL AREA
U.S. ARMY GARRISON – REDSTONE
MADISON COUNTY, ALABAMA
APRIL 2021**

B1.0 Introduction

As specified in Section VI.E.3 of the U.S. Army Garrison–Redstone’s (hereinafter referred to as the Army) Alabama Hazardous Wastes Management and Minimization Act Hazardous Waste Storage Facility, Thermal Treatment, Solid Waste Management Unit Corrective Action Permit, Modification No. 15 (hereafter referred to as the Permit) (dated September 23, 2020) (Alabama Department of Environmental Management [ADEM], 2020), a request for permit modification is to be submitted along with a corrective measures implementation (CMI) work plan. The Army has been directed to include this request for permit modification in an appendix to the CMI work plan. Therefore, this request for modification to the Permit has been prepared for Solid Waste Management Unit RSA-221-R-01, Fuse Storage and Munitions Disposal Area, at Redstone Arsenal (RSA) in Madison County, Alabama. The Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) report for RSA-221-R-01 (Aptim Federal Services, LLC [APTIM], 2018) received concurrence from ADEM on October 11, 2018. The Army has prepared the CMI work plan and is ready to implement corrective measures at RSA-221-R-01.

As part of the RFI report, the Army requested that ADEM move this site from Table VI.2 to Table VI.6 in the Permit and list it as requiring corrective measures for soil. ADEM subsequently moved RSA-221-R-01 to Table VI.6 in Permit Modification No. 14 (ADEM, 2019) as requiring action for soils and groundwater. As identified in the RFI report for this site, groundwater was found to pose no unacceptable risks to residential, construction worker, or groundskeeper receptors. Therefore, Army requests that ADEM remove groundwater from media requiring action at this site. As specified in Section VI.E.3 of the Permit, this modification will serve to incorporate the proposed remedy, including all procedures necessary to implement and monitor the final corrective measures for this site, into the Permit in accordance with Alabama Administrative Code r. 335-14-8-.04(2).

B2.0 Facility and Site Description

RSA is located in the southwestern portion of Madison County, which is in the northern portion of Alabama (Figure 1-1 in the CMI work plan). RSA is a U.S. Army facility that encompasses

approximately 38,300 acres of land, all of which are either owned or controlled by the Army. Development within RSA has largely centered on the historical production (and later disposal) of conventional and chemical munitions and, more recently, development and testing of missiles and rockets. These processes have produced chemical wastes since operations began in the early 1940s.

RSA-221-R-01 occupies 13.4 acres in the southeastern portion of RSA above groundwater unit RSA-146 (Figure 1-1 in the CMI work plan). RSA-221-R-01 is immediately west of the intersection of Deerberry and Ninebark Roads. The site contains six buildings (Buildings 7261 through 7266) constructed in 1943 and a drainage swale (Figure 1-3 in the CMI work plan). The buildings were initially used for fuze storage in support of activities conducted at the Redstone Ordnance Plant in the 1940s. By the 1950s, the buildings were used for small component storage for the Redstone Depot. Fuze storage was resumed in the 1960s. By the 1980s, the buildings were in use by morale and welfare clubs for general storage (e.g., horse saddles, hay, and audiovisual equipment). The buildings are currently designated for explosives, seed, and non-specific storage. A former railroad line paralleled Ninebark Road and was used to access the storage buildings (Figure 1-2 in the CMI work plan).

A drainage swale on the east side of RSA-221-R-01 was reportedly used as a disposal area for munitions-related items in the late 1940s and 1950s (Malcolm Pirnie, Inc., 2008a,b).

Geophysical surveys and intrusive investigations conducted during the RFI revealed wholly inert munitions (e.g., 155-millimeter illumination projectile bodies that were never loaded and base plates for the aforementioned projectiles that were never installed), componentry (e.g., lifting lugs since they have nothing to do with the item's intended purpose), and scrap metal (e.g., wire, nails, and bolts). No munitions and explosives of concern (MEC) were confirmed at this site during the RFI.

RSA-221-R-01 has been assigned to the U.S. Department of Defense (DoD) Military Munitions Response Program (MMRP) for investigation and cleanup.

B3.0 Investigative History

Environmental investigations relevant to RSA-221-R-01 are listed below.

- RSA-146 Potential Source Area Investigation (Shaw Environmental, Inc. [Shaw], 2005)
- RSA Historical Records Review (Malcolm Pirnie, Inc., 2008b)

- RSA Site Inspection (Malcolm Pirnie, Inc., 2008a)
- RSA RCRA Facility Assessment (ADEM, 2008)
- RSA-146 Groundwater Unit RFI (CB&I Federal Services LLC [CB&I], 2015a)
- RSA-221-R-01 RFI (APTIM, 2018).

The RSA-221-R-01 RFI consisted of statistically based MEC characterization and environmental sampling to evaluate potential releases from historical on-site activities. A full-coverage detector-aided visual survey (DAVS) and a digital geophysical mapping survey were performed over accessible site areas to evaluate surface and subsurface magnetic anomalies, then followed by an intrusive investigation to confirm such findings.

The RSA-221-R-01 total usable data set to characterize munitions constituents (MC) and hazardous and toxic waste (HTW) constituents included results from 48 surface soil samples, 43 subsurface soil samples, and 17 overburden groundwater samples (Figure 2-3 in the CMI work plan). The samples were analyzed for one or more of the following: volatile organic compounds (VOC), semivolatile organic compounds (SVOC), metals, explosives, perchlorate, and the chemical agent breakdown product thiodiglycol. Although not within the conceptual site model (CSM) for RSA-221-R-01, analysis for VOCs was included in groundwater samples to evaluate possible impacts from offsite sources and to evaluate vapor intrusion (Figure 2-6 in the CMI work plan). The nature and extent of contamination in soil and groundwater at RSA-221-R-01 have been defined.

B4.0 Scope of the Corrective Measures for RSA-221-R-01 _

The overall strategy for cleanup at RSA has been presented to the regulatory agencies in two cleanup strategy documents, the *Installation-Wide Groundwater Cleanup Strategy* (Shaw, 2009a) and the *Installation-Wide Strategy for Cleanup of Impacted Wetlands* (Shaw, 2010a). These strategy documents have been designed to integrate groundwater units, surface media sites, and wetland areas by incorporating strategies (i.e., cleanup of surface media sites) to 1) ensure that the Army provides a systematic and uniform approach to investigating and remediating these areas to reach closure in an expeditious and fiscally responsible manner, and 2) ensure protection of potential receptors (i.e., implementation of the installation-wide groundwater land-use control [LUC]) until final corrective measures result in COCs meeting the CGs where applicable. The scope of the corrective measures for RSA-221-R-01 is consistent with these strategies. The selected corrective measures will reduce or prevent the hazards associated with exposure to low-probability MEC that may be present at the site. Without corrective measures,

the exposure to MEC poses a potential risk to current and future receptors. No corrective measures are required for groundwater under RSA-221-R-01.

B5.0 Site Characteristics

This chapter provides general information on the site characteristics of RSA-221-R-01 and identifies the components of the CSMs for the site. Site features are shown on Figure 1-3 in the CMI work plan. Further discussion of the site characteristics is included in the RFI report (APTIM, 2018).

The topography at the site is relatively flat (elevation is approximately 580 feet above mean sea level) with a topographic high of approximately 590 feet above mean sea level just north of the site. The majority of the site is covered by dense growth of mature trees. The open areas of the site are mowed grassy areas that surround the storage buildings and extend just south of Ninebark Road. A drainage swale approximately 785 feet long is located just east of Building 7261 and runs east, parallel with the site. This swale terminates in the southeast corner of the site and runs in a southwesterly direction via a culvert under Ninebark Road. An ephemeral drainage feature intermittently flows through the west-central portion of the site between Buildings 7264 and 7265. This feature flows south-southeast and passes via a culvert underneath Ninebark Road and discharges south of the site boundary. Neither drainage feature supports aquatic habitat. The entire site lies outside the 100-year floodplain. No ecologically sensitive areas exist within or near the site boundary and no threatened or endangered species have been identified within the site. The average depth to groundwater is 3.30 feet below ground surface. The overburden thickness as determined from soil borings ranges from approximately 8 to 12.5 feet below ground surface.

Conceptual Site Model. The final CSMs for MEC, MC, and HTW at RSA-221-R-01 include the following main components:

- During the RFI, a full-coverage digital geophysical mapping (DGM) survey was performed over 9.6 acres of the 13.4-acre site (100 percent of the accessible areas of the site), followed by an intrusive investigation of all 10 saturated response areas (SRA) through the use of 19 test pits and approximately 8 percent (370) of the total single point anomaly (SPA) anomalies (4,644) that exceeded the threshold criteria. No MEC was found on the surface or within the subsurface of RSA-221-R-01. Intrusive investigation results and statistical analysis (Hypergeometric Model) indicate a 95 percent confidence that the density of UXO at the site is less than 0.50 UXO per acre. Since 100 percent of the anomalies present above the established target threshold were not intrusively investigated, it is statistically possible, that a

potentially complete pathway exists for MEC at this site as shown on Figure 2-7 in the CMI work plan.

- Potential MC include metals and explosives. Figure 2-8 in the CMI work plan shows the pathways for MC are incomplete or that the pathway is complete but poses no unacceptable risks to human health or the environment at RSA-221-R-01.
- The most viable contaminant transport pathway is leaching of contaminants from soil to groundwater. An evaluation of contaminant transport revealed that no contaminants in RSA-221-R-01 soil pose a potential leaching threat to groundwater. Anomalies remaining in the subsurface may be transported to the soil surface via erosion.
- Current human receptors are limited to commercial and construction workers. Future potential receptors include all current receptors, plus hypothetical child and adult residents under a land reuse scenario. No COCs for HTW/MC that pose unacceptable risks to any receptor were identified in soils (Figures 2-6 and 2-8 in the CMI work plan).

B6.0 Investigative Results

This chapter provides general summary information on the nature and extent of MEC and HTW/MC contamination at RSA-221-R-01. Further discussion of the investigative results is included in the RFI report (APTIM, 2018).

B6.1 Munitions and Explosives of Concern

No MEC was encountered during the 2014 DAVS conducted across the entire site and during the DGM survey performed for the entire site in 2015. During the 2016 intrusive anomaly investigation, no UXO or discarded military munitions were found but items identified as wholly inert items and componentry were discovered. In addition, MC present in high enough concentrations to pose an explosive hazard was not found in the 2016/2017 environmental sampling. Results of the intrusive investigation are shown on Figures 2-1 and 2-2 in the CMI work plan and items found are listed on Table 2-1 in the CMI work plan. A summary of the MEC investigative results follows:

- **2014 DAVS:** A total of 6,126 pounds of metallic items were found on the surface of the site including 5,914 pounds of wholly inert items and componentry which included numerous empty 155-millimeter (mm) illumination projectile bodies that were never loaded, base plates, and lifting lugs. These wholly inert items and componentry were collected and removed from the drainage swale east of Building 7261 in grids J2, K2, and L2 (Figure 1.4-2 in the RFI report [APTIM, 2018]). All of the recovered items were identified as wholly inert items and componentry and not discarded military munitions (DMM) as defined in EM 385-1-97 (Department of the

Army, 2008) since they appeared to have never held explosive components or been assembled into complete munitions. No items containing an explosive hazard were encountered. It should be noted that all items encountered at the surface outside of the drainage swale area were miscellaneous debris and scrap metal (e.g., nails and spikes associated with the former rail line through the site).

- **2015 DGM Survey:** A total of 4,644 identified SPAs and 10 SRAs were identified. Application of the Hypergeometric Model determined that 355 SPAs along with the 10 SRAs would require intrusive investigation to meet the designed statistical confidence level. An additional 15 “high quality” SPAs were added in the field for biased intrusive investigation, making a total of 370 SPAs.
- **2016 Intrusive Investigation:** A total of 370 of 4,644 identified SPAs were intrusively investigated and a total of 10 SRAs were partially excavated using 19 test pits. Various wholly inert items (e.g., empty 155-millimeter illumination projectile bodies that were never loaded and base plates for the aforementioned projectiles that were never installed), componentry (e.g., lifting lugs since they have nothing to do with the item’s intended purpose), or scrap metal (e.g., wire, nails, and bolts) were recovered from 81 of the SPA excavations and 12 of the test pit excavations within the SRAs. These items are consistent with the site’s storage history of wholly inert items and non-explosive componentry and location along a former rail line. Thus, no items were classified as discarded military munitions.
 - **Wholly inert items/componentry:** The total weight of all the wholly inert items and componentry recovered was 1,852.95 pounds (210.45 pounds from SPAs and 1,642.50 pounds from test pits). All items were inspected, classified as material documented as safe, and then removed from the site for scrap recycling via an off-post vendor.
 - **Scrap metal and other debris:** Items found during the DAVS and intrusive investigation included bolts, cans, clips, nails, pipes, scrap metal, scrap steel, wire, rebar, hot rocks/soil, and other miscellaneous debris-type items. Approximately 780 pounds of other debris were removed from the site and recycled as scrap via an off-post vendor.
 - **MEC:** No MEC was found on the ground surface or in the subsurface during the intrusive anomaly investigation.

The MEC work plan (CB&I, 2014) and Standard Operating Project Procedure (SOPP) No. 27 (Shaw, 2013) was used to design the DGM and the Hypergeometric Model was used to evaluate and determine the number of anomalies to investigate to meet project objectives of a 95 percent confidence that the true rate of unacceptable items is no greater than 0.50 UXO per acre at the site. Although a large amount of wholly inert items and componentry were recovered from this site, MEC was not found. Uninvestigated anomalies above the target threshold still exist in the subsurface, and thus there is a low probability that MEC is present at this site. It is expected that

through erosion, frost heave, flooding, and other natural processes over 60 years, numerous previously buried items would now be at or near the surface.

B6.2 Hazardous and Toxic Waste/Munitions Constituents

Although soil and groundwater results are summarized here, the scope of the CMI is potential for MEC in soil. Further discussion of the investigation results is included in the RFI report (APTIM, 2018).

Metals. Mercury was determined to be present in only one surface soil location (221-SS02) at an anomalous concentration that exceeds its background screening value (BSV) and preliminary screening value (PSV) (Figure 2-4 in the CMI work plan). The anomalous mercury concentration is bounded laterally and vertically by surface and subsurface soil samples that are below the BSV and PSV or determined to be naturally occurring in the site-to-background evaluation. All other metals detected in surface and subsurface soil were at concentrations below the PSV and BSV or determined to be naturally occurring. Metals detected in groundwater were considered to be naturally occurring or within the background range.

VOCs. All VOC concentrations detected in soil and groundwater were below the PSVs.

SVOCs. SVOCs were not detected in soil. These compounds were not analyzed for in groundwater samples; SVOCs are not in the CSM for this site.

Explosives. All concentrations of explosive compounds in soil were below PSVs. Six explosive compounds (2-nitrotoluene, 3-nitrotoluene, 1,3-dinitrobenzene, nitrobenzene, nitroglycerin, and RDX) have been detected in groundwater samples at concentrations exceeding their PSVs (Figure 2-5 in the CMI work plan). Explosives exceedances have been delineated laterally and vertically by concentrations less than the PSVs at surrounding wells. Explosive compounds have been detected in groundwater upgradient and side-gradient to RSA-221-R-01, including at sites in the immediate vicinity of RSA-221-R-01 (such as RSA-217 and RSA-219) as well as in many locations within the RSA-146 groundwater unit.

Perchlorate. Perchlorate was not detected in soil. This compound was not analyzed for in groundwater samples and is not in the CSM for this site.

Agent Breakdown Products. The mustard breakdown product thiodiglycol was not detected in soil. Thiodiglycol was not analyzed for in groundwater samples and is not in the CSM for this site.

B7.0 Land and Resource Use

Current and Future Land Use. According to the Installation Master Plan, land use surrounding RSA-221-R-01 is designated as Industrial Zone. RSA-221-R-01 is located in a Land Use District which is classified as the Patton Road (East/South of Redstone/North Buxton) in the southeastern portion of RSA. The primary missions include storage, base operations, and explosive operations (RSA, 2013). Where practical, the Army has restricted entry into the RCRA solid waste management units by fencing them and/or placing warning signs at key entry points in accordance with the site access control (SAC) program (Army, 2012). A fence line separates the site from an operational range (RSA-046) south of the site but does not provide total enclosure of the site. The site lies within the secure RSA boundary. Site redevelopment (e.g., construction of skills training pads, roads, or other structures) may occur in the future consistent with continued industrial use as shown on Figure 1-3 in the CMI work plan, but residential or daycare facilities are not planned. Hunting is not currently permitted within RSA-221-R-01 or within the igloo area north of the site, and hunting is not planned for this site area in the future.

Current Groundwater Use. Groundwater under RSA-221-R-01 is not currently used for human consumption or any nonpotable purposes. RSA's installation-wide groundwater interim record of decision (IROD) (Shaw, 2007) and LUC remedial design (Shaw, 2009b) as implemented by the Army's SAC program (Army, 2012) prevent the current use of groundwater for potable purposes and ensure that any nonpotable uses of groundwater are reviewed and evaluated by the Army prior to being allowed.

Future Groundwater Use. Future use of groundwater under RSA-221-R-01 is possible. However, under the provisions of RSA's installation-wide groundwater IROD (Shaw, 2007) and the Army's SAC program (Army, 2012), future groundwater resources beneath RSA-221-R-01 and elsewhere on RSA may not be developed for potable purposes, and groundwater withdrawals for nonpotable uses must be managed until remedies are selected in the final decision documents for the various groundwater units within RSA, including the RSA-146 groundwater unit. In the meantime, as part of the Permit, ADEM has required that the Army perform annual monitoring of wells located within the RSA perimeter (ADEM, 2020). This annual monitoring will allow the Army and ADEM both to assess the rate of long-term groundwater recovery and ensure protection for residents living outside of the boundary of RSA (APTIM, 2020).

B8.0 Site Risks

A MEC evaluation is presented in Section B8.1. An Alabama Risk-Based Corrective Action (ARBCA) human health risk evaluation and a screening-level ecological risk assessment (SLERA) are summarized in Sections B8.2 and B8.3. The fate and transport evaluation is summarized in Section B8.4. Further detail is presented in the RFI report (APTIM, 2018).

B8.1 Munitions and Explosives of Concern Evaluation

No MEC has been discovered at RSA-221-R-01. The DGM was designed using SOPP No. 27.0 (Shaw, 2013). The Hypergeometric Model was used to determine a statistical number of anomalies to investigate to meet desired confidence level. After the analog investigation, intrusive investigation and statistical analysis indicated a 95 percent confidence that the true unacceptable item rate is no greater than 0.50 UXO per acre at the site. Based on this representative evaluation, it was concluded that RSA-221-R-01 has a low probability that MEC is present.

B8.2 Human Health Risk

Receptors under current and future site use of RSA-221-R-01 consisted of a commercial worker and a construction worker. A residential receptor was also included as a potential hypothetical future receptor. It is not anticipated that RSA-221-R-01 will be developed for residential use. Although Army risk regulations, policy, and guidance are to only evaluate those receptors that are actually at a site or that could reasonably be anticipated to occur, the risk assessment includes a residential use scenario only to comply with the Alabama Environmental Investigation and Remediation Guidance (ADEM, 2017a) and ARBCA guidance (ADEM, 2017b). In the Permit, ADEM requires that these guidance documents and approved risk assessment work plans (IT Corporation, 2002; Shaw, 2010b) be adhered to during environmental investigations and evaluations. RSA is legally mandated to comply with the Permit. At RSA, the hypothetical residential scenario is included in the Risk Management (RM)-2 human health risk assessment (HHRA) in order to determine whether a site is eligible for unrestricted use as defined in Alabama Administrative Code 335-5-1-.03(r) or support the use of LUCs as a component of the selected remedy. Therefore, risks to a residential site user receptor were assessed in this RM-2 HHRA.

All receptors were evaluated for exposure to soil and groundwater. Evaluation of groundwater exposure was conducted for the hypothetical development as a potable source. There is no current potable use of groundwater at RSA-221-R-01. An installation-wide groundwater IROD (Shaw, 2007) was instituted to prevent potable use and provide management control over

nonpotable uses of all groundwater beneath RSA. RSA's SAC program was designed to be used at sites that have not had final remedy selection made. The IROD is interim in nature and is not a final remedy. In order to design the final remedy, which may include LUCs, the potable use must be considered.

The ARBCA guidance (ADEM, 2017b) considers an individual excess lifetime cancer risk (IELCR) of $1E-05$ to be the target cumulative risk. The target noncancer threshold is a hazard index (HI) of 1.0. Estimated cumulative risks/hazards at or below these target levels do not require additional action.

Mercury was identified as the only COC in total soil. The hypothetical medium or data set called total soil was created to simplify the risk evaluation and conservatively evaluates human exposure to surface soil and subsurface soil brought to the surface by excavation during future site development. Barium, six explosive compounds, and four VOCs were identified as COCs in groundwater.

The cumulative IELCR and HI estimates for RSA-221-R-01 are summarized in Table 2-2 in the CMI work plan. The conclusions of the RM-2 HHRA, relevant COCs in soil, and significant contributors to unacceptable risk in groundwater are summarized in Table 2-3 in the CMI work plan. These results are discussed briefly below.

The cancer risks associated with soil exposure were not estimated, as mercury is not a known or suspected carcinogen (Table 2-2 in the CMI work plan). The noncancer HI estimated for soil for all receptors are below an HI of 1.0. Therefore, no chemicals in soils were identified as relevant COCs (Table 2-3 in the CMI work plan).

For groundwater, the cumulative IELCR estimates for the commercial worker, the construction worker, and the hypothetical receptor are less than $1E-05$. The cumulative HI also did not exceed the HI for any receptors. Therefore, no relevant COCs were identified in groundwater for any receptor (Table 2-3 in the CMI work plan).

A screening-level vapor intrusion evaluation was conducted to determine whether there has been a release of VOCs to groundwater or soil at RSA-221-R-01 that may volatilize and migrate upward to pose an unacceptable risk to occupants of buildings (including residential buildings) erected on the site in the future. The vapor intrusion evaluation concluded that VOC concentrations in soil and groundwater are unlikely to pose an unacceptable health threat by the vapor intrusion pathway.

B8.3 Ecological Risk

The SLERA for RSA-221-R-01 (APTIM, 2018) was conducted in accordance with the guidelines set forth in the Alabama Environmental Investigation and Remediation Guidance (ADEM, 2017a), ARBCA guidance manual (ADEM, 2017b), the RSA installation-wide work plan (IT Corporation, 2002), and the final SLERA supplements to the installation-wide work plan (Shaw, 2010b). A SLERA was performed in order to determine if the site is eligible for no further action in accordance with ADEM requirements. Note that the SLERA evaluation relies on ecological screening values (ESV) rather than on the human-health based PSVs.

The surface soil data for RSA-221-R-01 were compared to their respective BSVs and ESVs. Constituents with concentrations above their BSVs (if applicable) and ESVs (or with no ESVs) were identified as preliminary chemicals of potential ecological concern (COPEC). A COPEC refinement process determined whether site-related constituents at RSA-221-R-01 have the potential to pose hazards to ecological receptors.

Eleven metals, one explosive compound, and one VOC were identified as preliminary COPECs (Table 2-4 in the CMI work plan). Based on the results of the screening evaluation and COPEC refinement, lead, mercury, and zinc warranted further evaluation for potential effects on community-level receptors and food chain receptors. Calcium, magnesium, and carbon disulfide warranted further reevaluation for potential effects on community-level receptors, but not food chain receptors because they are not important bioaccumulative compounds. Other COPECs were found likely to be naturally occurring, background related, or not in the CSM for the site. In addition, nitroguanidine was detected at a frequency of less than 5 percent, and as such, is unlikely to contribute significantly to the overall hazard at the site. Therefore, further evaluation of nitroguanidine was not conducted.

The results of the food chain and community-level assessments in the SLERA indicated that COPECs in the surface soil at RSA-221-R-01 are unlikely to pose hazards to ecological receptor communities and/or populations, and further evaluation of ecological hazards from surface soil exposures at RSA-221-R-01 was not warranted.

B8.4 Contaminant Fate and Transport

The primary contaminant migration mechanism operating at RSA-221-R-01 is the leaching of site-related chemicals from soil to form leachate and the subsequent transport to the water table as a result of the downward percolation of infiltrating rainfall. Off-site transport of contaminants by surface water in the drainage swale and other storm water drainage areas is possible but

limited due to the ephemeral nature of the features, relatively level topography, vegetation present, and lack of contaminants of potential concern in site surface media.

Mercury and RDX were detected in surface and subsurface soil at concentrations exceeding their respective RSA-specific dilution-attenuation factor 4 soil screening levels. Using weight-of-evidence criteria, neither contaminant is considered to be a current or future source of contamination to groundwater from the soil-to-groundwater migration pathway (APTIM, 2018).

B8.5 Site Hazards

Following the DGM, the Hypergeometric Model was used to determine the number of items above the target threshold requiring investigation in order to achieve a 95 percent confidence that the true unacceptable item rate is no greater than 0.50 UXO per acre at this site. This Hypergeometric Model has been used at numerous RSA MMRP sites and has been accepted by ADEM as a fiscally responsible statistical tool for estimating risk with encountering MEC. Based on the following lines of evidence, there is a low probability that MEC is present at this site:

- During the RFI intrusive investigations, a large amount (approximately 7,767 pounds) of wholly inert items were recovered from the site from 12 of 19 the test pits in SRAs and from 81 of 370 of the SPA excavations.
- Uninvestigated anomalies detected above the target threshold still exist in the subsurface since only a statistically significant number of anomalies detected above the target threshold were investigated.
- RSA-221-R-01 is adjacent to active and historical ranges. While RSA-221-R-01 is adjacent to active and historical ranges, the area has always been used for storage of wholly inert items and non-explosive componentry and has never been used as a firing point or impact area(s).

B8.5.1 Munitions and Explosives of Concern Hazard Assessment

A MEC hazard assessment is used to evaluate the potential explosive hazard associated with conventional MEC present at a site under a variety of site conditions (U.S. Environmental Protection Agency [EPA], 2008). However, no MEC was recovered at RSA-221-R-01 and thus, generation of a MEC hazard assessment score was not required.

B8.5.2 Munitions Response Site Prioritization Protocol Summary

The Munitions Response Site Prioritization Protocol (MRSPP) is a methodology developed by the DoD to assess the relative risks and assign a relative priority to Munitions Response Sites (MRS) (DoD, 2007). The MRSPP uses three modules to evaluate hazards associated with a site: Explosive Hazard Evaluation (EHE) Module, Chemical Warfare Materiel Hazard Evaluation

(CHE) Module, and Health Hazard Evaluation (HHE) Module. The overall MRSPP priority is determined by converting the individual module rating scores to priorities. As summarized in the RFI report (APTIM, 2018), the results of applying this protocol to RSA-221-R-01 are as follows:

- EHE Module: G
- CHE Module: No Known or Suspected Chemical Warfare Materiel Hazard
- HHE Module: G
- Alternate MRS Priority: 8 (lowest priority).

B8.5.3 MEC Fate and Transport

No MEC was found during the intrusive investigation and environmental sampling. The UXO probability for RSA-221-R-01 is “Low.” It is expected that through erosion, frost heave, flooding, and other natural processes over 60 years, numerous items previously disposed in the drainage swale may now be at the surface. Although MEC has not been found at RSA-221-R-01, it cannot be ruled out.

B9.0 Objectives of the Corrective Measures and Cleanup Goals

The RFI conducted at RSA-221-R-01 defined the nature and extent of contamination and concluded that further action is not required for environmental media such as soils and groundwater. However, this site has been assigned to the MMRP for investigation and cleanup and a full site investigation for MEC was not performed (i.e., investigation performed at a statistically representative percentage of SPAs and SRAs). Thus, the site retains a low probability that MEC is present.

The corrective measure objectives (CMO) for RSA-221-R-01 are as follows:

- Prevent or limit direct human contact with MEC, thereby reducing risks associated with a “low” probability MEC site consistent with current and future land use.

Cleanup goals are relevant to alternatives that reduce concentrations of chemical contaminants, such as soil excavation or treatment. For RSA-221-R-01, the development of numerical cleanup goals is not relevant to achieving the CMO for MEC. Since the CMO is related to reducing the hazards associated with potential MEC, the selected alternative would ensure the likelihood of encountering MEC is negligible.

B10.0 Description and Comparison of Alternatives _____

The site conditions at RSA-221-R-01 meet the requirements under EPA guidance for a streamlined or focused corrective measures study (EPA, 1994). Feasible technologies or general response actions were screened against the criteria of performance, reliability, safety, implementability, and cost.

The following technology considered in the initial screening was not retained for further development and evaluation in the corrective measures study report (CB&I, 2017):

Complete Geophysical Anomaly Removal. Under this approach, excavation and recovery of all remaining subsurface anomalies within the existing geophysical anomaly data set would be performed. The site has already been cleared of all potential surface hazards, and all areas except for rock outcrops have been geophysically-mapped. Excavation of a statistical subset of SPAs and of test pits within saturated areas was performed during the RFI (APTIM, 2018). This technology would consist of excavation of all remaining geophysical anomalies and SRAs already mapped and located in the existing geophysical data set. The RFI verified that there was no evidence of MEC present within the boundaries of the site and no areas with increased probability of MEC occurrence. RSA-221-R-01 has a UXO probability of “low.” However, even the removal of the additional subsurface anomalies in the existing data set is unlikely to eliminate the need for LUCs for the site. Therefore, a complete geophysical anomaly removal was not retained as a feasible alternative for RSA-221-R-01.

As a result of the screening, three corrective measure alternatives were developed and retained for further evaluation as against a number of criteria, including technical feasibility, cost-effectiveness in cleaning up the contamination, and protection of human health.

The following three alternatives were included in the detailed analysis of corrective measure alternatives for RSA-221-R-01:

- **Alternative 1: No Action.** Under the no-action alternative, no corrective measures would be taken to address the MEC hazards at RSA-221-R-01. Because this alternative may not be protective of human health and the environment, it is not considered a candidate for implementation but presents a baseline for evaluating other retained alternatives.
- **Alternative 2: Land-Use Controls.** This alternative involves implementation of restrictions including an engineering barrier due to potential hazards with MEC. LUCs include fencing, signage, on-call UXO support for intrusive activities,

restricting future land use in the RSA Real Property Master Plan, and annual inspections and reporting to ensure compliance with the LUCs.

- **Alternative 3: Dig and Sift MEC Removal.** This alternative involves excavation of soil to a depth of 3.5 feet below ground surface (0.5 feet deeper than debris found during the investigation) across the entire site except where covered by existing buildings or roadways. Vegetation would be cleared from the site, soil would be excavated and stockpiled to sift for MEC, and soil would be returned to the site and vegetation restored. Any MEC found would be removed and properly disposed.

Because of the potential for exposure to MEC at the site, which may pose unacceptable risks to current and future human receptors, the no-action alternative does not meet the CMO to reduce the hazards to low probability MEC at the site. Implementation of Alternative 3 would be effective, reliable, and feasible and would satisfy the CMO. While Alternative 3 would reduce the potential for human exposure to the lowest achievable level by ensuring that all MEC greater than the specified size was removed, this alternative has an extremely high cost compared to Alternative 2 and may not provide a significant improvement in protectiveness since MEC may not be found. Additionally, ADEM may still require LUCs at this site after completion of the dig and sift MEC removal. Implementation of Alternative 2 (LUCs including an engineering barrier [e.g., fencing]) would prevent or limit receptor exposure to potential MEC and limit impacts to the environment. Therefore, Alternative 2 was selected as the preferred corrective measure for RSA-221-R-01.

B11.0 Selected Corrective Measure

The major components of the selected corrective measures in Alternative 2 include the following:

- Post signage at the site prohibiting soil disturbance without Army approval, on-call UXO support and anomaly avoidance
- Install high-visibility fencing around the drainage swale area
- Arrange on-call UXO support
- Establish a LUC boundary
- Outline restrictions for this site in the RSA Property Master Plan
- Comply with Alabama Administrative Code r. 335-5-1-.02(3)(a)
- Conduct annual LUC inspections, sign/fence repairs, and reporting.

Alternative 2 meets the applicable general standards for corrective measures applicable to RSA-221-R-01 (overall protection of human health and the environment, attainment of media cleanup standards, control of the sources of the release, and compliance with standards for management of wastes). As discussed in Chapter 10.0, the selected corrective measures in Alternative 2 were chosen over the other corrective measures in the corrective measures study report (CB&I, 2017) because they provide the best balance of trade-offs among the other corrective measure alternatives with respect to the evaluation criteria. Figure 4-1 in the CMI work plan presents the LUC boundary, planned area for fencing, and the proposed sign locations. The details of the LUC signs are presented on Figure 4-2 in the CMI work plan.

B12.0 Public Involvement

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-221-R-01 corrective measure. In addition, the Army will inform the public of the proposed RSA-221-R-01 corrective measure in a newspaper announcement in local newspapers.

B13.0 Conclusions

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-221-R-01. As part of the RFI report, the Army requested that ADEM move this site from Table VI.2 to Table VI.6 in the Permit and list it as requiring corrective measures for soil. ADEM subsequently moved RSA-221-R-01 to Table VI.6 in Permit Modification No. 14 (ADEM, 2019) as requiring action for soils and groundwater. As identified in the RFI report for this site, groundwater was found to pose no unacceptable risks to residential, construction worker, or groundskeeper receptors. Therefore, Army requests that ADEM remove groundwater from media requiring action at this site.

B14.0 References

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APPENDIX C

CORRECTIVE MEASURES IMPLEMENTATION SCHEDULE

RSA-221-R-01 Corrective Measures Implementation Schedule

Activity Name	OD	Start	Finish	2021												2022						
				Jan	F	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	N	Dec	Jan	F	Mar	Apr	M	Jun	Jul
501388 RSA-221 CMI RSA-221-R-01 Corrective Measures Implementation Sche	474	01-Jun-21	17-Sep-22																			
501388 RSA-221 CMI.1 RSA-221-R-01 Corrective Measures Implementation	63	01-Jun-21	02-Aug-21																			
* Procurement and Subcontracting	30	01-Jun-21*	30-Jun-21																			
Mobilization	2	01-Jul-21	02-Jul-21																			
Vegetation Clearance	2	06-Jul-21	07-Jul-21																			
Surveying	5	08-Jul-21	14-Jul-21																			
Install Fencing	10	15-Jul-21	24-Jul-21																			
Install LUC Signs	5	25-Jul-21	29-Jul-21																			
Site Restoration and Demobilization	2	30-Jul-21	02-Aug-21																			
501388 RSA-221 CMI.2 RSA-221-R-01 Corrective Measures Report (CMR)	110	04-Aug-21	21-Nov-21																			
Advance Draft Rev0 Corrective Measures Report	60	04-Aug-21	02-Oct-21																			
Army Review	30	03-Oct-21	01-Nov-21																			
Rev 0 Corrective Measures Report	20	02-Nov-21	21-Nov-21																			
501388 RSA-221 CMI.3 RSA-221-R-01 LUC Inspection **	47	02-Aug-22	17-Sep-22																			
LUC Inspection	2	02-Aug-22	03-Aug-22																			
LUC Inspection Report	45	04-Aug-22	17-Sep-22																			

* Start Date dependent upon regulatory concurrence on RSA-221-R-01 Corrective Measures Implementation Work Plan, Permit Modification and Army Funding

** Inspections continue on an annual basis until such time that the Army demonstrates to ADEM's satisfaction that no residual munitions and explosives of concern remain in the subsurface

Page 1 of 1
Data Date: 31-Mar-21



APPENDIX D

QUALITY ASSURANCE PROJECT PLAN

**Quality Assurance Project Plan
for the
Corrective Measures
RSA-221-R-01
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:
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April 2021

List of Quality Assurance Project Plan Worksheets

Worksheet Nos. 1 & 2	Title and Approval Page
Worksheet Nos. 3 & 5	Project Organization and QAPP Distribution
Worksheet Nos. 4, 7, & 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 & 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 Nos. 19 & 30	Sample Containers, Preservation, and Hold Times
Worksheet No. 20	Field Quality Control (QC)
Worksheet No. 21	Field Standard Operating Procedures (SOPs)
Worksheet No. 22	Field Equipment Calibration, Maintenance, Testing, and Inspection
Worksheet No. 23	Analytical SOPs
Worksheet No. 24	Analytical Instrument Calibration
Worksheet No. 25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection
Worksheet Nos. 26 & 27	Sample Handling, Custody, and Disposal
Worksheet No. 28	Analytical Quality Control and Corrective Action
Worksheet No. 29	Project Documents and Records
Worksheet Nos. 31, 32 & 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

Attachment 1 – Scoping Session Memorandum for Worksheet No. 9

1.0 Introduction

This quality assurance project plan (QAPP) has been prepared to guide the conduct of corrective measures for RSA-221-R-01. This QAPP is an appendix to the corrective measures implementation (CMI) work plan for RSA-221-R-01. 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 & 2: Title and Approval Page

Site Name/Project Name	Redstone Arsenal, Madison County, Alabama/Huntsville MEGA
Site Location	RSA-221-R-01, Fuse Storage and Munitions Disposal Area
Site Number/Code	RSA-221-R-01
Operable Unit (OU)	OU-15
Contractor Name	Aptim Federal Services, LLC (APTIM)
Contract Number	W912DY-17-D-0003
Contract Title	Corrective Measures Implementation at Multiple Sites, Redstone Arsenal
Delivery Order	W912DY-19-F-1116
Guidance used to prepare site-specific plan	<p>Aptim Federal Services, LLC (APTIM), 2019, <i>Statement of Basis/Decision Document, RSA-221-R-01, Fuse Storage and Munitions Disposal Area, Operable Unit 15, U.S. Army Garrison-Redstone, Madison County, Alabama</i>, Prepared for Mission & Installation Contracting Command, June.</p> <p>Aptim Federal Services, LLC (APTIM), 2018, <i>Revised Revision 1 RCRA Facility Investigation Report RSA-221-R-01, Fuse Storage and Munitions Disposal Area, Operable Unit 15, U.S. Army Garrison-Redstone, Madison County, Alabama</i>, Prepared for Mission & Installation Contracting Command, September.</p> <p>CB&I Federal Services LLC (CB&I), 2017, <i>Final Focused Corrective Measures Study Report, RSA-221-R-01, Fuse Storage and Munitions Disposal Area, Operable Unit 15, US Army Garrison-Redstone, Madison County, Alabama</i>, Prepared for Mission & Installation Contracting Command, May.</p> <p>Intergovernmental Data Quality Task Force, 2005, <i>Uniform Federal Policy for Quality Assurance Project Plans</i>.</p> <p>IT Corporation (IT), 2002a, <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>U.S. Army Corps of Engineers, 2015, <i>Technical Guidance for Military Munitions Response Action, Engineer Manual 200-1-15</i>, 30 October.</p> <p>U.S. Department of Defense (DoD), 2017, <i>Quality Systems Manual for Environmental Laboratories Version 5.1</i>, January.</p>

Worksheet Nos. 1 & 2: Title and Approval Page

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Regulatory Program	<p>Resource Conservation and Recovery Act (RCRA), ADEM</p> <p>Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), EPA Region 4</p>
Approval Entities	<p>U.S. Army Garrison – Redstone; U.S. Army Engineering and Support Center, Huntsville (CEHNC); Alabama Department of Environmental Management (ADEM)</p>
Work Plan	<p><input checked="" type="checkbox"/> Corrective Measures Implementation <input type="checkbox"/> Generic Field Sampling Plan</p>
Dates of Scoping Session	<p>November 20, 2019 (see Attachment D-1)</p>
Dates and Titles of SFSP Documents Written for Previous Site Work (if applicable)	<p>References for documents used to prepare the CMI Work Plan are included in Chapter 6.0 of the CMI Work Plan.</p>
Organizational Partners (stakeholders) and Their Connection with Lead Organization	<p>U.S. Army Garrison-Redstone – Site manager for RSA-221-R-01 and point of contact with regulators.</p> <p>CEHNC – Oversees contractor’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>
Data Users	<p>CEHNC, Project/Task Leads, Engineering, support personnel, U.S. Army Garrison-Redstone, ADEM, EPA Region 4</p>

Worksheet Nos. 1 & 2: Title and Approval Page

The below signatures indicate the representatives of the subject organizations have reviewed this RSA-221-R-01-specific QAPP and concur with its implementation as written.

Approval:

Donnie C. Burton

Digitally signed by Donnie C.
Burton
Date: 2021.04.15 13:41:16 -04'00'

Don Burton

APTIM Project Manager (PM)

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Date: 2021.04.15 13:10:43 -05'00'

Date

Ashley Roeske, USACE PM/

Contracting Officer Representative (COR)

Date

Worksheet Nos. 3 & 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	Ashley.E.Roeske@usace.army.mil
Clint Howard	Chief Installation Restoration Branch	U.S. Army Garrison - Redstone	256-842-3702	joseph.c.howard1.civ@mail.mil
Jason N. Watson	Army Site Task Manager	U.S. Army Garrison - Redstone	256-842-1448	Jason.n.watson3.civ@mail.mil
Philip Stroud	Lead Remedial Project Manager	ADEM	334-270-5684	PNS@adem.alabama.gov
Dr. Heather McDonald, PE	Technical Manager	U.S. Army Engineering & Support Center, Huntsville	256-895-1892	Heather.B.Mcdonald@usace.army.mil
Don Burton	Project Manager	APTIM	865-207-1394	Don.burton@aptim.com
Dennis Seymore	Senior Scientist	APTIM	865-414-6073	Dennis.seymore@aptim.com
Gail Cooley	Site Technical Lead	APTIM	865-556-1967	Gail.cooley@aptim.com
Emily Davis	Regulatory Specialist	APTIM	717-737-1049	Emily.davis@aptim.com
Tricia Felt	Corporate Quality Management Director	APTIM	303-741-7426	Tricia.felt@aptim.com
Brian Rhodes	Project QA/QC Manager/Quality Control Site Manager (QCSM)	APTIM	256-714-4200	Brian.rhodes@aptim.com
Vicki Graves	Project Chemist	APTIM	865-560-7818	Vicki.graves@aptim.com
Ken Hurley	Project Engineer	APTIM	865-560-7831	Kenneth.hurley@aptim.com

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 & 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 No. 4, 7, & 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications	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	
Jason Watson	Army Site Manager	U.S. Army Garrison - Redstone	Responsible for the coordination and implementation of the site-specific corrective measures tasks associated with RSA-221-R-01, including all technical and regulatory issues.	Specified by Army requirements	
Don Burton	Project Manager	APTIM	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. 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. Responsible for monthly progress and cost reporting and change management in response to RSA's mission needs.	(1) A college degree in business, engineering, construction management, geology, chemistry, or related field. (2) Professional registration, in their respective field, if appropriate. (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.	

Worksheet No. 4, 7, & 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications	Signature/Date
Dennis Seymore	Senior Scientist	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 contractor 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-17-F-1116 activities.	(1) An advanced 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	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 No. 4, 7, & 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications	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.	
Tricia Felt	Corporate Quality Management Director	APTIM	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:	(1) A college degree in engineering, construction management, geology, chemistry, or related field and professional registration. (2) Professional registration, in their respective field, if appropriate. (3) A minimum of 5 years Quality Assurance/Control experience, with a minimum of 3 years in Environmental Remediation projects.	

Worksheet No. 4, 7, & 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications	Signature/Date
Tricia Felt (Continued)	Corporate Quality Management Director	APTIM	<ul style="list-style-type: none"> • 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. • Reviews quality-related tasks in the detailed site-specific plans. • Provides project-specific training in QA/QC matters to contractor personnel, as needed, identified, or requested by the PM. • Acts as the QCSM, if required. 		
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"> • 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. • Implements project-specific QAPP • Actively tracks the progress of quality tasks in the QAPP and consults periodically with the Program Manager and PM on quality-related issues • Prepares and submits QC reports as required to the PM as well as to the corporate QA management. • Approves field CAs prior to implementation. 	BS in environmental science or related field plus 5 years experience in quality assurance	

Worksheet No. 4, 7, & 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications	Signature/Date
Brian Rhodes (Continued)	QCSM	APTIM	<ul style="list-style-type: none"> • 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. • Ensures that performance and system inspections are performed. • Ensures that necessary CAs are taken for incidents of nonconformance. • Assists in the implementation of CAs to prevent recurrence of any problems. • If significant adverse conditions exist, implements a CA Request in accordance with APTIM policies and Corporate Quality Management Director oversight. • Assists on training and orientation of field staff regarding task-specific and IW plans • Conducts performance and systems inspections • Identifies and reports nonconforming items or activities • Initiates recommended CA • Verifies implementation of CA • Monitors subcontractors on and off site • Certifies submittal documents • Prepares all QC reports as required by contract specifications • Notifies the Corporate Quality Management Director of conditions adverse to quality which cannot be resolved at the project level. 		

Worksheet No. 4, 7, & 8: Personnel Qualifications and Sign-Off Sheet

Name	Title	Organizational Affiliation	Responsibilities	Minimum Required Qualifications	Signature/Date
Brian Rhodes	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	Works with the project team in formulating plans and approaches and helps to assess sampling, analytical, and QA/QC requirements for each sampling and analysis project task, if required. However, no sampling and laboratory analyses are currently planned for the RSA-221-R-01 corrective measures.	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	
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.
- CMI – Corrective measures implementation.
- CTC – Cost-to-complete.
- DO – Delivery order.
- EPA – U.S. Environmental Protection Agency.

Worksheet No. 4, 7, & 8: Personnel Qualifications and Sign-Off Sheet

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.
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 U.S. Army Engineering and Support Center, Huntsville (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 Jason Watson	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) Phillip Stroud	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	Dennis Seymore	865-414-6073	Maintains communication with all project and task technical lead personnel and communicates with the Contractor 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	865-660-7065	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 Program 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.).
Field Activities	APTIM QCSM	Brian Rhodes	256-714-4200	Daily field activities are summarized on weekly reports and posted for distribution.
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 QA/QC Manager, who forwards to the APTIM Technical Lead and appropriate individuals for input and approval.

Worksheet No. 6: Communication Pathways and Procedures

Communication Drivers	Responding Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
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.
GIS 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.
 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.
 TBD – To be determined.

Worksheet No. 9: Project Planning Session Summary

Project Title: Multiple Sites Corrective Measures Project Contract/Delivery Order: <u>W912DY-17-D-0003/W912DY-19-F-1116</u> Project Manager: Don Burton		Site Name(s): <u>RSA-221-R-01/Redstone Arsenal</u> Site Location: <u>Madison County, Alabama</u>		
Date of Session: November 20, 2019 Scoping Session Purpose: See Description Below				
Name	Title	Affiliation	Phone #	E-mail Address
Ashley Roeske	Contracting Officer Representative	CEHNC	256-895-1429	ashley.e.roeske@usace.army.mil
Dr. Heather McDonald PE	Technical Manager	CEHNC	256-895-1392	Heather.b.mcdonald@usace.army.mil
Jason Watson	Remedial Project Manager	U.S. Army Garrison Redstone	256-842-1448	jason.n.watson3.civ@mail.mil
Philip Stroud	Lead Remedial Project Manager	ADEM	334-270-5684	PNS@adem.alabama.gov
Richard Jannett	Hydrogeologist	ADEM	TBD	TBD
Dan Haines	UXO Specialist	UXO Pro	TBD	TBD
Don Burton	Project Manager	APTIM	865-207-1394	don.burton@aptim.com
Emily Davis	Regulatory Specialist/Technical Lead	APTIM	717-737-1049	Emily.davis@aptim.com
Dennis Seymore	Senior Scientist	APTIM	865-414-6073	dennis.seymore@aptim.com
Gail Cooley	Subject Matter Expert	APTIM	865-556-1967	gail.cooley@aptim.com
Christopher Strzempka	Subject Matter Expert	APTIM	567-208-9069	Christopher.strzempka@aptim.com

TBD – To be determined.

See RSA-221-R-01 CMIP Scoping Session Memorandum for the scoping session held on November 20, 2019 in Attachment D-1.

Worksheet No. 10: Conceptual Site Model

Corrective measures are required to address residual MEC potentially present in soil posing unacceptable risks to human health and does not allow for unrestricted use. An investigation was conducted for MEC at the site, but not all anomalies above the project threshold in the subsurface were investigated. There is a 95 percent confidence that the true unacceptable item rate is no larger than 0.5 UXO per acre at the site. The CMI Work Plan provides the site description, history, and environmental setting (Section 1.2); investigations conducted and results (Sections 2.1 and 2.2); human health and ecological risk results and land-use considerations (Section 2.3); site hazards with potential MEC (Section 2.4); and the final conceptual site model (Section 2.6). Background site maps are included in the CMI work plan.

Worksheet No. 11: Project/Data Quality Objectives

Chapter 3.0 of the corrective measures implementation (CMI) work plan provides the decision summary for the corrective measures at RSA-221-R-01, including objectives of the corrective measures and the need for the corrective measures. The project quality objectives are presented below.

Step 1. State the Problem

- The Resource Conservation and Recovery Act facility investigation concluded that residual munitions and explosives of concern (MEC) may remain in soil since not all subsurface anomalies were investigated. Uninvestigated anomalies in the subsurface detected above project threshold limits have the potential to be MEC posing unacceptable risk to human receptors. The potential for MEC is a result of former Department of Defense (DoD) activities.
- If restricted use at RSA-221-R-01 is to be authorized, action is required to reduce potential exposure of current and future receptors to soil potentially containing MEC.
- Chemicals of concern (COC) in groundwater under RSA-221-R-01 do not require corrective measures.

Step 2. Identify the Goal of the Study

- To allow restricted use at RSA-221-R-01, corrective measures are needed to address soil potentially contaminated with MEC, which have been identified as posing a potential threat to human health warranting further action.
- No chemicals of concern are present in groundwater under RSA-221-R-01.

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-221-R-01 soil.
- Review of historical documents indicates that site buildings were formerly used for fuze storage and the site drainage swale was used for munitions disposal.
- Results of the existing investigations.
- The conceptual site model (CSM) for RSA-221-R-01.
- All quality control (QC) and quality assurance (QA) records of data quality checks.

Step 4. Define the Boundaries of the Study

- MEC is potentially present within the subsurface soil within the study boundaries defined in the RFI, which was conducted in accordance with the Department's Alabama Environmental Investigation and Remediation Guidance.
- Based on site history and existing data collected, the current boundary includes six buildings and a drainage swale.
- The drainage swale and building areas have been identified as potential locations where residual MEC may be present.

Worksheet No. 11: Project/Data Quality Objectives

- Corrective measures will be conducted to the limits of the identified site boundary.

Step 5. Develop the Analytic Approach

- The corrective measures will include establishment of land-use controls including an engineering barrier.

Step 6. Specify Performance or Acceptance Criteria

- Selected definable features of work and tasks will achieve the performance criteria specified in the CMIP and supporting documents.

Step 7. Develop 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.

CMI – Corrective measures implementation.

COC – Chemical of concern.

MEC – Munitions and explosives of concern.

Worksheet No. 12: Measurement Performance Criteria

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

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 RFI (APTIM, 2018)	Aptim Federal Services, LLC (APTIM), 2018, <i>Revision 1 RCRA Facility Investigation Report RSA-221-R-01, Fuse Storage and Munitions Disposal Area, Operable Unit 15, U.S. Army Garrison- Redstone, Madison County, Alabama, September.</i>	Refer to Section 2.1 in the CMI Work Plan	Previous data collected for this site were reviewed in Chapter 3 and Table 3-1 of the RFI 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 & 16: Project Tasks and Schedule

The project tasks are presented in Chapter 4.0 of the RSA-221-R-01 corrective measures implementation work plan and the construction quality assurance plan (Appendix G). Appendix C in the corrective measures implementation work plan contains the project schedule.

Worksheet No. 15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet No. 17: Sampling Design and Rationale

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet No. 18: Sampling Locations and Methods

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet Nos. 19 & 30: Sample Containers, Preservation, and Hold Times

These worksheets are not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet No. 20: Field Quality Control Sample Summary

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet No. 21: Field Standard Operating Procedures (SOPs)

The following SOPs from the IW QAPP will be followed as applicable during the conduct of the RSA-221-R-01 corrective measures. Sampling and analysis tasks are not part of the RSA-221-R-01 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.
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 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 activities.
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 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 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 34.0	Subsurface Utility Avoidance Rev. 4 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.
SOP 40.0	Receipt Inspection Rev. 4 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. 4 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.

Worksheet No. 21: Field Standard Operating Procedures (SOPs)

Reference Number	Title, Revision Date and/or Number	Equipment Type	Comments
SOP 42.0	Surveillance Rev. 4 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. 4 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. 4 December 2019	NA	SOP 44.0 defines the requirements for identifying and processing a Corrective Action Request.
SOP 45.0	Quality Audits Rev. 4 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.

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	Hand-Held Metal Detection Instrument	<p>Calibrate in accordance with manufacturer's requirements.</p> <p>Check sensitivity against surrogate verification strip-surrogates to mimic 75 percent of the metal footprint of a 60-millimeter mortar.</p>	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 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.

Worksheet No. 23: Analytical SOPs

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet No. 24: Analytical Instrument Calibration

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet No. 25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

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

These worksheets are not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet No. 28: Analytical Quality Control and Corrective Action

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

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 is not 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.

Corrective Measures Documents and Records	On-Site Documents and Records	Off-Site Documents and Records	Data Assessment Documents and Records	Health and Safety
CMI Work Plan including the QAPP Corrective Measures Implementation Report Field Activity Daily Log Variance Request	Field Activity Daily Log Equipment Calibration Receipt and Logs Photo Documentation and Tracking Log Daily Construction Log	NA	NA	Accident Prevention Plan Project-specific Safety and Health Plan Project Environmental Safety and Health Plan and Sign-off Sheet Munitions and Explosives of Concern Guidance for Environmental and Construction Activities Daily Safety Meeting Daily Activity Hazard Analysis Equipment Calibration Receipt 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	Excavation Permits	QAPP and all revisions	Project Schedule	CMIP
Incoming Correspondence	Right-of-Entry Permits	Management Assessment Reports – Internal	Project Budget	Decision Documents
Outgoing Correspondence	Construction Permits	Independent Assessment Reports – Internal	Work Breakdown Structure	Project Reports
Correspondence from Others	Overhead Utility Clearance Permit	Receipt Inspection Checklist	Contract Change Request	Surveys
Telephone Conversation Logs	Underground Utility Clearance Permit	Preparatory Inspection Checklist	Project Activity Reports	Drawings and Checklists/Check prints
Meeting Notes – Internal	Underground Utility Variance	Initial Inspection Checklist	Project Summary/Status Report	As-Built Drawings
Meeting Notes – External		Follow-up Inspection Checklist	Invoices	Corrective Measures Implementation Reports
Project Related Emails		Nonconformance Report and Tracking Log	Insurance	
		Variance Report and Tracking Log		
		Site QC Reports		

CMIP – Corrective measures implementation.
 QAPP – Quality Assurance Project Plan.
 QC – Quality control.

Record-Keeping, Archival, and Retrieval Requirements

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

Field Records Generation

Field records generation will be in accordance with APTIM SOPs.

Record Archival and Retrieval Procedures for Field Information

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

Worksheet No. 29: Project Documents and Records

Location of Study Records, Reports, and Formal Documents

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

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

Record Retention Time Procedures

At the close of this task 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 SOPs.

Computer Hardware and Software

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

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

Assessments

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
LUC Inspections	Annually	Internal	Army	Jason Watson, Dr. Heather McDonald or designees	Jason Watson, Dr. Heather McDonald or designees	Jason Watson, Dr. Heather McDonald or designees	Jason Watson, Dr. Heather McDonald or designees
Preparatory Inspections/ meetings	Task kickoff	Internal	APTIM	Don Burton, Project Manager, APTIM, Brian Rhodes, QCSM, APTIM, Jason Watson, 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	Don Burton, Project Manager, APTIM, Brian Rhodes, QCSM, APTIM, Jason Watson, 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, & 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)
Follow-Up Inspections	Task as required	Internal	APTIM	Don Burton, Project Manager, APTIM, Brian Rhodes, QCSM, APTIM, Jason Watson, 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 as required	Internal	APTIM	Don Burton, Project Manager, APTIM, Brian Rhodes, QCSM, APTIM, Jason Watson, 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, & 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. The Quality Assurance (QA) Manager or Project Manager (PM) may conduct audits at a greater frequency than indicated in Worksheet No. 31.

Management Assessments and Independent Assessments

Management assessments and independent assessments may be used to review documentation procedures. Assessment results are used to evaluate a system's ability to fulfill program objectives and to identify any areas requiring corrective actions (CA). Inspections 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 the information 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 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, & 33: Assessments and Corrective Action

Table 31-1 Guidance on Audits and Inspections (Continued)

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
- Document control
- 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.

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 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, & 33: Assessments and Corrective Action

Table 31-1 Guidance on Audits and Inspections (Continued)

Receipt Inspections

Standard 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 contractor project files in accordance with the SOPs. Any damaged, unsealed, or used equipment (unless adequately cleaned and returned to service) will not be accepted.

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 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 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 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.

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

Table 31-1 Guidance on Audits and Inspections (Continued)

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 Alabama Department of Environmental Management and other regulatory agencies shall be notified of any significant CAs by the U.S. Army Garrison-Redstone.

Nonconformance Documentation

Complex field investigation, remediation, sampling, and analysis tasks, such as those performed routinely as part of the RSA environmental projects, 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 IW QAPP Volume II or task 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 the IW Quality Assurance Program Plan (HGL, 2019).

The identification of a nonconformance is the responsibility of every person assigned to support the RSA 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 the specifics of what occurred. The site 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. If the nonconforming activity, service, or material is severe, it may require cessation of all activities and implementation of a stop work order (SOP 39.0) as presented in the IW QAPP Volume II.

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 DQOs 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. An example project variance form is included in IW QAPP Volume II. This form has been designed to ensure 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, & 33: Assessments and Corrective Action

Assessment Findings and Corrective Action Responses:

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Time Frame of Notification ¹	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Organization) ²	Time Frame for Response
Management Assessments	Nonconformance Report (NCR) ^{3,4}	Stephen Moran, Program Manager, APTIM	5 Days	Corrective Action Request (CAR)	Steve Moran, Program Manager, APTIM; Don Burton, Project Manager, APTIM; Dennis Seymore, Senior Scientist, APTIM	30 Days
Independent Assessments	NCR ^{3,4}	Don Burton, Project Manager, APTIM Tricia Felt, Corporate Quality Management Director, APTIM Dennis Seymore, Senior Scientist, APTIM	5 Days	CAR	Steve Moran, Program Manager, APTIM; Don Burton, Project Manager, APTIM	30 Days
Receipt Inspections	NCR ^{3,4}	Dennis Seymore, Senior Scientist, 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, APTIM	NA
Field Inspections	NCR ^{3,4}	Don Burton, Project Manager, APTIM Brian Rhodes, QCSM, APTIM Tricia Felt, Corporate Quality Management Director, APTIM; Dennis Seymore, Senior Scientist, 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 Dennis Seymore, Senior Scientist, APTIM	NA	NA	NA	NA

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

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Time Frame of Notification ¹	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Organization) ²	Time Frame for Response
Initial Inspection	NCR ^{3,4}	Don Burton, Project Manager, APTIM Dennis Seymore, Senior Scientist, 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 Dennis Seymore, Senior Scientist, APTIM; Brian Rhodes, QCSM, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	30 days
Follow-up Inspections	NCR ^{3,4}	Don Burton, Project Manager, APTIM Dennis Seymore, Senior Scientist, APTIM Tricia Felt, Corporate Quality Management Director, APTIM	5 days	CAR, based on the severity of the nonconforming action, service, or item.	Stephen Moran, Program Manager, APTIM Don Burton, Project Manager, APTIM; Brian Rhodes, QCSM, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	30 days
Final Inspections	NCR ^{3,4}	Gail Cooley, Task Lead, APTIM Don Burton, Project Manager, APTIM Dennis Seymore, Senior Scientist, APTIM Tricia Felt, Corporate Quality Management Director, APTIM	5 days	CAR, based on the severity of the nonconforming action, service, or item.	Stephen Moran, Program Manager, APTIM Don Burton, Project Manager, APTIM; Brian Rhodes, QCSM, APTIM; Tricia Felt, Corporate Quality Management Director, APTIM	30 days

¹ 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.

² 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.

³ 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.

⁴ A copy of the procedure is included in the IW QAPP Volume II with a usable form (HGL, 2019 or most current version).

Worksheet Nos. 31, 32, & 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	Gail Cooley, Task Lead, APTIM or Brian Rhodes, QCSM, APTIM	Don Burton, Project Manager, APTIM and other staff as designated by the Project Manager; Tricia Felt, Corporate Quality Management Director or Designee
Daily Construction QC Report- Subcontracted	Daily	Daily	Gail Cooley, Task Lead, APTIM or Brian Rhodes, QCSM, APTIM	Don Burton, Project Manager, APTIM and other staff as designated by the Project Manager; Tricia Felt, Corporate Quality Management Director or Designee
Daily Construction QC Report- Self Performed	Daily	Daily	Gail Cooley, Task 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	Gail Cooley, Task 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 or Designee	Small working group
Three Phase Inspection Checklist	As needed	As needed	Gail Cooley, Task Lead, APTIM or Brian Rhodes, QCSM, APTIM	Don Burton, Project Manager, APTIM and other staff as designated by the Project Manager Tricia Felt, Corporate Quality Management Director, APTIM; Project Central Files
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	Don Burton, Project Manager, APTIM and other staff as designated by the Project Manager Tricia Felt, Corporate Quality Management Director, APTIM

Worksheet Nos. 31, 32, & 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 Variance	As needed	Prior to executing the definable feature of work	Responsible Party Jason Watson, Army POC Dennis Seymore, Senior Scientist, 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, 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, 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
APTIM Internal Audit Reports	As needed	No later than 30 days after the audit	APTIM Auditors	Dennis Seymore, Senior Scientist, APTIM Tricia Felt, Corporate Quality Management Director, APTIM Don Burton, Project Manager, APTIM

DoD – U.S. Department of Defense.
 POC – Point of contact.
 QA – Quality assurance.
 QC – Quality control.
 QCSM – Quality control site manager.

Worksheet No. 34: Data Verification and Validation Inputs

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet No. 35: Data Verification Procedures

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet No. 36: Data Validation Procedures

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

Worksheet No. 37: Data Usability Assessment

This worksheet is not applicable since sampling and analysis tasks are not part of the RSA-221-R-01 corrective measures.

ATTACHMENT D-1

SCOPING SESSION MEMORANDUM FOR WORKSHEET NO. 9

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

**Corrective Measures Implementation Work Plans RSA-141-R-01 and RSA-221-R-01,
Redstone Arsenal, Madison County, Alabama**

1.0 Introduction

This document provides a record of the Scoping Meeting for the Corrective Measures Implementation work plans (CMIP) for RSA-141-R-01 and RSA-221-R-01 at the Redstone Arsenal (RSA) in Huntsville, Alabama. This meeting commenced at 9:00 AM Central on November 20, 2019 at Building 4488, Redstone Arsenal, Madison County, Alabama. 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: Revised Slide Presentation.

Table 1.1: Kickoff Meeting Participants

Participant Information	Participant Information
CEHNC COR Ashley Roeske	APTIM PM Don Burton
ADEM Philip Stroud	APTIM SME Gail Cooley (teleconference)
ADEM Richard Jannett	APTIM Technical Lead/SME Emily Davis (teleconference)
CEHNC Technical Manager Dr. Heather McDonald PE	APTIM SME Chris Strzempka (teleconference)
RSA PM Jason Watson	UXO Pro Dan Haines (teleconference)

ADEM – Alabama Department of Environmental Management
 CEHNC – U.S. Army Engineering and Support Center, Huntsville
 COR – Contracting Officer Representative
 PM – Project Manager
 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-141-R-01 and RSA-221-R-01 to the Project Team and stakeholders. To support this presentation a site description/history, document status, and RFI and CMS summaries 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-141-R-01 and RSA-221-R-01 under this DO are:

- 1) Achieve DA approval and Regulatory concurrence of CMIPs;
- 2) Achieve DA approval of statement of basis/decision documents (SB/DD); and
- 3) Achieve DA approval and Regulatory concurrence of the Corrective Measures Implementation-Construction (CMIC) activities and the Corrective Measures Report (CMR) for RSA-221-R-01. Conduct of the CMIC and preparation of the CMR for RSA-141-R-01 are optional tasks that can be exercised by the Army.

1.2 Meeting Discussion Topics

Don began the discussion by leading the Project Team members through the CMIP Scoping Meeting presentation for RSA-141-R-01 and RSA-221-R-01 and SB/DD Scoping Meeting presentation for RSA-221-R-01 (Attachment A). The following comments and discussions occurred during the meeting with the decisions and details summarized below.

RSA-141-R-01

- **RSA-141-R-01, Site Description/History (Slide 11)** – Philip requested further information regarding the “actual discovery of several 4.2-inch mortar projectiles.” Emily explained that these items were “mortar-like” and believed to not be explosively configured – no written records have been located of their recovery or disposal.
- **RSA-141-R-01, RFI Summary (Slide 15)** – Philip asked about 95% confidence level with respect to potential munitions and explosives of concern (MEC) left in-place. Jason explained the Army’s position on these sites in “Low” unexploded ordnance (UXO) probability areas and no identified MEC by using the “Site Access and Use Restrictions” approach (like RSA-294-R-01). This approach is managed under the Site Access Control (SAC) program, explosives safety management program (ESMP)/AMCOM Safety, and Master Planning. The Army cannot get environmental dollars for addressing the “potential” for MEC at either RSA-141-R-01 or RSA-221-R-01. Ashley addressed Philip’s concern if a MEC item is found during the corrective measures by stating that the Army has contingency plans as part of the CMIP for unplanned but possible issues such as finding a potential MEC item. Ashley also responded to Philip’s question that there are no plans at this time for night time work at this site but stated that an ordnance and explosives safety specialist (OESS) would still be on site (not full time) for this work.
- **RSA-141-R-01, RCRA Document Status (Slide 19)** – Philip made a point that the Department does not get involved in the CMSs but he appreciated that the Army is walking him through the alternatives evaluated for the sites.

- **RSA-141-R-01, Revised Cleanup Goals for PAH Compounds Presented in Proposal (Slide 20)** – Don explained that the CMIP would document the revised risk evaluation using the updated toxicity values and the development of the new cleanup goal (CG) for polynuclear aromatic hydrocarbons (PAH).
- **RSA-141-R-01, Corrective Measure Figure (Slide 21)** – Philip said that the excavations may increase in size and that the red boxes are not necessarily the final excavation limits. The Project Team agreed and Don stated post excavation sampling will define the final excavation limits.
- **RSA-141-R-01, CMIP Execution Strategy (Slide 22)** – Philip asked if the dig would be to residential (unrestricted) and the schedule for the dig. Don confirmed that the dig would be to the residential CGs for arsenic and PAHs and that the schedule is targeting summer time/dry time of year to minimize need for excavation dewatering.
- **RSA-141-R-01, Proposed CMIP Activities (Slides 23 and 24)** – Discussion covered several topics as follows:
 - Philip touched on use of best management practices with the corrective measures. Don agreed that they will be included.
 - Philip asked about the future status of site fencing and if it was needed for the site access and use restrictions. Jason clarified that the fence will not be needed for the corrective measures and it will be in the National Aeronautics and Space Administration (NASA)’s court if they want it and the resulting maintenance needed.
 - Philip asked if the Army would keep the monitoring wells for the site or transfer them to NASA. Jason said they would need to talk with NASA about a transfer and Emily noted that some may be needed for the Army’s future RSA-148/149 groundwater unit monitoring.
 - Philip asked why the Army is responsible for land-use controls (LUC) for vapor intrusion if groundwater is NASA’s responsibility? Emily explained that this was decided some time ago during the U.S. Environmental Protection Agency (EPA) involvement at RSA and defining what media stay with the surface sites and which go to the groundwater unit responsibility. Surface media was ultimately defined to include soil vapor because any risks with vapor intrusion would be most expeditiously addressed with the surface media site cleanup versus the groundwater units especially if dense non-aqueous phase liquid is present.
 - Philip asked about how the Army is addressing the notice of environmental use restriction (NEUR). Gail explained that the environmental use restriction is still

presented in the CMIP with detail in an appendix but the NEUR is not included until the CMR. RSA-056/139 CMIP is an example of a recent CMIP following this process. Emily provided an example of RSA-060. Don explained that the Army and ADEM are still in disagreement with the wording of the NEUR.

- Jason further emphasized the use of the Army's SAC program for potential MEC. Philip asked if ADEM was ever involved in reviewing and approving of the SAC program. Jason stated that this has been an internal Army program and ADEM has not been involved.
- **RSA-141-R-01, Path Forward (Slide 25)** – Don noted that due to the holidays that the due date for the Advance Review Rev. 0 CMIP to Army would be 4 January 2020. Don concluded the RSA-141-R-01 scoping with a listing of the following action items: 1) Fencing and 2) monitoring wells to be retained with Army's RSA-149 groundwater unit program or transfer to NASA.
- **Do outs to ensure that the CMIP review can go smoothly:**
 - Make sure ahead of time that NASA has agreed to address the groundwater beneath RSA-141-R-01.
 - Make sure that the fence issue is resolved.
 - Ensure that wells will be “transferred” to RSA-149 or to NASA.

RSA-221-R-01

- **RSA-221-R-01, CMS Report (Slide 34)** – Several discussion items were raised:
 - Jason explained why LUCs are stated here in Alternative 2 with finalization of the CMS report in 2017 and how they will be changed to Site Access and Use Restrictions like RSA-294-R-01 in the CMIP.
 - Jason explained that the site access and use restriction implemented by the SAC program involves AMCOM Safety and Master Planning and not the Environmental Management Department any longer. For example, if someone wants to dig at the site then will have to have on call UXO support and the ESMP provides worker education, protocols before can dig, etc. He emphasized it comes down to the level of risk and how the Army can pay for it.
- **RSA-221-R-01, SB/DD Summary (Slide 37)** – Don noted that Slides 37 through 39 present details of SB/DD scoping and the SB/DD will continue through Army entity review and public comment; however, the document will not be finalized until ADEM concurrence with the CMIP.

- **RSA-221-R-01, Proposed CMIP Activities (Slide 42)** – Several discussions ensued as Don opened the floor for questions. These included:
 - Philip asked why the Army selected LUCs rather than removal of metal. Ashley stated that the Army can't get money for a dig due to the nature of the items (wholly inert munitions components and not UXO) and the site UXO probability of "Low". Because the wholly inert munitions components pose no unacceptable risk, Army environmental funds cannot be used to remove this scrap metal.
 - Jason explained that the UXO probability of "Low" is not a result of the wholly inert munitions components but rather is because of the site's location on a range.
 - Ashley said that the intention is that any site uses follow plans in the ESMP which is an accepted RSA procedure. She emphasized that qualified personnel will be available for identification of any potential concerns and anyone accessing the site will be educated in the ESMP. Don suggested that the CMIP emphasize the corrective measures objectives. Don also noted that based on the most recent hunting map, RSA-221-R-01 and the igloo area north of the site is considered restricted from hunting.
 - Philip acknowledged that the Army did a good job with the RFI and noted that a CMIP would be prepared to address the potential for MEC. He has concerns with approving a plan to leave what is known to be wholly inert munitions components given the low uncertainty/potential for MEC. Philip wants to take this back to his management for guidance. Ashley suggested the January compliance meeting as a possible venue for the discussion.
 - Dan Haines asked why are the items not called DMM rather munitions components? Ashley and Jason explained that because the material is only components that were never built into a munition, the scrap does not meet the definition of DMM, essentially because the material was never a munition technically.
 - Philip asked if adjacent land was classified as range. Jason addressed land use including hunting and range areas and confirmed this site lies within a "Low" UXO probability area due to the range. Philip suggested inclusion of future land use plans in the CMIP.
 - Jason noted that RSA-294-R-01 set the precedence for the Army's approach to handling MMRP sites without confirmed findings of MEC. AMCOM Safety and Master Planning will manage implementation of site access and use restrictions at RSA-221-R-01 like RSA-294-R-01; the actions are already in place (e.g., Master Planning has the site access and use restriction boundary in place), signs are there,

and the CMIP would basically codify what the Army has already done to implement site access and use restrictions for this site.

- Philip noted that metals breakdown from the wholly inert munitions components will not be an issue for ADEM.
- **RSA-221-R-01, Path Forward (Slide 43)** – Don noted that due to the holidays that the submittal date for the Advance Review Rev. 0 CMIP to Army will be 4 January 2020. Don concluded the RSA-221-R-01 scoping with a listing of the following action items: 1) add site access and use restriction language to CMIP, 2) ADEM requested a site visit which as being tentatively scheduled for this afternoon, if possible, and 3) A meeting will be scheduled to discuss the Army’s corrective measures strategy for MMRP sites like RSA-221-R-01 where wholly inert munitions components have been found but without confirmed MEC and site within “Low” probability area.
- **Do outs to ensure that the CMIP review can go smoothly:**
 - Ensure that terms like DMM versus wholly inert munitions components are explained completely in the CMIP.
 - Explain the reason for the UXO probability rating and how removing the wholly inert munitions components would not reduce the UXO probability.

The meeting was adjourned at approximately 11:10 PM Central.

2.0 Meeting Materials

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

- Attachment A: Revised Slide Presentation

ATTACHMENT A
Revised Slide Presentation

SCOPING SESSION CORRECTIVE MEASURES IMPLEMENTATION WORK PLANS FOR RSA-141-R-01 AND RSA-221-R-01

Redstone Arsenal, Madison County, Alabama
20 November 2019



US Army Corps of Engineers

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SCOPE OF SERVICES

- › Base Delivery Order Objectives for RSA-141-R-01 and RSA-221-R-01:
 - Achieve Department of Army (DA) and Regulatory approvals of Corrective Measures Implementation Plans (CMIP) for RSA-141-R-01 and RSA-221-R-01.
 - Achieve DA approval of Statement of Basis/Decision Documents (SB/DD) for RSA-141-R-01 and RSA-221-R-01.
 - Achieve DA and Regulatory approvals of the Corrective Measures Implementation-Construction (CMI-C) activities and the Corrective Measures Report (CMR) for RSA-221-R-01 (complete remediation services and achieve response complete).
- › Optional Delivery Order Objective for RSA-141-R-01:
 - Achieve DA and Regulatory approvals of the CMI-C activities and the CMR for RSA-141-R-01 (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)
- › US Army Garrison - Redstone Arsenal (RSA)
- › Federal and State Regulations and Guidance to include Interim Guidance (IG)



AGENDA

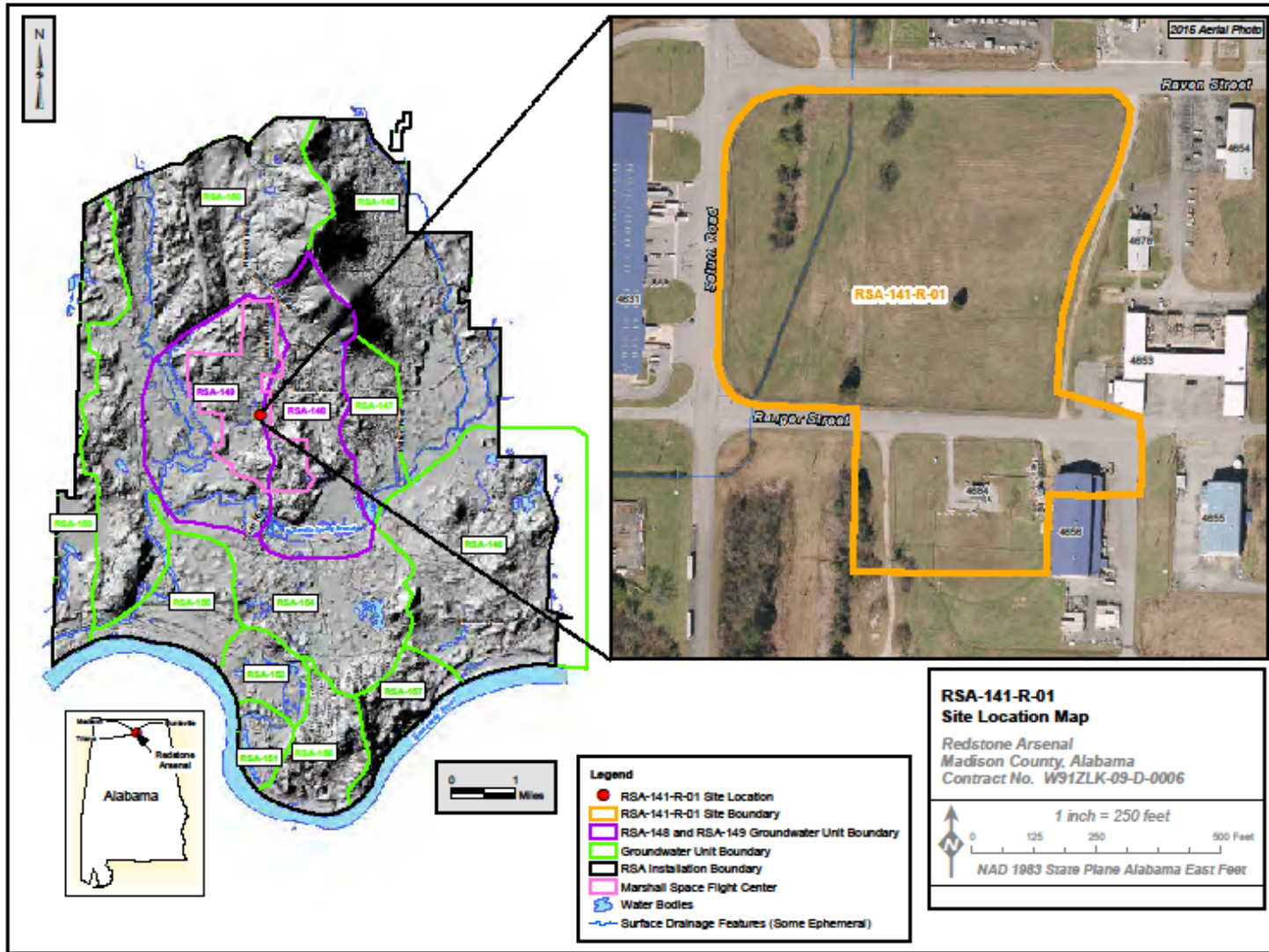
- › Topics for Scoping Session by Site:
- › Site Description/History
- › Document Status
- › Resource Conservation and Recovery Act Facility Investigation (RFI) Summary
- › Corrective Measures Study (CMS) Summary
- › SB/DD Summary (RSA-221-R-01)
- › CMIP Execution Strategy
- › Proposed CMIP Activities
- › Schedule



RSA-141-R-01 – 4.2-INCH MORTAR DISPOSAL SITE BUILDING 4656



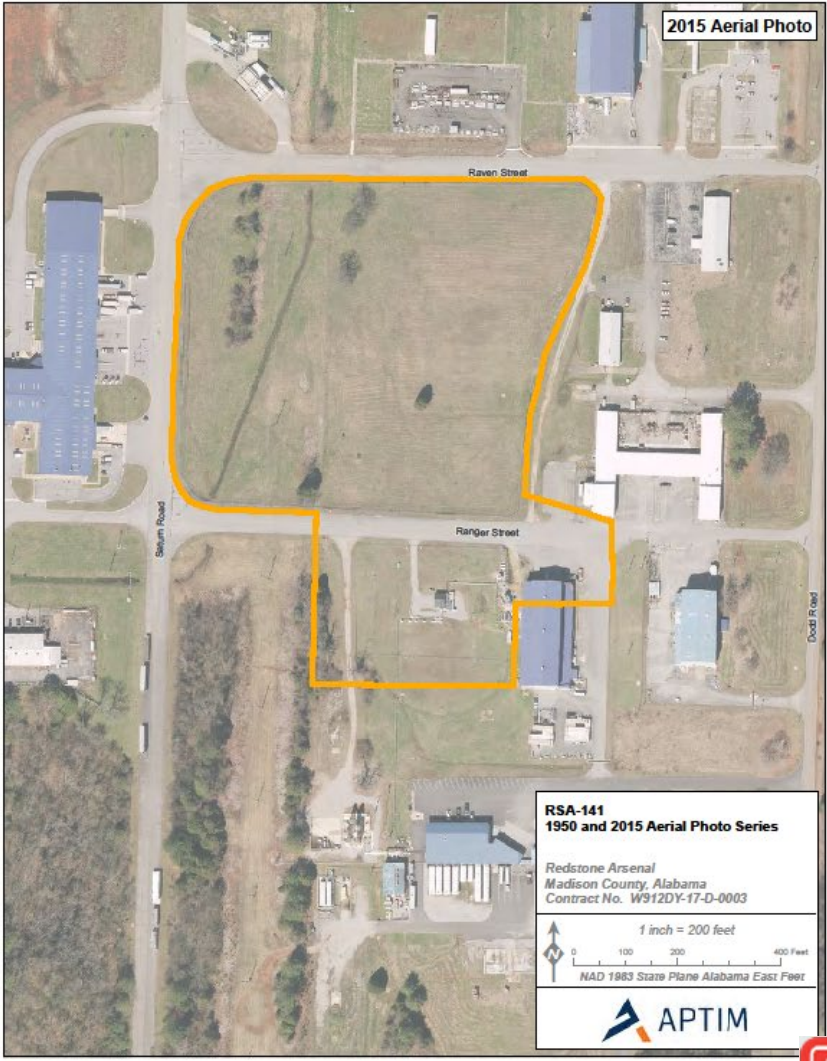
SITE LOCATION MAP



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SITE MAP



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SITE DESCRIPTION/HISTORY: RSA-141-R-01

- › Located on 14.5 acres within central portion of George C. Marshall Space Flight Center (MSFC), above RSA-148 and RSA-149 groundwater units.
- › Army responsible for RSA-141-R-01 surface media site and National Aeronautics and Space Administration (NASA) is responsible for groundwater as part of NASA's Operable Unit 3 under CERCLA.
- › Investigation and cleanup of RSA-141-R-01 surface media funded by RSA's Military Munitions Response Program (MMRP).
- › Unexploded ordnance (UXO) Probability is "Low". Chemical warfare materiel (CWM) probability is "Seldom".
- › Land use: Professional zone and primary mission is administrative and research and development.



SITE DESCRIPTION/HISTORY (CONTINUED): RSA-141-R-01

- › Railroad tracks formerly ran north-south through the site, connecting Huntsville Arsenal Chemical Plants Area No. 1 to the north and the Gulf Chemical Warfare Depot to the south.
- › Beginning in the 1940s, site served as Post Engineer heavy equipment open storage, motor pool, and coal storage yard.
- › Former buildings (razed in 1964):
 - A-152: Oils and grease storage; vehicle steam and washing equipment
 - T-460: Ice storage
 - T-456: Supply storage; tool crib; office
 - T-457A: Insect and rodent control supplies storage
 - T-457: Electrical and railroad supplies and equipment storage
- › Current buildings include northern portion of Building 4656 (NASA hydraulic equipment) and Building 4684 (test bunker for Building 4656).



SITE DESCRIPTION/HISTORY (CONTINUED): RSA-141-R-01

- › During NASA development in 1992, several 4.2-inch mortars (assumed mortar projectiles) were discovered just west of Building 4656 and removed.
- › RSA-141-R-01 is considered a disposal area for munitions-related items as supported by:
 - Actual discovery (several 4.2-inch mortars projectiles)
 - Historical verbal accounts “site was used for disposal (burial) of potential mustard filled munitions after World War II” and “MEC may extend the length of the coal pile” reported in Malcolm Pirnie, Inc. 2008 reports.
- › Majority of the site north and south of Ranger Road was fenced in 1995 under the Site Access Control (SAC) program.
- › In 1999, it was discovered that an industrial waste outfall from NASA Building 4653 (just east of RSA-141-R-01) discharged engine parts cleaning waste into the middle of RSA-141-R-01.



RFI SUMMARY: RSA-141-R-01

- › Conceptual site model (CSM) for Army historical operations includes:
 - Potential buried munitions and explosives of concern (MEC)
 - Select volatile organic compounds (VOC), polynuclear aromatic hydrocarbons (PAH), metals, insecticides, and rodenticides from oil and grease, coal, and insect/rodent control storage activities
 - Munitions-related explosives, perchlorate, metals, and mustard breakdown products from munitions disposal
- › Constituents detected in soil have been delineated to concentrations below applicable screening criteria.
- › Mustard breakdown products were not detected in soil or groundwater and mustard was not detected from the low-level mustard agent analyses on the 4.2-inch mortar projectiles found in 1992.
- › Arsenic and PAHs in soil pose unacceptable risk to human health.



RFI SUMMARY (CONTINUED): RSA-141-R-01

- › No constituents pose unacceptable risks to the environment or a leaching threat to groundwater.
- › A digital geophysical mapping survey and intrusive investigation for MEC were performed in select areas of the site.
- › Eighteen possible burial pits were identified; 16 were investigated via test pits and the remaining two were previously investigated in 1994. No 4.2-inch mortar projectiles or other munition-related items found.
- › A total of 4,967 single point anomalies (SPA) (i.e., interpreted not to be possible burial pits) were identified; 5% or 247 SPAs were randomly selected for investigation. Munitions debris (MD) was recovered from six SPA locations and disposed.
- › MEC was not found during the intrusive investigations at SPAs or possible burial pits.
- › Potential MEC is present in the subsurface since not all anomalies were investigated.



RFI SUMMARY (CONTINUED): RSA-141-R-01

- › Corrective measures for chemicals of concern in groundwater (manganese, methylene chloride, tetrachloroethene, and trichloroethene [TCE]) will be conducted by NASA as part of Source Area 7 within Operable Unit 3.
 - NASA, Final Proposed Plan: Interim Remedial Action for the Highest Concentration Chlorinated Solvent Plumes at Operable Unit 3, April 2019
- › Elevated concentrations of TCE are present in soil vapor from groundwater and pose vapor intrusion risk to occupants of future buildings erected on site. NASA has evaluated vapor intrusion within current buildings in and around RSA-141-R-01.
 - NASA Final Operable Unit 3, Vapor Intrusion Investigation Report, January 2017



RFI SUMMARY (CONTINUED): RSA-141-R-01

- › RFI recommended corrective measures to manage unacceptable human health risks with:
 - Arsenic and select PAHs in soil
 - MEC potentially remaining in the subsurface within uninvestigated anomalies
 - Elevated VOCs in soil gas as a result of groundwater contamination contributing to vapor intrusion concerns within future buildings
- › Alabama Department of Environmental Management (ADEM) concurred with the RFI recommendations on July 25, 2017.



CMS SUMMARY: RSA-141-R-01

- › CMS prepared based on information and recommendations provided in the RFI report.
- › The CMS presented corrective measures to address unacceptable human health risks from:
 - Arsenic and PAHs in soil
 - Potential subsurface MEC
 - Vapor intrusion in the event that buildings are erected on the site
- › Three corrective measures objectives (CMO):
 - Reduce the exposure of commercial worker and hypothetical resident receptors to soils contaminated with arsenic and certain PAHs such that background levels are achieved for arsenic and acceptable risk levels are achieved for the PAHs.
 - Prevent or minimize direct human contact with buried MEC.



CMS SUMMARY: RSA-141-R-01

- Engineering controls must be evaluated/incorporated in the design of buildings intended for occupation to prevent exposure to unacceptable concentrations of TCE in indoor air resulting from elevated concentrations in groundwater.
- › Alternatives evaluated in the CMS:
 - Alternative 1: No Action
 - Alternative 2: Excavation with Off-Site Disposal and Land-Use Controls (LUC)
 - Alternative 3: Closure in Place and LUCs.
- › Following a detailed analysis of alternatives, Alternative 2 was recommended for RSA-141-R-01.
- › DA has concurred with the recommendation of Alternative 2.



RCRA DOCUMENT STATUS: RSA-141-R-01

› Restoration Status

- RFI report: The RFI report received ADEM concurrence on July 25, 2017.
- Final CMS report submitted to Army June 16, 2017 under Task Order 6 of the Program Management Contract (PMC). RSA reviewers approved the final document. U.S. Army Engineering and Support Center, Huntsville (CEHNC)/U.S. Army Environmental Command (AEC) are in agreement with the Final CMS as discussed in the project kickoff meeting (October 23, 2019) and document is considered final.
- SB/DD submitted to Army June 23, 2017 under Task Order 6 of the PMC. Review conducted by RSA. Public comment period held May 25, 2017 to June 23, 2017; no comments received from the public.



RCRA DOCUMENT STATUS (CONTINUED): RSA-141-R-01

› Contracted Work

- SB/DD: Respond to any additional review comments on SB/DD and obtain DA approval.
- CMIP: Prepare CMIP and obtain DA and Regulatory approvals.

› Optional Work

- CMIC: Conduct corrective measures in accordance with approved CMIP.
- CMR: Prepare CMR and obtain DA and Regulatory approvals.

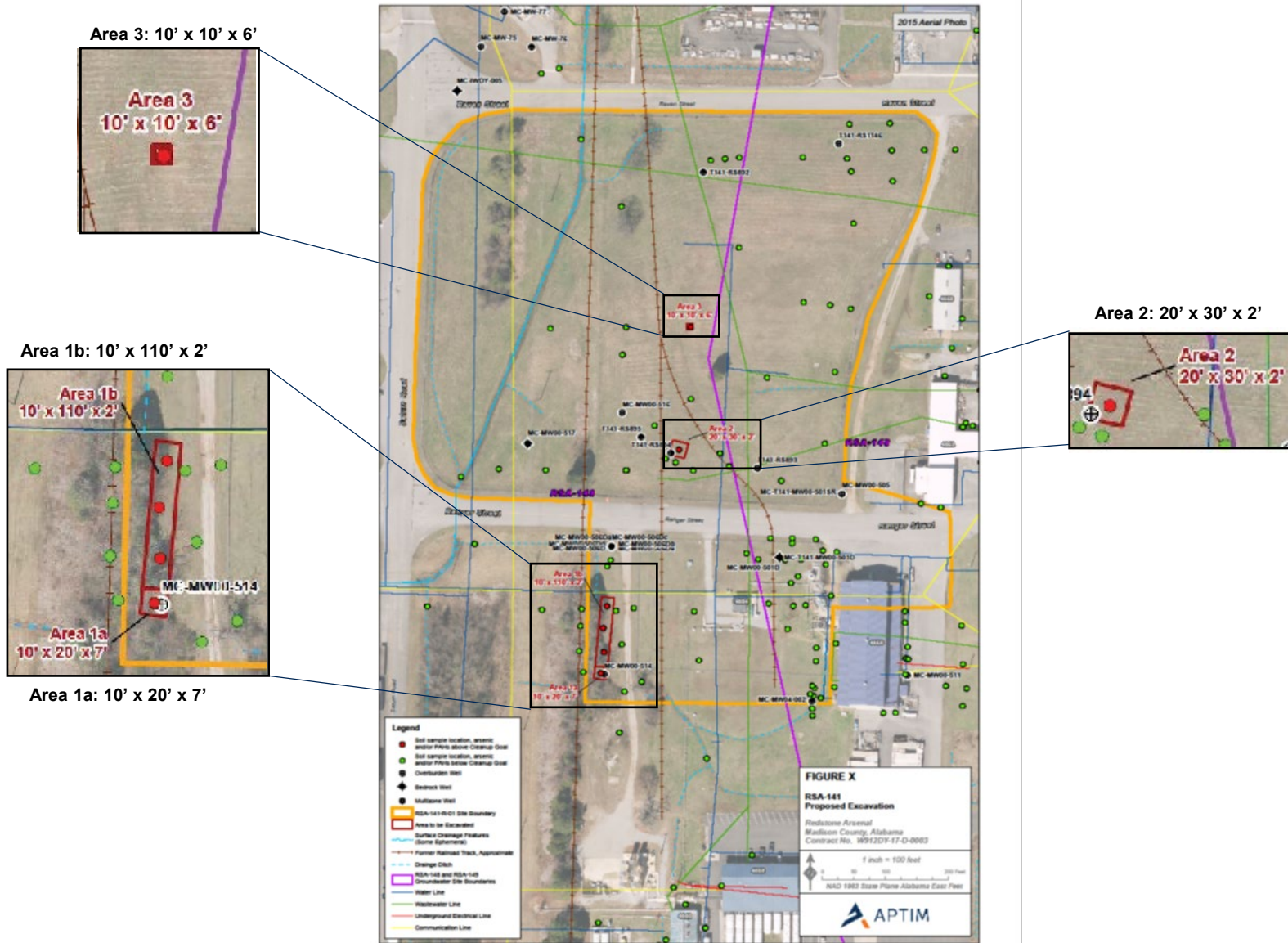


REVISED CLEANUP GOALS FOR PAH COMPOUNDS PRESENTED IN PROPOSAL

- › U.S. Environmental Protection Agency (EPA) published updated toxicity values in 2017 for carcinogenic PAHs.
- › APTIM has used these updated toxicity values to revise the cleanup goals (CG) for carcinogenic PAHs for the residential (unrestricted) receptor from 0.7 milligrams per kilogram (mg/kg) to 5.1 mg/kg.
- › The volume of soil contaminated with arsenic and PAHs to be excavated and disposed will be reduced from approximately 1,380 bank cubic yards (BCY) to 452 BCY.
- › The excavation will cover approximately 4,100 square feet with estimated excavation depths of 7, 2, 2, and 6 feet below ground surface in excavation areas 1A, 1B, 2, and 3, respectively.



CORRECTIVE MEASURES FIGURE



CMIP EXECUTION STRATEGY: RSA-141-R-01

- › Prepare CMIP to implement the CMS recommended Alternative 2 (Excavation and Off-site Disposal and LUCs) and obtain DA and Regulatory approvals.
- › The CMIP will present the following in accordance with Attachment G of the Performance Work Statement (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 at the site (e.g., MEC encountered during the excavations, excavation dewatering, and unknown utilities encountered)



PROPOSED CMIP ACTIVITIES

› Excavation and Off-site Disposal:

- Site preparation, including dig and storm water permits, site clearing, monitoring well closure (and replacement, if needed, for wells within excavation areas), and placement of storm water controls
- Removal of contaminated soils with arsenic and PAHs from four areas and waste characterization for off-site disposal
- Collection and analysis of post-excavation confirmation samples
- Transport of contaminated soil for off-site disposal (expected to be a Subtitle D landfill for nonhazardous waste)
- Backfill and grading of the excavated areas
- Site restoration



PROPOSED CMIP ACTIVITIES (CONTINUED)

- › Site Access and Use Restriction for Potential MEC:
 - Installation of warning signs through SAC program
 - Establish site access and use boundary for use restrictions with Master Planning
 - On-call UXO support through the RSA Explosives Safety Management Program (ESMP)
 - Annual inspections through SAC program
 - Environmental use restriction in accordance with AAC r. 335-5-1-.02(3)(a)
- › LUC for Vapor Intrusion:
 - Establish LUC boundary and future building design requirements with Master Planning
 - Inspections and reporting
 - Environmental use restriction in accordance with AAC r. 335-5-1-.02(3)(a)
 - Need for LUCs can be re-evaluated following NASA's groundwater corrective measures and vapor intrusion evaluation



PATH FORWARD

- › CMIP Scoping Meeting RSA-141-R-01 and RSA-221-R-01: 20 November 2019
- › Minutes and revised scoping slides to Army within 14 days of meeting
- › RSA-141-R-01 Advance Review Rev. 0 CMIP to Army: 4 January 2020

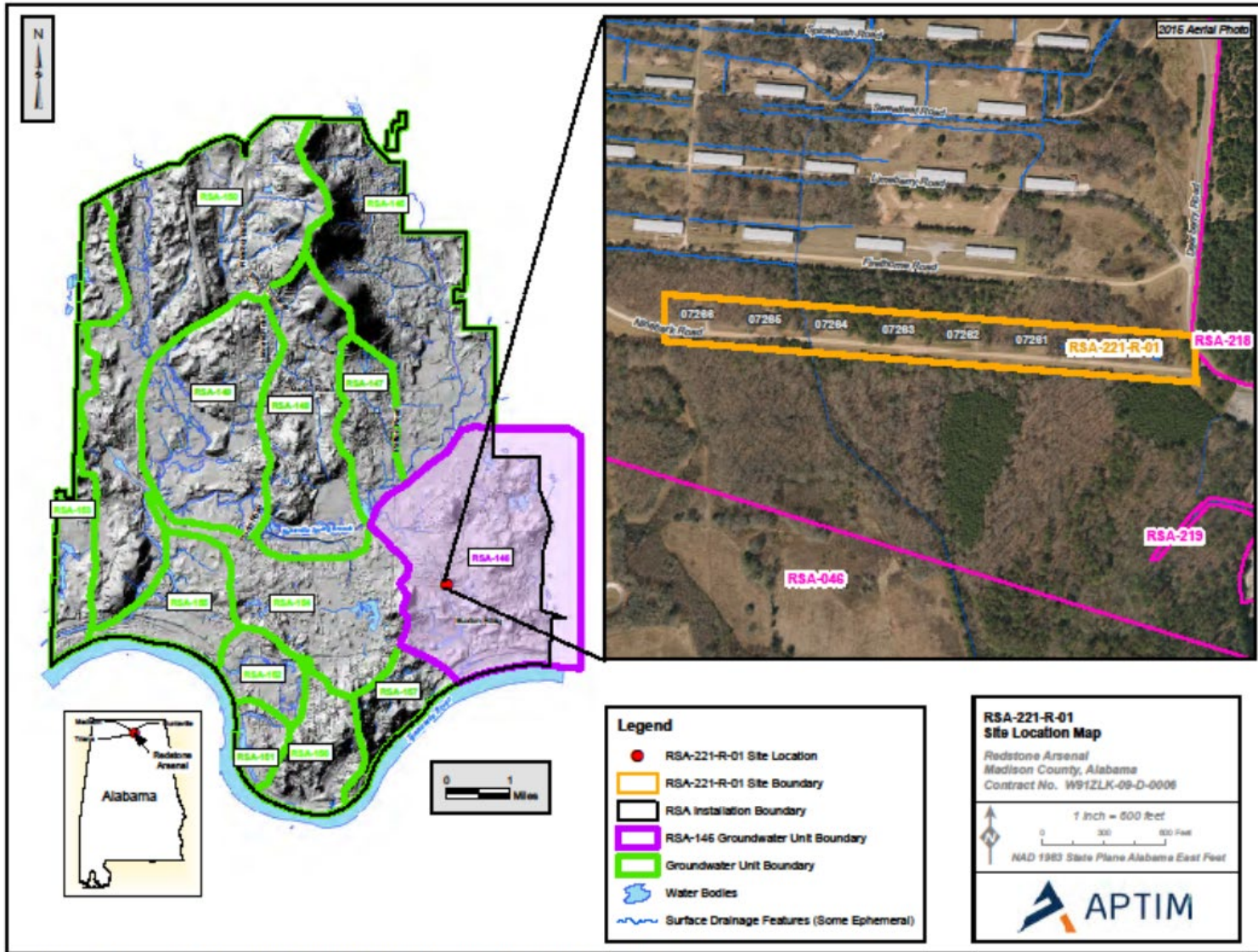
QUESTIONS



RSA-221-R-01 – FUSE STORAGE AND MUNITIONS DISPOSAL AREA



SITE LOCATION MAP



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SITE MAP



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SITE DESCRIPTION/HISTORY

RSA-221-R-01, FUSE STORAGE AND MUNITIONS DISPOSAL AREA

- › Located on 13.4 acres within southeastern portion of RSA, above RSA-146 groundwater unit.
- › Investigation and cleanup of RSA-221-R-01 surface media funded by RSA's MMRP.
- › UXO Probability is "Low". CWM probability is "Unlikely".
- › Land use: Industrial zone and primary missions include storage, base operations, and explosive operations.
- › Buildings 7261 through 7266 built in 1943 and initially stored fuzes for the Redstone Ordnance Plant and later the buildings were used for storage of small components and general items.
- › Former railroad line paralleled Ninebark Road south of the buildings and was used to access the storage buildings.
- › Drainage swale in the east portion of site and reportedly a disposal area for munitions-related items in late 1940s and 1950s.



RFI SUMMARY: RSA-221-R-01

- › Conceptual site model (CSM) includes:
 - Potential buried MEC
 - VOCs, PAHs, metals, explosives, perchlorate, and mustard breakdown products from storage operations and munitions disposal
- › Constituents detected in soil have been delineated to concentrations below applicable screening criteria.
- › Mustard breakdown products were not detected.
- › Constituents in soil do not pose unacceptable risk to human health, the environment, or leaching threat to groundwater.
- › Constituents in groundwater do not pose unacceptable risk to human health if it is developed as a potable source and groundwater received no-further-action regulatory approval.
- › A detector-aided visual survey (DAVS) and full coverage digital geophysical mapping (DGM) survey performed across site during RFI.



RFI SUMMARY (CONTINUED): RSA-221-R-01

- › 6,123.5 pounds of surface metallic items (including 5,914 pounds of munitions debris [e.g., 155-mm projectile bodies]) collected and removed during DAVS.
- › 370 of 4,644 identified SPAs and 10 saturated response areas (SRA) investigated via 19 test pits were excavated and characterized following the DGM survey.
- › MEC was not encountered on the ground surface or in the subsurface during the DAVS, DGM survey, or intrusive investigation.
- › Uninvestigated anomalies detected above the project threshold, which have the potential to be wholly inert munitions and munitions components, still exist in the subsurface.
- › Based on findings of the MEC investigation, UXO Estimator indicates there is a 95 percent confidence that the density of UXO at the site is less than 0.5 UXO items per acre.



RFI SUMMARY (CONTINUED): RSA-221-R-01

- › The RFI recommended corrective measures to manage the unacceptable risk of human exposure to MEC potentially present in the subsurface at the site and no further action for groundwater.
- › ADEM concurred with the RFI recommendations on October 11, 2018.



CMS REPORT: RSA-221-R-01

- › Based on information and recommendations in the RFI report, a focused CMS report was prepared for the site.
- › The CMS presents a focused set of presumptive remedies (technologies) for addressing the potential for residual MEC posing unacceptable risks to current and future site receptors.
- › The CMO is to prevent or minimize human contact with MEC, thereby reducing hazards associated with a “low” probability MEC site consistent with current and future land use.
- › Alternatives evaluated in the CMS:
 - Alternative 1: No Action
 - Alternative 2: LUCs
 - Alternative 3: Dig and Sift MEC Removal



CMS REPORT (CONTINUED): RSA-221-R-01

- › Following a detailed analysis of alternatives, Alternative 2 (LUCs) was recommended for RSA-221-R-01.
- › DA has concurred with the recommendation of Alternative 2.



RCRA DOCUMENT STATUS: RSA-221-R-01

› Restoration Status

- RFI report: The RFI report received ADEM concurrence on October 11, 2018.
- Final CMS: Final CMS report submitted to Army May 12, 2017. RSA reviewers approved the final document with Alternative 2 (LUCs) as preferred alternative. CEHNC/AEC are in agreement with the Final CMS as discussed in the Project Kickoff meeting (October 23, 2019) and document is considered final.
- Draft SB/DD: Draft SB/DD submitted to Army February 26, 2019. Review by EMCX and CEHNC. Back check submitted June 26, 2019. Back check approved as reported in Project Kickoff (October 23, 2019).



RCRA DOCUMENT STATUS (CONTINUED): RSA-221-R-01

› Contracted Work

- SB/DD: SB/DD to be submitted to AEC for review concurrently with submittal of the CMIP to ADEM. Respond to additional Army entity (AEC) review comments, advertise for public comment, and obtain DA approval.
- CMIP: Prepare CMIP and obtain DA approval and Regulatory concurrence.
- CMIC: Conduct corrective measures in accordance with approved CMIP.
- CMR: Prepare CMR and obtain DA approval and Regulatory concurrence.

› Optional Work

- CMS: Respond to additional review comments on CMS report and obtain DA approval.



SB/DD SUMMARY: RSA-221-R-01

- › SB/DD presents Army's preferred corrective measure alternative and is made available for public review in accordance with public participation requirements under RCRA and CERCLA and the Army's Defense Environmental Restoration Program (DERP) guidance.
- › SB/DD presents a declaration, decision summary, and responsiveness summary as outlined in EPA protocol for proposed plans and RODs and in format agreed upon by the Army.
- › SB/DD contains:
 - Summary of site description/history, investigation history and results, human health and ecological risks
 - Problems warranting action from the RFI report, CMOs, CGs, feasible technologies evaluated, corrective measure alternatives, and evaluation of the alternatives to the criteria in the EPA RCRA corrective action plan guidance along with consideration of public acceptance
 - Army's preferred alternative from the CMS report
 - Supporting tables and figures



SB/DD SUMMARY (CONTINUED): RSA-221-R-01

- › Advance review SB/DD submitted to RSA on February 26, 2019.
 - Presented site access and use restrictions as implemented by the SAC program to ensure that all required site access and intrusive activities are safely managed.
- › EMCX and CEHNC comments received March 27, 2019.
- › Comment responses prepared and document revised. Back check submitted June 26, 2019.
- › Back check approved as documented in the October 23, 2019 Project Kickoff Meeting.
- › SB/DD to be submitted to AEC for review concurrently with submittal of CMIP to ADEM.
- › Prepare comment responses, revise document, and submit backcheck. Respond to AEC comments and receive backcheck approval.
- › Upon back check approval, place an advertisement in local newspapers to solicit public review comments on the preferred remedy.

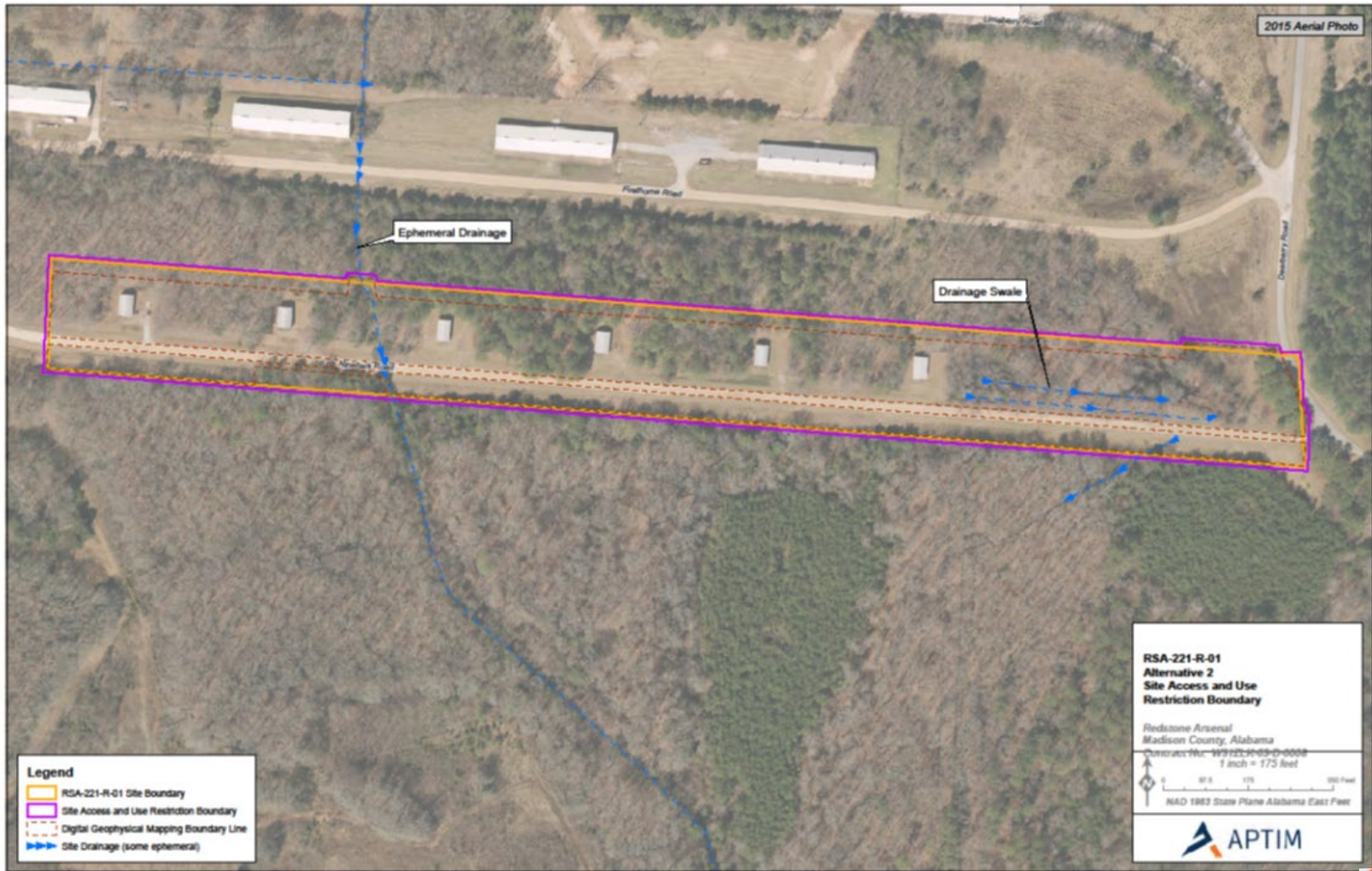


SB/DD SUMMARY (CONTINUED): RSA-221-R-01

- › 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.
- › Prepare and submit a final SB/DD for DA approval to meet delivery order objective.



CORRECTIVE MEASURES FIGURE



CMIP EXECUTION STRATEGY: RSA-221-R-01

- › Prepare CMIP to implement the CMS recommended Alternative 2 (LUCs) and obtain DA and Regulatory approvals.
- › The CMIP will present the following in accordance with 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 at the site (e.g., MEC is unexpectedly encountered during installation of warning sign posts)



PROPOSED CMIP ACTIVITIES

- › The LUCs will be implemented per the RSA Site Access Control program, RSA Master Planning, and RSA's ESMP:
 - Install or relocate warning signs using anomaly avoidance
 - Establish site access and use restriction boundary, and capture use restrictions by RSA master planning
 - On-call UXO construction support
 - Inspections (Annual)
 - Environmental use restrictions in accordance with AAC r. 335-5-1-.02(3)(a)



PATH FORWARD

- › CMIP Scoping Meeting RSA-141-R-01 and RSA-221-R-01: 20 November 2019
- › Minutes and revised scoping slides to Army within 14 days of meeting
- › RSA-221-R-01 Advance Review Rev. 0 CMIP to Army: 4 January 2020

QUESTIONS



ADDITIONAL QUESTIONS/COMMENTS

Don Burton
don.burton@aptim.com
865 207 1394



APPENDIX E

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Site-Specific Safety and Health Plan

Corrective Measures Implementation

RSA-221-R-01, Fuse Storage and Munitions Disposal Area

Operable Unit 15

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
2410 Cherahala Boulevard
Knoxville, Tennessee 37932

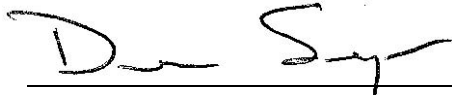
Contract No. W912DY-17-D-0003
Delivery Order No. W912DY19F1116
APTIM Project No. 501388

October 2020

**Site Safety and Health Plan
Corrective Measures Implementation, RSA-221-R-01 Redstone
Arsenal, Madison County, Alabama**

Contract No. W912DY-17-D-0003

Plan Preparer:

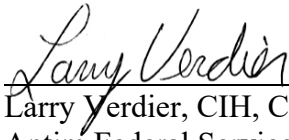


Dennis Seymore, Project Scientist
Aptim Federal Services, LLC

Date

10/23/2020

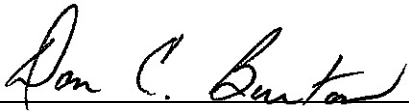
Plan Approval:



Larry Verdier, CIH, CSP, CPEA
Aptim Federal Services, LLC

Date

10/27/2020



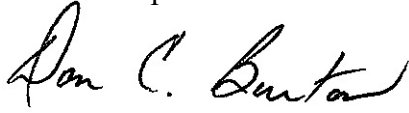
Don Burton, Project Manager
Aptim Federal Services, LLC

Date

10/27/2020

ACKNOWLEDGEMENTS

The approved version of this site-specific safety and health plan (SSHP) for corrective measures implementation at RSA-221-R-01 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

11/3/2020

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

11/3/2020

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.

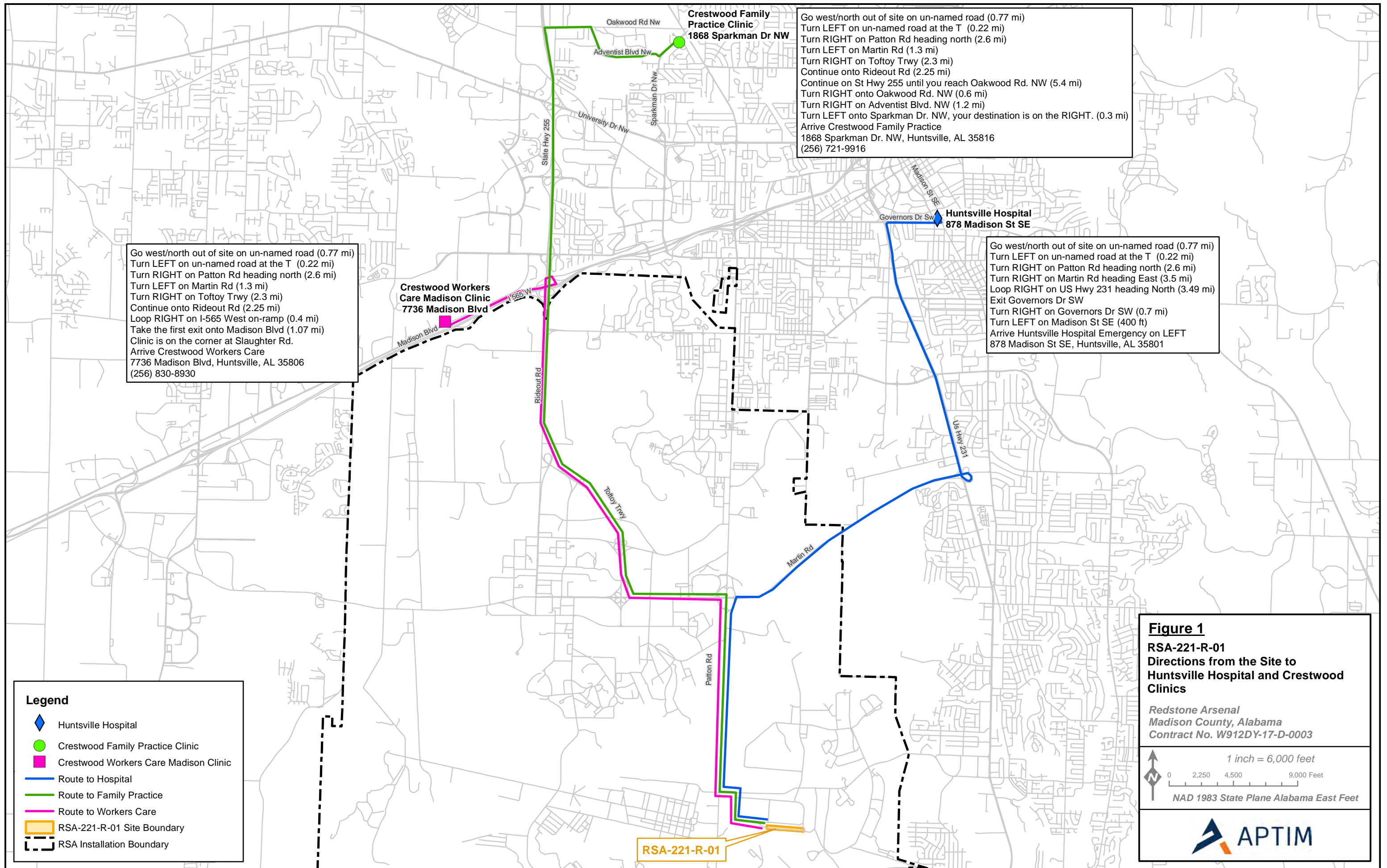
EMERGENCY TELEPHONE NUMBERS AND PROJECT CONTACTS

Emergency Medical Care		
Hospital: Huntsville Hospital (Emergency/Trauma Center)	911 (256) 265-1000	
Chemical Agent Emergencies (state that you are at Redstone)	911	
National Poison Control Center	(800) 222-1222	
National Response Center Environmental Emergencies	(800) 424-8802	
Federal Occupational Safety and Health Administration (OSHA) Emergency Hotline	(800) 321-6742	
Local Emergency Numbers		
Fire Department Emergency ask for Redstone Arsenal Fire Department	Emergency Nonemergency	911 (256) 876-2117
Law Enforcement Military Police	Emergency Nonemergency	911 (256) 876-2222
Installation Emergency Operations Center	Nonemergency	(256) 313-1043
Installation Operations Center	Nonemergency	(256) 313-1043
Garrison Safety Office 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)
CEHNC-OEC Safety Occupational Health Specialist	Kenny Jones	(256) 230-5092 (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
APTIM Contact Information		
Health and Safety Emergency Number		(800) 537-9540 opt. 2
Project Manager	Don Burton	(865) 207-1394
Corporate Quality Management Director	Tricia Felt, QESH	(303) 741-7426
Health & Safety Manager	Winston Russell	(865) 414-9545
Senior Vice President Health, Safety, Environmental	Jeff Thompson	(985) 969-2580
Project Certified Industrial Hygienist (CIH)	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 Rd SW, Huntsville, AL 35801 as shown on Figure E1, following.



Redstone Arsenal Gate Hours

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

*Gate 3 outbound lanes will remain open until 1800

*Gate 7 outbound lanes will remain open until 1800

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

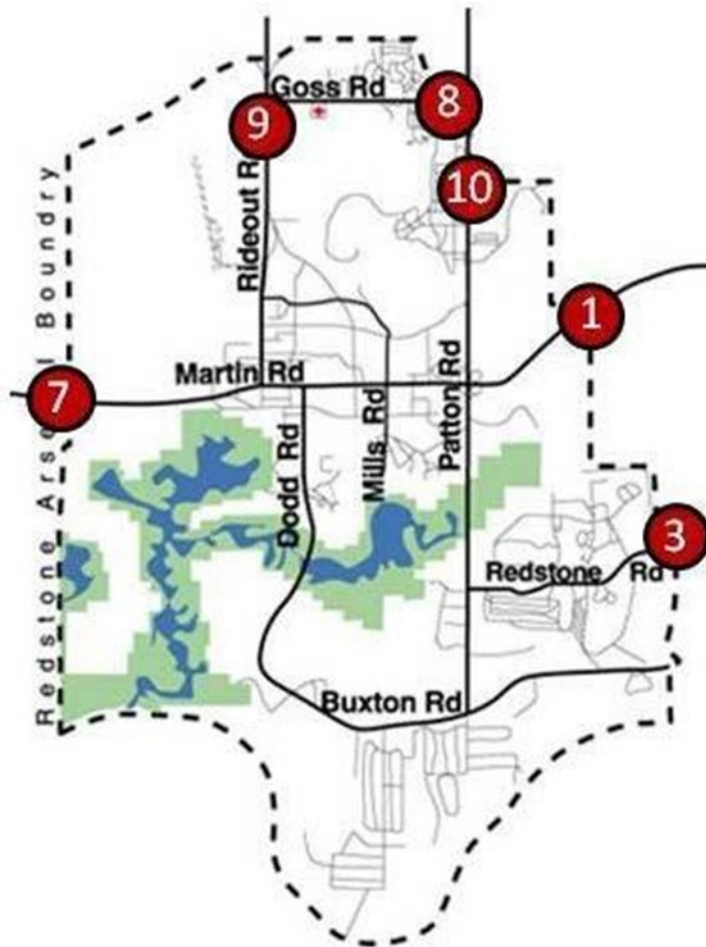


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List of Acronyms and Abbreviations

°F	degrees Fahrenheit
ACGIH	American Conference of Governmental Industrial Hygienists
AHA	Activity Hazard Analysis
APP	Accident Prevention Plan
APTIM	Aptim Federal Services, LLC
ARBCA	Alabama Risk-Based Corrective Action
CA	chemical agent
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
CHE	Chemical Warfare Materiel Hazard Evaluation
CIH	Certified Industrial Hygienist
CMI	corrective measures implementation
COVID-19	Coronavirus Disease 2019
COC	chemical of concern
CPR	cardiopulmonary resuscitation
CRZ	contamination reduction zone
CWM	chemical warfare materiel
DAVS	detector-aided visual survey
dBA	A-weighted decibel
DEET	N,N-Diethyl-m-toluamide
DGM	digital geophysical mapping
DMM	discarded military munitions
DoD	U.S. Department of Defense
ECT	equivalent chill temperature
EHE	Explosive Hazard Evaluation
EM	Engineer Manual
EMS	Emergency Medical Services
EZ	exclusion zone
F-B	flash to bang
HAZWOPER	Hazardous Waste Operations and Emergency Response
HHE	Health Hazard Evaluation
HSM	Health and Safety Manager

List of Acronyms and Abbreviations (Continued)

IAW	in accordance with
IEOC	Garrison Installation Emergency Operations Center
KO	Contracting Officer
LUC	land-use controls
MD	munitions debris
MEC	munitions and explosives of concern
MRS	Munitions Response Site
MPPEH	Material Potentially Presenting an Explosive Hazard
MRSPP	Munitions Response Site Prioritization Protocol
OESS	Ordnance and Explosives Safety Specialist
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
RP	red phosphorus
RSA	Redstone Arsenal
SDS	Safety Data Sheet
SLERA	screening-level ecological risk assessment
SPA	single point anomaly
SRA	saturated response area
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SZ	support zone
TLV	Threshold Limit Value
TSM	tailgate safety meeting
USACE	U.S. Army Corps of Engineers
UXO	unexploded ordnance
UXOSO	Unexploded Ordnance Safety Officer
WBG	wet bulb globe thermometer
WP	white phosphorus

E1.0 Site Description and Contamination Characterization

E1.1 RSA-221-R-01 Site Description

RSA-221-R-01 occupies approximately 13.4 acres in the southeast portion of Redstone Arsenal (RSA), immediately west of Deerberry and Ninebark Roads (Figure 1-1 of the corrective measures implementation [CMI] work plan). The site lies above the RSA-146 groundwater unit.

Although no munitions and explosives of concern (MEC) was found at the site during the Resource Conservation and Recovery Act facility investigation (RFI), there is limited uncertainty within the drainage area of this site for the presence of MEC. Intrusive investigation and statistical analysis using the statistical sampling program Unexploded Ordnance (UXO) Estimator indicate a 95 percent confidence that the density of UXO at the site is less than 0.5 UXO per acre. Since full-coverage subsurface investigations were not performed in all areas of the site and 100 percent of the anomalies were not intrusively investigated, it is possible, though unlikely, that a potentially complete pathway exists for MEC in the subsurface.

Section 1.2 of the CMI work plan provides a detailed summary of the RSA-221-R-01 description and operational history, and Chapter 2.0 provides a detailed summary of the site investigation results.

The current chemical warfare materiel (CWM) and UXO probability designations for RSA-221-R-01 are “Unlikely” and “Low,” respectively. Based on being identified as a former munitions disposal area, RSA-221-R-01 has been assigned to the U.S. Department of Defense (DoD) Military Munitions Response Program for investigation and cleanup.

The Army has specified site access and use restrictions in the RSA Real Property Master Plan to ensure compliance with this CMI work plan (U.S. Army Garrison-Redstone, 2013). Section 4.4 of the CMI work plan provides a detailed summary of the Master Plan restrictions for RSA-221-R-01.

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 Federal Services, LLC (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-221-R-01, Fuse Storage and Munitions Disposal Area, located within Operable Unit 15 (Figure 1-1 of

the CMI work plan). This plan incorporates applicable elements of Alabama Department of Environmental Management 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 employee's human health from hazardous constituents at concentrations exceeding applicable limits.

The CMI work plan describes the corrective measures necessary to support completion of corrective measures and achievement of response complete at RSA-221-R-01. Because only a statistically significant number of anomalies detected above the target threshold criteria during the digital geophysical mapping were randomly selected to be intrusively investigated, uninvestigated anomalies above the target threshold still exist in the subsurface. Therefore, there is a statistically derived low probability that MEC are present at this site. The Hypergeometric Model, which was the statistical sampling program used, indicated that the true rate of unacceptable items is zero per acre, and there is 95 percent confidence that the true rate of unacceptable items is no greater than 0.50 UXO per acre present at the site. The selected corrective measures manage the risks by implementing land-use controls (LUC) to reduce and/or minimize exposure to the potential of buried MEC based on a "Low" UXO probability.

An Alabama Risk-Based Corrective Action (ARBCA) evaluation for human health and a screening-level ecological risk assessment (SLERA) were prepared for RSA-221-R-01 as part of the RFI. The ARBCA evaluation concluded that chemicals in soil pose no unacceptable human health risks to commercial/industrial or hypothetical future residential receptors and no threat to groundwater due to contaminant leaching and migration to the water table. The SLERA determined that contaminants present in surface soil are not expected to pose a potential risk for adverse impacts to terrestrial plant or soil invertebrate communities and food chain receptors are unlikely to be impacted. However, the RFI report concluded that corrective measures are needed to address risks with the potential presence of MEC at the site. No relevant chemicals of concern (COC) were identified in groundwater at this site and thus no corrective measures are required for groundwater under RSA-221-R-01.

E1.3 Project Tasks

The following project activities to meet the CMI objectives are detailed in Chapter 4.0 of the RSA-221-R-01 CMI work plan, of which this SSHP is an appendix to:

- Mobilization/demobilization
- Utility clearance and marking
- Vegetation clearance
- On-Call UXO Support

- Installation of LUC signposts and fencing with posting of new LUC signs
- Marking and surveying of areas within LUC boundary
- Site restoration
- Routine LUC inspections and maintenance
- Environmental Use Restriction
- Implementation of LUCs.

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

E1.4 Contamination Characterization

The RFI did not identify any MEC on the ground surface or in the subsurface at RSA-221-R-01. Since 100 percent of the anomalies were not intrusively investigated, there remains a statistical possibility that a potentially complete pathway exists for MEC in the subsurface. The RFI report (CB&I Federal Services LLC, 2015) concluded that corrective measures are required to prevent MEC exposure to current and future human receptors at RSA-221-R-01.

E2.0 Activity Hazard Analysis

E2.1 Anticipated Hazards

The nature and extent of contamination at RSA-221-R-01 have been characterized.

The RSA-221-R-01 RFI report also concluded that the Army's historical operations at this site have not resulted in the release of hazardous chemicals that pose an unacceptable risk to human health or the environment or a leaching threat to groundwater. Therefore, no corrective measures are needed for chemicals present in soil or groundwater at RSA-221-R-01. However, because of the site's limited statistical uncertainty regarding the presence of small numbers of MEC and potential for posing unacceptable hazards to receptors at the site, corrective measures are required to ensure the likelihood of current and future human receptors encountering MEC is negligible.

Table E2-1 provides a table of contaminants of interest and potential acute health effects.

At the time of preparation of this SSHP, the Army-provided CWM and UXO probability designations for RSA-221-R-01 are "Unlikely" and "Low," respectively.

Munitions and Explosives of Concern/Chemical Warfare Materiel/Chemical Agent.

RSA-221-R-01 has been identified as a Military Munitions Response Program site. The U.S. Department of Defense has established the Military Munitions Response Program to address sites suspected of containing MEC or munitions constituents. 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]).

Following is a summary of the investigation history of RSA-221-R-01 as more fully detailed in Section 2.1 of the CMIP.

A detector-aided visual survey (DAVS) was conducted in 2014 across all accessible areas of the 13.4 acres in 2014 at RSA-221-R-01 to 1) identify potential surface MEC/munitions debris (MD) and disposal features such as disturbed ground, and 2) remove potential MEC/MD and relatively larger scrap metal on the surface that would pose a safety concern or interfere with the

subsequent digital geophysical mapping (DGM) data collection and anomaly reacquisition activities. Following the DAVS, a DGM survey was conducted over 9.6 acres of the site in 2015 (e.g., all accessible areas of the site not covered by buildings, roadway, or dense tree stands) using the performance metric and quality objectives specified in Standard Operating Project Procedure No. 27, *Digital Geophysical Mapping Surveys* (Shaw Environmental & Infrastructure, Inc., 2013). This DGM survey was performed in 56 grids in accordance with the MEC work plan (CB&I, 2014). Anomaly maps were produced and utilized in the selection of anomalies to be subsequently investigated for single point anomalies (SPA) and test pits for saturated response areas (SRA) consisting of more dense areas of anomalies. The Hypergeometric Model was used as a statistical testing tool to determine the number of anomalies to intrusively sample which ensured that the results had the required confidence for decision-making at the site.

No surface MEC was encountered during the 2014 DAVS conducted across the entire site or during the 2015 DGM survey performed for the entire site. During the 2016 intrusive anomaly investigation, no UXO or discarded military munitions were found in the subsurface but various wholly inert items, componentry, and scrap metal were discovered. In addition, munition constituents were not present in high enough concentrations to pose an explosive hazard in the 2016/2017 environmental sampling.

During the 2014 DAVS, a total of 6,126 pounds of metallic items were found on the surface of the site and removed, including 5,914 pounds of wholly inert items and componentry which included numerous empty 155-millimeter illumination projectile bodies that were never loaded, base plates, and lifting lugs. These wholly inert items and componentry were collected and removed from the drainage swale east of Building 7261. All of the recovered items were identified as wholly inert items and componentry not discarded military munitions (DMM) as defined in EM 385-1-97 (Department of the Army, 2008) since they appeared to have never held explosive components or been assembled into complete munitions. No items containing an explosive hazard were encountered.

During the 2015-2016 DGM and intrusive investigation, a total of 370 of 4,644 identified SPAs were intrusively investigated and a total of 10 SRAs were partially excavated using 19 test pits. Various wholly inert items (e.g., empty 155-millimeter illumination projectile bodies that were never loaded and base plates for the aforementioned projectiles that were never installed), componentry (e.g., lifting lugs since they have nothing to do with the item's intended purpose), or scrap metal (e.g., wire, nails, and bolts) were recovered from 81 of the SPA excavations and 12 of the test pit excavations within the SRAs. These items are consistent with the site's storage

history of wholly inert items and non-explosive componentry and location along a former rail line. Thus, no items were classified as DMM.

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 job site.
- 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 through the development and implementation of a COVID-19 control plan specific to their risks. APTIM and U.S. Army Engineering

and Support Center, Huntsville (CEHNC) leadership must approve subcontractor plans before implementation at the jobsite.

- 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-221-R-01:

- Mobilization and demobilization
- COVID-19 job site work practices
- Visual site inspections and surveys
- Site surveys (utility)
- Vegetation removal
- Small equipment operations for installation of LUC fencing and sign posts
- Equipment decontamination
- Disposal of investigation and/or remedial-derived waste
- Site restoration
- 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.

Munitions and Explosives of Concern Hazard Assessment. A MEC hazard assessment is used to evaluate the potential explosive hazard associated with conventional MEC present at a site under a variety of site conditions (U.S. Environmental Protection Agency, 2008). However, no MEC was found at RSA-221-R-01 and thus, generation of a MEC hazard assessment score was not required.

Munitions Response Site Prioritization Protocol Summary. The Munitions Response Site Prioritization Protocol (MRSPP) is a methodology developed by the DoD to assess the relative risks and assign a relative priority to Munitions Response Sites (MRS) (DoD, 2007). The

MRSPP uses three modules to evaluate hazards associated with a site: Explosive Hazard Evaluation (EHE) Module, Chemical Warfare Materiel Hazard Evaluation (CHE) Module, and Health Hazard Evaluation (HHE) Module. The overall MRSPP priority is determined by converting the individual module rating scores to priorities; the highest priority is 1 and the lowest is 8. As summarized from the tables included in the RSA-221-R-01 RFI report (APTIM, 2018a), the results of applying this protocol to RSA-221-R-01 are as follows:

- EHE Module: G (lowest rating)
- CHE Module: No Known or Suspected Chemical Warfare Materiel Hazard
- HHE Module: G (lowest rating)
- MRS Priority: 8 (lowest priority).

Should any suspicious item be encountered during site activities, protocol as documented in Chapter 5.0 of the RSA-221-R-01 CMI work plan will be followed, which includes but is not limited to stopping all work and notifying appropriate project personnel.

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

Hazard Identification

Site tasks such as site preparation, brush clearing, and vehicle 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 design and operation will be according to 29 Code of Federal Regulations (CFR) Subpart O, 1926.600 through 1926.602. The types of vehicles to be used on site include pickup trucks.

Hazard Mitigation/Prevention

Before any 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* (Attachment 2). APTIM has also implemented additional protocols for motor vehicle use on RSA. A 360-degree walk-around is required before placing vehicles in motion that have been parked or temporarily staged. Traffic cones are required to be placed 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.

E2.4.3 Hazardous Energy Control

Hazard Identification

The specific hazards include, but are not limited to, overhead and underground utilities. Additionally, stored energy associated with heavy equipment hydraulics can be released during servicing or maintenance.

Hazard Mitigation/Prevention

Before site activities, conduct a visual assessment of potential hazardous energy sources, including equipment. This procedure applies to all equipment, vehicles, processes or systems that are powered by Electrical, Mechanical, Hydrostatic, or Pneumatic energy.

Lock out/tag out activities shall follow AMS-710-02-PR-01500, Control of Hazardous Energy. 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.

E2.4.4 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 intrusive activities, the existence and location of underground pipe, electrical equipment, and gas lines will be determined. This will be done in accordance with (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 will obtain a digging clearance, if appropriate, and will 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.

E2.4.5 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[®]) 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, crane, 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 down the object.
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

E2.4.8.1 Material Potentially Presenting an Explosive Hazard

As a result of the former use of the MRS and based on the findings of previous investigations, it is possible that the field teams may encounter MEC that have been fired, buried, or abandoned, and that still represent a hazard. If MEC or material potentially presenting an explosive hazard (MPPEH) is encountered or suspected to have been encountered, DON'T TOUCH IT. 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. If MEC or MPPEH is found, a new probability assessment will be conducted and documented. All anomaly avoidance procedures and MEC safety precautions will be provided during daily safety meetings and are addressed in EP 75-1-2 (U.S. Army Corps of Engineers [USACE, 2004] or most current), RSA *Explosive Safety Management Program (ESMP)* (U.S. Army Aviation and Missile Command Safety Office, 2018), and EP 385-1-97 Change 1, *Explosives Safety and Health Requirements Manual* (U.S. Department of the Army, 2013, or most current).

E2.4.8.2 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 and 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 (UXOSO).
- 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.
- 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.

- Clearly mark the location of any ordnance item found for future location and avoidance.
- Follow the procedures of the CMI work plan and SSHP. Upon locating any MEC hazards, immediately notify the Site Manager and SSHO.
- 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

The ARBCA evaluation as prepared and provided in the RSA-221-R-01 RFI concluded that chemicals in soil pose no unacceptable human health risks to commercial/industrial or hypothetical future residential receptors. Additionally, the selected corrective measures will not require that materials with chemical hazards be brought on site.

Chemical hazards associated with site activities is restricted to fuels (primarily gasoline) brought on site for small equipment use. 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 Physical Hazards

E2.6.1 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
- 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 MRS 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 the following:

- 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.

E2.6.2 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.

E2.6.3 Hazardous Noise

Hazard Identification

Planned activities may involve the use of noise-producing equipment such as weed trimmers 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 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.

E2.6.4 Heat and Cold Stress

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

E2.7 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 E2-2 shows the biological hazards for the site. Additionally, hazards associated with COVID-19 are discussed in Section E2.2 and the associated AHA (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 casings around monitoring wells.

E2.7.1 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 (Occupational Safety and Health Administration [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 Centers for Disease Control (www.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[®], 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.

E2.7.2 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 on a pillow and apply a paste of baking soda and water for itching.

E2.7.3 Stinging Insects

Workers should keep alert for bee and wasp activity and avoid wearing bright 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[®], 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.

E2.7.4 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.

E2.7.5 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.

E2.7.6 Brown Recluse Spiders

Adult brown recluse spiders are soft bodied, yellowish tan to dark brown, about $\frac{1}{4}$ to $\frac{1}{2}$ 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 4 pairs of eyes; 8 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.

E2.7.7 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.

E2.7.8 Venomous Snakes

Alabama has a variety of snakes; however, the Coral Snake, Eastern Diamond-Backed 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 between 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 they are covered in hour-glass 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.

E2.7.9 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) 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 antivenom. As soon as the dressings are released the venom will spread. The hospital at this time must be prepared to administer the antidote (antivenom).
 - 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.

E2.7.10 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.

E2.7.11 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 E2-1.

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 may 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).

E2.7.12 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 the following:

- 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).

E2.8 Mishap Reporting and Investigation

E2.8.1 Exposure Data (Man-Hours Worked)

The HSM is responsible for reporting and maintaining records of all exposure and accident experiences incidental to the work, including those of subcontractors, and ensuring the information is reported to 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.

E2.8.2 Accident Investigations, Reports, and Logs

The Site Manager, SSHO, and PM shall conduct accident/incident investigations in consultation with the HSM. A report is completed by the Site Manager and must be submitted to the HSM and APTIM Corporate Safety Department in Baton Rouge, Louisiana. The incident reporting forms are provided in AMS-710-05-PR-02300, Incident Investigation and 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 (ENG) 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 Contracting Officer (KO) or authorized representative following the accident in accordance with EM 385-1-1 as soon as possible but no more than 5 days following the accident.

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 in accordance with AMS-710-05-PR-02200, Incident Reporting.

E2.8.3 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 APTIMs EH&S Hotline (800)-537-9540:

- 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 (in-patient) 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 KO 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. The Ordnance and Explosives Safety representative will be notified within one day of any accident or injury that may require reporting. An OSHA 300 log of work-related injuries and illnesses will be maintained at the site.

E2.8.4 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 and project manager (PM) will be immediately summoned if not already aware of the situation to begin immediate first aid. The SSHO or PM will immediately make contact with other field personnel

to alert them of a medical emergency situation and recommended action if required. The PM or 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 in accordance with EM 385-1-1, Section 01, Paragraph 01.D, sub-paragraph 01.D.05 as provided in Section 8.0 of the IW APP (CEHNC, 2019).

E3.0 Staff Organization, Qualifications, and Responsibilities

E3.1 Health and Safety Manager

The Health and Safety Manager (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 Project Manager (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, 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. 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 exclusion zones (EZ), 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 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 SSHA 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

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, RSA Explosives Safety Management Program, and applicable Explosives Site Plan
- f. MEC avoidance and anomaly investigation
- g. AHA
- h. Hazard communication program
- i. Heat/cold stress
- j. Hearing conservation
- k. Control of hazardous energy
- l. Sanitation
- m. Buddy system requirements
- n. Fire prevention and protection/hot work
- o. PPE
- p. Site control measures
- q. Exposure monitoring air sampling
- r. Medical surveillance
- s. Emergency Response and Contingency Plan
- t. Record keeping and data management
- u. Incident and near miss reporting and investigation
- v. Site-specific hazard communication.

E4.2 Mandatory Training and Certifications

IAW CFR 1910.120(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
- 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.

UXO personnel shall meet the training requirements of TP-18, *Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities*. Recertification or refresher training for the cited Technical Paper shall be maintained and documentation available for review.

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

No tasks in the scope of work require specific emergency response training beyond what is required in Sections 4.1 and 4.2. All APTIM personnel who have completed the APTIM 40-hour HAZWOPER training are qualified as emergency first responder operations level per 29 CFR 1926.65(q)(6)(ii). Site-specific emergency response procedures 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, APTIM will stop work, leave the location, and notify the PM, SSHO, and HSM as applicable.

E4.4 Supervisory and Employee Safety Meetings

E4.4.1 Daily Safety and Tailgate Meetings

The Supervisor, with assistance from 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 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 will sign off attending the safety briefing.

E4.6 UXO Training

Non-UXO Personnel. All non-UXO trained site personnel will be trained in MEC/chemical agent (CA) recognition, hazards, and actions to take in the event that they are encountered.

UXO Personnel. All UXO-trained personnel, regardless of position, will receive site-specific MEC, CA, and demolition training.

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. 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, and hearing conservation training. Documentation of all workers' current training credentials will be kept on site.

E5.0 Personal Protective Equipment

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; 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 the 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 (CIH). 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 to 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.

Task	Initial Level of PPE
Mobilization and Equipment Staging	Level D
Utilities Identification and Locating	Level D
Vegetation Clearing and Grubbing	Level D
Protection of Existing Wells	Level D
Surveying for LUCs: fencing and signposts	Level D
Installation of fencing and signpost/signs	Level D
Site Restoration	Level D

A complete description of Level D protection follows.

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:

- Permeable Tyvek[®], Kleenguard, or its equivalent
- Latex boot covers
- Nitrile gloves (outer)

- Lightweight nitrile gloves (inner)
- Steel/composite-toed safety boots
- Safety glasses
- Hard hat
- 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 air monitoring action levels. The equipment to be used for Level C protection will be provided by SSHO as applicable. Level C respiratory protection includes use of air-purifying respirators equipped with high efficiency air (HEPA) filters.

Table E5-1 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 over-ruled by exclusion zone respiratory PPE requirements, each employee shall wear a face mask or other facial covering (as practical) when around other people, especially when social distancing measures (maintaining a distance of 6 feet in separation) are not practical to maintain. It is also recommended that employees wear nitrile gloves at a minimum when working outside the exclusion zone as tasks require.
- Hard hats will be required when working around heavy equipment or an overhead hazard exists.
- Steel toe and shank boots are not required during anomaly location and reacquisition unless a serious toe hazard exists, which requires use of a fiber safety toe. Where 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, regardless of the 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 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). Respiratory protection is not anticipated based on the current scope of work.

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 all of their own PPE.

E6.0 Medical Surveillance

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 (below) will review all 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)

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 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/her immediate supervisor will be informed of any medical conditions that would result in work restriction or that would prevent him 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 above. The SSHO will notify the CDHS immediately if such an event occurs.

E7.0 Exposure Air Monitoring and Air Sampling Program

The RSA-221-R-01 RFI report concluded that the Army's historical operations at this site have not resulted in the release of hazardous chemicals that pose an unacceptable risk to human health or the environment or a leaching threat to groundwater. Therefore, an air sampling program for COCs is not required to implement the corrective measures at RSA-221-R-01.

The SSHO or qualified field leader will perform air monitoring for total dust during the following activity:

- Installation of LUC fencing and signposts.

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, and Table E7-2 provides the minimum air monitoring frequency and locations.

E8.0 Heat Stress and Cold Stress

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 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., semi- or non-permeable 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. Don't 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. 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 which 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 thermometer (WBGT) heat stress monitor (such as the 3M Questemp QT32 or similar) and the heat stress TLV[®]. 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. Non-permeable ensembles are not anticipated for work at this site; if it is determined that non-permeable clothing is required, the SSHO will post and implement a similar table for non-permeable clothing ensembles. Table E8-3 defines the different workloads.

Note: These values are intended as an initial screening tool to evaluate whether a heat stress situation may exist and thus, the values are more protective than the TLV[®]. Because the values are more protective, they are not intended to prescribe work and recovery periods (ACGIH, 2019).

If impermeable clothing 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 as a consequence 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

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.
- **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.
- **Restricting Eating, Drinking, and Smoking.** 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 Locations 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 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).

E9.5 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 A-weighted decibels (dBA) or above—levels that require a person to raise his/her voice to carry on a conversation at a distance of three 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.

E9.6 Fire Prevention Plan

Any APTIM activities that could cause a spark will be carefully monitored. At least one 10 BC 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 in accordance with 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. A 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 (EMS), 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.

E9.7 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 (GHS).

E10.0 Site Control Measures

The scope of the selected corrective measures for RSA-221-R-01 is to ensure the likelihood of encountering MEC at this site is negligible. Applicable work zones will be established during conduct of on-site activities.

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 USACE Ordnance and Explosives Safety Specialist (OESS) to identify corrective action. As applicable, workers and site visitors will be screened for COVID-19 in accordance with 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 the potential for encountering MEC. Site control involves the physical arrangement of, and controlling access into, established work 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 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.

Exclusion Zone. The EZ is the area established around a MEC work area. Only project personnel and authorized, escorted visitors are allowed within the exclusion zone. 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 presented at the site.

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, OESS, or PM. 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.

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 a control line. Public access beyond the control line will be prevented during intrusive operations. Level D PPE is appropriate apparel within this zone.

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.

On-site communication will consist of:

- Handheld radios issued to the field team leader, supervisors, and managers
- 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

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), EM 385-1-1, Section 2.

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. PPE prevents the wearer from becoming contaminated and good work practices reduce contamination of protective clothing and equipment.

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

The RSA-221-R-01 RFI concluded that chemicals in soil pose no unacceptable human health risks to commercial/industrial or hypothetical future residential receptors. Additionally, the selected corrective measures will not require that materials with chemical hazards be brought on site. Therefore, equipment decontamination will consist of removal of any media from equipment/tooling required for signpost installation within the EZ.

Due to the COVID-19 pandemic, hand tools and common 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, initially using soap and water followed by a solution that contains at least 70 percent denatured alcohol.

E13.0 Emergency Equipment and First Aid

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

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 chapter must be implemented before and during any site activities involving exposure to safety and health hazards.

E14.1 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, USACE OESS, and SSHO are 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 Installation Emergency Operations Center (IEOC) at (256) 313-1043 after initial emergency contacts have been completed in order to update IEOC on the situation.

E14.2 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 USACE OESS of the emergency situation. The SSHO has full responsibility and commensurate authority for responding to any emergency that may occur at the MEC 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. On-site medical support personnel will be on site during intrusive investigation. Personnel on site will include at minimum one Emergency Medical Technician – Basic and one Emergency Medical Technician – Paramedic (certified in Advanced Life Support) who have been trained in CWM casualty care.

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.

E14.3 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 CDHS will assess this information to determine whether the contingency plans in this section need to be updated.

E14.4 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.

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. Figure E1 is a map showing the route from the project site to the hospital.

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
- Removing injured personnel from the site
- Emergency contacts, telephone numbers, and hospital route.

E14.5 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.

E15.0 References

American Conference of Governmental Industrial Hygienists (ACGIH), *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*.

CB&I Federal Services LLC, 2015, *RCRA Facility Investigation Report, RSA-146 Groundwater Site, Groundwater Unit GW-02, Operable Unit 19, U.S. Army Garrison-Redstone, Madison County, Alabama*, December.

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Shaw Environmental & Infrastructure, Inc., 2013, *Revision 2 Installation-Wide Quality Assurance Program Plan for the Program Management Contract, U.S. Army Garrison-Redstone, Madison County, Alabama*, Volumes I and II, May.

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U.S. Army Corps of Engineers (USACE), 2004, *Engineer Pamphlet (EP) 75-1-2 Munitions and Explosives of Concern (MEC) Support During Hazardous, Toxic, and Radioactive (HTRW) and Construction Activities*, 01 August.

U.S. Army Engineering and Support Center, Huntsville [CEHNC], 2019, *Final Installation Wide Accident Prevention Plan, Redstone Arsenal, Madison County, Alabama*, prepared for U.S. Army Corps of Engineers, Huntsville District, October.

U.S. Army Garrison-Redstone, 2013, *Redstone Arsenal Real Property Master Plan - Digest*, prepared by Master Planning Division, Directorate of Public Works, April.

U.S. Department of Defense (DoD), 2007, *Munitions Response Site Prioritization Protocol Primer*, April.

U.S. Department of the Army, 2013, *Engineer Manual (EM) 385-1-97 Change 1, Safety – Explosives Safety and Health Requirements Manual*, 12 April.

U.S. Environmental Protection Agency, 2008, *Munitions and Explosives of Concern Hazard Assessment Methodology - Interim*, EPA 505B08001, October.

TABLES

Table 2-1

**Toxicological and Physical Properties of Chemicals
RSA-221-R-01
Redstone Arsenal, Madison County, Alabama**

Substance [CAS]	IP ^a (eV)	Odor Threshold (ppm)	Route ^b	Symptoms of Exposure	Treatment	TWA ^c	STEL ^d	Source ^e	IDLH (NIOSH) ^f
<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

Chemical substances italicized represent material that will be used onsite and is not representative of site contaminants.

^aIP - Ionization potential (electron volts).

^bRoute - Inh, Inhalation; Abs, Skin absorption; Ing, Ingestion; Con, Skin and/or eye contact.

^cTWA - 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.

^dSTEL - 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.

^ePEL - Occupational Safety and Health Administration (OSHA) permissible exposure limit (29 CFR 1910.1000, Table Z).

TLV - American Conference of Governmental Industrial Hygiene (ACGIH) threshold limit value—TWA.

REL - National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit.

^fIDLH (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.

Ca - Carcinogen.

LEL - Lower explosive limits.

References:

American Conference of Governmental Industrial Hygienists Guide to Occupational Exposure Values, 2015, compiled by the American Conference of Governmental Industrial Hygienists.

Amoore, J. E. Hautala, "Odor as an Aid to Chemical Safety," Journal of Applied Toxicology, 1983.

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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, 2014.

Verschuseren, 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 2-2
Biological Hazards
RSA-221-R-01
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 2-2

**Biological Hazards
RSA-221-R-01
Redstone Arsenal, Madison County, Alabama**

(Page 2 of 2)








Stinging and Biting Insects		
 <p>Various Bees and Wasps</p>	 <p>Mosquitoes</p>	
 <p>Ants (including Fire Ants)</p>	 <p>Centipedes</p>	
Poisonous Plants		
 <p>Poison Ivy</p>	 <p>Poison Oak</p>	 <p>Poison Sumac</p>

Table 5-1
PPE Action Levels
Corrective Measures Implementation
RSA-221-R-01
Redstone Arsenal, Madison County, Alabama

Level of Protection	Activity Example	Criteria for Use	Action Taken for Upgrade Criteria
Level D	Site set-up, vegetation clearing, surveying land-use control boundary, fence and signpost installation, small equipment decontamination, site restoration.	Required for all work outside of EZs	If unanticipated splash hazards are encountered
Modified Level D	Small equipment decontamination.	Initial level of protection for all work associated with activities where a splash hazard may exist	Upgrade to Level C if: <ul style="list-style-type: none"> • Air monitoring detects industrial chemicals at or above action levels. • Presence of strange odor.
Level C	Fence and signpost installation, small equipment decontamination, site restoration.	Initial level of protection when: <ul style="list-style-type: none"> • Air monitoring detects possible industrial chemicals at or above Action Levels and below 1 x STEL. • No chemical splash hazards. 	<ul style="list-style-type: none"> • NA

EZ – Exclusion zone.

PPE – Personal protective equipment.

STEL – Short-Term Exposure Limit

Table 7-1

**Particulate Concentrations and PPE Action Levels
Corrective Measures Implementation
RSA-221-R-01
Redstone Arsenal, Madison County, Alabama**

Concentration of Particulate in Breathing Zone	Required Level of Protection
0 to 2.5 mg/m ³ above background ^a	Modified Level D
> 2.5 to 10 mg/m ³ ^a	Level C respirator
> 10.0 mg/m ³	Stop work; contact HSM, use dust suppression, possible Level B.

^a Sustained reading for 1 minute.

HSM – Health and Safety Manager.

PPE – Personal protective equipment.

mg/m³ – milligrams per cubic meter.

No one is permitted to downgrade levels of PPE without authorization from the Health and Safety Manager.

Table 7-2

**Air Monitoring Frequency and Location
Corrective Measures Implementation
RSA-221-R-01
Redstone Arsenal, Madison County, Alabama**

Work Activity	Instrument	Frequency	Location
Fence and signpost installation	DataRam 1000 aerosol or equivalent	Periodically	BZ of employees

BZ - Breathing zone.

Table 8-1

**Suggested Treatment Actions for Heat Stress
RSA-221-R-01
Redstone Arsenal, Madison County, Alabama**

Heat Rash	<ul style="list-style-type: none">• Keep the affected area dry.• Use dusting powder to increase comfort.
Heat Cramps	<ul style="list-style-type: none">• Stop all activity.• Sit in a cool place.• Do not return to work for a few hours after the cramps subside – further exertion may lead to heat exhaustion or stroke.• 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.
Heat Exhaustion	<ul style="list-style-type: none">• Move to a cool, shaded (or air-conditioned) area.• Loosen any restrictive clothing.• Drink plenty of water.• Pat skin with a damp rag or sponge.
Heat Stroke	<ul style="list-style-type: none">• CALL 911 (or designated emergency number).• Move to a cool, shaded location.• Cool by soaking clothes with water, spraying or showering them with water, or fanning body.

Adapted from Centers of Disease Control and Prevention Workplace Safety and Health Topics, www.cdc.gov/niosh/topics/heatstress

Table 8-2

**ACGIH Screening Criteria and Action Limit for Heat Stress Exposure
(WBGT Values in Degrees Celsius /°F)**

RSA-221-R-01

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. ACGIH – American Conference of Governmental Industrial Hygienists.

Table 8-3

**Work Load Definitions, Modified ACGIH Table 3, Metabolic Rate Changes
RSA-221-R-01
Redstone Arsenal, Madison County, Alabama**

Work Load	Examples
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 8-4

**Symptoms of Hypothermia
RSA-221-R-01
Redstone Arsenal, Madison County, Alabama**

Core Temperature (°F)	Symptoms
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

Table 8-5

**Types and Symptoms of Frostbite
RSA-221-R-01
Redstone Arsenal, Madison County, Alabama**

Condition	Symptoms
Frostnip	Area of skin whitened; slightly burning or painful.
Superficial Frostbite	Waxy, white skin with a firm sensation but with some resiliency. Feels "warm" to the victim with a notable cessation of pain.
Deep Frostbite	Tissue damage deeper than the skin, sometimes down to the bone. Skin is cold, numb, and hard.

Table 8-6

**Equivalent Chill Temperature (°F) at Various Air Temperatures and Wind Speeds
RSA-221-R-01
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	LITTLE DANGER <i>In less than 1 hour with dry skin. Maximum danger is false sense of security.</i>				INCREASING DANGER <i>From freezing of exposed flesh within 1 minute.</i>				GREAT DANGER <i>Flesh may freeze within 30 seconds.</i>			
	Zone A				Zone B				Zone C			
	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 8-7

**Work/Warming Schedule for a 4-Hour Shift
RSA-221-R-01
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">Nonemergency work should cease. NOTE: The above work/warming regimens are applicable to workers in dry not 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

Table 13-1

**Emergency Equipment Requirements
RSA-221-R-01
Redstone Arsenal, Madison County, Alabama**

Emergency Equipment	No. Per Location	Area Where Item(s) Will Be Stored	Operation Requiring Specified Equipment
Portable Eye Wash Kit*	2 each	Each vehicle	All operations
15-Minute Eye Wash*	1 each	SZ	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	[SUXOS/Site Manager]/[SSHO/UXOSO] and SZ	All operations

*For use if employees are exposed to corrosives, strong irritants, or toxic chemicals.

ATTACHMENT 1
ACTIVITY HAZARD ANALYSES

Activity Hazard Analysis (AHA)

Activity/Work Task: Mobilization (and Demobilization)	Overall Risk Assessment Code (RAC) (Use highest code)	M		
Project Location: RSA-221-R-01 Redstone Arsenal, Huntsville, AL	Risk Assessment Code (RAC) Matrix			
Contract Number: W912DY-17-D-0003	Severity	Probability		
Date Prepared: 11/17/19		Frequent Likely Occasional Seldom Unlikely		
Prepared by (Name/Title): Kym Edelman, CIH, CSP, HSE Manager	Catastrophic	E E H H M		
Reviewed by (Name/Title): Kym Edelman, CIH, CSP, HSE Manager	Critical	E H H M L		
	Marginal	H M M L L		
	Negligible	M L L L L		
Notes: (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.	RAC Chart		
	“ 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
Travel at project site.	Vehicle Operation.	See AHA 2.0.	18.A	M
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.	18.A	M
	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.	01.B.03 01.E.01 28	L
	Allergies.	All personnel should complete the Known Allergies Questionnaire (voluntary only).	01.C.01	L

Job Steps	Hazards	Controls	EM 385-1-1	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 site-specific safety and health plan (SSHP), they shall sign the SSHP 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.	01.B.03 01.E.01 28 03.A.01.b	M
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.		M
	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	M
	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	18.G	M
Prepare site.	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
	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.	11.A	M
	Fire.	Fire extinguishers shall be placed in work areas. The UXOSO shall establish smoking areas in compliance with the facility	09.E.01 09.A.06	L

Job Steps	Hazards	Controls	EM 385-1-1	RAC
		policy. Fire extinguishers will be available in all APTIM work trucks and office facilities. 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.		
	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.	28 06.B.02.b 06.B.01.b	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 Drinking water Weather radio or AM/FM radio	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) – 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

Activity Hazard Analysis (AHA)

Activity/Work Task: Visual Site Inspections and Surveys	Overall Risk Assessment Code (RAC) (Use highest code)	M
Project Location: RSA-221-R-01 Redstone Arsenal Huntsville AL	Risk Assessment Code (RAC) Matrix	
Contract Number: W912DY-17-D-0003	Severity	Probability
Date Prepared: 12/5/19		Frequent Likely Occasional Seldom Unlikely
Prepared by (Name/Title): Dennis Seymore/Project Scientist	Catastrophic	E E H H M
Reviewed by (Name/Title): Kym Edelman, CIH,CSP	Critical	E H H M L
	Marginal	H M M L L
Notes: (Field Notes, Review Comments, etc.)	Negligible	M L L L L
	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.		RAC Chart
"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	M
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.		M
	Heavy lifting, strains, and sprains.	No individual employee is permitted to lift any object that weighs over 60 pounds. Proper lifting techniques shall be used. Multiple employees or the use of mechanical lifting devices are required for lifting objects over the 60-pound limit.	14.A.01	M
	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	M
	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	M

Job Steps	Hazards	Controls	EM 385-1-1	RAC
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	M
	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
	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	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. 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	L
	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	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.	06.1	M
	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. 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): TBD– 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) – TBD 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)	Overall Risk Assessment Code (RAC)	L				
Project Location: RSA-221-R-01 Redstone Arsenal, Huntsville, AL	Risk Assessment Code (RAC) Matrix					
Contract Number: W912DY-17-D-0003	Severity	Probability				
Date Prepared: 12/17/19		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Kym Edelman, CIH, CSP, HSE Manager	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by (Name/Title): Kym Edelman, CIH, CSP, HSE Manager	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L
Notes: (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 “ 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.				RAC Chart	
	“ 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	RAC
Walking the Site Lifting Equipment and Materials	Slips, trips, and falls	<ul style="list-style-type: none"> Inspect work areas for washes, potholes, or other surface irregularities that could cause slips, trips or falls. Always establish good footing. Maintain good housekeeping. Keep walkways clear of debris and tools. 	L
	Muscle strains	<ul style="list-style-type: none"> Observe 50 pound individual lifting limit. Do not lift and twist. Get help for loads greater than 60 pounds. Train workers in safe lifting techniques. 	L
Mobile Equipment	Striking workers or equipment	<ul style="list-style-type: none"> Use spotters when backing. Inspect area for overhead and underground hazards. Know the safest route to and from your work area. Use flags, traffic cones to control traffic. 	L
Changed or Unanticipated Conditions	Safety or health hazards that may be derived from changed or unanticipated conditions	<ul style="list-style-type: none"> Modify the AHA as often as necessary to address new or unanticipated hazards. Use “Job Safety Analysis” form to facilitate field documentation. 	NA

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> • Level D personal protection: safety boots, Safety eyewear, long pants protection, abrasion resistant gloves 	<ul style="list-style-type: none"> • Tailgate safety meeting • HAZWOPER 40-hour • HAZWOPER 8-hour refresher • Worker must be trained in the safe application of task specific tools and materials • TBD – CP/SSHO 	<ul style="list-style-type: none"> • Inspect all equipment at least daily • Utility clearance checklist • Inspect non-construction equipment and power tools per manufacturer requirements.

Activity Hazard Analysis (AHA)

Activity/Work Task: Vegetation Removal	Overall Risk Assessment Code (RAC) (Use highest code)	M
Project Location: RSA-221-R-01 Redstone Arsenal Huntsville AL	Risk Assessment Code (RAC) Matrix	
Contract Number: W912DY-17-D-0003	Severity	Probability
Date Prepared: 12/5/19		Frequent Likely Occasional Seldom Unlikely
Prepared by (Name/Title): Dennis Seymore/Project Scientist	Catastrophic	E E H H M
	Critical	E H H M L
Reviewed by (Name/Title): Kym Edelman, CIH, CSP	Marginal	H M M L L
	Negligible	M L L L L
Notes: (Field Notes, Review Comments, etc.)	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.	RAC Chart
	“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 H = 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.	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	M
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.		M
	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	M
	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	M
	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	M
	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	M

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.	18.A 18.G 18.B 05.F 18.B.12	M
	Above/underground Utilities	Identify all utilities in the work area and ensure utilities will not be impacted by site operations. Mark all overhead utilities in the travel path of equipment; Utilize spotters as needed if working around utilities; Maintain clearances IAW requirements of EM 385 1-1 Table 11.1		L
	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	13.F 13.A 31.C	M

Job Steps	Hazards	Controls	EM 385-1-1	RAC
		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 chain saws above shoulder height. Personnel shall be familiar with cutting techniques.		
Vegetation removal (continued).	Tree pruning, falling, 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.	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. 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 Section 2.5 of 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 Section 8.0 the SSHP.	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 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:</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 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>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) – TBD</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: Fueling Operations	Overall Risk Assessment Code (RAC) (Use highest code)	M				
Project Location: RSA-221-R-01 Redstone Arsenal Huntsville AL	Risk Assessment Code (RAC) Matrix					
Contract Number: W912DY-17-D-0003	Severity	Probability				
Date Prepared: 12/5/19		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Dennis Seymore/Project Scientist	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
Reviewed by (Name/Title): Kym Edelman, CIH, CSP	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	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.				RAC Chart	
	"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
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</p> <p>09.B.05</p>	L
	Fire: extinguisher requirements.	<p>10 pound A:B:C fire extinguisher shall be readily 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 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</p> <p>09.B.03</p>	L

Job Steps	Hazards	Controls	EM 385-1-1	RAC
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 weed eaters, mowers, etc. shall be allowed to cool prior to re-fueling.	09.B.21	M
	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	L
	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	L
	Storage and transportation: five-gallon cans in pick-up trucks.	Gasoline shall be stored and transported in properly marked/labeled five-gallon 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	L
	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	L
	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	M
	Spills.	All spills shall be immediately cleaned-up. Spill control equipment shall be readily available. All spills shall be reported to the SS and SSHO.	09.B.19	M
Fueling operations (continued).	Storage and transportation: safety containers and saddle	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	09.B.08	L

Job Steps	Hazards	Controls	EM 385-1-1	RAC
	tanks in pick-up trucks.	<p>tanks shall be securely mounted to the pick-up truck, as recommended by the manufacturer.</p> <p>Saddle tanks shall be properly marked (see 49 Code of Federal Regulation 172.101) with the proper shipping name and labeled for “No Smoking.”</p> <p>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.)</p>		

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 Eye wash station 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>Quality Control Site Manager (QCSM)</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 (QCSM) – TBD Daily site safety inspection (SSHO) – 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: Vehicle Operations	Overall Risk Assessment Code (RAC) (Use highest code)	M				
Project Location: RSA-221-R-01 Redstone Arsenal Huntsville AL	Risk Assessment Code (RAC) Matrix					
Contract Number: W912DY-17-D-0003	Severity	Probability				
Date Prepared: 11-25-19		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Dennis Seymore/Project Scientist	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by (Name/Title): Kym Edelman, CIH, CSP	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)	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.				RAC Chart	
	"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
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. All company owned, leased, or rented commercial vehicle operations shall comply with the requirements of AMS. 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	M
	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 in accordance with the site-specific safety and health plan. If a APTIM employee is injured, the medical forms per AMS must be completed at the health clinic or Emergency Room.			01.D.01	M

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>DO NOT TAILGATE!</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

Job Steps	Hazards	Controls	EM 385-1-1	RAC
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.		M
	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	M
	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	M
	Operation of motor vehicles and trucks-Spacing/Distance	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	M
	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	M
	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	M
	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	M

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
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 (SSHO) – TBD Vehicle inspections (daily) Vehicle inspections (prior to trips greater than 50 miles for APTIM provided vehicles)

Activity Hazard Analysis (AHA)

Activity/Work Task: Fencing/Sign Post Installation		Overall Risk Assessment Code (RAC) (Use highest code)			M		
Project Location: RSA-221-R-01 Redstone Arsenal Huntsville AL		Risk Assessment Code (RAC) Matrix					
Contract Number: W912DY-17-D-0003		Severity	Probability				
Date Prepared: 11/7/19			Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Dennis Seymore/Project Scientist		Catastrophic	E	E	H	H	M
Reviewed by (Name/Title): Larry Verdier CIH <i>Larry Verdier</i>		Critical	E	H	H	M	L
		Marginal	H	M	M	L	L
		Negligible	M	L	L	L	L
Notes: (Field Notes, Review Comments, etc.)		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.			RAC Chart		
		"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	M	
Fencing/Sign post installation	Poor planning.	Complete Job Safety Analysis for each task. Use Hazard Assessment Resolution Program frequently – for each task to be completed. Utilize perimeter fencing and sign post technical specifications as provided in the corrective measures implementation plan (CMIP).				M	
	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 60-pound limit.			14.A.01	M	
	Intrusive activities and underground utilities.	Follow procedure for intrusive activities in the CMIP and site-specific safety and health plan (SSHP) prior to commencing activities.			25.A.01	M	
	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	M	

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Fencing/Sign post installation (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	M
	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
	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 the 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. 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. Follow procedures outlined in the SSHP.	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.	06.I	M
	Dust.	Dust shall be monitored and 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. Smoking shall not be permitted near fueling areas. Gasoline shall be stored in 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 – Level D: Hard Hat as applicable Safety Glasses Safety-Toed Boots Work Gloves ANSI Class 2 reflective warning vests Disposable coveralls and protective gloves (when contact with irritating plants possible) Equipment: Fire Extinguishers Emergency Eyewash First Aid Kit Drinking water Weather radio or AM/FM radio Hand tools	Quality Control Site Manager (QCSM) Training Requirements: 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 (QCSM) – TBD Daily site safety inspection (SSHO) – TBD Vehicle inspection daily Check Known Allergies Questionnaire Housekeeping (daily) Fire extinguisher (monthly) Vehicle inspection daily Overhead and underground utilities 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: Small Equipment Operations – Fencing Removal/Sign-Post Installation	Overall Risk Assessment Code (RAC) (Use highest code)	M				
Project Location: RSA-221-R-01 Redstone Arsenal, Huntsville, AL	Risk Assessment Code (RAC) Matrix					
Contract/Project Number: W912DY-17-D-0003	Severity	Probability				
Date Prepared: 8/13/20		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by (Name/Title): Dennis Seymore/Env. Scientist	Catastrophic	E	E	H	H	M
Reviewed by (Name/Title): Larry Verdier CIH	Critical	E	H	H	M	L
	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L
Notes: (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.				RAC Chart	
	“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	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. Use excavator and/or backhoe to perform work.	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 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.	M
	Unqualified operator(s).	Verify operator is qualified and authorized for the equipment being used. Note: verify any state-specific licensing requirements are met, as necessary.	M
	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.	M

Job Steps	Hazards	Controls	RAC
See job steps above.	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.	M
	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.</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>	M
	Unsafe equipment.	<p>Before 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 the USACE Safety Inspection 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 equipment shall be inspected by the operator prior to use on the project and shall then be inspected on a daily basis. Daily inspections shall be documented on the Daily Equipment Inspection form. Deficiencies in equipment shall be noted on the inspection form. Do not use equipment that is not in proper operating condition.</p> <p>Verify all manufacturers' safety guards, features, controls, 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>	M

Job Steps	Hazards	Controls	RAC														
See job steps above.	Overhead/aboveground hazards and utilities.	<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)	M
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Over 750 – 1,000 kV	45 feet (13.7 m)																

Job Steps	Hazards	Controls	RAC
See job steps above.	Underground utilities and other underground hazards.	<p>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 hours 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.</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.</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>	M
	Hand injuries.	<p>Personnel shall wear leather 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>	L
	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
See job steps above.	Use of small equipment (e.g., portable generators).	<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 Contractor guidelines prior to operating equipment. Operators must know the capacity and operating characteristics of the equipment to be operated.</p> <p>If equipped with such, use the machine stabilizers.</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 slow.</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>	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 "DANGER – STAY CLEAR" (or equivalent) warning sign(s) is visibly posted on the equipment.</p> <p>Personnel shall maintain a safe distance from operations.</p>	M

Job Steps	Hazards	Controls	RAC
See job steps above.	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 sight 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>	M
	Dust.	<p>Control dust by maintaining equipment operation rates.</p> <p>Control dust by applying water.</p> <p>Personnel shall stay out of dust and work from upwind when possible.</p> <p>Perform dust monitoring as specified in the SSHP.</p>	L

Job Steps	Hazards	Controls	RAC
See job steps above.	Slips, trips, and falls.	<p>Understand the hazards of slips, trips, and falls – consider the consequences.</p> <p>Do not jump from elevated surfaces.</p> <p>Clean-up work areas throughout the day and at the end of each workday.</p> <p>Use three-point contact rule for entering/exiting vehicles and trucks.</p> <p>Use hand rails and other stationary objects (door frames, door knobs, steering wheels, walls, etc.) to increase stability.</p> <p>Use extra caution when walking on wet, muddy, frosty, icy, or snow-covered surfaces. Consider postponing work as necessary and feasible.</p> <p>Increase your awareness, keep alert, stay focused, and know your environment.</p> <p>Stay away from slopes, hills, and grades.</p> <p>Be cautious when using stairs.</p> <p>Remove snow and ice when possible (shoveling, chipping, and salt application).</p> <p>Apply traction aids, such as sand, gravels, and straw.</p> <p>Lower your center of gravity when necessary. Slow down - take smaller steps.</p>	M
	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>	L

Job Steps	Hazards	Controls	RAC
See job steps above.	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>Follow additional procedures outlined in the SSHP.</p>	L
	Severe weather.	<p>The SSHO to monitor weather conditions each day in order to plan and prepare for hazardous conditions and identify the nearest suitable storm shelter at each work location.</p> <p>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.</p>	M
	Heat stress.	<p>Allow several days for workers to acclimatize to elevated ambient temperatures.</p> <p>Monitor for heat stress and perform physiological monitoring in accordance with the requirements of the SSHP.</p> <p>Drink plenty of water when under heat stress conditions (~ 1 quart per hour).</p> <p>Provide for adequate electrolyte replacement.</p> <p>Personnel shall take required breaks to cool down as needed.</p> <p>Provide shade or shelter during rest periods.</p>	M

Job Steps	Hazards	Controls	RAC
See job steps above.	Cold stress.	<p>Workers should dress in layers in response to the conditions.</p> <p>Monitor for cold stress in accordance with the requirements of the APP.</p> <p>Drink warm beverages when under cold stress conditions, but avoid caffeine.</p> <p>Personnel shall take required breaks to warm up as needed.</p> <p>Provide heated areas for rest periods.</p>	L

Equipment to be Used	Training Requirements/Competent or Qualified Personnel Name(s)	Inspection Requirements
TBD by Contractor.	TBD by Contractor.	TBD by Contractor.

Activity Hazard Analysis (AHA)

Activity/Work Task: Pressure Washing	Overall Risk Assessment Code (RAC)	M				
Project Location: RSA-221-R-01 Redstone Arsenal, Huntsville, AL	Risk Assessment Code (RAC) Matrix					
Contract Number: W912DY-17-D-0003	Severity	Probability				
Date Prepared: 12/17/19		Frequent	Likely	Occasional	Seldom	Unlikely
Prepared by: Kym Edelman, CIH, CSP, HSE Manager	Catastrophic	E	E	H	H	M
	Critical	E	H	H	M	L
Reviewed by: Kym Edelman, CIH, CSP, HSE Manager	Marginal	H	M	M	L	L
	Negligible	M	L	L	L	L
Notes: (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 "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.				RAC Chart	
	"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	RAC
Preparation for Pressure Washing	Musculoskeletal injury from handling heavy objects	Observe proper lifting techniques Obey sensible lifting limits (50 pounds maximum per person manual lifting) Use mechanical lifting equipment (hand carts, trucks, forklift) to move large loads, awkward loads	M
	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.	M
	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	M
	Lack of communication	Before starting, the team members shall agree on signals to be used during the operation of the equipment.	M

Job Steps	Hazards	Controls	RAC
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>	M
	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>	L
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.	M
	Foot injury from high pressure water jet	Jetting gun operators shall be protected with waterproof boots with steel toecaps, shanks, and metatarsal guards.	M
	Hand injury	Hand protection shall be used where there is a reasonable probability of injury and if required by the original equipment manufacturers' specifications.	M
	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>	M
	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>	L
	Noise	Pressure water jetting operations may produce high noise levels. Use ear protection.	M

Job Steps	Hazards	Controls	RAC
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

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
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)

Activity/Work Task: Equipment Decontamination	Overall Risk Assessment Code (RAC) (Use highest code)	M					
Project Location: RSA-221-R-01 Redstone Arsenal, Huntsville, AL	Risk Assessment Code (RAC) Matrix						
Contract Number: W912DY-17-D-0003	Severity	Probability					
Date Prepared: 12/17/19		Frequent Likely Occasional Seldom Unlikely					
Prepared by (Name/Title): Kym Edelman, CIH, CSP, HSE Manager	Catastrophic	E	E	H	H	M	
	Critical	E	H	H	M	L	
Reviewed by (Name/Title): Kym Edelman, CIH, CSP, HSE Manager	Marginal	H	M	M	L	L	
	Negligible	M	L	L	L	L	
Notes: (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.				RAC Chart		
	"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	
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.				M	
	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 (SSHO). Personnel shall perform proper decontamination procedures each time when exiting the Exclusion Zone.			28 05.A.01	L	
	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	L	
	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	M	
	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	M	
	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	M	
	Noise.	Personnel shall wear hearing protection when operating pressure washer.			05.C	L	

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Clean equipment (continued).	Fire.	Fire extinguishers shall be placed in work areas. Smoking shall only be allowed in designated areas.	09.E.01 09.A.06	L
	Heat and Cold stress.	Follow procedures outlined in the SSHP.	06.I 02.C	M
	Use of pressure or steam washer.	<p>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.</p> <p>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.</p> <p>Hot surfaces shall be avoided. Units shall be shut off and allowed to cool prior to re-fueling (if gas-powered).</p> <p>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 indoor areas.</p>	13.A.02 13.A.02 09.B.21 13.A.12	L
	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 (SSHO).	09.B.18	L

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 Face shield Metatarsal and leg protection Work gloves PVC rain-gear or Poly coated Tyvek Protective over-boots Hearing protection</p> <p>Equipment:</p> <p>GFCI Fire extinguishers Emergency eyewash First aid kit Drinking water Weather radio or AM/FM radio Spill control equipment</p>	<p>Competent Person (CP) / Qualified Person (QP): Quality Control Site Manager (QCSM)</p> <p>TBD – QP/SSHO TBD – QP/First Aid and CPR</p> <p>Training Requirements:</p> <p>Site safety orientation HAZWOPER 40-Hour Lifting/back safety Fire extinguisher use Emergency procedures National Lightning Safety Institute Lightning Safety procedures</p>	<p>Daily site safety inspection (SSHO) – TBD Daily site safety inspection (QCSM) – TBD</p> <p>Housekeeping (daily) Fire extinguisher (weekly) Equipment and tools inspection daily and before use Monitor approaching storms</p>

Activity Hazard Analysis (AHA)

Activity/Work Task: Waste Management	Overall Risk Assessment Code (RAC)	M
Project Location: RSA-221-R-01 Redstone Arsenal, Huntsville, AL	Risk Assessment Code (RAC) Matrix	
Contract Number: W912DY-17-D-0003	Severity	Probability
Date Prepared: 12/17/19		Frequent Likely Occasional Seldom Unlikely
Prepared by: Kym Edelman, CIH, CSP, HSE Manager	Catastrophic	E E H H M
Reviewed by: Kym Edelman, CIH, CSP, HSE Manager	Critical	E H H M L
	Marginal	H M M L L
Notes: (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment	Negligible	M L L L L
	<p>Step 1: Review each "Hazard" with identified safety "Controls" and determine RAC (See above)</p> <p>"Probability" is the likelihood to cause an incident, near miss, or accident and identified as: Frequent, Likely, Occasional, Seldom or Unlikely.</p> <p>"Severity" is the outcome/degree if an incident, near miss, or accident did occur and identified as: Catastrophic, Critical, Marginal, or Negligible</p> <p>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.</p>	
		RAC Chart
		E = Extremely High Risk
		H = High Risk
		M = Moderate Risk
		L = Low Risk

Job Steps	Hazards	Controls	RAC
Drums Handling	Handling heavy objects	<p>Observe proper lifting techniques.</p> <p>Obey sensible lifting limits (50 pounds maximum per person manual lifting).</p> <p>Use mechanical lifting equipment (handcarts, trucks, and forklift) to move large loads, awkward loads.</p> <p>Check and secure drum lids before moving.</p>	M
	Caught in/between moving parts/pinch points	<p>Identify and understand parts of equipment, which may cause crushing, pinching, rotating, or similar motions.</p> <p>Remove all jewelry, especially rings, bracelets, watches</p> <p>Watch hand placement and foot placement</p> <p>Assure guards are in place to protect from these parts of equipment during operations.</p> <p>Abrasion resistant work gloves when the possibility of pinching, or other injury may be caused by moving / handling large or heavy objects.</p> <p>Maintain all equipment in a safe condition.</p> <p>Keep all guards in place during use.</p> <p>De-energize and lock-out machinery before maintenance or service.</p>	M

Job Steps	Hazards	Controls	RAC
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

Equipment to be Used	Training Requirements/Competent or Qualified Personnel name(s)	Inspection Requirements
<ul style="list-style-type: none"> Level D: hard hat, safety glasses, safety boots, ear protection, abrasion resistant gloves Hand tools Drum dolly Forklift 	<ul style="list-style-type: none"> Tailgate Safety Meeting Site-specific orientation HAZWOPER 40-hr. HAZWOPER 8-hour refresher 8-hr Supervisor training Forklift operator training TBD – CP/SSHO 	<ul style="list-style-type: none"> Use this AHA as a checklist Inspect all equipment and tools prior to use per manufacturer requirements.

Activity Hazard Analysis (AHA)

Activity/Work Task: Disposal of Investigative Derived Waste	Overall Risk Assessment Code (RAC) (Use highest code)	M
Project Location: RSA-221-R-01 Redstone Arsenal Huntsville, AL	Risk Assessment Code (RAC) Matrix	
Contract Number: W912DY-17-D-0003	Severity	Probability
Date Prepared: 12/17/19		Frequent Likely Occasional Seldom Unlikely
Prepared by (Name/Title): Kym Edelman, CIH, CSP, HSE Manager	Catastrophic	E E H H M
Reviewed by (Name/Title): Kym Edelman, CIH, CSP, HSE Manager	Critical	E H H M L
	Marginal	H M M L L
	Negligible	M L L L L
Notes: (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.	RAC Chart
	"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	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.	M
	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.	L
	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.	L
	Slip, trip and falls	Housekeeping shall be a routine task throughout daily activities.	M

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 site-specific safety and health plan. 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 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 60 pounds 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. 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): TBD HAZWOPER 40-Hour Site safety orientation Emergency procedures Hazard communication Hazardous materials shipping Applicable AHAs Fire extinguisher use	Daily site safety inspection (SSHO) – TBD Daily site safety inspection (CP) –TBD Housekeeping (daily) Fire extinguisher (weekly) Vehicle inspection daily Inspect shipping containers and labeling

Activity Hazard Analysis (AHA)

Activity/Work Task: Site Restoration	Overall Risk Assessment Code (RAC) (Use highest code)	M
Project Location: RSA-221-R-01 Redstone Arsenal, Huntsville, AL	Risk Assessment Code (RAC) Matrix	
Contract Number: W912DY-17-D-0003	Severity	Probability
Date Prepared: 12/17/19		Frequent Likely Occasional Seldom Unlikely
Prepared by (Name/Title): Kym Edelman, CIH, CSP, HSE Manager	Catastrophic	E E H H M
Reviewed by (Name/Title): Kym Edelman, CIH, CSP, HSE Manager	Critical	E H H M L
	Marginal	H M M L L
	Negligible	M L L L L
Notes: (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.	RAC Chart
	"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	M
Restore site.	Poor planning.	Complete Job Safety Analysis for each task. Use Hazard Assessment Resolution Program frequently – for each task to be completed.		M
	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	M
	Intrusive activities and underground utilities.	Follow procedure for Utility Contact Prevention in site-specific safety and health plan (SSHP) 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	M

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Restore site (continued).	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	M
	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	M
	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.	18.A 18.G 18.B 05.F	M

Job Steps	Hazards	Controls	EM 385-1-1	RAC
Restore site (continued).	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. 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.	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.	06.I	M
	Dust.	Dust shall be monitored and controlled. Respiratory protection may be required if dust cannot be adequately controlled.		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 40-B:C fire extinguisher shall be available when refueling. 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) Quality Control Site Manager (QCSM): TBD – CP/SSHO TBD – 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) – TBD Daily site safety inspection (QCSM) – TBD 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)	L
Project Location: RSA-221-R-01 Redstone Arsenal, Huntsville, AL	Risk Assessment Code (RAC) Matrix	
Contract Number: W912DY-17-D-0003	Severity	Probability
Date Prepared: 07/21/20		Frequent Likely Occasional Seldom Unlikely
Prepared by (Name/Title): Dennis Seymore	Catastrophic	E E H H M
Reviewed by (Name/Title): Larry Verdier, CIH, CSP, HSE Manager	Critical	E H H M L
	Marginal	H M M L L
Notes: (Field Notes, Review Comments, etc.) This AHA serves as the hazard assessment	Negligible	M L L L L
	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.	RAC Chart
	"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 H = High Risk M = Moderate Risk L = Low 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.		

Job Steps	Hazards	Controls	RAC
Mobilization to site	Inadequate preparation and training that can lead to possible infection	<ul style="list-style-type: none"> • Site Safety & Health Officer (SSHO) to identify potential infection sources due to the task, location, and surrounding areas. Include discussion of same in site specific training. • 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"> 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. 2. The most frequent symptoms are fever, coughing, shortness of breath. 3. Maintain 6-foot separation unless the job task requires working closely. If working closer than 6 feet wear a mask. • All personnel shall follow guidance in AMS-710-01-FM-04201, <i>COVID-19 Control Plan</i>. • Check of the APTNet Corona Virus webpage for the latest CDC guidance and update recommendations, as applicable. • Site workers are required to report travel to high-risk areas, potential exposure to infected people, and symptoms of illness. • Do not share tools, pens, or anything else without disinfecting between uses. Use your own pen. • 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. 	L

Job Steps	Hazards	Controls	RAC
		<ul style="list-style-type: none"> • 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. • In addition to what is provided in this AHA, subcontractors and Government personnel are directed to follow their Corporate HR policies. • CDC document How It Spreads: https://www.cdc.gov/coronavirus/2019-ncov/prepare/transmission.html • 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. • 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. • Wipe the steering wheel and other high-contact surfaces of rental vehicles with disinfectant. Any cloth or tissue saturated with disinfectant such as >60% isopropyl alcohol, >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: https://www.epa.gov/sites/production/files/2020-03/documents/sars-cov-2-list_03-03-2020.pdf • Designate a representative to monitor for signs of illness in the workplace, and if someone is showing symptoms, SSHO shall ask them to leave. • 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. • 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. • 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. • 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. • 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 	

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"> • Provide disposable gloves where appropriate; instruct workers to wash hands after removing gloves. • Communicate key CDC recommendations (and post signage where appropriate) to your staff and tradespeople. 	
Hotel Stays	Infection	<ul style="list-style-type: none"> • 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. • Request no maid service for short stays. • Minimize time spent in common areas like the hotel lobby, exercise facility, or restaurant. Practice social distancing with hotel staff and other guests. • Wipe high-contact areas like doorknobs and countertops with disinfectant. Any cloth or tissue saturated with disinfectant such as >60% isopropyl alcohol, >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: https://www.epa.gov/sites/production/files/2020-03/documents/sars-cov-2-list_03-03-2020.pdf 	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"> • Transport disinfectants in vehicles in compliance with DOT Materials of Trade exception: <ul style="list-style-type: none"> ○ Materials in labeled leak-tight containers. ○ Containers secured so that they do not move while in transit, driver aware of hazardous materials in vehicle. ○ No more than 5 gallons of flammable liquid in any single container. ○ If disinfectants must be shipped (for example by FedEx) use ground shipment. 	L
Site tasks	Infection or spread of infection to other site personnel	<ul style="list-style-type: none"> • 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. • Also, when the buddy system is employed maintain spacing of at least 6 feet. • Hold tailgate safety meetings outdoors or in a space large enough to allow separation. • To the extent practical, limit time within trailers and office spaces. Each trailer is equipped with its individual HVAC unit that includes a filter. • All Site Worker's temperatures will be monitored at the beginning of each workday by designated personnel. • Personnel will be sent home if their temperature exceeds 100.4° F (38.0° C). • Do not share pens, tools or personal protective equipment (PPE). • 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. • Avoid handshakes and hugs. 	L

Job Steps	Hazards	Controls	RAC
		<ul style="list-style-type: none"> • Provide handwashing station or hand sanitizer and use often. Soap is preferable to hand sanitizers when it is available. Sanitizers can break down the skin making an individual more prone to chemical and biological exposures. • Clean high-contact surfaces daily with disinfectant. 	
<p>Site-specific tasks: Multiple operators in equipment, multiple drivers of work vehicles, sharing ice cooler, sharing hand tools, sharing analog instruments, sharing portable toilet</p>	<p>Possible infection or spread of infection</p>	<ul style="list-style-type: none"> • Limit operators and decontaminate equipment and vehicles twice daily. • Pack water in personal backpacks and small coolers. • Each team member will have a personal shovel and instrument to use for job duration. • Portable toilet commonly touched surfaces will be cleaned after each use. 	L
<p>Confirmed infection</p>	<p>Infection of others Logistical issues related to managing infected personnel far from home</p>	<ul style="list-style-type: none"> • Personnel who develop symptoms like fever, cough, or shortness of breath that might indicate infection are to self-quarantine and notify the UXOSO. UXOSO is to notify PM and Corporate lead entity. UXOSO may not release the name of quarantined personnel to others without authorization from Corporate lead entity. • Subcontractor and Government personnel who develop symptoms like fever, cough, or shortness of breath that might indicate infection should notify the SUXOS/UXOSO and follow guidance within their Corporate HR policies. • APTIM's PM, in concert with senior management, will provide coordination and support to facilitate quarantine. If infected person is local the person will be asked to self-quarantine at home or go to a hospital if seriously ill. If infected person is not local, the person may have to quarantine in a hotel, unless seriously ill. If/when this occurs it will be reported up the chain and situation-specific responses will be determined. • If suspected infected personnel must be within 6 feet of other personnel (in a car, for instance) the suspected infected individual and any personnel within a 6 foot radius should wear an N95 if available, face covering or surgical mask. • If an employee tests positive for COVID-19, they should follow HGL's requirements for sick leave, benefits, and return to work. Subcontractors and Government personnel are directed to follow guidance within their Corporate HR policies regarding employee leave. In addition, before returning to the project site the site worker must provide the UXOSO with documentation of a negative test, a note from a doctor, or a state or local testing facility. • Contact Tracing: All of the people that the positive testing employee had sustained contact with for more than 10 minutes (within a 6 foot distance) will be made aware of their potential for exposure and will be told to do daily self-checks and monitor their symptoms and temperature. 	L
<p>Restricting Job Site Visitors</p>	<p>Possible Exposure by Unvetted Visitor</p>	<ul style="list-style-type: none"> • Restrict the number of visitors to the job site, including the trailer or office. • All visitors should be screened in advance. If the visitor can answer "yes" to any of the following questions (without identifying which question applies), the visitor will not be permitted to access the facility. The questions are: <ul style="list-style-type: none"> ○ Have you been asked to self-quarantine since December 2019? 	L

Job Steps	Hazards	Controls	RAC
		<ul style="list-style-type: none"> ○ Have you been in close contact with any person(s) who has been asked to self-quarantine since December 2019? ○ Have you experienced a recent onset of any illness-related symptoms, such as fever, cough, or shortness of breath? ○ Have you traveled outside of North America in the past 14 days? ○ Have you been in close contact with any person(s) who have traveled outside of North America in the last 14 days? ○ Have you been in close contact with any person(s) who has been diagnosed with COVID-19? 	
Site clean-up and demobilization	Possible infection or spread of infection Employee stopped or prevented from traveling home due to state restrictions due to stay at home orders	<ul style="list-style-type: none"> • Decontaminate equipment before shipping to home office. • Decontaminate GPS units before returning. • Clean boots, work clothes, and gear used at work prior to travel home to prevent further exposure and spread. • Plan ahead for specific state restrictions personnel will travel through during demobilization and provide a letter stating employee is essential personnel. 	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/chemical resistant gloves Equipment: As needed for task	Competent Person (CP) / Qualified Person (QP): TBD - CP/SSHO TBD - CP/First Aid and CPR Training Requirements (as determined by SSHO): Tailgate meetings Emergency procedures Hazard communication	Daily site safety inspection (SSHO) – TBD Housekeeping (daily) Hand washing station or hand sanitizer solution available and used. Distancing being practiced. Do any personnel show signs of infection? SSHO to notify Project Manager and HR of any reports of signs of infection immediately. SSHO is not to provide names of involved personnel to others without authorization from HR.

ATTACHMENT 2

AMS HEALTH AND SAFETY PROCEDURES

AMS-710-02-CK-01613, Intrusive Activity Checklist
AMS-710-02-FM-06901, Underground/Overhead Utility Checklist/Diagram
AMS-710-02-PR-02700, Non-Commercial Motor Vehicle Safety
AMS-710-02-PR-05700, Mechanized and Marine Equipment
AMS-710-02-PR-01610, Utility Contact Prevention
AMS-710-01-PR-00300, Bloodborne Pathogens
AMS-710-05-PR-00400, Stop Work Authority
AMS-710-04-PR-00300, Hazardous Waste Operations
AMS-710-05-PR-01700, Work Area Hazard Assessment
AMS-710-02-PR-03000, Personal Protective Equipment
AMS-710-02-PR-03500, Respiratory Protection Program
AMS-710-02-PR-06400, Permit to Work
AMS-710-01-PR-05000, Medical Surveillance Program
AMS-710-01-PR-01000, Sanitation and Potable Water
RSA IW UFP QAPP SOP 28.0, MEC Anomaly Avoidance
AMS-710-01-FM-04201, COVID-19 Control Plan
AMS-710-02-PR-01500, Control of Hazardous Energy



INTRUSIVE ACTIVITIES CHECKLIST

Purpose: This form is designed to help the Competent Person – Intrusive Activities make decisions during boring/excavation around underground/overhead utilities.

DATE _____ PROJECT NAME/NUMBER _____

Competent Person – Intrusive Activities: _____

DURATION/SUMMARY OF WORK TO BE PERFORMED: _____

Consideration	Check	Check	Explanation	Initial
Has the city and state one-call been contacted?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
If one-call not available, has a private locating service been contacted?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Were any utilities identified through private locating service? (If yes, indicate on site drawings)	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Are any as-built drawings available? If so, do they show any utilities?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Has a visual inspection of the work area(s) been completed for signs of underground/overhead utilities?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Are there any "No Drill Zones" on-site. If so, have proposed boreholes/excavations been relocated	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Are there overhead utilities that will be closer than the minimum clearance distances established in Exhibit 7.1 (Minimum Clearance Distances) of AMS-710-02-PR-06600 near heavy equipment?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Are there any fiber optic cables or high pressure fuel lines within 50 feet of hole locations?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
If fiber optic cables or high pressure fuel lines are within 50 feet, there is an agreement with the fiber optic company been established?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		



INTRUSIVE ACTIVITIES CHECKLIST

If yes to question above, has a Fiber Optic or High Pressure Fuel Line Contingency plan been approved?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Can a test borehole be advanced by hand digging, augured probing, post hole digging, hydrovacting and/or air knifed to 5 feet bgs?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
If hand digging, probing, post hole digging, and or air knifing to 5 feet bgs is not possible, can a non-invasive geophysical investigation be conducted? If not, has an Authorization to Drill Permit been signed?	<input type="checkbox"/> Yes	<input type="checkbox"/> No		
Person completing Form	Signature:			
Other considerations:				



Underground/Overhead Utility Checklist/Diagram

Site Name/Number _____ **Date** _____

Location _____

Process:

A diagram of site depicting the proposed location of excavation or drilling locations must be attached to this Underground/Overhead Utility Checklist. The diagram must clearly indicate the areas checked for both underground and overhead utilities, structures, and facilities. This form and the diagram must be signed by the Project Manager, the APTIM Field Supervisor, and the client representative (if applicable).

Type of Structure	Present	Not Present	Method Of Mark-out
Electric Power Line			
Natural Gas Line			
Communication Line			
Fiber Optic Line			
Water Line			
Product Line			
Steam Line			
Sewer Line			
Drain Line			
Underground Tank			
Overhead Power Line			
Overhead Product Line			
Overhead Fiber Optic Line			
Overhead Communication Line			
Septic Tank/Sewer/Drain			
Underground Duct Backs			

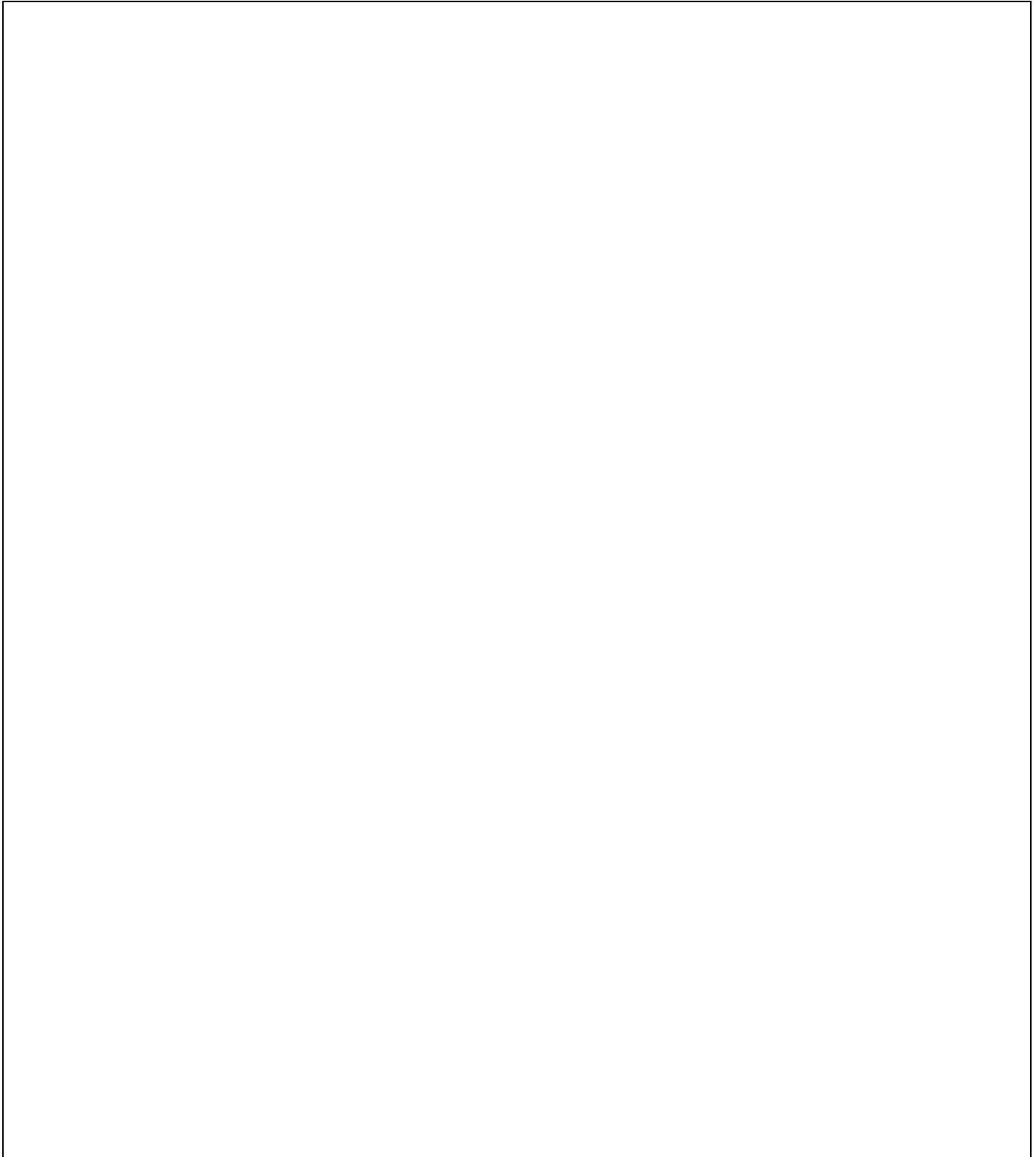
Client Representative _____ (Date) _____
(If applicable) (Signature)

APTIM Site Manager _____ (Date) _____
(If applicable) (Signature)

APTIM Field Supervisor _____ (Date) _____
(If applicable) (Signature)



Diagram of Intrusive Activities Locations and Utilities Locations:



PROCEDURE

Procedure Number:

AMS-710-02-PR-02700

Revision:

1

Procedure Owner:

HSE

Issuing Authority:

VP HSE & Security

Approval Date:

3/4/2019



NON-COMMERCIAL MOTOR VEHICLE SAFETY

1	Clarification regarding the use of the point system for existing employees, sections 4.2.3, 4.2.5-4.2.7.	M. Hetzler	3/4/2019
0	Initial Issue	M. Hetzler	2/22/2019
Rev	Changes	Approved	Date

Parent Document:

N/A

NON-COMMERCIAL MOTOR VEHICLE SAFETY

1.0 PURPOSE

The purpose of this Procedure is to establish the minimum requirements for using non-commercial motor vehicles on APTIM sites and driving on company business. More stringent regulatory agency or client procedures may supersede these requirements. Each project is responsible for identifying the most stringent procedure and including those requirements in the site-specific safety plan. The most stringent of the requirements shall be adhered to.

The following deliverables are defined within this procedure:

Deliverable	Producer	Customer
Vehicle Inspection Form AMS-710-02-FM-02701	Driver	Site Files / Equipment Services Group
Motor Vehicle Procedure Acknowledgement Form AMS-710-02-FM-02702	Driver / Supervisor	HR Personnel Files
Notice of Citation Form AMS-710-02-FM-02704	Driver	HSE Rep and HR Personnel Files
Request for Check of Driving Record Form AMS-710-02-FM-02705	Driver / Site Manager /HR Representative / Hiring Manager	Supervisor, HSE Rep, and MVR Coordinator
Training	Drivers	Site Files / Learning Management System

2.0 SCOPE

This procedure addresses the operation of non-regulated over-the-road vehicles (e.g., cars, trucks, and vans with gross weight of 10,000 lbs or less) by Company authorized drivers. On-site mobile equipment, rough terrain vehicles, golf carts, and similar utility vehicles are not covered in this procedure.

This procedure applies to all APTIM employees, contractors, and subcontractors associated with an APTIM site who operate a motor vehicle on behalf of APTIM (e.g. company- owned, rented, or leased by APTIM or its clients – hereafter referred to as “company vehicle”). In addition, this procedure applies to the use of personal vehicles on company business.

The requirements for operating Commercial Motor Vehicles (i.e. those which typically require a Commercial Driver’s License and/or are regulated by DOT) can be found in the Commercial Motor Vehicle Safety Procedure (AMS-710-02-PR-03900).

- It should be noted that the requirements of AMS-710-02-PR-03900 apply to non-commercial vehicles when the combined Gross Vehicle Weight Rating (GVWR) or Gross Combination Weight Rating (GCWR) of the vehicle and its load/attachments exceed 10,000 pounds.

NON-COMMERCIAL MOTOR VEHICLE SAFETY

- Any vehicle, no matter how small, hauling hazardous materials in quantities requiring placards is defined as a Commercial Motor Vehicle, and the driver requires a Commercial Driver's License with proper endorsements.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- APTIM Human Resources
- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Equipment Services Group
- APTIM Contractors
- APTIM Subcontractors

4.0 PROCEDURE

- 4.1.1 All personnel who operate a company vehicle and those operating a personal vehicle for business purposes (all hereby referred to as "driver(s)") shall be familiar with this procedure and certify acceptance of the requirements by completing Motor Vehicle Procedure Acknowledgement Form (AMS-710-02-FM-02702).
- 4.1.2 Company vehicles are to be utilized exclusively for business purposes and occupied by authorized passengers as defined in this procedure.
- 4.1.3 Drivers shall have a valid driver's license for the area in which they are operating a vehicle. Any person with a suspended license is prohibited from driving any company vehicle.
- 4.1.4 Drivers shall comply with all local, state, and federal traffic regulations.
- 4.1.5 Drivers are personally responsible for any and all citations incurred by violating traffic regulations. Citations issued while driving a company vehicle or a personal vehicle while on company business shall be reported using the Notice of Citation Form (AMS-710-02-FM-02704).
- 4.1.6 Drivers shall be familiar with and abide by all laws and regulations applicable to the operation of their vehicle and should not drive motor vehicles in areas (i.e. other countries) where they are unsure of or inexperienced in local driving rules and regulations.
- 4.1.7 Drivers shall use cell phones/cellular devices in accordance with Cellular Device Use Procedure (AMS-710-02-PR-05600).

NON-COMMERCIAL MOTOR VEHICLE SAFETY

- 4.1.8 Drivers shall notify their supervisor immediately of any event that might alter their driver's license status, to include suspension or revocation of driver's license.
- 4.1.9 Where applicable, requests for reinstatement of denied or revoked driving privileges can be made to the appropriate SBU HSE Lead.
- 4.1.10 Smoking in company-owned, leased, or rented vehicles is prohibited.
- 4.1.11 No pets are allowed in company-owned, leased, or rented vehicles.
- 4.1.12 Failure to comply with this procedure may result in disciplinary action up to and including termination.

4.2 Driver Qualification and Status

- 4.2.1 New hire candidates (including non-APTIM personnel) may be subject to a Motor Vehicle Record background check (MVR), based on the position for which he/she is applying, prior to driving for APTIM business purposes.
- 4.2.2 The applicable hiring manager, HR Rep, or other APTIM personnel shall complete a Request for Check of Driving Record Form (AMS-710-02-FM-02705) and provide a copy to an MVR Coordinator.
 - 4.2.2.1 MVR Coordinators shall perform the following steps:
 - 4.2.2.2 Generate an MVR.
 - 4.2.2.3 Evaluate results and render a decision based on the Driving Record Point System shown in section 4.2.3.
 - 4.2.2.4 Communicate results back to the MVR requestor.
- 4.2.3 Drivers shall be evaluated in accordance with the Driving Record Point System shown in the table below.

Description of Violation	Assigned Point Value
Non-Moving: vehicular equipment deficiency, no seatbelt use, failure to secure load.	1
Moving: speeding (less than 15 miles per hour over limit, disobey traffic control signal, failure to signal, tailgating, use of cell phone while driving.	2
At-fault accident	3

NON-COMMERCIAL MOTOR VEHICLE SAFETY

Major citations: speeding (15 mph or more over limit, reckless driving, suspended license for driving violation, speed contest, open alcohol container (Non-Work Related).	6	
Driving under the influence (Non-Work Related), Hit and run (leaving the scene of an accident), Refusal to submit to testing.	8	
Driving under the influence (DWI/DUI) Work Related, Work Related Open Alcohol Container	Ineligible / Termination	
Driving Privilege Status Description	Past 12 Months	Past 24 Months
Can drive without restriction.	0-3 points	0-5 points
Can drive with understanding of probationary status.	4-6 points	6-8 points
Not eligible for company driving privileges for 12 months.	7-11 points	9-15 points
Not eligible for company driving privileges.	12 points or more	16 points or more

4.2.4 Pre-Employment Driving Record Point System

4.2.4.1 If a new hire candidate has accumulated three points or less in the last 12 months or five points or less in the last 24 months per date of MVR, they shall be given the privilege to drive motor vehicles on company business without restrictions.

4.2.4.2 If a new hire has accumulated four to six points in the last 12 months or six to eight points in the last 24 months, they shall be placed on probation for a period of 12 months. They shall be afforded the privilege to drive motor vehicles on company business during this probationary period. Any driving infractions (e.g., speeding tickets, at-fault accidents, and any other citations) accumulated during this probationary period shall result in termination of the privilege to drive a motor vehicle on company business.

4.2.4.3 If the new hire candidate has accumulated seven to eleven points in the last 12 months or nine to fifteen points in the last 24 months, they shall not be eligible for company driving privileges. Employment can only be offered with the strict understanding of denial of the privilege to drive motor vehicles on company business. After the first 12 months of employment, the employee can petition the appropriate SBU President and SBU HSE Lead for reconsideration of driving privileges. An MVR will be generated at this time.

4.2.4.4 If a new hire candidate is expected to drive a vehicle to fulfill the responsibilities of his/her role and there has been an accumulation of twelve points or more in the last 12 months or sixteen points or more in the last 24 months, the candidate shall not be hired.

NON-COMMERCIAL MOTOR VEHICLE SAFETY

4.2.5 Existing Drivers

4.2.5.1 Requiring drivers to maintain an acceptable driving record is a risk mitigation measure utilized by the company for continued driving privileges. Accordingly, each affected driver's MVR traffic record may be subject to periodic review to ensure compliance with state and federal regulations, as well as company policy.

4.2.5.2 The applicable APTIM Manager/Supervisor or HSE Representative may initiate the MVR process by completing a Request for Check of Driving Record Form (AMS-710-02-FM-02705) and submitting the form to the HSE Representative.

4.2.5.3 Drivers shall provide verbal and written notice to their supervisor of traffic or vehicular citations in accordance with 4.2.6 - 4.2.7.

4.2.6 Work Related Traffic Violations

4.2.6.1 Drivers shall provide verbal and written notice to their supervisor of citations involving company vehicles within 24 hours of the event. This applies to citations occurring during business hours and non-business hours.

4.2.6.2 This verbal notice shall be followed by the driver completing a Notice of Citation Form (AMS-710-02-FM-02704), which shall be forwarded to the respective SBU HSE Lead or designee.

4.2.7 Non-Work Related Traffic Violations

4.2.7.1 It is not necessary for drivers to report non-work related citations to their supervisor as they occur, with the exception of Driving Under the Influence (DWI/DUI).

4.2.7.2 However, drivers have the responsibility to keep track of their non-work related vehicular citations and utilize established evaluation criteria, as described in the table shown in section 4.2.3, to determine if their overall traffic citations exceed acceptable company limits.

4.2.7.3 Additionally, if a driver's overall MVR record (work related or not) exceeds the company's established points system criteria, the driver shall verbally inform their supervisor as soon as practical, but no longer than the following business day after the occurrence.

4.2.7.4 Continued employment may only be extended with the strict understanding of denial/revocation of the privilege to drive company vehicles, or personal vehicles on company business. After the first 12 months following driving privilege revocation, the driver can petition their respective SBU President and SBU HSE Lead for reconsideration of driving privileges.

4.2.8 Drivers assigned a company vehicle are responsible to ensure that other drivers are qualified in accordance with this procedure before operating the vehicle. Failure to do so may result in disciplinary action up to and including termination.

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4.3 Incident Reporting

- 4.3.1 Drivers shall report all vehicle citations and incidents while driving a company vehicle or personal vehicle incurred while on company business to their supervisor, or responsible APTIM personnel, as soon as possible, but not later than 24 hours after the occurrence.
- 4.3.2 Incidents involving company vehicles or personal vehicles being used for business purposes shall be reported in accordance with the Incident Reporting Procedure (AMS-710-05-PR-02300).

4.4 Use of Personal Vehicles for Business Purposes

- 4.4.1 Personal vehicles shall only be used for company business on APTIM sites if approved by the Site Manager or his designee.
- 4.4.2 Drivers using personal vehicles for Company business, other than on project sites, shall not be reimbursed for any damage sustained by or to their vehicle. The Company also assumes no liability for any incident while operating personal vehicles.
- 4.4.3 Drivers using personal vehicles on Company business shall maintain liability coverage that meets or exceeds statutory minimum limits. Drivers are recommended to maintain the following limits: \$100,000 per person, \$300,000 per occurrence, and \$25,000 property damage.

4.5 Vehicle Inspection & Maintenance

- 4.5.1 All drivers shall perform a visual 360 degree walk around prior to each use.
- 4.5.2 All company vehicles shall be inspected, at a minimum, on a weekly basis by using the Vehicle Inspection Form (AMS-710-02-FM-02701). Completed Inspection forms shall be sent to the Equipment Services Group.
- 4.5.3 Drivers that have been assigned a company vehicle shall ensure that the vehicle is maintained in accordance with manufacturer specifications. The Driver Responsibility sheet in each vehicle outlines the services to be rendered at prescribed mileage intervals.
- 4.5.4 Drivers using a personal vehicle are responsible to ensure that the vehicle is maintained in accordance with manufacturer specifications and applicable federal, state, and local requirements.

4.6 Impaired Driving

- 4.6.1 Personnel shall not operate a vehicle for company business when mental or physical impairment might interfere with their ability to operate the vehicle in a safe manner.

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- 4.6.2 Personnel shall not operate a vehicle for company business while impaired, intoxicated or under the influence of alcohol or illegal drugs as outlined in the Substance Abuse Program Procedure (AMS-710-01-PR-03600).
- 4.6.3 Personnel shall not operate a vehicle for company business while under the influence of medication that may interfere with motor vehicle operation.
- 4.6.4 Personnel shall not operate a vehicle for company business when under conditions of extreme stress, fatigue, or any other physical or mental impairment that may hinder safe vehicle operation.
- 4.7 Driver Safety Notification Sticker**
- 4.7.1 A safety notification bumper sticker shall be applied to all US/Canada based company vehicles in an effort to ensure continued compliance with driving safety regulations.
- 4.7.2 The notification service shall be managed by a third party fleet safety management company and shall serve as the recipient of all calls that are placed concerning unsafe driving behavior. The Equipment Services Group shall serve as the first point of contact as it pertains to notifications that are received from the third party company who administers the bumper sticker safety call in service.
- 4.7.3 Upon receiving a report from the third party administrator, the Equipment Services Group shall contact the respective SBU HSE Lead or designee. The SBU HSE Lead or designee shall then contact the affected driver's supervisor concerning the complaint and provide an Employee Counselling Record (AMS-710-05-FM-00201), where applicable. All third party reports should be closed out by the driver's supervisor as instructed on the report.
- 4.7.4 Upon verification that the report was made in error or the caller statement was verified to be unsubstantiated, the SBU HSE Lead or designee should request the report be removed from the system. Reports can only be removed from the system with final authorization from the SBU HSE Lead or designee.
- 4.7.5 Deemed the primary/responsible operator of the vehicle, it is the responsibility of the driver to ensure that the sticker remains on the vehicle and is legible at all times. If the vehicle is project or program assigned and there is no designated primary operator, then the Project/Site Manager shall be considered the primary/responsible party.
- 4.7.6 The primary/responsible party shall contact the Equipment Services Group immediately upon recognizing that the sticker is defaced or removed so a new one can be applied. Failure on the part of the primary operator to ensure that a legible sticker remains on the vehicle shall result in disciplinary action up to and including revocation of vehicle usage or possible termination of employment.

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4.8 Global Positioning System

- 4.8.1 Global Positioning System (GPS) speed and location gathering devices may be installed in company vehicles. The company utilizes data generated by these devices to track vehicle use, substantiate reports of unsafe driving, and monitor driving behavior.
- 4.8.2 Unsafe and unlawful driving behavior (i.e. excessive speeding), reported by GPS devices shall be investigated to evaluate the circumstances. Where applicable, the driver may be subject to disciplinary action up to and including termination of employment per the HSE Disciplinary Action Procedure (AMS-710-05-PR-00200).
- 4.8.3 Drivers caught disabling, tampering, or refusing to drive Company vehicles equipped with GPS shall be subject to disciplinary action up to and including immediate termination.

4.9 Transporting Personnel and Materials

- 4.9.1 Personnel shall not be used to support or steady loads while a vehicle is in motion.
- 4.9.2 Truck running boards shall not be ridden by personnel.
- 4.9.3 Drivers and passengers shall be seated with arms and legs inside the vehicle.
- 4.9.4 Personnel shall mount and dismount vehicles only when stopped and the gear in park. For manual transmissions, the gear shall be set based on manufacturer's recommendations with the parking brake engaged.
- 4.9.5 Personnel shall vacate all vehicles that are being loaded by a crane, backhoe, shovel, loader, or other equipment and shall move away from the vehicle during loading.
- 4.9.6 Loads extending beyond the bed of a truck or wagon shall be flagged and marked appropriately.
- 4.9.7 If left overnight, loads extending beyond the bed of a truck or wagon shall be flagged and marked appropriately (i.e. cones, reflective tape, etc.).
- 4.9.8 Drivers are responsible for safe loading, unloading, and securing of cargo.
- 4.9.9 Load shall not exceed manufacturer's specifications.
- 4.9.10 Where passengers are permitted to ride in the bed of trucks, the following requirements shall be met:
- Seats shall be firmly attached or passengers shall sit flat on the bed of the truck and shall not lean against the tailgate. Passengers shall keep their arms and legs inside the boundaries of the truck.
 - The maximum speed at which the vehicle may travel on site is 10 mph, unless posted signage dictates a lower speed.

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- At a minimum, passengers shall wear safety glasses unless the bed of the truck is enclosed.
- The weight of the people and their materials/tools shall not exceed the weight capacity of the vehicle.
- Passengers shall not be transported on the back of flatbed trucks.

4.9.11 Vehicles shall not be left running while unattended.

4.9.12 If a vehicle is parked on an incline or grade, the parking brake shall be engaged and wheels properly chocked.

4.9.13 When repair work or maintenance of any sort is performed on any vehicle, the parking brake shall be engaged.

4.10 Safety Features and Supplies

All company vehicles used on site shall be equipped in accordance with state and local laws and regulations. The Company also requires the following equipment:

4.10.1 First-aid Kit (when necessary due to the set-up of the site)

4.10.2 Snow tires and chains where conditions warrant

4.10.3 A minimum 2 1/2 pound ABC-rated fire extinguisher

4.11 Training

To help equip employees with the knowledge and skills of defensive driving, the following has been established:

4.11.1 New Hire Training - personnel expected to be driving a company vehicle or driving a personal vehicle on company business shall be required to complete a standard/initial defensive driver training program. This typically will apply to professional employees and certain craft employees, based upon roles and responsibilities.

4.11.2 Refresher Training – APTIM drivers will be required to complete a “refresher” defensive driver training program once every 2 years.

4.11.3 Post-Incident Training – Employees involved in an incident while driving on company business may be required to take post-incident training.

4.11.4 In the event one of APTIM’s clients has an established Driver Qualification program that meets or exceeds the company approved defensive driver training as approved by Corporate HSE, then the employee is only required to complete one training.

4.11.5 Recordkeeping - All training forms and supporting documentation shall be retained in the company’s learning management system.

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5.0 TERMINOLOGY

Key terms within the context of the procedure. Terminology is to be listed in a table as shown below:

Term	Definition
Authorized Passengers	<p>Authorized passengers in APTIM Company Vehicles are limited to:</p> <ul style="list-style-type: none"> • Company employees or employees of all subsidiaries • Consultants or subcontractors to the Company when on Company business • Company clients or potential clients, Company vendors, and other on legitimate Company business
Company Vehicle	Any motor vehicle that is owned, leased, rented, provided by a Client or otherwise provided by or through Company
Company	APTIM and its subsidiaries and affiliates
Driver	Individuals who are assigned a company vehicle or drive a company- owned/leased/rented vehicle, or personal vehicle, on Company business.
Motor Vehicle	Motor vehicle means motorized over-the-road vehicles to include: any passenger vehicle, cars, trucks used upon the highway for transporting passengers and/or property, as well as driving of company vehicles on site locations. This includes personal vehicles operated on company business.
Motor Vehicle Operator (MVO)	Individuals who are assigned a company vehicle or drive a company- owned/leased/rented vehicle, or personal vehicle, on Company business.
Motor Vehicle Report (MVR)	Motor Vehicle Report or MVR is a report from a driver's license agency that shows a list of violations and accident history.
Project Assigned Employees	Any employee that is assigned to a field operations project position. This designation includes: Project Managers, Site Managers/Supervisors, Foremen, Technicians, Scientists, Geologists, and Project Business Accountants. This does not include employees that are typically assigned to an office but are visiting a site for brief periods of time, such as to provide technical assistance, perform audits, and perform program reviews.
Site	Any location, facility, or project where APTIM is performing work. Sites may include, but are not limited to, laboratories, offices, shops, owned facilities, leased facilities, and/or project sites.

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6.0 REFERENCES

6.1 Required Forms/Checklists

AMS-710-02-FM-02701	Vehicle Inspection Form
AMS-710-02-FM-02702	Motor Vehicle Procedure Acknowledgement Form
AMS-710-02-FM-02704	Notice of Citation
AMS-710-02-FM-02705	Request for Check of Driving Record

6.2 Other Internal References

AMS-710-05-PR-02300	Incident Reporting
AMS-710-02-PR-05600	Cellular Device Use
AMS-710-02-PR-03900	Commercial Motor Vehicle Safety
AMS-710-01-PR-03600	Substance Abuse Program

6.3 Other External References

None

7.0 ATTACHMENTS

Attachment	Attachment Title
Attachment 7.1	Vehicle Inspection Form
Attachment 7.2	Motor Vehicle Procedure Acknowledgement Form
Attachment 7.3	Notice of Citation
Attachment 7.4	Request for Check of Driving Record
Attachment 7.5	Driver Qualification Process Flow
Attachment 7.6	Vehicle Inspection Process Flow



Procedure Number: **AMS-710-02-PR-02700**

Revision: **1**

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NON-COMMERCIAL MOTOR VEHICLE SAFETY

**ATTACHMENT 7.1
VEHICLE INSPECTION FORM**



NON-COMMERCIAL MOTOR VEHICLE SAFETY

Make		Model		
Unit #		Inspection Date		Odometer Reading
<i>The items below are to be inspected on a weekly basis. Report ALL items in need of repair to the mechanics at the time of inspection. Return the completed sheet to the Equipment Superintendent and Safety Department at the end of the week.</i>				
Inspection	Notes			
Lubrication	<input type="checkbox"/>			
Starting System	<input type="checkbox"/>			
Instruments (speedometer & temperature gauge)	<input type="checkbox"/>			
Cooling System (Radiator)	<input type="checkbox"/>			
Air System	<input type="checkbox"/>			
Glass	<input type="checkbox"/>			
Mirrors (Rear-view & left outside)	<input type="checkbox"/>			
Defroster	<input type="checkbox"/>			
Brakes	<input type="checkbox"/>			
Steering System	<input type="checkbox"/>			
Tires	<input type="checkbox"/>			
Headlights	<input type="checkbox"/>			
Tail lights	<input type="checkbox"/>			
Brake lights	<input type="checkbox"/>			
Horn	<input type="checkbox"/>			
Windshield Wipers	<input type="checkbox"/>			
Fire Extinguisher	<input type="checkbox"/>			
Seat belts	<input type="checkbox"/>			
Back-up alarm	<input type="checkbox"/>			
Condition of vehicle body	<input type="checkbox"/>			
Initials & badge # of inspector	<input type="checkbox"/>			
Driver Notification Sticker present and legible	<input type="checkbox"/>			
Other	<input type="checkbox"/>			
To be completed by Mechanic / Equipment Services Group:				
Date Reported	Repairs Made		Date Repaired	
This form must be sent to ESGdocs@aptim.com				
Signature of Mechanic / ESG Representative				



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NON-COMMERCIAL MOTOR VEHICLE SAFETY

**ATTACHMENT 7.2
MOTOR VEHICLE PROCEDURE ACKNOWLEDGEMENT FORM**



NON-COMMERCIAL MOTOR VEHICLE SAFETY

I, the undersigned, acknowledge that I have been provided with the Company’s Non-Commercial Motor Vehicle Safety Procedure and/or the Commercial Motor Vehicle Safety Procedure (if a CDL driver). I was afforded an opportunity to ask questions about these procedures, acknowledge that they apply to me, and understand that I may speak with my supervisor about any parts of the policy or procedures that I may not understand. Key elements of APTIM’s Motor Safety Policy and Procedures include:

As an APTIM employee, or a Non-APTIM employee operating an APTIM vehicle or personal vehicle on company business, I understand that these driving activities are privileges and not rights of employment. My driving status and possibly my employment are conditioned upon the policy, procedures, and my adherence to them.

I further understand and acknowledge that I am required to follow federal, state, and local laws, including laws relating to licensing and the operation of motor vehicles, as well as the applicable procedures, rules, and regulations of APTIM clients relating to my operation of a motor vehicle. When such procedures, rules, or regulations conflict, I will follow the most conservative and safest practice and promptly speak with my supervisor for clarification.

Printed Name: _____ Date: _____

Employee ID Number (if applicable): _____

Signature: _____

Supervisor Printed Name: _____ Date: _____

Project / Location: _____

Signature: _____

Please send a copy of this form to the designated HR Representative to be kept in the personnel file.



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**ATTACHMENT 7.3
NOTICE OF CITATION FORM**



NON-COMMERCIAL MOTOR VEHICLE SAFETY

This form is to be completed each time an APTIM approved driver is issued a citation while driving a company vehicle or a personal vehicle for business purposes. Once complete, it is to be signed by the driver's supervisor and forwarded to the appropriate Human Resources Representative and the Corporate HSE Fleet Safety Department.

Driver Name _____ Employee No. (If applicable) _____

Nature of Citation _____

Date Citation Received: _____ Time Citation Received: _____

Location of Citation (City, State) _____

Law Enforcement or entity Issuing Citation: _____

Is Citation Being Contested? No Yes Details _____

Court Location and Court Date from Citation: _____

Driver Signature _____ Date _____

Corrective Action Being Taken _____

Supervisor Signature _____ Date _____

PLEASE PROVIDE A COPY OF THIS FORM TO SBU HSE LEAD AND YOUR HUMAN RESOURCES REPRESENTATIVE.

CORPORATE HSE USE ONLY

MVR Check ran on Employee ___Y ___N Date: _____

Total Point Count: _____

New Driving Status: _____ Change in Driving Status: ___Y ___N



Procedure Number: AMS-710-02-PR-02700

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**ATTACHMENT 7.4
REQUEST FOR CHECK OF DRIVING RECORD**



NON-COMMERCIAL MOTOR VEHICLE SAFETY

Fair Credit Reporting Act Disclosure Statement

In accordance with the provisions of Section 604 (b) (2) (A) of the Fair Credit Reporting Act, 15 U.S.C. 1681 et seq, as amended by the Consumer Credit Reporting Reform Act of 1996 (title II, Subtitle D, Chapter I, of Public Law 104-208, 110 Stat. 3009-426) and other applicable consumer credit legislation, you are being informed that reports verifying your driving record may be obtained for employment purposes. These reports are required by Sections 382.413, 391.23 and 391.25 of Federal Motor Carrier Safety Administration Regulations. You have the right to receive a copy of the reports and have the prescribed allotment of time by law to have any errors corrected and the reports obtained after corrections have been posted.

Violation	Assigned Point Value
Overweight, loss of load, vehicular equipment infraction, etc.	1
Moving violation: speeding, failure to stop, failure to signal turn, etc.	2
At-fault accident	3
Major citation: reckless driving (including speeding 15 or more miles per hour over the limit), tailgating, suspended license, speed contest, improper lane usage, open container, etc.	6
Driving under the influence or Hit and Run (Leaving the Scene)	8

In the space provided below, please list all violations and accidents (regardless of fault) currently listed on your driving record by the state issuing your driver's license (include all states for which you have held a driver's license during the last two (2) years). Determine the number of points assigned from the table above, and write in column labelled Points. Finally, write the sum total of all points where indicated. If you are unsure if a violation is on your record, write it down.

Violations	Driver's License Number	State of Issue	Date of Violation (M/Y)	Points as Determined from Above
Attach a blank sheet of paper if additional space is needed. DO NOT WRITE ON THE BACK OF THIS FORM.				
Total Points				

I hereby certify that the information provided is a complete and accurate statement of my driving record for the previous twenty-four (24) months. I authorize the company to obtain a copy of my driving record from the state of issuance of my license(s) prior to my hire, post-accident, annually, and/or as determined necessary to ensure compliance with Federal, state, and local law, and with APTIM policies and/or procedures. Any driving record check that is conducted on me will fall under the Fair Credit Reporting Act as explained above. I also understand that falsification of data may disqualify me from being hired or result in revocation of my company driving privileges or other disciplinary action as provided by company policies and procedures.

Signature _____ Date _____ Position/Applied For _____

Driver License No. _____ State of Issue _____ Expiration Date _____

Do You Have a CDL? Y N List all Endorsements on CDL: _____

Printed Name _____ SSN _____ DOB _____ Employee # _____

Current Address _____ City _____ State _____ Zip _____

Requesting Authority (printed name) _____ Site / Location _____

--- Send completed form to your respective MVR Coordinator ---



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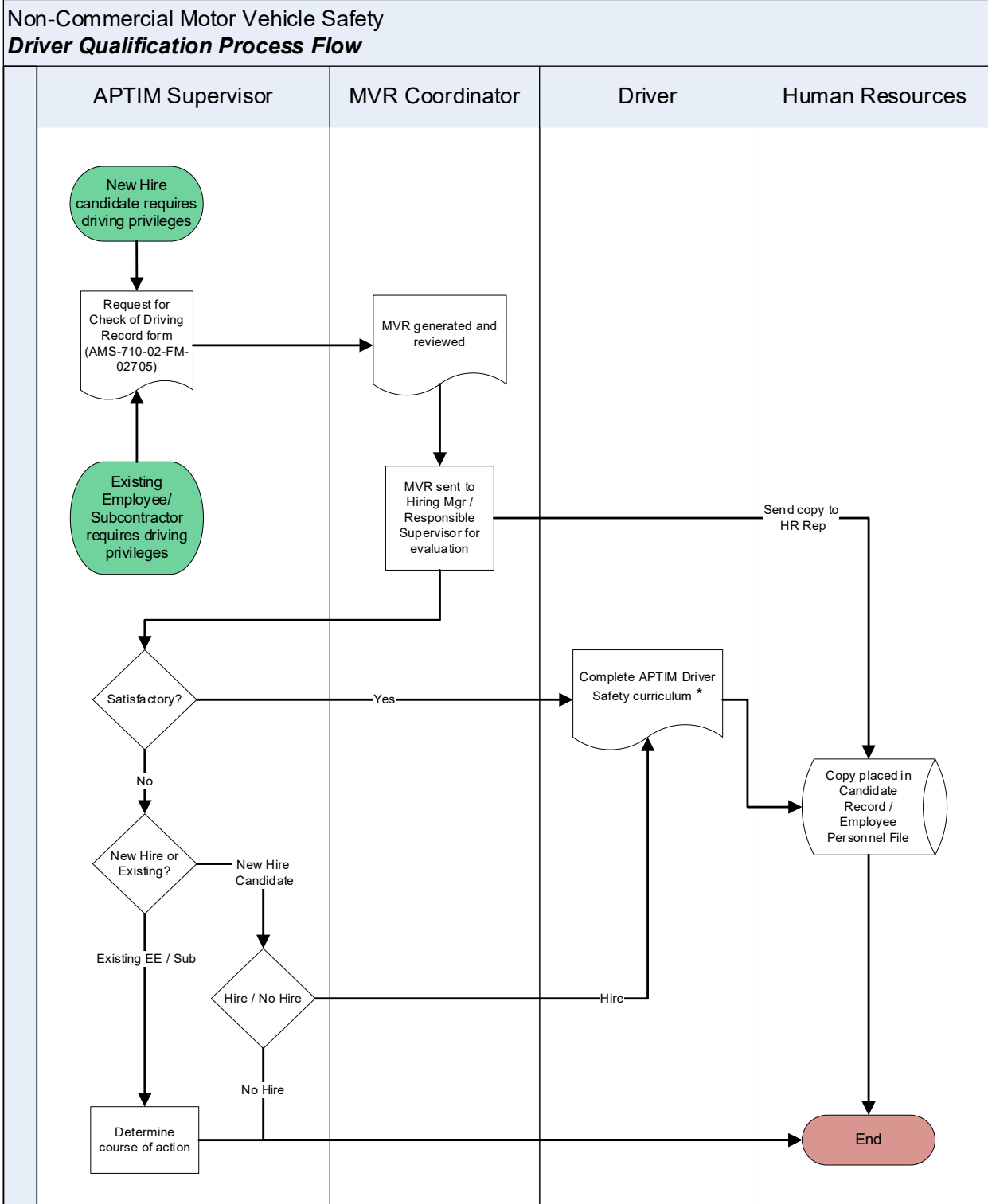
Revision: 0

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NON-COMMERCIAL MOTOR VEHICLE SAFETY

**ATTACHMENT 7.5
DRIVER QUALIFICATION PROCESS FLOW**

NON-COMMERCIAL MOTOR VEHICLE SAFETY





Procedure Number: AMS-710-02-PR-02700

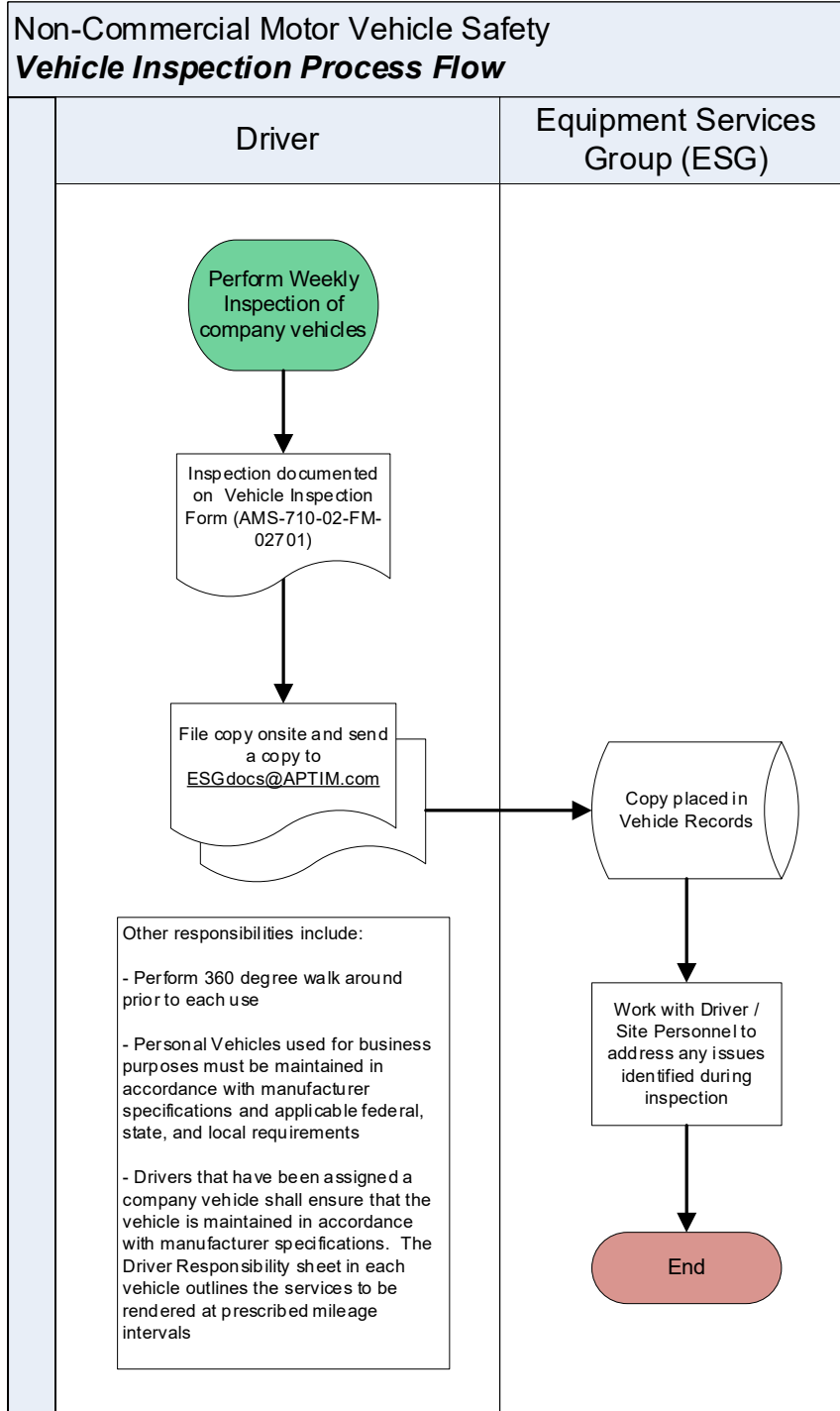
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NON-COMMERCIAL MOTOR VEHICLE SAFETY

**ATTACHMENT 7.6
VEHICLE INSPECTION PROCESS FLOW**

NON-COMMERCIAL MOTOR VEHICLE SAFETY





PROCEDURE

Procedure Title:	Mechanized and Marine Equipment	AMS Number:	AMS-710-02-PR-05700
Procedure Owner:	HSE	Issuing Authority:	APTIM Quality Management

MECHANIZED AND MARINE EQUIPMENT

INT	Issued for Interim Use	M. Hadacek & S. Lachney	7/30/2017
Rev	Changes	Approved	Date



Mechanized and Marine Equipment

AMS Number:	Revision:	Approval Date:
AMS-710-02-PR-05700	INT	7/30/2017

1.0 PURPOSE

The purpose of this Procedure is to establish the minimum requirements for Mechanized and Marine Equipment used on APTIM sites.

2.0 SCOPE

This procedure applies to all APTIM employees, contractors, subcontractors, and visitors associated with a APTIM site.

3.0 RESPONSIBILITIES

- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors
- APTIM Visitors

4.0 PROCEDURE

Each site shall make every attempt to prevent the possibility of incidents to employees or damage to the equipment or facilities when performing work activities with Mechanized and Marine Equipment through compliance with safety regulations, training of employees to properly perform their job activities and through employee involvement in safe work activities.

4.1 Mechanized and Marine Equipment

- 4.1.1 Mechanized and marine equipment covered by this procedure are those that operate within an off-highway project/facility, not open to public traffic.
- 4.1.2 These rules apply to the following types of mechanized and marine equipment: scrapers, loaders, crawler or wheel tractors, bulldozers, off-highway trucks, graders, compactors, backhoes, excavators, pile driving, agricultural and industrial tractors, and similar equipment.
- 4.1.3 The safety requirements, ratios, or limitations applicable to machines or attachment usage covered in Construction Manual 300, shall be complied with, and shall apply to cranes, machines, and attachments.
- 4.1.4 All mechanized and marine equipment covered by this procedure shall comply with the requirements of AMS-710-02-PR-06600 Working Around Overhead Power Lines when working or being moved in the vicinity of power lines or energized transmitters.

4.2 General Requirements

- 4.2.1 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.
- 4.2.2 No modifications or additions which affect the capacity or safe operation of the equipment shall be made without the manufacturer's written approval.
 - 4.2.2.1 If such modifications or changes are made, the capacity, operation, and maintenance instruction plates, tags, or decals shall be changed accordingly.
 - 4.2.2.2 In no case shall the original safety factor of the equipment be reduced.
- 4.2.3 All equipment left unattended at night, adjacent to a highway in normal use, or adjacent to construction areas where work is in progress, shall have appropriate lights or



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reflectors, or barricades equipped with appropriate lights or reflectors, to identify the location of the equipment.

- 4.2.4 A safety tire rack, cage, or equivalent protection shall be provided and used when inflating, mounting, or dismounting tires installed on split rims, or rims equipped with locking rings or similar devices.
- 4.2.5 Heavy machinery, equipment, or parts thereof, which are suspended or held aloft by use of slings, hoists, or jacks shall be substantially blocked or cribbed to prevent falling or shifting before employees are permitted to work under or between them. Bulldozer and scraper blades, skid steer loader buckets, dump bodies, and similar equipment, shall be either fully lowered or blocked when being repaired or when not in use. All controls shall be in a neutral position, with the motors stopped and brakes set, unless work being performed requires otherwise.
- 4.2.6 All equipment shall have a service brake system, an emergency brake system, and a parking brake system. These systems may use common components, and shall be maintained in operable condition.
- 4.2.7 Whenever the equipment is parked, the parking brake shall be set. Equipment parked on inclines shall have the wheels chocked and the parking brake set.
- 4.2.8 The use, care and charging of all batteries shall conform to the applicable requirements which include the following;
 - 4.2.8.1 Face shields, aprons, and rubber gloves shall be provided for workers handling acids or batteries.
 - 4.2.8.2 Facilities for quick drenching of the eyes and body shall be provided within 25 ft. (7.62 m) of battery handling areas.
 - 4.2.8.3 When batteries are being charged, the vent caps shall be kept in place to avoid electrolyte spray. Vent caps shall be maintained in functioning condition.
- 4.2.9 Whenever visibility conditions warrant additional light, all equipment/vehicles, or combinations of equipment/vehicles, in use shall be equipped with at least two headlights and two taillights in operable condition.
- 4.2.10 All equipment/vehicles, or combination of equipment/vehicles, shall have brake lights in operable condition regardless of light conditions.
- 4.2.11 All equipment with cabs shall be equipped with windshields and powered wipers. Cracked and broken glass shall be replaced.
 - All cab glass shall be safety glass, or equivalent, that introduces no visible distortion affecting the safe operation of the equipment.
- 4.2.12 Equipment operating in areas or under conditions that cause fogging or frosting of the windshields shall be equipped with operable defogging or defrosting devices.
- 4.2.13 All equipment with enclosed cabs operated in hot weather environments should be outfitted with cooling units, and personnel should be monitored for heat stress.
- 4.2.14 Equipment/vehicles used to transport employees shall have seats firmly secured and adequate for the number of employees to be transported.
- 4.2.15 Tools and material shall be secured to prevent movement when transported in the same compartment with employees.
- 4.2.16 Equipment shall not be loaded beyond its established load limit and the load shall be secured for safe transport
- 4.2.17 Passengers shall not be allowed on equipment unless seated in a manufacturer's installed seat and with the seat belt fastened.



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- 4.2.18 All equipment/vehicles, whose pay load is loaded by means of cranes, power shovels, skid steer loaders, or similar equipment, shall have a cab shield and/or canopy adequate to protect the operator from shifting or falling materials.
- 4.2.19 All equipment/vehicles with dump bodies shall be equipped with positive means of support, permanently attached, and capable of being locked in position to prevent accidental lowering of the body while maintenance or inspection work is being done.
- 4.2.20 Operating levers controlling hoisting or dumping devices on haulage bodies shall be equipped with a latch or other device which will prevent accidental starting or tripping of the mechanism.
- 4.2.21 Trip handles for tailgates of dump trucks shall be so arranged that, in dumping, the operator will be in the clear.
- 4.2.22 Pneumatic-tired earth-moving equipment (trucks, scrapers, tractors, and trailing units) whose maximum speed exceeds 15 mph (24 kph), shall be equipped with fenders on all wheels.
 - Mud flaps may be used in lieu of fenders whenever motor equipment/vehicle is not designed for fenders.
- 4.2.23 Scissor points on skid steer loaders and similar equipment, which constitute a hazard to the operator during normal operation, shall be guarded.
- 4.2.24 Mobile equipment shall be equipped with a fire extinguisher with a minimum rating of 10BC.
- 4.2.25 Never use buckets, forks, or attachments as a work platform or personnel carrier.
- 4.2.26 All rubber-tired, self-propelled scrapers, rubber-tired skid steer loaders, rubber-tired dozers, wheel-type agricultural and industrial tractors, crawler tractors, crawler-type skid steer loaders, and motor graders, with or without attachments that are used in construction work shall be equipped with rollover protective structures (ROPS) and seat belts. This requirement does not apply to side boom pipe laying tractors.
- 4.2.27 When a signal person is used, the equipment shall not be moved unless the designated signal person giving signals is in full view of the operator.
- 4.2.28 For movement of mobile equipment in congested areas, a designated signal person shall be in full view of the operator and shall direct the movement. In some cases, multiple signal persons may be required.
- 4.2.29 No one shall be allowed within the boom, bucket, or counterweight swing radius, when it is in operation. Barricades shall be erected to keep workers from entering, as appropriate.
- 4.2.30 Walk behind compactors (or similar) shall be equipped with a continuous pressure (dead man type) control to stop the equipment if released.
- 4.2.31 Personnel such as surveyors, who are required to work around heavy earthworking equipment, shall wear a high visibility vest or clothing.
- 4.2.32 The operator must place marker guides, lighting or other effective signs to indicate to the driver the limit of safe approach to the tipping area when dumping operations are being carried out (whether by day or night).
- 4.2.33 Drivers of trucks delivering materials to site in multi-stage tippers or side un-loaders must take into account the gradient of the ground on which they are tipping, the nature of the material being discharged and to watch out for "hang up" of material during discharge. If necessary, a spotter must be used to direct discharge via radio communication or hand signals.



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4.2.34 When it is necessary (e.g., maintenance/refueling) to approach closer than 20 meters (65 feet) to a heavy vehicle, this shall only be done with the verbal permission of the driver/operator of the heavy vehicle. The following rules shall apply to parking of heavy equipment:

- Only park in designated areas;
- Lower all attachments on equipment fitted with moveable attachments (i.e., forks, buckets, blades, ripper's) when parking;
- If on an incline chock the wheels;
- Turn wheels into the side of the bank or road; and
- Apply the park brake and slew brake where applicable.

4.2.35 Vehicles used for the primary purpose of transporting fuel, explosives, oils etc. shall not haul passengers.

4.2.36 Smoking is not allowed in or within 50' of vehicles transporting fuel, explosives, oils, etc.

4.3 General Requirements for Operators

4.3.1 It is the responsibility of the operator to read and understand the operator's manual and the manufacturers' recommendations for each type and model of equipment to be operated and the requirements of this procedure.

4.3.2 The equipment must be inspected by the operator (designated person) prior to each use. Do not use equipment that is not in proper operating condition or is not within the last monthly inspection period. Attach a "Danger — Do Not Use" tag to inoperable equipment and notify the supervisor. Remove key from the equipment.

4.3.3 When so equipped, check the "operator presence/seat interlock" prior to starting equipment. Do not operate the equipment if the system is not functioning properly.

4.3.4 Operators must know the capacity and operating characteristics of the equipment to be operated.

4.3.5 The equipment must be attended at all times or attachments must be placed in the "transport lock position" or lowered to the ground.

4.3.6 The operator must check the work area for slopes, obstructions, potholes, etc. prior to beginning work. Check for overhead obstructions such as power lines, pipe racks, etc. and ensure proper clearances. See AMS-710-02-PR-06600 Working Around Overhead Power Lines.

4.3.7 When mounting or dismounting equipment, clean shoes and hands before climbing. Always use handrails, grab rails, and steps. Maintain a three-point contact 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.

4.3.8 Loads must be carried as low as possible to maintain stability of the equipment and operator visibility.

4.3.9 Operations are to be performed only from the operators control station.

4.3.10 When equipped with "roll over protective structures" (ROPS), the operator must wear seat belt at all times and keep their body (hands, arms, legs, head) inside the protected area.

4.3.11 Never lift loads over people, occupied buildings, or operating equipment.

4.3.12 Use caution when handling objects such as round bales, poles, stumps, cylinders, sheets of plywood, etc. with skid steer loaders. Lifting too high or rolling the bucket too far back could result in objects sliding down the loader arms and falling onto the operator's control station.



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- 4.3.13 Obey posted speed limits. When operating on the project/facility, take it slow and easy. Give right of way to loaded machines and maintain a safe distance from other machines.
- 4.3.14 Avoid steep slopes or unstable surfaces. When operating on a slope, keep the load low and use extreme caution. Avoid sudden starts, stops, and turns when operating on inclines.
- 4.3.15 When moving mobile equipment, plan the move by evaluating road or ground conditions, overhead obstacles, traffic and congestion, and work adjacent to the travel path.
- 4.3.16 When driving on a sloped area, always drive 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.
- 4.3.17 When parking, select a place out of the traffic areas. Select a level area whenever possible. When it is necessary to park on an incline, position the machine at right angles to the incline. Secure or lower buckets, blades, and attachments and set the parking brake. Shut down the machine and chock wheels. Cycle the controls to ensure all attachments are secure.
- 4.3.18 The driver of a haul or dump truck shall not enter or leave the cab while the truck is being loaded.
- 4.3.19 The driver of a shovel or loader shall not cause the bucket of the shovel or loader to be traversed over the driver's cab of a truck or other motor vehicle during loading operations.
- 4.4 Transporting or Driving Equipment on Public Highways
 - 4.4.1 When traveling on public roads, lock dual brake pedals together. Make sure all clearance flags, lights, and warning signs are in place and visible. Make sure the "Slow Moving Vehicle" emblem is visible to traffic approaching from the rear. Use escort vehicles, as required.
 - 4.4.2 When loading or unloading equipment, select a level surface. Chock the transport vehicle to prevent movement. Keep trailer bed and ramps free of oils, mud, snow, ice, and debris. On articulated machines, attach the steering frame lock after loading and remove it before unloading. Chain and block the machine securely. Secure all attachments in the transport mode and lower buckets or blades. Cover or remove "Slow Moving Vehicle" emblems before transporting.
 - 4.4.3 Only the equipment operator and personnel trained and qualified to load equipment shall be allowed in the area during equipment loading or unloading.
 - 4.4.4 Unless qualified as an operator of the specific type of equipment to be transported, the truck driver shall not be allowed to drive the equipment onto or off of the trailer.
- 4.5 General Requirements for Excavations
 - 4.5.1 The location of underground utilities, i.e., electric, gas lines, water lines shall be identified prior to beginning excavation.
 - 4.5.2 Check with the supervisor or the facility owner for permit requirements. If unidentified encumbrances or utilities are struck, stop all work and notify the supervisor.
 - 4.5.3 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.



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- 4.5.4 Vehicles/equipment shall not approach an excavation while employees are in the excavation.
- 4.5.5 When excavating, extreme caution should be utilized to avoid hazards caused by cave in, i.e., roll over, tipping, or objects falling from overhead. If equipped with such, use the machine stabilizers. Avoid dangers such as rock or earth slides, when working at the base of excavations, overhangs, or stockpiles. See AMS-710-02-PR-01600 Excavation and Trenching for additional requirements.
- 4.5.6 The supervisor must confirm that the design, layout, construction and maintenance of any dumping or stockpiling operations take the following into account:
 - The nature of the material being dumped;
 - The size and weight of the equipment being used;
 - The site conditions, including stability of the area on which the dump is built; and
 - The weather conditions.
- 4.5.7 The operator must not dump rock or other material from a haul or dump truck over a bank or into a bin unless there is an effective backstop provided or a person (spotter) suitably stationed to guide and direct the driver to a safe dumping position, via radio communications or hand signals.
- 4.6 Equipment Specific Precautions
 - 4.6.1 Trencher
 - 4.6.1.1 Prior to operating this equipment, the operator shall receive proper training and study the operator's manual to ensure a comprehensive understanding of the machine operation and controls.
 - 4.6.1.2 When operating a trencher, ensure the equipment is ready for the job it must do.
 - Use a digging boom of the right length with a tooth pattern appropriate to soil conditions.
 - Keep guards, personnel restraints and trench cleaner in proper adjustment in relation to the digging chain.
 - 4.6.1.3 If the trencher is a riding model, operate the machine only from the operator's seat. The digging chain, auger, or wheel of the trencher can throw rock or debris a considerable distance. Use proper face and eye protection.
 - 4.6.1.4 Never allow anyone in the trench while digging.
 - 4.6.1.5 When beginning a new trench, set the digging boom down carefully with the chain moving slowly. The chain will tend to pull the machine. Be prepared to counteract the pull. Dropping a rapidly moving digging chain to the ground can cause the trencher to move quickly and unexpectedly.
 - 4.6.1.6 Use caution when trenching on hillsides. Avoid the potential for roll over or tipping. Always try to dig with the trencher in a level position. Vibration will tend to make the trencher slip sideways down a slope. Thoroughly evaluate the potential hazards and design the job such that equipment will remain stable throughout the course of the job.
 - 4.6.1.7 Avoid fences, walls, or other obstructions. If the tip of the digging boom makes contact with an obstacle, the machine can climb up and tip backwards onto the operator.
 - 4.6.1.8 During digging, if the machine strikes an unforeseen encumbrance and begins to labor, or jams, shut down the machine and inspect the worksite



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and the chain. Never attempt to free a stuck chain while the trencher is running.

4.6.1.9 Stop the engine before attempting to service the chain.

4.6.2 Backhoes and Excavators (Trackhoes)

4.6.2.1 Prior to operating this equipment, the operator shall receive proper training and study the operator's manual to ensure a comprehensive understanding of the machine operation and controls.

4.6.2.2 Never operate the controls from the ground. Always operate from the operators control station.

4.6.2.3 Use stabilizers if equipped. Apply enough pressure to the stabilizers to support and level the machine. Do not elevate the tires off the ground higher than required.

4.6.2.4 Never enter, or allow anyone to enter the backhoe's pivot-point area or the swing radius of the boom. Maintain a clear zone of at least 10 ft. (9 m) beyond the maximum reach of the boom or counterweight.

4.6.2.5 Do not dig under the equipment or stabilizers.

4.6.2.6 When operating on a slope, swing to the uphill side to dump the load, if possible. If downhill dumping is necessary, swing only as far as required to dump the load. Use extreme caution. If equipped, use stabilizers to support the machine.

4.6.2.7 When using the backhoe/excavator bucket for hoisting:

- Consult the manufacturer's manual for lifting capacity.
- Position the machine so that load lowering is done over the front or back of the machine, not the side.
- For backhoes, always use stabilizers, and in soft soil place pads under each stabilizer.
- Ensure that the load is balanced and move slowly to maintain control of the load. Use tag lines when needed.
- Never lift the load higher than necessary to clear obstacles.
- Lower the load as soon as the obstacle is cleared and never hoist loads over people.

4.6.3 Skid Steer Loaders

4.6.3.1 Prior to operating this equipment, the operator shall receive proper training and study the operator's manual to ensure a comprehensive understanding of the machine operation and controls.

4.6.3.2 All skid-steer style loaders with cabs shall be fitted with a manufacturer-approved safety glass front door, front cage cover of equivalent effectiveness.

4.6.3.3 Skid steer loaders can tip quickly due to their short wheelbase and operating characteristics if the operator does not stay within the manufacturer operational limits.

4.6.3.4 Operators must maintain complete control at all times and operate at a speed suitable to site conditions.

4.6.3.5 Operate the skid steer loader from the operator's compartment—never from the outside.

4.6.3.6 Stay seated when operating the skid steer loader controls.



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- 4.6.3.7 The operator must keep hands, arms, legs, and head inside the cab while operating the skid steer loader.
- 4.6.3.8 Travel and turn with the bucket in the lowest position possible. Come to a complete stop before raising the bucket to dump.
- 4.6.3.9 When changing direction, look both ways to ensure adequate clearance from personnel and equipment.
- 4.6.3.10 Use extreme caution when operating in and around excavations to avoid tipping.
- 4.6.3.11 Always travel up and down slopes with the loaded bucket facing up the hill or the empty bucket facing down the hill.
- 4.6.3.12 Avoid sudden starts, stops, and turns to prevent tipping or striking other equipment or people.
- 4.6.3.13 Attachments used with skid steer loaders must be approved by the manufacturer and used in accordance with manufacturer instructions. Equipment capacities must be adjusted to accommodate such attachments.
- 4.6.3.14 On skid steer loaders where the operator's seat and controls are between the lift arms and in front of the lift arm pivot points, and where the operators must enter and exit from the loader through the front of the machine and over the bucket, operators must use great care to avoid contact of foot or hand controls that may be activated and cause movement of the lift arms, bucket, or other attachment.
- 4.6.4 Compactors
 - 4.6.4.1 Prior to using compaction equipment, the operator shall receive proper training and study the operator's manual to ensure a comprehensive understanding of the machine operation and controls.
 - 4.6.4.2 Operators are required to wear safety toe shoes and metatarsal guards while operating hand held compaction equipment. Other types of personal protective equipment may be required, e.g., hearing protection, respiratory protection.
 - 4.6.4.3 Caution must be exercised when working in or around excavations to avoid tipping or cave in. When in excavations 4 ft. (1.2 m) deep and greater, sides must be sloped or shored to prevent cave in. Shoring evaluation must consider the additional load, which may be imposed due to the compaction activity.
 - 4.6.4.4 To minimize personnel exposure on steep slopes and exposures to excavation hazards in areas such as washouts or in excavations that are not shored or sloped, a remotely-controlled compactor should be used. Personnel shall stay clear of the equipment when in operation.
- 4.6.5 Burial Plow Attachment
 - 4.6.5.1 When transporting a burial plow attachment, raise the plow to its fully elevated position and engage the transport lock. For parking, the plow should be either locked in the transport position or lowered to the ground.
 - 4.6.5.2 Know the location of underground utilities and clear the area of all obstructions or bystanders before operating the machine.
 - 4.6.5.3 When plowing on slopes, the machine's stability is increased due to the blade in the ground. Always enter or exit the ground slowly. Rapid entry or exit may cause the machine to tip.
- 4.6.6 Horizontal Boring Attachment



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- 4.6.6.1 Prior to operating this equipment, the operator shall receive proper training and study the operator's manual to ensure a comprehensive understanding of the machine operation and controls.
- 4.6.6.2 Do not guide drill rod or pipe with hands, arms, feet, or other bodily contact. Use only guide tools as recommended by the manufacturer.
- 4.6.6.3 Keep bystanders and unauthorized personnel out of the work area and away from exposed drill rod or pipe.
- 4.6.6.4 Do not use excessive crowd (pushing) force on drill rod or pipe. Whipping action may result increasing the potential for incidents or injury.
- 4.6.6.5 Never use fasteners or hardware other than that supplied by the manufacturer to retain drill rod or pipe connectors
- 4.6.6.6 Do not service drill rod or pipe while engine is running.
- 4.6.7 Rock Cutting Attachment
 - 4.6.7.1 Prior to operating this equipment, the operator shall receive proper training and study the operator's manual to ensure a comprehensive understanding of the machine operation and controls.
 - 4.6.7.2 Read and understand the danger, caution, and warning signs on the equipment prior to beginning work.
 - 4.6.7.3 Rock cutting may require hearing and/or respiratory protection. Check with your supervisor to determine the proper personal protective equipment.
 - 4.6.7.4 Keep all unauthorized personnel away from the work area.
- 4.6.8 Industrial/Agricultural Mower
 - 4.6.8.1 Prior to operating this equipment, the operator shall receive proper training and study the operator's manual to ensure a comprehensive understanding of the machine operation and controls.
 - 4.6.8.2 Ensure that chain, flexible, or solid deflector shields are in place on the front and rear of the mower deck and are in good repair. Do not operate with damaged or missing shields.
 - 4.6.8.3 Check for broken, missing, bent, or severely worn blades.
 - 4.6.8.4 Check work area for debris and foreign objects to avoid them being picked up and thrown out by the mower. Inspect for rough terrain, drop-offs, ditches, potholes, steep slopes, stumps, standing water, mud, soft soil, or slippery conditions.
 - 4.6.8.5 Keep unauthorized personnel out of the work area. The mower may throw objects up to 300 ft. (91 m).
 - 4.6.8.6 Do not operate mower in transport position.
 - 4.6.8.7 Avoid excessive ground speed for terrain conditions and sudden starts, stops, or turns.
 - 4.6.8.8 Plan to mow downhill on steep slopes. Avoid over-speed of the power take off.
 - 4.6.8.9 Ensure all required guards are in place.
 - 4.6.8.10 Keep clear of rotating blades, parts, and drivelines.
- 4.7 Seat Belts
 - 4.7.1 Seat belts shall be provided on all equipment covered by this procedure.



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- 4.7.1.1 Seat belts need not be provided for equipment that is designed only for stand-up operation.
- 4.7.1.2 Seat belts need not be provided for equipment that does not have rollover protective structure (ROPS) or adequate canopy protection
- 4.7.2 Tractors shall have seat belts as required for the operators when seated in the normal seating arrangement for tractor operation, even though backhoes, breakers, or other similar attachments are used on these machines for excavating or other work.
- 4.8 Audible Alarms
 - 4.8.1 All bi-directional equipment shall be equipped with a horn, distinguishable from the surrounding noise level, which shall be operated as needed when the machine is moving in either direction. The horn shall be maintained in an operative condition.
 - 4.8.2 All bi-directional equipment that has an obstructed view to the rear to be used in reverse gear shall be equipped an operational reverse signal alarm distinguishable from the surrounding noise level.
- 4.9 Access Roads and Grades
 - 4.9.1 No earthmoving and hauling equipment shall move upon any access roadway or grade unless the access roadway or grade is constructed and maintained to accommodate safely the movement of the equipment.
 - 4.9.2 Every emergency access ramp and berm shall be constructed to restrain and control runaway equipment.
- 4.10 Pile Driving Equipment General Requirements
 - 4.10.1 Boilers and piping systems which are a part of, or used with, pile driving equipment shall meet the applicable requirements of the ASME, Power Boilers (Section I).
 - 4.10.2 All pressure vessels which are a part of, or used with, pile driving equipment shall meet the applicable requirements of the ASME, Pressure Vessels (Section VIII).
 - 4.10.3 Overhead protection, which will not obscure the vision of the operator, shall be provided. Protection shall be the equivalent of 2-inch (50 mm) planking or other solid material of equivalent strength.
 - 4.10.4 Stop blocks shall be provided for the leads to prevent the hammer from being raised against the head block.
 - 4.10.5 Boom stops will be provided to prevent the leads from being pulled past "Top Dead Center" towards the operators cab.
 - 4.10.6 Any work that would require an employee to work down line from an energy source, will fall into the lockout, tagout and try safety procedure.
 - 4.10.7 A blocking device, capable of safely supporting the weight of the hammer, shall be provided for placement in the leads under the hammer at all times while employees are working under the hammer.
 - 4.10.8 Guards shall be provided across the top of the head block to prevent the cable from jumping out of the sheaves.
 - 4.10.9 When the leads must be inclined in the driving of batter piles, provisions shall be made to stabilize the leads.
 - 4.10.10 Fixed leads shall be provided with ladder, and adequate rings, or similar attachment points, so that the loft worker (pile buck) may engage his safety lanyard to the leads. If the leads are provided with loft platform(s), such platform(s) shall be protected by standard guardrails.



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- 4.10.11 Air and steam hose leading to the hammer or jet pipe shall be securely attached to the hammer with an adequate length of at least 1/4-inch (9 mm) diameter chain or cable to prevent whipping in the event the joint at the hammer is broken. Safety chains, or equivalent means, shall be provided for each hose connection to prevent the line from thrashing around in case the coupling becomes disconnected.
 - 4.10.12 Steam line controls shall consist of two shutoff valves, one of which shall be a quick-acting lever type within easy reach of the hammer operator.
 - 4.10.13 The use of steam as a testing medium for equipment is prohibited without prior approval of the Senior Site Manager / Supervisor and the Site EHS Manager / Supervisor / Representative (or the Construction Business Line Management representative in the absence of the Site EHS Manager / Supervisor / Representative).
 - 4.10.14 Guys, outriggers, thrust-outs, or counterbalances shall be provided as necessary to maintain stability of pile driver rigs.
 - 4.10.15 Vibrations of pile driving rigs may cause loosening of bolts and other connections. Daily inspections at the beginning of the shift, and as necessary thereafter, shall be made to control these hazards.
 - 4.10.16 Piles are usually delivered to the jobsite in railroad flatcars or trailer trucks. Upon arrival at the jobsite, an inspection shall be made of each load. Spacers, binders or dunnage may shift while in transit causing problems such that piles could fall, roll, or slip during unloading. Stanchions shall remain in place until all piles have been removed from the trailer or flatcar. Tag lines will provide proper control during movement of the pile by crane to the storage area. Workers shall not be allowed on top of the load if all stakes and reinforcing wire have been removed. Piling tongs shall not be permitted.
- 4.11 Pile Driving
- 4.11.1 Setting up the Pile Driving Rig
 - 4.11.1.1 A coordinated effort is needed by each worker in setting up the pile driving rig. All equipment shall be inspected prior to assembly. The rig shall be assembled on solid ground, firmly supported by heavy timber sills or substantial cribbing. In some cases, heavy mats may be needed due to soil conditions. Steel blocks and wire rope shall be used for hoisting and pulling. All pile driving leads should be assembled separately and erected with power equipment. The crane shall be set level to enable the swing brake to hold and to maintain the boom angle consistent with the boom angle indicator. The jib shall be removed from boom for pile driving operations.
 - 4.11.2 Operation
 - 4.11.2.1 All employees shall be kept clear when piling is being hoisted into the leads.
 - 4.11.2.2 Piles shall be properly placed for handling by the driving rig as close to the hoisting center as possible. Proper spacing with dunnage is necessary for the rig to safely hook onto the next desired pile. Tag lines are essential for the proper placement of the pile by the rig. Workers shall not guide the pile directly by hand until the pile is close to the driving lead.
 - 4.11.2.3 When lifting a pile into the driving leads, all personnel not actually engaged in this operation shall be kept at least 2 pile lengths distance from the area.
 - 4.11.2.4 Dogs on pile-driven hoist drums that automatically disengage either by relieving the load or rotating the drum shall be prohibited.



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- 4.11.2.5 Pulling piles with hammer or pile line rigged through the head block is prohibited, unless driver and rigging are designed to safely withstand the imposed strain.
- 4.11.2.6 Stirrups shall be provided for worker's use on sheet piles or a mechanical device shall be used to guide the pile into place. If it is required to go aloft on sheet piling, the worker shall use a ladder or aerial lift.
- 4.11.2.7 There shall be head room at least twice the length of the individual sheet when interlocking sheet piling from the top of a driven sheet pile.
- 4.11.2.8 When piles are being driven in an excavated pit, the walls of the pit shall be sloped to the angle of repose or sheet-piled and braced. See AMS-710-02-PR-01600 Excavation and Trenching.
- 4.11.2.9 When steel tube piles are being "blown out", employees shall be kept well beyond the range of falling materials.
- 4.11.2.10 When it is necessary to cut off the tops of driven piles, pile driving operations shall be suspended except where the cutting operations are located at least twice the length of the longest pile from the driver.
- 4.11.2.11 When driving jacked piles, all access pits shall be provided with ladders and bulkheaded curbs to prevent material from falling into the pit.
- 4.11.3 Barges or floats supporting pile driving operations shall meet the applicable requirements for marine operation as outlined in 4.14 of this procedure.
 - 4.11.3.1 All hose connections supplying power or that has material passing through them shall be secured at the connections with 1/4" diameter chain or cable to prevent whipping.
 - 4.11.3.2 Lines supplying power to the hammer or other high pressure equipment shall be equipped with quick-acting, single action shut-off valves.
 - 4.11.3.3 Work areas shall be kept clear of obstructions such as extra hose footage, piling cutoffs or materials spoils.
 - 4.11.3.4 A safe work area of 1 1/2 times the height of the leads shall be "Red" barricaded and maintained free of all personnel not directly involved in the pile driving operations.
- 4.11.4 Inspection and Maintenance
 - 4.11.4.1 All equipment shall be maintained in accordance with established guidelines and/or the manufacture's guidelines, which ever depicts the most stringent application for achieving optimum safety results.
 - 4.11.4.2 Monthly inspection records shall be maintained. Crane inspection documents will be supplied before any crane operation begins.
 - 4.11.4.3 Provisions shall be installed to allow for a general maintenance of the leads top sheaves to be accomplished from ground level.
 - 4.11.4.4 Equipment will only be operated in a manner as it was designed to do. Alterations shall require site management approval at minimum.
 - 4.11.4.5 Any piece of equipment that will not or does not operate in the manner designed by the manufacture shall be tagged "Defective" and taken out of service until properly repaired.
- 4.11.5 Pile Driving Equipment Operators
 - 4.11.5.1 Only qualified and designated employees shall operate any piece of equipment.



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- 4.11.5.2 Operators shall operate their assigned equipment only and shall only operate it in a safe and responsible manner.
- 4.11.6 Pile Driving Equipment Signaling
 - 4.11.6.1 Equipment and winch operators shall accept signals only from the designated signal person. See AMS-710-02-PR-05900 General Crane and Derrick Safety
 - 4.11.6.2 One person shall be the designated signal person.
 - 4.11.6.3 When assigned to signal a piece of equipment, this employee accepts the shared responsibility for the safe operation of that piece of equipment.
- 4.11.7 Pile Driving Operations on, Over, or Adjacent to Water
 - 4.11.7.1 The width of hulls for floating pile drivers shall not be less than 45% of the height of lead above the water.
 - 4.11.7.2 Pile driver and dredge fairlead sheaves and spudline sheaves shall be guarded to prevent workers or tools from being drawn into them.
 - 4.11.7.3 All walkways over water shall be a minimum of 20-inch wide with standard handrails along both sides on structures and gang planks.
- 4.11.8 Pile Extraction
 - 4.11.8.1 Extreme stress on equipment can develop during pile extraction especially in water where the current is strong. Normal extraction is done with an extracting hammer designed for this purpose. The vibratory and sonic hammers designed for extraction have proved to be very satisfactory. For pile extraction, the following shall be executed:
 - 4.11.8.2 If piling cannot be pulled without exceeding the load rating of equipment, a pile extractor shall be used.
 - 4.11.8.3 When pulling piling, crane booms shall not be raised in excess of the crane manufacturer's written specifications for such operations and the crane shall not be allowed to tip. Remove jib from boom for extraction operations.
 - 4.11.8.4 Extractor hooks shall be carefully inspected daily for signs of failure.
 - 4.11.8.5 The screwbolt should be locked in the extractor pin with a spring clip or the vibration may loosen the bolt.
- 4.11.9 Personnel Protective Equipment
 - 4.11.9.1 Guidelines shall be followed per the project Dress code which identifies the personnel protective equipment required.
 - 4.11.9.2 Appropriate gloves shall be worn at all times.
 - 4.11.9.3 Hearing protection areas shall be established and maintained.
 - 4.11.9.4 Employees working where a fall exposure exist, shall be protected by Fall Protection Procedure.
- 4.11.10 Material Handling
 - 4.11.10.1 The loading, unloading or moving of material shall be done in a safe manner that will not expose personnel to inherent dangers and as being under loads or pinch points.
 - 4.11.10.2 All load hooks will have operable safety latches.
 - 4.11.10.3 When possible, loads shall be lifted in a flat and controlled manner.



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4.11.10.4 Piling lifted by one end shall be attached in a positive manner to prevent slippage. Examples not all inclusive would be: Place a full wrap on round material and pre-cut a hole in I-beam material to secure the shackle.

4.12 Site Clearing General Requirements

4.12.1 Employees engaged in site clearing shall be protected from hazards of irritant and toxic plants and suitably instructed in the first aid treatment available.

4.12.2 All equipment used in site clearing operations shall be equipped with rollover guards (ROPS). In addition, rider-operated equipment shall be equipped with an overhead and rear canopy guard meeting the following requirements:

4.12.2.1 The overhead covering on this canopy structure shall be of not less than 1/8-inch (3 mm) steel plate or 1/4-inch (9 mm) woven wire mesh with openings no greater than 1 inch (25 mm), or equivalent.

4.12.2.2 The opening in the rear of the canopy structure shall be covered with not less than 1/4-inch woven wire mesh with openings no greater than 1 inch (25 mm).

4.13 Industrial Trucks

4.13.1 Industrial trucks shall meet the requirements of AMS-710-02-PR-00800 Forklifts and Powered Industrial Trucks.

4.14 Marine Material Handling Operations

4.14.1 Access to Barges

4.14.1.1 Ramps for access of equipment/vehicles to or between barges shall be of adequate strength, provided with side boards, well maintained, and properly secured.

4.14.1.2 Unless employees can step safely to or from the wharf, float, barge, or river towboat, either a ramp, meeting the requirements of paragraph 4.15.1.1 of this procedure, or a safe walkway, shall be provided.

4.14.1.3 Jacob's ladders shall be of the double rung or flat tread type. They shall be well maintained and properly secured.

4.14.1.4 A Jacob's ladder shall either hang without slack from its lashings or be pulled up entirely.

4.14.1.5 When the upper end of the means of access rests on or is flush with the top of the bulwark, substantial steps properly secured and equipped with at least one substantial hand rail approximately 33 inches (838 mm) in height, shall be provided between the top of the bulwark and the deck.

4.14.1.6 Obstructions shall not be laid on or across the gangway.

4.14.1.7 The means of access shall be adequately illuminated for its full length.

4.14.1.8 Unless the structure makes it impossible, the means of access shall be so located that the load will not pass over employees.

4.14.2 Working Surfaces of Barges

4.14.2.1 Employees shall not be permitted to walk along the sides of covered lighters or barges with coamings more than 5 ft. (1.5 m) high, unless there is a 3 ft. (1 m) clear walkway, or a grab rail, or a taut handline is provided.

4.14.2.2 Decks and other working surfaces shall be maintained in a safe condition.

4.14.2.3 Employees shall not be permitted to pass fore and aft, over, or around deckloads, unless there is a safe passage.



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4.14.2.4 Employees shall not be permitted to walk over deckloads from rail to coaming unless there is a safe passage. If it is necessary to stand at the outboard or inboard edge of the deckload where less than 24 inches (610 mm) of bulwark, rail, coaming, or other protection exists, all employees shall be provided with a suitable means of protection against falling from the deckload.

4.14.3 First-Aid and Lifesaving Equipment.

4.14.3.1 Provisions for rendering first aid and medical assistance shall be provided.

4.14.3.2 The employer shall ensure that there is in the vicinity of each barge in use at least one U.S. Coast Guard-approved 30-inch (762 mm) lifering with not less than 90 feet (28 m) of line attached, and at least one portable or permanent ladder which will reach the top of the apron to the surface of the water. If the above equipment is not available at the pier, the employer shall furnish it during the time that he is working the barge.

4.14.3.3 Employees walking or working on the unguarded decks of barges shall be protected with U.S. Coast Guard-approved work vests or buoyant vests.

4.15 Inspection and Maintenance

4.15.1 Frequent Inspection

4.15.1.1 All equipment shall have as a minimum a Frequent Inspection conducted by a designated person(s) upon its arrival on the project/facility and monthly intervals thereafter.

4.15.1.2 The initial and monthly frequent inspections shall be documented using the Mechanized and Marine Equipment Inspection Form AMS-710-02-FM-05701.

4.15.1.3 A designated person(s) shall inspect each piece of equipment covered by this procedure for defects. All equipment in use shall be visually checked at the beginning of each shift to assure the equipment, and accessories are in safe operating condition and free of apparent damage that could cause failure while in use.

4.15.1.4 All defects shall be corrected before the equipment is placed in service.

4.15.1.5 For rental equipment, it is recommended that

- The rental company be required to conduct the initial inspection, along with a APTIM designated person, upon initial delivery to the site and
- Conduct the monthly inspection of their equipment along with a APTIM designated person.

4.15.2 Preventive Maintenance

4.15.2.1 A preventive maintenance schedule shall be established per manufacturer's requirements.

4.15.2.2 Do not service or repair moving parts on equipment while it is running.

4.15.2.3 Bleed pressure, hot liquid, etc. before performing maintenance or repairs. Lotto (Lock Out, Tag Out, Try Out). See AMS-710-02-PR-01500 Control of Hazardous Energy.

4.15.2.4 Properly block equipment or loads before repairing or maintaining equipment.

4.15.2.5 Preventive maintenance records. See 4.17 of this procedure.

4.15.3 General Requirements for Fueling and Maintenance



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- 4.15.3.1 Refueling and/or battery charging shall be done in well-ventilated and designated areas.
 - 4.15.3.2 Shut down equipment before refueling. Sufficient time should be allowed for the engine to cool before refueling.
 - 4.15.3.3 Use approved fuel hose with embedded grounding and approved connections. If not available, attach a static ground from equipment to fuel transfer equipment to avoid fuel ignition due to static discharge.
 - 4.15.3.4 Always ensure the availability of safety shower or eyewash facilities near fueling areas. Fire protection equipment must be readily available.
 - 4.15.3.5 Starting aids, such as jumper cables or ether, may only be used with extreme caution and according to manufacturer's instructions. Always connect the ground cable last. The ground cable should be attached to the engine at a point away from the battery.
 - 4.15.3.6 Only trained and authorized personnel are permitted to perform equipment maintenance. This includes inflating or changing tires and "jump starting." Control of the sudden release of hazardous energy must be implemented during service or maintenance.
 - 4.15.3.7 Equipment towing should be avoided. If it is necessary, use a rigid tow bar and consult the manufacturer's requirements.
- 4.16 Document Retention
- 4.16.1 Inspection documents shall be kept in the Project/Facility HSE Mgr. file.
 - 4.16.2 The qualification and training records shall be kept in the Project/Facility HSE Mgr. file readily available for review.
 - 4.16.3 Preventive maintenance records shall be completed and retained in the project/facility maintenance files.
- 4.17 Equipment Operator Qualification Procedure
- 4.17.1 The project/facility manager or his designated Competent Person shall:
 - Prior to skills testing, train the operators using the manufacturer's manual for the equipment on which they are to be qualified.
 - Evaluate the skills of each prospective operator to ensure that they have the physical abilities and knowledge to safely operate the equipment they are being qualified on.
 - After fulfilling these requirements, complete the Mechanized and Marine Operators Qualification Form AMS-710-02-FM-05702.
 - Issue each operator a AMS-710-02-FM-02803 Type C Wallet Card.
 - 4.17.2 Operators of dump trucks, tractor/trailer trucks, buses, and any equipment that can be driven on a public roadway must also be licensed by the government/state to operate the vehicles on public roads or property.
 - 4.17.3 Operators of mobile equipment covered in this procedure with the exception of crane operators and drivers of equipment driven on public roadways shall complete a Medical Questionnaire AMS-710-02-FM-05202 prior to being assigned work requiring the use of such equipment.
 - The completed form shall be reviewed by the project/facility manager and the project/facility HSE manager.
 - Occupational Health Services or a medical doctor shall resolve any concerns that might affect the ability of the prospective operator to safely operate the equipment.



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5.0 REFERENCES

AMS-710-02-PR-00800	Forklifts and Powered Industrial Trucks
AMS-710-02-PR-01400	Electrical Safety
AMS-710-02-PR-01500	Control of Hazardous Energy
AMS-710-02-PR-01600	Excavation and Trenching
AMS-710-02-FM-02803	Type C Wallet Card
AMS-710-02-FM-05202	Medical Questionnaire
AMS-710-02-PR-05900	General Crane and Derrick Safety
AMS-720-01-FM-00020	Business Glossary
AMS-720-01-FM-00021	Technical Glossary
Construction Manual 300	Mobile Crane Safety

6.0 TERMINOLOGY

<u>Term</u>	<u>Definition</u>
ASME	American Society of Mechanical Engineers
Backhoe	A tractor mounted attachment for digging trenches and excavations.
Bulldozer	A track mounted machine with a front mounted blade designed for moving materials by pushing it from one place to another.
Coaming	A raised edge around a hatch or opening in a deck of a ship or roof to prevent water from running down below.
Designated Person	A person selected or assigned by the employer or employer's representative as being competent to perform specific duties.
Dump Trucks	A vehicle with a tilting body to facilitate unloading itself.
Frequent Inspection	Daily or monthly intervals, by a designated person.
Loft Worker	A craft employee sometime referred to as a "pile buck" that assists with the placement and alignment of piles.
Skid Steer Loader	A machine with a bucket attachment designed for loading loose materials for transport.
ROPS	Roll Over Protective Structures mounted on equipment to protect the operator.
Scraper	Vehicles designed for removing soil by simultaneously scraping, loading, and transporting excavated materials.
Site	Any location, facility or project where APTIM is performing work. Sites may include, but are not limited to, laboratories, offices, shops, owned facilities, leased facilities and/or project sites.
Excavator	A track-mounted backhoe with a revolving superstructure.
Tractor/Trailer Dump Bed	A trailer type vehicle, which has a tilting body to facilitate unloading itself and which is moved by an independent tractor or truck.



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7.0 EXHIBITS

- Exhibit 7.1 AMS-710-02-FM-05701 – Mechanized and Marine Equipment Inspection Form
- Exhibit 7.2 AMS-710-02-FM-05702 – Mechanized and Marine Equipment Operators Qualification Form
- Exhibit 7.3 AMS-720-01-FM-00020 – Business Glossary
- Exhibit 7.4 AMS-720-01-FM-00021 – Technical Glossary

8.0 ATTACHMENTS

None

PROCEDURE

Procedure Number:

AMS-710-02-PR-01610

Revision:

0

Procedure Owner:

HSE

Issuing Authority:

VP HSE

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9/3/2019



UTILITY CONTACT PREVENTION

Rev	Changes	Approved	Date
0	Initial Issue	M, Karr	9/3/2019

Parent Document:

N/A

UTILITY CONTACT PREVENTION

1.0 PURPOSE

The purpose of this document is to provide the minimum requirements to ensure that all utilities are properly identified, to prevent personal injury, property damage and/or causing negative impact to the surrounding community and environment.

The following deliverables are defined within this procedure:

Deliverable	Producer	Customer
Authorization to Drill Permit Form (AMS-710-02-FM-01611)	Competent Person – Utility Contact Prevention	Project Manager HSE Employees External Client
Utility Mark-Out Documentation Form (AMS-710-02-FM-01612)	Competent Person – Utility Contact Prevention	Project Manager HSE Employees External Client
Intrusive Activities Checklist (AMS-710-02-CK-01613)	Competent Person – Utility Contact Prevention	Project Manager HSE Employees External Client

2.0 SCOPE

This procedure applies to all APTIM sites planning above ground or intrusive activities, where the utility locations and clearances are not positively identified.

Work conducted around overhead power lines with mobile equipment is addressed in AMS-710-02-PR-06600, Equipment Operation Around Overhead Power Lines.

This procedure authorizes implementation of local, or client required procedures, when those procedures are more protective. Applicable local and/or client specific procedures shall be documented in the project-specific Health and Safety Plan (HASP), Work Plan, or Accident Prevention Plan.

2.1 Exceptions

Exceptions must be approved per the requirements of AMS-710-05-PR-01300, HSE Request for Variances.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- APTIM Managers
- APTIM Project Managers

UTILITY CONTACT PREVENTION

- APTIM Utility Contact Prevention – Competent Person
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors

3.1 APTIM Managers

APTIM Managers are to ensure their Project Managers are adhering to these expectations.

3.2 APTIM Project Managers

Project Managers have to designate their Competent Persons and ensure they're implementing these expectations.

3.3 APTIM Utility Contact Prevention – Competent Person

See detailed responsibilities in section 4.1.1.

3.4 APTIM Supervisors, Employees, Contractors and Subcontractors

Supervisors, employees, contractors and subcontractors are required to not proceed or act outside of the expectation.

4.0 PROCEDURE

4.1 Underground Utility Contact Avoidance during Intrusive Activities

4.1.1 Preliminary Requirements

4.1.1.1 The Project Manager - Designates a Competent Person – Utility Contact Prevention (UCP), to manage the aspects of work associated with the intrusive activities, supervise the employees who have the potential to contact any utilities, and fulfill the requirements of this procedure.

4.1.1.2 The Competent Person - UCP is responsible for the following:

- Determining location-specific regulations and client requirements for the notification, identification, locating, marking, contact prevention, and protection of utilities.
- Ensuring boundaries of intrusive activities have been clearly marked, prior to contacting utility locating services.
- Ensuring National One-call center and/or other utility locating services have been contacted, and formal notification of the pending intrusive activities has been completed.

UTILITY CONTACT PREVENTION

- Ensuring that utility owners are contacted to mark the location of their facilities in the area of the intrusive activities. They shall obtain and document the utility mark-out confirmation number or ticket number provided by the One Call Center. Generally, this notification for a mark-out request must be made from at least two (2) business days (48 hours) to three (3) business days (72 hours) before beginning intrusive activities.
- Ensuring private utility locating services have been contacted and have completed mark-outs, in areas not covered by a One-call center.
- Ascertaining the requirements for maintaining the open ticket with the One Call Center (or local equivalent), client, and/or property owner after the initial formal notification and taking action required to maintain the open ticket, until intrusive activities are completed.
- Ensure time requirements for allowing utility owners to mark locations are met, and authorizing intrusive activities, after satisfaction that all utilities have been located and marked.
- Ensuring all above ground utilities are marked, flagged, or otherwise protected, in areas where equipment could come into contact with them.
- Photograph all utility markings.
- Ensure markings are protected and preserved as feasible.

4.1.1.3 Due to the sensitivity and costs associated with damage to fiber optic cables, the Competent Person - UCP must ensure and document verbal contact and an agreement with the fiber optic cable owner, for all work within 50 feet of fiber optic cables. Additional protective measures for intrusive activities near fiber optic cables shall be specified in site specific HASP, Site Safety Plan, etc.

4.1.1.4 The Competent Person - UCP must verify that the necessary emergency procedures to be taken if underground utilities become damaged are provided in the HASP, work plan, Job Safety Analysis, or Activity Hazard Analysis. These emergency procedures must be conveyed to employees as specified in Section 4.2.3, Field Crew Training (below).

4.1.2 General Requirements

4.1.2.1 A designated Competent Person - UCP shall be onsite at all times when intrusive activities are conducted.

4.1.2.2 Overhead utility locations must be marked where heavy equipment or other equipment has the potential for contacting overhead or adjacent utilities. Where required by law, advanced notification to the utility company may be required for any work where potential exists for incidental contact with utility lines. Daily site inspections are required to determine where activities will take place and to ensure all adjacent above ground utilities are identified, marked, and/or protected, to prevent contact. Provide updated information to employees in daily tailgate meetings.

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- 4.1.2.3 Maintain a minimum of 10 feet from overhead power lines, up to 50 kV. Adjust distances based on voltages over 50 kV by adding 0.4 inches per kV to the minimum 10 foot clearance. 20 feet of separation from lines, is required if voltage is unknown. Spotters are required to ensure safe clearance is maintained.
- 4.1.2.4 Prior to conducting any intrusive activities, the Competent Person - UCP must verify the Intrusive Activities Checklist (AMS-710-02-CK-01613) and the Utility Mark-out Documentation form (AMS-710-02-FM-01612) have been completed. No intrusive activities work is to be performed until all utility mark-outs are verified and until the facility owner-members have all provided the appropriate positive response.
- 4.1.2.5 Location specific procedures may not always be conveyed to contractors. The property owner, client, and/or facility operator must be consulted on the issue of underground utilities. All knowledge of past and present utilities must be evaluated prior to conducting work.
- 4.1.2.6 Only hand digging is permitted within 3 feet of underground high voltage lines, product lines, gas lines, or fiber optic cables. 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.
- 4.1.2.7 If possible, shoveling/digging should be conducted parallel to the expected utility run.

4.1.3 Operating Requirements Specific to Excavation Activities

- 4.1.3.1 Refer to Section 5.0, Terminology to determine the applicable activities considered to be included as excavation.
- 4.1.3.2 The requirements of AMS-710-02-PR-01600, Excavation and Trenching must be followed.
- 4.1.3.3 After all mark outs have been completed, and the excavation locations have been accepted by the Competent Person - UCP prior to mechanical excavation, each utility identified inside the excavation location must be hand dug or vacuum excavated to a verify the utility location. The utility locations must be exposed in enough locations to verify its path of travel. If possible, the excavation location should be moved away from any utilities.
- 4.1.3.4 All utilities exposed during an excavation will be protected from accidental damage.
- 4.1.3.5 Utilities which are found to change elevation (shallower or deeper) or direction of run (curve) require UCP approval prior to soil removal/excavation operations.
- 4.1.3.6 When excavating close to a utility, outside the required 3 foot radius, the excavator should have a spotter to assist and guide the excavation equipment operator.
- 4.1.3.7 While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard employees.

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- 4.1.3.8 The utility owner should be contacted for guidance on protecting the utility from damage when backfilling excavations. When excavation is complete, as practical, 6 inches of soil may be placed over the utility to shield/protect during backfilling operations
- 4.1.3.9 Areas of refusal (tree roots, large rocks, concrete structures) which prevent either digging to depth or exposing utilities require UCP approval prior to beginning soil removal operations.
- 4.1.4 Operating Requirements Specific to Drilling Activities**
- 4.1.4.1 Refer to Section 5.0, Terminology to determine the applicable activities considered to be drilling activities.
- 4.1.4.2 Follow all requirements in Section 4.1.1. & 4.1.2
- 4.1.4.3 After all mark outs have been completed, prior to drilling, each individual location must be hand dug or vacuum excavated to a minimum of 5 feet below ground surface (bgs).
- 4.1.4.4 Should the local geology be prone to refusal or should there be any other reason the drilling location cannot be cleared to a minimum of 5 feet bgs by hand digging or vacuum extraction, then the appropriate geophysical techniques should be utilized to verify the drilling location is clear of utilities to 5 feet bgs.
- 4.1.4.5 At any drilling location that cannot be cleared by hand digging or vacuum extraction, then an Authorization to Drill Permit (AMS-710-02-FM-01611) must be approved by the Director of Operations (or designee, which may be delegated to the business line manager for each area) in addition to the project/program manager/director. The SBU HSE lead may be consulted, but signature is not required.
- 4.1.5 Operating Requirements for Boring & Trenching Activities at Retail Fuel Dispensing Stations**
- 4.1.5.1 Work in and around known retail fuel systems (lines and tanks) may be best performed by a licensed, APTIM approved tank subcontractor.
- 4.1.5.2 Gauge tank pit observation wells prior to beginning drilling activities.
- 4.1.5.3 Locate emergency shut off system prior to drilling activities.
- 4.1.5.4 Look for any visual indications that product lines or utilities have been installed in boring location (cracked concrete, sagging concrete, patched concrete, trench cuts, etc.)
- 4.1.5.5 Establish "No Drill Zones" if possible. No Drill Zones are areas around UST's, gas dispensers, lines or the canopy of retail fuel dispensing stations.
- 4.1.5.6 Boring and trenching activities at retail fuel dispensing systems should be moved to a pea gravel free area of the site when possible.

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- 4.1.5.7 If relocation is not possible, an air knife or vacuum extraction approach will be used for pre-clearance of underground utilities.
- 4.1.5.8 If pea gravel is encountered, stop work and either move the bore hole location or install with vacuum extraction techniques to a depth of 5 feet, if possible.
- 4.1.5.9 Standard pre-clearance tools (i.e. hand augurs, post hole diggers, spud bars, etc.) are prohibited when working in and around pea-gravel due to the possibility of damage to fiberglass tanks and lines from tool strikes.

4.1.6 Operating Requirements Specific to Sheet Piling Activities

- 4.1.6.1 Follow Section 4.1.4, Operating Requirements Specific to Drilling Activities.
- 4.1.6.2 After all mark outs have been completed, prior to installation of piling, each utility identified inside the sheet piling location must be hand dug or vacuum excavated to a verify the utility location. Additional planning may be necessary to change the location of the sheet piling location or the location of the utilities.

4.2 Training Requirements

4.2.1 Competent Person – Utility Contact Prevention

The Competent Person UCP must have successfully completed APTIM's internal Underground and Overhead Utility Contact Prevention training. It is the Project Manager's responsibility to verify that the Competent Person –UCP has completed training prior to overseeing activities.

4.2.2 Competent Person - Excavation Training

The Competent Person - Excavation shall have documented training or documented experience in excavation activities.

4.2.3 Field Crew Training

- 4.2.3.1 Prior to assignment of work, the Competent Person - UCP will provide the above and underground utilities information obtained to affected field crew personnel via the job safety analysis (JSA). Information will include:
- The utilities identified in work areas that may be affected by operations.
 - The location and depth of the utilities associated with the affected essential services
 - Any conditions on the proposed intrusive activities work and clearance requirements.
- 4.2.3.2 Prior to assignment of work, the Competent Person - UCP will also provide the following information to affected field crew personnel:
- The requirements of this procedure.

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- The required work practices and controls to prevent contacting utilities.
- The emergency procedures necessary if utilities are damaged.
- The roles and responsibilities of each worker within the work crew.

4.3 Incident Reporting Requirements

- 4.3.1 Employees are required to immediately report to their direct supervisor any utility contact incident or near miss incident.
- 4.3.2 All incidents involving utility contact shall be reported by the Competent Person – UCP and site supervisor as required by AMS-710-05-PR-02200, Incident Reporting.
- 4.3.3 Any damage caused or discovered to natural gas, liquid petroleum, or any hazardous liquid utilities, underground utilities must be immediately reported by the Competent Person – UCP, to emergency services, to the facility owner, and utility owner.
- 4.3.4 All other utilities contact, and damages are to be reported to the facility operator and the One Call Center (or local equivalent) by the Competent Person - UCP.
- 4.3.5 The Competent Person - UCP shall verify that all other local reporting requirements are met, e.g., reporting underground pipeline damages involving excavation in Texas to the Railroad Commission of Texas.

5.0 TERMINOLOGY

Key terms within the context of the procedure. Terminology is to be listed in a table as shown below:

Term	Definition
As-Built Drawings	As-built drawings are blueprints that are usually obtained from the facility owner or client. They show original buried utilities and any modifications that have been made.
Company	APTIM
Competent Person – Utility Contact Prevention	Assigned by the Project Manager: An APTIM employee who is capable of identifying existing and predictable hazards presented by utilities located at an APTIM site that may be, hazardous, or dangerous to employees, could result in property damage, or negatively impact the community or environment. The Competent Person Utility Contact Prevention has successfully completed APTIM's in-house 'Underground/Overhead Utility Contact Prevention' training course, possesses an appropriate educational background, field experience, and has the authority to correct deficiencies or take prompt corrective measures to eliminate them. The required identification and documentation procedure for competent persons is specified in AMS-710-02-PR-04200, Competent/Qualified Person Procedure.

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Drilling Activities	Any mechanical or manual penetration of the earth's surface using drilling, boring, auguring, or similar type of equipment. For the purposes of this procedure, drilling activities include the use of direct-push equipment and driving equipment such as hammers, impact hammers, vibratory drivers, or similar types of equipment.
Driving Activities	Any mechanical or manual penetration of the earth's surface using driving equipment. Driving activities include the installation of piles, sheet piles, poles, stakes, and fence posts.
Excavation	Any operation in which earth, rock, or other material in or on the ground is moved, removed, or otherwise displaced by means of any tools, power equipment or explosives, and includes, without limitation, grading, trenching, digging, ditching, drilling, auguring, boring, tunneling, scraping, cable or pipe plowing, piling, and driving. Any manmade cut, cavity, trench, or depression in an earth surface formed by earth removal.
Excavation Activities	Any mechanical or manual penetration of the earth's surface using heavy equipment such as excavators, backhoes, dozers, etc. Excavation activities also include manual use of hand shovels, pick-axes, etc. The use of 3-foot or larger diameter augers is also considered excavation activity.
Fiber Optic Cables	Optical communication cables that are buried underground.
Intrusive Activities	Any mechanical or manual penetration of the earth's surface, including drilling activities, driving activities, and/or excavation activities using drilling equipment, driving equipment, or excavating equipment.
No Drill Zones	No Drill Zones are areas located on retail petroleum sites where drilling is not permitted due to the presence of Underground Storage Tanks's (UST's), gas dispensers, lines or the canopy of retail fuel dispensing stations.
One Call Center	811-One Call, Dig Safe, Miss Dig, etc. dial-in telephone number for requesting the location and mark-out of buried utilities, such as gas lines, electrical lines, telephone/cable lines, sewer lines, and water lines
Private Utility Locating Service	A private utility locating service is a firm established to locate underground utilities using specialized locating equipment, such as ground penetrating radar location devices or radio transmitter type utility locating equipment.
Site	Any location, facility or project where APTIM is performing work. Sites may include, but are not limited to, laboratories, offices, shops, owned facilities, leased facilities, and/or project sites.
Site Survey	Inspection of the site to look for signs of buried utilities that may not be indicated through as-built drawings or through utility locating services. The survey typically involves inspection of overhead electrical services, basements, utility rooms, garages,

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	etc., for signs of old electrical conduits or fuel/water/septic lines.
Utility	<p>Any active or inactive above ground or subsurface structure that is or was designed to service a public or private facility. These may include, but are not limited, to the following:</p> <ul style="list-style-type: none"> • Electric power lines • Propane lines • Natural gas lines • Telephone lines • Telephone cables • Fiber optic lines • Fiber optic cables • Water lines • Steam and pneumatic lines • Sewer/sewage lines • Drain lines • Underground storage tanks • Septic tanks • Process or product lines • Reclaimed water lines
Vacuum Excavator	Equipment that excavates underground utilities with a combination of alternating water-and-air or air-and air pulsations (e.g., air knife, water knife, etc.)

6.0 REFERENCES

Forms/checklists and other supporting policies, work processes, and procedures, included in the body of the procedure.

6.1 Required Forms/Checklists

Forms and checklists that are required for use by the procedure should be listed in Section 6.1.

AMS-710-02-FM-01611	Authorization to Drill Permit Form
AMS-710-02-FM-01612	Utility Mark-Out Documentation Form
AMS-710-02-CK-01613	Intrusive Activities Checklist

6.2 Other Internal References

AMS-710-02-PR-04200	Competent/Qualified Person Procedure
AMS-710-02-PR-06600	Working Around Overhead Power Lines with Mobile Equipment
AMS-710-02-PR-01600	Excavation and Trenching
AMS-710-05-PR-01300	HSE Request for Variances



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AMS-710-05-PR-02200	Incident Reporting
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6.3 Other External References

None

7.0 ATTACHMENTS

Attachment	Attachment Title
None	



PROCEDURE

Procedure Title:	Bloodborne Pathogens	AMS Number:	AMS-710-01-PR-00300
Procedure Owner:	HSE	Issuing Authority:	VP HSE

BLOODBORNE PATHOGENS

0	Added 4.3.4.5 "Hand-washing Facilities"	M. Hetzler	2/1/2018
INT	Issued for Interim Use	M. Hadacek & S. Lachney	7/30/2017
Rev	Changes	Approved	Date



Bloodborne Pathogens

AMS Number:	Revision:	Approval Date:
AMS-710-01-PR-00300	0	2/1/2018

1.0 PURPOSE

The purpose of this Procedure is to establish the minimum requirements for the control of Bloodborne Pathogens on APTIM sites.

2.0 SCOPE

This procedure applies to all APTIM employees, contractors, subcontractors and visitors associated with APTIM site.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors
- APTIM Visitors

4.0 PROCEDURE

APTIM sites shall use this procedure as the minimum requirements for their site specific Bloodborne Pathogens Standard.

4.1 Program Development

The Bloodborne Pathogens Program Coordinator/Site HSE Manager shall ensure that the exposure determination is conducted during the mobilization stages of the project and that the Exposure Control Plan (ECP) is completed.

4.2 Exposure Determination

4.2.1 Exposure Determination includes:

- 4.2.1.1 Exhibit 7.1 - List I - list of job classifications in which all employees have occupational exposure.
- 4.2.1.2 Exhibit 7.2 - List II - list of job classifications in which some employees have occupational exposure.
- 4.2.1.3 Exhibit 7.3 - List III - list all tasks and Practices in which occupational exposure occurs and that are performed by employees in job classifications included in the lists above.

4.3 Exposure Control Plan

4.3.1 The Site HSE Manager completes the APTIM ECP.

4.3.2 The ECP is a template which includes the information as listed in 4.3.4, 4.3.5, 4.3.6, and 4.4. This Plan provides the overall requirements for compliance with this Practice, and instructs each project to include site specific information for disposal of contaminated waste, care of Personal Protection Equipment (PPE), laundering materials, personal hygiene, decontamination etc.

4.3.3 The Site HSE Manager implements the elements of the APTIM ECP and uses the template to develop the specific procedures and practices.

4.3.4 The ECP shall address the following Methods of Compliance at a minimum:

- 4.3.4.1 Engineering and Work Practice Controls
- 4.3.4.2 Universal Precautions



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- 4.3.4.3 Personal Protective Equipment (PPE)
- 4.3.4.4 Housekeeping:
 - Decontamination
 - Handling of Regulated Waste
 - Laundry
- 4.3.4.5 Hand-washing Facilities - If provision of handwashing facilities are not feasible, then an appropriate antiseptic hand cleanser in conjunction with cloth/paper towels or antiseptic towelettes must be provided.
- 4.3.5 The ECP shall address the following Medical Management at a minimum:
 - 4.3.5.1 Hepatitis B Vaccination
 - 4.3.5.2 Post-Exposure Evaluation and Follow-up
- 4.3.6 The ECP shall address the following training elements at a minimum:
 - 4.3.6.1 Bloodborne Pathogen Training for employees included in the plan
 - 4.3.6.2 Awareness training for all employees
 - 4.3.6.3 Employees covered under this plan due to reasonably anticipated exposure shall be provided training that includes at least:
 - A copy of APTIM's reference standard and any additional country or regional specific standards.
 - A general explanation of epidemiology and symptoms of bloodborne diseases
 - An explanation of modes of transmission
 - An explanation of the ECP
 - Appropriate methods of identifying tasks that may involve exposure
 - An explanation of use and limitations of methods to prevent or reduce exposure
 - PPE information
 - Selection basis for PPE
 - Hepatitis B vaccination information
 - Actions and notification in emergency situation
 - Practices to follow in event of exposure
 - Post-exposure evaluation and follow-up
 - Signs and labels or color-coding system
 - Opportunity for interactive questions and answers
 - 4.3.6.4 Training shall be done at the time of initial assignment and at least annually thereafter, within one year of their previous training.
 - 4.3.6.5 Employees who are not expected to contact blood or Other Potentially Infectious Materials (OPIM) shall be informed of the existence of the ECP and the responsible individuals on site.
- 4.3.7 The ECP shall address the communication of hazards to employees, recordkeeping and the procedure for the evaluation of circumstances surrounding exposure incidents.
- 4.3.8 The ECP shall be accessible to employees so they can have the opportunity to examine and copy the plan.
- 4.3.9 The ECP shall be reviewed and updated at least annually and whenever necessary to reflect new or modified task and procedures which affect occupational exposure and to reflect new or revised employee positions with occupational exposure. The revisions to the ECP will also reflect changes in technology that eliminate or reduce exposure to bloodborne pathogens.



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4.3.10 The Site HSE Manager will solicit input from non-managerial employees responsible for direct patient care who are potentially exposed to injuries from contaminated sharps in the identification, evaluation, and selection of effective engineering and work practice controls and shall document the solicitation in the ECP, as applicable.

4.4 Medical Management

4.4.1 Hepatitis B Vaccination Series

4.4.1.1 All employees who, due to the nature of their assignment are at risk of occupational exposure (those are the employees included in List I and List II above) shall be offered the Hepatitis B vaccination series. The offer shall be made following training and within 10 days of initial assignment. The employee need not accept the offer of the vaccination; however, the declining employee must complete the Declination Form included in the AMS-710-01-FM-00301 Bloodborne Pathogens Plan Template prior to performing any assigned duties.

4.4.1.2 If an employee initially declines HBV vaccination but at a later date, while still covered under the program decides to accept the HBV vaccine, APTIM will provide the vaccine at that time. Should a booster dose be recommended at a future date, such booster dose(s) shall be provided.

4.4.2 Post-Exposure Evaluation and Follow-Up

4.4.2.1 Following an exposure incident, APTIM will make available to each potentially exposed employee, a confidential medical evaluation and follow-up. This follow-up will include documentation of the route(s) of exposure and the circumstances under which the exposure incident occurred, identification and documentation of the source individual (unless the identification cannot be established or it is prohibited by a local law), appropriate testing, prophylaxis for Hepatitis B virus, illness reporting, evaluation of reported illnesses, and counselling following a report of an occupational exposure incident to blood or other potentially infectious materials.

4.4.2.2 Employees covered in the ECP (those included in List I and List ii) who are exposed to blood or other potentially infectious materials shall be offered the post exposure evaluation and follow-up within 24 hours of the exposure.

4.4.2.3 If an employee, who was not included in the program, has an occupational exposure through a “Good Samaritan” act, the employee will be offered the post-exposure evaluation and follow-up in addition to the Hepatitis B vaccination at no charge and at a reasonable time and place (within 24 hours of the exposure).

4.4.2.4 The site HSE Manager shall ensure that the healthcare professional evaluating an employee after an exposure incident is provided the following information:

- A copy of any applicable regulation;
- A description of the exposed employee’s duties as they relate to the exposure incident;
- Documentation of the route(s) of exposure and circumstances under which exposure occurred;
- Results of the source individual’s blood testing, if available; and
- All medical records relevant to the appropriate treatment of the employee including vaccination status.

4.5 Regulated Waste Handling and Disposal



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4.5.1 Each site shall make arrangements for the proper disposal of medical wastes (i.e., bandages, gauze, sharps, etc.) in accordance with AMS-710-04-PR-04123.

4.6 Record Retention

4.6.1 The following records shall be maintained in the site HSE files for the duration of the employee's employment plus thirty (30) years.

4.6.1.1 Medical Records. The medical records shall include:

- Name and social security number, as applicable, of the employee;
- A copy of the employee's hepatitis B vaccination status including dates of all the hepatitis B vaccinations and any medical records relative to the employee's ability to receive vaccination;
- A copy of all results of examinations, medical testing, and follow up procedures;
- Healthcare written opinion; and
- A copy of the information provided to the healthcare professional.

4.6.1.2 Training. Training records shall include the following:

- Dates of training sessions;
- Contents or a summary of the training sessions;
- Names and qualifications of persons conducting the training; and
- Names and job titles of all persons attending the training session.

4.6.1.3 Sharps Injury Log. The Sharp Injury Log shall contain:

- Type and brand of device involved in the incident;
- Department or work area where the exposure incident occurred; and
- Explanation of how the incident occurred.
- Data will be entered into APTIM's HSE Data Management System for use as the Sharps Injury Log.

5.0 REFERENCES

AMS-720-01-FM-00020	Business Glossary
AMS-720-01-FM-00021	Technical Glossary
AMS-710-04-PR-04123	Medical Waste Management

6.0 TERMINOLOGY

Bloodborne Pathogens	Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).
Engineering Controls	Controls (e.g., sharps disposal containers, self-sheathing needles, safer medical devices, such as sharps with engineered sharps injury protections and needleless systems) that isolate or remove the bloodborne pathogens hazard from the workplace.
Other Potentially Infectious Materials (OPIM)	(1) The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids;



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- (2) Any unfixed tissue or organ (other than intact skin) from a human (living or dead); and
- (3) HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV

Regulated Wastes	Liquid or semi-liquid blood or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps; and pathological and microbiological wastes containing blood or other potentially infectious materials.
Site	Any location, facility or project where APTIM is performing work. Sites may include, but are not limited to, laboratories, offices, shops, owned facilities, leased facilities and/or project sites.
Universal Precautions	An approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.
Work Practice Controls	Controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by a two-handed technique).

7.0 EXHIBITS

Exhibit 7.1	List I – Job Classifications with Regular Exposure
Exhibit 7.2	List II – Job Classifications with Some Exposure
Exhibit 7.3	List III – Tasks and Practices With Exposure
Exhibit 7.4	Bloodborne Pathogens Plan Template – AMS-710-01-FM-00301

8.0 ATTACHMENTS

None



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9.0 EXHIBIT 7.1 – LIST I JOB CLASSIFICATIONS WITH REGULAR EXPOSURE PAGE 1 OF 1

JOB CLASSIFICATION	REGULAR EXPOSURE	SOME EXPOSURE	NO EXPOSURE
Staff Physician	X		
Registered Nurse	X		
Licensed Practical Nurse	X		
Emergency Medical Technician	X		



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EXHIBIT 7.2 – LIST II JOB CLASSIFICATIONS WITH SOME EXPOSURE PAGE 1 OF 1

JOB CLASSIFICATION	REGULAR EXPOSURE	SOME EXPOSURE	NO EXPOSURE
First Aid/CPR Certified Personnel		X	
Safety Representative		X	
Security Representative		X	
Custodian		X	
Non-Designated EMT and First Aid/CPR Certified Personnel (Good Samaritans)			X
All Other APTIM Personnel (Good Samaritans)			X



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EXHIBIT 7.3 - LIST III TASKS AND PRACTICES WITH EXPOSURE

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TASKS AND PROCEDURES
Bleeding Control With Spurting Blood
Bleeding Control With Minimal Bleeding
Emergency Childbirth
Blood Drawing (Phlebotomy, Needle sticks, Etc.)
Starting An Intravenous (IV) Line
Endotracheal Intubation, Esophageal Obturator Use
Oral/Nasal Suctioning, Manually Cleaning Airway
Handling And Cleaning Instruments With Microbial Contamination
Giving Injections
Rendering First Aid
Rendering Cardiopulmonary Resuscitation (CPR)
Decontamination Following Accidents/Injuries
Vehicle/Equipment Accidents Where There Is Presence Of Blood
Rescue Of Bleeding Employee
Medical Procedures With Blood (Suturing And Suture Removal)
Handling Of Regulated Waste Containers
Laboratory Blood Processing
Wound Care
Epistaxis (Nosebleed) Control
Handling Of Contaminated Waste
Handling Of Contaminated Personal Protective Clothing & Equipment
Handling Of Contaminated Laundry And Personal Clothing
Housekeeping/Custodial Duties Where There Is Presence Of Blood

10.0 ATTACHMENTS

None



PROCEDURE

Procedure Title:	Stop Work Authority	AMS Number:	AMS-710-05-PR-00400
Procedure Owner:	HSE	Issuing Authority:	VP HSE

STOP WORK AUTHORITY

Rev	Changes	Approved	Date
1	Added sections 4.5.3.7 and 4.5.3.8 to give more clarity on existing requirements.	M. Hetzler	5/31/2018
0	Updated to incorporate the APTIM branded STOP WORK Authority Card	M. Hetzler	2/9/2018
INT	Issued for Interim Use	M. Hadacek & S. Lachney	7/30/2017



Stop Work Authority

AMS Number:	Revision:	Approval Date:
AMS-710-05-PR-00400	1	5/31/2018

1.0 PURPOSE

The purpose of this procedure is to outline the requirement of all employees to stop an unsafe act or condition in the workplace.

2.0 SCOPE

This procedure applies to all APTIM employees, contractors, subcontractors, vendors, and site visitors associated with an APTIM site.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure.

- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors
- APTIM Vendors
- APTIM Site Visitors

4.0 PROCEDURE

4.1 As an APTIM representative, employees have the responsibility and the authority, without fear of reprimand or retaliation, to immediately stop any work activity that presents a danger to themselves, co-workers, clients, the public, or the environment.

4.2 It is each employee's responsibility to get involved by questioning and rectifying any situation that is an at-risk behavior or condition. If the employee does not feel the issue is addressed adequately, the employee has the responsibility to raise it to a higher level.

4.3 No work will resume until all stop work issues and concerns have been adequately addressed.

4.4 Any form of retribution or intimidation directed at any individual or company for exercising their authority as outlined in this program will not be tolerated.

4.5 Follow the three steps identified on the Stop Work Authority (SWA) Card (Attachment 8.1)

4.5.1 Recognize the hazard that could bring harm to you, fellow employees or the environment.

When a person identifies a perceived unsafe condition, act, error, omission, or lack of understanding that could result in an undesirable event, a "stop work intervention shall be immediately initiated with the person(s) potentially at risk.

4.5.2 Stop the task before an incident happens. This may be the most difficult part, but it is a responsibility and an expectation. Remember, every employee has the authority to do so.

4.5.2.1 If the supervisor is readily available and the affected person(s) are not in immediate risk, the "stop work action" should be coordinated through the supervisor.

4.5.2.2 If the supervisor is not readily available or the affected person(s) are in immediate risk, the "stop work" intervention should be initiated directly with those at risk.

4.5.2.3 "Stop work" interventions should be initiated in a positive manner by briefly introducing yourself and clarifying the intent and set expectations of the Stop Work events.



Stop Work Authority

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- 4.5.2.4 Notify all affected personnel and supervision of the stop work issue. If necessary, stop associated work activities, remove person(s) from the area, stabilize the situation and make the area as safe as possible.
- 4.5.3 Discuss the hazardous condition or behavior and share the information with others to help avoid similar situations. Develop a plan to eliminate or mitigate the hazard.
 - 4.5.3.1 All parties shall discuss and gain agreement on the stop work issue.
 - 4.5.3.2 If determined and agreed that the task or operation is okay to proceed as is (i.e., the stop work initiator was unaware of certain facts or procedures), the affected persons should thank the initiator for their concern and proceed with the work.
 - 4.5.3.3 If determined and agreed that the stop work issue is valid, then every attempt should be made to resolve the issue to all affected person's satisfaction prior to the commencement of work.
 - 4.5.3.4 If the stop work issue cannot be resolved immediately, work shall be suspended until proper resolution is achieved. When opinions differ regarding the validity of the stop work issue or adequacy of the resolution actions, the location's "person in charge" shall make the final determination.
 - 4.5.3.5 Positive feedback should be given to all affected employees regarding resolution of the stop work issue. Under no circumstances should retribution be directed at any person(s) who exercise in good faith their stop work authority as detailed in this program.
 - 4.5.3.6 All stop work interventions and associated detail shall be documented and reported via the behavior-based safety observation processes.
 - 4.5.3.7 Stop Work reports shall be reviewed by a supervisor or manager in order to measure participation, determine quality of interventions and follow-up, trend common issues, identify opportunities for improvement, and facilitate sharing of lessons learned.
 - 4.5.3.8 It is the desired outcome of any Stop Work Intervention that the identified safety concern(s) have been addressed to the satisfaction of all involved persons prior to the resumption of work. Most issues can be adequately resolved in a timely manner at the job site, occasionally additional investigation and corrective actions may be required to identify and address root causes.

4.6 Training

- 4.6.1 All employees and contractors shall be trained in the use of Stop Work Authority during APTIM HSE Induction.
- 4.6.2 Upon completion of training, employees and contractors shall be issued a SWA card.

5.0 REFERENCES

None

6.0 TERMINOLOGY

Term

Definition

Site

Any location, facility, or project where APTIM is performing work. Sites may include, but are not limited to, laboratories, offices, shops, owned or leased facilities, and/or project sites.



Stop Work Authority

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Supervisor

Person in control of the work and the personnel conducting the work (foreman, general foreman, superintendent)

7.0 EXHIBITS

Exhibit 7.1

AMS-720-01-FM-00020 – Business Glossary

Exhibit 7.2

AMS-720-01-FM-00021 – Technical Glossary

8.0 ATTACHMENTS

Attachment 8.1

Stop Work Authority Card



Stop Work Authority

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ATTACHMENT 8.1

STOP WORK AUTHORITY CARD

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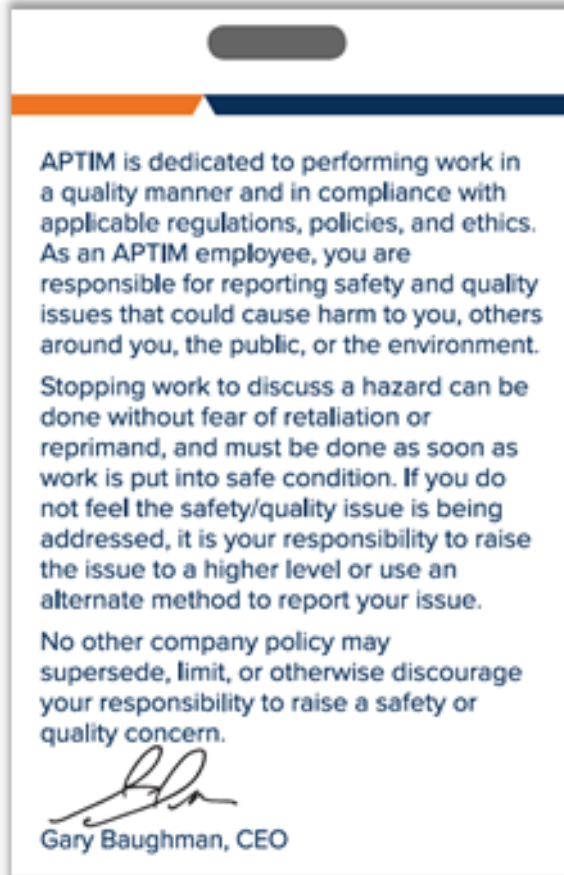


STOP WORK AUTHORITY

APTIM

- I will IDENTIFY** hazards that could cause harm to me, my fellow employees, others in the surrounding area, or to the environment.
- I will STOP** the task before a harmful event might occur. While this can be difficult or uncomfortable, I commit to using my authority to stop work in a respectful and timely manner.
- I will DISCUSS** the hazardous condition or behavior, share information with others to help avoid similar situations, and help develop a plan to eliminate or mitigate the hazard.

APTIM Ethics Line 1-800-461-9330



APTIM is dedicated to performing work in a quality manner and in compliance with applicable regulations, policies, and ethics. As an APTIM employee, you are responsible for reporting safety and quality issues that could cause harm to you, others around you, the public, or the environment.

Stopping work to discuss a hazard can be done without fear of retaliation or reprimand, and must be done as soon as work is put into safe condition. If you do not feel the safety/quality issue is being addressed, it is your responsibility to raise the issue to a higher level or use an alternate method to report your issue.

No other company policy may supersede, limit, or otherwise discourage your responsibility to raise a safety or quality concern.

[Signature]
Gary Baughman, CEO



PROCEDURE

Procedure Title:	Hazardous Waste Operations	AMS Number:	AMS-710-04-PR-00300
Procedure Owner:	HSE	Issuing Authority:	APTIM Quality Management

HAZARDOUS WASTE OPERATIONS

Rev	Changes	Approved	Date
INT	Issued for Interim Use	M. Hadacek & S. Lachney	7/30/2017



Hazardous Waste Operations

AMS Number:	Revision:	Approval Date:
AMS-710-04-PR-00300	INT	7/30/2017

1.0 PURPOSE

The purpose of this procedure is to establish the minimum requirements for developing and implementing a written health and safety program for APTIM employees involved in hazardous waste operations conducted at treatment, storage, and disposal (TSD) facilities.

2.0 SCOPE

This procedure applies to personnel who develop and implement written HSE Programs for employees involved in hazardous waste operations.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- APTIM Managers
- APTIM Supervisors
- APTIM Employees

4.0 PROCEDURE

4.1 General

The Site HSE Manager shall develop and implement a written safety and health program for employees involved in hazardous waste operations (AMS-710-04-WI-00301 Health and Safety Plans for Hazardous Waste Operations Sites). The program shall be designed to identify, evaluate, and control safety and health hazards in the facility for the purpose of employee protection. The program shall provide for emergency response and shall address, as appropriate, site analysis, engineering controls, maximum exposure limits, hazardous waste handling procedures, and the use of new technologies (AMS-710-04-WI-00302 Emergency Response at Hazardous Waste Sites).

4.2 Hazard Communication

The safety and health program shall contain a hazard communication program. Refer to AMS-710-01-PR-00400 Hazard Communication.

4.3 Emergency response

The safety and health program shall contain Emergency Response requirements or shall reference the Emergency Preparedness Plan (AMS-710-03-PR-00400).

4.4 Medical Surveillance

A medical surveillance program shall be developed and implemented. All employees who are or may be exposed to health hazards or hazardous substances at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels without regard to the use of respirators for thirty (30) days or more in a calendar year shall be included in the program at no cost to the employee.

4.5 Decontamination

4.5.1 A decontamination program shall be developed, communicated to employees, and implemented before any employees or equipment enters an area on site where potential exposure to hazardous substance(s) exists (AMS-710-04-WI-00305 Hazardous Waste Decontamination).

4.5.2 All employees leaving a contaminated area shall be appropriately decontaminated. All contaminated clothing and equipment leaving a contaminated area shall be appropriately disposed of or decontaminated (AMS-710-04-PR-04113 Waste Characterization).



Hazardous Waste Operations

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AMS-710-04-PR-00300	INT	7/30/2017

- 4.5.3 Decontamination shall be performed in geographical areas that will minimize cross contamination or the exposure of uncontaminated employees or equipment.
- 4.5.4 The Site HSE Manager shall monitor all methods of decontamination and determine their effectiveness. If methods are found to be ineffective, appropriate steps will be taken to correct the deficiencies.
- 4.5.5 Regular showers and changing rooms shall be provided outside the contaminated area.

4.6 New Technology

A program shall be developed and implemented to introduce new and innovative equipment for employee protection into the work place.

4.7 Material Handling

Where employees handle drums or containers, AMS-710-02-PR-00300 Material Storage and Handling shall be implemented prior to starting such work.

4.8 Engineering Controls

Engineering controls work practices, personal protective equipment, or a combination of these shall be implemented in accordance with 29 CFR 1910.120 (g) to protect employees from exposure to hazardous substances and safety and health hazards.

4.9 Monitoring

4.9.1 General

Monitoring shall be performed in accordance with 29 CFR 1910.120 (h) to prevent employee exposure to hazardous concentrations of hazardous substances and to assure proper selection of engineering controls, work practices, and personal protective equipment (AMS-710-04-WI-00304 Hazardous Waste Site Control).

4.9.2 Air Monitoring

Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and safety and health hazards in order to determine the appropriate level of employee protection.

4.9.3 Initial Entry

Upon initial entry, representative air monitoring shall be conducted to identify any immediately dangerous to life and health (IDLH) condition, exposure over Permissible Exposure Limits (PELs) or if other dangerous condition(s) exist (i.e., the presence of flammable atmosphere or oxygen deficient environments).

4.9.4 Periodic Monitoring

Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed, or when there is indication that exposure may have risen over PELs. Periodic monitoring shall be considered when the PELs have risen and one or more of the following scenarios occur:

- Beginning of new work on a different portion of the site
- Contaminates other than those previously identified are being handled
- When a different type of operation is initiated
- When obvious liquid contamination is present

4.10 Training

All employees working on sites or at treatment, storage, and disposal (TSD) operations where they may be exposed to health hazards or hazardous substances must receive training to enable the employees to perform their assigned duties and functions in a safe and healthful manner so as not to endanger themselves or other employees (AMS-710-04-WI-00303 Hazardous Waste Operations Training).



Hazardous Waste Operations

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4.10.1 New Employees

Employees engaged in hazardous substance removal or other activities, which expose or potentially expose them to hazardous substances and health hazards shall receive initial training which consists of a minimum of 40 hours of instruction off-site and three days of field experience, under direct supervision of a trained, experienced supervisor as described in 29 CFR 1910.120.

4.10.2 Current Employees

Current employees whose previous work experience and/or training are equivalent to the initial training requirement shall be considered as having met the initial training requirements. The Training Manager or his/her designee shall make the determination of equivalency. Current employees shall receive 8 hours of refresher training annually as described in 29 CFR 1910.120.

4.10.3 Trainers

Trainers shall be qualified to instruct employees on the subject matter presented in training. Such trainers shall have satisfactorily completed a training program for teaching their subjects, or they shall have the academic credentials and instructional experience necessary to teach as described in 29 CFR 1910.120.

4.11 Project Manager shall:

4.11.1 Verify compliance with the appropriate regulatory standard(s)

4.11.2 Ensure project-specific Health and Safety Program (HASP) documents are applicable health and safety requirements

4.12 HSE Representative shall:

4.12.1 Verify compliance with the appropriate regulatory standard(s) (AMS-710-04-WP-00001 Implement Environmental Management System (EMS)).

4.12.2 Ensure project-specific Health and Safety Program (HASP) documents are applicable health and safety requirements

4.12.3 Ensure medical and exposure records are handled correctly (AMS-710-01-PR-03500)

5.0 REFERENCES

29 CFR 1910.1200	Hazard Communication
29 CFR 1910.141	Sanitation
AMS-710-01-PR-00400	Hazard Communication
AMS-710-03-PR-00400	Emergency Preparedness Plan
AMS-710-01-PR-03500	Medical and Exposure Records
AMS-710-02-PR-00300	Material Storage and Handling
AMS-710-04-PR-04113	Waste Characterization
AMS-710-04-WI-00301	Health and Safety Plans for Hazardous Waste Operations Sites
AMS-710-04-WI-00302	Emergency Response at Hazardous Waste Sites
AMS-710-04-WI-00303	Hazardous Waste Operations Training



Hazardous Waste Operations

AMS Number:	Revision:	Approval Date:
AMS-710-04-PR-00300	INT	7/30/2017

AMS-710-04-WI-00304	Hazardous Waste Site Control
AMS-710-04-WI-00305	Hazardous Waste Decontamination
AMS-710-04-WP-00001	Implement Environmental Management System (EMS)

6.0 TERMINOLOGY

<u>Term</u>	<u>Definition</u>
Buddy System	A system of organizing employees into work groups in such a manner that each employee of the work group is designated to be observed by at least one other employee in the work group. The purpose of the buddy system is to provide rapid assistance to employees in case of an emergency.
Clean-up Operation	An operation where hazardous substances are removed, contained, incinerated, neutralized, cleared-up, or in any manner processed or handled with ultimate goal of making the site safer for people or the environment.
Decontamination	The removal of hazardous substances from employees and their equipment to the extent necessary to preclude the occurrence of foreseeable adverse health effects.
Emergency Response or Responding to Emergencies	A response effort by employees from outside the immediate release area or by designated responders to an occurrence which results, or is likely to result, in an uncontrolled release of a hazardous substance. Responses to incidental releases of hazardous substances where the substance can be absorbed, neutralized or otherwise controlled at the time of release by employees in the immediate release area, or by maintenance personnel are not considered emergency responses. Responses to releases of hazardous substances where there is no potential safety or health hazard are not considered to be emergency responses.
Facility	Any building, structure, installation, equipment, pipe or pipeline, well, pit, pond, lagoon, impoundment, ditch, storage container, motor vehicle, rolling stock, or aircraft, or any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any water-borne vessel.
Hazardous Substance	A substance which results or may result in adverse effects on the health or safety of employees.
Health Hazard	A chemical, mixture of chemicals, or a pathogen for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed employees. Health hazards include: chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, agents which act on the hematopoietic system and agents which damage the lungs, skin, eyes, or mucous membranes.

7.0 EXHIBITS

AMS-720-01-FM-00020	Business Glossary
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Hazardous Waste Operations

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AMS-710-04-PR-00300	INT	7/30/2017

AMS-720-01-FM-00021

Technical Glossary

8.0 ATTACHMENTS

None



PROCEDURE

Procedure Title:	Work Area Hazard Assessment	AMS Number:	AMS-710-05-PR-01700
Procedure Owner:	HSE	Issuing Authority:	APTIM Quality Management

WORK AREA HAZARD ASSESSMENT

INT	Issued for Interim Use	M. Hadacek & S. Lachney	7/30/2017
Rev	Changes	Approved	Date



Work Area Hazard Assessment

AMS Number:	Revision:	Approval Date:
AMS-710-05-PR-01700	INT	7/30/2017

1.0 PURPOSE

The purpose of this Procedure is to establish the minimum requirements for Work Area Hazard Assessment on APTIM sites.

2.0 SCOPE

This procedure applies to all APTIM employees, contractors, subcontractors, and visitors associated with a APTIM site.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors

4.0 PROCEDURE

4.1 Work Area Hazard/Recognition Process Philosophy

4.1.1 It is The Work Area Hazard/Recognition Process Philosophy that a hazard's risk potential is the product of the Level of Focus and the Level of Distraction. The Level of Focus and the Level of Distraction have an inverse relationship. An increase in focus shall decrease the distraction resulting in less risk potential for an incident to occur at the actual work front. An increase in distraction shall have a decrease in focus resulting in a greater risk potential for an incident to occur at the actual work front. This philosophy is applicable at all levels, phases, and stages of work activity.

4.1.2 Varied types of work hazard analyses are to be conducted to mitigate hazard risk potential with the Level of Focus increasing and the Level of Distraction decreasing as the hazard analysis becomes nearer to the actual work activity.

4.1.3 The result from the completion of every hazard analysis/recognition process becomes the basis from which to begin the next level of hazard analysis/recognition study. This process is visually displayed in the Pyramid of Work Area Hazard Recognition/ Assessment (Figure 4-1).

4.1.4 If during the Work Area Hazard/Recognition Process it is discovered that a previous step failed to identify a potential risk or hazard, then the previous step shall be repeated or revisited to incorporate the new findings.

4.1.5 Work shall not proceed to the next level or step of the Work Area Hazard Analysis Process prior to the completion of the previous step.

4.2 Work Area Hazard Assessment Flow

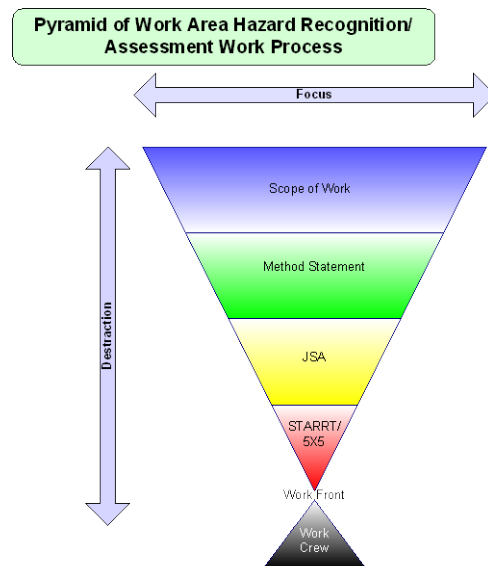


Figure 4-1



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- 4.2.1 The basic work flow process is depicted in Attachment 8.1. Utilizing this methodology each site shall develop a Work Area Hazard Assessment Process specific to their needs. Performing a method statement is a best management practice to tie steps one (1) and three (3) together, but is not required
- 4.2.2 The location specific Work Area Hazard Assessment Process shall minimally include a means of engaging the supervision in developing an assessment prior to the start of work and a method of engaging their respective work crews in the assessment process. The location specific Work Area Hazard Assessment Process shall, minimally, have a means of ensuring each worker has the opportunity to conduct a 360° review of their specific work task, as well as documenting that review.
- 4.2.3 Scope of Work (Step One)
 - 4.2.3.1 The first step in the Work Hazard Analysis/Recognition Process begins with the process of defining the Scope of Work. The Scope of Work is a definition of the work to be performed. The objective is to establish an understanding of the work to be performed.
 - 4.2.3.2 The Scope of Work shall define the major elements of work to be executed (e.g., civil, structural, mechanical, or electrical).
 - 4.2.3.3 Within the Scope of Work each of the major disciplines shall be defined to include elements such as:
 - Painting and coating
 - Instrumentation and electrical
 - Structural
 - Civil
 - 4.2.3.4 The major disciplines identified in the Scope of Work review shall serve as the basis for development of the method statements
- 4.2.4 Method Statement (Step Two)
 - 4.2.4.1 The second step in the Work Hazard Analysis/Recognition Process entails the development of a Work Method Statement or equivalent document (e.g., Job Hazard Assessment). A Work Method Statement shall provide specific instructions on the work to be performed, outline hazards involved, and identify key safety measures to be implemented during the work activity. The Method Statement shall also detail which control measures have been introduced to ensure the safety of anyone who is affected by the task or process.
 - 4.2.4.2 For each discipline of work identified under the site scope of work the Site Manager shall prepare Method Statements, using AMS-710-05-FM-01702— Sample Method Statement 2.
 - 4.2.4.3 The site HSE Manager/Supervisor shall maintain a copy of the site method statements and shall submit copies to Business Unit/Operating Group HSE Director or designee for business sector, area, district and/or global application.
 - 4.2.4.4 Within the Method Statement the following minimum information shall be included:
 - Sequence of key activities
 - Identification of the craft required, including necessary skill/certification
 - Identification of the tools and equipment required
 - A clear statement of responsible persons, i.e., who is in charge of the work, who has specific responsibilities, e.g., flagmen, riggers.
 - Identification of what materials are required for execution of the activity



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- Identification of what services are required and how they shall be provided
- Reference to emergency procedures, including contact telephone numbers, reference to emergency provisions such as spill kits.
- Key activities identified in the Method Statement(s) (or equivalent document(s)) shall serve as the basis for the development of an activity specific Job Safety Analysis (JSA).

4.2.5 Job Safety Analysis (Step Three)

4.2.5.1 The third step in the Work Area Hazard Analysis/Recognition Process is to develop a JSA for each key activity to be performed, during the shift. A JSA shall document each step of the activities, identify potential hazards associated with each step, and list the control measure(s) to be used to mitigate the potential hazard(s).

4.2.5.1 A new JSA shall be completed at the work location every day, before commencement of any work activity and updated in the event of changing conditions. If conditions that a work crew encounters during a work period (inclement weather, another contractor began work in area change), the JSA shall be modified to address the new hazards. The JSA shall be changed to reflect new conditions in the task being performed or new hazards not identified previously.

4.2.5.2 Utilize the hierarchy of control measures to develop safe job procedures to eliminate or mitigate the hazards and prevent potential accidents:

1. Eliminate the hazard if possible
2. Use engineering controls to mitigate the hazard
3. Use administrative controls to minimize exposure
4. Use PPE

4.2.5.3 For each key activity identified under the site method statement supervision shall prepare a JSA. Supervision should use one of the following to prepare the JSA:

- AMS-710-05-FM-01704—Sample JSA 1
- AMS-710-05-FM-01705—Sample JSA 2
- AMS-710-05-FM-01708—Sample JSA 3

4.2.5.4 Supervision shall review the prepared JSA prior to work and ensure all appropriate elements are addressed in the JSA and that it is specific to their planned work activities.

4.2.5.5 The supervisor shall review the completed JSA with their respective work crews prior to starting the work activity.

4.2.5.6 Periodic reviews shall be conducted by the site HSE Manager and Senior Level Site Manager to ensure the integrity of the JSA process.

4.2.5.7 JSA's are to remain with the work crew(s) until the task(s) are completed at which time they shall be submitted to the site HSE Manager for inclusion in the site HSE files.

4.2.5.8 These steps identified in the JSA shall serve as the basis for development of job step specific worker completed assessments.

4.2.6 5 x 5 Analysis/STARRT (Step Four)

4.2.6.1 The fourth step in the Work Hazard Analysis/Recognition Process is to develop a 5 X 5 Analysis/Safety Task Analysis and Risk Reduction Talk (STARRT) Card or equivalent form) just prior to the performance of the work. The job or task specific analysis is performed by the individual who is to



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perform the work. This is the individual's opportunity to confirm that he has everything needed to perform the work in a safe manner.

- 4.2.6.2 The individual shall prepare job step specific analysis, using one of the following
 - AMS-710-05-FM-01706—Sample 5x5 Analysis
 - AMS-710-05-FM-01707—Sample STARRT Card
 - Or an equivalent form
- 4.2.6.3 The work crew shall be actively involved in conducting a 360° review of their specific work area, identifying hazards of their work and the hazards of work activities that surround them. The work crew lead and the work crew shall collectively review the means of mitigation and ensure proper controls and measures are in place.
- 4.2.6.4 The job or task specific analysis is a tool for the individual to identify any unaccounted hazards that one may encounter associated with the tasks they shall actually be performing.

5.0 REFERENCES

None

6.0 TERMINOLOGY

<u>Term</u>	<u>Definition</u>
Hazard	A condition, practice, behavior or situation, or a combination of these, that can cause injury or illness in people, or damage to the environment or property.
JSA	Job Safety Analysis, technique that focuses on job tasks as a way to identify hazards before they occur
Site	Any location, facility or project where APTIM is performing work. Sites may include, but are not limited to, laboratories, offices, shops, owned facilities, leased facilities and/or project sites.
Work Area Hazard Assessment	Evaluation of a work place condition, practice, behavior or situation that an employee may encounter while performing a job/task that has the potential for risks/hazards.

7.0 EXHIBITS

Exhibit 7.2	AMS-710-05-FM-01702—Sample Method Statement 2
Exhibit 7.3	AMS-710-05-FM-01704—Sample JSA 1
Exhibit 7.4	AMS-710-05-FM-01705—Sample JSA 2
Exhibit 7.5	AMS-710-05-FM-01706—Sample 5x5 Card
Exhibit 7.6	AMS-710-05-FM-01707—Sample STARRT Card
Exhibit 7.7	AMS-710-05-FM-01708---Sample JSA 3
Exhibit 7.8	AMS-720-01-FM-00020---Business Glossary
Exhibit 7.9	AMS-720-01-FM-00021---Technical Glossary

8.0 ATTCHMENTS

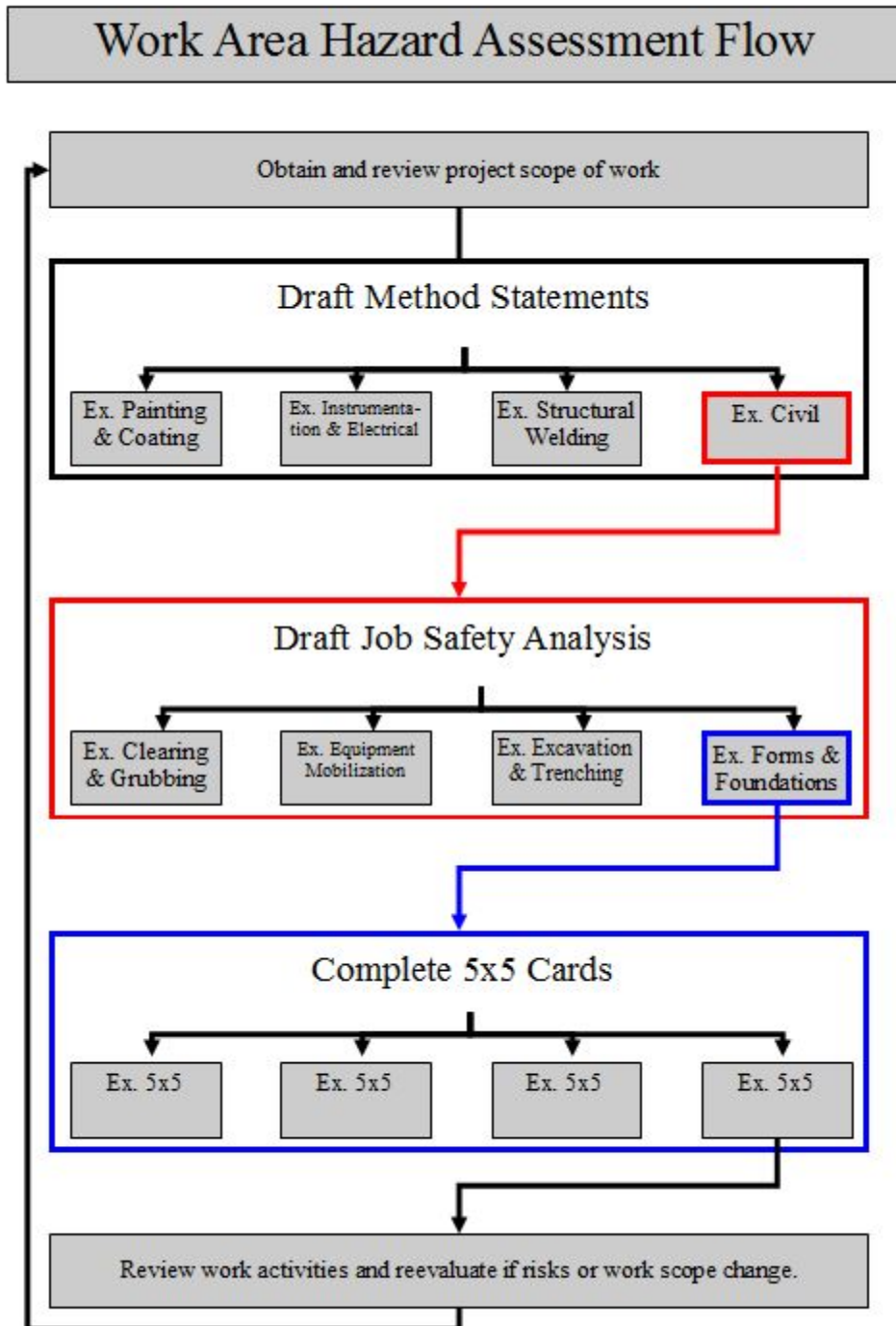
Attachment 8.1 Work Area Hazard Assessment Process Flow



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Attachment 8.1 Work Area Hazard Assessment Process Flow





PROCEDURE

Procedure Title:	Personal Protective Equipment	AMS Number:	AMS-710-02-PR-03000
Procedure Owner:	HSE	Issuing Authority:	APTIM Quality Management

PERSONAL PROTECTIVE EQUIPMENT

Rev	Changes	Approved	Date
INT	Issued for Interim Use	M. Hadacek & S. Lachney	7/30/2017



Personal Protective Equipment

AMS Number:	Revision:	Approval Date:
AMS-710-02-PR-03000	INT	7/30/2017

1.0 PURPOSE

The purpose of this Procedure is to establish the minimum requirements for the use of Personal Protective Equipment (PPE) on APTIM sites.

2.0 SCOPE

This procedure applies to all employees of APTIM, contractors, subcontractors and visitors associated with a APTIM site.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors
- APTIM Visitors

4.0 PROCEDURE

4.1 Requirements

- 4.1.1 PPE is the last line of defense against hazards and shall not be used as a substitute for engineering, work practice, and/or administrative controls. PPE shall be used in conjunction with these controls to ensure employee safety and health. PPE includes all clothing or other work accessories designed to create a barrier against work place hazards. Employees must be made aware that PPE does not eliminate the hazard. If PPE fails, hazard exposure will occur.
- 4.1.2 Every attempt shall be made to prevent the possibility of incidents when employees perform work activities by providing them with the appropriate PPE, through compliance with safety regulations and training of employees to properly use, inspect and wear the required PPE and through employee involvement in safe work activities.
- 4.1.3 The Company reserves the right to select and/or approve all PPE to be issued and used by its employees, visitors, and/or subcontractors. Only such equipment issued or approved will be allowed on its jobsites. Failure to comply with this procedure will result in disciplinary action up to and including termination in accordance with AMS-710-05-PR-00200.
- 4.1.4 The Site Manager shall ensure that the Site HSE Manager has assessed the workplace to determine if hazards are present or likely to be present. This assessment shall be documented in writing. The documentation shall identify the work place, the person(s) evaluating the work place, the dates of the assessment, and the hazards if any. The Site Manager shall approve the hazard assessment as accurate and complete. If hazards are present, controls shall be implemented to eliminate or reduce the hazard. If controls are not available and/or the hazard is not eliminated, the requisite PPE shall be used. APTIM Management shall:
 - 4.1.4.1 Select and have each affected employee use the types of PPE chosen.
 - 4.1.4.2 Communicate appropriate selection of PPE to employees. (Training).
 - 4.1.4.3 Ensure that employees have PPE that properly fits them.
 - 4.1.4.4 Ensure that employees understand the proper usage of the required PPE.



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- 4.1.5 Workers must report any damaged or defective PPE and the defective or damaged PPE shall be removed from service and shall not be reused.
- 4.1.6 APTIM shall ensure that each employee who is required to wear PPE is trained in the following:
 - 4.1.6.1 When PPE is necessary.
 - 4.1.6.2 What PPE is necessary.
 - 4.1.6.3 How to put on, take off, adjust, and wear the PPE.
 - 4.1.6.4 The limits of the PPE.
 - 4.1.6.5 The proper care, maintenance, useful life, inspection and disposal of the PPE.
 - 4.1.6.6 The proper practices for keeping the PPE clean and hygienic.
 - 4.1.6.7 The proper use to ensure the PPE is not misused or damaged.
- 4.1.7 Each affected employee shall demonstrate an understanding of the training and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE.
- 4.1.8 When there is reason to believe that any affected employee who has already been trained does not have the understanding and skill required, the employee shall be retrained. Circumstances where retraining is required include, but are not limited to, the following:
 - 4.1.8.1 Changes in the workplace which renders previous training obsolete.
 - 4.1.8.2 Changes in the type of PPE to be used which renders previous training obsolete.
 - 4.1.8.3 Inadequacies in an affected employee's knowledge or use of assigned PPE.
- 4.2 The Site HSE Manager along with Site Management will authorize the purchase of appropriate types and models of PPE.
- 4.3 The company will provide all PPE to the employee at no cost to the employee with exception of items deemed to be personal in nature to include, but not limited to:
 - 4.3.1 Prescription Safety Eyewear
 - 4.3.2 Thermal undergarments
 - 4.3.3 Safety Toed Protective Footwear
 - 4.3.4 Sites may, at their discretion, accept the cost of these personal in nature items as well.
- 4.4 The site shall document each affected employee has been trained using the Personal Protective Equipment Training Record form, AMS-710-01-FM-03001. The written documentation shall include the name of each employee trained, the dates of the training, and the subject of the training.
- 4.5 Employee-owned Equipment
 - 4.5.1 Each employee shall be issued a hard hat (AMS-710-02-PR-03100), protective eyewear (AMS-710-02-PR-03200), hearing protection (AMS-710-01-PR-00900), hand protection (AMS-710-02-PR-03400) and/or respiratory protection (AMS-710-02-PR-03500), fall protection (AMS-710-02-PR-00900), personal flotation devices (AMS-710-02-PR-03700) and flagmen and traffic vests (AMS-710-02-PR-03600) if required. An employee wishing to utilize their own PPE must be able to demonstrate it meets APTIM requirements and must pass inspection by the Site HSE Manager.



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4.5.2 Employees are responsible to provide their own work clothes (AMS-710-02-PR-03800) and sturdy safety-toed work boots (AMS-710-02-PR-03300) that meet APTIM's PPE requirements. Should an employee report for work with unsatisfactory PPE, the employee will not be permitted to work until APTIM's requirements are met.

4.6 Miscellaneous

4.6.1 Sweat Pads

4.6.1.1 When weather or working conditions cause perspiration, sponge pads can be worn on the forehead to prevent perspiration from seeping into eyes or fogging safety goggles.

4.6.2 Sunscreen

4.6.2.1 Clothing, hats and shade are the best method for protecting skin from ultraviolet (UV) rays. Any remaining exposed skin may be protected by applying sunscreen with approval from the Site HSE Manager. In active facilities approval for use of sunscreen must be obtained from the client.

5.0 REFERENCES

AMS-710-02-PR-03100	Head Protection
AMS-710-02-PR-03200	Eye Protection
AMS-710-02-PR-03300	Foot Protection
AMS-710-02-PR-03400	Hand Protection
AMS-710-02-PR-03500	Respiratory Protection
AMS-710-02-PR-03600	Flagmen and Traffic Vests
AMS-710-02-PR-03700	Personal Floatation Devices
AMS-710-02-PR-03800	Basic Work Clothing
AMS-710-02-PR-00900	Fall Protection
AMS-710-01-PR-00900	Noise Control and Hearing Conservation

6.0 TERMINOLOGY

<u>Term</u>	<u>Definition</u>
PPE	Personal Protective Equipment
Site	Any location, facility or project where APTIM is performing work. Sites may include, but are not limited to, laboratories, offices, shops, owned facilities, leased facilities and/or project sites.

7.0 EXHIBITS

Exhibit 7.1	AMS-710-02-FM-03001 – Personal Protective Equipment Training Record
Exhibit 7.2	AMS-710-02-FM-03002 – Global Approved PPE Listing
Exhibit 7.3	AMS-720-01-FM-00020 – Business Glossary
Exhibit 7.4	AMS-720-01-FM-00021 – Technical Glossary

8.0 ATTACHMENTS

None



PROCEDURE

Procedure Title:	Respiratory Protection	AMS Number:	AMS-710-02-PR-03500
Procedure Owner:	HSE	Issuing Authority:	APTIM Quality Management

RESPIRATORY PROTECTION

INT	Issued for Interim Use	M. Hadacek & S. Lachney	7/30/2017
Rev	Changes	Approved	Date



Respiratory Protection

AMS Number:	Revision:	Approval Date:
AMS-710-02-PR-03500	INT	7/30/2017

1.0 PURPOSE

The purpose of this Procedure is to establish the minimum requirements for Respiratory Protection on APTIM projects and at office, warehouse, or shop locations.

2.0 SCOPE

This procedure applies to all APTIM employees, contractors, subcontractors and visitors associated with a APTIM project, office, warehouse, or shop locations.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors
- APTIM Visitors

4.0 PROCEDURE

Each project, shop, warehouse or facility shall follow this procedure and use it as the minimum guidelines to develop their site specific procedure for Respiratory Protection.

4.1 General

- 4.1.1 Every consideration will be given to the use of effective engineering controls to eliminate or reduce exposure to respiratory hazards to the point where respirators are not required. However, when feasible engineering controls are not effective in controlling toxic substances, the company, at no charge, will provide appropriate respiratory protective equipment to the employee.
- 4.1.2 Employees required to use respiratory protective devices because of exposure to toxic substances will do so as a condition of employment. Employees required to use respirators will be properly fitted, appropriately tested, medically screened, and thoroughly trained in their use.

4.2 Written Plan

- 4.2.1 A written Respiratory Protection Plan will be developed for the specific respiratory hazards of the location based upon a location/task risk assessment. The written Plan will also include information that is to be included in training, the provisions for controlling the distribution of respirators, the method to be used for cleaning and maintenance of respirators, and how the requirements of this Procedure will be met at the location level.
- 4.2.2 The Location HSE Manager is responsible for the development and implementation of the location-specific respiratory protection program.
- 4.2.3 The Location HSE Manager will develop a respiratory hazard assessment specific to their risks using AMS-710-02-FM-03507. This hazard assessment will be reviewed, minimally, on an annual basis or as changing conditions warrant.

4.3 Respirator Selection and Use

- 4.3.1 If a question exists concerning the type of respirator required Corporate HSE shall be consulted.
- 4.3.2 The Location HSE Manager will select respirators to be used on site, based on the hazards to which workers are exposed. The Location HSE Manager will conduct a hazard evaluation for each operation, process, or work area where airborne



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contaminants may be present in routine operations or during an emergency. The hazard evaluation will include:

- 4.3.2.1 Identification and development of a list of hazardous substances used in the workplace, by department, or work process.
- 4.3.2.2 Review of work processes to determine where potential exposures to these hazardous substances may occur. This review shall be conducted by surveying the workplace, reviewing process records, and talking with employees and supervisors.
- 4.3.2.3 Exposure monitoring to quantify potential hazardous exposures.
- 4.3.3 Issuing Respirators
 - 4.3.3.1 Respirators will not be fit tested or issued to individuals who have facial hair (including stubble) or any other condition, which interferes with the sealing surface of the respirator.
 - 4.3.3.2 Respirators will not be fit tested nor issued to individuals who have not received appropriate respirator training in addition to fit testing and a medical clearance.
 - 4.3.3.3 Employee owned respirators shall not be used.
- 4.3.4 General Use Procedures:
 - 4.3.4.1 Employees will use their respirators under conditions specified by this program, and in accordance with the training they receive on the use of each particular model. In addition, the respirator shall not be used in a manner for which it is not certified by NIOSH or by its manufacturer.
 - 4.3.4.2 All employees shall conduct user seal checks each time that they wear their respirator. Employees shall use either the positive or negative pressure check (depending on which test works best for them) specified in Appendix B-1 of the Respiratory Protection Standard.
 - 4.3.4.3 All employees shall be permitted to leave the work area to go to the locker room to maintain their respirator for the following reasons: to clean their respirator if the respirator is impeding their ability to work, change filters or cartridges, replace parts, or to inspect respirator if it stops functioning as intended. Employees should notify their supervisor before leaving the area.
 - 4.3.4.4 Employees are not permitted to wear tight-fitting respirators if they have any condition, such as facial scars, facial hair, or missing dentures, that prevents them from achieving a good seal. Employees are not permitted to wear headphones, jewelry, or other articles that may interfere with the face piece-to-face seal.
 - 4.3.4.5 Once the type of respirator that is applicable and suitable for the purpose intended has been selected, the selection process should give consideration to the fit and comfort of the respirator.
- 4.3.5 Emergency Procedures:
 - 4.3.5.1 When an alarm sounds, employees in the affected department must immediately don their emergency escape respirator, shut down their process equipment, and exit the work area. All other employees must immediately evacuate the building. The location specific Emergency Preparedness Plan describes these procedures (including proper evacuation routes and rally points) in greater detail.
- 4.3.6 Respirator Malfunction



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- 4.3.6.1 For any malfunction of an APR (e.g., such as breakthrough, facepiece leakage, or improperly working valve), the respirator wearer should inform his or her supervisor that the respirator no longer functions as intended, and go to the designated safe area to maintain the respirator. The supervisor must ensure that the employee receives the needed parts to repair the respirator, or is provided with a new respirator.
- 4.3.6.2 All workers wearing atmosphere-supplying respirators will work with a “buddy”.
- 4.3.6.3 If a worker experiences a malfunction of an SAR, he or she should signal to the “buddy” that he or she has had a respirator malfunction. The buddy shall don an emergency escape respirator and aid the worker in immediately exiting the spray booth.

4.4 Breathing Air Quality and Use

- 4.4.1 The Location HSE Manager shall ensure that compressed air, compressed oxygen, liquid air, and liquid oxygen used for respiration accords with the following specifications:
- 4.4.2 Compressed and liquid oxygen shall meet the United States Pharmacopoeia requirements for medical or breathing oxygen; and
- 4.4.3 Compressed breathing air shall meet at least the requirements for Grade D breathing air described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989, to include:
 - 4.4.3.1 Oxygen content (v/v) of 19.5-23.5%;
 - 4.4.3.2 Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less;
 - 4.4.3.3 Carbon monoxide (CO) content of 10 ppm or less;
 - 4.4.3.4 Carbon dioxide content of 1,000 ppm or less; and
 - 4.4.3.5 Lack of noticeable odor.
- 4.4.4 The Location HSE Manager shall ensure that compressed oxygen is not used in atmosphere-supplying respirators that have previously used compressed air.
- 4.4.5 The Location HSE Manager shall ensure that oxygen concentrations greater than 23.5% are used only in equipment designed for oxygen service or distribution.
- 4.4.6 For supplied-air respirators, only Grade D breathing air shall be used in the cylinders. The Location HSE Manager will coordinate deliveries of compressed air with the company’s vendor, Compressed Air Inc., and require Compressed Air Inc. to certify that the air in the cylinders meets the specifications of Grade D breathing air.
- 4.4.7 The Location HSE Manager will maintain a minimum air supply of one fully charged replacement cylinder for each SAR unit. In addition, cylinders may be recharged as necessary from the breathing air cascade system located near the respirator storage area.
- 4.4.8 For all IDLH atmospheres, the location shall ensure that:
 - 4.4.8.1 One employee or, when needed, more than one employee is located outside the IDLH atmosphere;
 - 4.4.8.2 Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere;
 - 4.4.8.3 The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue;



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- 4.4.8.4 The Location HSE Manager shall be notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue;
- 4.4.8.5 The Location Area HSE Manager shall review the JSA and approve all respiratory protection to be used in potentially IDLH Environments.
- 4.4.8.6 Equivalent means for rescue where retrieval equipment is not required.

4.5 Medical Evaluation

- 4.5.1 Employees who are either required to wear respirators, or who choose to wear an APR voluntarily, must successfully complete a medical evaluation before being permitted to wear a respirator on the job.
- 4.5.2 Employees are not permitted to wear respirators until a physician has determined that they are medically able to do so. Any employee refusing the medical evaluation will not be allowed to work in an area requiring respirator use.
- 4.5.3 A licensed and company approved physician will provide the medical evaluations. Medical evaluation procedures are as follows:
 - 4.5.3.1 The medical evaluation will be conducted using AMS-710-02-FM-03501. The Location HSE Manager will provide a copy of this questionnaire to all employees requiring medical evaluations. To the extent feasible, the company will assist employees who are unable to read the questionnaire (by providing help in reading the questionnaire). When this is not possible, the employee will be sent directly to the physician for medical evaluation.
 - 4.5.3.2 All affected employees will be given a copy of the medical questionnaire to fill out, along with a stamped and addressed envelope for mailing the questionnaire to the company physician. Employees will be permitted to fill out the questionnaire on company time.
 - 4.5.3.3 Follow-up medical exams will be granted to employees as required by the standard, and/or as deemed necessary by the company approved physician.
 - 4.5.3.4 All employees will be granted the opportunity to speak with the physician about their medical evaluation, if they so request.
 - 4.5.3.5 The Location HSE Manager has provided the company approved physician with a copy of this program, a copy of the Respiratory Protection standard, the list of hazardous substances by work area, and for each employee requiring evaluation:
 - His or her work area or job title
 - Proposed respirator type and weight
 - Length of time required to wear respirator
 - Expected physical work load (light, moderate, or heavy)
 - Potential temperature and humidity extremes
 - Any additional protective clothing required
 - 4.5.3.6 Any employee required for medical reasons to wear a positive pressure air purifying respirator will be provided with a powered air purifying respirator.
 - 4.5.3.7 After an employee has received clearance and begun to wear his or her respirator, additional medical evaluations will be provided under the following circumstances:
 - Employee reports signs and/or symptoms related to their ability to use a respirator, such as shortness of breath, dizziness, chest pains, or wheezing.



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- The company approved physician or supervisor informs the Location HSE Manager that the employee needs to be reevaluated;
- Information from this program, including observations made during fit testing and program evaluation, indicates a need for reevaluation;
- A change occurs in workplace conditions that may result in an increased physiological burden on the employee.

4.5.4 The Location HSE Manager will maintain a list of employees currently included in the respiratory protection program and having successfully completed the medical evaluation requirements of this procedure.

4.5.5 All examinations and questionnaires are to remain confidential between the employee and the physician.

4.5.6 Medical Forms

4.5.6.1 When conducting the initial medical evaluation, the Medical Questionnaire for Respirator Use (AMS-710-02-FM-03501) must be used.

4.5.6.2 In addition to the standardized questionnaire, the physician must also be furnished with a copy of the latest OSHA Standard governing the type of exposure to which the employee will be subjected. A description of the employee's duties as they relate to the exposure, the anticipated exposure level, a description of the respiratory protective equipment to be used, and any available information from previous medical evaluations of the employee must also be furnished to the physician on the Request for Medical Evaluation for Respirator Use (AMS-710-02-FM-03502).

4.5.6.3 At the conclusion of the evaluation, the physician will submit a written opinion to the Company on the bottom of AMS-710-02-FM-03502. This will contain the results of the evaluation and any recommendations from the physician regarding the employee's limitations.

4.5.6.4 The Company must furnish a copy of the physician's opinion to the employee, within thirty (30) days of its receipt by the Company.

4.6 Fit-Testing Requirements

4.6.1 Employees who are required to wear half-facepiece APRs will be fit tested:

4.6.1.1 Prior to being allowed to wear any respirator with a tight fitting facepiece.

4.6.1.2 Annually.

4.6.1.3 When there are changes in the employee's physical condition that could affect respiratory fit (e.g., obvious change in body weight, facial scarring, etc.).

4.6.2 Employees will be fit tested with the make, model, and size of respirator that they will actually wear. Employees will be provided with several models and sizes of respirators so that they may find an optimal fit. Fit testing of PAPRs is to be conducted in the negative pressure mode.

4.6.3 Respirators will be fitted properly and be tested for their face piece-to-face seal.

4.6.4 There are two acceptable methods for conducting these tests:

- Qualitative
- Quantitative

4.6.5 The fit test is valid only for respirators of the same model and size tested.

4.6.6 Qualitative fit testing is based on the wearer's subjective response to a challenge atmosphere, of which three popular tests are: the irritant smoke test, the saccharin solution test, and the odorous vapor test.



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4.6.7 Irritant Smoke Test:

4.6.7.1 Directing an irritant smoke from a smoke tube towards the respirator being worn performs the Irritant Smoke Test. If the wearer does not detect the irritant smoke, a satisfactory fit is assumed to be achieved.

4.6.7.2 Since this type of test provokes an involuntary response from the employee, it is the preferred testing method when available.

4.6.8 Saccharin Solution Test:

4.6.8.1 This test relies on the wearer's ability to taste a saccharin solution sprayed around the outside of the respirator. The test is performed by placing an enclosure over the respirator wearer's head and shoulders and administering the solution from a nebulizer. If the wearer does not react to the chemical, then a satisfactory fit is assumed to be achieved.

NOTE: This test is dependent on the wearer's honest indication of taste. There is not an involuntary response.

4.6.8.2 The saccharin solution aerosol protocol is the only currently available, validated test protocol for use with disposable particulate respirators not equipped with high-efficiency filters.

4.6.9 Odorous Vapor Test:

The odorous vapor test relies on the respirator wearer's ability to detect an odorous material, usually isoamyl acetate (banana oil) inside the respirator. The test is performed by placing an isoamyl acetate saturated material near the respirator. If the wearer is unable to smell the chemical, then a satisfactory fit is assumed to be achieved.

4.6.10 Fit Test Card

4.6.10.1 The respirator wearer shall be issued an employee fit test card (AMS-710-02-FM-03504) with the following information:

- Name
- Date of fit test
- Manufacturer, model, and size of each successfully tested respirator
- Name and signature of the person that conducted the test
- Fit test challenge agent used
- Fit factor if a quantitative fit test was performed

4.6.11 Semi-annual Testing

The qualitative fit test should be repeated at least once every 12 months for routine use.

4.6.12 Fit Checks

There are two tests that are used in the field to check the seal of the respirator. These are known as the positive and negative fit checks. Each of these two tests must be performed every time an employee puts on a respirator and prior to entering a contaminated area.

4.7 Purchase of Approved Equipment

These requirements apply to all NIOSH/MSHA approved respirators used on APTIM locations. Non-approved "Dust Masks" with one strap shall not be used on APTIM projects.

4.8 Cleaning, Care, Maintenance, and Storage

4.8.1 Cleaning

4.8.1.1 Respirators shall be cleaned, disinfected, or sanitized as frequently as necessary recommended weekly to ensure that proper protection is provided to the user. Each worker shall be briefed on the cleaning procedure and be



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assured that they will always receive a clean and disinfected/sanitized respirator. Such assurances are very important when respirators are not individually assigned to workers. Respirators maintained for emergency or general use shall be cleaned and disinfected/sanitized after each use.

- 4.8.1.2 The following procedure is recommended for cleaning and disinfecting/sanitizing respirators:
 - Remove any filters, cartridges, canisters, speaking diaphragms or valve assemblies.
 - Wash facepiece and breathing tube in cleaner-disinfectant or detergent solution (43°C or 110°F maximum temperature). Use a soft hand brush to help in removal of dirt and grime.
 - Rinse completely in clean water (43°C or 110°F maximum temperature).
 - Air dry in clean area or wipe dry with clean rags.
 - Clean other respirator parts as recommended by the manufacturer.
 - Inspect valves, headstraps, and other parts. Replace with new parts if defective.
 - Insert new filters, cartridges, or canisters, and make sure seal is tight.
 - After completely dry, place in a plastic zip-lock baggie or other suitable container for storage.
- 4.8.1.3 Cleaner-disinfectant solutions are available that effectively clean the respirator and contain a bactericidal agent.
- 4.8.1.4 Alternately, respirators may be washed in a liquid detergent solution, and then wiped with a clean piece of paper toweling, which has been dipped into a disinfecting/ sanitizing solution or a solution of rubbing alcohol. The respirator must then be rinsed in fresh water and air dried.
- 4.8.1.5 Respirators must be cleaned and disinfected after each day's use.
- 4.8.1.6 Respirator-freshening wipes are not an adequate substitute for this cleaning and disinfecting process.
- 4.8.1.7 The location shall assign specific individuals to be responsible for the cleaning and disinfecting of respirators.
- 4.8.1.8 A log shall be maintained which will include a record of date of cleaning and the cleaning attendant.
- 4.8.2 Storing the Respirator
 - 4.8.2.1 When respirators are not being used, they shall be individually sealed in plastic bags and stored at locations established by location management in order to protect them against dust, sunlight, extreme temperatures, excessive moisture, or damaging chemicals. Respirators should not be stored (thrown) in toolboxes or gang boxes. They shall be stored in such a way that the face piece and exhalation valve are not distorted.
 - 4.8.2.2 Atmosphere supplying respirators will be stored in the storage cabinet outside of the Location HSE Manager's office.
- 4.8.3 Inspecting the Respirator
 - 4.8.3.1 All respirators shall be inspected by the individual before and after each use, and at least monthly by the user's supervisor to ensure that they are in satisfactory working condition. These maintenance inspections will be documented by the supervisor using AMS-710-02-FM-03509.



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4.8.4 Maintenance

4.8.4.1 Personnel involved in respirator maintenance shall be thoroughly trained. Substitution of parts from different brands or types of respirators invalidates approval of the device. Repairs and adjustments should never be made beyond the manufacturer's recommendations.

4.8.4.2 Respirators are to be properly maintained at all times in order to ensure that they function properly and adequately protect the employee. Maintenance involves a thorough visual inspection for cleanliness and defects. Worn or deteriorated parts will be replaced prior to use.

4.8.4.3 No components will be replaced or repairs made beyond those recommended by the manufacturer. Repairs to regulators or alarms of atmosphere-supplying respirators will be conducted by the manufacturer.

4.8.4.4 The following checklist will be used when inspecting respirators

- Facepiece:
 - cracks, tears, or holes
 - facemask distortion
 - cracked or loose lenses/faceshield
- Headstraps:
 - breaks or tears
 - broken buckles
- Valves:
 - residue or dirt
 - cracks or tears in valve material
- Filters/Cartridges:
 - approval designation
 - gaskets
 - cracks or dents in housing
 - proper cartridge for hazard
- Air Supply Systems:
 - breathing air quality/grade
 - condition of supply hoses
 - hose connections
 - settings on regulators and valves

4.8.4.5 Employees are permitted to leave their work area to perform limited maintenance on their respirator in a designated area that is free of respiratory hazards. Situations when this is permitted include to wash their face and respirator facepiece to prevent any eye or skin irritation, to replace the filter, cartridge or canister, and if they detect vapor or gas breakthrough or leakage in the facepiece or if they detect any other damage to the respirator or its components.

4.8.5 Defective Respirators

4.8.5.1 Respirators that are defective or have defective parts shall be taken out of service immediately.

4.8.5.2 If, during an inspection, an employee discovers a defect in a respirator, he/she is to bring the defect to the attention of his or her supervisor. Supervisors will give all defective respirators to the Location HSE Manager. The Location HSE Manager will decide whether to:

- Temporarily take the respirator out of service until it can be repaired.
- Perform a simple fix on the spot such as replacing a headstrap.
- Dispose of the respirator due to an irreparable problem or defect.



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4.8.5.3 When a respirator is taken out of service for an extended period of time, the respirator will be tagged out of service, and the employee will be given a replacement of similar make, model, and size. All tagged out respirators will be kept in the storage cabinet inside the Location HSE Manager's office.

4.9 Training

4.9.1 All personnel shall be trained in the proper use of respirators prior to wearing one in the field.

4.9.2 The Location HSE Manager will provide training to respirator users and their supervisors on the contents of the Respiratory Protection Program and their responsibilities. Workers will be trained prior to using a respirator in the workplace. Supervisors will also be trained prior to using a respirator in the workplace or prior to supervising employees that must wear respirators.

4.9.3 The training course will cover the following topics:

- The location specific Respiratory Protection Program
- The OSHA Respiratory Protection standard
- Respiratory hazards encountered at the location and their health effects
- Proper selection and use of respirators
- Limitations of respirators
- Respirator donning and user seal (fit) checks
- Fit testing
- Emergency use procedures
- Maintenance and storage
- Medical signs and symptoms limiting the effective use of respirators

4.9.4 Employees will be retrained annually or as needed (e.g., if they change departments and need to use a different respirator). Employees must demonstrate their understanding of the topics covered in the training through hands-on exercises and a written test. Respirator training will be documented by the Location HSE Manager and the documentation will include the type, model, and size of respirator for which each employee has been trained and fit tested.

4.10 Program Evaluation

The Location Manager shall ensure that the Program is periodically evaluated to determine the effectiveness of the Program during all phases of operation in which respirators are being used. Frequent walk-through inspections during these activities shall be conducted to monitor and document supervisor and worker compliance with the requirements of the program. In addition to general assessment of the overall Respiratory Protection Program, specific evaluations of the respirator cleaning, inspection, maintenance, repair, storage, and use practices shall be conducted and documented weekly to ensure that the desired results of these operations are consistently achieved.

4.11 6.0 Documentation and Recordkeeping

4.11.1 A written copy of this program will be maintained in the Location HSE Manager's office and is available to all employees who wish to review it.

4.11.2 Also maintained in the Location HSE Manager's office are copies of training and fit test records.

4.11.3 These records will be updated as new employees are trained, as existing employees receive refresher training, and as new fit tests are conducted.

4.11.4 The Location HSE Manager will also maintain copies of the medical records for all employees covered under the respirator program. The completed medical questionnaire and the physician's documented findings are confidential and will remain at the company



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approved medical provider. The company will only retain the physician's written recommendation regarding each employee's ability to wear a respirator.

5.0 REFERENCES

Title 30, Part II of the Code of Federal Regulations - NIOSH/MSHA Approvals for Respirators

Title 29 CFR (Code of Federal Regulation) 1926.103 Respiratory Protection

Title 29 CFR (Code of Federal Regulation) 1910.134 Respiratory Protection

Title 29 CFR (Code of Federal Regulation) 1910.1020 Hazardous waste operations and emergency response.

Title 30, Part II of the Code of Federal Regulations - NIOSH/MSHA Approvals for Respirators

American National Standards Institute - Practices for Respiratory protection Z88.2-1992

American National Standards Institute - Practices for Respiratory protection Z88.2-1992

6.0 TERMINOLOGY

<u>Term</u>	<u>Definition</u>
Approved	Tested and listed as satisfactory jointly by the Mine Safety and Health Administration (MSHA) of the U. S. Department of Labor and the National Institute for Occupational Safety and Health (NIOSH) of the U. S. Department of Health and Human Services.

7.0 EXHIBITS

- Exhibit 7.1 AMS-710-02-FM-03501 – Medical Questionnaire for Respirator Use
- Exhibit 7.2 AMS-710-02-FM-03502 – Request for Medical Evaluation for Respirator Use
- Exhibit 7.3 AMS-710-02-FM-03503 – Respirator Training and Fit Test Record
- Exhibit 7.4 AMS-710-02-FM-03504 – Employee Fit Test Card
- Exhibit 7.5 AMS-710-02-FM-03505 – Selection Table for Respiratory Protection
- Exhibit 7.6 AMS-710-02-FM-03506 – Respiratory Protection Training Program Certificate
- Exhibit 7.7 AMS-710-02-FM-03507 – Location Specific Respiratory Hazard Evaluation Form
- Exhibit 7.8 AMS-710-02-FM-03508 – Location Specific Voluntary and Mandatory Respirator Use
- Exhibit 7.9 AMS-710-02-FM-03509 – Monthly Maintenance Checklist for Respirators
- Exhibit 7.10 AMS-720-01-FM-00020 – Business Glossary



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Exhibit 7.11 AMS-720-01-FM-00021 – Technical Glossary

8.0 ATTACHMENTS

None



PROCEDURE

Procedure Title:	Permit to Work	AMS Number:	AMS-710-02-PR-06400
Procedure Owner:	HSE	Issuing Authority:	APTIM Quality Management

PERMIT TO WORK

INT	Issued for Interim Use	M. Hadacek & S. Lachney	7/30/2017
Rev	Changes	Approved	Date



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1.0 PURPOSE

The purpose of this Procedure is to establish the minimum requirements for a permit to work system on APTIM sites.

2.0 SCOPE

This procedure applies to all APTIM employees, contractors, subcontractors, and visitors associated with a APTIM site.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors
- APTIM Visitors

4.0 PROCEDURE

Each site shall make every attempt to prevent the possibility of incidents and accidents to employees when performing work activities through implementation, as determined by the Site HSE Manager and the Site Manager, of this non-mandatory permit to work system.

4.1 General

4.1.1 The intent of this procedure is to describe the APTIM Permit to Work System (PTW), which is used to provide the controls necessary during construction and commissioning activities in ensuring the safe performance of potentially hazardous tasks which cannot be adequately controlled under standard work practices, procedures, or method statements.

4.1.2 This procedure specifically applies to all site activities under the control of APTIM and as determined by the Site HSE Manager and the Site Manager.

4.1.3 This procedure may be superseded by Client mandated PTW.

4.1.4 This PTW is not required to be implemented during routine/normal construction activities. Activities where PTW shall be implemented may include:

4.1.4.1 Where a task is deemed hazardous and/or specific control measures are required above and beyond standard work practices e.g.,

- Excavations.
- Hotwork.
- Confined space entry (including activities that may generate hazardous atmospheres)
- Energised systems.
- Radiography (surveys using radioactive source).
- Heavy and/or Critical Lifts

4.1.4.2 In special cases when the APTIM Site HSE Manager and/or Site Manager deems it necessary to keep adequate control of hazards on site or area construction

4.1.5 This procedure shall be applied to all APTIM and subcontractor construction activities including construction or maintenance activities.



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4.1.6 Any work or activity not falling under the category of a permitted activity or type of activity as listed in 4.1.3 shall be controlled by the “Work Area Hazard Assessment Process” (AMS-710-05-PR-01700).

4.2 Key Personnel and Associated Activities

4.2.1 The Issuer (The Party who Approves the Permit)

- 4.2.1.1 The Issuer has the sole authority to issue and approve the permit.
- 4.2.1.2 The Issuer shall be fully aware of Site conditions, the type of work to be carried out, and all the requirements stated in the permit.
- 4.2.1.3 The Issuer shall consult with the APTIM HSE Department to ensure all required safety precautionary measures are stated in the permit.
- 4.2.1.4 Prior to approving a permit, the Issuer shall conduct an onsite inspection jointly together with the Executor to ensure that Site conditions are safe to work, that there are no interferences either to or from other work groups, and ensure that all requirements stated in the permit are implemented.
- 4.2.1.5 The Issuer shall withhold approval of the permit if the requirements are not met, or Site conditions are not safe for the work to be carried out.
- 4.2.1.6 The Issuer shall, if noticing the presence of any other potential hazards that may jeopardize the safety of the workers, tools, or equipment, stop the work and then advise the Executor of appropriate countermeasures to be taken before approving the permit.
- 4.2.1.7 The Issuer shall ensure that all required safety-monitoring measurements are properly completed prior to the approval of the permit and so stated in the permit, e.g., gas tests, isolation of potential energy releases.
- 4.2.1.8 Once informed that the work is complete, the Issuer shall visit the Site jointly with the Executor to ensure that the work has been completed and the site is duly reinstated and proper job site clean up is complete.

4.2.2 The Executor (Receiver of the Permit)

- 4.2.2.1 The Executor must be able to speak, read, and write at a level sufficient to understand the requirements of the permit.
- 4.2.2.2 The Executor shall accept all requirements stated in the permit and comply with them at all times.
- 4.2.2.3 The Executor shall ensure that his work crew fully understand requirements stated in the permit and that the pre-task safety toolbox meeting attendance is completed for every permit.
- 4.2.2.4 The Executor shall ensure the requirements specified in the permit are implemented prior to the commencement of the work. He shall remain at the workplace to supervise the work at all times while the work is in progress, as defined in the PTW. In the event that the supervisor must leave the workplace for any reason, he must either arrange for an alternate, competent person as a stand in or the work must cease until such a person is provided. This change over must be recorded in writing and accepted by the Issuer.
- 4.2.2.5 The Executor shall under no circumstances, either by his own discretion or that of his work crew, change the original scope of the work, which is described in the permit.
- 4.2.2.6 The Executor shall request a new permit in the event a change in the scope of the work becomes necessary.



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- 4.2.2.7 Whenever Site conditions are drastically changed such as to create a hazard, the Executor shall immediately stop the work and inform the Issuer of the change and await further instruction from him/her.
- 4.2.2.8 Upon the occurrence of an emergency, the Executor shall immediately stop the work and follow emergency procedure. Upon resolution of the emergency, the Executor shall have the PTW revalidated before resuming work.
- 4.2.2.9 The Executor shall report the completion of the work or the expiration of the validity of the permit to the Issuer and on completion of the work ensure that the site is duly reinstated without any remaining risks.
- 4.2.3 Authorized Gas Testers (AGT)
 - 4.2.3.1 All Authorized Gas Testers must undergo the AGT course which is presented by APTIM and annual training thereafter.
 - 4.2.3.2 APTIM will maintain a register of personnel who have undertaken this course. This course will cover issues such as the physical and chemical properties of gases, the reasons for testing, and the method of testing. In addition to the classroom based course a competent person will assess the AGT in the field.
 - 4.2.3.3 All gas detectors shall be bump tested in accordance with the manufacturer's guidelines. The bump test and reading will be documented.
 - 4.2.3.4 All gas detectors must be calibrated by a third party at a frequency stated by the manufacturer as a minimum or when it fails a bump test. APTIM will maintain a register of records of calibration for all of their detectors.
 - 4.2.3.5 The AGT must ensure that the gas meter in use is fully functional and has an in-date calibration certificate.
 - 4.2.3.6 The Authorized Gas Testers approved by APTIM shall conduct any required gas testing prior to the commencement of the work and validation of the PTW.
 - 4.2.3.7 In case the concentration of any gas is detected outside of the permissible level of concentration (H₂S, 0ppm, LEL >2%, O₂ 19.5-23%) the AGT shall withhold the permit and immediately inform the Issuer and conduct retesting. Should the re-test also show levels in excess of these concentrations then additional means of ventilation shall be employed, such as fans, air movers, etc., prior to allowing work to commence.
 - 4.2.3.8 Gas tests shall be carried out before any entry into a Confined Space and before validation of any Hot Work Permit. The AGT will use appropriate PPE, (SCBA, SABA), while testing an unknown atmosphere in a confined space where the AGT has to enter the confined space to take the readings.
 - 4.2.3.9 AGT's may be required, depending upon the work, to carry out further gas tests throughout the working day. Should any gas concentration exceed those stated above, then the work shall be immediately stopped and APTIM informed.
- 4.2.4 The APTIM Permit Coordinator
 - 4.2.4.1 The designated Permit Coordinator reports to the APTIM Construction Manager and is responsible for daily coordination of the work permits, including maintenance of a log showing the status of all PTW's. In addition, he/she shall maintain a copy of all PTW's Job Safety Analysis and Method Statements in sequential order.



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- 4.2.4.2 He/she is responsible for full clerical control of the permit to work system including retention of the closed out Work Permits until the end of the Site.
- 4.2.4.3 He/she is responsible for displaying all planned, open, and suspended work permits on visual display in the permit to work office.

4.3 Permit to Work (PTW) System Components

- 4.3.1 Under this procedure, individual Permit to Work Forms are issued for works as described in section 4.1.4.
- 4.3.2 A set of PTW Forms, applicable Certificates, Documents, and authorized Permit signatories is called a PTW System. The components of the PTW are described below.
- 4.3.3 Permit to Work
 - 4.3.3.1 A Permit to Work (PTW) is an official document with which APTIM authorizes activities to be carried out under specific safe working conditions. It is a signed declaration by the Issuing Party that the worksite conditions are safe to perform the specified task within a specified period. The work shall be done in accordance with the requirements of the PTW.
 - 4.3.3.2 Each PTW shall be uniquely and individually numbered for identification purposes with sufficient copies made for all parties involved.
 - 4.3.3.3 Every application for a PTW must have attached to it as a minimum the following supporting documentation:
 - Job Safety Analysis (JSA)
 - Material Safety Data Sheet (MSDS) where applicable
 - Other items that may be required include:
 1. Marked up Drawings
 2. Isolation details, LO/TO
 3. Crane Inspection Certificate, including load test
 4. Rigging Certificates
 5. Competent Person Certificates.
 6. Rigging/Lifting Plan

4.4 Types of Work Requiring a Permit to Work

Any work falling into the following categories may require a specific PTW issued by APTIM. The APTIM Site HSE Manager and Site Manager may designate any other works as work requiring a permit in addition to the above when deemed necessary.

4.4.1 Excavation/Ground Disturbance

The definition of an excavation shall be consistent with AMS-710-02-PR-01600. For the purposes of the PTW the definition of excavation/ground disturbance may also include, but not be limited to:

- Any excavation involving the removal of soil deeper than thirty (30) cm or driving of a peg below this depth in areas known to have underground piping/utilities
- Cutting into of ground or floors below surrounding level where there is the risk of damage to existing services or harm to personnel
- Cutting into or drilling into walls or ceilings where existing services are known to run

4.4.2 Hot Work

All work involving ignition sources performed within fifteen meters (15m) of equipment containing flammable/combustible liquids or work performed within ten meters (10m) of large quantities of ordinary combustible materials (e.g., cardboard, wood).



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4.4.3 Electrical Work

Any work requiring de-energizing or isolation of electrical System and/or its associated component parts including any work on any item or piece of equipment capable of being electrically charged or activated, energized or pressurized.

4.4.4 Confined Space Entry

Any entry into an area which is not designed for human occupancy has restricted access/egress or where the presence of toxic or flammable gases or deficiency/enrichment in oxygen possibly exists, as defined in AMS-710-02-PR-01700.

4.4.5 Heavy and/or Critical Lifts

The following lifts will require a Permit to Work:

- Lifts over live Equipment or Plant
- Lifts equal to or exceeding eighty percent (80%) of crane's rated capacity.
- Lifts of > 25 tons
- Lifts requiring more than one crane.

4.4.6 Radiation Work

Any work requiring the use of radioactive sources or x-ray machines for NDE works.

4.5 Validity of the Permit

Validity of the permit shall be restricted to the number of hours or days as specified in the permit, to a maximum of seven (7) days. No works shall be carried out after the validity has expired unless the permit has been duly extended or a new permit has been obtained from the Issuer.

4.6 Revalidation of the Permit

If the validity of the permit extends across more than one working day/shift then the permit shall be re-validated by the Executor at the start of the oncoming shift.

4.7 Closure of the Permit

4.7.1 On completion of the work, the Executor shall signify that the work is complete and that they wish to close the permit by signing in the correct space on the permit and returning the permit to the Issuer.

4.7.2 The permit is only considered closed when signed by the Issuer and after the Issuer has visited the Site and confirmed that the worksite has been left in a safe condition.

4.8 Training and Authorization

4.8.1 All Permits to Work Executors are required to attend the APTIM Permit to Work Training course and must pass an accompanying written examination.

4.8.2 All Executors must be sufficiently conversant, written and verbal, to enable them to understand the requirements that the PTW places on them and their workers.

4.8.3 In the event of any incident involving non-compliance with a PTW then the relevant Executor must undergo refresher training before he is allowed to sign further permits.

4.8.4 No Executor will be permitted to undergo more than two (2) refresher courses before he/she is removed from the authorized list permanently.

4.9 Operational Procedures for the APTIM PTW System

4.9.1 Under this procedure, there are three-sheet PTW Forms.

4.9.2 Original Form of PTW shall stay at the worksite with the Executor, the subcontractor task supervisor/engineer responsible for the work as stated in the PTW. The PTW must be displayed on a stand located at the workplace; the stand should be clearly



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marked and placed in a prominent location within the work area. The first copy remains with the Issuer of the permit. The second copy is held by the PTW Coordinator.

- 4.9.3 The description of the work shall be a precise statement of the planned activity and the location of the work by identification of the area or equipment to be worked upon. Broad scopes of work of a general nature are not acceptable.
- 4.9.4 Job Safety Analyses will be produced and shall be attached to form part of the permit. Such additional documents shall be attached to the original of the Permit.
- 4.9.5 The Executor shall submit the permits to the Issuer by 08:00 hours the day before the actual commencement of the work.
- 4.9.6 The Issuer shall distribute the permits to the APTIM PTW Coordinator for HSE review and verification by 11:00 hours the day before work commences.
- 4.9.7 The APTIM Permit Coordinator shall submit the permits to the Site Construction Manager or his designee who shall verify that all HSE requirements specified in the permits are appropriate and return the verified permits to the Permit Coordinator.
- 4.9.8 The APTIM Permit Coordinator shall produce all verified permits to the Issuer the evening before work is due to commence.
- 4.9.9 The Issuer shall review the permit to ensure that all required safety precautionary measures are stated and that concurrence has been received from all appropriate parties for authorization of the permits.
- 4.9.10 On the day of the work, the Issuer or his nominees together with the Executor shall go to the Site to ensure that all requirements in the permit are met and hand over the permit to the Executor. Issuance of the permit to the Executor in the office shall not take place.
- 4.9.11 Upon receipt of the permit from the Issuer, the Executor can commence the work after the HSE requirements of the permit have been discussed with the personnel performing the work. (JSA and 5 X 5 Pre-Task Safety Talk)
- 4.9.12 When the work is completed, or when no further work is to take place under a permit, the Executor shall sign in the permit and return the permit to the Issuer or his nominees to indicate he has completed the work satisfactorily.
- 4.9.13 Upon receipt of the permit, the Issuer and the Executor shall inspect the work Site to ensure that the work Site is duly reinstated with all waste material removed and no remaining risks. When satisfied that the site has been left in a safe condition the Executor shall sign the permit as closed.
- 4.9.14 The Issuer shall return the completed permit to the APTIM Permit Coordinator for file.
- 4.9.15 The APTIM permit coordinator shall attach the original of the closed permit to his file copy to verify closure. Copies of closed permits are to be kept for the life of the site; remaining copies may be disposed of.
- 4.10 Emergency and Changing Conditions
 - 4.10.1 In the event of an emergency, the Executor shall immediately stop all works and shut down all equipment before moving to the appropriate Muster Point.
 - 4.10.2 All permits shall be nullified and no work shall be resumed unless the permit has been revalidated or a new permit has been issued out by the Issuer.
 - 4.10.3 Prior to the revalidation or issuance of a new permit, the Issuer shall visit the work Site to ensure that there is no imminent hazard/risk present and that the Work Site is safe to work.



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- 4.10.4 All workers have the right to stop work should they find an unsafe condition after inspection of the Work Site and work methods that the conditions listed in the permit are not being followed.
- 4.10.5 Should the work conditions change significantly, e.g., underground services being found where not expected, a positive gas reading in excess of the levels mentioned above, or other such circumstances, the work must be immediately stopped and the Issuer informed. In such cases, the permit will be reviewed and if necessary cancelled and a new PTW issued taking account of new circumstances.

5.0 REFERENCES

AMS-710-05-PR-01700	Work Area Hazard Assessment Process
AMS-710-02-PR-01600	Excavation and Trenching
AMS-710-02-PR-01700	Confined Space Entry

6.0 TERMINOLOGY

<u>Term</u>	<u>Definition</u>
Executor	<ul style="list-style-type: none"> • This is the person responsible for initiating the PTW and supervising the work specified in the PTW. • The Executor may be APTIM or subcontractor.
Issuer	<ul style="list-style-type: none"> • For activities taking place within the site, the Issuer will always be APTIM or supervisors nominated by the Site Construction Manager and Site HSE Manager to approve the permits. • APTIM will develop and maintain a list of positions authorized to issue permits, including nominated personnel allowed to sign.
Site	Any location, facility, or project where APTIM is performing work. Sites may include, but are not limited to, laboratories, offices, shops, owned facilities, leased facilities and/or project sites.
The Authorized Gas Testers (AGT)	<ul style="list-style-type: none"> • The only personnel authorized to perform initial gas tests required for permit validation. Authorized Gas testers must pass the AGT training course provided by APTIM. • Initial gas tests for the validation of PTW' s may only be carried out by AGT' s from APTIM, follow up testing during the working day may then be performed by AGT' s from the subcontractor.

7.0 EXHIBITS

Exhibit 7.1	PTW Flow Chart
Exhibit 7.2	AMS-720-01-FM-00020 – Business Glossary
Exhibit 7.3	AMS-720-01-FM-00021 – Technical glossary

8.0 ATTACHMENTS

None



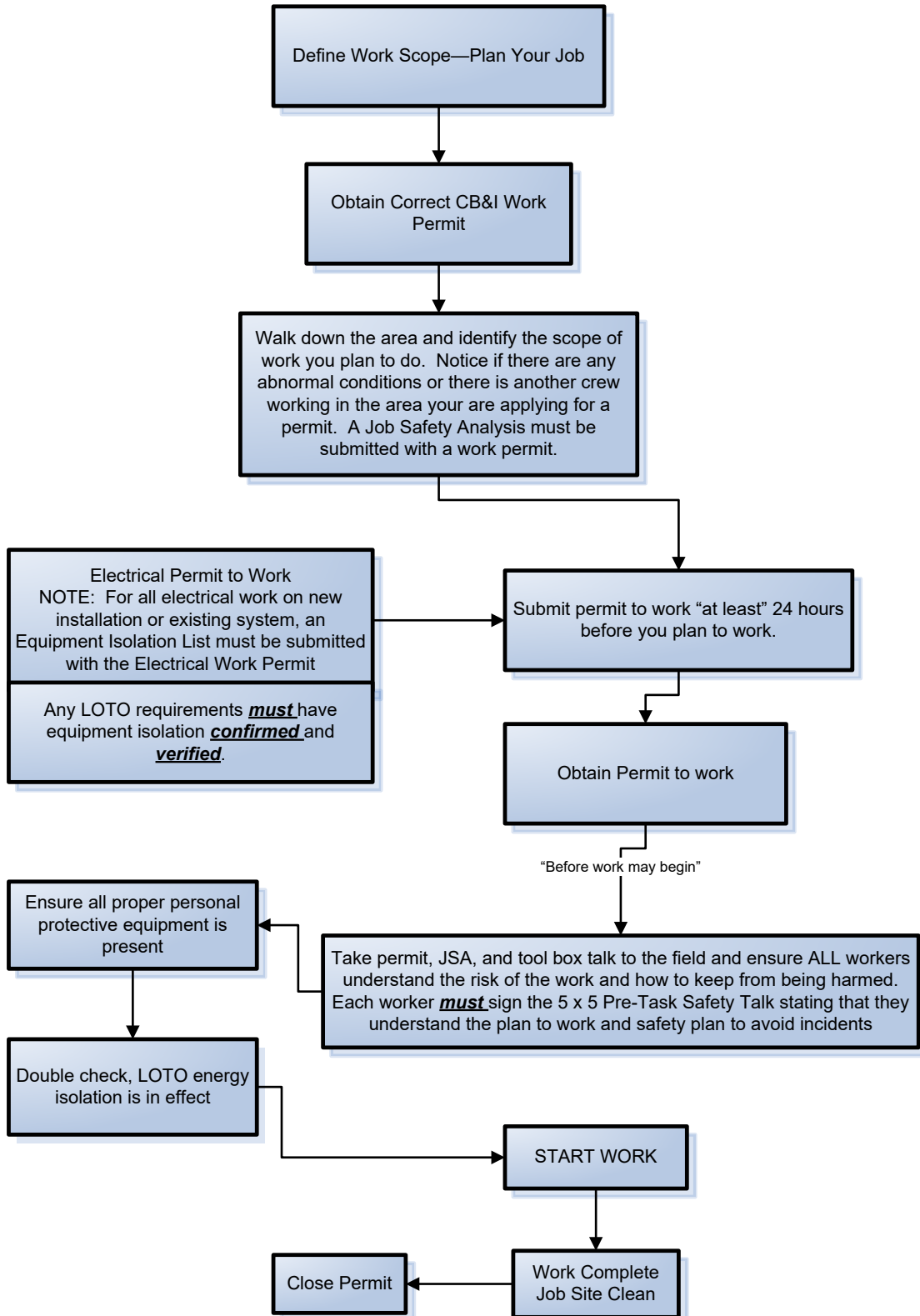
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EXHIBIT 7.1

PTW FLOW CHART

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PROCEDURE

Procedure Title:	Medical Surveillance Program	AMS Number:	AMS-710-01-PR-05000
Procedure Owner:	HSE	Issuing Authority:	APTIM Quality Management

MEDICAL SURVEILLANCE PROGRAM

INT	Issued for Interim Use	M. Hadacek & S. Lachney	7/30/2017
Rev	Changes	Approved	Date



Medical Surveillance Program

AMS Number:	Revision:	Approval Date:
AMS-710-01-PR-05000	INT	7/30/2017

1.0 PURPOSE

The purpose of this Procedure is to establish the minimum requirements for the implementation and management of the Medical Surveillance Program.

2.0 SCOPE

This procedure applies to all APTIM employees and temporary employees associated with a APTIM site.

Subcontractors and lower tier subcontractors (a lower tier subcontractor is any subcontractor at any level working on any company project whether directly with APTIM or through a third party) are required to provide documentation that they maintain, at a minimum, a medical surveillance program equal to this procedure.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure.

- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors
- APTIM Vendors
- APTIM Site Visitors

4.0 PROCEDURE

4.1 Medical screening and medical surveillance are two fundamental necessities for ensuring the health and safety of employees when used in conjunction with AMS-710-01-PR-02300 Occupational Health Plan. Medical screening is, in essence, only one component of a comprehensive medical surveillance program. Occupational health regulations concerning "medical surveillance" requirements are generally a combination of medical screening and medical surveillance and are clinically focused with information obtained from the clinical processes used in the monitoring and analysis of results.

4.2 The company's Medical Surveillance Program consists of various examination protocols which vary based upon each employee's essential job functions, site specific requirements, and jurisdictional regulatory requirements.

4.3 General

4.3.1 APTIM reserves the right to modify this procedure at any time consistent with changes in medical procedures, technologies, laws, or APTIM's operational needs. This procedure shall not, in any event, alter the basic "at will" status of any employee, nor shall it create any expressed or implied contractual rights relative to employment with APTIM.

4.3.2 This procedure is subject to the regulations, laws, and customs of the jurisdictions in which the work will occur; therefore, each APTIM site will use this procedure as a template to create a site specific medical surveillance procedure.

4.3.3 This procedure is intended to set forth the minimum medical surveillance program standards for APTIM. In accordance with the applicable authority matrices, business groups or projects may implement more stringent requirements as needed to satisfy any specific industry concerns, additional contractual, legal, and/or regulatory obligations that may be applicable.

4.3.4 Medical surveillance exams and consultations will be performed by or under the direct supervision of a licensed physician and all medical test analyses should be performed



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by a laboratory that has demonstrated satisfactory performance in an established inter-laboratory testing program and meets the minimum requirements for certification in the jurisdiction in which it is located.

- 4.3.5 APTIM will provide medical surveillance exams at a reasonable time and location, at no cost to the employee and without loss of pay.
- 4.3.6 The licensed physician providing written opinion may review the result of any associated drug screen against the medical questionnaire when evaluating the final opinion. Failure to disclose any medical condition or the use of any prescribed medication capable of affecting the employee's mental and/or physical ability to perform the essential functions of the job on the medical questionnaire is a violation of this procedure and is grounds for disciplinary action up to and including termination.

4.4 Baseline Medical Protocols

- 4.4.1 Employees will be subject to pre-employment and pre-placement baseline examination based on the essential functions of the job, site-specific requirements, and the regulatory requirements of the jurisdiction. Baseline examinations are performed on a conditional post offer basis, and when potential hazardous exposures are identified by the project site's hazardous risk assessment.
 - 4.4.1.1 All baseline examinations are conducted strictly upon a post-offer of employment and/or pre-placement basis. The individual responsible for scheduling the examinations must verify that a formal offer of employment has been made and the offer accepted prior to arranging the exam.
 - 4.4.1.2 Following an employment offer and prior to becoming an active employee, the prospective employee will be tested for alcohol and illegal drugs. No prospective employee will begin work on any project or at any subcontractor location without submitting to and successfully passing an approved pre-employment drug test pursuant to the requirements set forth in the Substance Abuse Program procedure AMS-710-01-PR-03600.
 - 4.4.1.3 Offer letters must be provisioned that the receipt of a negative drug/alcohol screen result and physician written opinion (PWO) noting that an individual is medically fit to perform the specific job assignment is required prior to proceeding with employment.
- 4.4.2 All employees whose job functions involve potential exposure at or above action levels are subject to periodic/annual examinations as required by the occupational health laws of the jurisdiction.
- 4.4.3 Employees who participate in the asbestos medical surveillance program must follow the requirements set forth in AMS-710-01-PR-02500 Asbestos on the Job.

4.5 Periodic/Annual Medical Protocols

The frequency and content of examinations will vary based on the essential functions of the job, site-specific requirements, and the regulatory requirements of the jurisdiction. More frequent examinations may be necessary, depending on the extent of potential or actual exposure, the type of chemicals involved, the duration of the work assignment, and the individual worker's profile.

4.6 Exit Protocols

At the end of employment, all personnel in the medical surveillance program should complete an Exit Examination Acceptance/Declination form. Exit examinations are required for all employees leaving the company unless their most recent exam is less than six months old.

- 4.7 Medical Surveillance Protocols – Baseline, Periodic/Annual, and Exit, as applicable, includes but is not limited to:
 1. 1,2-dibromo-3-chloropropane



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2. 1,3-Butadiene
3. Acrylonitrile
4. Arsenic (Inorganic) (AMS-710-01-PR-02900)
5. Asbestos (Construction and Shipyards)
6. Asbestos (General Industry)
7. Benzene (AMS-710-01-PR-03000)
8. Bloodborne Pathogens (AMS-710-01-PR-00300)
9. Cadmium
10. Carcinogens (Suspect)
11. Chromium(VI), Hexavalent Chromium (AMS-710-01-PR-03800)
12. Coke Oven Emissions
13. Compressed Air Environments
14. Crane Operator Exam
15. Designated Qualified Operator Exam (DQO)
16. Diver Exam
17. Diver Medical Exam
18. DOT Exam (Department of Transportation)
19. Ethylene Oxide
20. Fit for Duty Exam – Craft, Professional/Salary, and Clean Construction (Union/Non-Union) (AMS-710-01-PR-01100)
21. Fit for Duty Exam – Field Labor (AMS-710-01-PR-01100)
22. Formaldehyde
23. Functional Assessment Exam
24. GE Hudson Exam
25. HAZWOPER Field Exposure
26. Knoll's Atomic Power Laboratory (KAPL)
27. Laboratory - Hazardous Chemicals
28. Lead (AMS-710-01-PR-02700)
29. Medical Surveillance Exams – Baseline, Periodic/Annual, and Exit (AMS-710-01-PR-03500)
30. Methylene Chloride
31. Methylenedianiline
32. Noise (AMS-710-01-PR-00900)
33. Pre-Placement General Labor Exam
34. Quantitative/ Qualitative Respirator Fit Test
35. Respirator Certification Exam (AMS-710-02-PR-03500)
36. U.S. Army Corp of Engineers (USACE)
37. Vaccinations (Business Travel and Potential Exposure)
38. Vinyl Chloride

4.8 Physician Written Opinions (PWO)

4.8.1 It is important to note that physician written opinions (PWO) are not considered confidential medical records. The physician written opinion (PWO) is designed and intended to communicate employee medical clearances, restrictions, and disqualifications to management and the employee. A physician written opinion (PWO) that notes restrictions will be signed by both the employee and the employee's manager.

4.8.2 The physician written opinion (PWO) must include:

- a. Name of the individual
- b. Date of the exam
- c. Employee number or personal identification numbers
- d. Name of the specific regulation upon which the medical opinion was based (if applicable)



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- e. If any detected medical conditions would place the employee at increased risk of material impairment of the employee's health while working in the specific job position
- f. Recommended limitations/restrictions upon the employee's assigned work
- g. If the employee is unable to perform his or her job duties with or without accommodations
- h. If the employee has been informed of the examination results
- i. Any medical recommendations for respirator use such as:
 - No limitations,
 - Medically not able to wear a respirator,
 - May wear a respirator for escape only,
 - Any specific limitations that have been placed on the use of the respirator, and
 - If the document has been provided to the employee.
- j. Date, printed name, and signature of the licensed physician providing the opinion

4.8.3 Whenever a restricted medical clearance is issued, the HSE manager, Human Resource manager, and hiring manager will be notified and will determine if the medical restriction will have an impact on the employee's ability to perform the essential duties of the intended job.

Specifically, all persons must be able to perform the essential functions of their job, with or without reasonable accommodations, and without posing a direct threat to the health and safety of themselves or others.

4.9 Re-Hiring Former Employees

4.9.1 When a former employee is being re-hired, if the most current company medical examination is less than six months old and the HSE manager can confirm that the individual was not subject to hazardous exposures during non-company employment, the HSE manager may choose to waive a new baseline examination. Periodic/Annual examinations will be based on the most recent examination date rather than a new date of hire.

4.9.2 Returning former employees shall be subject to post offer/pre-employment drug and alcohol testing at the time of re-hire unless the break in service has been less than 30 days, as permitted under the laws and customs of the jurisdiction in which the employee is employed.

5.0 REFERENCES

AMS-710-01-PR-02900	Arsenic Exposure Control Program
AMS-710-01-PR-02500	Asbestos on the Job
AMS-710-01-PR-00300	Bloodborne Pathogens
AMS-710-01-PR-03000	APTIM Benzene Safety Program
AMS-710-01-PR-02700	Construction Lead Hazard Abatement Program
AMS-710-01-PR-01100	Fitness for Duty Program
AMS-710-01-PR-03800	Hexavalent Chrome
AMS-710-01-PR-03500	Medical and Exposure Records
AMS-710-01-PR-00900	Noise Control and Hearing Conservation
AMS-710-01-PR-02300	Occupational Health Plan



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Respiratory Protection

AMS-710-01-PR-03600

Substance Abuse Program

6.0 TERMINOLOGY

Term

Fitness for Duty

Toxic Substance or Harmful
Physical Agent

Definition

The employees' physical, mental, and medical qualifications to perform their job duties

Any chemical substance, biological agent (bacteria, virus, fungus, etc.), or physical stress (noise, heat, cold, vibration, repetitive motion, ionizing and non-ionizing radiation, hypo-hyperbaric pressure, etc.) which: (1) be listed in the latest edition of the NIOSH Registry of Toxic Effects of Chemical Substances, (2) have yielded positive evidence of an acute or chronic health hazard in testing conducted by or known to the employer, or (3) be the subject of a material safety data sheet (MSDS) kept by or known to the employer indicating that the material may pose a hazard to human health.

7.0 EXHIBITS

Exhibit 7.1

AMS-720-01-FM-00020 – Business Glossary

Exhibit 7.2

AMS-720-01-FM-00021 – Technical Glossary

8.0 ATTACHMENTS

None



PROCEDURE

Procedure Title:	Sanitation and Potable Water	AMS Number:	AMS-710-01-PR-01000
Procedure Owner:	HSE	Issuing Authority:	APTIM Quality Management

SANITATION AND POTABLE WATER

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Sanitation and Potable Water

AMS Number:	Revision:	Approval Date:
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1.0 PURPOSE

The purpose of this Procedure is to establish the minimum requirements for Sanitation and Potable Water on APTIM sites.

2.0 SCOPE

This procedure applies to all APTIM employees, contractors, subcontractors and visitors associated with an APTIM site.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Contractors
- APTIM Subcontractors
- APTIM Visitors

4.0 PROCEDURE

APTIM sites shall ensure they follow the Sanitation and Potable Water requirements in this procedure.

4.1 Potable Water

- 4.1.1 An adequate supply of potable water shall be provided in all places of employment.
- 4.1.2 Portable containers used to dispense drinking water shall be capable of being tightly closed, sealed, and equipped with a tap. Water shall not be dipped from containers.
- 4.1.3 Any container used to distribute drinking water shall be clearly marked as to the nature of its contents and the current fill date, and shall not be used for any other purpose.
- 4.1.4 A common drinking cup shall not be used for potable water facilities.
- 4.1.5 Where single service cups (disposable) are supplied, both a sanitary container for the unused cups and a receptacle for disposing of the used cups shall be provided.
- 4.1.6 Drinking Water containers shall be cleaned and sanitized on a daily basis according to the following steps:
 - 4.1.6.1 The individual assigned to the task of cleaning the containers shall wash their hands with soap and water and put on disposable or rubber gloves.
 - 4.1.6.2 The outside of the container shall be rinsed off prior to opening the container.
 - 4.1.6.3 Containers are to be washed with a detergent daily. Hot water shall be used when available. Dishwashing liquid and a scrub brush or sponge shall be used to clean the containers.
 - 4.1.6.4 Containers are to be rinsed with clean water to remove all soap residues.
 - 4.1.6.5 Containers are to be sanitized using the following method:
 - Rinse containers in a solution of 2 tablespoons of chlorine bleach in one gallon of water.
 - Rinse containers in clean water.
 - When a location is available, the containers shall be allowed to air dry prior to refilling.



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- Containers should be cleaned on an elevated or grated, platform to keep them from being subjected to dirt and grime.

4.1.6.6 Potable water shall be sampled periodically and records maintained of the sample results or appropriate documentation verifying the water meets the quality standards prescribed in the U.S. Public Health Service Drinking Water Standards, published in 42 CFR Part 72, or water which is approved for drinking purposes by the State or local authority having jurisdiction.

4.2 Non-potable Water

- 4.2.1 Outlets for non-potable water, such as water for industrial or fire fighting purposes only, shall be identified by signs to indicate clearly that the water is unsafe and is not to be used for drinking, washing or cooking purposes.
- 4.2.2 There shall be no open or potential cross-connection between a potable water system and a non-potable water system.

4.3 Toilets at Construction Projects

- 4.3.1 Temporary toilets shall be maintained in accordance with Federal, State, or Local ordinances.
- 4.3.2 Toilets shall be constructed to shield the occupants from view and protect against weather and falling objects.
- 4.3.3 Toilets shall be ventilated and all windows and vents screened.
- 4.3.4 All toilet facilities shall be cleaned and emptied on a regular basis and an adequate supply of tissue shall be made available according to project needs.
- 4.3.5 All toilet facilities shall be located on the project so that clear access is provided for cleaning and servicing.
- 4.3.6 Toilets shall be placed where users do not exit into roadways.
- 4.3.7 The following table provides the minimum number of toilet facilities to be provided for employees:

Number of employees	Minimum number of facilities
20 or less	1
20 or more	1 toilet seat and 1 urinal per 40 workers
200 or more	1 toilet seat and 1 urinal per 50 workers

4.4 Washing Facilities

- 4.4.1 Lavatories shall be made available in all places of employment.
- 4.4.2 The washing facilities shall be maintained in a sanitary condition.
- 4.4.3 Each lavatory shall be provided with running, potable water.
- 4.4.4 Hand soap or similar cleansing agents shall be provided.
- 4.4.5 Individual hand towels or sections thereof, of cloth or paper, warm air blowers or clean individual sections of continuous cloth toweling, convenient to the lavatories shall be provided.
- 4.4.6 Whenever showers are required by a particular standard, the showers shall meet the following requirements:
 - 4.4.6.1 One shower shall be provided for each 10 employees of each sex, or numerical fraction thereof, who are required to shower during the same shift.



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- 4.4.6.2 Body soap or other appropriate cleansing agents shall be provided.
- 4.4.6.3 Showers shall be provided with hot and cold water feeding a common discharge line.
- 4.4.6.4 Employees who use showers shall be provided with individual clean towels.

4.5 Eating and drinking areas

- 4.5.1 No employees shall be allowed to consume food or beverages in a toilet room or in any area exposed to a toxic material.
- 4.5.2 Eating and drinking will be allowed only in designated areas.

4.6 Vermin Control

Every enclosed workplace shall be so constructed, equipped, and maintained so far as reasonable to prevent the entrance or harbouring of rodents, insects, and other vermin. A continuous, effective extermination program shall be instituted where their presence is detected.

4.7 Change rooms

Whenever employees are required by a particular standard to wear protective clothing because of the possibility of contamination with toxic materials, change rooms equipped with storage facilities for street clothes and separate storage facilities for the protective clothing shall be provided.

5.0 REFERENCES

Title 29 CFR (Code of Federal Regulation) 1926.27	Sanitation
Title 29 CFR (Code of Federal Regulation) 1926.51	Sanitation
American National Standards Institute (ANSI) Z4.1	Sanitation in Places of Employment-Minimum Requirements
ANSI Z4.3	Sanitation-Non-sewered Waste-Disposal Systems – Minimum Requirements
ANSI Z4.4	Sanitation in Fields and Temporary Labor Camps – Minimum Requirements
Title 42 Code of Federal Regulations (CFR) Part 72	Occupational Injury and Illness Recording and Reporting
ANSI Z4.4	Sanitation in Fields and Temporary Labor Camps – Minimum Requirements

6.0 TERMINOLOGY

<u>Term</u>	<u>Definition</u>
Potable Water	Water that meets the quality standards prescribed in the US Public Health Service Drinking Water Standards, published in 42 CFR Part 72, or water that is approved for drinking purposes by the State or local authority having jurisdiction.
Site	Any location, facility or project where APTIM is performing work. Sites may include, but are not limited to, laboratories, offices,



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shops, owned facilities, leased facilities and/or project sites.

7.0 EXHIBITS

- Exhibit 7.1 AMS-720-01-FM-00020 – Business Glossary
- Exhibit 7.2 AMS-720-01-FM-00021 – Technical Glossary

8.0 ATTACHMENTS

None

Subject: MEC ANOMALY AVOIDANCE

1.0 PURPOSE

This standard operating procedure (SOP) describes the procedures for Redstone Arsenal (RSA) contractor and subcontractor personnel providing munitions and explosives of concern (MEC) anomaly avoidance support during field operations where there is a potential for encountering MEC hazards.

2.0 SUMMARY OF METHOD

All personnel tasked with performing MEC-related activities must qualify in accordance with (IAW) Department of Defense Explosives Safety Board (DDESB) Technical Paper (TP) 18. Perform all work in a manner consistent with Occupational Safety and Health Administration-established standards and requirements. Conduct all activities in conformance with the Installation-Wide (IW) Quality Assurance Project Plan (QAPP) (current version) and the project-specific Accident Prevention Plan (APP) and Site Safety and Health Plan (SSHP).

This MEC SOP discusses surface and subsurface anomaly avoidance procedures and techniques to be used while conducting munitions response and hazardous, toxic, or radioactive waste (HTRW)-related activities during investigative, design, and remedial actions. Anomaly avoidance techniques must be employed on properties known or suspected to contain MEC or chemical agent to avoid surface and subsurface explosive and chemical hazards. Anomaly avoidance techniques are implemented for activities that include the following:

- Surveying and mapping,
- Environmental and natural resource assessments,
- Surface and subsurface sampling,
- Boring and drilling,
- Groundwater monitoring, and
- Sign and fence installation.

3.0 DEFINITIONS AND ABBREVIATIONS/ACRONYMS

3.1 Definitions

Anomaly Avoidance: Techniques employed on property known or suspected to contain MEC or chemical agent, regardless of configuration, to avoid contact with potential surface or subsurface hazards, to allow entry into the area for the performance of required operations.

Hazardous, Toxic, and Radioactive Waste (HTRW) Activities: Activities undertaken for the following:

- The U.S. Environmental Protection Agency's Superfund program,
- The Defense Environmental Restoration Program, including Formerly Used Defense Sites (FUDS),
- Installation Restoration Program sites at active U.S. Department of Defense (DoD) facilities,
- HTRW actions associated with civil works projects, and
- Any other mission or non-mission work performed for others at HTRW sites.

HTRW actions during the investigative/design phase of an HTRW project on a site with known MEC or unknown fillers require anomaly avoidance procedures. MEC removal actions may be required in advance of HTRW activities (construction) on a HTRW project site with known MEC hazards.

Munitions and Explosives of Concern (MEC): Specific categories of military munitions that may pose unique explosives safety risks, including the following:

- Unexploded ordnance (UXO), as defined in 10 United States Code (U.S.C.) § 101(e)(5)(A) through (C);
- Discarded military munitions (DMM), as defined in 10 U.S.C. § 2710(e)(2); or
- Munitions constituents (such as TNT or RDX), as defined in 10 U.S.C. § 2710(e)(3), present in high enough concentrations to pose an explosive hazard.

Munitions Constituents: Any materials originating from UXO, DMM, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

Munitions Debris: Remnants of munitions remaining after munitions use, demilitarization, or final disposition. Examples of munitions remnants include fragments, penetrators, projectiles, shell casings, links, and fins. Munitions debris also includes inert munitions-related material recovered during an MEC removal.

Recovered Chemical Warfare Materiel (CWM): Non-stockpiled CWM previously discarded, buried, or fired and discovered either unexpectedly or during planned environmental restoration operations that DoD has either secured in place or placed under DoD control pending final disposition. CWM is normally secured in a DDESB-approved storage location or interim holding facility, pending final disposition.

Unexploded Ordnance (UXO): As defined by 10 U.S.C. § 101(e)(5)(A) through (C), military munitions that

- Have been primed, fuzed, armed, or otherwise prepared for action;
 - Have been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to operations, installation, personnel, or material; and
-

- Remain unexploded whether by malfunction, design, or any other cause.

UXO-Qualified Personnel: Personnel who have performed successfully in military explosive ordnance disposal positions or are qualified to perform in the following contractor positions as listed in the Department of Labor’s Service Contract Act Directory of Occupations: UXO Technician II, UXO Technician III, UXO Safety Officer, UXO Quality Control Specialist, or Senior UXO Supervisor.

4.0 PERSONNEL

For anomaly avoidance on a site with potential MEC, the contractor provides a UXO team consisting of a minimum of two personnel, one of whom must be a UXO Technician II or above (see exception in following paragraph). The UXO Technician serves as the UXO Team Leader and has ultimate responsibility for ensuring that all MEC anomaly avoidance support activities are performed IAW this SOP, IW QAPP (current version), IW APP (current version), and site-specific project planning documents, including work plans and APP/SSHP. The UXO Technician directs all MEC anomaly avoidance support during field operations.

A UXO Technician I can provide escort duties if under the supervision of UXO-qualified personnel. (Note: Although escort by a UXO Technician I is typically performed under the supervision of UXO-qualified personnel, the responsible commander or authority may approve UXO Technician I personnel to perform escort duties without supervision. Such approval must be based on an approved risk assessment and implementation of methods to mitigate potential exposures). Escorts will help ensure that MEC on the surface and subsurface anomalies are avoided.

4.1 UXO Personnel

UXO personnel perform the following:

- Provide MEC recognition, location, and explosives safety functions.
- Conduct explosives safety briefing for all site personnel and visitors.
- Conduct a surface and subsurface anomaly avoidance.
- Work closely with U.S. Army personnel on all MEC-related matters.
- Coordinate and report MEC discoveries IAW project planning documents.

4.2 Non-UXO Personnel

Non-UXO personnel perform the following:

- Obtain training in recognizing the potential hazards associated with MEC.
 - Remain with the UXO Technician at all times unless otherwise cleared to work without a UXO escort.
 - Follow the instructions given by the UXO Technician if an accident occurs.
-

- Exercise caution when walking on site and follow UXO Technician directions.

5.0 EQUIPMENT AND SUPPLIES

5.1 General Equipment and Supplies

The following geophysical equipment is typically used during MEC anomaly avoidance operations:

- Magnetometers such as the Schonstedt GA 52-CX,
- Frequency-domain electromagnetic induction metal detectors such as the White's All Metals Detector, and
- Downhole monitors.

The following supplies are typically used during MEC anomaly avoidance operations:

- Flagging ribbon,
- Pin flags,
- Global positioning system (GPS) units, and
- High visibility, biodegradable spray paint.

5.2 Equipment Inspections

Staff must perform the following equipment inspections:

- Perform a daily equipment function check on all geophysical instruments and GPS equipment. Describe the performance results of the equipment check in the logbook or in an instrument maintenance and calibration log following each functionality test.
- If an equipment function check indicates that any piece of equipment is not operating correctly, and it cannot be field repaired immediately, remove the equipment from service until it can be repaired.

6.0 SAFETY

Before entering an area requiring MEC anomaly avoidance, the UXO Technician must conduct a safety brief covering emergency procedures, operations, MEC hazards, and anomaly avoidance procedures. If MEC is encountered during any phase of work, follow the procedures in the project planning documents. In general, adhere to the following MEC safety precautions and protocols:

- Observe this cardinal principle when work may involve ordnance, explosives, ammunition, severe fire hazards, or toxic materials: 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.
-

- DO NOT touch, move, or jar any ordnance items regardless of their markings or apparent condition.
- **Under no circumstances handle any MEC during avoidance activities or move MEC 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.
- 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 or that has not been cleared of MEC hazards by the UXO Technician.
- DO NOT rely on color codes for positive identification of ordnance items nor their contents.
- DO NOT drive vehicles into a suspected MEC area until anomaly avoidance techniques have been implemented.
- DO NOT be misled by markings on the MEC item stating “practice” or “dummy.” Practice ordnance can have explosive charges used to mark and/or spot the point of impact, or the item could be marked incorrectly.
- Clearly mark the location of any ordnance item found during anomaly avoidance activities so that it can be easily located and avoided.

— WARNING —

Removing or taking any munitions, explosives, or unexploded ordnance or munitions-related debris from the site by any employee is strictly prohibited.

7.0 ANOMALY AVOIDANCE PROCEDURES

Conduct anomaly avoidance procedures during field investigation activities whenever there is a potential for encountering MEC. The purpose of the procedures is to avoid any potential surface and subsurface MEC hazards during these activities. Anomaly avoidance procedures including the following are outlined in the subsections below:

- Establishing site access routes and site boundaries, and conducting MEC avoidance surveys;
- Conducting land surveying and mapping;
- Conducting Preliminary Assessments/Site Inspections on FUDS and Base Realignment and Closure sites;
- Conducting geophysical surveying; and

- Assessing environmental and natural resources:
 - Surface soil sampling,
 - Subsurface soil sampling,
 - Boring and drilling,
 - Groundwater monitoring, and
 - Test pits and trenches excavations.

7.1 Access Survey and MEC Avoidance Procedures

The UXO escort must conduct an access path survey for surface hazards and subsurface anomalies before any type of activities commence, including foot and vehicular traffic. The UXO escort is responsible for conducting the access survey using the following steps:

- Conduct an access survey of the footpath and/or vehicular lanes approaching and leaving work areas with known or suspected MEC. Typically, the access route will be twice as wide as the widest vehicle that will use the route.
- Conduct an access survey around the proposed work site that is large enough to support all planned operations. The size of the area will consider the maneuverability of the equipment and the space required to stage support vehicles or equipment.
- Use geophysical instrumentation capable of detecting the smallest known or anticipated MEC to locate anomalies just below the ground surface that may be encountered because of erosion from rain or because of continual foot or vehicular traffic. If the emplacement depth is greater than the detection capabilities, then the escort must complete the geophysical survey in intervals until the required depth is reached (for example, every 6 inches, 1 foot, 2 feet, and so forth).
- Clearly mark the route(s) for future entry control.
- If anomalies or surface MEC are encountered, mark the items and relocate the work area to an anomaly free area to avoid contact.
- Prohibit personnel from working outside of the surveyed areas.

7.2 Clearing and Grubbing

Initial clearing and grubbing operations may be required before field activities. The objective of clearing and grubbing is to create unhindered access for the field teams. In areas with potential MEC hazards, the UXO Team must perform the following:

- Survey the proposed clearing and grubbing area with a geophysical instrument. Mark hazards with survey flagging or pin flags.
 - Begin clearing and grubbing within the area established by the survey.
 - Use qualified UXO Technicians to escort grubbing teams at all times.
-

- Exercise caution when using mechanical grubbing equipment.
- Keep the lowest part of the cutting deck of mechanized equipment at least 6 inches above ground level to avoid potential contact with any MEC hazards remaining after the initial survey.

7.3 Land Surveying and Mapping Procedures

The UXO Technician performs the following during land surveying and mapping activities:

- Conducts an access survey of the routes to and from the proposed survey site and an area around the site.
- Visually inspects the surface of each proposed survey point for any indication of MEC or MEC-related contamination.
- Uses a handheld geophysical instrument to assess the presence or absence of subsurface anomalies at the locations where survey points/stakes installation is planned. If responses indicate an anomaly, the UXO Technician disallows survey point/stake installation at that specific location and assists in selecting an alternate location.

7.4 Sampling and Drilling Procedures

7.4.1 Surface Soil Sampling (Zero to 6 Inches)

The following paragraphs describe anomaly avoidance procedures for surface soil sampling between 0 and 6 inches below ground surface (bgs) in areas with potential MEC.

- Conduct a surface access survey of the routes to and from the proposed investigation site as well as of a support area around the investigation site.
- Visually inspect the surface of each proposed surface soil sampling site for any indication of MEC or MEC-related contamination.
- Survey the proposed sample locations using handheld geophysical instruments.
- Select an alternate location to collect surface soil samples if anomalies are detected at a proposed sampling location or too many anomalies are detected in a general area of interest.

7.4.2 Subsurface Soil Sampling (Below 6 Inches) and Monitoring Well Installation

The following paragraphs describe anomaly avoidance procedures for subsurface soil sampling and monitoring well installations in an area with potential MEC. Subsurface soil sampling is defined as the collection of samples below a nominal depth of approximately 6 inches with a split-spoon, Shelby tube, direct push sampler, or bucket

auger (hand auger) soil sampler using drilling techniques. Drilling techniques are also used to install groundwater monitoring wells for HTRW investigations. The UXO team adheres to the following procedures:

- Conduct a surface access survey of the routes to and from the proposed investigation site as well as an area around the investigation site.
- Conduct a subsurface survey of the proposed drill hole location(s) with a handheld, geophysical instrument to detect subsurface MEC anomalies.
- Prominently mark the locations of any anomalies detected with survey flagging or non-metallic pin flags for avoidance.
- Select a new sampling or borehole location if an anomaly is detected.
- Incrementally complete the downhole geophysical survey (for example, every 2 feet) if the subsurface sampling depth is greater than the geophysical detection capabilities.

7.4.3 Incremental Geophysical Survey for Conventional MEC Avoidance

For intrusive sampling (subsurface sampling and well drilling) in areas with suspected MEC, the team completes follows this procedure:

1. Begin the installation:

- Complete the access survey of the area.
- Complete the geophysical survey and install a pilot hole at the sample or drill location if no anomalies are detected.
- As long as no anomalies are detected, advance the pilot hole to the maximum reach of the auger or to the maximum depth of the proposed drill hole.
- During installation, incrementally complete the downhole geophysical survey (for example, every 2 feet) if the subsurface sampling depth is greater than the geophysical detection capabilities.
- When working in impact areas, the UXO team may discontinue incremental screening once a depth of 30 feet bgs is reached or the depth of MEC penetration has been exceeded, whichever is less.
- For all other areas, incremental geophysical screening will be determined based on an assessment of the site's characteristics and history.

2. If anomalies are detected:

- Stop installation immediately and backfill the pilot hole IAW project-specific procedures.
 - Direct HTRW sampling personnel to select a new location.
-

7.4.4 Test Pits and Trench Excavations

Test pits and trench excavations are used to identify and characterize large subsurface HTRW areas of concern. Adhere to the following procedures:

- Conduct an access survey of the routes to and from the proposed excavation locations.
- If an anomaly is detected, select a new excavation location.
- If the proposed excavation depth is greater than the geophysical instrument detection capabilities, the UXO team proceeds as follows:
 - HTRW personnel can begin excavation in 1-foot increments.
 - At the end of each 1-foot increment, the UXO team screens for anomalies. If an anomaly is detected, the HTRW team must modify the excavation to avoid the anomaly.
 - If MEC is encountered, all operations must cease. The UXO team accesses the item and follows MEC procedures detailed in the project planning documents.
 - After the MEC hazard has been removed, excavation using anomaly avoidance can continue.
- If potentially hazardous waste, debris, or drums are encountered during test pit or trenching operations, stop all excavation activities. The Site Safety Officer adheres to the following procedure:
 - Assess the situation and direct a change to the personal protective equipment for site workers, if necessary.
 - Notify the appropriate personnel IAW the project planning documents.
 - Handle wastes IAW the project planning documents.

7.4.5 Soil Sampling with Direct Push Technology

The following paragraphs describe anomaly avoidance procedures for soil sampling and use of direct-push technology (DPT) in areas with potential MEC. Soil sampling with DPT typically involves manual or mechanical penetration at the desired location, followed by withdrawal and collection of a soil sample. The UXO Team adheres to the following procedure:

- Conduct a surface access survey of the routes to and from the proposed investigation site as well as an area around the investigation site.
 - Follow the anomaly-avoidance procedures described above for subsurface soil sampling and monitoring well installations as follows:
 - Conduct an incremental down-hole geophysical survey for metallic anomalies.
 - Conduct actual sampling and geophysical instrument screening through the DPT
-

borehole.

- Backfill the sampling location IAW project-specific procedures after collection of the soil samples.

7.4.6 Groundwater Monitoring

Groundwater monitoring activities include measuring groundwater elevations, measuring free product thickness, and collecting analytical samples. Unless a path is clearly marked, HTRW sampling personnel must be escorted by UXO-qualified personnel when conducting groundwater monitoring/aquifer characterization activities in areas with potential MEC.

7.5 Preliminary Assessment and Site Inspection

On sites where MEC hazards may be present, UXO Technicians perform anomaly avoidance measures to prevent non-UXO personnel conducting site characterization work on the site from contacting MEC hazards.

8.0 MUNITIONS AND EXPLOSIVES OF CONCERN

8.1 MEC ENCOUNTERED

If MEC is encountered, the UXO Technician performs the following:

- Stops the team, draws attention to the hazard, and marks the hazard with a high-visibility pin flag, paint, or surveyors tape.
- If safe to do so, attempts to identify the MEC hazard via markings and other external features such as shape, size, and external features.
- Records the locations of any MEC hazard items in a GPS, if possible.
- Photographs the hazard.
- Makes notifications required in the project planning documents.

8.2 MEC DISPOSITION

The UXO escort is not authorized or equipped to perform MEC disposition. MEC discoveries must be reported to the designated personnel/agencies identified in project planning documents. If staff encounter a MEC item that cannot be avoided or that, based on its fuzing or current condition, presents an imminent hazard, the UXO escort must immediately notify the personnel/agencies designated in project planning documents.

9.0 QUALITY CONTROL

Project Managers and supervisors ensure that all site personnel read, understand, and follow this SOP, and they must bring any discrepancies with procedural steps or safety

issues pertaining to this SOP to the attention of the responsible supervisor for corrective action.

The senior UXO-qualified person on site has final on-site authority on all munitions and MEC procedures and safety issues. This individual has direct reporting and communications responsibility with all responsible authorities as directed by the contractor's Project Manager.

10.0 REFERENCES

U.S. Department of Defense (DoD), Defense Explosives Safety Regulation 6055.09, Edition 1.

DoD Explosives Safety Board, Technical Paper 18, Minimum Qualifications for Personnel Conducting Munitions and Explosives of Concern-Related Activities.

U.S. Army Corps of Engineers (USACE), Engineer Manual 385-1-97, Explosives Safety and Health Requirements Manual.

CORONA VIRUS CONTROL PLAN

COVID-19 CONTROL PLAN**1.0 GENERAL**

Coronavirus Disease 2019 (COVID-19) is a respiratory disease caused by the SARS-CoV-2 virus. The COVID-19 pandemic is impacting all aspects of daily life, including travel, trade, tourism, food supplies, and financial markets. This plan defines location-specific efforts regarding:

- Awareness and Education
- Screening Methods
- Contamination Prevention and Sanitation
- Reporting and Illness/Exposure Management

This COVID-19 Control Program (CCP) is applicable to all APTIM employees at Redstone Arsenal (RSA). APTIM expects subcontractors/visitors/vendors to protect their employees through compliance with APTIM's CCP or through the development and implementation of a COVID-19 control plan specific to their risks. APTIM leadership must approve subcontractor plans, as applicable before implementation at RSA.

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

2.0 CONTROLS**2.1 Awareness and Education**

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.

- At a minimum, COVID-19 training shall be provided through internal communications, new hire orientation, daily toolbox talks, risk assessment tools including JSA's, TARGET observation program, Near Miss/Great Catch reporting, findings from inspections, informational postings and informal discussions with supervision or employees.
- All employees reporting to work in an office location must complete the APTIM COVID-19 training available on-line through assignment in Talent Connection.
- On-going assessment of local, state and federal guidelines from organizations such as the Centers for Disease Control (CDC) and Occupational Safety Health Administration (OSHA), are required by all leadership employees to maintain an accurate understanding of the current hazards.
- The APTIM Corporate COVID-19 Management Team meets regularly to evaluate APTIM's pandemic efforts and implement appropriate responses.

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- APTIM maintains a Corporate COVID-19 resource page providing guidance from the CDC, World Health Organization (WHO), as well as APTIM-specific information. This page is located on the company intranet and is available to all employees with a company email address.
- Signage: HSE, working with Facilities, will ensure that CDC-recommended signage reminding employees about social distancing, handwashing, and staying home when sick is posted in common areas (restrooms, bulletin boards, lobby, etc.).

2.2 Screening Methods

Employees can be exposed to the virus either at the work location or away from work. Fever, coughing, and shortness of breath are primary symptoms that may be present between two and fourteen days from exposure to 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.

- Employees are reminded to continually evaluate themselves for the onset of any symptoms, particularly tfever, coughing or shortness of breath.
- If the location requires a screening tool at arrival, APTIM will use the screening questionnaire in Appendix 1. [Client-required questionnaires may be used in lieu of Appendix 1 where applicable.]
- If the screening tool in Appendix 1 is used, APTIM may separate individuals and send individuals home or away, as warranted, depending on the answers to questions in the tool, read in accordance with current guidance from the CDC or other applicable health organization.
- Contactless thermometers will be deployed as available and as necessary to assess all individuals for potential fevers prior to entering the workspace.
 - A temperature measured as greater than 100.4 °F is considered a fever.
 - Individuals registering a fever may sit isolated for no more than 10 minutes before being rechecked to confirm the fever. If a temperature of 100.4 °F or greater is registered after the second reading, the individual will not be allowed into the workspace and will be turned away/sent home.
- Any employee experiencing symptoms of illness will be isolated from the workforce and turned away/sent home.
- An employee who notices a co-worker exhibiting or complaining of symptoms of acute respiratory illness (fever, coughing, shortness of breath) has Stop Work Authority if they are concerned about another's health. The immediate supervisor should be notified and HSE contacted to evaluate how to proceed and limit further exposure.
 - NOTE: Employees are expected to treat each other with respect and dignity in keeping with APTIM's policies and collaborative culture. **Harassment, bullying or other mistreatment of employees because of a suspicion of symptoms is grounds for discipline, up to and including termination of employment.**

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- APTIM may require employees to complete fitness for duty evaluations as needed to respond to an objective concern for the health or safety of an employee and co-workers. A manager/supervisor must discuss a request for a fitness for duty evaluation with HR and HSE in advance; HSE will coordinate the fitness for duty process.

2.3 Contamination Prevention and Sanitation

Current medical understanding is that the virus is primarily transmitted via respiratory droplets when an infected person coughs, sneezes or talks. It may be possible that a person can get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose or eyes. The virus can potentially survive on varying surfaces from hours to multiple days. Primary routes of entry include the mouth, eyes and nose.

2.3.1 Sick Employees Stay Home

- Any employee who is experiencing symptoms of acute respiratory illness (fever, cough, shortness of breath) shall notify the employee's supervisor and not report to work.
- Employees who are well but who have a sick family member at home with COVID-19 should notify their supervisor and follow CDC recommended precautions.

2.3.2 Social Distancing Practices:

- Whenever possible, everyone is to maintain a minimum 6ft. distance from other people. This practice insulates individuals from potential exposure to respiratory droplets. If situations require close contact, time within 6ft. should be minimized. Employees are also to not touch other employees unless absolutely necessary to complete a task. Any touching should be followed by appropriate disinfecting as soon as possible. Please don't shake hands with other employees; a wave or a nod is a better practice to greet others during this pandemic.
- APTIM supports remote working where it is an efficient and effective option to complete assigned work. APTIM encourages managers to consider carefully before determining that employees who are temporarily working remotely should return to the office environment. APTIM's strong preference during the pandemic is to continue efficient, effective remote working assignments instead of returning employees to office environments. Think carefully about who needs to be in the office and who can still work from home.
- Workspaces, conference rooms, etc. shall be reconfigured, to provide at least 6ft. of distancing. Please do not rearrange, place chairs closer together, or bring in additional seating.
- Avoid congregating in common areas such as lobbies, kitchens, and restrooms and always maintain 6 ft distance. Allow a person to complete their task such as using the microwave and exit the space before entering.
- Visitors, sales representatives, and others whose presence at the location is not business critical are restricted from visiting the location until further notice. The Project Manager must approve any deviation request in advance. All visitors will be required to be met by staff in the lobby where they will be asked to complete the APTIM COVID-19 Questionnaire. [Once

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cleared to enter the visitor will be escorted to the temperature monitoring station. Visitors with temperatures above 100.4 degrees will not be allowed to enter and asked to leave.]

- Break times, including lunch times, have been staggered to minimize interactions with others.
- Whenever possible, meetings are to be conducted via teleconference rather than in person. In-person meetings or gatherings must not exceed 10 people and proper social distancing must be enforced.
- Other site-specific measure to maintain distance are captured on the COVID-19 Job Site Practices Activity Hazard Analysis (AHA).
- For project office facilities
 - Employees should not enter another's office until invited. Whenever possible, conduct conversation from the doorway. If privacy/confidentiality is required, the office occupant should invite the other party in, and the parties should don face masks and remain 6-foot distance throughout the discussion.
 - Employees assigned to cubicle workspaces are already limited in their ability to maintain 6-foot distance, and no employee should enter another's cubicle unless necessary and invited. Communication should be conducted via email, phone and Teams/Chat whenever possible. If a discussion is necessary, the parties should locate an available larger space such as a conference room. If the discussion requires the cubicle equipment (such as to discuss and revise a drawing) both parties shall don face masks throughout the interaction.
- Site-specific restroom use is included on the COVID-19 Job Site Practices AHA.

2.3.3 Sanitation Measures:

- Employees should not cover any cough or sneeze with their hands but should use a tissue or their elbow to contain the cough or sneeze. This process reduces contamination on their hands and in the air. Employees must properly wash their hands following any cough or sneeze.
- At a minimum, all employees shall conduct adequate hand washing prior to eating, before and after preparing food, following use of the restroom, following sneezing or coughing, and following touching of the face, especially the mouth, eyes or nose.
 - Adequate hand washing is achieved by following these five steps:
 1. Wet your hands with clean, running water (warm or cold); turn off the tap, and apply soap.
 2. Lather your hands by rubbing them together with the soap. Lather the backs of your hands, between your fingers, and under your nails.
 3. Scrub your hands for at least 20 seconds. Need a timer? Hum the "Happy Birthday" song from beginning to end twice.
 4. Rinse your hands well under clean, running water.
 5. Dry your hands using a clean towel or air dry them.

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- An adequate supply of soap must be available to maintain the ability for effective hand washing. **If there is no soap available, hand sanitizing liquid/gel may be utilized as a substitute. If neither option is available, the office/location will be closed unless it is deemed to be “critical” by senior leadership and/or government entities.**
- Do not touch your eyes, nose or mouth. Sores should also stay covered and protected. These measures are to prevent routes of entry.
- Face Masks: Wherever possible, APTIM is working to ensure that employees can work at least 6’ away from other individuals, in order to maintain the recommended social distance in this pandemic. Employees working in an area where they can avoid prolonged interaction with others can choose to use a cloth mask (as recommended by the [CDC](#)). Please see Appendix 2 for information from the CDC about making cloth masks, directions on how to don and doff these masks, and instructions for properly laundering the masks. The site has a small for use by employees in unexpected/planned close-contact situations that do not have a mask with them.
- HSE will work with employees who are working on tasks that require working within 6’ feet of others for a prolonged period to help plan steps to minimize this close contact work and to ensure that, where required, employees have adequate respiratory protection suited to the job task (such as NIOSH-approved, particulate filtering masks). Cloth masks are not a good substitute in these situations.
- [for office locations]: Masks requirements:
 - Employees are not required to wear a mask when;
 - Alone or in an office/cubicle with no interaction with others closer than 6-foot distance
 - In the break room while eating or drinking. During the pandemic employees should confine break/lunchroom time to eating/drinking and avoid lingering or congregating. Stay 6’ away from others.
 - Employees must wear masks;
 - Whenever engaged in an interaction/conversation within 6-foot distance
 - When engaged in a conversation inside an office; all parties should don masks upon invitation to enter by the occupant
 - In all common spaces, including conference rooms, elevators, hallways, breakrooms, restrooms, etc.
- Site-specific hand-washing solutions are included on the COVID-19 Job Site Practices AHA
- If means for handwashing are not immediately available, employees should use hand sanitizer containing at least 60% alcohol. Hand sanitizer should not be used in lieu of handwashing if hands are visibly soiled. Hand sanitizer shall be made readily available for employees to frequently disinfect their hands throughout the jobsite.
 - Use hand sanitizer in the following manner:

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- Apply the gel product to the palm of one hand. (Read the label to learn the correct amount).
- Rub your hands together.
- Rub the gel over all the surfaces of your hands and fingers until your hands are dry. This process should take around 20 seconds.
- Hand sanitizer should be placed and maintained in strategic locations throughout the workspace.
- Site-specific solutions to janitorial service issues are included on the COVID-19 Job Site Practices AHA.
- Site-specific solutions to restroom cleaning are included on the COVID-19 Job Site Practices AHA.
- [for office locations:] Disinfectant wipes are also available in the printer/copier areas and the kitchens and employees are encouraged to use them to wipe/sanitize touch surfaces as desired. Employees are also encouraged to wipe/disinfect their desks, phones, and keyboards as desired and at least once a day using the wipes provided.
- The procurement and ongoing availability of materials such as soap, disinfectant, PPE, etc. is the responsibility of the site Director/Manager. HSE and Procurement are continually evaluating availability of these products and may assist in this process if requested.
- Some business processes are heavily reliant on the shared handling of paper or other office products. The site must assess and implement measures to minimize exposure to paper, limit interactions among employees, discontinue use of shared pens, use personal protective measures (such as gloves) and disinfect following handling.
- Commonly touched surfaces and items should be identified for cleaning, as well as the frequency required based on the exposure. The CDC recommends that these surfaces be cleaned at least weekly.

2.3.4 Travel Limitations:

- APTIM has suspended all non-essential business travel. Essential business travel must be approved by APTIM Executive Leadership. Anyone approved to travel will be screened prior to reporting back to the jobsite.
- Employees traveling domestically or internationally may be subject to a self-quarantine period and should be familiar with the federal, state and local orders prior to traveling.

2.4 Reporting and Illness Management**2.4.1 General**

- 2.4.1.1 To ensure both prompt medical evaluation and prevention of any potential contamination to the jobsite, APTIM requires employees to immediately report any symptoms (fever, cough, or difficulty breathing), no matter how slight, to their manager, HSE and HR.

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- 2.4.1.2 APTIM will communicate appropriate notifications in accordance with established protocols and in keeping with applicable privacy laws.
- 2.4.1.3 Employees experiencing symptoms of any illnesses are to stay home and not report to work until symptom and fever-free for at least 24 hours, without the assistance of fever reducing medications. Employees experiencing symptoms consistent with COVID-19 who should stay home and not report to work until the protocols for return to work are met (test based, or symptom based). See below. Please take the necessary steps for your health and safety and the health and safety of your co-workers. Notification to supervision is required.
- 2.4.1.4 HSE, working with site Leadership and HR, maintains a confidential log of information related to employees who are symptomatic, who test positive for COVID-19, or who were potentially exposed outside of work. The log should include the name of the affected employees, the potential exposure or test date, date of onset and description of symptoms (if symptomatic), information about the exposure event, dates of expected quarantine, and status. HSE, working with site Leadership, also maintains a confidential log of any employees assigned to the jobsite potentially exposed by "close contact" to another COVID-19 positive (test, diagnosed or suspected) employee, including the potential exposure date, any testing information, a description of the potential exposure, the dates of any quarantine period, and a status update.
- 2.4.1.5 Site Leadership is responsible to notify HSE and HR of any COVID-19 positive (test, diagnosis or suspicion).
- 2.4.1.6 If an employee's illness appears to be personal and non-emergent, APTIM will direct the employee to see his or her personal health care provider.
- 2.4.1.7 Cases believed to be emergent in nature without regard to work-relatedness will be handled by following this AMS.
- 2.4.1.8 Cases potentially work-related will be evaluated at:
- Crestwood Workers Care Madison Clinic, 2236 Madison Blvd, Huntsville, AL
Crestwood Family Practice Clinic, 1868 Sparkman Dr. NW, Huntsville, AL
Huntsville Hospital, 878 Madison St. SE, Huntsville, AL

For potentially work-related cases, consideration should be given to allowing the affected employee to self-transport to seek medical care in order to maintain social distancing of 6ft. or greater. Vehicles offering adequate distance, such as passenger vans may also be used. Vehicles used for transport will be disinfected following the trip.

2.4.1.9 Return to Work Protocol

APTIM follows current CDC recommendations for returning employees to work after COVID-19 diagnosis or exposure. Please see Appendix 3 for a flow chart setting forth these criteria. Information about return to work protocols is also contained in the next sections.

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- A. Person with COVID-19 (tested, diagnosed, or suspected due to symptoms) can return to work after meeting one of the following protocols:
- Symptom Based Strategy: At least 10 days have passed since symptoms first appeared;
 - At least 24 hours have passed since resolution of fever without the use of fever-reducing medications; and
 - Other symptoms* of COVID-19 have improved.
 - (*Note that loss of taste and smell may persist for weeks or months after recovery and need not delay the end of isolation.
 - Most people do not require testing to decide when they can be around others. However, APTIM employees should follow the advice of their healthcare provider regarding when it is safe for the employee to return to work.
- B. People who have not had COVID-19 Symptoms but Tested Positive for COVID-19 can return to work after:
- At least 10 days have passed since the date of their first positive COVID-19 diagnostic test (assuming they have not developed symptoms.)
 - If symptoms develop, then follow symptom-based or test-based strategy for the return-to work protocol.
- C. People who are severely immunocompromised or who were severely ill with COVID-19 Test Based Strategy: May need to stay home longer than 10 days and up to 20 days after symptoms first appeared and may require testing to determine when it is appropriate to return to work. These individuals will need a release from their healthcare provider before returning to work.

2.4.2 Potential or Known Exposure to COVID-19 or Employees with Symptoms:**2.4.2.1 Symptomatic employees**

If an employee is experiencing symptoms of acute respiratory illness and a fever (greater than 100.4 degrees Fahrenheit, or 37.8 degrees Celsius), the employee must not come to work. The employee must alert his or her supervisor that he or she is symptomatic and is staying away from work. Supervisors should alert HSE immediately once they receive information that an employee is staying home with acute respiratory illness symptoms. Please see Potential Workplace Exposure section below for the required analysis of potential exposure to symptomatic employees. Please see Return to Work Protocol for persons who are positive for COVID-19 with symptoms, above.

2.4.2.2 Diagnosed Employees

Employees testing positive for COVID-19 are required to follow their health care provider's orders and will not be allowed to return to work until cleared by the health care provider to return to work. Recognizing strains on the medical system during this pandemic, APTIM will work with employees to

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balance the need for information on the employee's fitness to work with the availability of a health care provider. We will follow CDC guidelines for return to work criteria for employees who test positive or are presumed positive for COVID-19. Please see Return to Work Protocol above.

Please see Potential Workplace Exposure section below for the required analysis of potential exposure to symptomatic employees.

2.4.2.3 Potentially exposed but asymptomatic employees

If an employee has been exposed to:

- a. a household member or intimate partner or
- b. has provided care in a household without using recommended infection control precautions, or
- c. has had "close contact" (< 6 feet) for a "prolonged" period of time

to a person with symptomatic COVID-19 (can be a laboratory-confirmed disease or a clinically compatible illness) but the employee does not have symptoms, the employee may also need to stay home and not come to work or may be able to continue work, subject to workplace protections being in place, if the employee is working in a critical infrastructure position. (see section below).

The potential exposure period is the 48-hour period before the person with symptomatic COVID-19 began experiencing symptoms.

Please note the following definitions of "close contact" and "prolonged" (from CDC guidance):

Factors to consider when defining close contact include proximity, the duration of exposure (e.g., longer exposure time likely increases exposure risk), whether the individual has symptoms (e.g., coughing likely increases exposure risk) and whether the individual was wearing a facemask (which can efficiently block respiratory secretions from contaminating others and the environment).

Prolonged exposure varies on the length of time of exposure from 10 minutes or more to 30 minutes or more. Brief interactions are less likely to result in transmission; however, symptoms and the type of interaction (e.g., did the person cough directly into the face of the individual) remain important.

The potentially exposed employee must alert the employee's supervisor and HSE will work with the employee to determine whether, following CDC guidelines, the employee must remain self-quarantined and return to work for 14 days from the last exposure to the confirmed or suspected COVID-19 individual.

Asymptomatic Employees Working in Critical Infrastructure Positions:

Potentially exposed but asymptomatic employees who are working in "Critical Infrastructure" positions whose presence is critical to the ongoing progress of the project may continue to work with the following required protective measures in place:

- Prescreen: A temperature screening to confirm the absence of a fever (100.4 °F) and a symptom assessment is required prior to entering the workplace.

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- **Regular Monitoring:** Ongoing self-monitoring with assistance from HSE to ensure the employee remains asymptomatic and fever-free.
- **Wear a Mask:** The employee should wear a face mask at all times while in the workplace for 14 days after last exposure. Employee-supplied face masks are acceptable (see Appendix 2), or a site can issue a face mask (where supplies are adequate).
- **Social Distance:** The employee should maintain social distancing of at least 6ft. from other individuals. Any encroaching of 6ft. requires additional controls, such as adequate respiratory protection. (Contact HSE for support)
- **Disinfect and Clean:** The jobsite must clean and disinfect all areas such as offices, bathrooms, common areas, and shared equipment routinely.

If the employee becomes sick during the day, the employee should be sent home immediately. Surfaces in their workspace should be cleaned and disinfected. Information on persons who had contact with the ill employee during the time the employee had symptoms and 2 days prior to symptoms should be compiled. Others at the facility with close contact within 6 feet of the employee during this time would be considered exposed.

2.4.2.4 Potential Workplace Exposure

APTIM will inform employees of a potential workplace exposure while maintaining confidentiality (i.e., without revealing the infected individual's name unless otherwise directed by the CDC, applicable public health authority, or specifically required by applicable written government directive).

APTIM will analyze whether any other employees were potentially exposed to an employee diagnosed with COVID-19 through "close contact" with the diagnosed employee during the 48-hour period before the diagnosed employee started experiencing symptoms. Following CDC recommendations and directives, APTIM will direct potentially exposed asymptomatic employees to self-quarantine and remove them from the workplace for a 14-day period from the date of the employee's last exposure to the confirmed or suspected positive individual.

Please see above for information about potentially exposed, but asymptomatic, employees working in critical infrastructure. These employees can continue to work as long as they remain asymptomatic and the workplace protections set forth above are in place.

Employees are eligible to continue receiving per diem (if the employee is otherwise eligible for per diem) during the time the employee is not able to work because the employee is experiencing symptom of acute respiratory illness (fever, cough, shortness of breath) or is quarantined and away from home. The employee may need to provide medical documentation in order to be considered for continued per diem while they are not at work.

2.5 Roles and Responsibilities

2.5.1 Project Manager

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- Responsible for oversight and coordination of the CCP implementation to ensure consistency in program content and efficient use of resources.
- Responsible for ensuring that all employees adhere to the procedures, including training and awareness of CCP issues.
- Responsible to ensure communication of project/office expectations regarding the CCP.
- Support and endorse the Project HSE Management System and CCP.
- Ensure compliance to the CCP by all employees, subcontractors, and vendors.
- Provide the resources necessary for implementation of the CCP.
- Ensure that adequate Emergency Response Procedures are in place for the evacuation of employees.
- Communicate with Facilities department regarding office closure and re-opening (to include return to work plans).

2.5.2 Project Manager Designee]

- Assists the Project Manager in ensuring that all employees adhere to the procedures, including training and awareness of CCP issues.
- Assists the Project Manager in ensuring communication of project expectations in regard to the CCP.
- Actively support the CCP.

2.5.3 HSE Manager

- Review and analyze new data on COVID-19 risk, prevention, and management.
- Identify and provide training and awareness materials.
- Provide leadership with health risk assessment efforts for each area of the project.
- Identify and communicate program expectations (i.e., diagnosis, treatment and notification) to preferred medical providers.
- Review COVID-19 incident data.

2.5.4 Employees

- Adhere to all program requirements regarding prevention and mitigation measures.
- Participate actively and vocally in the awareness program.
- Report any suspected symptoms of acute respiratory illness (fever, coughing, shortness of breath) immediately to supervision.
- Stay home when sick.

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- Provide regular updates to leadership regarding anticipated return to work if the employee is required to stay home due to quarantine or illness.

2.5.5 Preferred Occupational Medical Provider

- Use rapid diagnosis method to test for COVID-19.
- Report confirmed or unconfirmed cases of COVID-19 to APTIM HSE Manager.
- Communicate with HSE Manager related to COVID-19 diagnosis and treatment as needed.
- Ensure clinic staff understands COVID-19 requirements for diagnostics and treatment.

3.0 RESOURCES:

Public Health Recommendations for Community-Related Exposure,

<https://www.cdc.gov/coronavirus/2019-ncov/php/public-health-recommendations.html>

[CDC RECOMMENDATIONS FOR MASK - https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-face-coverings.html](https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/about-face-coverings.html)

IMPLEMENTING SAFETY PRACTICES FOR CRITICAL INFRASTRUCTURE WORKERS WHO MAY HAVE HAD EXPOSURE TO A PERSON WITH SUSPECTED OR CONFIRMED COVID-19, <https://www.cdc.gov/coronavirus/2019-ncov/community/critical-workers/implementing-safety-practices.html>

DISCONTINUATION OF ISOLATION FOR PERSONS WITH COVID-19 NOT IN HEALTHCARE SETTINGS (INTERIM GUIDANCE) [HTTPS://WWW.CDC.GOV/CORONAVIRUS/2019-NCOV/HCP/DISPOSITION-IN-HOME-PATIENTS.HTML](https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-in-home-patients.html)

WHEN YOU CAN BE AROUND OTHERS: <https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/end-home-isolation.html> ENDING HOME ISOLATION: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-in-home-patients.html>



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**APPENDIX 1
COVID-19 QUESTIONNAIRE**



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APPENDIX 1 – COVID-19 QUESTIONNAIRE

Name:	
Contact Number/Cell:	
Date:	
Department:	
Supervisor:	
For use with On-Site temperature check: Verified that temp is less than 100.4?	Yes/No
Self-Fever Check – did you check your temperature today? Is it less than 100.4 F? If you have a fever of greater than 100.4, stay home and do not report to this work site.	Yes/No
Have you read the Covid-19 Safety Plan applicable to our location, and do you understand the safety measures we are asking you to take while working at this jobsite?	
Do you understand that you are required to wear a mask (in accordance with CDC recommendations) when working within a 6ft. proximity of coworkers?	
Do you understand that when possible you are to maintain 6ft. social distancing if you are not able to wear a mask?	
Within the last 14 days, have you had close contact (less than 6' for 15 minutes or more) with a person with COVID-19 (diagnosed with test or symptoms)?	Yes/No
Are you currently experiencing (now or in the last 24 hours) any symptoms of Covid-19? (symptoms can include some or all of the following: fever, chills, cough, shortness of breath, difficulty breathing, fatigue, muscle or body ache, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea, vomiting, diarrhea)?	Yes/No
Are you currently diagnosed with COVID-19 or are you waiting for test results?	Yes/No
Do you understand that if you are running a fever or exhibiting any signs of illness you are not to come into work?	Yes/No



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**APPENDIX 2
INSTRUCTIONS RELATED TO CLOTH MASKS**



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[DIY CLOTH FACE COVERING INSTRUCTIONS](#)

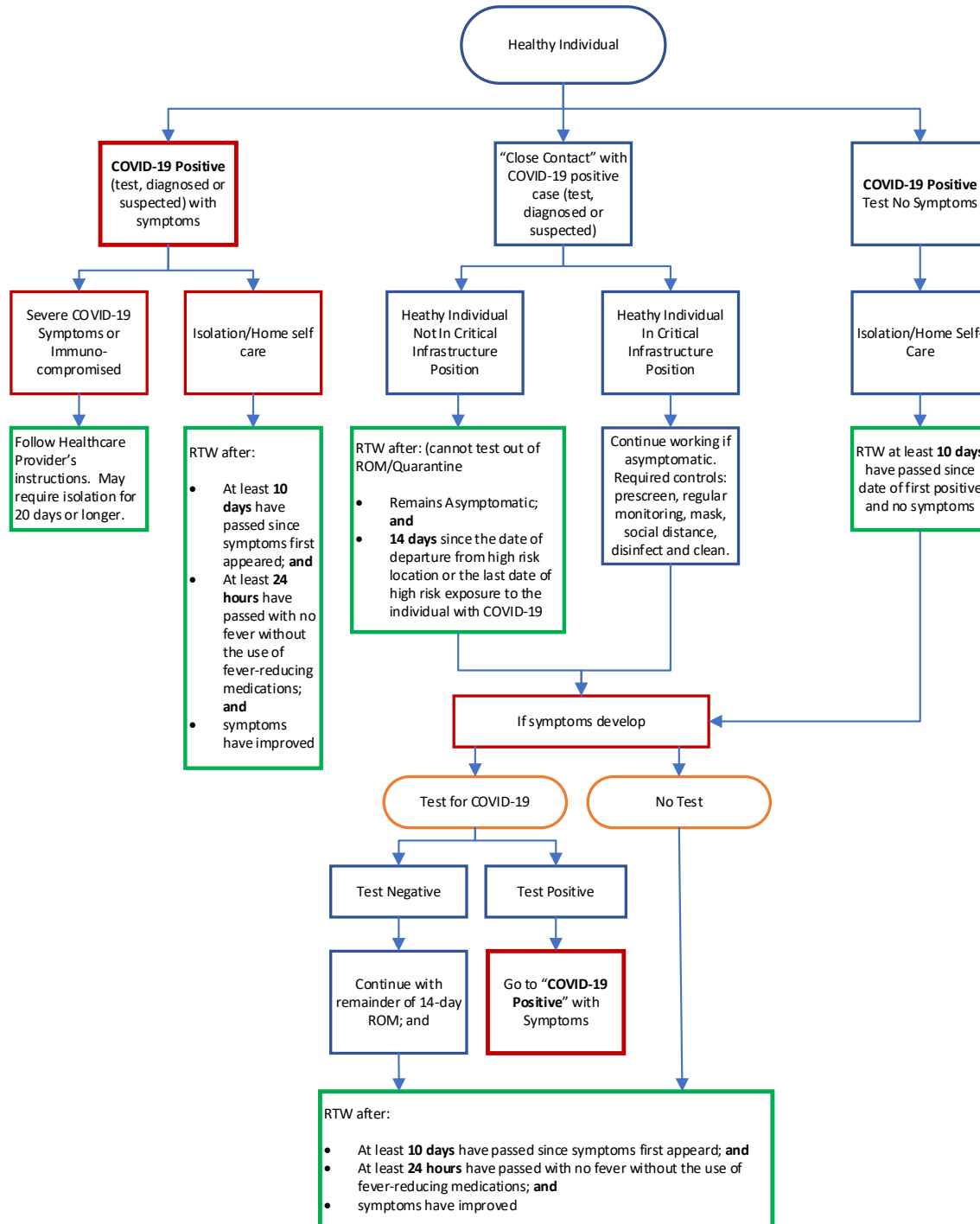


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**APPENDIX 3
RETURN TO WORK PROTOCOL**

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RETURN TO WORK (RTW) FLOWCHART COVID-19





PROCEDURE

Procedure Title:	Control of Hazardous Energy	AMS Number:	AMS-710-02-PR-01500
Procedure Owner:	HSE	Issuing Authority:	APTIM Quality Management

CONTROL OF HAZARDOUS ENERGY

INT	Issued for Interim Use	M. Hadacek & S. Lachney	7/30/2017
Rev	Changes	Approved	Date



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1.0 PURPOSE

The purpose of this Procedure is to establish the minimum requirements for Control of Hazardous Energy on APTIM sites.

The following deliverables are defined within this procedure:

- Written site specific control of hazardous energy sources (lock-out/tag-out) plan
- Annual inspections of control of hazardous energy procedures and controls
- Control of Hazardous Energy training for affected and authorized employees

2.0 SCOPE

This procedure is to be utilized when creating a site specific plan for control of hazardous energy, inspections of procedures and controls, and training of authorized employees.

3.0 RESPONSIBILITIES

The following personnel have responsibilities defined in this procedure:

- APTIM Managers
- APTIM Supervisors
- APTIM Employees
- APTIM Electrical Superintendent
- APTIM Contractors
- APTIM Subcontractors
- APTIM Visitors

4.0 PROCEDURE

Upon commencement of site activities, the Site Manager and Site HSE Manager shall develop a written plan for the control of hazardous energy sources (Lock-out/Tag-out) to prevent the possibility of incidents to employees when performing work activities on or around hazardous energy sources. The plan shall be maintained in the site electronic data management system. This procedure applies to all equipment, vehicles, processes or systems that are powered by Electrical, Mechanical, Hydrostatic, or Pneumatic energy. When APTIM shares a site with client personnel, the APTIM Plan shall compliment the Client program. If APTIM is required to work to the client program, the plan must address the program interfaces and verify the minimum requirements set forth in this Procedure shall be met. Employees shall not be allowed to work on energized systems or equipment without written authorization from the Site Manager and consultation of the HSE Manager.

4.1 General

- 4.1.1 This Procedure specifies methods of controlling hazardous energy sources during construction and maintenance activities involving work on electrical services, facilities, shop equipment, engine-driven equipment, pressurized pipelines, and systems used as service lines for construction. This Procedure also covers activities to be used during start-up phases.
- 4.1.2 APTIM employees, contractors, subcontractors, and visitors shall adhere to requirements listed in this procedure.
- 4.1.3 If an energy isolating device is not capable of being locked out, the Tag-out procedure will be used.
- 4.1.4 If an energy isolation device is capable of being locked out, then the Lock-out procedures shall be used.
- 4.1.5 Whenever replacement or major repair, renovation or modification of a machine or equipment is performed, and whenever new machines or equipment are installed,



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energy isolating devices for such a machine shall be designed to accept a lock-out device.

4.1.6 Affected workers, where Lock-out/Tag-out and/or Blinding/Blanking are performed, shall be made aware of systems that are being worked on in their areas.

4.2 Energy Control Procedures

4.2.1 Procedures shall be developed, documented and utilized for the control of potentially hazardous energy when employees are engaged in activities where Lock-out is required.

4.2.2 The procedures shall clearly outline the scope, purpose, authorization, rules, and techniques to be utilized for the control of hazardous energy, and the means to enforce compliance including but not limited to the following:

- A specific statement of the intended purpose of the procedure.
- Specific procedural steps for the shutting down, isolating, blocking and securing machines or equipment to control hazardous energy.
- Specific procedural steps for the placement, removal and transfer of lockout and tagout devices and the responsibility for them and;
- Specific requirements for testing a machine or equipment to determine and verify the effectiveness of lockout/tagout devices and other energy control measures.

4.3 Protective Materials and Hardware

4.3.1 A standard "DANGER - DO NOT OPERATE" tag (AMS-710-05-FM-01503) and individually keyed locks shall be used by each site.

4.3.2 Tags used shall be dated, signed, a description of the work being performed shown on the tag, and securely attached to the equipment/lock.

4.3.3 Tags shall not be reused, but destroyed immediately upon removal. No alterations to a tag are permitted.

4.3.4 No device shall be operated with a tag or lock attached regardless of circumstances.

4.3.5 No person shall remove another person's tag or lock unless it is deemed an emergency situation and the requirements of 4.9 are adhered to.

4.3.6 It is the discipline Supervisor's responsibility to ensure that no work is performed beyond the protection of blinds, blanks, locks, and tags.

4.3.7 Tags required beyond one shift shall be replaced by the oncoming shift. In no case will locks and tags be permitted to remain for more than 30 days without another inspection and redating with signatures.

4.3.8 Each authorized worker performing work on a system is required to affix a lock and tag on the system even though the equipment or system is already locked out. In these situations, a multiple locking device shall be used.

4.3.9 Lockout devices and tagout devices shall be singularly identifiable; shall be only devices used for controlling energy; shall not be used for other purposes; and shall meet the following requirements:

4.3.9.1 Lockout and tagout devices shall be capable of withstanding the environment to which they are exposed for the maximum amount of time the exposure is expected.

4.3.9.2 Tagout devices shall be constructed and printed so that exposure to weather conditions or wet and damp locations will not cause the tag to deteriorate or the message on the tag to become illegible.



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- 4.3.9.3 Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria: color, shape, or size; and additionally, in the case of tagout devices, print and format shall be standardized.
- 4.3.10 Lockout and tagout devices shall be substantial enough to prevent removal without the use of excessive force or unusual techniques, such as with the use of bolt cutters.
- 4.3.11 Tagout devices, including their means of attachment, shall be substantial enough to prevent inadvertent or accidental removal. Tagout device attachment means shall be
 - non-reusable.
 - attachable by hand.
 - self-locking.
 - non-releasable with a minimum unlocking strength of 50 lbs.
- 4.3.12 At least equivalent to a one-piece, all-environment nylon cable tie. Lockout devices and tagout devices shall indicate the identity of the employee applying the device.
- 4.4 Types of Systems Requiring Lock-out/Tag-out and/or Blinding/Blanking
 - 4.4.1 Examples of types of energy sources requiring lock-out/tag-out and/or blinding/blanking are as follows:
 - 4.4.1.1 Electrical systems prior to being connected to a power source and energized will be locked out until they are released for service. Any time repairs or modifications are made to electrical systems, either temporary or permanent, they shall be locked out. Locks/Tags shall be applied to the main disconnect whenever possible.
 - 4.4.1.2 Lines, valves, and similar systems that are being tested pneumatically with gases shall be tagged and/or locked out in accordance with 4.3, to prevent accidental discharge of the pressure within the line. In addition, areas affected by the pneumatic test shall be barricaded against entry and the Site HSE Manager notified before commencement of the test. For safe test distance requirements for personnel see 4.8.2.
 - 4.4.1.3 Sources of energy such as pipelines, valves, and pumps shall be locked, blanked off, and otherwise secured to prevent charging, energizing, or creating any type of hazard to persons working on systems or inside a confined space.
 - 4.4.2 Electrical Operated Systems
 - 4.4.2.1 Whenever work on electrical equipment or services are scheduled, the power source (disconnects, circuit breakers, switches) controlling electrical equipment or systems shall be de-energized.
 - 4.4.2.2 The Electrical Superintendent or their designee shall assure that any power panel(s), distribution panel(s), or equipment controller(s) have been de-energized. Control circuit devices, such as push buttons, selector switches, and interlocks, may not be used as the sole means of de-energizing circuits or equipment.
 - 4.4.2.3 Stored electrical energy which might endanger personnel shall be released. Capacitors shall be discharged and high capacitance elements shall be short-circuited and grounded, if the stored electrical energy might endanger personnel.
 - 4.4.2.4 Completed Danger – Do Not Operate Tag(s) and locks shall be attached to the controlling device by:
 - The person responsible for de-energizing the system, and
 - The craft supervisor responsible for this operation.



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- 4.4.2.5 Each authorized worker required to work on the de-energized equipment or systems shall ascertain that the craft supervisor's and/or their foreman's completed Danger Tag and lock is attached to the controlling device or devices and place their lock and tag on the device before they begin work.
- 4.4.2.6 The de-energized equipment or system shall be tested using a voltmeter on the downstream side of the tagged-out controlling device. If the equipment is wired directly to a power panel box and is energized by turning on a push button or butterfly switch on the equipment, the power panel box on the downstream side shall be tested using a voltmeter.
- 4.4.2.7 The Electrical Superintendent or their designee will establish and maintain a lockout log. (See AMS-710-02-FM-01501).
- 4.4.2.8 The lockout log shall list craft workers or personnel applying a lock and tag on any power panel, distribution panel, or equipment-controlling device.
- 4.4.2.9 Each employee shall detail in the lockout log the time of day the lock was applied, the necessity for the lockout, the area or machine where the work is being performed and the approximate length of time that the power panel, distribution panel, or equipment controller will be de-energized.
- 4.4.2.10 When the work is completed, the employees shall report this information to the Electrical Superintendent before removing their lock. The employees shall log the time the work was completed in the lockout log and the time the lock was removed.
- 4.4.2.11 The last lock on the lockout device shall not be removed until the Electrical Superintendent inspects the power panel, distribution panel, or the equipment controller that was de-energized.
- 4.4.2.12 Faceplates, doors, and covers shall be installed and in place before the panels are re-energized.
- 4.4.2.13 The Electrical Superintendent shall notify craft workers in the area that the power panel, distribution panel, or controller is about to be re-energized. The Electrical Superintendent or his designee may then remove that last lock.
- 4.4.2.14 The Electrical Superintendent or their designee shall check the re-energized power panel, distribution panel or equipment controller for proper operation.
- 4.4.2.15 The date and time of day when these panels or equipment controllers were restored to service shall be entered in the lockout log.
- 4.4.2.16 To lock out electrically powered shop equipment to ensure maximum employee safety, a power disconnect switch shall be installed between the main power supply panel and each piece of electrically driven equipment which is directly connected to the power panel box. (This does not apply to equipment, which is equipped with a plug connection, including welding equipment.) This disconnect switch shall be located close to the equipment and properly identified. Pushbuttons or butterfly controls of equipment shall not be locked out. A short circuit can occur between a locked out pushbutton and relay causing the equipment to be energized with full power. Since some equipment is wired with dual controls and locking out one pushbutton does not render that equipment inoperable, after tag and lockout try start buttons to be certain disconnect is complete.
- 4.4.3 Construction Equipment or Facilities
 - 4.4.3.1 The Electrical Superintendent, or their designee, shall open the switch, pull fuses and place his lock and tag on the equipment and then shall try the system.



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- 4.4.3.2 Other employees shall place their locks and tags on the lockout device.
- 4.4.3.3 Employees shall complete lockout log information.
- 4.4.3.4 Upon completion of the work the employees shall remove their locks and tags. The Electrical Superintendent shall be that last person to remove their locks.

4.4.4 Operating Facilities and Equipment

- 4.4.4.1 Operating unit electrician shall de-energize the system or equipment and demonstrate accuracy to the Electrical Superintendent or their designee.
- 4.4.4.2 Electrical Superintendent or their designee shall ascertain that the system is de-energized and place their lock and tag on the lockout device.
- 4.4.4.3 Other employees working on the system shall place their locks and tags on the device and complete the lockout log.
- 4.4.4.4 Upon completion of the work, the Electrical Superintendent or their designee is the last construction personnel to remove their lock and tag in the presence of the Operating Unit Electrician.
- 4.4.4.5 The Operating Unit Electrician then assumes control of the system.

4.4.5 Mechanical Work

- 4.4.5.1 Whenever work is scheduled on mechanical equipment or pressurized systems, controlling devices such as circuit breakers, switches, valve handles, and other operating mechanisms shall be locked and tagged out to prevent their manipulation or operation.
- 4.4.5.2 Affected workers required to work on mechanical equipment or pressurized systems shall determine that the craft supervisor's and their foreman's completed Lock/Danger Tag is attached to the controlling device or devices before they begin work.
- 4.4.5.3 Where controlling devices permit, a lock shall be placed on the device by each employee to ensure that the controlling device is not inadvertently energized.
- 4.4.5.4 De-energized equipment or systems shall be checked or tested to verify that the equipment is inoperable or that the pressurized system has been drained of its contents on the downstream side. To prevent harmful exposures, pressurized systems shall then be flushed out with water if liquids are involved or with inert gas if compressed gases are involved.
- 4.4.5.5 Appropriate air tests shall be conducted whenever pressurized systems have previously contained hazardous gases or liquids, especially if welding and burning operations are involved when the system has been shut down. When isolating a pressurized system, slip-blind or blanks are required.
- 4.4.5.6 All work that may involve pressurized vessels, pipes, or systems shall be done in accordance with 4.3.

4.5 Isolation of Structures and Pipelines

4.5.1 Safety Rule

- 4.5.1.1 All structures and pipelines, on which hot work is to be performed, shall be physically isolated from sources of contamination, be clean, and gas free. The only exception to this rule is USA municipal potable water tanks and hot taps approved by Corporate HSE.
 - Flange class designation is not the design pressure of the flange.



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- Sample for lower flammable limit (LFL) and oxygen on all municipal potable water tanks before entry or any hot or cold work.

4.5.1.2 The isolation, emptying, cleaning, and gas freeing are to be performed by the customer unless special arrangements have been agreed upon beforehand with Business Unit/Operating Group HSE Director. Blanks can be sized for the design pressure of the pipeline when known or the flange class when the design pressure is unknown. All blinds shall be per the current edition of ASME B16.5 or B16.47, matching the mating flange Class (150, 300) and diameter.

4.5.2 Isolation Method

4.5.2.1 The preferred methods of isolation for structures and pipelines are illustrated in AMS-710-02-FM-05302 Isolation of Structures and Pipelines New/Repair Work/Maintenance, Figure 1.0. These methods use a “free air space” between the source of contamination and the structure or pipeline. These methods are applicable for new construction, repairs and maintenance work, but if the pipeline contains an expansion joint, Engineering-Assigned shall approve the method of isolation before the disconnect is made.

4.5.2.2 The isolation methods in AMS-710-02-FM-05302 Figure 2 shall only be used when the methods in Figure 1.0 are not physically possible. To use Figure 2 isolation methods requires:

- Authorization by the local Operation or Construction Manager after site inspection to assure this method of isolation is necessary.

4.5.2.3 Prior to installation of the isolation blank, the blank is examined by a qualified APTIM employee for correctness; identified (steel stencil) such that after installation, it can be confirmed to be installed at the correct location.

- A qualified APTIM employee confirms the blank is installed at the correct location with gaskets on either side and a tag is attached.

4.5.3 Isolation Exception

4.5.3.1 Exceptions to isolation illustrated in AMS-710-02-FM-05302 Figure 1.0 and Figure 2.0 can only be approved by Corporate Risk Analysis. Exceptions will only be considered after a written safety plan is submitted to Corporate HSE.

4.5.3.2 The safety plan must provide adequate HSE Supervision to control potential hazards. A minimum of one full time HSE Supervisor is required. Additional supervisors may be required to insure complete control of safety on large turn arounds, special projects or process facilities. This HSE supervision shall be furnished by APTIM.

4.5.4 Remote Blank/Blind With Vapor Barrier

4.5.4.1 When it is impractical to isolate at the structures, it is permissible through the Isolation Exception 4.5.3 to install an appropriately sized blank/blind at a remote location (i.e., battery limit). A vapor barrier is required at the structure so no product residue or liquid from low-areas in the piping can enter the structure. The vapor barrier can be 3/16 to 1/4 inch (4.76 to 6.35 mm) thick, skillet blind with a 1 inch wide X 6 inches long (25 to 152 mm) handle. The skillet blind shall have a ¼ inch (6.35 mm) hole in the handle to attach a tag.

4.5.5 Company Policy on cleaning and gas-freeing vessels

4.5.5.1 APTIM personnel are not to assume responsibility for the cleaning and gas-freeing of any structure or pipeline. Exceptions to this rule shall be approved by Corporate HSE.



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4.5.6 Blank Thickness

4.5.6.1 Carbon steel blank thickness can be determined based on pipeline design pressure when available, or flange class as follows:

- DESIGN PRESSURE KNOWN – Using Table 1.0, Exhibit 7.1, follow the pipe size vertically down to a pressure equal to or greater than the required design pressure, then horizontally across to the left to determine the required blank thickness i.e., 320 psi design pressure, 18" pipe - blank thickness required is 1-1/8 inches (minimum allowable temperature is 15° F - See Table 3.0, Exhibit 7.1
- FLANGE CLASS KNOWN – Using Table 1.0, Exhibit 7.1, flange class is stamped on the flange i.e., Class 600 flange, 18 inch pipe - blank thickness required is 2-3/8 inches (minimum allowable temperature is 40° F - See Table 3.0, Exhibit 7.1.

4.5.6.2 Test pressure maximum 1-1/2 times design pressure of pipeline

4.5.6.3 Blank thickness/pressure calculated per ASME B31.3 paragraph 304.5.3

4.5.6.4 Allowances, such as corrosion, assumed to be zero

4.5.6.5 Gasket required on both sides of installed blank

4.5.6.6 Sizes larger than 24 inches based on ASME B16.47 Series A

- Maximum temperature A283-C is 200° F
- Maximum temperature A36 is 700° F
- Minimum temperature - See Table 3.0, Exhibit 7.1

4.5.6.7 Stainless steel blank thickness can be determined based on pipeline design pressure when available or flange class as follows:

- DESIGN PRESSURE KNOWN - Using Table 2.0, Exhibit 7.1, follow the pipe size vertically down to a pressure equal to or greater than the required design pressure, then horizontally across to the left to determine the required blank thickness. i.e., 540 psi design pressure, 10 inch pipe - blank thickness required is 7/8 inches
- FLANGE CLASS KNOWN - Using Table 2.0, Exhibit 7.1, flange class is stamped on the flange i.e., Class 600 flange, 10 inch pipe - blank thickness required is 1-1/4 inches

4.5.6.8 Test pressure maximum 1-1/2 times design pressure of pipeline

4.5.6.9 Blank thickness/pressure calculated per ASME B31.3 paragraph 304.5.3

4.5.6.10 Allowances, such as corrosion, assumed to be zero

4.5.6.11 Temperature range is -325° F to 300 F for solution heat treated material

4.5.6.12 Gasket required on both sides of installed blank

4.6 Unauthorized Use of a Danger – Do Not Operate Tag

4.6.1 The standard Danger – Do Not Operate Tag shall be used only for the purpose of identifying a de-energized piece of equipment or system. It is not to be used as a substitute for a defective tag or a Caution Tag.

4.6.2 A Caution Tag is to be used to inform personnel of special precautions or instructions for safe and proper operation of equipment.

4.6.3 Do not use a Caution Tag to warn against operating a system or piece of equipment. Only a Danger – Do Not Operate Tag (AMS-710-02-FM-01503) may be used to prevent the operation of a system or piece of equipment.

4.7 Unauthorized Actions



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- 4.7.1 The unauthorized removal of a Danger Tag from the controlling device of de-energized systems or pieces of equipment shall be grounds for immediate termination of the employee(s) involved.
- 4.7.2 The unauthorized operation of a controlling device of a de-energized system or piece of equipment that has been tagged out with a Danger Tag shall be grounds for immediate termination of the employee(s) involved.
- 4.7.3 The unauthorized removal of a blind or blank from a de-energized system or piece of equipment shall be grounds for immediate termination of the employee(s) involved.
- 4.8 Testing
 - 4.8.1 Functional Testing
 - 4.8.1.1 When the performance of a work activity requires the functional testing of a machine, component, or system, the locks and tags may be temporarily removed in accordance with this procedure, to perform the test. As a result of the testing, if it is determined that the equipment needs further work, the locks and tags shall be positioned back on to the device. If it is not necessary to replace all the locks and tags, then the unnecessary locks and tags shall be returned to the Lockout/Tagout Coordinator. The Site HSE Manager shall initial the Lockout/Tagout Request in the removal block to indicate that these locks and tags have been removed.
 - Make sure all danger areas are clear of personnel.
 - Verify that the main disconnect switch or circuit breaker cannot be moved to the on position.
 - Use a voltmeter or other equipment to check the switch on electrical devices.
 - Press all start buttons and other activating controls on the equipment itself.
 - Shut off all machine controls when the testing is finished.
 - 4.8.1.2 When multi-worker or multi-craft situations exist, a multi-lockout tag is to be used. These devices allow for multiple locks for protection of all craft involved. Each lock shall be properly tagged.
 - 4.8.2 Safe Test Distances for Personal
 - 4.8.2.1 The following AMS Procedures shall be reviewed for establishing safe personal test distances:
 - Hydro-Pneumatic Testing of Field Erected Pressure Vessels - AMS-830-05-PR-46002
 - Hydrostatic Testing of Field Erected Pressure Vessels – AMS-830-05-PR-46003
 - Pneumatic Testing of Field Erected Pressure Vessels – AMS-830-05-PR-46004
 - Safe Working Distance for Hearing Protection during Hydrotest of Piping – AMS-830-06-FM-40003
 - Safe Working Distance for Hearing Protection During Pneumatic Testing of Piping – AMS-830-06-FM-40004
- 4.9 Emergency Removal of Employee's Lockout Lock
 - 4.9.1 Lockout/tagout device removal
 - 4.9.1.1 Each lockout/tagout device shall be removed from each energy-isolating device by the employee who applied the device. When the employee who applied the lockout/tagout device is not available to remove it, the device may be removed only after the following steps have been completed.



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- The craft supervisor and general foreman/foreman shall verify that the employee who applied the lockout/tagout device is not at the facility or available to return.
- The craft supervisor and general foreman/foreman shall make a reasonable effort to contact the employee to inform him or her that the lockout/tag-out device shall be removed. The employee shall return to the site, to remove the lock if possible.
- The craft supervisor and the general foreman/foreman shall "walk-down" the entire system to verify it is safe to start the system.
- The craft supervisor and general foreman/foreman shall complete an "Emergency Lockout Device Removal" form (AMS-710-02-FM-01502) and present it to the site superintendent and the Site HSE Manager for approval to remove the lock.

Note: If the Site Superintendent or the Site HSE Manager is absent, the Site Manager assumes their signature authority. If the Site Manager is also absent then the designees that have received signature authority by designation may sign the "Emergency Lock-out Device Removal" form only after contacting the person they are receiving this signature authority from and that person has granted verbal permission to do so.

- The craft supervisor and/or general foreman/foreman shall ensure that the employee whose lock was removed has been notified prior to returning to work on the system.

4.10 Training

4.10.1 Personnel shall receive Lock-Out/Tag-Out Training as required by the OSHA Standard for Control of Hazardous Energy Sources.

4.10.2 Authorized employees shall also be trained to recognize hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

4.10.3 Each affected employee shall be instructed in the purpose and use of the energy control procedure. workers shall receive Lock-Out/Tag-Out Training to include the following minimum requirements:

4.10.3.1 Retraining of all affected employees shall be conducted and documented when there is a change in:

- Assignments
- Machines
- Equipment
- Processes
- When lock out/tag out inspections reveal a need, or supervision sees a need
- New hazards or changes in the energy control procedure

4.10.4 When tagout systems are used, employees shall also be trained in the following limitations of tags:

4.10.4.1 Tags are essentially warning devices affixed to energy isolating devices, and do not provide the physical restraint on those devices that is provided by a lock.

4.10.4.2 When a tag is attached to an energy isolating means, it is not to be removed without authorization of the authorized person responsible for it, and it is never to be bypassed, ignored, or otherwise defeated.



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- 4.10.4.3 Tags must be legible and understandable by all authorized employees, affected employees, and all other employees whose work operations are or may be in the area, in order to be effective.
- 4.10.4.4 Tags and their means of attachment must be made of materials which will withstand the environmental conditions encountered in the workplace.
- 4.10.4.5 Tags may evoke a false sense of security, and their meaning needs to be understood as part of the overall energy control program.
- 4.10.4.6 Tags must be securely attached to energy isolating devices so that they cannot be inadvertently or accidentally detached during use.
- 4.10.5 Sites shall maintain a list of the names and job titles of all employees who are authorized to lock out/tag out the specified machine, system or equipment.
- 4.10.6 A written record shall be maintained of all employees who have been trained in the company or site's lock out/tag out program.

4.11 Periodic Inspections

- 4.11.1 Periodic inspections of the energy control procedures shall be conducted at least annually.
 - 4.11.1.1 The periodic inspection shall be performed by an authorized employee other than the one utilizing the energy control procedure.
 - 4.11.1.2 The periodic inspection shall be conducted to correct deviations or inadequacies identified.
 - 4.11.1.3 Where lockout is used for energy control, the periodic inspection shall include a review between each authorized and affected employee, of that employee's responsibilities under the energy control procedure.
 - 4.11.1.4 The site shall certify that periodic inspections have been performed. The certification shall identify the machine or equipment on which the energy control procedure was being utilized, the date of the inspection, and the person performing the inspection.

5.0 REFERENCES

29 CFR 1910.147	Control of Hazardous Energy
ASME B16.5	Pipe Flanges and Flanged Fittings
ASME B16.47	Series A Flanges

6.0 TERMINOLOGY

<u>Term</u>	<u>Definition</u>
Affected employee	An employee whose job requires him/her to operate or use a machine or equipment on which servicing or maintenance is being performed under lockout or tagout, or who's job requires him/her to work in an area which such servicing or maintenance is being performed.
Authorized employee	A person who locks out tags out machines, systems or equipment in order to perform servicing or maintenance on that machine, system or equipment. An affected employee becomes and authorized employee when the employees' duties include performing servicing.



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Blanking or Blinding	The absolute closure of a pipe, line or duct by the fastening of a solid plate (such as a spectacle blind or skillet blind) that completely covers the bore, that is capable of withstanding the maximum pressure of the pip, line or duct with no leakage beyond the plate.
Capable of being locked out	An energy isolating device is capable of being locked out if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it. Other energy isolating devices are capable of being locked out, if lockout can be achieved without the need to dismantle, rebuild, or replace the energy isolating device or permanently alter its energy control capability.
Caution Tag	This tag is used to inform personnel of special precautions or instructions about safe and proper operation of equipment. This tag is not to be used to prevent the machines, systems, or equipment from being operated.
Danger – Do Not Operate Tag	This tag is attached to warn others that the machines, systems, and/or equipment has been isolated from its power source (de-energized) and that employees are working on the machines, systems, or equipment.
Double Valve and Vent	A valve arrangement in a piping system in which three valves are arranged in conjunction with a vent line. One valve is upstream of the vent, another downstream, on one is on the vent itself. To isolate the downstream system, the vent valve is opened, the other two are closed and all three valves are locked into position.
Energy Sources	Any source of energy, i.e., electrical, spring, gravity, hydraulic, pneumatic, and chemical.
Qualified Person	A person who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated his/her ability to solve or resolve problems related to the subject matter, the work, or the project.
Site	Any location, facility or project where APTIM is performing work. Sites may include, but are not limited to, laboratories, offices, shops, owned facilities, leased facilities and/or project sites.

7.0 EXHIBITS

Exhibit 7.1	Tables
Exhibit 7.2	AMS-710-02-FM-01501 – Lock Out Log
Exhibit 7.3	AMS-710-02-FM-01502 – Emergency Lock Out Device Removal
Exhibit 7.4	AMS-710-02-FM-01503 – Do Not Operate Tag
Exhibit 7.5	AMS-710-02-FM-05302 – Isolation of Structures and Pipelines New/Repair Work/Maintenance
Exhibit 7.6	AMS-720-01-FM-00020 – Business Glossary
Exhibit 7.7	AMS-720-01-FM-00021 – Technical Glossary

8.0 ATTACHMENT

None



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EXHIBIT 7.1 TABLES

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**TABLE 1.0
CARBON STEEL BLANKS
(16.1 ksi stress - ASTM A283-C/A36)**

		PIPE SIZE															
		1	1 1/2	2	3	4	6	8	10	12	14	16	18	20	24	30	36
		DESIGN PRESSURE (psi)															
THICKNESS (in)	1/4	3120	1480	950	440	270	120	70	50	30	30	20	20	10	10	10	0
	3/8	7010	3320	2140	990	600	280	160	100	70	60	50	40	30	20	10	10
	1/2	12460	5910	3810	1750	1060	490	290	190	130	110	80	70	50	40	20	20
	5/8		9230	5950	2740	1660	760	450	290	210	170	130	100	80	60	40	30
	3/4			8560	3940	2390	1100	650	420	300	250	190	150	120	80	50	40
	7/8				5370	3250	1500	880	570	400	340	260	200	160	110	70	50
	1				7010	4240	1960	1150	740	530	440	340	270	210	150	100	70
	1 1/8				8870	5370	2480	1460	940	670	550	420	340	270	190	120	80
	1 1/4					6630	3060	1800	1160	830	680	520	410	340	230	150	100
	1 3/8					8020	3700	2180	1400	1000	830	630	500	410	280	180	130
	1 1/2					9540	4400	2600	1670	1190	990	750	600	480	340	210	150
	1 3/4						5990	3530	2280	1620	1340	1030	810	660	460	290	200
	2						7830	4620	2970	2110	1750	1340	1060	860	600	380	270
			BLANK THICKNESS (in)														
Class 150	1/4	1/4	1/4	1/4	3/8	3/8	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 1/2	1 3/4	2 1/8	
Class 300	1/4	1/4	1/4	3/8	1/2	5/8	7/8	1	1 1/4	1 3/8	1 1/2	1 3/4	1 7/8	2 1/4	2 7/8	3 3/8	
Class 600	1/4	1/4	3/8	1/2	5/8	7/8	1 1/4	1 1/2	1 5/8	1 7/8	2 1/8	2 3/8	2 3/4	3 1/4	4	5	

**TABLE 2.0
STAINLESS STEEL BLANKS
(20 ksi stress - ASTM A240 type 304/316)**

		PIPE SIZE															
		1	1 1/2	2	3	4	6	8	10	12	14	16	18	20	24	30	36
		DESIGN PRESSURE (psi)															
THICKNESS (in)	1/4	3870	1830	1180	540	330	150	90	60	40	30	30	20	20	10	10	0
	3/8	8710	4130	2660	1220	740	340	200	130	90	80	60	50	40	30	20	10
	1/2	15480	7340	4730	2180	1320	610	360	230	160	140	100	80	70	50	30	20
	5/8		11470	7390	3400	2060	950	560	360	260	210	160	130	100	70	50	30
	3/4			10640	4900	2960	1370	810	520	370	310	230	190	150	100	70	50
	7/8				6670	4030	1860	1100	710	500	420	320	250	200	140	90	60
	1				8710	5270	2430	1430	920	660	540	420	330	270	190	120	80
	1 1/8				11020	6670	3080	1810	1170	830	690	530	420	340	230	150	100
	1 1/4					8230	3800	2240	1440	1030	850	650	510	420	290	190	130
	1 3/8					9960	4590	2710	1750	1240	1030	790	620	500	350	220	160
	1 1/2					11850	5470	3230	2080	1480	1220	940	740	600	420	270	190
	1 3/4						7440	4390	2830	2010	1670	1280	1010	820	570	360	250
	2						9720	5740	3690	2620	2180	1670	1320	1070	740	470	330
			BLANK THICKNESS (in)														
Class 150	1/4	1/4	1/4	1/4	1/4	1/4	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 5/8	1 7/8		
Class 300	1/4	1/4	1/4	3/8	3/8	5/8	3/4	7/8	1 1/8	1 1/4	1 3/8	1 1/2	1 3/4	2	2 1/2	3	
Class 600	1/4	1/4	3/8	1/2	5/8	7/8	1	1 1/4	1 1/2	1 3/4	1 7/8	2 1/8	2 3/8	2 7/8	3 1/2	4 1/4	



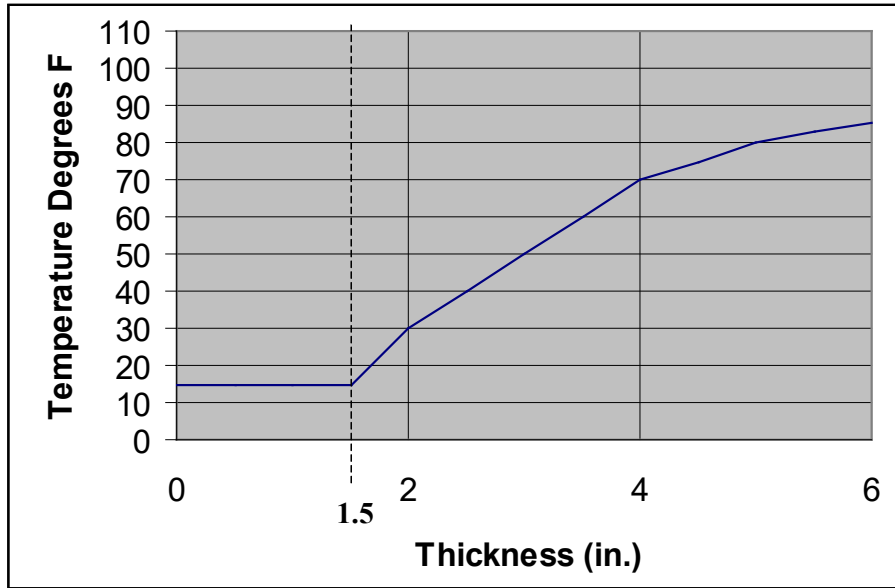
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**TABLE 3.0
MINIMUM TEMPERATURE FOR BLANKS W/O IMPACT TESTING
(A283-C/A36)**



**TABLE 4.0
BLANK AND GASKET DIAMETERS**

Pipe Size	Class 150			Class 300			Class 600		
	Blank O.D.	Gasket		Blank O.D.	Gasket		Blank O.D.	Gasket	
		O.D.	I.D.		O.D.	I.D.		O.D.	I.D.
1	2 1/2	2 5/8	1.0625	2 3/4	2 7/8	1.0625	2 3/4	2 7/8	1.0625
1 1/2	3 1/4	3 3/8	1.91	3 5/8	3 3/4	1.91	3 5/8	3 3/4	1.91
2	4	4 1/8	2 3/8	4 1/4	4 3/8	2 3/8	4 1/4	4 3/8	2 3/8
3	5 1/4	5 3/8	3 1/2	5 3/4	5 7/8	3 1/2	5 3/4	5 7/8	3 1/2
4	3/4	6 7/8	4 1/2	7	7 1/8	4 1/2	7 1/2	7 5/8	4 1/2
6	8 5/8	8 3/4	6 5/8	9 3/4	9 7/8	6 5/8	10 3/8	10 1/2	6 5/8
8	10 7/8	11	8 5/8	12	12 1/8	8 5/8	12 1/2	12 5/8	8 5/8
10	13 1/4	13 3/8	10 3/4	14 1/8	14 1/4	10 3/4	15 3/8	15 3/4	10 3/4
12	16	16 1/8	12 3/4	16 1/2	16 5/8	12 3/4	17 7/8	18	12 3/4
14	17 3/8	17 3/4	14	18 3/4	19 1/8	14	19 1/4	19 3/8	14
16	19 7/8	20 1/4	16	20 7/8	21 1/4	16	22 1/8	22 1/4	16
18	21 1/4	21 5/8	18	23 1/8	23 1/2	18	24	24 1/8	18
20	23 1/2	23 7/8	20	25 3/8	25 3/4	20	26 3/4	26 7/8	20
24	27 7/8	28 1/4	24	30 1/8	30 1/2	24	31	31 1/8	24
30	34 1/4	34 3/4	30	37	37 1/2	30	37 3/4	38 1/4	30
36	40 3/4	41 1/4	36	43 1/2	44	36	44	44 1/2	36

ATTACHMENT 3

INCIDENT REPORTING FORMS

USACE Summary of Contractor Work-Related Injuries and Illnesses



Month Submitted _____

Year _____

US Army Corps of Engineers

Review the Record and verify that the entries are complete & accurate before completing this summary.

Using the Record, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the record. If you had no cases write "0". This summary is a cumulative record of the injury/illness experience for the year

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	0	0	0
(G)	(H)	(I)	(J)

Number of Days

Total days of job transfer or restriction	Total days away from work
0	0
(K)	(L)

Injury and Illness Types

Total number of...			
(M)			
(1) Injury	0	(4) Poisoning	0
(2) Skin Disorder	0	(5) Hearing Loss	0
(3) Respiratory Condition	0	(6) All other illnesses	0

Establishment information

Establishment name _____

Street _____

City _____

State _____

Zip _____

Industry description (e.g., Manufacture of motor truck trailers) _____

Standard Industrial Classification (SIC), if known (e.g., SIC 3715) _____

or _____

North American Industrial Classification (NAICS) if known (e.g. 336212) _____

Employment information

Annual average number of employees _____

Total hours worked by all employees last year _____

Aptim Federal Services, LLC Incident Notification, Reporting, and Management Procedure

Directions, Notes, and Reminders

- Follow this procedure step-by-step for all incidents.
- This procedure has limited application to subcontractors. Assist subcontractors with medical emergencies (as applicable) and then immediately notify the Program H&S Manager for guidance.
- Periodically review this procedure in order to be familiar with the steps - prior to an incident occurring.
- For injuries and vehicle accidents, secure the scene to prevent additional injury/incident, administer on-site first aid, and arrange for emergency assistance prior to making any other notifications.
- The Site Supervisor is responsible for making all other notifications to:
 - CORE Health Networks (must be notified while employee is en route to medical care facility):
877-347-7429
 - Help Desk / Hot Line: 800-537-9540
 - Project Manager: Don Burton 865-207-1394 (cell)
 - Marcia Musgrave: 419-429-5520
- The Site Supervisor (or SSHO) is responsible for notifying the Program H&S Manager or Alternate H&S Manager by telephone prior to making any other notifications (other than calling 911 and CORE).
- The Site Supervisor or SSHO shall accompany all injured personnel to the CORE clinic or to the hospital emergency room.
- The Project Manager shall notify the Program Manager in person or by telephone no later than two hours after the incident and the U.S. Army Garrison Chief, Installation Restoration Branch (256) 842-3702.
- All incident reports shall be completed by typing (when feasible and applicable).
- All incident reports shall be submitted (email or fax) to the Program H&S Manager or Alternate H&S Manager for review and distribution.
- Complete all the blanks on the INCIDENT NOTIFICATION AND COMMUNICATION CONTACT LIST (page 6) and post near all site telephones.

Aptim Federal Services, LLC Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
1. Notify Site Supervisor for all incidents (no matter how minor)	Injured person, first person recognizing incident, driver/passenger, or employee causing damage <i>Immediately</i>	All incidents no matter how minor (including minor cuts, scratches, minor strains/sprains, and insect bites)	In person or by telephone	Site Supervisor to make note of very minor incidents (such as band-aid over scratch) in field logbook
2. For <i>life-threatening injuries / illnesses</i> - make scene safe, contact local emergency personnel	Site Supervisor <i>Immediately (concurrently with next step if injury or illness)</i>	In case of serious injury or illness requiring off-site medical care	Via ambulance	Site Supervisor or Site Safety Officer must immediately go to emergency care facility. Follow AMS-710-01-PR-03600 post accident alcohol and drug testing procedure.
For <i>non life-threatening injuries / illnesses</i> - make scene safe, transport injured person to doctor at an occupational medical facility See Clinic Route Maps and Directions	Site Supervisor <i>Immediately (concurrently with next step if injury or illness)</i>		Via vehicle	Site Supervisor or Site Safety and Health Officer must transport and stay with injured person until released from care.
For <i>vehicle accidents</i> – make scene safe, notify police, aid injured parties	Driver/passenger <i>Immediately</i>			Make medical personnel aware of “restricted work will be provided” and “no prescriptions if possible” policies.
For <i>equipment / property damage</i> - make scene safe, prevent further damage or injuries	Employee causing damage <i>Immediately</i>			CORE clinics are the preferred urgent care facilities when possible, unless injury is severe and victim is transported by ambulance.
3. Notify CORE Health Networks (for injuries / illnesses to APTIM employees only)	Site Supervisor <i>Immediately, prior to transporting the injured employee, unless injuries are life threatening</i>	<ul style="list-style-type: none"> • Serious injury requiring off-site medical care • If employee states that he/she has been exposed to any chemical or biological substance • If illness is work related 	CORE Medical 877-347-7429 Note: Outside Continental US call: 225-614-9561	Not required for temporary agency and subcontractor labor Provide name of injured employee, name and phone # of treating medical facility, description of the incident CORE will help with medical facility coordination and follow-up care
4. Notify Program H&S Manager (if unsure, see contact list) Notify Alternate H&S Manager if Program H&S Manager cannot be contacted. (if unsure, see contact list)	Site Supervisor <i>Immediately (concurrently with providing transportation to occupational medical facility or EMS transport to hospital)</i>	All incidents except on-site first aid cases	See Incident Notification and Communication Contact List (attached)	Program H&S Manager will notify H&S Director

Aptim Federal Services, LLC Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
5. Notify APTIM Notification Hotline / Help Desk	Site Supervisor <i>As soon as possible. Prior to sending an individual for medical treatment</i>	<ul style="list-style-type: none"> Illness and/or injury (doctors cases and above) Any utility damage Property damage (damage > \$5,000) Vehicle accidents (All) Criminal activity (i.e. bomb threat, theft) Natural disaster (all) Explosion and/or fires Environmental spills/releases (incidents that requires regulatory notification or have an offsite impact) Regulatory agency visit Fatalities 	APTIM Notification Hotline / Help Desk Phone Number: 800-537-9540 Note - Outside the Continental US call: 225-215-5056	Request name of Hotline / Help Desk operator for future reference and note date/time of notification
6. Complete forms: <i>Injuries and illnesses:</i> <ul style="list-style-type: none"> Authorization for Release of Protected Medical Information Authorization for Treatment of Occupational Injury/Illness Return-To-Work Examination Form <i>and</i> fax to CORE <i>and</i> email or fax to Program H&S Manager	Injured employee and medical facility personnel (Site Supervisor or Site Safety and Health Officer is responsible for verifying forms are completed) <i>Prior to leaving medical facility</i>	<ul style="list-style-type: none"> Serious injury requiring off-site medical care If employee states that he/she has been exposed to any chemical or biological substance 	Fax to CORE: 225.292.8986 Email or fax to Program H&S Manager	Site Supervisor or Site Safety and Health Officer must take these forms (Contained in 710-01-PR-02100, AMS-710-05-PR-02200, and AMS-710-05-PR-02300)
7. Call Project Manager and notify of incident (Remind Project Manager of notification responsibilities to Program Manager)	Site Supervisor <i>As soon as reasonably possible</i>	If Hot Line / Help Desk notification is required (see # 5 above)	See Incident Notification and Communication Contact List	Project Manager will verbally report incident to upper level of Operations/Business Line Management <i>As soon as reasonably possible</i>
8. Notify Marcia Musgrave	Site Supervisor	All incidents involving personnel (injuries, illnesses, vehicle accidents)	419-429-5520	

Aptim Federal Services, LLC Incident Notification, Reporting, and Management Procedure

Action	Who / When	Under what circumstances	How	Notes
9. Call back Program H&S Manager to report on status of <i>injured / ill employee</i>	Site Supervisor <i>Prior to employee leaving medical facility</i>	All injuries and illnesses requiring off-site medical care	See Incident Notification and Communication Contact List (attached)	
10. Complete forms (typed electronically): OSHA Recordable Cases <ul style="list-style-type: none"> • Supervisor's Employee Injury/Illness Report Form • Injured Employee Statement • Witness Statement Form(s) First Aid Cases (Doctor's) <ul style="list-style-type: none"> • Supervisor's Employee Injury/Illness Report • Injured Employee Statement • Witness Statement Form(s) Email or Fax completed forms to Program H&S Manager and CORE	<ul style="list-style-type: none"> • Site Supervisor • Witnesses <i>As soon as possible – no later than 24 hours</i>	All injuries, illnesses, and first aid cases	Email or fax to Program H&S Manager See Incident Notification and Communication Contact List (attached) Fax to CORE 225.292.8986	Site Supervisor should have these forms with him/her at all times (Contained in 710-01-PR-02100, AMS-710-05-PR-02200, and AMS-710-05-PR-02300)
11. Complete forms (typed electronically): Chargeable Vehicle Accidents <ul style="list-style-type: none"> • Vehicle Accident Report • Witness Statement Form(s) • Driving Record Certification (Procedure HS800) Non-Chargeable Vehicle Accidents <ul style="list-style-type: none"> • Vehicle Accident Report • Witness Statement Form(s) Equipment, Property Damage and General Liability Incidents <ul style="list-style-type: none"> • Equipment, Property Damage and General Liability Loss Report • Witness Statement Form(s) Email or Fax completed forms to Program H&S Manager	<ul style="list-style-type: none"> • Site Supervisor • Witnesses <i>As soon as possible – no later than 24 hours</i>	All vehicle accidents and /or all property damage	Email or fax to Program H&S Manager Health See Incident Notification and Communication Contact List (attached)	Supervisor should have these forms with him/her at all times (Contained in 710-01-PR-02100, AMS-710-05-PR-02200, and AMS-710-05-PR-02300)

Aptim Federal Services, LLC Incident Notification and Communication Contact List

Project Number: 501388 Project/Office Name/Location: RSA DO W912DY 19F1116 / Redstone Arsenal, Huntsville, AL

Name	Phone Number(s)	Fax Number	E-mail
Federal Services Notification Hotline/Helpdesk	800-537-9540	N/A	N/A
CORE (Must be notified prior to or during transport to medical treatment center)	877-347-7429	225-292-8986	N/A
Medical Services Administrative Manager Marcia Musgrave	419-429-5520 (office) 419-819-7848 (mobile)	419-429-5526	marcia.musgrave@aptim.com
APTIM H&S Manager: Doug Russell	865-560-7918 (office) 865-414-9545 (cell)		winston.russell@aptim.com
APTIM Program Manager: Steven Moran	865-560-7905 (office) 865-607-91484 (cell)	865-560-7956	Steve.g.moran@aptim.com
APTIM Project Manager: Don Burton	865-207-1394 (cell)		don.burton@aptim.com
APTIM Federal E&D Program CIH – Larry Verdier	513-378-8021 (cell)		larry.verdier@aptim.com
APTIM VP of HSE – Michael Karr	225-987-7740 (office) 985 969 2580 (cell)		michael.karr@aptim.com

Note: Incident reports shall be faxed or emailed only to the Program H&S Manager (or Alternate H&S Manager) for review and proper distribution.

WORK SHEET FOR GOVT & CONTRACTOR PRELIMINARY ACCIDENT NOTIFICATION

This work sheet is a field tool to assist the collection of information about an accident and facilitate the completion of a Preliminary Accident Notification. For Member of the Public Recreation Visitor accidents use the Initial Notification of Public Recreation Mishap Work Sheet

General Information:			
1. Project Name:	2. HNC Project Office Symbol:	3. Date Worksheet completed:	
4. Person Name Completing Worksheet:		5. Phone Number:	6. Contract Number:
7. Date of Mishap:		8. Time of Mishap	
9. Prime Contractor:		10. Subcontractor:	
Location and Mishap Information:			
1. Exact Location of Mishap:			
2. Number of Persons involved:		3. Number of Properties involved:	
Personnel Classification:			
Government Civilian: <input type="checkbox"/>	Military: <input type="checkbox"/>	Government Direct Contractor: <input type="checkbox"/>	Foreign National: <input type="checkbox"/>
Volunteer: <input type="checkbox"/>	Prime Contractor: <input type="checkbox"/>	Subcontractor: <input type="checkbox"/>	Public: <input type="checkbox"/> Other: <input type="checkbox"/>
Type of Mishap:			
Fatality: <input type="checkbox"/>	Injury / Illness: <input type="checkbox"/>	Property Damage: <input type="checkbox"/>	Fire: <input type="checkbox"/> Driving: <input type="checkbox"/>
Personal Data: (Note: If more than 2 persons involved provide their personal data on a separate sheet)			
1. Name: Last:		First:	Middle Initial:
4. Job Series & Title:		2. Age:	
3. Gender:		5. Grade:	
6. Duty Status: On Duty: <input type="checkbox"/>		Off Duty: <input type="checkbox"/>	TDY: <input type="checkbox"/>
7. Time Work Began:		10. Date Hired:	
8. Unit and Station Assignment:		9. Office Symbol:	
11. What was Person doing before the mishap occurred?			
Injury Information:			N/A
1. Nature of Injury:		2. Primary Body Part Affected:	2.a. Secondary:
3. Type of Injury:		4. Source of Injury:	
5. Severity of Injury: Fatality: <input type="checkbox"/> Permanent Total Disability: <input type="checkbox"/> Permanent Partial Disability: <input type="checkbox"/>			
Other: <input type="checkbox"/> If Other Describe:			
6. Estimated Days Away:		7. Estimated Days Restricted/Transferred:	
8. Primary Language Spoken:		9. English Literate: Yes: <input type="checkbox"/> No: <input type="checkbox"/>	
10. Does this person wish to remain anonymous: Yes: <input type="checkbox"/> No: <input type="checkbox"/>			
11. Was injured person hospitalized? Yes: <input type="checkbox"/> No: <input type="checkbox"/>			
12. Name of Physician/Health Care Professional:			
13. Medical Treatment Facility Name:			14. Phone #:
15. Facility Address:			
Summary of Mishap			
Remarks			
Describe Any Information Released to the Public			

Nature of Injury

Amputation
Abrasion
Back Strain
Burn
Contusion/Bruise
Concussion
Dislocation of joint

Drowning
Fracture
Hearing Loss
Hernia
Laceration/Cut
Puncture
Strain

Stroke
Traumatic Food Poisoning
Traumatic Heart Condition
Traumatic Mental Disorder
Traumatic Respiratory
Traumatic Skin Disease

Tuberculosis
Traumatic
Virological/Infective
Parasitic Disease
Other

Type of Injury

Struck by/against
Fell/slipped/tripped
Caught on/in/between

Punctured/lacerated
Stung/bit by
Contact with/by

Exerted
Exposed
Inhaled

Ingested
Absorbed
Traveling In

Severity of Injury

Injury

Illness

Fatality

Permanent Disability

Source of Injury

Environmental
Condition
Building or other
Area
Walking surface
Electricity
Temperature Extreme
Weather

Fire
Water
Mechanical
Equipment
Guard/Shield
Video Display
Terminal
Heating
Motor Vehicle/Cycle

Boat
Bicycle/Other non-
motorized vehicle
Noise
Radiation
Light
Ventilation
Smoke
Stress

Confined Space
Carbon Monoxide
Inanimate Object
Animal Insect
Human (Violence)
Diving Equipment
Parachute

Body Parts

Arm or Wrist
Breast
Testicle
Abdomen
Chest
Lower Back
Penis
Side
Upper Back
Waist
Trunk Other
Ear
Eye

Brain
Cranial Bones
Teeth
Jaw
Throat/Larynx
Mouth
Nose
Tongue
Head Other External
Elbow
Finger
Thumb
Toe

Face
Scalp
Knee
Leg
Hip
Ankle
Buttock
Hand
Feet
Collar Bone
Shoulder Blade
Rib
Sternum

Vertebrae
Trunk Bones other
Shoulder
Lung
Kidney
Heart
Liver
Reproductive Organs
Stomach
Intestines
Trunk/internal

<i>(For safety staff only)</i>	REPORT NO.	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT For use of this form, see Help Menu and USACE Supplement to AR 385-40 The proponent agency is CESO	REQUIREMENT CONTROL SYMBOL: CEEC-S-8 (R2)
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1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT <input type="checkbox"/> CIVILIAN <input type="checkbox"/> MILITARY	<input type="checkbox"/>	<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> CONTRACTOR	<input type="checkbox"/>	<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> PUBLIC	<input type="checkbox"/> FATAL <input type="checkbox"/> OTHER	XXXXXXXXXX	<input type="checkbox"/>	XXXXXXXXXX

2. PERSONAL DATA

a. NAME (Last, First MI.)	b. AGE	c. SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE
f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ON DUTY <input type="checkbox"/> TDY <input type="checkbox"/> OFF DUTY		h. EMPLOYMENT STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ARMY ACTIVE <input type="checkbox"/> ARMY RESERVE <input type="checkbox"/> VOLUNTEER <input type="checkbox"/> PERMANENT <input type="checkbox"/> FOREIGN NATIONAL <input type="checkbox"/> SEASONAL <input type="checkbox"/> TEMPORARY <input type="checkbox"/> STUDENT <input type="checkbox"/> OTHER (Specify) _____	

3. GENERAL INFORMATION

a. DATE OF ACCIDENT (YYYYMMDD)	b. TIME OF ACCIDENT (Military Time) hrs.	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME (1) PRIME
e. CONTRACT NUMBER <input type="checkbox"/> CIVIL WORKS <input type="checkbox"/> MILITARY <input type="checkbox"/> OTHER (Specify) _____	f. TYPE OF CONTRACT <input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> SERVICE <input type="checkbox"/> A/E <input type="checkbox"/> DREDGE <input type="checkbox"/> OTHER (Specify) _____		g. HAZARDOUS/TOXIC WASTE ACTIVITY <input type="checkbox"/> SUPERFUND <input type="checkbox"/> DERP <input type="checkbox"/> IRP <input type="checkbox"/> OTHER (Specify) _____
(2) SUBCONTRACTOR			

4. CONSTRUCTION ACTIVITIES ONLY (Fill in line and corresponding code number in box from list - see help menu)

a. CONSTRUCTION ACTIVITY (CODE) # <input style="width:50px;" type="text"/>	b. TYPE OF CONSTRUCTION EQUIPMENT (CODE) # <input style="width:50px;" type="text"/>
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5. INJURY/ILLNESS INFORMATION (Include name on line and corresponding code number in box for items e, f & g - see help menu)

a. SEVERITY OF ILLNESS/INJURY (CODE) # <input style="width:50px;" type="text"/>	b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY
e. BODY PART AFFECTED (CODE) PRIMARY # <input style="width:50px;" type="text"/> SECONDARY # <input style="width:50px;" type="text"/>	g. TYPE AND SOURCE OF INJURY/ILLNESS (CODE) TYPE # <input style="width:50px;" type="text"/> SOURCE # <input style="width:50px;" type="text"/>		
f. NATURE OF ILLNESS / INJURY (CODE) # <input style="width:50px;" type="text"/>			

6. PUBLIC FATALITY (Fill in line and correspondence code number in box - see help menu)

a. ACTIVITY AT TIME OF ACCIDENT (CODE) # <input style="width:50px;" type="text"/>	b. PERSONAL FLOTATION DEVICE USED? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A
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7. MOTOR VEHICLE ACCIDENT							
a. TYPE OF VEHICLE		b. TYPE OF COLLISION		c. SEAT BELTS	USED	NOT USED	NOT APPLICABLE
<input type="checkbox"/> <input type="checkbox"/> PICKUP/VAN <input type="checkbox"/> <input type="checkbox"/> AUTOMOBILE <input type="checkbox"/> <input type="checkbox"/> TRUCK <input type="checkbox"/> <input type="checkbox"/> OTHER (Specify) _____		<input type="checkbox"/> SIDE SWIPE <input type="checkbox"/> HEAD ON <input type="checkbox"/> REAR END <input type="checkbox"/> BROADSIDE <input type="checkbox"/> ROLL OVER <input type="checkbox"/> BACKING <input type="checkbox"/> OTHER (Specify) _____		(1) FRONT SEAT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
				(2) REAR SEAT	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. PROPERTY MATERIAL INVOLVED							
a. NAME OF ITEM			b. OWNERSHIP		c. AMOUNT OF DAMAGE		
(1)							
(2)							
(3)							
9. VESSEL/FLOATING PLANT ACCIDENT (Fill in line and correspondence code number in box from list - see help menu)							
a. ACTIVITY AT TIME OF ACCIDENT			a. ACTIVITY AT TIME OF ACCIDENT				
(CODE)			(CODE)				
# <input style="width: 50px;" type="text"/>			# <input style="width: 50px;" type="text"/>				
10. ACCIDENT DESCRIPTION (Use additional paper, if necessary, see attached page 4.)							
11. CAUSAL FACTOR(s) (Read instructions before completing)							
a. (Explain YES answers in item 13)							
DESIGN: Was design of facility, workplace or equipment a factor?					YES	NO	
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?					<input type="checkbox"/>	<input type="checkbox"/>	
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?					<input type="checkbox"/>	<input type="checkbox"/>	
OPERATING PROCEDURES: Were operating procedures a factor?					<input type="checkbox"/>	<input type="checkbox"/>	
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?					<input type="checkbox"/>	<input type="checkbox"/>	
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?					<input type="checkbox"/>	<input type="checkbox"/>	
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?					<input type="checkbox"/>	<input type="checkbox"/>	
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?					<input type="checkbox"/>	<input type="checkbox"/>	
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?					<input type="checkbox"/>	<input type="checkbox"/>	
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?					<input type="checkbox"/>	<input type="checkbox"/>	
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?					<input type="checkbox"/>	<input type="checkbox"/>	
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident?					<input type="checkbox"/>	<input type="checkbox"/>	
b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT? (If yes, attach a copy.)					<input type="checkbox"/>	<input type="checkbox"/>	
12. TRAINING							
a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?			b. TYPE OF TRAINING		c. DATE OF MOST RECENT FORMAL TRAINING (YYYYMMDD)		
<input type="checkbox"/> YES <input type="checkbox"/> NO			<input type="checkbox"/> CLASSROOM <input type="checkbox"/> ON JOB				
13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES (See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)							
a. DIRECT CAUSE(s) (Attach additional sheets as needed, See page 4)							
b. INDIRECT CAUSE(s) (Attach additional sheets as needed, See page 5)							

14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S)		
DESCRIBE FULLY (<i>Attach additional sheets as necessary, See page 5</i>)		
15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.		
a. BEGINNING (YYYYMMDD)		b. ANTICIPATED COMPLETION (YYYYMMDD)
c. DATE SIGNED (YYYYMMDD)	d. TITLE OF SUPERVISOR COMPLETING REPORT	e. CORPS SIGNATURE, SUPERVISOR COMPLETING REPORT
c. DATE SIGNED (YYYYMMDD)	d. TITLE OF SUPERVISOR COMPLETING REPORT	e. CONTRACTOR SIGNATURE, SUPERVISOR COMPLETING REPORT
f. ORGANIZATION IDENTIFIER (<i>Division, Branch, Section, etc.,</i>)		g. OFFICE SYMBOL
16. MANAGEMENT REVIEW (<i>1st</i>)		
a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NONCONCUR c. COMMENTS		
DATE (YYYYMMDD)	TITLE	SIGNATURE
17. MANAGEMENT REVIEW (<i>2nd - Chief Operations, Construction, Engineering, etc.,</i>)		
a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NONCONCUR c. COMMENTS		
DATE (YYYYMMDD)	TITLE	SIGNATURE
18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW		
a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NONCONCUR c. ADDITIONAL ACTIONS/COMMENTS		
DATE (YYYYMMDD)	TITLE	SIGNATURE
19. COMMAND APPROVAL		
COMMENTS		
DATE (YYYYMMDD)	COMMANDER SIGNATURE	

10.

ACCIDENT DESCRIPTION (Continuation)

13a.

DIRECT CAUSE(s) (Continuation)

13b.

INDIRECT CAUSE(s) (Continuation)

14.

ACTION(s) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(s) (Continuation)

GENERAL. Complete a separate report for each person who was injured, caused, or contributed to the accident (*excluding uninjured personnel and witnesses*). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the discretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16 and 17.

INSTRUCTIONS FOR SECTION 1 - ACCIDENT CLASSIFICATION

(Mark All Boxes That Are Applicable)

a. **GOVERNMENT.** Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.

(1) **INJURY/ILLNESS/FATALITY** - Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (*injury*), CA-2 (*illness*) or CA-6 (*fatality*) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.

(2) **PROPERTY DAMAGE** - Mark the appropriate box if accident resulted in any damage of \$1000 or more to government property (*including motor vehicles*).

(3) **VEHICLE INVOLVED** - Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) **DIVING ACTIVITY** - Mark if the accident involved an in-house USACE diving activity.

b. **CONTRACTOR.**

(1) **INJURY/ILLNESS/FATALITY** - Mark if accident resulted in any contractor lost-time injury/illness or fatality.

(2) **PROPERTY DAMAGE** - Mark the appropriate box if accident resulted in any damage of \$1000 or more to contractor property (*including motor vehicles*).

(3) **VEHICLE INVOLVED** - Mark if accident involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) **DIVING ACTIVITY** - Mark if the accident involved a USACE Contractor diving activity.

c. **PUBLIC.**

(1) **INJURY/ILLNESS/FATALITY** - Mark if accident resulted in public fatality or permanent total disability. (*The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander.*)

(2) **VOID SPACE** - Make no entry.

(3) **VEHICLE INVOLVED** - Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, regardless of whether "INJURY/ILLNESS/FATALITY" is marked.

(4) **VOID SPACE** - Make no entry.

INSTRUCTIONS FOR SECTION 2 - PERSONAL DATA

a. **NAME** - (*MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS*). Enter last name, first name, middle initial of person involved.

b. **AGE** - Enter age.

c. **SEX** - Mark appropriate box.

d. **SOCIAL SECURITY NUMBER** - (*FOR GOVERNMENT PERSONNEL ONLY*) Enter the social security number (*or other personal identification number if no social security number issued*).

e. **GRADE** - (*FOR GOVERNMENT PERSONNEL ONLY*) Enter pay grade. Example: 0-6; E-7; WG-8; WS-12; GS-11; etc.

f. **JOB SERIES/TITLE** - For government civilian employees enter the pay plan, full series number, and job title, e.g., GS-O810/Civil Engineer. For military personnel enter the primary military occupational specialty (*PMOS*), e.g., 15A30 or 11G50. For contractor employees enter the job title assigned to the injured person, e.g., carpenter, laborer, surveyor, etc.

g. **DUTY STATUS** - Mark the appropriate box.

(1) **ON DUTY** - Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.

(2) **TDY** - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.

(3) **OFF DUTY** - Person was not on official business at time of accident.

h. **EMPLOYMENT STATUS** - (*FOR GOVERNMENT PERSONNEL ONLY*) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3 - GENERAL INFORMATION

- a. DATE OF ACCIDENT - Enter the month, day, and year of accident.
- b. TIME OF ACCIDENT - Enter the local time of accident in military time. Example: 1430 hrs (*not* 2:30 p.m.).
- c. EXACT LOCATION OF ACCIDENT - Enter facts needed to locate the accident scene, (*installation/project name, building number, street, direction and distance from closest landmark, etc.*).
- d. CONTRACTOR NAME
 - (1) PRIME - Enter the exact name (*title of firm*) of the prime contractor.
 - (2) SUBCONTRACTOR - Enter the name of any subcontractor involved in the accident.
- e. CONTRACT NUMBER - Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.
- f. TYPE OF CONTRACT - Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.
- g. HAZARDOUS/TOXIC WASTE ACTIVITY (*HTW*) - Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (*IRP*) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (*FUDS*) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4 - CONSTRUCTION ACTIVITIES

- a. CONSTRUCTION ACTIVITY - Select the most appropriate construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

- | | |
|-------------------------|----------------------------|
| 1. MOBILIZATION | 13. CARPENTRY |
| 2. SITE PREPARATION | 14. ELECTRICAL |
| 3. EXCAVATION/TRENCHING | 15. SCAFFOLDING/ACCESS |
| 4. GRADING (EARTHWORK) | 16. MECHANICAL |
| 5. PIPING/UTILITIES | 17. PAINTING |
| 6. FOUNDATION | 18. EQUIPMENT/MAINTENANCE |
| 7. FORMING | 19. TUNNELING |
| 8. CONCRETE PLACEMENT | 20. WAREHOUSING/STORAGE |
| 9. STEEL ERECTION | 21. PAVING |
| 10. ROOFING | 22. FENCING |
| 11. FRAMING | 23. SIGNING |
| 12. MASONRY | 24. LANDSCAPING/IRRIGATION |
| | 25. INSULATION |
| | 26. DEMOLITION |

- b. TYPE OF CONSTRUCTION EQUIPMENT - Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

- | | |
|---|---------------------------------------|
| 1. GRADER | 12. DUMP TRUCK (<i>HIGHWAY</i>) |
| 2. DRAGLINE | 13. DUMP TRUCK (<i>OFF HIGHWAY</i>) |
| 3. CRANE (<i>ON VESSEL/BARGE</i>) | 14. TRUCK (<i>OTHER</i>) |
| 4. CRANE (<i>TRACKED</i>) | 15. FORKLIFT |
| 5. CRANE (<i>RUBBER TIRE</i>) | 16. BACKHOE |
| 6. CRANE (<i>VEHICLE MOUNTED</i>) | 17. FRONT-END LOADER |
| 7. CRANE (<i>TOWER</i>) | 18. PILE DRIVER |
| 8. SHOVEL | 19. TRACTOR (<i>UTILITY</i>) |
| 9. SCRAPER | 20. MANLIFT |
| 10. PUMP TRUCK (<i>CONCRETE</i>) | 21. DOZER |
| 11. TRUCK (<i>CONCRETE/TRANSIT MIXER</i>) | 22. DRILL RIG |
| | 23. COMPACTOR/VIBRATORY ROLLER |
| | 24. OTHER |

INSTRUCTIONS FOR SECTION 5 - INJURY/ILLNESS INFORMATION

- a. SEVERITY OF INJURY/ILLNESS - Reference paragraph 2-10 of USACE Supplement 1 to AR 385-40 and enter code and description from list below.

- | | |
|-----|---|
| NOI | NO INJURY |
| FAT | FATALITY |
| PTL | PERMANENT TOTAL DISABILITY |
| PPR | PERMANENT PARTIAL DISABILITY |
| LWD | LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK |
| NLW | RECORDABLE CASE WITHOUT LOST WORKDAYS |
| RFA | RECORDABLE FIRST AID CASE |
| NRI | NON-RECORDABLE INJURY |

- b. ESTIMATED DAYS LOST - Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED - Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY - Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED - Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME				
ARM/WRIST	AB	ARM AND WRIST	HEAD, EXTERNAL	H1	EYE EXTERNAL	
	AS	ARM OR WRIST		H2	BOTH EYES EXTERNAL	
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST	KNEE	H3	EAR EXTERNAL	
	B2	BOTH BREASTS		H4	BOTH EARS EXTERNAL	
	B3	SINGLE TESTICLE		HC	CHIN	
	B4	BOTH TESTICLES		HF	FACE	
	BA	ABDOMEN		HK	NECK/THROAT	
	BC	CHEST		HM	MOUTH/LIPS	
	BL	LOWER BACK		HN	NOSE	
	BP	PENIS		HS	SCALP	
	BS	SIDE		LEG, HIP, ANKLE, BUTTOCKS	KB	BOTH KNEES
	BU	UPPER BACK			KS	KNEE
	BW	WAIST		BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/ BUTTOCKS
	BZ	TRUNK OTHER			LS	SINGLE LEG/HIP/ ANKLE/BUTTOCK
	HEAD, INTERNAL	C1		SINGLE EAR INTERNAL	HAND	MB
BOTH EARS INTERNAL			MS	SINGLE HAND		
C2		SINGLE EYE INTERNAL	FOOT	PB	BOTH FEET	
C3		BOTH EYES INTERNAL		PS	SINGLE FOOT	
C4		BRAIN	TRUNK, BONES	R1	SINGLE COLLAR BONE	
CB		CRANIAL BONES		R2	BOTH COLLAR BONES	
CC		TEETH		R3	SHOULDER BLADE	
CD		JAW		R4	BOTH SHOULDER BLADES	
CJ		THROAT, LARYNX		RB	RIB	
CL		MOUTH		RS	STERNUM (BREAST BONE)	
CM		NOSE		RV	VERTEBRAE (SPINE; DISC)	
CN		THROAT, OTHER		RZ	TRUNK BONES OTHER	
CR		TONGUE		SHOULDER	SB	BOTH SHOULDERS
CT	HEAD OTHER INTERNAL	SS			SINGLE SHOULDER	
ELBOW	EB	BOTH ELBOWS		THUMB	TB	BOTH THUMBS
	ES	SINGLE ELBOW			TS	SINGLE THUMB
FINGER	F1	FIRST FINGER		TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	F2	BOTH FIRST FINGERS	V2		LUNGS, BOTH	
	F3	SECOND FINGER	V3		KIDNEY, SINGLE	
	F4	BOTH SECOND FINGERS	V4		KIDNEYS, BOTH	
	F5	THIRD FINGER	VH		HEART	
	F6	BOTH THIRD FINGERS	VL		LIVER	
	F7	FOURTH FINGER	VR		REPRODUCTIVE ORGANS	
	F8	BOTH FOURTH FINGERS	VS		STOMACH	
TOE	G1	GREAT TOE		VV	INTESTINES	
	G2	BOTH GREAT TOES		VZ	TRUNK, INTERNAL; OTHER	
	G3	TOE OTHER				
	G4	TOES OTHER				

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury/illness from the list below. This nature of injury/illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury/illness name on the line and place the corresponding CODE letters in the box provided.

* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME			
*TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION	PARASITIC DISEASE CONDITION/STROKE	TU	BURN, SCALD, SUNBURN
	TB	BACK STRAIN		TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TC	CONTUSION; BRUISE; ABRASION		TR	TRAUMATIC RESPIRATORY DISEASE
	TD	DISLOCATION		TQ	TRAUMATIC FOOD POISONING
	TF	FRACTURE		TW	TRAUMATIC TUBERCULOSIS
	TH	HERNIA		TX	TRAUMATIC VIROLOGICAL/INFECTIVE/
	GENERAL NATURE CATEGORY	CODE		NATURE OF INJURY NAME	T1
	TK	CONCUSSION	T2	TRAUMATIC HEARING LOSS	
	TL	LACERATION, CUT	T3	TRAUMATIC HEART CONDITION	
	TP	PUNCTURE	T4	TRAUMATIC MENTAL DISORDER, STRESS; NERVOUS CONDITION	
	TS	STRAIN, MULTIPLE	T8	TRAUMATIC INJURY - OTHER (EXCEPT DISEASE, ILLNESS)	

** A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which does not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME		
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY				
RESPIRATORY DISEASE	RA	ASBESTOSIS	DD	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
	RB	BRONCHITIS		
	RE	EMPHYSEMA	DE	EFFECT OF ENVIRONMENTAL
	RP	PNEUMOCONIOSIS	CONDITION	
	RS	SILICOSIS	DH	HEARING LOSS
	R9	RESPIRATORY DISEASE, OTHER	DK	HEART CONDITION
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES			DM	MENTAL DISORDER, EMOTIONAL STRESS, NERVOUS CONDITION
	VB	BRUCELLOSIS	DR	RADIATION
	VC	COCCIDIOMYCOSIS	DS	STRAIN, MULTIPLE
	VF	FOOD POISONING	DU	ULCER
	VH	HEPATITIS	DV	OTHER VASCULAR CONDITIONS
	VM	MALARIA	D9	DISABILITY, OTHER
	VS	STAPHYLOCOCCUS		
	VT	TUBERCULOSIS	SKIN DISEASE OR	
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC - OTHER	CONDITION	
				SB
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS	SC	CHEMICAL
	DB	BACK STRAIN, BACK SPRAIN	S9	DERMATITIS, UNCLASSIFIED
	DC	CEREBRAL VASCULAR CONDITION; STROKE		

g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples:

(1) An employee tripped on carpet and struck his head on a desk. TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface).

NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).

(2) A Park Ranger contracted dermatitis from contact with poison ivy/oak.

TYPE: 510 (contact) SOURCE: 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.

TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struck by another vehicle.

TYPE: 800 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME		
		0610	EXERTED
		0620	LIFTED, STRAINED BY (SINGLE ACTION)
			STRESSED BY (REPEATED ACTION)
0110	STRUCK		EXPOSED
0111	STRUCK BY	0710	INHALED
0120	STRUCK BY FALLING OBJECT	0720	INGESTED
	STRUCK AGAINST	0730	ABSORBED
0210	FELL, SLIPPED, TRIPPED	0740	EXPOSED TO
0220	FELL ON SAME LEVEL	0800	TRAVELING IN
0230	FELL ON DIFFERENT LEVEL		
	SLIPPED, TRIPPED (NO FALL)		
	CAUGHT	CODE	SOURCE OF INJURY NAME
0310	CAUGHT ON	0100	BUILDING OR WORKING AREA
0320	CAUGHT IN	0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC.)
0330	CAUGHT BETWEEN		
	PUNCTURED, LACERATED	0120	STAIRS, STEPS
0410	PUNCTURED BY	0130	LADDER
0420	CUT BY	0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0430	STUNG BY	0150	BOILER, PRESSURE VESSEL
0440	BITTEN BY	0160	EQUIPMENT LAYOUT (ERGONOMIC)
	CONTACTED	0170	WINDOWS, DOORS
0510	CONTACTED WITH (INJURED PERSON MOVING)	0180	ELECTRICITY
0520	CONTACTED BY (OBJECT WAS MOVING)		

0200	ENVIRONMENTAL CONDITION	0631	CARBON MONOXIDE
0210	TEMPERATURE EXTREME (INDOOR)	0640	MIST, STEAM, VAPOR, FUME
0220	WEATHER (ICE, RAIN, HEAT, ETC.)	0641	WELDING FUMES
0230	FIRE, FLAME, SMOKE (NOT TOBACCO)	0650	PARTICLES (UNIDENTIFIED)
0240	NOISE	0700	CHEMICAL, PLASTIC, ETC.
0250	RADIATION	0711	DRY CHEMICAL - CORROSIVE
0260	LIGHT	0712	DRY CHEMICAL - TOXIC
0270	VENTILATION	0713	DRY CHEMICAL - EXPLOSIVE
0271	TOBACCO SMOKE	0714	DRY CHEMICAL FLAMMABLE
0280	STRESS (EMOTIONAL)	0721	LIQUID CHEMICAL - CORROSIVE
0290	CONFINED SPACE	0722	LIQUID CHEMICAL - TOXIC
0300	MACHINE OR TOOL	0723	LIQUID CHEMICAL - EXPLOSIVE
0310	HAND TOOL (POWERED; SAW, GRINDER, ETC.)	0724	LIQUID CHEMICAL - FLAMMABLE
0320	HAND TOOL (NONPOWERED)	0730	PLASTIC
0330	MECHANICAL POWER TRANSMISSION APPARATUS	0740	WATER
0340	GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)	0750	MEDICINE
0350	VIDEO DISPLAY TERMINAL	0800	INAMINATE OBJECT
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL	0810	BOX, BARREL, ETC.
0370	HEATING EQUIPMENT	0820	PAPER
0380	WELDING EQUIPMENT	0830	METAL ITEM, MINERAL
0400	VEHICLE	0831	NEEDLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE	0840	GLASS
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE	0850	SCRAP, TRASH
0421	DRIVER OF GOVERNMENT VEHICLE	0860	WOOD
0422	PASSENGER OF GOVERNMENT VEHICLE	0870	FOOD
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)	0880	CLOTHING, APPAREL, SHOES
0440	AIRCRAFT (NOT COMMERCIAL)	0900	ANIMATE OBJECT
0450	BOAT, SHIP, BARGE	0911	DOG
0500	MATERIAL HANDLING EQUIPMENT	0912	OTHER ANIMAL
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)	0920	PLANT
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)	0930	INSECT
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST	0940	HUMAN (VIOLENCE)
0540	HOIST, SLING CHAIN, JACK	0950	HUMAN (COMMUNICABLE DISEASE)
0550	CRANE	0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)
0551	FORKLIFT	1000	PERSONAL PROTECTIVE EQUIPMENT
0560	HANDTRUCK, DOLLY	1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
0600	DUST, VAPOR, ETC.		
0610	DUST (SILICA, COAL, ETC.)	1020	RESPIRATOR, MASK
0620	FIBERS	1021	DIVING EQUIPMENT
0621	ASBESTOS	1030	SAFETY BELT, HARNESS
0630	GASES	1040	PARACHUTE

INSTRUCTIONS FOR SECTION 6 - PUBLIC FATALITY

a. **ACTIVITY AT TIME OF ACCIDENT** - Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the most appropriate primary activity area (*water related, non-water related or other activity*), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

- | | |
|---|--|
| 1. Sailing | 19. Camping/picnicking unauthorized area |
| 2. Boating-powered | 20. Guided tours |
| 3. Boating-unpowered | 21. Hunting |
| 4. Water skiing | 22. Playground equipment |
| 5. Fishing from boat | 23. Sports/summer (<i>baseball, football, etc.</i>) |
| 6. Fishing from bank dock or pier | 24. Sports/winter (<i>skiing, sledding, snowmobiling etc.</i>) |
| 7. Fishing while wading | 25. Cycling (<i>bicycle, motorcycle, scooter</i>) |
| 8. Swimming/supervised area | 26. Gliding |
| 9. Swimming/designated area | 27. Parachuting |
| 10. Swimming/other area | 28. Other non-water related |
| 11. Underwater activities (<i>skin diving, scuba, etc.</i>) | |
| 12. Wading | |
| 13. Attempted rescue | |
| 14. Hunting from boat | |
| 15. Other | |

OTHER ACTIVITIES

29. Unlawful acts (*fights, riots, vandalism, etc.*)
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33. Sleeping
34. Pedestrian struck by vehicle
35. Pedestrian other acts
36. Suicide
37. "Other" activities

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing (*general*)
18. Camping/picnicking authorized area

b. **PERSONAL FLOTATION DEVICE USED** - If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7 - MOTOR VEHICLE ACCIDENT

a. **TYPE OF VEHICLE** - Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.

b. TYPE OF COLLISION - Mark appropriate box.

c. SEAT BELT - Mark appropriate box.

INSTRUCTIONS FOR SECTION 8 - PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM - Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.

b. OWNERSHIP - Enter ownership for each item listed. (Enter one of the following: USACE; OTHER GOVERNMENT; CONTRACTOR; PRIVATE)

c. \$ AMOUNT OF DAMAGE - Enter the total estimated dollar amount of damage (parts and labor), if any.

INSTRUCTIONS FOR SECTION 9 - VESSEL/FLOATING PLANT ACCIDENT

a. TYPE OF VESSEL/FLOATING PLANT - Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel floating plant.

VESSEL/FLOATING PLANTS

1. ROW BOAT
2. SAIL BOAT
3. MOTOR BOAT
4. BARGE
5. DREDGE/HOPPER
6. DREDGE/SIDE CASTING
7. DREDGE/DIPPER
8. DREDGE/CLAMSHELL, BUCKET
9. DREDGE/PIPE LINE
10. DREDGE/DUST PAN
11. TUG BOAT
12. OTHER

b. COLLISION/MISHAP - Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1. COLLISION W/OTHER VESSEL
2. UPPER GUIDE WALL
3. UPPER LOCK GATES
4. LOCK WALL
5. LOWER LOCK GATES
6. LOWER GUIDE WALL
7. HAULAGE UNIT
8. BREAKING TOW
9. TOW BREAKING UP
10. SWEEP DOWN ON DAM
11. BUOY/DOLPHIN/CELL
12. WHARF OR DOCK
13. OTHER

INSTRUCTIONS FOR SECTION 10 - ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT - Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11 - CAUSAL FACTORS

a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

- (1) DESIGN - Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?
- (2) INSPECTION/MAINTENANCE - Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?
- (3) PERSON'S PHYSICAL CONDITION - Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?
- (4) OPERATING PROCEDURES - Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?
- (5) JOB PRACTICES - Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?
- (6) HUMAN FACTORS - Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?
- (7) ENVIRONMENTAL FACTORS - Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

- (8) CHEMICAL AND PHYSICAL AGENT FACTORS - Did exposure to chemical agents (*either single shift exposure or long-term exposure*) such as dusts, fibers (*asbestos, etc.*), silica, gases (*carbon monoxide, chlorine, etc.*), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (*UV radiation created during welding, etc.*) contribute to the accident/incident?
- (9) OFFICE FACTORS - Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?
- (10) SUPPORT FACTORS - Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (*in terms of employee skills, number of workers, and adequate supervision*) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc.?
- (11) PERSONAL PROTECTIVE EQUIPMENT - Did the person fail to use appropriate personal protective equipment (*gloves, eye protection, hard-toed shoes, respirator, etc.*) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?
- (12) DRUGS/ALCOHOL - Is there any reason to believe the person's mental or physical capabilities, judgment, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".
- b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS - Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. If one was performed, attach a copy of the analysis to the report.

INSTRUCTIONS FOR SECTION 12 - TRAINING

- a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? - For the purpose of this section "trained" means the person has been provided the necessary information (*either formal and/or on-the-job (OJT) training*) to competently perform the activity/task in a safe and healthful manner.
- b. TYPE OF TRAINING - Mark the appropriate box that best indicates the type of training; (*classroom or on-the-job*) that the injured person received, before the accident happened.
- c. DATE OF MOST RECENT TRAINING - Enter YYYYMMDD of the last formal training completed that covered the activity task being performed at the time of the accident.

INSTRUCTIONS FOR SECTION 13 - CAUSES

- a. DIRECT CAUSES - The direct cause is that single factor, which most directly lead to the accident. See examples below.
- b. INDIRECT CAUSES - Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

- a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.

Direct cause: failure to provide fall protection at elevation. Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (*possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety*); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.

- b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (*Note: USACE vehicle was in proper/safe working condition*).

Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.

Indirect cause: failure of employee to pay attention to driving (*defensive driving*).

INSTRUCTIONS FOR SECTION 14 - ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION - Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15 - DATES FOR ACTION

- a. BEGIN DATE - Enter the date YYYYMMDD when the corrective action(s) identified in section 14 will begin.
- b. COMPLETE DATE - Enter the date YYYYMMDD when the corrective action(s) identified in section 14 will be completed.
- c. DATE SIGNED - Enter YYYYMMDD that the report was signed by the responsible supervisor.
- d.e. TITLE AND SIGNATURE - Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE supervisor shall also sign the report. Upon entering the information required in 15c., 15d., 15e., 15f. and 15g. below, the responsible USACE supervisor shall forward the report for management review as indicated in section 16.

f. **ORGANIZATION NAME** - For GOVERNMENT employee accidents enter the USACE organization name (*Division, Branch, Section, etc.*) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15d. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

g. **OFFICE SYMBOL** - Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15f.

INSTRUCTIONS FOR SECTION 16 - MANAGEMENT REVIEW (1st)

1ST REVIEW - Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15d. shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (*2nd review*) for review and comment.

INSTRUCTIONS FOR SECTION 17 - MANAGEMENT REVIEW (2nd)

2ND REVIEW - The FOA Staff Chief (*i. e., FOA Chief of Construction, Operations, Engineering, Planning, etc.*) shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18 - SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW - The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc. are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.


INSTRUCTION FOR SECTION 19 - COMMAND APPROVAL

4TH REVIEW - The FOA Commander shall (*to include the person designated Acting Commander in his absence*) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

OSHA's Form 300A (Rev. 01/2004)

Summary of Work-Related Injuries and Illnesses

Year 2019



U.S. Department of Labor
Occupational Safety and Health Administration
Form approved OMB no. 1218-0176

All establishments covered by Part 1904 must complete this Summary page, even if no injuries or illnesses occurred during the year. Remember to review the Log to verify that the entries are complete.

Using the Log, count the individual entries you made for each category. Then write the totals below, making sure you've added the entries from every page of the log. If you had no cases write "0."

Employees former employees, and their representatives have the right to review the OSHA Form 300 in its entirety. They also have limited access to the OSHA Form 301 or its equivalent. See 29 CFR 1904.35, in OSHA's Recordkeeping rule, for further details on the access provisions for these forms.

Number of Cases

Total number of deaths	Total number of cases with days away from work	Total number of cases with job transfer or restriction	Total number of other recordable cases
0	1	2	8
(G)	(H)	(I)	(J)

Number of Days

Total number of days away from work	Total number of days of job transfer or restriction
75	81
(K)	(L)

Injury and Illness Types

Total number of... (M)	(1) Injury	(2) Skin Disorder	(3) Respiratory Condition	(4) Poisoning	(5) Hearing Loss	(6) All Other Illnesses
	11	0	0	0	0	0

Post this Summary page from February 1 to April 30 of the year following the year covered by the form

Public reporting burden for this collection of information is estimated to average 58 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave. NW, Washington, DC 20210. Do not send the completed forms to this office.

Establishment information

Your establishment name APTIM Government

Street 4171 Essen Lane

City Baton Rouge State LA Zip 70809

Industry description (e.g., Manufacture of motor truck trailers)
Other Heavy and Civil Engineering Construction

Standard Industrial Classification (SIC), if known (e.g., SIC 3715)

OR North American Industrial Classification (NAICS), if known (e.g., 336212)
2 3 7 9 9 0

Employment information

Annual average number of employees 2,248

Total hours worked by all employees last year 4,496,665

Sign here

Knowingly falsifying this document may result in a fine.

Alan Weakley

I certify that I have examined this document and that to the best of my knowledge the entries are true, accurate, and complete.

Alan Weakley President
Company executive Title

865-694-7384 1/28/2020
Phone Date

OSHA's Form 300 (Rev. 01/2004) Log of Work-Related Injuries and Illnesses

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Year 2019

U.S. Department of Labor
 Occupational Safety and Health Administration

Form approved OMB no. 1218-0176

You must record information about every work-related injury or illness that involves loss of consciousness, restricted work activity or job transfer, days away from work, or medical treatment beyond first aid. You must also record significant work-related injuries and illnesses that are diagnosed by a physician or licensed health care professional. You must also record work-related injuries and illnesses that meet any of the specific recording criteria listed in 29 CFR 1904.8 through 1904.12. Feel free to use two lines for a single case if you need to. You must complete an injury and illness incident report (OSHA Form 301) or equivalent form for each injury or illness recorded on this form. If you're not sure whether a case is recordable, call your local OSHA office for help.

Establishment name APTIM Government

City Baton Rouge State LA

Identify the person				Describe the case		Classify the case				Enter the number of days the injured or ill worker was:							
(A) Case No.	(B) Employee's Name	(C) Job Title (e.g., Welder)	(D) Date of injury or onset of illness (mo./day)	(E) Where the event occurred (e.g. Loading dock north end)	(F) Describe injury or illness, parts of body affected, and object/substance that directly injured or made person ill (e.g. Second degree burns on right forearm from acetylene torch)	CHECK ONLY ONE box for each case based on the most serious outcome for that case:				Enter the number of days the injured or ill worker was:		Check the "Injury" column or choose one type of illness:					
						Death	Days away from work	Remained at work		Away From Work (days)	On job transfer or restriction (days)	(M)					
						(G)	(H)	Job transfer or restriction	Other recordable cases	(K)	(L)	Injury	Skin Disorder	Respiratory Condition	Poisoning	Hearing Loss	All other illnesses
								(I)	(J)			(1)	(2)	(3)	(4)	(5)	(6)
2019-138		Inspection Spec	02/02	USVI Housing Authority	Allergic reaction from bee sting				X			X					
2019-384		Laborer	03/04	FUSRAP	Sprained neck from slipping on ice				X			X					
2019-835		Operator	04/30	Ft. Benning	Fractured pelvis from overturned backhoe		X			75	10	X					
2019-1404		Firefighter	07/20	High Desert Support Services	Foreign body in left eye from debris while doffing fire protection equipment				X			X					
2019-1434		Laborer	07/24	NAVFAC	Lacerated left pinky finger from trench box pin				X			X					
2019-1638		Electrician	08/21	Kings Bay Support Services	Allergic reaction to wasp sting				X			X					
2019-1692		Electrician	08/27	Ft. Rucker	Strained right hip from walking on uneven surface				X			X					
2019-1846		Crane Mechanic	09/19	Kings Bay Support Services	Contusion to left knee when struck by hydraulic cylinder				X			X					
2019-1909		Operator	09/30	Ft. Benning	Fractured left rib from tripping over riprap			X			57	X					
2019-2134		Foreman	10/30	NAVFAC	Strained knee from slipping on feed belt			X			14	X					
2019-2332		Laborer	12/02	Colorado Smelter Site	Strained right shoulder from vehicle accident				X			X					
Page totals						0	1	2	8	75	81	11	0	0	0	0	0

Be sure to transfer these totals to the Summary page (Form 300A) before you post it.

Public reporting burden for this collection of information is estimated to average 14 minutes per response, including time to review the instruction, search and gather the data needed, and complete and review the collection of information. Persons are not required to respond to the collection of information unless it displays a currently valid OMB control number. If you have any comments about these estimates or any aspects of this data collection, contact: US Department of Labor, OSHA Office of Statistics, Room N-3644, 200 Constitution Ave, NW, Washington, DC 20210. Do not send the completed forms to this office.

Injury (1)
 Skin Disorder (2)
 Respiratory Condition (3)
 Poisoning (4)
 Hearing Loss (5)
 All other illnesses (6)

APPENDIX F
REMEDIATION-DERIVED WASTE MANAGEMENT

Subject: INVESTIGATION-DERIVED WASTE

1.0 PURPOSE AND SUMMARY

This Standard Operating Procedure (SOP) establishes specific management practices for the in-process handling and subsequent disposition of environmental media generated as a result of investigation and removal actions at Redstone Arsenal (RSA), Madison County, Alabama. Investigation-derived waste (IDW) will be handled in accordance with the most recent versions of Alabama Environmental Investigation and Remediation Guidance and Alabama Administrative Code (AAC) 335-14. This SOP serves as an update to IDW plans previously submitted to comply with Alabama Department of Environmental Management (ADEM) Consent Order No. 97-203-CHW for the management of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) IDW.

In support of RSA's Installation Restoration Program under the Federal Facilities Compliance Act of 1992 and CERCLA and to meet the requirements of RSA's Resource Conservation and Recovery Act (RCRA) permit, RSA is conducting investigation and removal activities which generate environmental media. The media typically consist of drill cuttings and fluids, monitoring well purge and development water, spent personal protective equipment (PPE), and other inert materials (i.e., plastic, rope, tape, paper, etc.) generated during operations, well installation and sampling activities, remedial actions, and associated site activities. When accumulated, the media must be managed appropriately to minimize the exposure to human health and the environment while adhering to applicable regulatory requirements.

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3.0 RESPONSIBILITIES

3.1 Quality Control Site Manager

The Quality Control Site Manager (QCSM) is responsible for ensuring that field activities are completed to meet the project objectives, that they are conducted in accordance with the project plans and requirements, and that all activities are performed according to their respective procedures. The QCSM is responsible for ensuring that all site personnel are trained in the procedures, that the procedures are adhered to, and that all activities are documented.

3.2 Field Team

All members of the field team (samplers, technicians, field geologists, engineers, etc.) are responsible for understanding and implementing this field procedure as well as ensuring that all team members also perform work in accordance with this SOP.

3.3 Quality Assurance/Quality Control Manager

The Quality Assurance/Quality Control Manager is responsible for ensuring that this SOP is correctly implemented and that the quantity and quality of field- measurable physical characteristic samples collected meet the requirements of the Site-Specific Field Sampling Plans (SFSP).

4.0 DEFINITIONS

None.

5.0 TEXT

5.1 Required Records and Forms

For a description of required forms, refer to SOP No. 1.0, *Field Documentation*.

- Sample Collection Log (SCL)
 - Field Activity Daily Log
-

- Sample tags/labels and the appropriate forms/documentation for sample shipment
- Material Safety Data Sheets (MSDS)
- SFSP.

5.2 Required Materials, Equipment, or Supplies

- Indelible black ink pens and markers
- Appropriate sample containers
- Insulated cooler and waterproof sealing tape
- Nitrile or latex gloves
- Decontamination equipment and supplies, including rinse bottles and deionized water
- Personal protective equipment (PPE)
- Socket wrench or bung wrench to access drums
- Appropriate equipment and meters for obtaining field measurements as specified in the SFSP (i.e., photoionization detector/flame ionization detector).

5.3 Procedures

5.3.1 Preparation

The following steps must be followed when preparing for management activities of IDW:

- Verify that all personnel have read and understand the approved Site-Specific Health and Safety Plan and have the proper training and certifications required under the Occupational Safety and Health Administration.
- Don the appropriate PPE as dictated by the Site-Specific Health and Safety Plan.
- Document the sampling events, recording the information on the SCL or equivalent form as specified. Document any and all deviations from standard operating procedures on the Field Activity Daily Log and include rationale for changes.

5.3.2 Specific Preparation

The following paragraphs detail the planned methodologies for dealing with environmental media generated during site activities. For the purpose of this document, a site, an area of contamination (AOC), and a solid waste management unit (SWMU) are all synonymous.

5.3.2.1 Initial Handling Requirements

All environmental media will be managed in an effort to minimize exposure to human health and the environment. Typically, the media will be generated as a result of these

major activities: drilling soil borings; installation and development of monitoring wells; and groundwater sampling activities.

In instances where soil borings are advanced, either to retrieve soil samples or to allow for the retrieval of a groundwater sample via a hydropunch or similar sampling device (including obtaining a sample from an open borehole), the following handling protocols for IDW soil will be used:

- All soil cuttings will be placed adjacent to the borehole on plastic or other suitable material capable of preventing contact with the ground surface.
- All cuttings will be covered daily or during rainfall events to prevent contact with moisture.
- Upon completion of the downhole activity (i.e., drilling, groundwater sampling, etc.), the soil cuttings will be placed in open topped 55-gallon drums, labeled, sampled, and properly stored.

In cases where a soil test boring is advanced for the purposes of installing a monitoring well, all environmental media accumulated will be containerized to allow for characterization upon generation and situated at or near the point of generation. As solids are generated, they will first be placed into open-topped 55-gallon drums or other approved containers pending further characterization. Solids may be bulked into larger approved containers situated within the AOC. Liquids may be bulked upon generation unless directed otherwise. All solids and liquids will be separated prior to disposal.

Liquids may be held on site at the AOC or SWMU and are not required to be moved to a separate 90-day storage area. However, either the satellite accumulation restrictions regulating storage of less than 55 gallons or 90-day storage rules would apply to hazardous liquids that remain on the SWMU/AOC. Section 5.3.2.3 further discusses storage requirements. If hazardous liquids are stored on site, the satellite accumulation area or the temporary less-than-90-day storage area must meet ADEM requirements for secondary containment standards as noted in Section 5.3.2.3.

5.3.2.2 Labeling

After each container (i.e., drum, roll-off box, etc.) has been filled, the container and lid, if appropriate, will be labeled with a description of the media (i.e., soil, purge water, decon water, PPE), origin of media (i.e., Soil Boring A- 1, Monitor Well RS-0 1 2, etc.), date the media were placed in the container, site identification (i.e., SWMU or AOC number), date container was sealed and sampled, and a short statement stating that the contents are on hold waiting analytical test results. If the analytical results determine that the container contents are hazardous, a standard hazardous waste label will be placed on each container. The accumulation start date will be the same as the date recorded on the initial drum. A copy of correspondence (email) from ADEM clarifying their position on handling of potentially hazardous wastewater at RSA is provided as an attachment to this SOP. Nonhazardous waste containers may be labeled using a paint pen or other indelible

marker that will not fade when exposed to weather. Hazardous waste containers will be marked with labels and information pursuant 40 Code of Federal Regulations (CFR) 262.34. A record of the number of containers, their contents, and the regulatory status of the waste will be completed at each generation site and will be included in the Field Activity Daily Log before leaving each site.

5.3.2.3 Storage

At the end of each day and/or field activity, all containers will be sealed or covered in such a way to prevent the introduction of rain water or surface runoff. Nonhazardous IDW will either be moved to a central IDW storage area, or, if feasible and in the best interest of operations, nonhazardous IDW will remain in the SWMU/AOC from where it was generated until final disposition is selected.

Within 72 hours of being generated, hazardous solid IDW will be moved to an RSA-approved Satellite Accumulation Area, a temporary 90-day storage area, or a fully permitted waste storage area. Wastewater IDW may be held at the AOC or SWMU in a temporary less-than-90-day storage area or it may be moved to a central 90-day storage area. Any temporary 90-day storage area established on an AOC or SWMU will meet ADEM's secondary containment standards. Wastewater or solid hazardous IDW will be labeled during storage as discussed in Section 5.3.2.2.

Waste may be transported between storage areas when required or in preparation of disposal activities without specific regulatory concurrence (i.e., RSA is not required to obtain specific regulatory approval to transport wastes within the confines of RSA). Drums of hazardous wastewater will be removed from the AOC or SWMU in less than 90 days. All hazardous IDW will be shipped off site or properly treated and managed on site within 90 days of its accumulation start date.

5.4 Characterization of Media

The characterization of the media will be determined by a combination of generator knowledge and use of analytical data obtained during the activity from which the materials were generated. As stated, it is anticipated that specific generation activities will include soil borings, monitoring well installations, and monitoring well purge and development actions. Water obtained from specific monitoring well sampling points (i.e., purge and development water) will be characterized using groundwater sampling data taken from the specific well site from which the water was obtained. Analytical data obtained from a particular borehole reflecting soil contaminant levels will be used to characterize solids generated from that borehole. Other solids (such as rock) will be characterized for disposal based on the analytical results of the soil and water sampled at the specific location where the solids were generated. When appropriate, analytical data will be extrapolated to reflect toxicity characteristic leaching procedure (TCLP) values (i.e., 20x divisor rule for soils). Generator knowledge may be used to evaluate the media potential for toxicity, corrosivity, ignitability, reactivity, and listed waste scenarios.

In the event generator knowledge and data associated with previous site investigations are inadequate to accurately and thoroughly characterize the IDW, waste will be managed as hazardous waste. A representative sample will be retrieved from each waste stream warranting further characterization. In addition, representative samples will be collected from all IDW determined to be nonhazardous based on generator knowledge. These samples will be taken directly from containers after the waste has been generated. The suite of analyses to be run will be determined based on suspected contaminants and any information gleaned from previously available data. Hazardous versus nonhazardous determinations will be made utilizing those parameters outlined in AAC R. 335-14-2-.02, *Criteria for Identifying the Characteristics of Hazardous Wastes and for Listing Hazardous Waste*. More specifically, hazardous characteristics will be determined utilizing the requirements of AAC R. 335-14-2-.02 (1) and 335-14-2-.03. Where listed wastes are expected or where the potential exists, specific analytes (i.e., totals as opposed to TCLP) for the listed compounds will be tested in addition to determining any hazardous characteristics. All sampling and analytical testing protocols will be consistent with ADEM/U.S. Environmental Protection Agency (EPA) requirements and methodologies.

5.5 Management and Disposition

Once adequately characterized, the containers will be labeled as described. U.S. Department of Transportation-approved labels will be used if transportation outside of RSA boundaries is required or anticipated. The media may also be bulked on site (within the staging area) with like waste streams possessing compatible nonreacting characteristics.

5.6 Wastewater

In general, all wastewater generated during the described site activities will most likely be disposed either at an RSA-approved treatment facility or at the wastewater treatment facility currently operated at RSA.

5.6.1 Nonhazardous Wastewater

Upon proper characterization and approval from RSA representatives, wastewater determined to be nonhazardous (Section 40 CFR Part 261) but possessing some level of contaminants can be disposed directly into RSA's sanitary sewer system, where it will ultimately be treated at the RSA wastewater treatment plant (WWTP). The RSA representative will request waste characterization data, approximate volume, and the location of disposal in making the determination to accept sewer discharge. The nonhazardous water will typically be discharged at a manhole(s) located near the generation site.

All discharges will be in accordance with provisions outlined in Division 6, *Water Quality Program*, of the AAC. More specifically, the discharge will not be greater than 5 percent of the average dry weather capacity of the WWTP, greater than 5 percent of the

design capacity of the WWTP, or subject to Section 403.6 of the Federal Water Pollution Control Act. No disposal permit is required as long as the wastewater is discharged in quantities of less than 25,000 gallons per day and the water is nonhazardous (40 CFR 261).

Wastewater generated during site activities and for which analytical tests showed no level of contamination present above approved detection limits will be considered nonregulated. The disposal means and methods of nonregulated waste water are at the discretion of RSA representatives (e.g., storm water system, open ditch, etc.) and do not require regulatory consultation or concurrence.

On a quarterly basis, RSA will submit documentation of all discharges (regulated and nonregulated) to ADEM. The documentation will contain pertinent information regarding the discharge, including, date, time, volumes, analytical data (if available), site, action, etc. All discharges to the sanitary sewer system will be coordinated in advance.

5.6.2 Hazardous Wastewater

Hazardous wastewater will be transported, when required, and treated at an off-site wastewater treatment facility when the following conditions are met:

1. The treatment facility meets the definition of a wastewater treatment unit as defined in AAC R. 335-14-1-.02.
2. The treatment facility is capable of (a) rendering characteristically hazardous wastes (AAC R. 335-14-2-.03) nonhazardous or (b) removing listed wastes (AAC R. 335-14-2-.04) from the contaminated media so that the media no longer contain the listed waste for which the media were originally considered hazardous. If after treatment, analytical tests show the listed waste is not present above laboratory detection limits, then the contaminated media will be considered to no longer contain the listed waste and will no longer be considered hazardous.
3. The wastewater treatment facility has been constructed at RSA in conjunction with a removal, interim remedial action, or remedial action at an AOC.

At no time will liquids that possess hazardous characteristics or meet the definition of a listed waste be disposed into the sanitary sewer system, unless the waste is specifically exempt under RCRA, CERCLA, or its applicable or relevant and appropriate requirement without applicable ADEM authorization.

Wastewater determined to be hazardous may be transported between AOCs and within RSA boundaries for treatment/disposition in accordance with the previously outlined provisions without specific regulatory concurrence.

On a quarterly basis, RSA will submit documentation of discharges to ADEM. The documentation will contain pertinent information regarding the discharge including date, time, volumes, analytical (if available), site, action, etc.

All discharges to the sanitary sewer system will be coordinated prior to any discharge.

In the event that RSA does not have a facility on line capable of treating the hazardous wastewater at or around the time of generation, and the water is expected to remain on site for a prolonged period of time (but not to exceed 90 days), the water will be stored in an area with an adequate secondary containment system until an approved treatment system is on line.

Unless specifically mandated by ADEM and EPA, the treatment and disposal of hazardous and nonhazardous wastewater will be performed as previously described. The wastes will be treated and disposed in a timely manner so as to expedite site activities and to ensure the protection of human health and the environment. Except where noted, specific written concurrence from ADEM and EPA prior to those actions previously described is not required.

5.7 Solids

Solids may include soil cuttings, rock, grout, spent PPE, plastic sheeting, rope, unused monitoring well construction materials, and other environmental media generated during field activities. All solids will be containerized at or near the point of generation and staged as described in Section 5.3.2.1. Other specific management practices are described in Sections 5.7.1 and 5.7.2.

5.7.1 Nonhazardous Solids

Soil cuttings and rock determined to be nonhazardous will be staged within the confines of the AOC from which they were generated or stored properly in an RSA-approved storage area. After characterizations (hazardous versus nonhazardous) are finalized and depending upon site conditions, nonhazardous cuttings will be removed from containers and replaced “at or near” the location from which they were derived. “At or near” infers media will be placed as near to their point of origin as is practical. Examples would be placing monitoring well cuttings around the monitoring well from which they originated as opposed to within it. However, when not practical, the media may be centrally located within the confines of the originating AOC in an area of minimal traffic and where the media could be managed in a manner protective of human health and the environment. At no time will contaminated media originating from one AOC be transported to another AOC for placement without prior written concurrence from ADEM and EPA.

In the event that site conditions are not conducive to the replacement of the materials (i.e., restricted space, confined area, etc.), soils and rock determined to be nonhazardous may be disposed into RSA's Solid Waste Disposal Facility-Construction/Demolition Landfill (ADEM Permit No. 45-03) or an approved off-site non-hazardous solid waste disposal facility as long as the following conditions are met:

1. Soils exhibiting contaminant levels below analytical detection limits are considered nonregulated and will be disposed at the discretion of RSA representatives.
-

2. The soil analytes do not exceed 50 percent of the TCLP analysis for any given compound. A disposal report is submitted within 45 days of disposal that includes a signed copy of ADEM's Solid/Hazardous Waste Determination form and any applicable analytical results.

Other nonhazardous solids such as spent PPE, plastic sheeting, rope, unused monitoring well construction materials, and other environmental media generated during field activities that have been determined to be nonhazardous will be emptied into dumpsters or roll-offs for disposal off site at a permitted solid waste disposal facility.

5.7.2 Hazardous Solids

Hazardous IDW solids can be segregated into two categories for purposes of waste management. The first is strictly IDW soils. Hazardous IDW soils will be immediately handled and stored as hazardous waste while on RSA. The waste soils will be analyzed, profiled, and managed off site at a permitted transportation, storage, and disposal facility for its characteristic and/or listed waste status. The second hazardous IDW solid category is essentially all non-soil-like media, generally anticipated to be in the form of debris and PPE. The soil versus nonsoil differentiation is necessary in order to select the correct treatment and disposal technology. Hazardous nonsoil and debris media can present different analytical and treatment strategies than contaminated soils.

6.0 EXCEPTION PROVISION

None.

7.0 CROSS REFERENCES AND OTHER SOURCES OF INFORMATION

This SOP will be used in conjunction with the following cross references where applicable.

SOP No. 1.0 – Field Documentation

SOP No. 11.0 – Field Generated Records Management

Alabama Department of Environmental Management (ADEM), 2009, Division 14 - Hazardous Waste Program, Revised Effective March.

Alabama Department of Environmental Management (ADEM), 2005, **Alabama Environmental Investigation and Remediation Guidance**, September.

McCoy and Associates, 1995, **RCRA Regulations and Keyword Index**, Elsevier, 1995.

U. S. Environmental Protection Agency (EPA), 1992a, **Guide to Management of Investigative-Derived Wastes**, Office of Solid Waste and Emergency Response, Publication 9345.3-03FS, April 1992.

U. S. Environmental Protection Agency (EPA), 1992b, **Management of Contaminated Media**, Region IV EPA, Guidance Number TSC-92-02, December 28, 1992.

U. S. Environmental Protection Agency (EPA), 1991, **Management of Investigative-Derived Wastes During Site Inspections**, Office of Research and Development, Publication, EPA/540/G-91/009, May 1991.

8.0 ATTACHMENTS

- Attachment 1, ADEM Email Addressing IDW.
-

ATTACHMENT 1
ADEM EMAIL ADDRESSING IDW

Attachment I
ADEM Email Addressing IDW
RSA IWSAP SOPP 4.0

Kurth, Randy

Subject: FW: Response to ADEM original comments on the IDW discussion {Update}
Importance: High

From: Morrissette, Krishna M [mailto:KMorrissette@adem.state.al.us]
Sent: Wednesday, November 17, 2010 2:54 PM
To: Kurth, Randy
Cc: Davis, Emily; Burton, Don; Hodges, Barry A Mr CIV USA USACE; Shell, Ronald T; Wilson, J Jason; Reese, Dennis
Subject: RE: Response to ADEM original comments on the IDW discussion {Update}
Importance: High

Randy,

Sorry for the confusion on the 90-day storage issue. Here are some comments to further clarify ADEM position on the handling/ staging of potentially hazardous wastewater at RSA:

1. Wastewater can be held at the AOC or SWMU site and does not have to be immediately moved to another < 90 day storage area. The holding area must meet secondary containment standards.
2. It is OK to initially label the wastewater filled drums with the following information.
 - Description of the drum contents (e.g. wastewater from RSA-XXX)
 - Accumulation start date (the date the drum was filled)
 - A short statement that states that the contents are on hold awaiting analytical test results
3. If the analytical results come back noting the drum contents are hazardous, a standard hazardous waste label must be put on the drum noting all required information. The accumulation start date for the standard HW label should be the same date as recorded on the initial drum label.
4. Drums of hazardous wastewater must be removed from the AOC or SWMU in less than 90 days.

Remember that the generator must meet the < 90 day storage rules and regulations (e.g. weekly inspections, training, secondary containment, etc.) while holding the hazardous wastewater drums at the AOC or SWMU site.

As for your response to the example IDW information needed to support generator knowledge determination, it is adequate for our on-site visits. Since it is late in the afternoon for you (EST), I will try to call you to confirm the information presented in this email. Thanks again for your help in this matter, Randy!

Sincerely Yours,

Krishna "Kel" Morrissette

ADEM - Land Division: Facilities Engineering Section
Work: (334) 394-4335
Fax: (334) 279-3050
email: kmorrissette@adem.state.al.us

APPENDIX G

CONSTRUCTION QUALITY ASSURANCE PLAN

**Construction Quality Assurance Plan
RSA-221-R-01, Fuse Storage and Munitions Disposal Area,
Operable Unit 15
U.S. Army Garrison-Redstone
Madison County, Alabama
EPA ID No. AL7 210 020 742**

Prepared for:

**U.S. Army Engineering and Support Center
Huntsville Engineering and Support Center
ATTN: CEHNC-OEC
5021 Bradford Drive East
Huntsville, AL 35805**

Prepared by:

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

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

April 2021

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List of Attachments

Attachment	Title
G-1	Field Inspection Checklist
G-2	Fencing Technical Specifications

G1.0 Introduction

This construction quality assurance plan (CQAP) presents the overall program for construction quality assurance (CQA) to be implemented during corrective measures implementation (CMI) activities at Redstone Arsenal (RSA) site RSA-221-R-01. This document establishes a program to comply with requirements established in the CMI work plan and those of the Alabama Department of Environmental Management (ADEM) and U.S. Environmental Protection Agency. The scope of work for the project is detailed in the CMI work plan for RSA-221-R-01 (to which this CQAP is an appendix).

G1.1 Overall Directive

The procedures and practices set forth in the CQAP should be adhered to and specifically applied to all quality-related work on the project. It is the responsibility of all personnel performing work on the project to be familiar with and implement the technical requirements referenced in this CQAP or otherwise specified for the project, as included in the CMI work plan.

Conformance to the requirements of this CQAP will provide results which will verify that the contract, when completed, will conform to the specified requirements and will be documented by defensible evidence that the work performed meets or exceeds the standards set forth for the project.

G1.2 Project Background

RSA-221-R-01 occupies 13.4 acres in the southeastern portion of RSA. The site contains six buildings (Buildings 7261 through 7266) constructed in 1943 and a drainage swale. The buildings were initially used for fuze storage in support of activities conducted at the Redstone Ordnance Plant in the 1940s. By the 1950s, the buildings were used for small component storage for the Redstone Depot. Fuze storage was resumed in the 1960s. By the 1980s, the buildings were in use by morale and welfare clubs for general storage. The buildings are currently designated for explosives, seed, and non-specific storage. A former railroad line paralleled Ninebark Road and was used to access the storage buildings. A drainage swale on the east side of RSA-221-R-01 was reportedly used as a disposal area for munitions components. During a site visit in 2001, an unexploded ordnance (UXO) specialist identified projectile components, empty canisters, and empty shells. Further geophysical surveys and intrusive investigations revealed wholly inert munitions and munitions components (e.g., 155-millimeter projectiles, lifting lugs, base plates, and push plates) which had not been part of an assembled munition. No munitions and explosives of concern (MEC) have been confirmed at this site.

The Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) for RSA-221-R-01 defined the nature and extent of contamination and evaluated potential risks to current and future receptors (Aptim Federal Services, LLC [APTIM], 2018). The sampling results and resulting risk evaluations concluded that no chemicals of concern in soil pose unacceptable human health or ecological risks or leaching threats to groundwater. Additionally, no chemicals of concern were identified in groundwater. However, since not all anomalies identified above the target threshold during the geophysical investigations were investigated, there is a potential for MEC to be present. Since no surface or subsurface MEC was found during the investigation, the best estimate of the true rate of unacceptable items is zero per acre, and there is 95 percent confidence that the true unacceptable item rate is no larger than 0.5 UXO per acre present at the site. Due to the low probability for MEC in the subsurface, this site does not meet the requirements needed for unrestricted use as defined in Alabama Administrative Code r. 335-5.

Further site background and history are included in the RFI report (APTIM, 2018). The site map is shown on Figure 1-3 in the CMI work plan.

G1.3 Objectives of the Construction Quality Assurance Program

The objectives of the CQA program are to provide a system of procedures, practices, guidelines, and controls which, when implemented, will provide the confidence that project activities are accomplished in accordance with the specified contracts, design criteria, plans, drawings, and CMI plan developed during implementation of the corrective measures. This CQAP establishes requirements for developing the overall site-specific construction quality control (CQC) system to be implemented at RSA-221-R-01. The CQAP will be implemented during all phases of the project, including preliminary site activities, corrective measures (e.g., fencing, signposts, and signage), and close-out activities.

APTIM has been selected as the contractor to implement corrective measures at RSA-221-R-01. The U. S. Army Garrison-Redstone Site Manager and/or U.S. Army Engineering and Support Center, Huntsville (CEHNC) Technical Manager will observe the work during its performance by APTIM and subcontractors and will approve the work upon acceptable completion. APTIM has prepared a Quality Assurance Surveillance Plan under this contract; this plan sets forth procedures and guidelines that the CEHNC will use in evaluating the technical and safety performance of APTIM and its contractors (APTIM, 2019).

The CQAP is also applicable to off-site suppliers of equipment or services to the project, which could affect the quality of the CMI. In particular, the following items must be adhered to during the CQA activities:

- Guidelines and requirements prepared and documented in the CMI work plan
- Construction verification as it is performed, by inspection and verification testing, so that the fencing, signs, and signposts are implemented as intended
- Evaluation of variance to the design that may occur during construction and its effect upon system performance
- Complete documentation prepared and maintained during and after construction so that it can be demonstrated that the design has been implemented and that the performance requirements have been met.

G1.4 Presentation of the Construction Quality Assurance Plan

This CQAP is designed so that the CQC activities for all portions of the corrective measures are executed and managed from a common set of quality objectives and practices as described in the CQC plan and the quality assurance project plan (CMI work plan Appendix D). The CQA and CQC activities, as described herein, serve as the minimum requirements to verify that all work is in compliance with the quality requirements set forth in the CMI work plan and is consistent with the local, state, federal, and other appropriate regulatory agencies for the types of environmental activities performed.

G2.0 Responsibility and Authority

APTIM will perform the CMI for RSA-221-R-01. The RSA Site Manager and/or CEHNC Technical Manager or designee will observe the work as it is performed to ensure compliance with the CMI work plan. Observation by ADEM personnel will be dependent on the phase of the work being performed.

It is the responsibility of all project personnel to report activities that could adversely affect the CQC requirements set forth by the contract documents. The dedicated Quality Control Site Manager (QCSM) is responsible for identifying, reporting, and documenting activities affecting quality and for verifying correction of materials and activities that do not conform to the specified contract requirements. The QCSM will maintain a close working relationship with the Project Manager (PM), RSA Site Manager, and CEHNC Technical Manager, keeping them advised of all situations that if not corrected or controlled could affect the resulting quality of the project.

APTIM will designate an authorized representative to be responsible for CQA, referred to as the QCSM. The RSA Site Manager will ultimately be responsible for providing the relevant documentation to the oversight agency (ADEM). APTIM will be responsible for furnishing appropriate documentation (outlined in this CQAP) to RSA and CEHNC for submittal to the oversight agencies, as required.

G2.1 CQA Organization and Key Elements

The APTIM PM will be responsible to ensure the execution of the CQA duties for RSA-221-R-01, which will be performed by the QCSM. CEHNC has retained the services of APTIM to perform the required CMI at the site. APTIM, including its subcontractors, will be responsible for field activities for the project CQC. The responsibilities of key personnel involved in the CQA and CQC activities are described in Sections G2.1.1 through G2.1.5.

G2.1.1 Project Manager

The PM has the overall responsibility to ensure the execution of the work to be performed by APTIM, including efforts to ensure compliance with the requirements of ADEM. Among other duties, the PM will coordinate all financial and project-required resources (technical as well as administrative) necessary for the implementation of the project. The PM will maintain overall responsibility of the project through coordination activities with APTIM personnel, ADEM, and the Army. The PM shall verify that the corrective measures have been implemented in accordance with the CMI work plan. The PM has the authority to select and dismiss

organizations charged with implementation of the corrective measures and is vested with the authority to stop work if conditions adverse to quality are persistent and need to be corrected before proceeding further.

G2.1.2 Oversight Agency (ADEM)

The primary oversight agency for the RSA-221-R-01 CMI is ADEM. The oversight agency will provide review and comment on the CQAP to ensure that the proposed CQA program will provide for sufficient confirmation that work is being performed as intended. The oversight agency has the responsibility to review CQA documentation and, upon completion of the corrective measures, to confirm that the CQAP has been followed and that the construction has been performed in accordance with the regulatory requirements.

G2.1.3 Quality Control Site Manager

The QCSM will be responsible for the review and approval of the equipment and materials supplied by APTIM (including its subcontractors). The APTIM QCSM reports directly to the APTIM Corporate Quality Management Director. The work that the QCSM produces is subject to the review and approval of the PM, the APTIM Corporate Quality Management Director, and the Project Engineer.

A few deviations from the CMI work plan are not uncommon during the implementation of corrective measures. As such, activities may need to be adjusted accordingly during the progress of construction. The QCSM may be requested to change some aspects of the design and/or CMI work plan if unexpected conditions (e.g., a change in site conditions, unanticipated logistical problems, change in construction methodology, or lack of availability of certain materials) are encountered during the construction work. Accordingly, the QCSM will be responsible for preparing the appropriate variances and providing necessary feedback to the PM or APTIM Corporate Quality Management Director.

The QCSM is responsible for coordinating all required field activities. The results will be documented on the daily construction log. Additional responsibilities include preparing addenda to the CQAP and formulating corrective actions or variances when required.

G2.1.4 The Contractor and Subcontractors

APTIM has the overall responsibility for conducting the corrective measures in accordance with the approved CMI work plan. APTIM, including its subcontractors, must perform CQC tests, as required by the CMI work plan, during project corrective measures activities and provide CQC documentation as specified and report variances and nonconformances as outlined in this CQAP.

G2.1.5 Construction Quality Control Personnel

Field quality assurance (QA)/quality control (QC) personnel are individuals designated by APTIM and its subcontractors whose duty it is to ensure products and services are provided to RSA and CEHNC in accordance with the CMI work plan.

G2.2 Qualifications

Construction QA and QC activities will be accomplished by appropriately qualified personnel. Each individual shall understand and enforce the specified quality requirements and shall recommend improvements in processes and/or services which, when implemented, could affect the cost, schedule, and quality of the project in a positive manner.

The potential key personnel involved in the CQA/CQC program, which are to be identified by the contractor, and their minimum recommended qualifications are provided in the following table:

Key Personnel in CQA/CQC Organization	Role/Minimum Qualifications Requirements
PM	The specific individual(s) to certify that the construction activities have been completed in accordance with project design CMI Plan.
Project Engineer	The individual who prepared the CMI work plan and designated representative of APTIM with knowledge of the design and contract requirements.
APTIM Corporate Quality Management Director	Independent supervisor of the field QA/QC personnel. Five years of QA/QC project work.
QCSM	Responsible for the review and approval of the equipment and materials and coordinating all required field activities, including record keeping. Five years project work; college degree in science or technical field.
Field QA/QC Personnel	Designated APTIM and/or subcontractor personnel (or independent third parties) to perform specific CQC testing. Training required when appropriate for assigned tasks, certifications.

G2.3 Personnel Training

APTIM personnel assigned to the project, including subcontractors, are trained to ensure competence commensurate with the responsibility and qualifications necessary to perform the tasks to which they are assigned. In addition to education and experience, job-specific training may be required to qualify individuals to perform certain activities. The PM and QCSM will review and document the personnel qualifications and training to verify compliance to the subcontract requirements.

All personnel will be trained per Occupational Safety and Health Administration Section 1910.120. Project personnel will receive an orientation to the CMI work plan as appropriate to their responsibilities before participation in project activities.

The PM and QCSM will review the qualifications and training of all personnel assigned to the project. Training and qualification records will be maintained at the project site and available for review. Training of site personnel will be verified and documented as applicable to the work to be performed. The QCSM will monitor the training activities to verify all required training is completed for personnel performing work on the project and verify that the training is documented and that current records are maintained.

Training will include all phases of the work as necessary and will be commensurate with the complexity of the activities being performed. Training methods may include formal classroom, required reading, on-the-job training, or combination of these methods. Training procedures will be reviewed and approved by qualified CMI APTIM project personnel.

Training programs are conducted according to organizational needs and policies so that personnel:

- Have an acceptable understanding of the safety consideration of the work tasks
- Possess knowledge of the processes adequate to perform assigned tasks
- Have a working knowledge of the project or facility basis requirements
- Have an understanding of systems, terminology, reasons for performance of specific control functions and the acceptance and rejection criteria for the work
- Know the consequences of inadequate quality attainment.

The training program will be evaluated to determine the effectiveness of the program and instruction. If it is determined that the program content, instructor capabilities, or other conditions require changes, the program will be updated at that time. At a minimum, the training will be reviewed as part of the management assessment.

APTIM shall maintain qualification and training records for each employee. Training records should include all documents that establish the employee's capabilities, including outside training and training performed by approved training organizations. The QCSM will verify compliance with the project requirements.

G2.4 Communication Within the CQA Organization

Communication between the CQA program participants includes the exchange of information which allows work to proceed and the required reporting so that activities can be reviewed. Communication in the form of construction documents, inspection reports, audit reports, verification test results, and daily construction QC reports must be timely so that reviews and evaluations can be performed by all the parties responsible for execution of the work.

CQA personnel, the PM, and the subcontractors must communicate as required and as addressed in this CQAP to maximize the efficiency and effectiveness of the CMI and to minimize variance or nonconformance.

G2.5 CQA Meetings

CQA meetings will be held throughout the progression of construction activities on an as-needed basis. Progress meetings will be documented in the form of meeting minutes prepared by the QCSM and maintained in the on-site CQA files.

G3.0 Contract Scope of Work

The complete and detailed scope of work for the planned construction activities are presented in the CMI work plan and the supporting documents therein. Additionally, the CMI work plan provides the proposed schedule and sequencing of the activities. This chapter provides a general overview of the activities and an outline of the CQC testing requirements referenced in the CMI work plan. Subsequent to this chapter, Chapters G4.0 through G10.0 present the necessary supporting aspects of the CQC/CQA program that must be implemented to ensure the overall objectives of the program are met and to provide evidence of compliance with all applicable project and regulatory requirements.

G3.1 Proposed Work Activities

The general scope of work for RSA-221-R-01 includes the following:

- Mobilization/demobilization
- Locating, marking, and surveying of land-use control (LUC) boundaries, signpost areas, and fencing
- Utility clearance and marking/obtaining dig permit
- Vegetation clearance
- Protection of existing monitoring wells
- On-call UXO support
- Installation of fencing around drainage swale area
- Post signage at the site requiring on-call UXO support and Army approval for intrusive activities
- Site restoration
- Establish LUC boundary
- Outline restrictions for this site in the RSA Property Master Plan
- Comply with environmental use restrictions in Alabama Administrative Code r. 335-5-1-.02(3)(a) (ADEM, 2019)
- CMI completion report
- Conduct annual LUC inspections, sign/fencing repairs, and reporting

G3.2 CQC Requirements and Responsibilities

Sections G3.2.1 through G3.2.4 present a summary of the CQC testing requirements and responsibilities of the QCSM during implementation of corrective measures at RSA-221-R-01. The information presented herein is intended only to provide an overview of the requirements; the complete and full details of the planned work are contained in the CMI work plan and supporting documents.

G3.2.1 Preliminary Activities

Preliminary activities include mobilization, fulfilling requirements for base access, obtaining dig permits and utility marking, protection of existing monitoring wells near fencing to be installed, site controls, and surveying of fencing and warning signpost installation areas. The dig permit will be obtained from the Directorate of Public Works prior to commencement of the CMI. During these activities, the QCSM will be responsible for reviewing purchase orders and packing slips to ensure all materials received are in accordance with the CMI specifications. Site controls will be enforced in accordance with the site-specific safety and health plan prepared by APTIM.

G3.2.2 Vegetation Clearing

Ground preparation will generally involve removal of the existing vegetation within the areas where fencing and warning signposts and signs are to be installed. The brush will be cleared using manual and mechanical means (e.g., chainsaw, line trimmer, or heavy equipment). No tree cutting is expected to be required as the work area areas are primarily maintained grass. Any vegetation cleared will be stockpiled and disposed at the Construction and Demolition Landfill.

During ground preparation, the QCSM will be responsible for the following:

- Prior to vegetation removal, coordinate with RSA and verify that underground utilities have been identified.

G3.2.3 Installation of Fencing

A total of approximately 3,167 feet of high-visibility fencing will be installed around the eastern portion of the site as shown on Figure 4-1 of the CMI work plan. The fencing will encompass this area both north (1,686 feet) and south (1,481 feet) of Ninebark Road. This single-strand fencing will consist of a poly-coated cable with steel posts similar to fencing installed at landfills on RSA (e.g., RSA-060 and RSA-056/139). Two gates will be present within each of the northern and southern fenced areas. This high-visibility fencing allows easy installation across the drainage swale and streamlines groundskeeping in the area. Attachment G-2 presents the fencing technical specifications.

G3.2.4 Sign and Post Installation

Twenty-eight LUC signs will be posted around the site boundary at intervals of approximately 300 feet, which will be coincident with the LUC boundary, at the driveway entrance to each building, and just west of the Magazine Road extension (shown in green as locations 1 through 26 on Figure 4-1 of the CMI work plan). These signs will be posted on signposts as shown on Figure 4-2 of the CMI work plan and will state “No Dig without On-Call UXO Support.” The contact number for the Chief, Installation Restoration Branch within the Environmental Management Division will be on each site to obtain instructions for arranging On-Call UXO support. Two locations noted in green with an inscribed “x” on Figure 4-1 in the CMI work plan already have signposts, and a new sign will replace each existing sign.

Eleven additional LUC signs will be placed on fenceposts for the fencing installed around the drainage swale area (shown in yellow as locations 27 through 37 on Figure 4-1 in the CMI work plan). Figure 4-2 in the CMI work plan shows the proposed fenceposts with sign details noting “Conditional Access Area/No Dig without On-Call UXO Support.” The contact number for the Chief, Installation Restoration Branch within the Environmental Management Division will be on each site to obtain access permission and instructions for arranging On-Call UXO support.

Soil removed for signpost installation will be used as backfill and compacted to existing grade. Additional soil removed for signpost installation will remain at the original location.

G3.2.5 Site Restoration Activities

Once signpost and fencing installation is completed, the disturbed areas will be seeded and mulched to stimulate revegetation and reduce the potential for soil erosion. Seed and mulch will be applied to all disturbed areas according to the Best Management Practices handbook from the Alabama Soil and Water Conservation Committee (ASWCC) (ASWCC, 2018).

A site inspection will be conducted 2 to 4 weeks after the seeding to confirm the revegetation is successful. If revegetation is unsuccessful, the identified areas will be reseeded until an adequate stand of vegetation is present.

G3.2.6 Final Inspection and Demobilization

When planned corrective measures activities have been completed, temporary field structures, as applicable, will be removed from the site. A final inspection of the project site will then be conducted in accordance with the requirements as outlined in this CQAP.

After the completed work has been accepted by RSA and/or CEHNC, all personnel and equipment will be demobilized from the project site. During these activities, the QCSM will be responsible for the performance or oversight of the following:

- Oversee the removal of temporary field structures, as applicable.
- Participate in final field inspection and note deficiencies that require corrective action.
- Coordinate implementation of corrective actions and arrange for reinspection.
- Submit final approved inspection report to RSA and CEHNC.
- Oversee demobilization activities.

G3.3 Additional Considerations

The information contained in the sections above only represents an overview of the proposed work activities and is intended to serve as a guide to the complete details of work as included in the contract CMI work plan and other applicable supporting documents. As noted previously, the remaining chapters of this CQAP contain discussions of the additional components included in the overall CQA/CQC program which are implemented to ensure the generation of defensible evidence of compliance with contract and regulatory requirements.

G4.0 Document Control

The CQAP is a controlled document, and measures are included to maintain the currency and the use of the plan so that the CQC functions defined within are in accordance with the latest specified requirements. Distribution of the plan is controlled so that all revisions to the plan are issued to the plan holders and the superseded requirements revised accordingly in the existing plans.

Issuance and distribution of the plan will be controlled by the PM or his/her designee, the document controller. The plan will be transmitted to each plan holder on the distribution list. The transmittal document will reference the assigned document control number, which will appear in the top right corner of the transmittal letter included within each document. The assigned number will be kept on a log and maintained by the PM's designee in the home office. Copies will be maintained at specific locations and available to the individuals performing the work.

Revisions to the plan will be made by sections or by the addition of supplements or amendments and will be noted with change pages or with a new final or revised document. All accepted revisions to the plan will be transmitted to the plan holders according to the distribution list. Each individual or organization designated as a plan holder will be responsible for updating their copy of the plan.

G4.1 Documentation

The PM will provide a document control system to provide measures for the control of issuance, distribution, storage, and maintenance of documents relating to quality, including those from the subcontractors and other vendors or suppliers.

Preparation, review, issuance, and revisions to documents affecting construction quality will be controlled so that the specified contract, regulatory, and permitting requirements are clearly defined and made available to the personnel performing the work. Such documents may include but not be limited to the following:

- Correspondence
- Drawings
- Procedures
- Plans
- Reports
- CMI work plan.

The PM or his/her designee will review the documents to verify inclusion of the appropriate QA requirements.

G4.2 Daily Construction Log

CQC reporting will be addressed in the daily construction log, and APTIM will document all project activities as required by the contract. The log will cover both conforming and nonconforming work and will include but not be limited to the following:

- Weather conditions
- Site instructions
- Nonconforming conditions
- Results of inspections and tests
- Types of defects or causes for rejection
- Corrective actions - proposed and taken
- On-site personnel and major equipment log
- Delays and causes
- Verbal instructions.

A copy of a typical daily construction QC report is included as Table G4-1. RSA and CEHNC will be provided a copy of the daily QC reports throughout the duration of the project.

G4.3 Records

G4.3.1 Evidence of Contract Compliance

Records will be prepared to furnish documented evidence that design, construction, and operation activities are in compliance with the quality requirements of the contract. The records will be consistent with the applicable sections of the project technical CMI work plan and may include one or more of the following:

- Daily CQC report
- Technical reviews
- Inspection and test reports
- Audit reports
- Monitoring and surveillance activities
- Personnel qualifications
- As-built drawings
- Nonconformance reports and corrective actions
- Design documents
- Other specified documents.

G4.3.2 Storage of Field Records

Copies of field records will be maintained and stored at the project site until turnover as specified by CEHNC. On-site records will be readily retrievable for review and audit purposes by ADEM, RSA, and CEHNC. The records will be controlled so that the possibility of loss, damage, or other detrimental conditions of the records is avoided. The original project documents will be stored at APTIM's home office.

G4.4 Project Submittals

Project submittals include documents generated or revised in the home office or in the field site office at RSA. Project submittals will have tracking numbers issued with each new or revised document. In addition, project submittals specified in the contract documents and CMI work plan will be prepared by APTIM and submitted to the QCSM. The PM is responsible for the preparation and maintenance of the specified submittals for the project.

G4.4.1 Document Submittal Register

The project submittal register will be maintained by APTIM. Submittals returned unapproved or with comments requiring revisions will be so noted on the submittal register and re-entered as a revision. The Project Engineer or his/her designee will monitor the submittal register to verify submittals are being controlled, scheduled, tracked, and the status kept in an effective manner. The project submittal register will be updated continuously, as applicable, and reviewed by the Project Engineer or his/her designee to determine the status of the submittals and compliance to the project schedule requirements.

G4.4.2 Submittal Preparation and Transmittal

Submittals will be prepared by the PM or his/her designee. Submittals from subcontractors or vendors will be reviewed by the QCSM prior to transmitting the submittals to the PM and Project Engineer or designees. All appropriate information will be completed prior to transmittal of the submittals. Submittals will be scheduled to coincide with the needed dates and adequate time allowed for review and approval in accordance with the contract requirements. The submittals will be reviewed for conformance to specified requirements, completeness, and accuracy. Submittals requiring modifications or changes will be returned to the PM or his/her designee for corrective actions and resubmitted for review.

G4.4.3 Resubmittals

Submittals that are not approved by the QCSM or returned with comments that require resubmittal for approval will be processed in the same manner as the original submittals. The submittal number used for the original submittal will be used for each resubmittal followed by a

numerical notation indicating the revision. The resubmittals will be re-entered on the project submittal register with the new revision numbers.

G5.0 Nonconformances and Corrective Actions

This chapter addresses the procedure for reporting nonconformances and corrective action for variance from the contract documents.

G5.1 Nonconformance and Corrective Actions

G5.1.1 Nonconformance Report

Work, field testing, or materials not conforming to the CMI work plan or contract requirements, including noncompliances and deficiencies identified by RSA and CEHNC, will be documented on a nonconformance report (NCR). A sample NCR is shown in Table G5-1. At a minimum, the NCR will detail the nonconforming conditions, recommended corrective action(s), and disposition of the corrective action(s). Noncompliances or deficiencies identified by the QCSM will be immediately corrected. A master log of all NCRs will be kept by the QCSM for review by the PM. All NCRs will remain open until the nonconforming condition has been satisfactorily resolved and verified as acceptable by the APTIM Corporate Quality Management Director.

G5.1.2 Identification of Nonconforming Items

Items identified as nonconforming will be documented on the NCR, which, as applicable, will include the following:

- Description of nonconforming item or activity
- Detailed description of nonconformance
- Cause of nonconformance
- Referenced criteria
- Recommended disposition
- Disposition and verification of corrective action
- Responsible organization.

G5.1.3 Nonconformance Tracking Register

Each identified nonconformance will be documented on the sample NCR tracking register (Table G5-2) which, at a minimum, will include the following information:

- NCR tracking number
- Issue date
- Distribution parties
- Individual or organization assigned responsibility
- NCR closed-out date and initial of party responsible for closure.

The QCSM is responsible for maintaining the NCR tracking register and verifying that the corrective actions were implemented and verified prior to closing the NCR. RSA and CEHNC will be notified in advance of verification of the corrective actions to permit their participation in the inspections and acceptance of the results prior to closing the NCR.

G5.1.4 Control and Segregation

Nonconforming materials or items will be controlled to prevent inadvertent use or further processing which would cause the nonconforming condition to be inaccessible for correction. All items identified as nonconforming will be clearly identified and segregated from acceptable items except where size, installation status, and other conditions would make it impractical to segregate from conforming items. When nonconforming items are not segregated, they will be identified and clearly marked so that they may be easily recognized as nonconforming to prevent further activities prior to the implementation of the corrective action(s).

G5.1.5 Disposition

The disposition of NCRs will include the necessary actions required to bring the nonconforming condition to an acceptable condition and may include reworking, replacing, retesting, or re-inspecting. Implementation of the disposition will be in accordance with the original procedural requirements, a specific procedure, or other acceptable written instructions by the APTIM Corporate Quality Management Director.

G5.1.6 Documentation

Notifications of noncompliance and the proposed corrective actions will be documented on an NCR and processed in accordance with the provision described in this section. Corrective actions will be implemented upon receipt of the notification. The NCR will remain open until the noncompliance is resolved.

G5.1.7 Corrective Actions

In addition to resolving identified nonconforming conditions, corrective actions will address the cause of adverse conditions contributing to the nonconformance and establish methods and controls to preclude the recurrence of the same or similar types of nonconformances.

The QCSM will track corrective actions to identify trends in the causes of the nonconforming conditions and initiate necessary actions to prevent recurrence. Additionally, the QCSM will monitor the corrective actions to verify that corrective actions were properly implemented and accepted and the NCR closed.

G5.1.8 Stop Work Notice

Nonconforming conditions that affect the quality of the project, threaten safety, or cause an environmental threat will be stopped through the use of a stop work notice (Table G5-3). Stop work notices may also be issued in the event of insufficient corrective actions resulting in recurring nonconforming work. The issuance and tracking of stop work notices will be documented on a stop work notice log (Table G5-4), to be maintained by the PM or his/her designee.

G5.1.9 Conflict Resolution

Conflicts arising from nonconformance and corrective actions that cannot be resolved at the project management and QC levels will be directed to successive levels of management as necessary to obtain resolution. The levels of management will include the QCSM, APTIM Corporate Quality Management Director, and PM. All conflicts will be resolved within the specified requirements of the contract and the governing regulatory documents.

G6.0 Procurement Control

This chapter addresses the procedure for ensuring that procured items and services meet established requirements and perform as specified within procurement standard operating procedures.

G6.1 Overview

Prospective suppliers will be evaluated and selected on the basis of the specified criteria. APTIM will ensure that approved suppliers can provide acceptable items and services as required by the contract. The Project Engineer will review and approve all materials and supplies that may affect quality of the project. Upon approval of purchase requisitions, the QCSM will receive a copy of the approved purchase requisition. When materials and supplies arrive at the project site, the QCSM will be responsible to ensure the items and services meet the requirements listed in the purchase requisition and that no items are installed prior to approval of applicable submittals.

The procurement details include provisions for the following, as applicable to the scope of work or services:

- **Scope of Work.** A statement of the scope of work to be performed by the subcontractor will be in the procurement documents.
- **Technical Requirements.** Technical requirements will be specified. Where necessary, these requirements will be specified by reference to CMI work plan, codes, regulations, procedures, QA program documents, and statement of work requirements that describe the services to be furnished. The procurement documents will provide for identification of inspection, verification, and acceptance requirements for monitoring and evaluating the supplier's performance.
- **QA Program Requirements.** Procurement documents will require that subcontractors have a documented quality system that implements portions or all of the requirements of this plan, as applicable. The extent of the suppliers' quality system will depend on the type and use of the service being procured.
- **Right of Access.** At each tier of procurement, the procurement documents will provide for access to supplier's facilities and records for inspection or audit by APTIM or its authorized representative.
- **Documentation Requirements.** Procurement documents at each tier of procurement will identify the documentation required to be submitted to APTIM for information, review, or approval and the time of submittal. The retention times and the disposition requirements for specific quality records will be prescribed.

- **Questionable or Unusable Data.** The procurement documents will include requirements for reporting and approving disposition of questionable or unusable data.

G6.1.1 Review of Procurement Documents

The QCSM will ensure that site-initiated procurement documents and changes transmitted to the prospective supplier include adequate requirements, performance standards, and quality criteria. The purchase requisition will then go through the proper approval process including the PM, the Project Engineer, and the Procurement Leader.

The review of changes and their effects will be completed prior to transmittal to the prospective supplier. This review will include the considerations that the appropriate requirements are specified, additional or modified performance criteria determined, and analysis of exceptions or changes requested or specified by the supplier.

G6.1.2 Source Evaluation and Selection

The selection of suppliers and subcontractors will be based on an evaluation of their capability to provide items and/or services in accordance with the specified requirements. Measures for evaluating and selecting procurement sources will be documented and may include one or more of the following:

- Evaluation of the supplier's history of providing an identical or similar service, which reflects the current capability
- Supplier's current QA records supported by documented qualitative and quantitative information that can be objectively evaluated
- Supplier's technical and quality capability as determined by a direct evaluation of their facilities and personnel and an evaluation of the effectiveness of their implementation of their quality system.
- Submittals pertaining to the items or services to be provided must be approved prior to use or initiation of the work on the project site.

G6.1.3 Acceptance of Services

The procurement control will include flow-down provisions of the contract and site-specified task order. The acceptance methods used (e.g., source verification, receipt inspection, and technical verification of data produced) will be verified. Confirmation of specific characteristics will be performed at intervals and to a depth consistent with the service's complexity, quantity and frequency of procurement, and statement of work requirements.

G6.1.4 Receipt Inspection and Verification

The QCSM or designee will develop and implement procedures for receipt inspection and verification of purchased items. These controls will provide for the following, as applicable:

- Verification that the items received is in accordance with purchase order requirements
- Inspection for evidence of breakage, damage, or otherwise being unfit for use
- Verification that required documentation is received and acceptable
- Verification that the items conform to the supplier's published requirements that were provided submitted and approved.

G6.1.5 Handling, Storage, Packaging, and Shipping

The handling, storage, cleaning, preservation, packaging, and shipping of items shall be controlled to prevent damage or deterioration that would jeopardize the specified performance of the items.

Procurement documents shall include the following:

- Requirements for sellers to establish special procedures, when necessary, to ensure cleanliness, identification, and proper handling
- Requirements for the preparation of items for shipment, as necessary, to prevent damage or deterioration of the supplied items
- Requirements for material and equipment storage instructions, when specified, to be available at the site well in advance of the arrival of material or equipment.

G6.2 Subcontractor Quality Control

All subcontractors performing work for a project are responsible for compliance to the requirements of their respective subcontracts. Subcontractors include organizations supplying quality-related items or services to the project. The overall responsibility for conformance to the quality requirements for the subcontracted items and services is retained by APTIM.

The requirements for personnel qualifications, technical performance levels, QC procedures, acceptability levels, and documentation will be included as part of the subcontract documents. The PM or designee will review the subcontract procurement documents to verify that QC requirements are passed on to the subcontractor.

The QCSM is responsible for the implementation of inspections, surveillance, document review, audits, and other QC activities for monitoring the subcontractor to verify compliance with the

contract and subcontract requirements. These activities will be documented on inspection reports, audit reports, field logs, or other forms appropriate to the function performed.

For field operations, the field QA/QC personnel will provide QC checks before, during, and at the completion of the subcontractor's activities to determine that the subcontractor is in compliance with the QC measures set forth by the contract, the applicable subcontract documents, and the subcontractor's approved QC plan, including the following:

- Meeting quality requirements
- Generating, controlling, and maintaining required documentation
- Performing and documenting required inspections and tests
- Identifying, reporting, and correcting nonconforming conditions
- Turnover to APTIM.

G6.2.1 Other Subcontractors

Subcontractors performing work will be monitored by the QCSM or field QA/QC personnel to verify conformance to the contract and subcontract quality requirements. The monitoring activities will include audits, surveillances, witnessing of inspections and tests, document reviews, and interfacing with the subcontractor's QC or project management. All monitoring activities will be documented on the appropriate form or included in the daily construction log.

G6.2.2 Subcontractor Noncompliance

Work performed by subcontractors that does not comply with the specified requirements will be identified, reported, controlled, tracked, and corrected.

G7.0 Audits

Audits may be performed to verify compliance with aspects of the project documents. Audits will be performed with checklists and include a review of documents and records to determine if the CQAP and supporting procedures are being implemented. A site-specific assessment checklist for RSA-221-R-01 is provided as Attachment 1 of this CQAP. The individual elements of the checklist are based on the site-specific requirements presented in Chapter 4.0 of the CMI work plan.

An audit will note findings and observations. A finding will be a documented statement of fact concerning a noncompliance or deviation from established requirements. An observation will be a statement of fact regarding the potential for a noncompliance.

Audits will be performed by qualified personnel and include individuals that are technically knowledgeable in the areas to be assessed. Audit results will be documented and sent to the appropriate management.

G7.1 Scheduling and Planning

Audits typically will be performed early in the life of the activity as practical and continue until completion of the activity. The Auditor will provide written notification to the organization to be audited informing them of the scheduled audit date.

Audit schedules may be prioritized based on the importance of the activity, previously identified deficiencies of the activity, and the size or complexity of the activity. The QCSM will develop a schedule for the performance of audits. The audit schedule will be posted and distributed to project staff and managers. Unscheduled audits may be used to supplement scheduled audits when conditions warrant.

G7.2 Internal Performance Audits

Performance audits are conducted on site by an auditor who directly observes specific project activities to determine if these activities are being conducted in accordance with the contract requirements. The Auditor will be technically competent in the activities to be audited and independent of the subject work. The audit of project deliverables will be for the purpose of determining compliance with the procedures set forth in this plan (i.e., technical reviews, documentation of reviews, document control, and other procedures). Checklist items to be examined may include the following:

- Availability and implementation of approved work instructions
- Field documentation and checking
- Subcontractor performance
- Review of personnel training and qualification records
- Review of process controls and associated records to determine compliance with CMI work plan or plans
- Review of work areas for evidence of implementation of procedures and instructions
- Review of documentation indicating compliance with plan, document and design preparation, review, and approval procedures
- Change and nonconformance documentation and disposition.

G7.3 Execution of Audits

Audits will normally be conducted as described below.

G7.3.1 Pre-Audit Meeting

The Auditor will conduct a brief pre-audit meeting with management or supervisory personnel of the organization to be audited to confirm the audit scope, discuss the audit sequence, establish a tentative time for the post-audit meeting, and establish channels of communication.

G7.3.2 Audit

The Auditor will follow checklists, developed prior to the audit, to evaluate existing project records provided by designated project staff and may observe work in progress. If noncompliances are observed or uncovered during the audit, the Auditor will discuss these potential findings with the individuals being audited so that findings are accurate and understood. In addition to identifying noncompliances, the audit results may include observations of notable areas of strength.

G7.3.3 Exit Meeting

Upon completion of the audit, the Auditor will discuss observations and findings with the group or organizations audited and, whenever possible, agree on corrective actions. Minor administrative findings that can be resolved to the satisfaction of the audit team during the audit are not required to be documented as items requiring corrective actions. All findings that are not resolved during the course of the audit and findings affecting quality will be noted on the audit checklists.

G7.3.4 Audit Report

The Auditor will prepare and issue an audit report, which provides the following information at a minimum:

- Unique audit number
- Description of the audit scope
- Audited organization and location
- Persons contacted during the audit activities
- Audit dates
- Summary of audit results, including a statement on the effectiveness of the quality management elements which were audited
- Suggested opportunities for improvement in the form of observations and comments
- Description of each reported audit finding in sufficient detail to enable corrective action to be performed.
- Due date for completion of corrective actions and/or audit response (typically 30 days).

Audit results will include findings and observations. Findings are items that require corrective action. Findings will be documented on an audit finding report or equivalent. Observations are nonmandatory recommendations to improve project quality. The Auditor may make recommendations for corrective actions; however, the ultimate responsibility for taking corrective action lies with the auditee. The report will be signed by the Auditor. Checklists need not be included with the audit report but should be maintained as records in the project files.

The Auditor will prepare an audit report cover letter or memorandum for signature and issuance by the PM. The audit report will be issued to the management of the audited organization.

G7.4 Response

The response prepared by the auditee will clearly state for each finding the corrective action taken or planned, the cause of the deficiency, and the action to prevent recurrence. For each observation, the response will indicate actions taken or planned for quality improvement. The response will, at a minimum, be sent to the PM and the Auditor.

G7.5 Follow-Up

The QCSM or designee will track all audit findings to assure that all findings are appropriately addressed and to track audit findings for significant conditions adverse to quality. The QCSM or designee will maintain the status of audit findings for active audits and prepare correspondence relating to overdue audit responses. When responses are overdue, the QCSM or designee notifies the responsible organization by telephone that responses are overdue and prepares a memorandum or letter indicating a new response due date. If a request for extension of response is received, an evaluation will be made and a formal response submitted to the requesting organization.

The PM or designee, upon receipt of responses to audit findings, will coordinate with the Auditor for the evaluation of responses. The responsible evaluator will document the results of the evaluation. Unacceptable responses will be noted together with the specific reason for rejection. The PM or designee will prepare transmittal correspondence to the responsible organization to inform them of a new response due date.

Follow-up actions, possibly including re-audit of deficient areas, will be taken to verify whether corrective action is accomplished as scheduled. The QCSM or designee will assure that verifications of corrective action implementation are accomplished and document the results of verification.

Following acceptance and verification of all corrective actions, an audit closure document will be issued by the Auditor to the same distribution as the audit report. The closure document will indicate that corrective actions have been satisfactorily completed and will contain a statement that the audit is closed.

G7.6 Documentation

The following documents generated before, during and after the audit process will be maintained in the record file system in accordance with Chapter G4.0:

- Audit report
- Audit responses
- Audit closure letter
- Correspondence related to the audit.

G8.0 Construction Inspections

The primary function of inspections is to establish the measures required to verify the quality of work performed and compliance to the specified requirements, including the inspection of materials and workmanship before, during, and after each work element.

G8.1 Preparatory Inspections and Meetings

Along with representatives of RSA and CEHNC, the PM, the QCSM, and the Site Supervisor will conduct preparatory inspections/meetings at RSA-221-R-01. Preparatory inspections/meetings will be performed prior to starting definable features of work. Typical definable tasks and related inspection requirements can be modified based on project requirements. Where more than one work element is included in one work activity, one preparatory meeting may cover several work elements for the site. Likewise, a number of work activities, where feasible, can be combined into individual preparatory meetings. The preparatory inspection/meeting will be attended by the Army, applicable APTIM personnel and subcontractors involved with the feature of work, and responsible field QA/QC personnel. The QCSM will be notified in advance to coordinate participation in the inspection. The preparatory meeting may include but not be limited to:

- Review the basic elements of the work.
- Review documentation and reporting requirements.
- Review pertinent contract requirements.
- Review materials and equipment documentation for required tests, submittals, and approvals.
- Review required QC inspections and test requirements.
- Establish that the preliminary work required to begin the feature of work is complete and conforms to approved drawings and submittal data.
- Establish that the required materials and equipment for commencement of the work are on hand or available for use on the feature of work and that all equipment is properly calibrated and in proper working condition.
- Ensure the securing of utility clearances (“dig permits”).
- Address basic site health and safety considerations.
- Establish hours of operation.

Preparatory inspections will be reported on the daily QC reports. The detailed results of the preparatory inspection will be documented.

Personnel performing work activities affected by a preparatory inspection will be directed in the acceptable level of the workmanship involved for the feature of work covered by the inspection.

G8.2 Initial Inspections

The initial inspection may be conducted at the beginning of the work element. The inspection will be performed as soon as it is determined that a sufficient portion of the work element has been accomplished to evaluate the following criteria:

- Compliance with the CMI work plan, drawings, submittals, and other contract requirements
- Acceptable levels of workmanship
- Quality of materials
- Resolution of differences (when applicable).

Initial inspections will include participation of the responsible personnel, including appropriate subcontractors and the field QA/QC personnel involved with the work element. The Army will be notified in advance of each initial inspection to coordinate participation in the inspection. The initial inspections will be reported on the daily construction logs.

G8.3 Follow-Up Inspections

Follow-up inspections will be performed throughout the course of work. The frequency of the follow-up inspections will be dependent upon the extent of work being performed on each particular work element. Follow-up inspections will also be performed on completed work phase prior to starting subsequent phases. Deficiencies identified will be corrected in a timely manner or identified on a punch list which will be used as a tracking method until the work is completed and verified and the punch list item signed off. Deficiencies which would be made inaccessible for correction by subsequent work activities will be corrected and accepted prior to starting the new work.

The follow-up inspections will be reported on the daily construction logs and copies of the inspection forms as applicable.

G8.4 Pre-Final Inspection

Near the completion of the work or increment thereof as established (e.g., completion of signpost installation), the QCSM shall conduct an inspection of the work and develop a punch list of

items that do not conform to the approved CMI plan. The list of deficiencies will become a part of the CQC documentation which will include the estimated date by which the deficiencies will be corrected. The QCSM will then make a second inspection to ensure that all deficiencies have been corrected. Once this is completed, APTIM will notify the QCSM that the site is ready for pre-final inspection.

The Army will perform the pre-final inspection to verify that the site work has been satisfactorily completed. A pre-final “punch list” may be developed by the QCSM as a result of this inspection. The QCSM will then make sure that all items on this list have been corrected and so notify the PM so that a final inspection with RSA and CEHNC can be scheduled. Items noted in the pre-final inspection will be completed in a timely manner. These inspections and deficiency corrections will be accomplished within the time frame slated for completion of the project.

G8.5 Final Inspection

The PM, the QCSM, the RSA Site Manager, and the CEHNC Technical Manager will be in attendance at this inspection. The RSA Site Manager or CEHNC Technical Manager will formally schedule the Final Inspection based upon completion of the results of the pre-final inspection. Notice will be given to the Army at least 14 days prior to the final inspection and must include APTIM’s assurance that all the specific items previously identified as being unacceptable will be completed by the date scheduled for the final inspection.

APTIM will prepare the punch list. The punch list will identify all nonconforming or incomplete work. Upon completion of the punch list items, a second inspection will be conducted by RSA, CEHNC, and APTIM to verify all of the items conform to the requirements. The APTIM Corporate Quality Management Director will be the final authority to accept all of the punch list items as having been corrected.

G8.6 Inspection Documentation

The QCSM is responsible for the maintenance of the inspection records. Inspection records will be legible and clearly provide all information necessary to verify the items or activities inspected conform to the specified requirements or, in the case of nonconforming conditions, provide evidence that the conditions were brought into conformance or otherwise accepted by the Army.

G9.0 References

Alabama Department of Environmental Management (ADEM), 2019, *Alabama Department of Environmental Management Land Division - Uniform Environmental Covenants Program Administrative Code, Chapter 335-5-1*, Amended August 20, 2019, effective October 4, 2019.

Alabama Soil and Water Conservation Committee (ASWCC), 2018, *Alabama Handbook for Erosion Control, Sediment Control, and Stormwater Management on Construction Sites and Urban Areas*, July.

Aptim Federal Services, LLC (APTIM), 2019, *Quality Assurance Surveillance Plan for Corrective Measures Implementation at Multiple Sites*, U.S. Army Garrison-Redstone, *Madison County, Alabama*, Prepared for U.S. Army Engineering & Support Center, Huntsville, Alabama, November.

Aptim Federal Services, LLC (APTIM), 2018, *Revision 1 RCRA Facility Investigation Report RSA-221-R-01, Fuse Storage and Munitions Disposal Area, Operable Unit 15, U.S. Army Garrison- Redstone, Madison County, Alabama*, Prepared for Mission & Installation Contracting Command, September.

U.S. Army Garrison-Redstone, 2018, *Redstone Arsenal (RSA) Explosive Safety Management Program (ESMP)*, prepared by U.S. Army Aviation and Missile Command (AMCOM) Safety Office, 22 January.

U.S. Army Garrison-Redstone, 2013, *Redstone Arsenal Real Property Master Plan - Digest*, prepared by Master Planning Division, Directorate of Public Works, April.

TABLES

Table G4-1

Typical Daily Construction Log
Redstone Arsenal, Madison County, Alabama

Date: _____

Contractor: _____ Project No.: _____

Contract Title: _____ Report No.: _____

Area: _____ Unit: _____ Work: Contract (✓) _____ WO # _____

Shift: _____ Hrs. Wkd: From _____ To _____ Weather _____
Temp. _____ L _____ H _____

Manpower	No.	Total Hrs.	Major Equipment	No.	Total Hrs.

Description of Work Performed Today:

Remarks by Contractor: (Delays, interruptions, deviations, extra work activities, unusual occurrences, etc., relevant to today's work.)

For Contractor: _____ Title: _____ Date: _____

USACE Comments and/or Exceptions:

For USACE: _____ Title: _____ Date: _____

Table G5-1

**Nonconformance Report
Redstone Arsenal, Madison County, Alabama**

Linked w/Variance No: Page __ of __

Project Name:		Project Number:	
Date of Issue:		Report Number:	
-- Nonconformance Report --			
I. Description of the Nonconformance, include requirement violated: (by the person identifying the nonconformance)			
Identified by:		Date:	
Root Cause of nonconformance:			
II. Recommended Corrective Action: (by the person identifying the nonconformance and the review committee)			
To Be Performed by:		Date:	
To Be Verified by:		Date:	
III. Corrective Action Implementation: (by those implementing the corrective action)			
Was Performed by:		Date:	
Was Verified by:		Date:	
How was the Corrective Action Verified?			
IV. Nonconformance Resolution, include action taken to preclude recurrence: (by the review committee)			
Affected Organization:		-- Signatures --	
<u>Distribution List:</u>		Requested by: _____ Date: _____ (printed name and date) Signature: _____	
		QC Approved by: _____ Date: _____ (printed name and date) Signature: _____	
		Proj. Mgr. Approval: _____ Date: _____ (printed name and date) Signature: _____	
		Client QA Approval: _____ Date: _____ (printed name and date) Signature: _____	

Table G5-2

**Nonconformance Report Tracking Register
Redstone Arsenal, Madison County, Alabama**

PROJECT NO. CONTRACT NO. NONCONFORMANCE REPORT TRACKING REGISTER

NCR NO.	DESCRIPTION OF NONCONFORMANCE	DATE ISSUED	DATE CLOSED	COMMENTS

Table G5-3


**Stop Work Notice
Redstone Arsenal, Madison County, Alabama**

Project Name/Location: _____ Project No. _____ D.O. No. _____

S.W.O. No. _____ Date: _____ Page 1 of

1. Written Notice Issued to: Name: _____ Title: _____ Org.: _____	2. P.O. # or Activity: _____ 3. Location: _____ 4. Issued by (name): _____ Issued by (title): _____
5. Verbal Notice Issued to: Name: _____ Title: _____	Date: _____ Time: _____
6. Associated NCR No.: _____	7. Associated CAR No.: _____
8. Stop Work Order Condition Description: _____	Attachment _____
9. Remedial Action Required: By Whom: _____ By When: _____ Required Remedial Action Determined by: Project Manager: _____ Date: _____ CQA Director/Field CQA Coordinator: _____ Date: _____	Attachment _____
10. Follow-up of Remedial Action Taken: Verbal Notice to Resume Operations Given to: Name: _____ Date: _____ Time: _____ Title: _____ Stop Work Order Cancellation Authorized by: CQA Director/Field CQA Coordinator: _____ Date: _____	Attachment _____

ATTACHMENT G-1
FIELD INSPECTION CHECKLIST

	EPA ID No. AL7 210 020 742	Controlling Document: RSA-221-R-01 Corrective Measures Implementation (CMI) Plan	
Location: Redstone Arsenal, Madison County, Alabama			
Inspection Type: Field Inspection Checklist Subject: RSA-221-R-01 CMI Work Plan		Inspection Date:	
Descriptor / Requirements		Comments	Results

4.0 Corrective Measures Implementation		
This section provides an overview of the field activities planned to complete corrective measures at RSA-221-R-01. Work presented in this section will be completed in accordance with the procedures described in the CMI Work Plan and other approved documentation as appropriate. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.1 General Scope		
The general scope of work (SOW) includes the following: <ul style="list-style-type: none"> • Mobilization/Demobilization • Locating, Marking, and Surveying of LUC Boundary, Fence Corners, and Signpost Areas • Utility clearance and marking/obtain dig permit • Vegetation clearance • Protection of existing monitoring wells • On-call UXO support • Installation of fencing around drainage swale area • Post signage at the site requiring on-call UXO support and Army approval for intrusive activities • Site restoration • Prepare corrective measures report • Establish LUC boundary • Outline restrictions for this site in the RSA Property Master Plan • Comply with environmental use restrictions in AAC r. 335-5-1-.02(3)(a) • Conduct annual routine LUC inspections, sign/fence repairs, and reporting. RSA-221-R-01 CMI Work Plan Chapter 4.0		

Location: Redstone Arsenal, Madison County, Alabama		
Inspection Type: Field Inspection Checklist		
Subject: RSA-221-R-01 CMI Work Plan		
Descriptor / Requirements	Comments	Results
4.1.1 Procurement and Subcontracting		
<p>Subcontracted services and imported materials required for the completion of the project may include the following:</p> <ul style="list-style-type: none"> • Vegetation clearance • Protection of existing monitoring wells • Installation of fencing • Surveying for LUC boundary and locations of fencing and signage • Sign and post installation • Site restoration (Seed, fertilizer, and mulch) <p>RSA-221-R-01 CMI Work Plan Chapter 4.0</p>		
<p>The following equipment may be utilized to complete field remediation activities:</p> <ul style="list-style-type: none"> • Heavy equipment for fence installation (e.g., backhoe) • Skid Steer Loader with bucket and auger attachments (drilling of signpost holes) • Portable fuel tank • Miscellaneous support equipment (e.g., portable storage, computers, copier, fax machine, radios, relief station, eyewash, etc.). Support equipment and materials will be procured through equipment vendors and scientific supply vendors and shipped directly to the site. <p>RSA-221-R-01 CMI Work Plan Chapter 4.0</p>		
4.1.2 Field Personnel		
<p>Field personnel required to complete the field activities may include the following:</p> <ul style="list-style-type: none"> • Site supervisor • Site safety officer • Field construction quality control site manager • Equipment operators • Laborers <p>The number and schedule of personnel will be adjusted during the project as required.</p> <p>RSA-221-R-01 CMI Work Plan Chapter 4.0</p>		

Location: Redstone Arsenal, Madison County, Alabama		
Inspection Type: Field Inspection Checklist		
Subject: RSA-221-R-01 CMI Work Plan		
Descriptor / Requirements	Comments	Results
4.1.3 Quality Control Inspections for Field Activities		
Inspections may be performed and verified through visual observation, measurement of materials or equipment, examination of documentation/certification, evaluation of performance, or testing. RSA-221-R-01 CMI Work Plan Chapter 4.0		
Inspections will be performed using a three-phase inspection method: 1) Preparatory inspection(s) are performed prior to start-up and will examine training, procedures, equipment and materials, work plans and documents, and overall readiness to perform work; 2) Initial inspection(s) are performed when work begins on a particular feature of work and include an examination of the quality of workmanship and a review of control testing for compliance with work plan requirements. Follow-up inspection(s) are then performed to verify compliance with procedures; and 3) Follow-up inspections will ensure a continuation of quality and safety standards established during preparatory and initial inspections until completion of the definable work feature. Final follow-up inspection(s) will be conducted at the completion of the activity. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.1.4 Daily Reports		
Daily reports (including daily construction logs, etc.) are provided to the APTIM Project Manager or their designee during CMI activities. These reports are being submitted weekly to the CEHNC Contracting Officer's Representative/Project Manager and RSA. Variances, inspection forms, survey data including survey plat for LUC boundary, and dig permits will be included in the project reporting. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.1.5 Health and Safety Requirements		
All personnel involved in the corrective measures are following this CMI Work Plan and abiding by the health and safety requirements presented in the SSHP prepared by APTIM for implementing the corrective measures (Appendix E). RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.2 Preliminary Activities		
Preliminary activities include mobilization, fulfilling requirements for base access, utility marking and obtaining dig permits, protection of existing monitoring wells near fencing to be installed, vegetation clearance, and surveying. All field personnel will follow this work plan and abide by the health and safety requirements presented in a site-specific safety and health plan to be prepared by the CMI Contractor. RSA-221-R-01 CMI Work Plan Chapter 4.0		

Location: Redstone Arsenal, Madison County, Alabama		
Inspection Type: Field Inspection Checklist		
Subject: RSA-221-R-01 CMI Work Plan		
Descriptor / Requirements	Comments	Results
4.2.1 Mobilization		
Mobilization included deployment of personnel, equipment, subcontractors, and materials necessary to commence CMI activities. RSA-221-R-01 CMI Work Plan Chapter 4.0		
All contractor and subcontractor personnel have completed required training and health and safety requirements. This includes: <ul style="list-style-type: none"> • OSHA 40-hour HAZWOPER and 8-hour updates • Reviewed and signed site-specific health and safety plan • Any additional site or contract specific training or health and safety requirements RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.2.2 Access to Redstone Arsenal		
New personnel and subcontractor personnel have registered at the Redstone Arsenal Visitors Center at either Gate 1 (Martin Road East) or Gate 9. Personnel with prior approval from a host RSA organization will be issued a personnel badge upon presentation of proper identification. RSA-221-R-01 CMI Work Plan Chapter 4.0		
Personnel may access the RSA via any active gate but should note that gate access hours vary. Commercial trucks must pass through the inspection facilities at either Gate 1 or Gate 9 each time they enter RSA. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.2.3 Locating, Marking and Surveying of LUC Boundary, Fence Corners, and Signpost Areas		
A licensed land surveyor was subcontracted to survey the LUC boundary, fence corners, and signpost installation areas. The surveyor located these areas based on the coordinates provided on Figure 4-1 of the CMI Work Plan. RSA-221-R-01 CMI Work Plan Chapter 4.0		
The fencing locations (e.g., corners, etc.) were marked in the field with highly visible wooden stakes, tape, or pin flags. RSA-221-R-01 CMI Work Plan Chapter 4.0		
The signpost locations were marked in the field with highly visible wooden stakes, tape, or pin flags. RSA-221-R-01 CMI Work Plan Chapter 4.0		
Surveying methods followed the procedures specified in the CQAP (Appendix G). RSA-221-R-01 CMI Work Plan Chapter 4.0		

Location: Redstone Arsenal, Madison County, Alabama		
Inspection Type: Field Inspection Checklist		
Subject: RSA-221-R-01 CMI Work Plan		
Descriptor / Requirements	Comments	Results
4.2.4 Digging Permit and Utility Marking		
Permitting required prior to beginning CMI activities is a digging permit administered by the Directorate of Public Works. The digging permits include locating and marking any utilities which may be present in the vicinity of the proposed intrusive signposts. Notification should be by telephone to 256.876.9881 within 14 days of beginning intrusive work. RSA-221-R-01 CMI Work Plan Chapter 4.0		
Digging permits must be renewed every 30 days. Renewals should be requested at least 1-1/2 weeks prior to expiration of the current digging permit to avoid temporary shutdowns. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.2.5 Site Control		
APTIM will construct temporary fencing materials, barricades, or warning tape as necessary, to delineate the designated work activity areas to discourage unauthorized entry. An equipment storage and material laydown area will be designated during mobilization. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.2.6 Vegetation Clearing		
APTIM will clear brush/vegetation currently in the areas at RSA-221-R-01 where fencing and signposts are to be installed. It is expected that manual and mechanical (e.g., chainsaw) means will be used to accomplish the brush/vegetation clearing task. at RSA-221-R-01 CMI Work Plan Chapter 4.0		
Any vegetation cleared was stockpiled and disposed at the Construction and Demolition (C&D) Landfill. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.2.7 Existing Monitoring Well Protection		
The existing monitoring wells in the work zones (Figure 4-1 in the CMI Work Plan) were conspicuously marked in the field for protection during fence installation and signpost installation (i.e., temporary safety fencing was placed around the monitoring wells). RSA-221-R-01 CMI Work Plan Chapter 4.0		
If a monitoring well is inadvertently damaged requiring abandonment, the well was closed in accordance with SOP No. 21, <i>Monitoring Well and Borehole Abandonment</i> (HGL, 2019), and the AEIRG (ADEM, 2017a). RSA-221-R-01 CMI Work Plan Chapter 4.0		
If required, replacement monitoring well(s) were installed following the completion of the fence and signpost installation. Replacement wells were installed in accordance with procedures outlined in SOP No. 17.0, <i>Monitoring Well Installation</i> (HGL, 2019). Currently, no replacement wells are planned for RSA-221-R-01. RSA-221-R-01 CMI Work Plan Chapter 4.0		

Location: Redstone Arsenal, Madison County, Alabama		
Inspection Type: Field Inspection Checklist		
Subject: RSA-221-R-01 CMI Work Plan		
Descriptor / Requirements	Comments	Results
4.2.8 On-Call UXO Support		
The probability of encountering UXO has been determined to be low at this site, and on-call UXO support has been provided during the conduct of the corrective measures involving intrusive activities (fence and signpost installation). The on-call explosive ordnance disposal personnel are available 24/7 through the U.S. Army Aviation and Missile Command Safety Office if suspected UXO is encountered. Notification was provided to the Safety Office prior to the start of the intrusive activities. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.3 Installation of Fencing		
A total of approximately 3,167 feet of high-visibility fencing was installed around the eastern portion of the site as shown on Figure 4-1 of the CMI Work Plan. The fencing encompasses the area both north (1,686 feet) and south (1,481 feet) of Ninebark Road. The single strand fencing consists of a poly-coated cable with steel posts similar to fencing installed at landfills on RSA (e.g., RSA-060, RSA-056/139). Two lockable gates will be present within each of the northern and southern fenced areas. RSA-221-R-01 CMI Work Plan Chapter 4.0		
This high visibility fencing allows easy installation across the drainage swale and streamlines groundskeeping in the area. Attachment G-2 presents the fencing technical specifications. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.4 Posting of LUC Signage		
Twenty-eight LUC signs were posted around the site boundary at intervals of approximately 300 feet which is coincident with the LUC boundary, at the driveway entrance to each building, and just west of the Magazine Road extension (shown in green as locations 1 through 26 on Figure 4-1 of the CMI Work Plan). Two locations as noted in green with an inscribed "x" on Figure 4-1 of the CMI Work Plan had existing sign posts and only required updated signs. These signs were posted on signposts as shown on Figure 4-2 of the CMI Work Plan. Newly installed signs were placed near the top of the signpost using heavy-grade, noncorrosive fasteners. RSA-221-R-01 CMI Work Plan Chapter 4.0		
Eleven additional LUC signs were placed on fenceposts for the fencing installed around the drainage swale area (shown in yellow as locations 27 through 37 on Figure 4-1 of CMI Work Plan). LUC signs were posted approximately every 300 feet along the fencing. Figure 4-2 of the CMI Work Plan shows the proposed fenceposts with sign details noting "Conditional Access Area/No Dig without On-Call UXO Support." The contact number for the Chief, Installation Restoration Branch within the Environmental Management Division will also be on each site to obtain access permission and instructions for arranging On-Call UXO support. RSA-221-R-01 CMI Work Plan Chapter 4.0		

Location: Redstone Arsenal, Madison County, Alabama		
Inspection Type: Field Inspection Checklist		
Subject: RSA-221-R-01 CMI Work Plan		
Descriptor / Requirements	Comments	Results
The contact number for the Chief, Installation Restoration Branch within the Environmental Management Division is located on each sign to obtain access permission and instructions for arranging On-Call UXO support. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.5 Remediation-Derived Waste/Investigation-Derived Waste		
Remediation-derived waste (RDW) generated during the CMI activities at RSA-221-R-01 was expected to include miscellaneous debris from fence and signpost installation activities and disposable PPE. PPE was placed in trash bags and disposed as normal household trash in accordance with Appendix F (Section 5.7.1). RSA-221-R-01 CMI Work Plan Chapter 4.0		
Solid materials (e.g., Other types of RDW, if generated) were managed in accordance with Table 2 of Appendix G of the AEIRG (ADEM, 2017a) and Appendix F. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.6 Site Restoration and Demobilization Activities		
4.6.1 Site Restoration		
Once fencing and sign-post installation was complete, the disturbed areas were seeded and mulched to stimulate revegetation and reduce the potential for soil erosion. Seed and mulch were applied to all disturbed areas according to the BMP handbook from the ASWCC (ASWCC, 2018). RSA-221-R-01 CMI Work Plan Chapter 4.0		
A site inspection was conducted 2 to 4 weeks after the seeding to confirm the revegetation was successful. If revegetation was unsuccessful, the identified areas were reseeded until an adequate stand of vegetation is present. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.6.2 Demobilization		
Personnel, equipment, and subcontractors were demobilized from the project site after completion of site activities. RSA-221-R-01 CMI Work Plan Chapter 4.0		

Location: Redstone Arsenal, Madison County, Alabama		
Inspection Type: Field Inspection Checklist		
Subject: RSA-221-R-01 CMI Work Plan		
Descriptor / Requirements	Comments	Results
4.7 Corrective Measure Implementation Reporting		
A CMI report was prepared in accordance with Section VIII.D of the Permit (ADEM, 2020) and AEIRG (ADEM, 2017a). As required by the Permit, variances, inspection forms, survey data including a survey plat for LUC boundary, and dig permits were included in the CMI report (Section 4.7). RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.8 Environmental Use Restrictions		
An EUR is required when an approved CMI allows a cleanup that will not result in remediation of the property or portions of the property to unrestricted use. The purpose of an EUR is to ensure that risks to human health and/or the environment are properly managed by imposing activity and use restrictions on the applicable portions of the property and including these restrictions into the installation master plan. Section 4.9 presents the LUCs that the Army will implement at RSA-221-R-01 for site areas not being restored to unrestricted use. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.9 Implementation of Land Use Controls		
LUCs were implemented in accordance with Alabama AAC r 335-5 (ADEM, 2019) to ensure that future activities conducted at RSA-221-R-01 remain protective of human health. The LUC boundary is shown on Figure 4-1 of the CMI work plan. RSA-221-R-01 CMI Work Plan Chapter 4.0		
Signs were placed around the perimeter of the site boundary/LUC areas stating that prior to any intrusive activities that the Chief, Installation Restoration Branch be contacted for approval and for planning needs for on-call UXO support. The contact number was provided on each sign. RSA-221-R-01 CMI Work Plan Chapter 4.0		
The following controls were implemented at RSA-221-R-01: <ul style="list-style-type: none"> • Implementation of a Notice of Environmental Use Restriction (NEUR) in accordance with AAC 335-5-1-.02(3)(a)1.(i) (ADEM, 2019) that restricts land use within RSA-221-R-01 to industrial, require on-call UXO support for any intrusive work, and require any building construction at RSA-221-R-01 to implement engineering controls as necessary. The draft NEUR was included in the CMI report for this site for ADEM review and approval. • Incorporation of the NEUR into the facility Master Plan, as required by AAC r. 335-5-1-.02(3)(a)1.(iv) (ADEM, 2019) • Recording of the NEUR in the land records for the property, as required by AAC r. 335-5-.02(3)(a)1.(iv) (ADEM, 2019). RSA-221-R-01 CMI Work Plan Chapter 4.0		

Location: Redstone Arsenal, Madison County, Alabama		
Inspection Type: Field Inspection Checklist		
Subject: RSA-221-R-01 CMI Work Plan		
Descriptor / Requirements	Comments	Results
4.9.1 Survey Plat		
RSA has submitted a survey plat indicating the locations and dimensions of the land area included in the LUC boundary at RSA-221-R-01 in accordance with Section VIII.B.5 of the Permit. The survey plat was submitted to the Madison County Probate Judge's Office and to ADEM as part of the NEUR provided in the CMI report. This survey plat was prepared and certified by a professional land surveyor registered in the state of Alabama and contains a prominently displayed note stating RSA's obligations to limit property to the specified restricted uses. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.9.2 Notice of Environmental Use Restriction		
A draft NEUR was provided in the CMI report for this site for ADEM review and approval. ADEM will be notified within 10 days after uses inconsistent with the NEUR are identified. Additionally, notice regarding any observed changes in use, identified proposed changes in use, applications for building permits, or proposals for site work inconsistent with the NEUR will be provided to ADEM as part of the annual monitoring report. RSA-221-R-01 CMI Work Plan Chapter 4.0		
4.10 Ongoing Obligations and Responsibilities		
4.10.1 Inspections and Repairs		
<p>Inspections are being conducted and documented on an annual basis as follows:</p> <ul style="list-style-type: none"> • Inspection of the signage around the site boundary to determine whether signs are still present and legible. • Inspection of the fencing around the drainage swale area to ensure it remains in place. • A team of two UXO technicians will visually inspect the drainage swale east of Building 7261. It is possible that erosion may uncover additional items, and the UXO technicians will verify the disposition status of each item. • Repairs/replacements to the warning signs shall be completed on an as-needed basis to maintain access control and shall be initiated within 10 days of identifying the need for such repairs. • Ensure that site use remains for industrial use only and requirement for on-call UXO support is enforced. Ensure that land use remains appropriately restricted to commercial/industrial and appropriate approvals and safety controls are enforced during any intrusive activities (e.g., anomaly avoidance and on-call UXO support) • ADEM was notified within 10 days after uses inconsistent with the NEUR were identified, if applicable. <p>RSA-221-R-01 CMI Work Plan Chapter 4.0</p>		

Location: Redstone Arsenal, Madison County, Alabama		
Inspection Type: Field Inspection Checklist		
Subject: RSA-221-R-01 CMI Work Plan		
Descriptor / Requirements	Comments	Results

4.10.2 Monitoring including Change Monitoring		
<p>An annual inspection report will be submitted to ADEM. This report will document the inspections and identify the status of the NEUR and how any deficiencies or inconsistent uses have been addressed. The annual evaluation will address whether the use restrictions and controls referenced previously were communicated in the deed(s), the owners and state and local agencies were notified of the use restrictions and controls affecting the property and use of the property has conformed with such restrictions and controls. The report will include a copy of the inspection forms, any violations noted, and recommendations for any changes to the NEUR. Annual monitoring of signage will be conducted for visibility, maintenance, and repairs, as necessary, to ensure their long-term effectiveness and protection. RSA-221-R-01 CMI Work Plan Chapter 4.0</p>		
4.10.3 Notices		
<p>Notice shall be provided to ADEM in the annual monitoring report regarding any observed changes in use, any identified proposed changes in use, applications for building permits, or proposals for any site work inconsistent with the NEUR. RSA shall notify ADEM at least 90 days in advance of the proposed closing on any sale or other conveyance of any interest in any or all of the Property, in accordance with ADEM Memorandum #304 as cited in RSA's Permit. If the property is transferred to an owner that is not the federal government, an environmental covenant will be executed and filed at that time in accordance with AAC r. 335-5-1-.02(3)(a)1.(i) (ADEM, 2019). RSA-221-R-01 CMI Work Plan Chapter 4.0</p>		

Results:

- S = Satisfactory**
- I = Incomplete at the time of audit or surveillance. To be verified at a later date**
- O = Observation**
- F = Finding**
- NA = Not Applicable**

Comments: _____

Quality Control Site Manager: _____

Date: _____

ATTACHMENT G-2
FENCING TECHNICAL SPECIFICATIONS

SECTION 32 31 26 PERIMETER FENCE AND SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

Work under this section involves installation of the perimeter fence and land use control signage.

PART 2 PRODUCTS

2.1 MATERIALS

- 2.1.1 Wire shall be a minimum 12.5 gauge (200 KSI) with UV-Resistant, White, plastic coating.
- 2.1.2 Fasteners shall be a T-Post Pin-Lock Insulator, made with heavy-duty, UV-resistant plastic as manufactured by Kencove.
- 2.1.3 Steel line posts shall have the standard "T" section, and nominal dimensions of 1³/₈ inches by 1³/₈ inches by 1/8 inch with anchor plate. The posts shall be rolled from high carbon steel, weigh at least 1.25 pounds per foot of length, and shall be painted with a weather resistant paint for steel, enameled and baked, or hot dip galvanized.
- 2.1.4 Corner, gate, and end posts shall be a minimum of 2.375 inches outside diameter standard (Schedule 40) steel pipe or Grade B high strength steel, be of sufficient length to support the height of the fence.
- 2.1.5 Other materials may be used for corner, end, gate assembly, line posts, and brace members if they are of equal or greater strength and quality of above. They must be preapproved by the Engineer.
- 2.1.6 Signage with the following: 1) For fastening every 300 feet along the fenceposts "CONDITIONAL ACCESS AREA/NO DIG WITHOUT ON-CALL UXO SUPPORT CONTACT 256-876-4868 FOR INFORMATION" and 2) For installation on signposts every 300 feet around the site boundary and at the driveway entrances for Buildings 7261 through 7266 "NO DIG WITHOUT ON-CALL UXO SUPPORT CONTACT 256-876-4868 FOR INFORMATION" The font shall be written in English and shall be legible from a distance of at least 25 feet.

PART 3 EXECUTION

3.1 POST INSTALLATION AND SPACING

- 3.1.1 Post spacing for line posts shall not exceed 25 feet. Steel line posts shall be set or driven a minimum of 18 inches below the ground line. If posts are not driven, the backfill around the post shall be well compacted. Gate and corner posts will be firmly set or driven in the ground a minimum of 36 inches.

3.2 CORNER, END, PULL, AND GATE ASSEMBLIES

3.2.1 One of the following braces will be used:

- (1) A floating diagonal brace or H-brace is required on corners or ends.
- (2) H-bracing is required at all pull assemblies and must be installed every 660 feet maximum.

Wood horizontal or diagonal brace member shall be a minimum of 4 inches in diameter and a minimum of 7 feet in length, and 9 feet for diagonal braces. A tension wire composed of two complete loops of 9-gauge smooth wire, 12-gauge double strand wire, or a single loop of 12.5-gauge high tensile smooth wire shall be used for H-braces. One end of the tension member shall be at the height of the horizontal brace member and the other end shall be 4 inches above the ground line on the other post.

If the posts are to be set or driven to a 3-foot depth or more below the ground line, a single H-brace assembly may be used. Otherwise, a double H-brace assembly shall be used.

A corner assembly shall be used wherever the horizontal alignment changes more than 15 degrees and/or where vertical alignment changes more than 15 degrees

3.3 FASTENING

3.3.1 The top wire shall be at least 2 inches below the top of a wooden post, and 1 inch below the top of a steel post. All wires shall be attached to each line post. Wires shall be attached to steel posts using manufacturer's clips or by two turns of 14-gauge galvanized wire.

3.4 SIGNAGE

3.4.1 Signs shall be mounted separate Galvanized U-channel sign posts directly adjacent to the fence. Steel sign posts shall be set or driven a minimum of 24 inches below the ground line and signs shall be affixed to each post with a minimum of two bolts per sign.

3.5 ENTRY POINTS

3.5.1 A minimum of two gates will be installed as directed by the engineer. Entry points shall be a minimum of 15-feet wide and shall be lockable.

---END OF SECTION---

APPENDIX H
ENVIRONMENTAL USE RESTRICTION

Appendix H

**Environmental Use Restriction
RSA-221-R-01, Fuse Storage and Munitions Disposal Area
Operable Unit 15
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
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Prepared by:

**Aptim Federal Services, LLC
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**Contract No. W912DY-17-D-0003
Delivery Order No. W912DY19F1116
APTIM Project No. 501388**

April 2021

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H1.0 Introduction

The U.S. Army Garrison–Redstone is completing studies of the environmental impact of known or suspected waste sites at Redstone Arsenal (RSA), Madison County, Alabama, under the management of the U.S. Army Environmental Command. This draft Environmental Use Restriction (EUR) is prepared for RSA-221-R-01, Fuse Storage and Munitions Disposal Area, in accordance with Alabama Administrative Code (AAC) r. 335-5-1-.02(3) (ADEM, 2019). This draft EUR will be finalized based on comments provided by ADEM. Upon ADEM approval of the corrective measure implementation (CMI) completion report for the corrective measure performed at RSA-221-R-01, the Notice of Environmental Use Restriction (NEUR) will be filed with ADEM, the land-use controls (LUC) will be incorporated in the RSA Installation Master Plan, and the NEUR will be recorded into applicable land records with Madison County, as required by AAC r. 335-5-1.02(3)(a)(1)(iv) (ADEM, 2019). If the property is transferred to an owner that is not the federal government, an Environmental Covenant will be executed and filed in accordance with AAC r. 335-5-1-.02(3)(a)(1)(i) and (iii) (ADEM, 2019).

The remainder of this document provides descriptions of site background; the need for and nature of corrective measures; the need for an EUR; the use restrictions; and ongoing Army obligations and responsibility for inspections, repairs, monitoring, reporting, and notices.

H2.0 Site Background

H2.1 Site Conditions

The site contains six buildings (Buildings 7261 through 7266 and a 785-foot-long drainage swale east of Building 7261 (Figure 1-3 in the CMI work plan).

These magazines were constructed in 1943 and are still present at the site. Each building is 1,192 square feet in size. The buildings were initially used for Redstone Ordnance Plant fuze storage from 1943 to the late 1940s and again in the 1957 timeframe. In the early to mid-1950s the buildings were used for Redstone Depot small component storage. From the 1960s to present the buildings have been used for various general storage needs (e.g., furniture, hay, etc.).

The buildings were serviced initially by rail and later by road (Figure 1-2 in the CMI work plan). Each building has a concrete loading and unloading pad on the south end of the building. The drainage swale east of Building 7261 (Figure 1-3 in the CMI work plan) appears to be drainage that was constructed as part of the former railroad line that paralleled Ninebark Road. This drainage swale was reportedly a disposal area for munitions-related items in late 1940s and 1950s. This swale is approximately 1.5 to 2 feet deep and approximately 6 feet wide on the north

side of the railroad bed and less than 1 foot deep and approximately 5 to 6 feet wide on the southern side of the railroad bed. The swale drains to a culvert on the east side of the site within the site boundary. An ephemeral water feature intermittently flows through the site between Buildings 7264 and 7265 and passes beneath Ninebark Road (Figure 1-3 in the CMI work plan). The UXO probability at this site is “Low” and the CWM probability is “Unlikely” (Figure 1-4 in the CMI work plan). The UXO probability of “Low” is due to the site’s location just north of an operational range (RSA-046).

Based on being identified as a former munitions disposal area, RSA-221-R-01 has been assigned to the U.S. Department of Defense (DoD) Military Munitions Response Program (MMRP) for investigation and cleanup. OU-15 consists of sites, including RSA-221-R-01, within the MMRP.

H2.2 Summary of Need for Action

The RSA-221-R-01 Resource Conservation and Recovery Act facility investigation defined the nature and extent of contamination and evaluated potential risks to current and future receptors and concluded that corrective measures are required to attain site closure as follows:

- Exposure to both soil within RSA-221-R-01 poses no unacceptable risks to commercial worker, construction worker, and hypothetical resident receptors by direct exposure pathways or to groundwater if groundwater is developed as a potable source.
- Intrusive investigations did not encounter munitions and explosives of concern (MEC) within either the possible burial pits or point-source anomalies at this site. However, a low probability for MEC remains at this site and does not permit the land to be authorized for unrestricted use.

H2.3 Corrective Measures Activities

The CMI work plan for RSA-221-R-01 describes the correct measures consisting of LUCs including fencing (eastern portion of site) and signage to prevent site user exposure to potential buried MEC. Figure 4-2 in the CMI work plan presents the planned LUC signage.

H2.4 Reason for the Environmental Use Restriction

The corrective measures planned for RSA-221-R-01 will not restore the surface media to conditions suitable for unrestricted use because of the potential presence of buried MEC on site. Therefore, environmental use restrictions will be required at RSA-221-R-01 per AAC r. 335-5-1.02(3) (ADEM, 2019). Figure 4-1 in the CMI work plan shows the proposed LUC boundary areas and coordinates for RSA-221-R-01.

The EUR will require site controls for “on-call” unexploded ordnance (UXO) support for intrusive activities due to potential buried MEC.

A survey plat indicating the locations and dimensions of the LUC area at RSA-221-R-01 will be prepared in accordance with AAC r. 335-5 (ADEM, 2019) and the Permit Section VIII.B.5 (ADEM, 2020). The survey plat will be prepared and certified by a licensed surveyor in the state of Alabama and included with the NEUR. The survey plat will be part of the NEUR submitted to the Madison County Probate Office with jurisdiction over local land use and to ADEM as part of the final NEUR. The survey plat will be maintained until such time that the Army can demonstrate with ADEM’s approval that levels of hazardous constituents within the contaminated media are within appropriate limits for unrestricted use.

H3.0 Use Restrictions

The EURs for RSA-221-R-01 are as follows:

- Site restrictions include a requirement for use of anomaly avoidance and on-call UXO support for any intrusive activities within the LUC boundary area.
- Annual inspections to ensure 1) the signs remain present and legible and the fencing remains present on the eastern portion of the site, 2) intrusive activities within the site are conducted with appropriate approvals and safety controls (e.g., anomaly avoidance, on-call UXO support), and 3) undocumented activities inconsistent with the environmental use restrictions are not occurring at the site.

H4.0 Ongoing Obligations and Responsibilities

H4.1 Inspections and Repairs Monitoring

The following inspections will continue to be conducted on an annual basis:

- Inspection of the warning signs around the site and the fencing around the eastern portion of the site to ensure that they are still present and legible (signs). If repairs or replacements are needed, they must occur within 10 days of identifying the need for repair/replacement.
- Inspections to identify undocumented activities inconsistent with the environmental use restrictions are not occurring at the site.
- A team of two UXO technicians will visually inspect the drainage swale east of Building 7261. It is possible that erosion may uncover previously buried items. The items will be inspected in accordance with Army requirements prior to item disposal.

- Inspection for any changes in use or construction inconsistent with the restrictions included in Section H3.0. If inconsistent use or construction activities have been identified, ADEM shall be notified within 10 days.

If uses inconsistent with the EUR are identified, ADEM will be notified within 10 days after such uses are identified.

H4.2 Reporting

An annual monitoring report will be submitted to ADEM, either as a separate report or as part of another report for the site or combined with other site annual monitoring reports submitted to ADEM. This report documents the inspections and maintenance of signage and site conditions and use changes. It also provides a discussion of any maintenance activities conducted, verifies the status of the EUR, and documents how any deficiencies or inconsistent uses have been addressed. The annual evaluation addresses whether the use restrictions and controls referenced previously were communicated in the deed(s), the owners and state and local agencies were notified of the use restrictions and controls affecting the property, and use of the property has conformed with such restrictions and controls. The report includes copies of the inspection forms, any violations noted and procedures followed to address the violations, and recommendations for any changes to the EUR.

H4.3 Notices

Notice regarding any observed changes in use, identified proposed changes in use, applications for building permits, or proposals for any site work inconsistent with the EUR will be provided to ADEM as part of the annual monitoring report. RSA shall notify ADEM at least 90 days in advance of the proposed closing on any sale or other conveyance of any interest in any or all of the Property, in accordance with AAC r. 335-5-1-.02(3) (ADEM, 2019) and the Permit (ADEM, 2020).

H5.0 References

Alabama Department of Environmental Management (ADEM), 2020, *Redstone Arsenal's Alabama Hazardous Waste Management and Minimization Act Hazardous Waste Storage Facility, Thermal Treatment, Solid Waste Management Unit Corrective Action Permit, Modification No. 15*, September 23.

Alabama Department of Environmental Management (ADEM), 2019, *Alabama Department of Environmental Management Land Divisions - Uniform Environmental Covenants Program Administrative Code, Chapter 335-5-1*, Amended August 20, 2019, effective October 4, 2019.

RESPONSES TO COMMENTS

**Responses to Alabama Department of Environmental Management
Informal Comments on the Corrective Measures Implementation Work Plan,
RSA-221-R-01, Fuse Storage and Munitions Disposal Area, Operable Unit 15
Redstone Arsenal, Madison County, Alabama
Dated January 2021**

Informal Comments from ADEM dated February 16, 2021.

Comment 1: Risk related to the potential buried munition related items at RSA-221-R-01 and past disposals of these items.

Response 1: As stated in the approved RFI report, there is no unacceptable risk that can be quantified for MEC at RSA-221-R-01 since MEC has not been found at the site. It should be noted that a MEC Hazard Assessment evaluates the potential explosive hazard associated with conventional MEC present at that site under a variety of conditions, including various cleanup scenarios and land-use assumptions. Because MEC has not been found on the surface or in the subsurface at RSA-221-R-01, the Army could not prepare a MEC Hazard Assessment.

The Army used the Hypergeometric Model which assigned a 95 percent confidence that the true unacceptable item rate is no larger than 0.50 UXO per acre at this site. This Hypergeometric Model has been used at numerous RSA MMRP sites and has been accepted by ADEM as a fiscally responsible statistical tool for estimating risk with encountering MEC. Based on the following lines of evidence, there is a low probability that MEC is present at this site:

- During the RFI intrusive investigations, a large amount (approximately 7,767 pounds) of wholly inert items were recovered from the site from 12 of 19 the test pits in saturated response areas (SRA) and from 81 of 370 of the single point anomaly (SPA) excavations.
- Uninvestigated anomalies detected above the target threshold still exist in the subsurface since only a statistically significant number of anomalies detected above the target threshold were investigated. The RSA-221-R-01 CMS report projected a cost of approximately 8 million dollars to remove the remaining 4,274 subsurface SPAs as well as remaining trench and pit features. The Army cannot justify this large additional cost to remove all the identified anomalies and trench and pit features for a site where MEC has not been found especially since the final CSM for the site supports that only wholly inert items and componentry are present at the site. This is especially true since it is likely that LUCs would still be required as part of the site remedy.

- RSA-221-R-01 is adjacent to active and historical ranges. While RSA-221-R-01 is adjacent to active and historical ranges, the area has always been used for storage of wholly inert items and non-explosive componentry and has never been used for a firing point or impact area(s).

Because of the low probability of MEC at this site, the Army is proposing in the CMI work plan to implement LUCs at RSA-221-R-01 including installing a fence around the drainage swale area and signage around the site.

The text in Sections 2.4 and 3.3.1 will be revised to add the above text.

Comment 2: Definitions of terms (e.g., on-site vs on-call, wholly inert, wholly inert munitions components, inert, MD, etc.)

Response 2: The source of this confusing terminology was agreed to as noted in Comments 3 and 4 of the August 2, 2018 RFI Comment Onboard Review Meeting for terminology support from Keith Rivera (ADEM UXO Support contractor) (see attached). However, the unique conditions at this site have resulted in the Army re-evaluating the terminology agreed to in 2018.

As a result of this re-evaluation, based on a review by John Lewis, Chief, OEC Safety CEHNC of the items documented in the RFI, all have been identified as wholly inert items. Wholly inert items are discussed in the Army Memorandum on the subject of Munitions Response Terminology dated April 21, 2009. The determination has been made that all items encountered during the intrusive investigations at RSA-221-R-01 are either wholly inert items (e.g., empty 155 mm illumination projectile bodies that were never loaded, baseplates for the aforementioned projectiles that were never installed), componentry (e.g., lifting lugs since they have nothing to do with the item’s intended purpose), or scrap metal (e.g., wire, nails, bolts).

As a result of this review, the CMIP text will be revised to replace munitions-related terminology with “wholly inert items” and “componentry” as dictated by context.

Comment 3: Use of terms that cannot be quantified and/or qualified (e.g., “limited statistical uncertainty” in Section 1.1, “large amount of wholly inert munitions” in Section 2.6 and 3.0, etc.; “lack of any items classified as MEC” in Section 3, “small amounts of MEC” in Section 3.0, etc.).

Response 3: To be fully consistent with the terms in the approved RFI report, the terms noted above will be revised in the CMI work plan as follows:

- “Limited statistical probability” *will be replaced by* “low probability that MEC is present at the site. RFI intrusive investigation and statistical analysis using the statistical sampling program Hypergeometric Model

indicated that the best estimate of the true rate of unacceptable items is zero per acre, and there is a 95 percent confidence that the true rate of unacceptable items is no larger than 0.50 UXO per acre at the site.”

- “Large amount of wholly inert munitions” *will be replaced by* “large amount of wholly inert items.”
- “Lack of any items classified as MEC” *will be replaced by* “No MEC was found during the 2016 intrusive investigation.”
- “Small amounts (or numbers) of MEC” *will be replaced by* “... a low probability that MEC is present at this site.” For example, the sentence “However, because of the site’s munitions-related use and the fact that not all potential target objects were removed, this site retains limited statistical uncertainty regarding the presence of small amounts of MEC” *will be replaced by* “Although a large amount of wholly inert items and componentry were recovered from this site, MEC was not found. Uninvestigated anomalies above the target threshold still exist in the subsurface, and thus there is a low probability that MEC is present at this site.”

Comment 4: MEC in disposal area as part of CSM (i.e., Figure 2-7)

Response 4: Figure 2-7 is included in the CMI work plan as part of the presentation of the final conceptual site model (CSM) following completion of the RFI report. It was prepared in accordance with USACE guidance EM 200-1-12 Conceptual Site Models (28 December 2012). During the pathway analysis, the Army uses information such as sources of UXO or DMM, current and potential future receptors, access (access available or fenced no access), and activity performed (intrusive or non-intrusive). The CSM helps the Army to evaluate the source-receptor interaction and then demonstrate the need for any corrective action at the site to protect site receptors.

In the case of RSA-221-R-01, the evaluation of the CSM helped to define the CMO which is stated in Section 3.2 as: “Prevent or limit direct human contact with MEC, thereby reducing hazards associated with a “low” probability MEC site consistent with current and future land use.” The Army has proposed implementation of temporary fencing around the drainage swale area, signage, and on-call UXO support as components of LUCs for the site remedy to meet this CMO.

As shown on Figure 2-7, the pathways to potentially encountering MEC at RSA-221-R-01 would be potentially complete if a site receptor has access to the surface of the site (intrusive or nonintrusive) and subsurface (intrusive only). These pathways are shown as potentially complete exposure pathways since even though MEC has not been encountered at this site, not all anomalies above target thresholds were investigated during the RFI. It should be noted that Figure 2-7 is consistent with Figure 1.5.2 in the approved RFI

report. To be fully consistent with the text accompanying Figure 1.5-2 in the RFI report, the CMI work plan bullets 1 and 4 in Section 2.5 will be revised to state the following:

- During the RFI, a full-coverage DGM survey was performed over 9.6 acres of the 13.4-acre site (100 percent of the accessible areas of the site), followed by an intrusive investigation of all 10 SRAs through the use of 19 test pits and approximately 8 percent (370) of the total SPA anomalies (4,644) that exceeded the threshold criteria. No MEC was found on the surface or within the subsurface of RSA-221-R-01. Intrusive investigation results and statistical analysis (Hypergeometric Model) indicate a 95 percent confidence that the density of UXO at the site is less than 0.5 UXO per acre. Since 100 percent of the anomalies present above the established target threshold were not intrusively investigated, it is statistically possible, that a potentially complete pathway exists for MEC at this site as shown in Figure 2-7.
- Current human receptors at RSA-221-R-01 are limited to commercial and construction workers. Future potential receptors include all current receptors, plus hypothetical child and adult residents under a land reuse scenario. No COCs for HTW/MC that pose unacceptable risks to any receptor were identified in soils (Figures 2-6 and 2-8).