DEPARTMENT OF THE ARMY
MCALESTER ARMY AMMUNITION PLANT
1 C TREE ROAD
MCALESTER OK 74501-9002

REPLY TO
ATTENTION OF

December 21, 2022

Installation Services Environmental

RECEIVED
DEC 28 2022
LAND PROTECTION DIVISION
DEPT. OF ENVIRON. QLTY

James Wilkins
Land Protection Division
Department of Environmental Quality
P.O. Box 1677
Oklahoma City, OK 73101-1677

Dear Mr. Wilkins:

McAlester Army Ammunition Plant has a RCRA Part B permit (#OK6213822798-2013) that was issued on June 28, 2013. As required by Title 40 Code of Federal Regulations (CFR) Section 270.13, this letter includes the permit application forms required for permit renewal. There is one hard copy and one electronic copy enclosed.

I hereby certify that the contents of this letter are accurate and correct to the best of my knowledge.

If you have any questions or comments, please contact Mr. Cody W. Camp at 918-420-7221 or email at cody.w.camp.civ@army.mil.

Sincerely,

Cody Camp
Hazardous Waste Program Manager
Installation Services Environmental

Enclosure

MCALESTER ARMY AMMUNITION PLANT

MCALESTER, OKLAHOMA

APPROVED FOR PUBLIC RELEASE

OKLAHOMA HAZARDOUS WASTE MANAGEMENT RENEWAL APPLICATION FOR PERMIT NUMBER 6213822798-2013

SUBMITTED: DECEMBER 2022

CERTAIN MAPS AND DRAWINGS HAVE BEEN REDACTED FROM THIS VERSION OF THE APPLICATION TO PROTECT NATIONAL SECURITY CONCERNS.

Coterie ENVIRONMENTAL

1150 FIRST AVENUE, SUITE 501 ● KING OF PRUSSIA, PA 19406

610.945.1777 ● WWW.COTERIE-ENV.COM

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LIST OF ATTACHMENTS

1.0 APPLICATION FORMS

The United States Army, as the owner and operator of the McAlester Army Ammunition Plant (MCAAP), is submitting this hazardous waste renewal permit application for the Ammunition Peculiar Equipment (APE) 1236M2 deactivation furnace and open burn/open detonation (OB/OD) units covered under Oklahoma permit number 6213822798-2013.

This section provides the permit application forms required by Title 40 Code of Federal Regulations (CFR) Section 270.13 for all hazardous waste permit applications. As required, these forms have been completed and signed by the appropriate responsible officials. The following United States Environmental Protection Agency (USEPA) forms are provided in Attachment 1-1:

- USEPA Form 8700-12: Site Identification Form
- USEPA Form 8700-23: Part A Permit Application

Note to reader: Section 15 of this Permit renewal application includes a cross-reference table between the applicable environmental regulatory requirements of 40 CFR Part 270 and the various sections of this application. The table also provides cross-reference to the applicable Oklahoma Administrative Code (OAC) Title 252, Chapter 205 requirements. These tables specify where each of the requirements in 40 CFR Part 270 and OAC § 252:205 can be located within the application.

Attachment 1-1: USEPA FORMS

United States Environmental Protection Agency
RCRA SUBTITLE C SITE IDENTIFICATION FORM

1. Reason for Submittal (Select only one.)

☐	Obtaining or updating an EPA ID number for on-going regulated activities (Items 10-17 below) that will continue for a period of time.
☐	Submitting as a component of the Hazardous Waste Report for __________ (Reporting Year)
	☐ Site was a TSD facility, a reverse distributor, and/or generator of ≥ 1,000 kg of non-acute hazardous waste, > 1 kg of acute hazardous waste, or > 100 kg of acute hazardous waste spill cleanup in **one or more months of the reporting year** (or State equivalent LQG regulations)
☐	Notifying that regulated activity is no longer occurring at this Site
☐	Obtaining or updating an EPA ID number for conducting Electronic Manifest Broker activities
☑	Submitting a new or revised Part A (permit) Form

2. Site EPA ID Number

O	K	6	2	1	3	8	2	2	7	9	8

3. Site Name

McAlester Army Ammunition Plant

4. Site Location Address

Street Address 1 C Tree Road		
City, Town, or Village McAlester		County Pittsburg
State Oklahoma	Country United States	Zip Code 74501-9002
Latitude 34.855278	Longitude 95.921944	☐ Use Lat/Long as Primary Address

5. Site Mailing Address ☐ Same as Location Street Address

Street Address 1 C Tree Road		
City, Town, or Village McAlester		
State Oklahoma	Country United States	Zip Code 74501-9002

6. Site Land Type

☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other

7. North American Industry Classification System (NAICS) Code(s) for the Site (at least 5-digit codes)

A. (Primary) 332993	C.
B.	D.

8. Site Contact Information ☑ Same as Location Address

First Name **Cody**	MI	Last Name **Camp**
Title **Environmental Physical Scientist**		
Street Address **1 C Tree Road**		
City, Town, or Village **McAlester**		
State **Oklahoma**	Country **United States**	Zip Code **74501-9002**
Email **cody.w.camp.civ@army.mil**		
Phone **918-420-7221**	Ext	Fax

9. Legal Owner and Operator of the Site

A. Name of Site's Legal Owner ☑ Same as Location Address

Full Name **United States Army**		Date Became Owner (mm/dd/yyyy)
Owner Type: ☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other		
Street Address **1 C Tree Road**		
City, Town, or Village **McAlester**		
State **Oklahoma**	Country **United States**	Zip Code **74501-9002**
Email **usarmy.mcalester.usamc.list.co-office@army.mil**		
Phone **918-420-6551**	Ext	Fax
Comments		

B. Name of Site's Legal Operator ☑ Same as Location Address

Full Name **McAlester Army Ammunition Plant**		Date Became Operator (mm/dd/yyyy) **9/20/1943**
Operator Type: ☐ Private ☐ County ☐ District ☑ Federal ☐ Tribal ☐ Municipal ☐ State ☐ Other		
Street Address **1 C Tree Road**		
City, Town, or Village **McAlester**		
State **Oklahoma**	Country **United States**	Zip Code **74501-9002**
Email **usarmy.mcalester.usamc.list.co-office@army.mil**		
Phone **918-420-6551**	Ext	Fax
Comments		

10. Type of Regulated Waste Activity (at your site)

Mark "Yes" or "No" for all current activities (as of the date submitting the form); complete any additional boxes as instructed.

A. Hazardous Waste Activities

☑ Y ☐ N	1. Generator of Hazardous Waste—If "Yes", mark only one of the following—a, b, c		
	☑	a. LQG	-Generates, in any calendar month, 1,000 kg/mo (2,200 lb/mo) or more of non-acute hazardous waste (includes quantities imported by importer site); or - Generates, in any calendar month, or accumulates at any time, more than 1 kg/mo (2.2 lb/mo) of acute hazardous waste; or - Generates, in any calendar month or accumulates at any time, more than 100 kg/mo (220 lb/mo) of acute hazardous spill cleanup material.
	☐	b. SQG	100 to 1,000 kg/mo (220-2,200 lb/mo) of non-acute hazardous waste and no more than 1 kg (2.2 lb) of acute hazardous waste and no more than 100 kg (220 lb) of any acute hazardous spill cleanup material.
	☐	c. VSQG	Less than or equal to 100 kg/mo (220 lb/mo) of non-acute hazardous waste.
☐ Y ☑ N	2. Short-Term Generator (generates from a short-term or one-time event and not from on-going processes). If "Yes", provide an explanation in the Comments section. *Note: If "Yes", you MUST indicate that you are a Generator of Hazardous Waste in Item 10.A.1 above.*		
☑ Y ☐ N	3. Treater, Storer or Disposer of Hazardous Waste—Note: Part B of a hazardous waste permit is required for these activities.		
☑ Y ☐ N	4. Receives Hazardous Waste from Off-site		
☐ Y ☑ N	5 Recycler of Hazardous Waste		
	☐	a. Recycler who stores prior to recycling	
	☐	b. Recycler who does not store prior to recycling	
☐ Y ☑ N	6. Exempt Boiler and/or Industrial Furnace—If "Yes", mark all that apply.		
	☐	a. Small Quantity On-site Burner Exemption	
	☐	b. Smelting, Melting, and Refining Furnace Exemption	

B. Waste Codes for Federally Regulated Hazardous Wastes. Please list the waste codes of the Federal hazardous wastes handled at your site. List them in the order they are presented in the regulations (e.g. D001, D003, F007, U112). Use an additional page if more spaces are needed.

D001	D008					
D003	D010					
D005	D030					
D006	U160					
D007						

C. Waste Codes for State Regulated (non-Federal) Hazardous Wastes. Please list the waste codes of the State hazardous wastes handled at your site. List them in the order they are presented in the regulations. Use an additional page if more spaces are needed.

11. Additional Regulated Waste Activities (NOTE: Refer to your State regulations to determine if a separate permit is required.)

A. Other Waste Activities

☐ Y ☑ N		1. Transporter of Hazardous Waste—If "Yes", mark all that apply.
	☐	a. Transporter
	☐	b. Transfer Facility (at your site)
☐ Y ☑ N		2. Underground Injection Control
☐ Y ☑ N		3. United States Importer of Hazardous Waste
☐ Y ☑ N		4. Recognized Trader—If "Yes", mark all that apply.
	☐	a. Importer
	☐	b. Exporter
☐ Y ☑ N		5. Importer/Exporter of Spent Lead-Acid Batteries (SLABs) under 40 CFR 266 Subpart G—If "Yes", mark all that apply.
	☐	a. Importer
	☐	b. Exporter

B. Universal Waste Activities

☑ Y ☐ N		1. Large Quantity Handler of Universal Waste (you accumulate 5,000 kg or more) - If "Yes" mark all that apply. Note: Refer to your State regulations to determine what is regulated.
	☑	a. Batteries
	☐	b. Pesticides
	☑	c. Mercury containing equipment
	☑	d. Lamps
	☐	e. Aerosol Cans
	☐	f. Other (specify) ____
	☐	g. Other (specify) ____
☐ Y ☑ N		2. Destination Facility for Universal Waste Note: A hazardous waste permit may be required for this activity.

C. Used Oil Activities

☐ Y ☑ N		1. Used Oil Transporter—If "Yes", mark all that apply.
	☐	a. Transporter
	☐	b. Transfer Facility (at your site)
☐ Y ☑ N		2. Used Oil Processor and/or Re-refiner—If "Yes", mark all that apply.
	☐	a. Processor
	☐	b. Re-refiner
☐ Y ☑ N		3. Off-Specification Used Oil Burner
☐ Y ☑ N		4. Used Oil Fuel Marketer—If "Yes", mark all that apply.
	☐	a. Marketer Who Directs Shipment of Off-Specification Used Oil to Off-Specification Used Oil Burner
	☐	b. Marketer Who First Claims the Used Oil Meets the Specifications

D. Pharmaceutical Activities

☐ Y ☑ N	1. Operating under 40 CFR Part 266, Subpart P for the management of hazardous waste pharmaceuticals—if "Yes", mark only one. Note: See the item-by-item instructions for definitions of healthcare facility and reverse distributor.
☐	a. Healthcare Facility
☐	b. Reverse Distributor
☐ Y ☑ N	2. Withdrawing from operating under 40 CFR Part 266, Subpart P for the management of hazardous waste pharmaceuticals. Note: You may only withdraw if you are a healthcare facility that is a VSQG for all of your hazardous waste, including hazardous waste pharmaceuticals.

12. Eligible Academic Entities with Laboratories—Notification for opting into or withdrawing from managing laboratory hazardous wastes pursuant to 40 CFR Part 262, Subpart K.

☐ Y ☑ N	A. Opting into or currently operating under 40 CFR Part 262, Subpart K for the management of hazardous wastes in laboratories— If "Yes", mark all that apply. Note: See the item-by-item instructions for definitions of types of eligible academic entities.
☐	1. College or University
☐	2. Teaching Hospital that is owned by or has a formal written affiliation with a college or university
☐	3. Non-profit Institute that is owned by or has a formal written affiliation with a college or university
☐ Y ☑ N	B. Withdrawing from 40 CFR Part 262, Subpart K for the management of hazardous wastes in laboratories.

13. Episodic Generation

☐ Y ☑ N	Are you an SQG or VSQG generating hazardous waste from a planned or unplanned episodic event, lasting no more than 60 days, that moves you to a higher generator category. If "Yes", you must fill out the Addendum for Episodic Generator.

14. LQG Consolidation of VSQG Hazardous Waste

☐ Y ☑ N	Are you an LQG notifying of consolidating VSQG Hazardous Waste Under the Control of the Same Person pursuant to 40 CFR 262.17(f)? If "Yes", you must fill out the Addendum for LQG Consolidation of VSQG hazardous waste.

15. Notification of LQG Site Closure for a Central Accumulation Area (CAA) (optional) OR Entire Facility (required)

☐ Y ☑ N	LQG Site Closure of a Central Accumulation Area (CAA) or Entire Facility.
	A. ☐ Central Accumulation Area (CAA) or ☐ Entire Facility
	B. Expected closure date: ____________ mm/dd/yyyy
	C. Requesting new closure date: ____________ mm/dd/yyyy
	D. Date closed : ____________ mm/dd/yyyy ☐ 1. In compliance with the closure performance standards 40 CFR 262.17(a)(8) ☐ 2. Not in compliance with the closure performance standards 40 CFR 262.17(a)(8)

16. Notification of Hazardous Secondary Material (HSM) Activity

☐ Y ☑ N	Are you notifying under 40 CFR 260.42 that you will begin managing, are managing, or will stop managing hazardous secondary material under 40 CFR 260.30, 40 CFR 261.4(a)(23), (24), (25), or (27)? If "Yes", you must fill out the Addendum to the Site Identification Form for Managing Hazardous Secondary Material.

17. Electronic Manifest Broker

☐ Y ☑ N	Are you notifying as a person, as defined in 40 CFR 260.10, electing to use the EPA electronic manifest system to obtain, complete, and transmit an electronic manifest under a contractual relationship with a hazardous waste generator?

18. Comments (include item number for each comment)

19. 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 fines and imprisonment for knowing violations. **Note: For the RCRA Hazardous Waste Part A permit Application, all owners and operators must sign (see 40 CFR 270.10(b) and 270.11).**

Signature of legal owner, operator or authorized representative [signature]	Date (mm/dd/yyyy) 12 20 2023
Printed Name (First, Middle Initial Last) **Colonel Michael F. Hammond**	Title **MCAAP Commander**
Email **michael.f.hammond.mil@army.mil**	

Signature of legal owner, operator or authorized representative	Date (mm/dd/yyyy)
Printed Name (First, Middle Initial Last)	Title
Email	

EPA ID Number	O	K	6	2	1	3	8	2	2	7	9	8

OMB# 2050-0024; Expires 04/30/2024

United States Environmental Protection Agency

HAZARDOUS WASTE PERMIT PART A FORM

1. Facility Permit Contact

First Name **Cody**	MI	Last Name **Camp**
Title **Environmental Physical Scientist**		
Email **cody.w.camp.civ@army.mil**		
Phone **918-420-7221**	Ext	Fax

2. Facility Permit Contact Mailing Address

Street Address **1 C Tree Road**		
City, Town, or Village **McAlester**		
State **Oklahoma**	Country **United States**	Zip Code **74501-9002**

3. Facility Existence Date (mm/dd/yyyy)

9/20/1940

4. Other Environmental Permits

A. Permit Type	B. Permit Number													C. Description
N	O	K	0	0	0	0	5	2	3					NPDES/OPDES
P	2	0	1	2	-	6	7	2	-	C		M	7	Air Permit
E	O	K	R	0	5	0	8	8	6					Industrial Stormwater Permit
E	O	K	R	1	0	6	5	9	0					Construction Stormwater Permit
E	3	5	6	1	0	1	4							Industrial Landfill
E	1	9	9	3	0	0	2	5						Surface Water Rights
E	O	K	1	0	2	0	6	0	5					Public Water System

5. Nature of Business

The McAlester Army Ammunition Plant (MCAAP) is owned by the Federal Government and operated by the Department of the Army. As a storage facility for the Department of Defense (DoD), the plant has the responsibility to receive, store, and issue ammunition, explosives, and other expendable ordnance items for the DoD. As a production facility, the plant has six load, assembly, and pack plants. MCAAP has the capability to renovate, maintain, and demilitarize conventional ammunition. This application is for the Ammunition Peculiar Equipment (APE) 1236M2 deactivation furnace and open burn/open detonation (OB/OD) units, These units are used for the treatment and destruction of energetic wastes generated from obsolete or unserviceable munitions and production and laboratory wastes.

6. Process Codes and Design Capacities

Line Number		A. Process Code			B. Process Design Capacity (1) Amount	B. Process Design Capacity (2) Unit of Measure	C. Process Total Number of Units	D. Unit Name
0	1	T	0	3	2.88	N	001	APE 1236M2 Incinerator
0	2	X	0	1	11.7	N	001	Open Burn Unit
0	3	X	0	1	1.55	N	001	Open Detonation Area 1
0	4	X	0	1	1.55	N	001	Open Detonation Area 2

7. Description of Hazardous Wastes (Enter codes for Items 7.A, 7.C and 7.D(1))

Line No.		A. EPA Hazardous Waste No.				B. Estimated Annual Qty of Waste	C. Unit of Measure	D. Processes (1) Process Codes									D. Processes (2) Process Description (if code is not entered in 7.D1))
0	1	D	0	0	1	2,300	T	T	0	3	X	0	1				
0	2	D	0	0	3												Included with above
0	3	D	0	0	5												Included with above
0	4	D	0	0	6												Included with above
0	5	D	0	0	7												Included with above
0	6	D	0	0	8												Included with above
0	7	D	0	1	0												Included with above
0	8	D	0	3	0												Included with above
0	9	U	1	6	0	1.25	T	X	0	1							Included with above

8. Map

Attach to this application a topographical map, or other equivalent map, of the area extending to at least one mile beyond property boundaries. The map must show the outline of the facility, the location of each of its existing intake and discharge structures, each of its hazardous waste treatment, storage, or disposal facilities, and each well where it injects fluids underground. Include all spring, rivers, and other surface water bodies in this map area. See instructions for precise requirements.

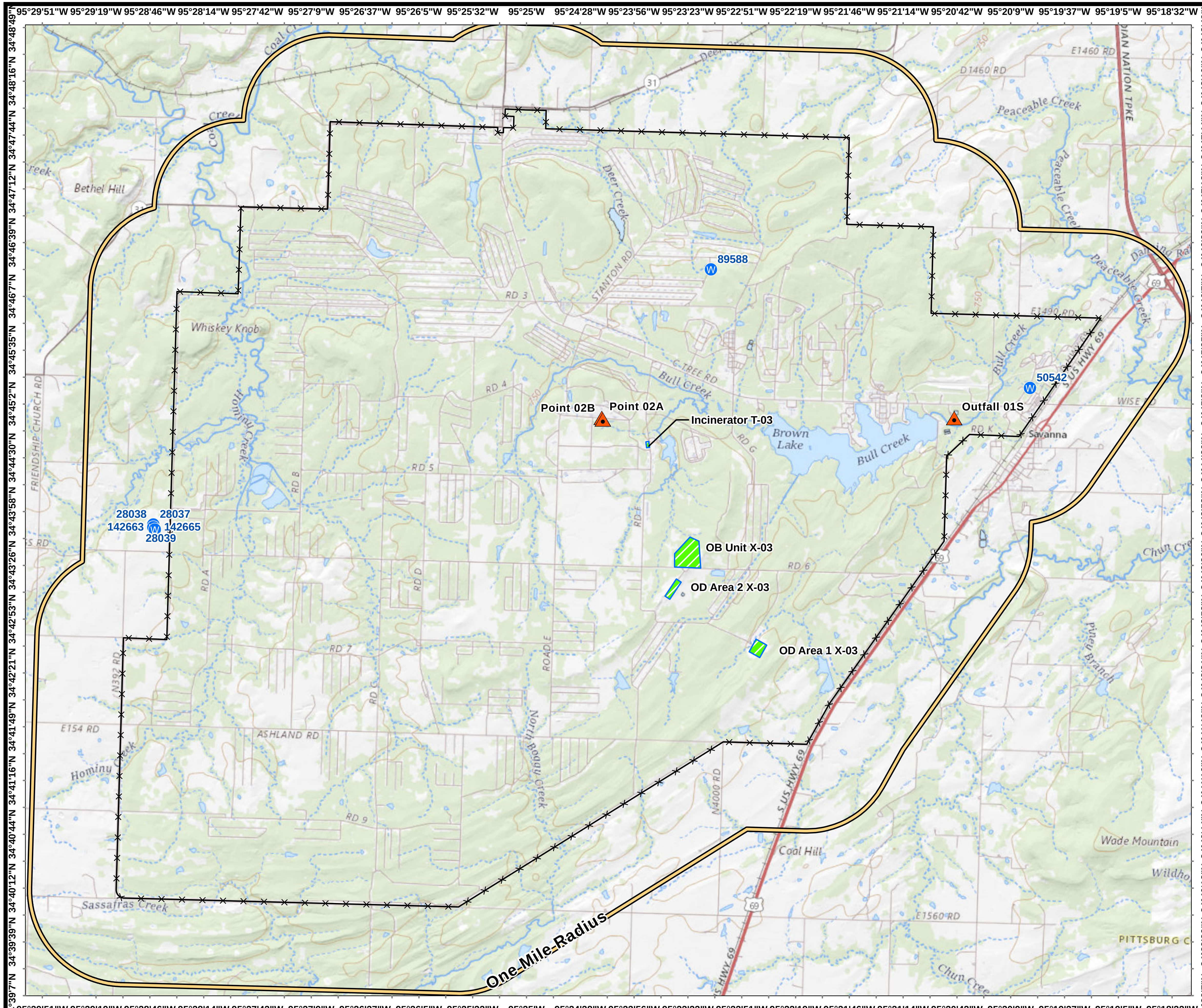
9. Facility Drawing

All existing facilities must include a scale drawing of the facility. See instructions for more detail.

10. Photographs

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment, and disposal areas; and sites of future storage, treatment, or disposal areas. See instructions for more detail.

11. Comments



Legend

- Facility Boundary / Fence line
- Stormwater Discharge Structures
- Thermal Treatment Units
- One Mile Radius
- Drinking Water Well

Sources:
Drinking Water Well: Oklahoma Water Resources Board Well Data.
USGS Topographic Quadrangles 7.5 Minute Series: McAlester SW, Ashland, Savanna, Haywood

0 3,000 6,000 FEET

1" = 6,000 FEET
1:72,000

MCALESTER ARMY AMMUNITION PLANT (MCAAP)
EPA ID: OK6213822798

FIGURE 1-1
TOPOGRAPHIC MAP

DRAWN BY:	L WILSON	SCALE:		PROJ. NO.	RCRA 2022
CHECKED BY:	P HARRELL	AS NOTED		FILE NO.	Project.mxd
APPROVED BY:	P HARRELL	DATE PRINTED:			
DATE:	December 2022	12/13/2022			

Coterie ENVIRONMENTAL
1150 First Ave., Ste 501
King of Prussia, PA 19406

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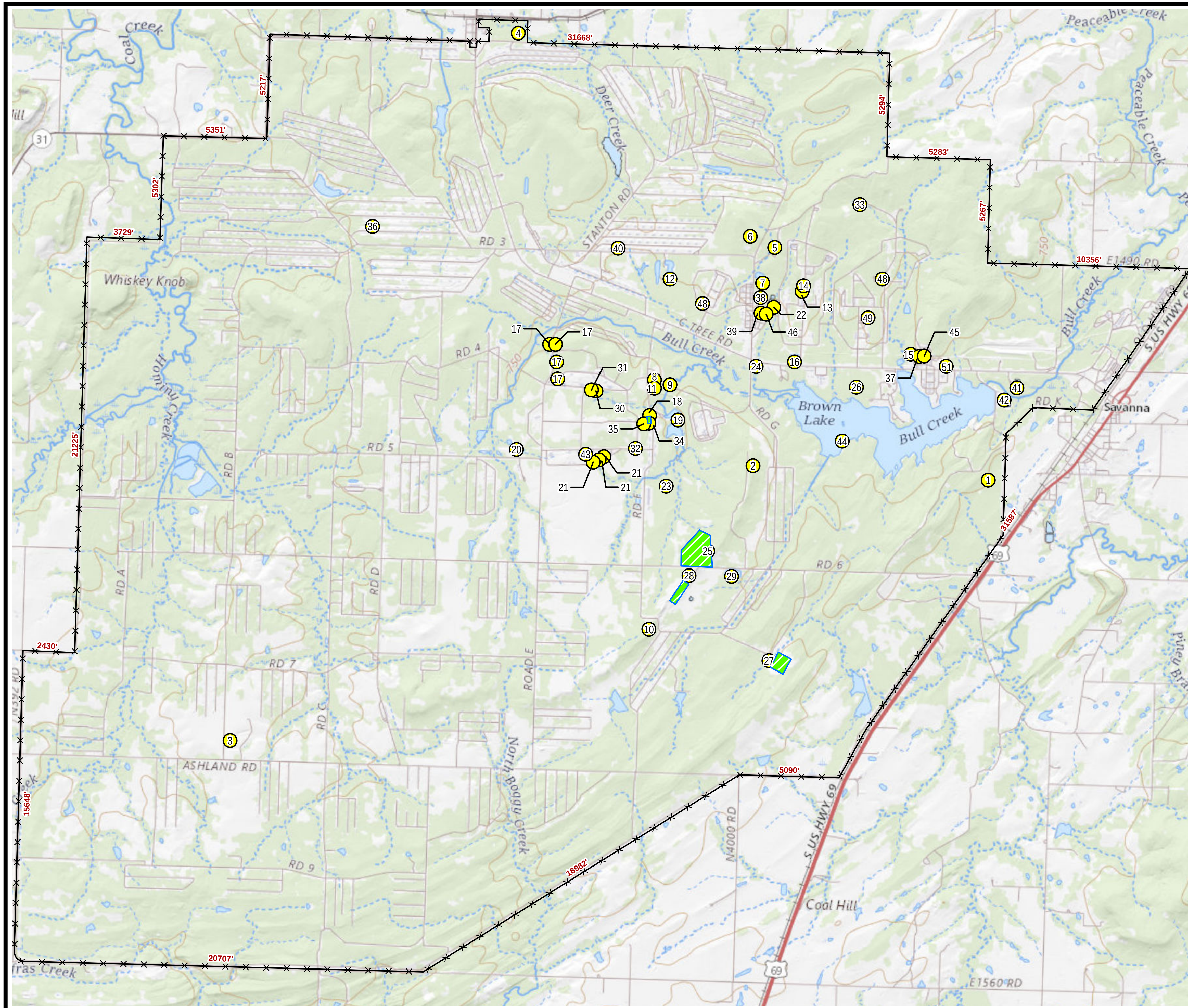

Legend

- Facility Boundary / Fence line
- Thermal Treatment Units
- Solid Waste Management Unit (SWMU)

Approximate Boundary Dimensions:
Incinerator T-03 = 27' x 22'
OB Unit X-03 = 573' x 694'
OD Area 1 X-03 = 1899' x 1453'
OD Area 2 X-03 = 1674' x 1235'

N

0 2,500 5,000 FEET

1" = 5,000 FEET
1:60,000

MCALESTER ARMY AMMUNITION PLANT (MCAAP)
EPA ID: OK6213822798

FIGURE 1-2
SITE LAYOUT AND SOLID WASTE MANAGEMENT UNITS

DRAWN BY: L WILSON	SCALE:	PROJ. NO.	RCRA 2022
CHECKED BY: P HARRELL	AS NOTED	FILE NO.	Project.mxd
APPROVED BY: P HARRELL	DATE PRINTED:		
DATE: December 2022	12/13/2022		

Coterie ENVIRONMENTAL
1150 First Ave., Ste 501
King of Prussia, PA 19406

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EPA ID: OK6213822798

SOLID WASTE MANAGEMENT UNITS TABLE

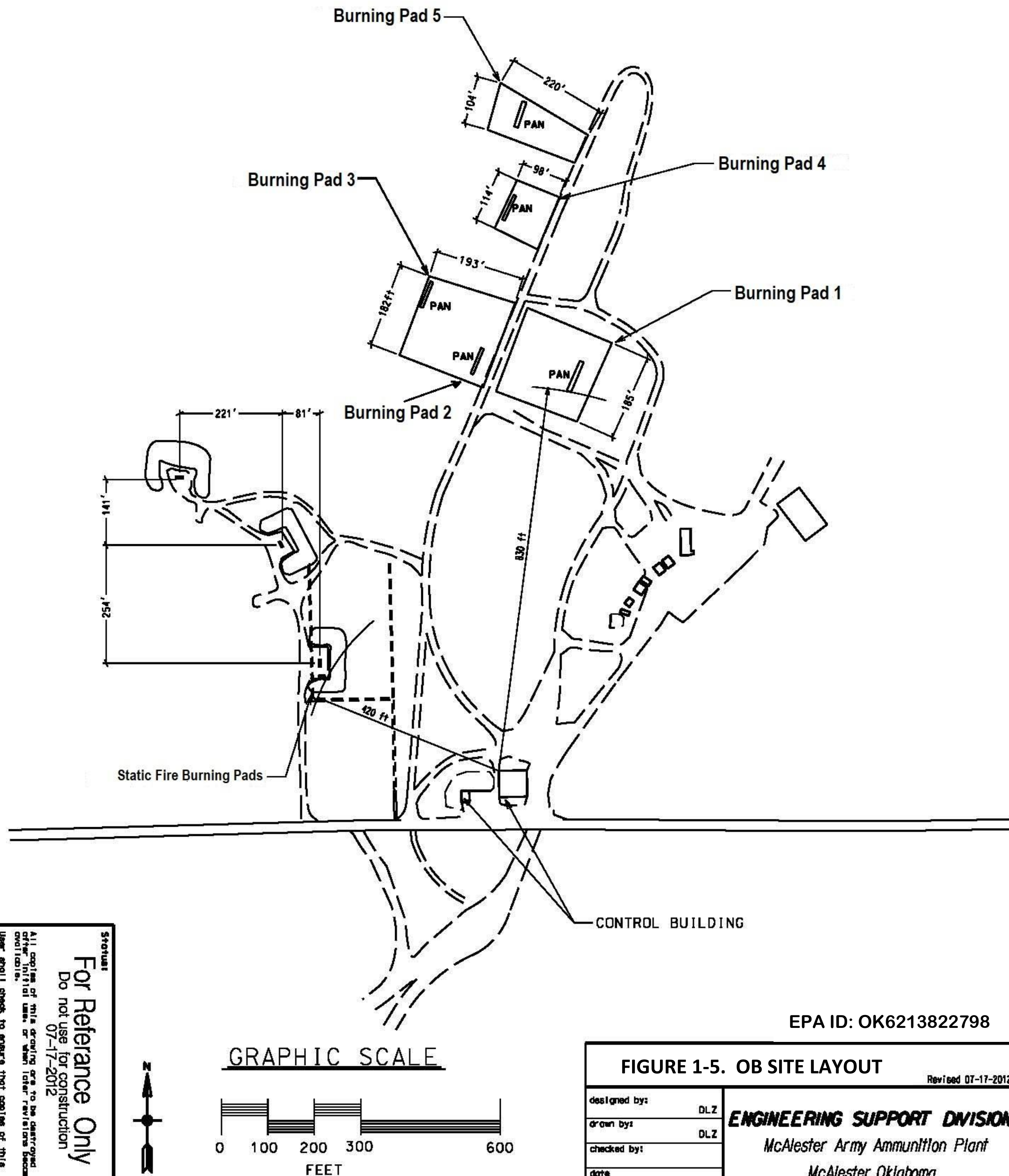
FIGURE 1-3

SWMU No.	Unit Name	Current Status
1	Landfill	NFA
2	Landfill Southwest of Brown Lake	NFA
3	Active Landfill	NFA
4	Suspected Abandoned Landfill	NFA
5	Scrap Metal Disposal Area	NFA
6	Suspected Abandoned Landfill	NFA
7	Suspected Disposal Area	NFA
8	Wood Scrap Yard	NFA
9	Landfill	NFA
10	Abandoned Landfill	NFA
11	Abandoned Landfill	NFA
12	Group 41 LC Lagoon	NFA
13	Concrete Bomb Settling Ponds	NFA
14	Concrete Bomb Settling Ponds	NFA
15	Roundhouse Lagoons	NFA
16	Sewage Retention Ponds	NFA
17	Ponds and Lagoons	NFA

SWMU No.	Unit Name	Current Status
18	Deactivation Furnace Lagoon	NFA
19	Rocket Lake	NFA
20	B Plant West Lagoon	NFA
21	B Plant East Lagoon	NFA
22	Medium Caliber Lagoons	NFA
23	Special Weapons Lagoon	NFA
24	C-Tree Lagoon	NFA
25	Active Open Burning Ground	NFA
26	Burn Area 2	NFA
27	Old Demolition Area	NFA
28	New Demolition Area	NFA
29	Sedimentation Retention Basis	NFA
30	Pink Water Treatment System	NFA
31	Pink Water Treatment Collection System	NFA
32	Bldg 209, Pallet Dipping Operation	NFA
33	Bldg 471, Pallet Dipping Operation	NFA
34	Deactivation Furnace	NFA

SWMU No.	Unit Name	Current Status
35	Suspected Acid Neutralization Pit	NFA
36	Burial Site	NFA
37	Former Waste Oil Storage Tanks	NFA
38	DRMO Yard	NFA
39	Hazardous Waste Storage Area, Building 669	NFA
40	Hazardous Waste Storage Bunkers, Buildings 41 LC 103 A, B, C	NFA
41	Sewage Treatment Plant	NFA
42	Water Treatment Plant	NFA
43	Minol Building 664	NFA
44	Brown Lake	NFA
45	Roundhouse	NFA
46	Baler Site	Under Investigation
47	PCB Contamination Area	NFA. Clean Closed under TSCA
48	Miscellaneous Tank Sites	Under Investigation
49	Soils Around Case Load Building	NFA
51	PCP Contamination Ind. Area	NFA

EPA ID: OK6213822798 **INCINERATOR PHOTO** **FIGURE 1-4**



Status:
For Referance Only
Do not use for construction
07-17-2012

All copies of this drawing are to be destroyed after initial use, or when later revisions become available.

User shall check to ensure that copies of this drawing are the latest revision prior to using.

EPA ID: OK6213822798

FIGURE 1-5. OB SITE LAYOUT

Revised 07-17-2012

designed by: DLZ	**ENGINEERING SUPPORT DIVISION**
drawn by: DLZ	McAlester Army Ammunition Plant
checked by:	McAlester, Oklahoma
date 07-17-2012	

OB UNIT BURN PAD PHOTO

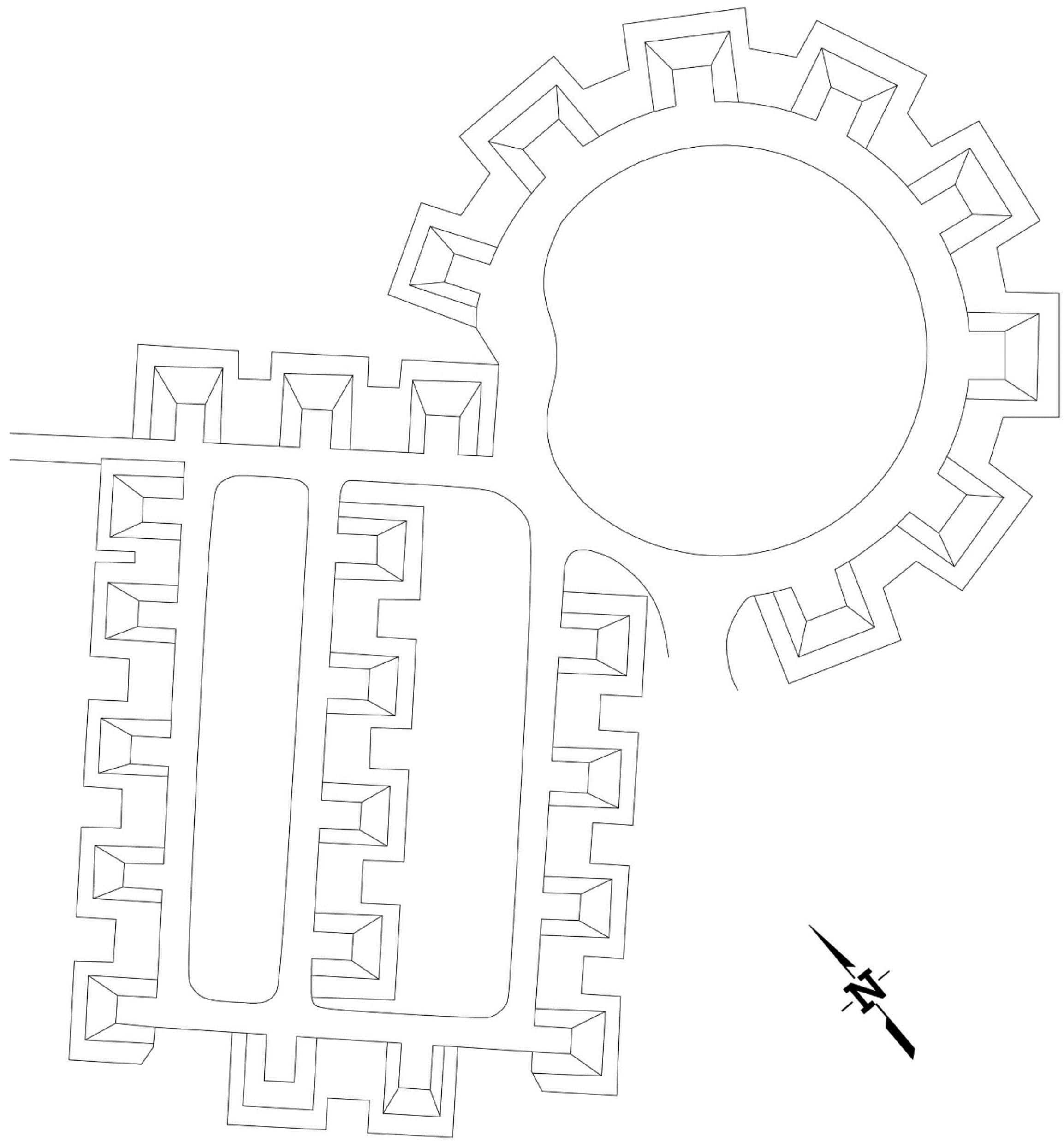
OB UNIT BURN PAN PHOTO

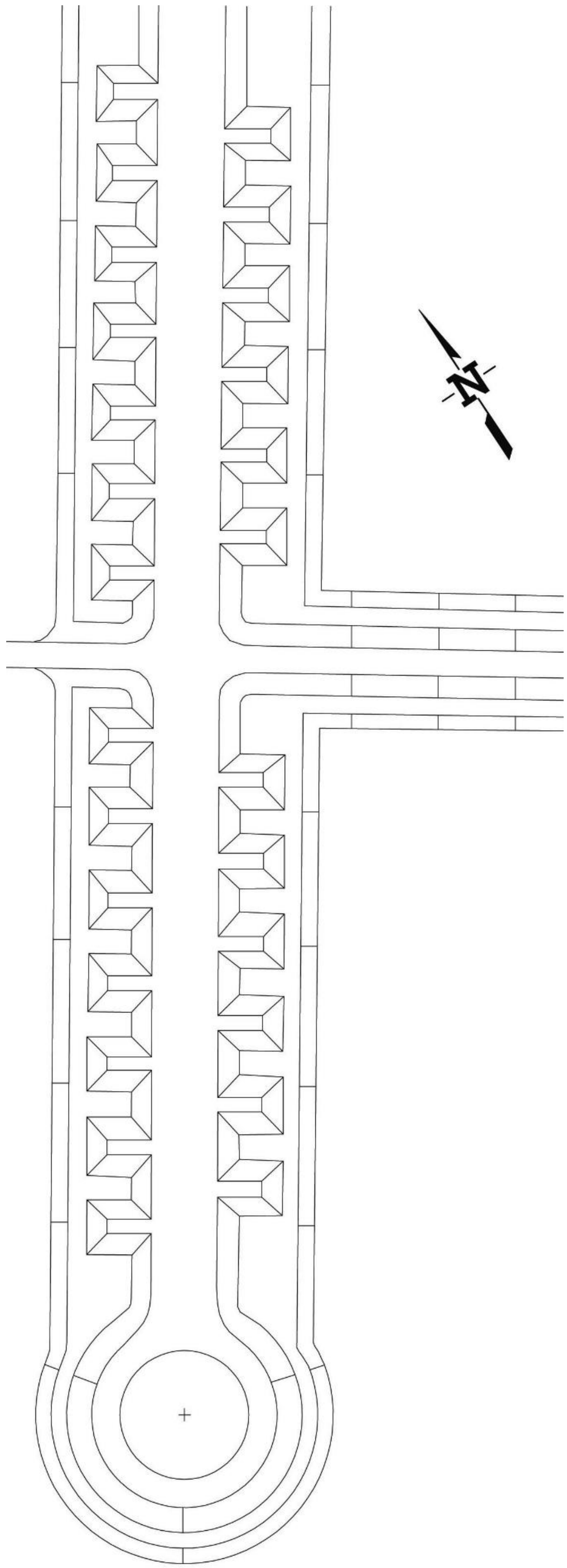
FIGURE 1-7

EPA ID: OK6213822798 | OB UNIT STATIC FIRING PAD AND SADDLE PHOTO | FIGURE 1-8

OD AREA 1 UNIT LAYOUT

FIGURE 1-9




N

OD DETONATION PIT PHOTO

FIGURE 1-11

2.0 TREATMENT UNIT DESCRIPTIONS

This section presents a description of the treatment units included in this permit application and is being provided pursuant to the general Part B permitting requirements of 40 CFR Parts 270 and 264. All figures and maps referenced in this section can be found in Attachment 2-1.

2.1 GENERAL DESCRIPTION

[§270.14(b)(1)]

The McAlester Army Ammunition Plant (MCAAP) is owned by the United States Government and is operated by the Department of the Army (US Army). The facility has been in continuous operation since its construction in 1943 and serves as both a production and storage facility for ammunition and explosives. Prior to 1 October 1977, MCAAP operated under Naval jurisdiction and was known as the McAlester Naval Ammunition Depot. On 1 October 1977, the facility was transferred to the US Army under the Single Manager System for Conventional Ammunition. The installation is now known as the MCAAP.

The MCAAP occupies 44,965 acres in the southwest section of Pittsburg County, Oklahoma, approximately 9 miles southwest of McAlester, Oklahoma, as shown on Figure 2-1. The present mission of MCAAP is two-fold, functioning both as a storage facility and as a production facility for the Department of Defense (DoD). As a storage facility, the plant has the responsibility to receive, store, and issue ammunition, explosives, and other expendable ordnance items for the DoD. As a production facility, the plant has six load, assembly, and pack plants. MCAAP has the capability to renovate, maintain, and demilitarize conventional ammunition. The assigned functions also include explosive ordnance disposal services, shipment of personal property, operation of a calibration laboratory, and performance of additional tasks as directed by the Joint Munitions Command (JMC). Additionally, various tenant operations are located on the MCAAP; however, none of these tenants generate hazardous waste treated under this permit.

MCAAP conducts thermal treatment of energetic and explosive hazardous wastes generated at the MCAAP and other offsite facilities under Oklahoma hazardous waste permit number 6213822798-2013, issued by the ODEQ. These munitions and the associated propellants, explosives, and pyrotechnics (PEP) consist primarily of military energetic materials and ordnance that have exceeded their "shelf-life," off-specification versions of these items, or various waste components from manufacturing processes that cannot be recycled or otherwise disposed of safely. In addition, MCAAP also treats several energetic waste streams generated from process operations. These wastes are treated in one of four different treatment units as shown on Figure 2-1:

- The Ammunition Peculiar Equipment (APE) 1236M2 deactivation furnace (herein referred to as the incinerator), which is regulated as a hazardous waste incinerator unit under the RCRA Subpart O program. However, pursuant to 40 CFR §§ 264.340(b), 270.19(e), and 270.62, most of the RCRA standards and permitting requirements for this unit are no longer applicable as this unit has demonstrated compliance with the maximum achievable control technology (MACT) requirements of the Hazardous Waste Combustor National Emission Standards for Hazardous Air Pollutants (HWC NESHAP) at 40 CFR Part 63, Subpart EEE.

- The open burning (OB) unit and two open detonation (OD) units, which are regulated as miscellaneous (Subpart X) units under the RCRA program.

Obsolete or unserviceable ammunition is treated in the incinerator, which is located in the central portion of the MCAAP facility. These munitions range from small arms through 20-millimeter (mm) rounds. Items larger than 20-mm are disassembled before treatment. The OB and two OD units are located in the east-central and southeast portion of the MCAAP facility. The PEP materials treated in the OB/OD units are primarily military energetic materials and ordnance that have exceeded their shelf life, as well as off-specification versions of these same materials. Energetic and explosive waste streams generated during process and laboratory operations are also treated at the OB unit.

2.1.1 Incinerator

The APE Model 1236M2 deactivation furnace installed at the MCAAP consists of a rotary kiln, a cyclone, an afterburner, an evaporative cooler, a fabric filter baghouse, a high-efficiency particulate air (HEPA) filter, an induced draft (ID) fan, and a stack. The furnace can accept feed from two systems: the conventional feed system and the positive feed system (PFS). The Munitions Cryofracture Demilitarization Facility (MCDF) that is associated with the furnace is used to disassemble Area Denial Artillery Munition (ADAM) anti-personnel mines through a series of steps so that their energetic components can be transferred into the furnace via the PFS. The cryofracture process freezes and fractures the ADAM mine's overlay kill mechanism (OKM), exposing the energetic material prior to delivering it to the kiln. Energetic hazardous debris from the press operations is processed in the drum heating system (DHS), which exhausts into the APE 1236M2 upstream of the afterburner.

A description of the wastes treated in the incinerator is provided in Section 3. A description of the incineration equipment is provided in Section 4.1.

2.1.2 Open Burn/Open Detonation Areas

The OB/OD areas consist of an area for open burning and two different areas for open detonation. These locations are designated as follows:

- Open Burning Grounds
- OD Area 1 (formerly known as the "old demo range")
- OD Area 2 (formerly known as the "new demo range")

The OB unit consists of five burning pads, with each pad containing five burning pans, and three rocket static-firing pads. Wastes treated at the burning pads are placed in elevated, refractory lined steel pans for burning. The burning pads are leveled open areas that are cleared of vegetation to the extent necessary to minimize the spreading of fires. At the rocket static-fire pads, single rockets are loaded onto a framed saddle that is secured to the pad, strapped down, and ignited to burn out the energetic components. The concrete firing pads are located in a leveled open area that is cleared of all vegetation and approximately 300 feet from the burning pads.

The OD areas each consist of a series of 26 pits connected by an access road. Explosive items are placed in the pits, are wired for detonation, and are then covered with a minimum of two feet of dirt. Detonations are initiated by remote firing from inside a shelter. Both the pits and the access roads are excavated to approximately 10 to 15 feet below grade and are constructed of the naturally occurring soil materials.

A description of the wastes treated at the OB/OD units is provided in Section 3. A detailed description of the OB/OD units is provided in Sections 4.2 and 4.3 and the arrangement of the equipment at the OB/OD units is detailed in Attachment 4-1.

2.2 TOPOGRAPHIC MAP

[§270.14(b)(19)]

In accordance with 40 CFR §270.14(b)(19), this hazardous waste permit application contains topographic maps of the each of the treatment units included in this application. These maps are provided to denote the topographic features in and around MCAAP and the incinerator and OB/OD units. Certain maps have been scaled down to one inch per 200 feet to clearly show the pattern of surface water flow in the vicinity of each unit. For clarity of the information presented, multiple maps have been provided to satisfy the requirements of this section. These maps, which are provided in Attachment 2-1, include:

- Figure 2-1 provides a general location drawing of the MCAAP on a 7.5-minute United States Geological Survey (USGS) topographic map relative to the immediate surrounding area at an extent of 1,000 feet from the property line in all directions.
- Figure 2-2 provides a topographic map of the MCAAP relative to the immediate surrounding area at an extent of 1,000 feet from the property line in all directions and includes all buildings, roads, and sanitary sewer lines at the facility.
- Figure 2-3 provides a zoomed version of the topographic map immediately surrounding the incinerator to allow resolution of the topographic contours to a scale of one inch equal to not more than 200 feet. This map also provides an overall site plan for the incinerator and indicates the surface water flow pattern in the vicinity of the incinerator.
- Figure 2-4 provides a zoomed version of the topographic map immediately surrounding the OB unit to allow resolution of the topographic contours to a scale of one inch equal to not more than 200 feet. This map highlights the design features of the OB unit and indicates the surface water flow pattern in the vicinity of the OB unit.
- Figure 2-5 provides a zoomed version of the topographic map immediately surrounding OD Area 2 to allow resolution of the topographic contours to a scale of one inch equal to not more than 200 feet. This map shows the design details of the unit and indicates the surface water flow pattern in the vicinity of OD Area 2.

- Figure 2-6 provides a zoomed version of the topographic map immediately surrounding OD Area 1 unit to allow resolution of the topographic contours to a scale of at least one inch per 200 feet. This map shows the design details of the unit and indicates the surface water flow pattern in the vicinity of OD Area 1.
- Figure 2-7 shows the land use surrounding the incinerator and the OB/OD units up to an area of 1,000 feet in all directions from the facility boundary.
- Figure 2-8 provides the location of the incinerator and the OB/OD units relative to the 100-year floodplain.

In addition to the details specified above, each topographic map includes a wind rose to provide an indication of the wind direction and potential dispersion of emissions from the incinerator and the OB/OD units.

2.2.1 General Requirements

[§270.14(b)(19)]

Seven maps have been prepared for this hazardous waste permit application to satisfy the general requirements of 40 CFR §270.14(b)(19), as detailed above. These maps, when combined:

- Indicate the map's orientation, scale, and date.
- Show the legal boundaries of the MCAAP and the hazardous waste treatment units included in this permit application.
- Show all buildings and hazardous waste treatment, storage, and disposal operations included in this permit application, and other structures within the MCAAP property boundary.
- Identify all operational units included in this application that are within the MCAAP and that will conduct permitted treatment, storage, or disposal of hazardous waste.
- Show all access control points (*e.g.,* fences and gates) to the level permitted by government operational security requirements.
- Identify all nearby surface waters.
- Define the 100-year floodplain area.
- Identify surrounding land use (*e.g.,* residential, commercial, agricultural, and recreational).
- Provide a wind rose showing the predominant wind directions.

None of the maps provide information on nearby injection or withdrawal wells, as there are none located within the boundaries of MCAAP or within one mile of any of the waste treatment units. Additionally, there are no stormwater or industrial sewers within the boundaries of any of the waste treatment units.

Please note that some of these maps have been declared confidential business information (CBI) because the DoD designated them as controlled unclassified information (CUI) that requires protection from dissemination under 32 CFR Part 2002. The marked maps have been redacted from all public versions of this application to protect National security concerns. Access to and dissemination of those items marked CUI shall be allowed as necessary and permissible to any individual(s), organization(s), or grouping(s) of users, provided such access or dissemination is consistent with or in furtherance of a Lawful Government Purpose and in a manner consistent with applicable law, regulations, and Government-wide policies.

2.2.2 Additional Requirements for Land Disposal Facilities (*Not Applicable*)

[§270.14(c)(3)]

The additional requirements specified for the topographic map for land disposal facilities are not applicable to MCAAP, as MCAAP is not requesting a permit for any land disposal units.

2.3 Location Information

[§270.14(b)(11), §270.23(b), §264.18, §264.600]

As required by 40 CFR §§ 270.14(b)(11) and 270.23(b), this section provides information related to the location of the MCAAP incinerator and OB/OD units. The physical location of the MCAAP relative to area roads, surface water bodies, *etc.*, is shown on Figures 2-1 and 2-2. Additionally, information is provided on the surrounding land use, seismic conditions, and floodplain locations, in the sections that follow.

2.3.1 Surrounding Land Use

[§270.23(b), §264.600]

The area surrounding the MCAAP facility and the thermal treatment units is primarily herbaceous/grassland and deciduous forest and is largely undeveloped, as shown on Figure 2-7. The land in the immediately vicinity of the units is being used as a National Defense Installation. There are no residential areas within 1,000 feet of the units. Operations and buildings located near the units include munitions and ordnance production areas and demilitarization facilities.

2.3.2 Seismic Requirements

[§§270.14(b)(11)(i)-(ii), §264.18(a)]

The information required for MCAAP to demonstrate compliance with the Federal seismic standard is specified in 40 CFR §§ 264.18(a) and 270.14(b)(11). MCAAP must identify the political jurisdiction in which they are located and must then determine if this jurisdiction is identified in Appendix VI of 40 CFR Part 264 as a jurisdiction that must demonstrate compliance with the seismic standard.

None of the political jurisdictions within the State of Oklahoma are included in Appendix VI of 40 CFR Part 264 as a jurisdiction that must demonstrate compliance with the seismic standard. Additionally, none of the permitted units are located near a fault that has had displacement in Holocene time. Therefore, there is no additional information required by the Federal regulations for this portion of the hazardous waste permit application.

2.3.3 Floodplain Requirements

[§270.14(b)(11)(iii) and §264.18 (b)]

The MCAAP facility consists of 70 square miles of rolling, hilly landscape within the drainage basin of the Canadian River. Six small drainage systems, flowing in various directions, carry the surface water run-off from MCAAP. The predominant flow is to the north. The floodplain information for the area was taken directly from the Federal Emergency Management Agency (FEMA) Flood Map Service Center for Pittsburg County, City of McAlester, dated 10/14/2022. None of the permitted units are located within the 100-year floodplain, as shown in Figure 2-8. Therefore, there is no additional information required by 40 CFR § 264.18(b) for this portion of the hazardous waste permit application.

2.4 TRAFFIC PATTERN INFORMATION

[§270.14(b)(10)]

The traffic system for MCAAP consists of 210 miles of railroad and 404 miles of motor vehicle roads. All hazardous waste is transported within the boundaries of the plant by motor vehicles or by railcar to the incinerator, or by truck to the OB/OD units, over a system that is in good condition and is well maintained.

2.4.1 TRAFFIC PATTERN

Waste energetic material and waste munitions are generated at production facilities and are held in magazines throughout the 70-square mile site; therefore, most of the roads within the property boundary may be used for the transportation of hazardous wastes. Figure 2-9 provides a representation of traffic flow for hazardous waste within the facility.

2.4.2 TRAFFIC CONTROL

MCAAP is a secured US Army installation with access through two controlled gates. The main depot entrance, C-Tree Road, is manned 24 hours per day by installation security forces. The second entrance is along the north boundary at Haywood, with access available during scheduled hours. All installation traffic is checked and controlled through these access points.

Primary motor vehicle access to the MCAAP is through the Main Gate at the east entrance intersection of C-Tree Road and Highway 69. The main arterial road through MCAAP is C-Tree Road, which provides access from the Main Gate to the headquarters, industrial, and housing areas. At the North Gate (Haywood), C-Tree Road connects to the U.S. Route 270 access road. All other roads on the installation are accessed from C-Tree Road.

The 210-mile Government-owned railroad system at MCAAP connects to servicing commercial railroad systems at the east and north wyes. The Missouri-Kansas-Texas Railroad services the installation from its track siding near the east wye. The Rock Island Pacific Railroad services the ammunition plant from its interchange trackage at Haywood.

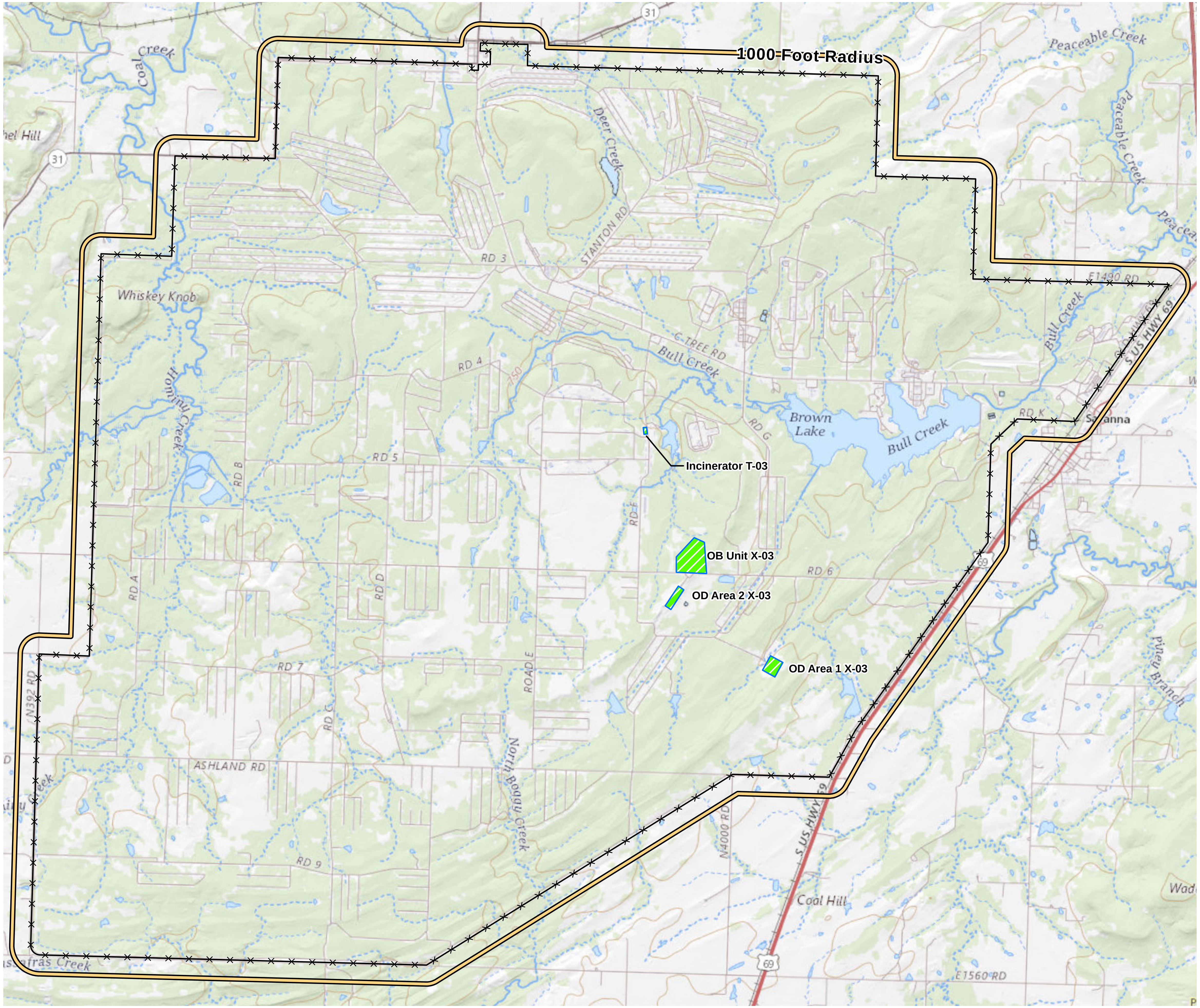
2.4.3 ACCESS ROAD SURFACING

Of the 404 miles of road at the plant, 82 miles are paved, 246 miles are gravel surfaced, and 76 miles are unimproved. The main roads through the installation, C-Tree Road, Roads A through F, Roads 4 through 7, Ashland Road, and Road 9 are all paved. C-Tree Road is paved with 2 inches of asphaltic concrete overlying 8 inches of compacted base material and 6 inches of compacted subgrade. It is 22 feet wide with two lanes that carry two-way traffic. All other paved roads on the installation are designed for lower traffic volumes. These roads are paved with double bituminous surface treatment with 8 inches of compacted base material and 6 inches of compacted subgrade. They are 18 to 22 feet wide, two-laned, and carry two-way traffic. The all-weather gravel surface roads are 18 to 20 feet wide constructed with 8 inches of compacted base material and 6 inches of compacted subgrade.

2.4.4 Load-Bearing Capacity

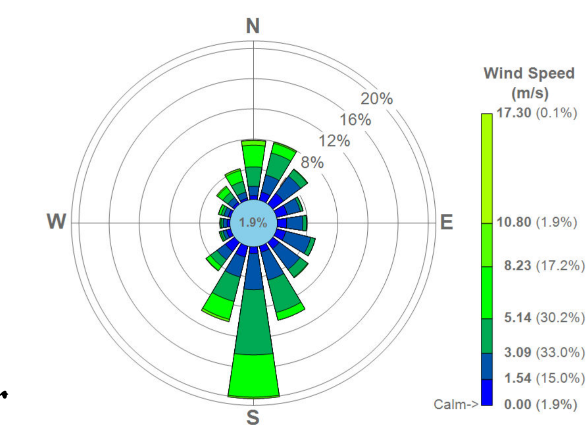
Both paved and gravel surface roads are designed to carry loaded semitrailer trucks. However, loads are limited to 20,000 pounds on single axles and 34,000 pounds on tandem axles to avoid bearing capacity problems. Total gross weight is limited to 80,000 pounds for the protection of bridges. The perimeter road bounding the installation is unimproved but is not used for the transport of hazardous waste. It is primarily used by security for fence line inspections.

Attachment 2-1: MAPS AND FIGURES



Legend

- Facility Boundary / Fence line
- Thermal Treatment Units
- 1000 Foot Radius



Note: Wind Rose shows the direction the wind is blowing from.

0 2,600 5,200 FEET

1" = 5,200 FEET
1:62,400

MCALESTER ARMY AMMUNITION PLANT (MCAAP)
1 C TREE ROAD
MCALESTER, OK 74501

FIGURE 2-1
USGS 7.5-MINUTE TOPOGRAPHIC MAP OF THE MCAAP

DRAWN BY: L WILSON	SCALE: AS NOTED	PROJ. NO.	RCRA 2022
CHECKED BY: P HARRELL		FILE NO.	Project.mxd
APPROVED BY: P HARRELL	DATE PRINTED: 12/13/2022		
DATE: December 2022			

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3.0 WASTE CHARACTERISTICS

This section presents a description of the energetic hazardous waste handled at the site and is being provided pursuant to the general Part B permitting requirements specified in 40 CFR Parts 270, 264, and 268.

3.1 WASTE GENERATION AND MINIMIZATION

[§270.14(b)(2) and §264.73(b)(9)]

In general, three types of waste are treated at the incinerator and the OB/OD units: military energetic materials and ordnance that are out of date or off-specification, waste components from manufacturing processes, and laboratory waste. All these wastes are, at their core, items that contain in whole or in part, propellant, energetic, and pyrotechnic (PEP) materials. In addition, a fourth group of wastes, classified as residues, is generated from the operation of the incinerator and the OB/OD units; these waste streams include the non-combustible fraction of the wastes or the metal components of the munitions item and are generated in the incinerator and its associated air pollution control (APC) system, on the pans at the OB unit, and in the OD units.

MCAAP's waste minimization program is designed to provide a specific plan of action to minimize and/or reduce the volume and toxicity of hazardous waste generated at the facility as practicable from the standpoint of economics and safety. Annually, MCAAP provides a certification of their waste minimization activities in accordance with 40 CFR § 264.73(b), indicating that a program is in place at MCAAP to reduce the volume and toxicity of hazardous waste generated to the degree determined to be practicable from the standpoint of economics and safety.

3.2 CHEMICAL AND PHYSICAL ANALYSES OF MANAGED WASTES

[§270.14(b)(2) and §264.13(a)]

As required by 40 CFR §§ 270.14(b)(2) and 264.13(a), MCAAP conducts periodic chemical and physical analysis of the hazardous waste treated in the incinerator and OB/OD units. This section provides information on the chemical and physical characteristics of the hazardous wastes that are treated. The waste analysis plan in Attachment 3-1 describes the procedures that will be used to characterize the wastes and the resulting residues for compliance with the applicable RCRA provisions.

Table 3-1 presents a list of the hazardous waste codes that may be associated with each waste type treated or generated at the incinerator and OB/OD units. As shown in the table, all wastes treated at the incinerator and the OB/OD units are reactive due to their PEP component. They may carry other codes based on the chemical composition of the actual PEP material. Note that not all wastes will carry all of the codes specified, but any waste may carry one or more of the codes identified for that group.

TABLE 3-1
HAZARDOUS WASTE CODES TREATED OR GENERATED AT THE INCINERATOR AND OB/OD UNITS

WASTE TYPE	TREATMENT UNIT	APPLICABLE WASTE CODES	
Munitions and PEP	Incinerator OB/OD	D001 D003 D005 D006 D007 D008 D010 D030	Ignitability Reactivity Toxic for barium Toxic for cadmium Toxic for chromium Toxic for lead Toxic for selenium Toxic for 2,4-Dinitrotoluene
Process wastes and laboratory wastes	OB	D001 D003 D005 D006 D007 D008 D010 D030 U160	Ignitability Reactivity Toxic for barium Toxic for cadmium Toxic for chromium Toxic for lead Toxic for selenium Toxic for 2,4-Dinitrotoluene Methyl Ethyl Ketone Peroxide
Treatment residues	Incinerator	D003 D005 D006 D007 D008 D010 D030	Reactivity[1] Toxic for barium Toxic for cadmium Toxic for chromium Toxic for lead Toxic for selenium Toxic for 2,4-Dinitrotoluene
Treatment residues	OB	D003 D005 D006 D007 D008 D010 D030	Reactivity[1] Toxic for barium Toxic for cadmium Toxic for chromium Toxic for lead Toxic for selenium Toxic for 2,4-Dinitrotoluene
Treatment residues	OD	D003	Reactivity [1]

[1] Prior to disposal, MCAAP verifies that the treatment residues no longer contain energetics via the test methods described herein. Should unreacted energetics be found, the residues are again thermally treated to destroy any remaining energetic material.

The chemical and physical information for the waste streams is provided in the following sections as represented by the process generating the waste. For most of the waste streams, absent the residues, MCAAP uses a combination of process knowledge and published data to characterize the wastes due to the hazards and challenges with analyzing energetic and explosive items.

3.2.1 MUNITIONS AND PEP

Munitions and the PEP within them are produced to very strict military specifications. Information is known about the materials that go into the formulation of the PEP and the materials of construction used in the cartridges and cases housing the PEP. These strict and controlled product manufacturing codes allow MCAAP to determine the hazardous waste classification of these wastes using process knowledge. Off-specification materials contain the same raw materials and do not contain significantly different chemicals or concentrations as on-specification products; the off-specification materials may be classified as such due to manufacturing defects, physical size variations, *etc*. Both configured munitions and bulk PEP material may be treated at the incinerator and the OB/OD units.

These wastes are all hazardous for one or more of the following reasons:

- Ignitable – Waste may be D001 ignitable as an oxidizer.
- Reactive – Waste may be D003 reactive because it is either explosive material or it contains significant amounts of explosive residue that make it capable of detonation or explosive reaction when subjected to a strong initiating source or heated under confinement. Wastes may also be D003 reactive due to reactivity to water or because are they are a forbidden explosive per 49 CFR § 173.54 or are a Division 1.1, 1.2, or 1.3 explosive as defined in 49 CFR §§ 173.50 and 173.53.
- Toxic for barium – Waste may be D005 for barium toxicity because it may be present in the PEP.
- Toxic for cadmium – Waste may be D006 for cadmium toxicity because it may be present in the PEP.
- Toxic for chromium - Waste may be D007 for chromium toxicity because it may be present in the PEP.
- Toxic for lead – Waste may be D008 for lead toxicity because it may be present in the PEP.
- Toxic for selenium – Waste may be D010 for selenium toxicity because it may be present in the PEP.
- Toxic for 2,4-dinitrotoluene - Waste may be D030 for 2,4-dinitrotoluene toxicity because it may be present in the PEP.

3.2.2 PROCESS AND LABORATORY WASTE

Wastes generated from laboratory and process operations may be characterized as reactive due to the presence of energetics. These wastes consist of chemical mixture byproducts generated during the manufacturing process, spent materials containing PEP, contaminated materials and cleanup wastes, and off-specification products. Table 3-2 presents the waste streams typically generated from these processes.

TABLE 3-2
PROCESS AND LABORATORY WASTES TREATED OR GENERATED AT THE OB UNIT

WASTE	DESCRIPTION
Plastic Bonded Explosives (PBX)/Solvent Sludge	Cleaning of the kettles used to pour PBX explosives with a non-halogenated solvent. This waste is a sludge-like mixture of explosives and solvent and cannot be transported for offsite treatment.
Methyl Ethyl Ketone Peroxide	Out of date or off-specification material used in the manufacturing process. This material may become unstable and is not appropriate for transport to an offsite treatment facility.
Hypersolve	Cloth rags, gloves, and personal protective equipment (PPE) routinely used when using Hypersolve to clean out bomb bodies.
Pink Water Sumps	Cleanout of building sumps in munitions processing buildings.
Explosives Contaminated Personal Protective Equipment	Explosives contaminated PPE generated throughout the munitions processing buildings.
Laboratory Waste	Spent heptane and acetone reagents that contain measurable amounts of explosives.
Waste PBX	Scrap PBX generated from explosive fill operations.

In all cases, the chemical and physical characteristics of the munition formulations are very clearly defined by the military specifications from which they were manufactured. In addition, safety data sheets (SDSs) are available for chemical products that may be contaminated with energetics or are discarded commercial chemical products. Therefore, process knowledge can be used to assign the hazardous waste classifications to them. No secondary sampling and analysis are generally necessary to characterize them for compliance. Process and laboratory wastes are treated at the OB unit.

These wastes may be hazardous for one or more of the following reasons:

- Ignitable –Waste may be D001 ignitable as an oxidizer.
- Reactive – Waste may be D003 reactive because it is either energetic or explosive material or it contains significant amounts of energetic or explosive residue that make it capable of detonation or explosive reaction when subjected to a strong initiating source or heated under confinement. Wastes may also be D003 reactive due to reactivity to water or because they are a forbidden explosive per 49 CFR § 173.54 or a Division 1.1, 1.2, or 1.3 explosive as defined in 49 CFR §§ 173.50 and 173.53.
- Toxic for barium – Waste may be D005 for barium toxicity because it may be present in the PEP.
- Toxic for cadmium – Waste may be D006 for cadmium toxicity because it may be present in the PEP.
- Toxic for chromium - Waste may be D007 for chromium toxicity because it may be present in the PEP.
- Toxic for lead – Waste may be D008 for lead toxicity because it may be present in the PEP.
- Toxic for selenium – Waste may be D010 for selenium toxicity because it may be present in the PEP.
- Toxic for 2,4-dinitrotoluene - Waste may be D030 for 2,4-dinitrotoluene toxicity because it may be present in the PEP.

- Reactive and toxic for methyl ethyl ketone (MEK) peroxide – Waste may be U160 for MEK peroxide as a discarded commercial chemical product.

3.2.3 Treatment Residue

Thermal treatment of wastes at the incinerator and the OB/OD generates various treatment residues. These include:

- At the incinerator, two types of treatment residues may be generated from the treatment of munition and munition components: metal parts and heavier ash-like material from the kiln, and lightweight fly-ash from the base of the baghouse. When the cryofracture operations are in process, these residues are considered mixed hazardous and low-level radioactive wastes (mixed wastes) and are managed in accordance with Nuclear Regulatory Commission (NRC) License Number SUB-9940.
- Additional treatment residues from the thermal treatment of ADAM mines at the incinerator, including mine housing debris from the DHS. Like the other residues from MCDF operation, these are a mixed waste and are managed as required under NRC License Number SUB-9940. As such, these treatment residues are not addressed in the waste analysis plan.
- From the OB units, treatment operations may generate two classes of treatment residue: ash residue and solid residue. Solid residues from the OB include items such as recoverable metal casings, fragments, and pieces of untreated munitions filler material.
- Only one residue, metallic shrapnel is generated from the OD units.

Treatment residues from the incinerator and OB units are sampled and analyzed in accordance with the Waste Analysis Plan included in Attachment 3-1. Waste residues are then shipped offsite for recycling, further treatment, or proper disposition. At the OD units, shrapnel residue is visually inspected for evidence that the energetic component of the items has been successfully treated. In all cases, any unreacted PEP materials are retreated and retested prior to being sent for offsite recycling.

The waste residues collected from the incinerator and the OB units may be hazardous for one of the following reasons:

- Reactive –Wastes may D003 reactive due to reactivity to water. (If a residue remains reactive due to explosive or energetic content, it is retreated prior to final disposition.)
- Toxic for barium – Waste may be D005 for barium toxicity because it may be present in the PEP.
- Toxic for cadmium – Waste may be D006 for cadmium toxicity because it may be present in the PEP.
- Toxic for chromium - Waste may be D007 for chromium toxicity because it may be present in the PEP.
- Toxic for lead – Waste may be D008 for lead toxicity because it may be present in the PEP.
- Toxic for selenium – Waste may be D010 for selenium toxicity because it may be present in the PEP.
- Toxic for 2,4-dinitrotoluene - Waste may be D030 for 2,4-dinitrotoluene toxicity because it may be present in the PEP.

3.3 WASTES NOT TREATED IN THE TREATMENT UNITS

There are several specific waste types that are not accepted for thermal treatment at the incinerator or OB/OD units. These include materials that may have been contaminated with military chemical warfare agents, as well as the smoke and incendiary compounds listed in Table 3-3.

TABLE 3-3
MATERIALS NOT ACCEPTED FOR THERMAL TREATMENT

TYPE	COMPOUND
Chemical Warfare Agents	Choking agents
	Nerve agents
	Blood Agents
	Blister agents
	Incapacitating agents
	Vomiting agents
	Tear-producing compounds
	Herbicides
Smokes	Titanium tetrachloride
	Sulfur trioxide/chlorosulfonic acid
	Hexachloroethane mixture containing grained aluminum and zinc oxide
	White phosphorus
	Bulk red phosphorus
	Plasticized white phosphorus
	Oil smoke
	Colored smokes (red, yellow, green, violet, white)
Incendiaries	Eutectic white phosphorus
	Napalm B

3.4 WASTE ANALYSIS PLAN

[§270.14(b)(3) and §§264.13(b) and (c)]

Attachment 3-1 provides a copy of the Waste Analysis Plan (WAP) that is required pursuant to 40 CFR §270.14(b)(3) and 40 CFR §§264.13(b) and (c). As per those requirements, the WAP specifies the procedures used to obtain the required chemical and physical analyses of the hazardous wastes. In addition to providing characterization procedures, the plan also includes the parameters for which each waste will be analyzed, the methods that will be used to sample and test for the parameters, and the frequency of analyses.

3.5 ADDITIONAL REQUIREMENTS FOR WASTES GENERATED OFFSITE

[§270.14(b)(3), §§264.13(a)(3)(ii) and (a)(4), §264.13(b)(5), §264.13(c), §264.73(b)(7), and OAC §252:205-9-6)]

MCAAP may accept waste munitions or waste PEP shipments from other DoD facilities for treatment at the incinerator or OB/OD units. Prior to acceptance of offsite hazardous waste, MCAAP coordinates with the generating facility and reviews all applicable information used to characterize the waste. Such information may include the history of generation, military specifications (MILSPECs), hazardous properties, pertinent chemical and physical data, and SDSs. No wastes will be received until proper characterization of the waste is provided and the appropriate treatment process is determined.

MCAAP will provide written notifications to offsite generators in accordance with 40 CFR § 264.12, stating that they have the appropriate permits for and are willing to accept the waste the generator is shipping. Copies of these notices will be retained at MCAAP as part of the operating record.

Before an offsite generated waste is accepted at MCAAP, the waste is visually inspected for consistency with pre-acceptance documents. If there are discrepancies between the waste received and the pre-acceptance paper-work, the generator will be notified and the issue will be resolved. All wastes received from offsite are tracked through the facility using a waste tracking form. Records of thermal treatment are maintained in the treatment unit daily operating records.

3.6 ADDITIONAL REQUIREMENTS FOR IGNITABLE, REACTIVE, OR INCOMPATIBLE WASTES

[§270.14(b)(3), §264.13(b)(6), and §264.17]

The wastes treated at the incinerator and the OB/OD units are all reactive wastes and some of them are also ignitable. Therefore, MCAAP complies with the additional requirements in 40 CFR § 264.13(b)(6) for units that are managing ignitable, reactive, or incompatible wastes.

The hazards that can result from the management, handling, and treatment of the ignitable and reactive wastes treated at the incinerator and OB/OD units are well documented via MILSPECs and SDSs. Hazards that have been evaluated include:

- The potential for the wastes to generate extreme heat or pressure, cause fire or explosions, or other violent reactions during storage, transfer, or treatment.
- The potential for the wastes to produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health or the environment during storage, transfer, or treatment.
- The potential for the wastes to damage the structural integrity of either the incinerator or the OB/OD units.
- The potential for the wastes, through other like means to threaten human health or the environment.

No further waste analysis is required to evaluate these hazards or determine mitigation plans for them.

3.7 WASTE ANALYSIS PERTAINING TO LAND DISPOSAL RESTRICTIONS

[§270.14(a), §262.10, §264.13, §264.73, and §268]

None of the residues generated at MCAAP are sent by MCAAP to a land disposal facility. Residues are either sent to a properly regulated hazardous waste incinerator (Management Method Code H040) or are sent to a regulated treatment facility for encapsulation, stabilization, or fixation (Management Method Code H110). Therefore, the requirements of 40 CFR § 268.7(a) are not applicable. Should MCAAP determine that some of the residues need to be land-disposed in the future, this permit application will be modified to address the appropriate requirements.

Attachment 3-1: WASTE ANALYSIS PLAN

McAlester Army Ammunition Plant

McAlester, Oklahoma

Waste Analysis Plan for the APE 1236M2 Deactivation Furnace and Open Burn/Open Detonation Units

December 2022

Included as Attachment 3-1 to the MCAAP Hazardous Waste Renewal Application

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1.0 INTRODUCTION

This Waste Analysis Plan (WAP) has been prepared for the APE 1236M2 deactivation furnace (herein referred to as the incinerator) and the open burn/open detonation (OB/OD) units operated at the McAlester Army Ammunition Plant (MCAAP) to satisfy the requirements of 40 CFR § 270.14(b)(3), and 40 CFR §§ 264.13(b) and (c). While not required to be a stand-alone document, this WAP has been prepared as such to facilitate distribution to the various departments that may need to reference it. Administratively, the WAP resides in Section 3 of the RCRA Part B permit application for the incinerator and the OB/OD units.

The information required in the WAP is distributed throughout this plan as follows:

- Section 2 provides the parameters for which each waste and the associated treatment residues will be analyzed and the rationale for selection of those parameters.
- Section 3 discusses the test methods that will be used to evaluate/analyze for these parameters.
- Section 4 describes the sampling and analytical methods that are employed for the treatment residues.
- Section 5 discusses the frequency with which the initial characterization will be reviewed or repeated to ensure that the profile for the waste and the treatment residues is accurate and up to date.

2.0 WASTE ANALYSIS PARAMETERS AND RATIONALE

This section specifies the parameters for which the hazardous wastes treated at the incinerator and the OB/OD are "analyzed" (*i.e.,* evaluated) to ensure compliance with the applicable requirements and the rationale for determination of those parameters. The information provided herein is intended to satisfy the requirements of 40 CFR §§ 270.14(b)(3) and 264.13(b)(1).

2.1 WASTES TREATED AT THE INCINERATOR AND THE OB/OD UNITS

Under 40 CFR §§ 262.11(c) and (d)(1), all wastes generated at the MCAAP must be evaluated to determine if the waste is a hazardous waste pursuant to 40 CFR § 261.1. This includes evaluation of the following parameters for each waste:

- The hazardous characteristics identified in Subpart C of 40 CFR Part 261, including:
  - The characteristic of ignitability as defined in 40 CFR § 261.21.
  - The characteristic of corrosivity as defined in 40 CFR § 261.22.
  - The characteristic of reactivity as defined in 40 CFR § 261.23.
  - The characteristic of toxicity as defined in Table 1 of 40 CFR § 261.24.
- The listing descriptions under Subpart D of 40 CFR Part 261, including:
  - Hazardous wastes from non-specific sources, as specified in 40 CFR § 261.31.
  - Hazardous wastes from specific sources, as specified in 40 CFR § 261.32.
  - Hazardous wastes classified as discarded commercial chemical products, off-specification species, container residues, and spill residues thereof under 40 CFR § 261.33.

As specified in 40 CFR § 264.13(a)(1), the parameters selected for this "analysis" must also contain any other information that must be known to treat, store, and/or dispose of the waste in the units covered by the permit application. For the incinerator and OB/OD units, no further characterization in addition to that specified above is required, as these units do not have constituent feed rate limits under the RCRA rules. (Note the incinerator does have constituent feed rate limits under the National Emission Standards for Hazardous Air Pollutants from Hazardous Waste Combustors (HWC NESHAP) program found at 40 CFR Part 63, Subpart EEE; however, those requirements are addressed by the Feedstream Analysis Plan required by the HWC NESHAP and regulated through the Clean Air Act Title V program).

2.2 TREATMENT RESIDUES

The treatment residues generated from the incinerator and the OB units must be characterized to allow for subsequent treatment at an off-site appropriately permitted hazardous waste treatment facility, such as an incinerator or a stabilization, encapsulation, or fixation facility. Table 2-1 provides a summary of the parameters selected for the treatment residues and the rationale for them. Note that no parameters are included for evaluation versus the land disposal standards, as MCAAP does not directly land dispose of any of the treatment residues.

ATTACHMENT 3-1, TABLE 2-1
PARAMETERS AND RATIONALE FOR TREATMENT RESIDUE ANALYSES

PARAMETERS	RATIONALE
TCLP Barium	Hazardous waste classification and LDR compliance
TCLP Cadmium	Hazardous waste classification and LDR compliance
TCLP Chromium	Hazardous waste classification and LDR compliance
TCLP Lead	Hazardous waste classification and LDR compliance
TCLP Selenium	Hazardous waste classification and LDR compliance
Total Energetics (including 2,4-Dinitrotoluene)	Treatment effectiveness and LDR compliance

Metallic shrapnel is the only treatment residue generated from the OD process. Shrapnel is visually inspected to ensure all energetic components have been destroyed. If energetic residue remains on the shrapnel, it is retreated.

3.0 TEST METHODS

The test methods employed for accomplishing the characterizations discussed in Section 2 vary depending upon where the waste will be treated in the case of hazardous waste feed streams and from which treatment unit the waste was generated in the case of treatment residues. This section provides a discussion of the test methods for each waste stream managed at the treatment units.

3.1 WASTES TREATED AT THE INCINERATOR AND OB/OD UNITS

As permitted by 40 CFR §§ 262.11(c) and (d)(1) and 40 CFR § 264.13(a)(2), process knowledge, including confidential manufacturing data and military product specifications (MILSPECs), is used to “analyze” or evaluate the hazardous waste streams and obtain the chemical and physical data necessary to treat the wastes in the incinerator and the OB/OD units. Prior to treatment of wastes at the incinerator and OB/OD units, historical data and ordnance publications are used to obtain information regarding the nature of the waste to be treated. The primary source of this information is the Munitions Items Disposition Action System (MIDAS) database that houses very specific manufacturing specifications on the wastes that are treated at MCAAP.

The munitions specifications provided in the MIDAS database provide detailed constituent information for the propellant, energetic, and pyrotechnic (PEP) compositions present in munitions and ordnance items. In addition to the MIDAS data, MCAAP may also utilize site-specific manufacturing data in obtaining the data on each waste item. While off-specification materials are treated at the incinerator and the OB/OD units, these materials contain the same constituents in similar concentrations. Therefore, the MIDAS data and site-specific manufacturing data is also used in the characterization of waste from off-specification materials. The MIDAS database is maintained by the Joint Munitions Command (JMC). Access to MIDAS is limited to authorized personnel only, but information on any specific waste item can be provided upon request, within the security restrictions placed on the distribution of controlled unclassified information (CUI) by the Department of Defense (DoD).

For those wastes that are received from off-site locations, the same general process is used to characterize the wastes, as the only off-site waste that is received is from other DoD installations. Prior to waste acceptance, MCAAP coordinates with the generating facility and performs a review of all available waste information. Both physical and chemical data must be sufficient to ensure that the composition of the waste is consistent with the those that can be treated at the MCAAP facility and that the appropriate treatment process is selected. Once an off-site shipment is received, the manifest is verified against the wastes received. Any discrepancies are clarified with the waste generator to ensure proper waste classification prior to treatment at the incinerator or OB/OD units.

3.2 Treatment Residues from the Incinerator and OB/OD Units

For the treatment residues resulting from the incinerator and OB operations, process knowledge can be used to help isolate the compounds that may be present in the residues. For example, if the MIDAS database indicates that no barium is present in the item being treated, there is no reason to suspect that barium would be present in the treatment residues. However, for those compounds that are present, MIDAS data alone cannot be used to ensure proper characterization of the residue for shipment offsite. Therefore, periodic physical sampling and laboratory analysis of the residues is also employed to achieve the required chemical and physical characterization. A discussion of the methods employed in this regard is provided in Section 4 of this WAP.

At the OD units, the PEP and the item that housed the PEP are destroyed in the treatment process. Therefore, neither process knowledge from MIDAS nor physical sampling and laboratory analysis is useful in making any necessary determination for classification of the scrap metal residues that result from the treatment process. For these residues, visual inspections are used to determine whether the material is free of the energetic hazardous materials. After this visual inspection, the material is documented as safe and non-reactive and can be shipped off-site for recycling.

4.0 SAMPLING AND ANALYTICAL METHODS

No physical sampling of the hazardous wastes treated at the thermal treatment units is performed. As described in Section 3 of this WAP, MCAAP relies on process knowledge in characterizing all waste treated at the incinerator and the OB/OD units. Therefore, this section of the WAP, which is provided pursuant to 40 CFR § 264.13(b)(3), discusses only the sampling and analytical methods that will be employed to obtain and analyze a representative sample of the treatment residues from each unit.

4.1 SAMPLING METHODS

The sampling methods used to collect representative samples of the treatment residues from the incinerator and OB unit are discussed in this section as required by §§ 270.14(b)(3) and 264.13(b)(3). The methods themselves are described, along with the sample handling practices and preservation techniques.

4.1.1 TREATMENT RESIDUES AT THE INCINERATOR

Treatment operations at the incinerator, generate treatment residues from the rotary kiln and from the cyclone and baghouse. Residues from the rotary kiln include metallic debris and fly ash-like material depending on the item being treated. Metallic debris is collected in drums at the end of the kiln and screened for unreacted materials prior to being sent off-site for recycling. Fly ash-like material from the rotary kiln is also deposited into drums at the end of the kiln. Both this ash and the APC ash-like residues from the cyclone and the baghouse are sampled periodically. Composite samples of each waste type are taken from the drums holding the ash during each designated sampling event. These composite samples are analyzed to properly characterize the residues for offsite shipment (or as required pursuant to the MCAAP's NRC license).

The sampling equipment and collection/handling methods used for collecting samples of the residues follow USEPA-approved sampling protocols contained in the most recent edition of the USEPA's *Test Methods for Evaluating Solid Waste* (SW-846). The composite sample is prepared with adequate volume to support any analyses that may be required (*e.g.,* TCLP analysis). Once the composite sample is created, the sample is labeled, and the appropriate chain-of-custody documentation is completed.

4.1.2 TREATMENT RESIDUES AT THE OB UNITS

Treatment residues from the pans at the OB unit are collected into 55-gallon drums, which are segregated by the type of waste burned. Up to 100 drums of each waste type are held in a specially marked area at the OB unit that is labeled as "Pending Waste Analysis" until such time that the data required for off-site management of the residues is available. Once 100 drums of a waste type have accumulated, grab samples are taken from approximately 5 percent of the drums. The grab samples are then composited.

The sampling equipment and collection/handling methods used for collecting these samples follow USEPA-approved sampling protocols contained in the most recent edition of SW-846. The composite sample is prepared with adequate volume to support any analyses that may be required (*e.g.,* TCLP analysis). Once the composite sample is created, the sample is labeled, and the appropriate chain-of-custody documentation is completed.

4.2 Analytical Test Methods

40 CFR § 264.13(b)(2) requires that the WAP indicate the methods that will be used to determine each analytical parameter required to make a hazardous waste determination and ensure proper management of the treatment residues. As stated previously, any "analyses" conducted for the hazardous wastes treated in the units are conducted using process knowledge determinations. These methods were described previously in Section 2.

Analytical methods utilized for the treatment residues are shown in Table 4-1. Analytical procedures specified are from the latest version of USEPA's SW-846. The apparatus, reagents, calibration methods, quality controls, analytical procedures, and calculation methods specified in these methods are incorporated into this WAP by reference. Laboratories analyzing the treatment residues will operate in conformance with a quality assurance and quality control (QA/QC) plan that meets the requirements described in Chapter 1 of SW-846 or other approved methods.

Attachment 3-1, Table 4-1
Test Methods for Analysis of Incinerator and OB Unit Treatment Residues

Parameter	Analysis Type [1]	Method Number [2]
Toxicity characteristics	TCLP preparation	SW-846 Method 1311
TCLP Barium	ICP-OES	SW-846 Method 6010 or 6020
TCLP Cadmium	ICP-OES	SW-846 Method 6010 or 6020
TCLP Chromium	ICP-OES	SW-846 Method 6010 or 6020
TCLP Lead	ICP-OES	SW-846 Method 6010 or 6020
TCLP Selenium	ICP-OES	SW-846 Method 6010 or 6020
Total Energetics (includes 2,4-Dinitrotoluene)	HPLC	SW-846 Method 8330

[1] ICP-OES = Inductively Coupled Plasma – Optical Emission Spectrometry. HPLC = High performance liquid chromatography.
[2] Where SW-846 methods are referenced, the latest update that has been incorporated to the laboratory's procedures will be used.

5.0 FREQUENCY OF ANALYSIS

Pursuant to 40 CFR § 264.13(b)(4), MCAAP has established a frequency with which the initial analysis of the waste will be reviewed or repeated to ensure that the analysis is accurate and up to date. All records of waste analysis, whether through physical sampling and analysis or process knowledge, are maintained on-site for at least three years pursuant to 40 CFR § 264.73(b)(3).

5.1 WASTES TREATED AT THE INCINERATOR AND THE OB/OD UNITS

Process knowledge is used to determine the chemical and physical characteristics of wastes prior to first treating the individual waste item at any unit. In addition to that initial analysis, the overall list of applicable waste codes for each type of waste processed at the incinerator and the OB/OD units is evaluated:

- As part of an annual review.
- In advance of a new potential waste generation and/or treatment.
- As needed, if an unexpected situation occurs in the manufacturing process that could change the waste characteristics from those in the applicable product or military specification.
- As needed, should the process generating the waste change or should a new MILSPEC be provided for an item that was previously characterized.

5.2 TREATMENT RESIDUES AT THE INCINERATOR

MCAAP has established a profile for the incinerator residues based on historical analytical results from sampling and analysis events. This profile is reviewed annually and periodically, the profiles are updated by collecting a discrete set of composite samples in a given shipment. In addition, if MCAAP begins treating a new item in the incinerator that has not previously been treated or a new specification is created for a previously treated item (and henceforth reflected in the historical analyses), MCAAP will conduct a secondary discrete sampling event after that waste stream has been treated and prior to shipment of the residues generated during that treatment period.

5.3 TREATMENT RESIDUES AT THE OB UNIT

Samples of the treatment residues from the OB unit are collected and analyzed for every 100 drums of waste type that are generated. The time required for each waste type to result in 100 drums of residues varies depending upon production schedules and demilitarization priorities.

4.0 PROCESS INFORMATION

This section presents information on the design and operation of the MCAAP incinerator and OB/OD units and is being provided pursuant to the general Part B permitting requirements of 40 CFR Part 270, and 40 CFR Part 264 Subparts O and X. Attachment 4-1 presents design drawings and figures referenced in this section.

Please note that some of these drawings have been declared CBI because the DoD designated them as CUI that requires protection from dissemination under 32 CFR Part 2002. The marked drawings have been redacted from all public versions of this application to protect National security concerns. Access to and dissemination of those items marked CUI shall be allowed as necessary and permissible to any individual(s), organization(s), or grouping(s) of users, provided such access or dissemination is consistent with or in furtherance of a Lawful Government Purpose and in a manner consistent with applicable law, regulations, and Government-wide policies.

4.1 INCINERATOR PROCESS INFORMATION

The incinerator is classified as a hazardous waste incinerator and is regulated under both 40 CFR Part 264, Subpart O and 40 CFR Part 63, Subpart EEE, the HWC NESHAP. The incinerator includes not only the APE 1236M2 deactivation furnace chamber, but also the associated afterburner and downstream air pollution control (APC) system and the feed room and barricaded area. In addition, the unit feed housing has a small port to allow for feeding of overlay kiln mechanisms (OKMs) through the positive feed system (PFS).

While the specific RCRA operating requirements and emission standards for incinerators do not apply to the incinerator pursuant 40 CFR §§ 264.340(b) and 270.19(e), the incinerator remains a hazardous waste treatment unit and as such, a description of its components and design is appropriate for inclusion in this permit application. The sections that follow provide a description of the incinerator.

Section 4.1.1 provides a description of the incinerator’s components. Section 4.1.2 provides information on the operations at the incinerator, including the emergency operating scenarios.

4.1.1 INCINERATOR DESIGN

The APE1236M2 deactivation furnace operated at the MCAAP is designed to thermally treat obsolete or unserviceable ammunition ranging from small arms through 20-millimeter (mm) rounds. Items larger than 20-mm must be disassembled before treatment. ADAM mines that are fed to the furnace are first disassembled and fractured in the munitions cryofracture demilitarization facility (MCDF), which freezes, fractures, punches, and exposes the energetic material in the mines’ overlay kill mechanisms (OKMs) before feeding them to the furnace via the PFS. All other items larger than 20-mm are disassembled away from the furnace, if necessary, and are fed to the system through the conventional feed system.

Debris from the MCDF press operations is containerized in drums and treated in the drum heating system (DHS).

Both the conventional feed items and the OKMs from the MCDF enter the system at the rotary kiln. In this chamber, the items are initiated, and their exposed energetic components are ignited from the heat provided from a natural gas-fired burner. Ash and metal components not entrained in the flue gas pass through the kiln and exit on the discharge conveyor. Items entrained in the flue gas are transported downstream to the cyclone, where any entrained sparks are removed from the system, and pass into the afterburner. Upstream of the afterburner, off-gases from the DHS mix with the main flue gas stream. These off-gases are the result of the thermal treatment of residue generated from the pressing operations in the MCDF system. These residues contain energetic material that is activated in the DHS, rendering the residues no longer reactive. Once in the afterburner, the combined flue gas stream is heated to a high temperature to ensure that all organics are thoroughly destroyed. After they exit the afterburner, the flue gases pass through an evaporative cooler, which rapidly quenches the flue gases. From here, the gases pass through a fabric filter baghouse and high efficiency particulate air (HEPA) filter for particulate-based pollutant removal before being discharged through the exhaust stack. The prime motive force for the flue gases is provided by an induced draft (ID) fan, which is located between the HEPA and the stack.

In addition to the components listed above, the furnace is equipped with continuous monitoring systems (CMS) that monitor, control, and record the required operating parameters and stack continuous emission monitors (CEMS) measurements.

Figure 4-1 provides a schematic diagram of the incineration system at the MCAAP. A plot plan for the incineration facility is provided in Figure 4-2.

4.1.2 Incinerator Operations

Wastes are received at the incinerator primarily by railcar and occasionally by flatbed truck. Each railcar serves as a central accumulation area. The wastes are unloaded from the transfer vehicle and are moved to either a temporary, conditionally exempt storage area or transferred to a depalletization area. Ammunition boxes are unpacked, and the packaged ammunition is placed in the feedbox, weighed, and loaded into the furnace. As the wastes process through the furnace, any metal parts exit the kiln on the discharge conveyor, where they are accumulated in drums and are screened to confirm that all energetic material is destroyed. Any debris that is “suspect” for containing unreacted energetic material is collected in metal containers for retreatment. “Cleared”, non-suspect residue is then sent offsite for recycling. Some of the items treated also general a fly-ash like residue, which also exits the back of the kiln and is deposited into drums. This ash, as well as cyclone and baghouse ash residues, which are containerized in drums underneath each unit, is then sent to a central accumulation area, where they collected before being shipped offsite for further treatment.

4.1.2.1 *NORMAL INCINERATOR OPERATIONS*

As noted above, pursuant to 40 CFR §§ 264.340(b) and 270.62, specific RCRA operating requirements for incinerators no longer apply because MCAAP has completed their initial demonstration of compliance with the HWC NESHAP and has submitted the associated Notification of Compliance (NOC). As such, more specific information on operation of the incinerator and associated components is not required in this permit application; these criteria are now addressed by the Clean Air Act.

4.1.2.2 *EMERGENCY SCENARIOS*

Under 40 CFR § 270.235(a), hazardous waste incinerators have several options for dealing with excess emissions from startup, shutdown, and malfunction events, including those events in which the emergency safety vent (baghouse bypass) opens. As the HWC NESHAP startup, shutdown, and malfunction plan has not been requested by or approved by ODEQ air division, MCAAP will address these excess emission scenarios within this RCRA permit. Accordingly, there are several emergency situations could exist at the incinerator that could impact human health or the environment. These events are non-normal unit operations and the responses to them are designed to protect personnel, the treatment equipment, and the environment to the extent practical. Table 4-1 identifies the applicable emergency scenarios and the automated responses that will happen in the event that each event occurs.

TABLE 4-1
EMERGENCY SCENARIOS FOR THE INCINERATOR

CONDITION	PROTECTIVE ACTIONS
Loss of ID Fan	All waste feeds will automatically stop, holding materials safely within contained feed systems. The burners will continue to operate unless they reach a high safety limit. The combustion air blowers will continue to operate. The baghouse will bypass. All water pumps will continue to operate to maintain system cooling. Absent potential air emissions increases, which are covered under the HWC NESHAP, no releases of hazardous waste to the environment are expected.
Total loss of PAS water supply or loss of PAS water pumps	All waste feeds will automatically stop, holding materials safely within contained feed systems. The baghouse will bypass. The kiln and afterburner burners will automatically shut down and the DHS will start the cooling cycle. The combustion air blowers and ID fan will continue to run to provide some cooling. Absent potential air emissions increases, which are covered under the HWC NESHAP, no releases of hazardous waste to the environment are expected.

TABLE 4-1 (CONTINUED)
EMERGENCY SCENARIOS FOR THE INCINERATOR

CONDITION	PROTECTIVE ACTIONS
Loss of Human Machine Interface for system controls	The operators will switch the system to manual (panel board) control, which provides an interface capability for the burners, conveyors, and the ID fan. All waste feed also automatically stops, holding materials safely within contained feed systems. The operators will then perform a manual shutdown of the system after the hazardous waste residence time expires. (The PLCs will continue to control the system within limits despite HMI operation). Absent potential air emissions increases, which are covered under the HWC NESHAP, no releases of hazardous waste to the environment are expected.
Loss of APE 1236M2 PLC	The waste feeds will automatically stop, holding materials safely within contained feed systems. The DHS will enter the cooling cycle. The operators will perform a manual, controlled shutdown of the system once the hazardous waste residence time expires. Absent potential air emissions increases, which are covered under the HWC NESHAP, no releases of hazardous waste to the environment are expected.
Loss of PAS PLC	Waste feed will automatically stop, holding materials safely within contained feed systems. The burners will automatically shut down. The DHS will enter a cooling cycle. The combustion air blowers and ID fan will continue to run. The baghouse will bypass and the emergency quench will activate. Absent potential air emissions increases, which are covered under the HWC NESHAP, the only potential release point for hazardous waste to the environment is via activation of the emergency quench. MCAAP has installed a receiving tank adjacent to the cooler to capture water discharge from the cooler and provided secondary containment to contain any water that escapes.
Loss of line power	The waste feeds will automatically stop and all equipment, such as the burners, retort, combustion and ID fans, water pumps, etc., will de-energize. The baghouse will bypass and the emergency quench will be activated. The diesel generator will start, allowing operators to clear out residual munitions and safely and securely shut down the system. Absent potential air emissions increases, which are covered under the HWC NESHAP, the only potential release point for hazardous waste to the environment is via activation of the emergency quench. MCAAP has installed a receiving tank adjacent to the cooler to capture water discharge from the cooler and provided secondary containment to contain any water that escapes.

4.2 Open Burning Unit Process Information

[§270.23(a)(1) and §264.600]

The OB unit is classified as a 40 CFR Part 264, Subpart X Miscellaneous Unit. This unit consists of two primary thermal treatment operations: burning pads and static firing pads. A general layout of the OB unit is shown in Figure 4-3.

Sections 4.2.1 and 4.2.2 provide a description of the OB unit's components. Sections 4.2.3 and 4.2.4 provide information on the operations at the OB unit. Information on the emergency equipment located within the OB unit is provided in Section 6 of this permit application.

4.2.1 Burning Pads Design

At the OB unit there are five burning pads, each containing five burning pans. The pads are leveled open areas that are cleared of vegetation to the extent necessary to minimize the spreading of fires. They measure approximately 100 to 200 feet wide by 100 to 200 feet long. Each pad is equipped with metal burn pans that are constructed in accordance with the detailed drawings and specifications as shown in Figures 4-4 and 4-5. Each pan is elevated off the ground by supports attached to the bottom of the pan. Each burn pan has a 4-inch-thick refractory lining. The primary function of the refractory is to reflect and dissipate heat generated during each burn, minimizing structural damage to the burning pans.

Precipitation covers are utilized to prevent the accumulation of precipitation in the burn pans. Each cover is equipped with handles to allow operations personnel to place the cover on the pan and remove it from the pan. Covers are tight fitting and remain on the burn pans during non-operational periods.

4.2.2 Firing Pads Design

At the OB unit approximately 300 feet from the burning pads, there are three static firing pads used for the open burning of rockets and missiles. These pads are located in a leveled open area that is cleared of all vegetation. This area measures approximately 125 feet wide by 600 feet long. Each rocket firing pad consists of a concrete slab approximately 50 feet wide by 70 feet long. A 10-foot earthen berm is constructed around each firing pad. To allow for truck and forklift access, there is 150 feet between the pad and the berm. One pad has a concrete saddle, while the other two consist of a metal saddle bolted to a concrete slab.

4.2.3 Burning and Firing Pads Operation

Wastes are received at the OB unit by flatbed truck and are logged into the daily operating record for the unit. Once in the area, the transport trucks are secured behind the entrance gate and the red warning light or flag is displayed to clearly indicate that the OB unit is "hot" – meaning there are energetic and explosive materials present. The trucks are then parked at least 150 feet from the burn pans and the wastes are unloaded with a forklift or SkyTrak and are then transported to the burn pads. Once all items have been unloaded, the trucks leave the immediate area and retreat to a safe location. Containers of explosive wastes are then opened, and the wastes are manually placed inside the burning pan or strapped to the saddle of the firing pad. Wastes loaded into the pans are spread to a depth of no more than 3 inches deep to ensure that the material burns and does not detonate. For some wastes, diesel fuel is also applied to the material to assist with proper combustion of the waste.

Ignition charges are set and all but two personnel leave the area and return to the shelter, a minimum of 300 feet from the burning site. The remaining two personnel then splice connecting firing wire to the igniter and prepare the ignition pan. The work leader assures that all personnel are in the shelter prior to ignition and that all vehicles are at least 500 feet away. The work leader also ensures that all pallets and empty containers are at a sufficient distance to prevent charring or damage during burning. Once ignited, the operators return to the shelter, where they can observe the burn.

After each burn and a minimum wait time of 30 minutes, the supervisor and one operator return to the burn site to inspect the pan or pad used in the treatment cycle. Once the area is deemed safe, remaining personnel return to the burn site. A search is made of the surrounding area for unburned ammunition or explosives. After the last burn of the day, or during inclement weather, personnel place covers over the burn pans. Any debris found is inspected for contamination. Any contaminated debris is placed in a marked container and re-treated at the OB unit. All other debris is placed in a drum for further analysis and subsequent offsite treatment.

Operations at the OB are restricted to daylight hours between one-half hour after sunrise and one-half hour before sunset. Surface average wind speed must be between 3 and 20 miles per hour, with gusts less than 30 miles per hour, and must not be from a direction that will carry emissions over any publicly accessible area within one mile of the OB unit. In addition, OB operations have restrictions based on several other meteorological factors. If any of the following are occurring or are forecasted, the burn cannot occur:

- Electrical or thunderstorms.
- Periods of precipitation or a forecasted probability of precipitation greater than 50 percent.
- Periods of reduced visibility to less than one mile.
- Overcast conditions with more than 80 percent cloud cover with a ceiling of less than 2,000 feet.
- Periods of local air quality advisories or alerts.

4.3 OPEN DETONATION UNITS

[§270.23(a)(1) and §264.600]

The OD units are classified as a 40 CFR Part 264, Subpart X Miscellaneous Units. MCAAP operates two OD units, each consisting of 26 pits connected by an access road. These units are designated as OD Area 1 and OD Area 2. A general layout of the OD units is shown in Figures 4-6 and 4-7.

Section 4.3.1 provides a description of the OD units' components. Section 4.3.2 provides information on the operations at the OD units. Information on the emergency equipment located within the OD units is provided in Section 6 of this permit application.

4.3.1 Open Detonation Units Design

Each OD area contains 26 pits, measuring approximately 15 feet wide and 30 feet long. The pits and the access roads are excavated to approximately 10 to 15 feet below grade and are constructed of naturally occurring soil materials. Each pit is not less than four feet deep and is covered with no less than two feet of earth. The boundaries of each OD unit extend to the fire break. Dry grass, leaves, and other extraneous combustible materials in sufficient quantity to aid or spread fire are removed within a 200-foot radius from the point of destruction.

4.3.2 Open Detonation Unit Operation

Wastes are received at the OD units by flatbed truck and are logged into the daily operating record for the unit. The trucks then transport the waste containers to the designated pits where treatment is to occur. Once all items have been removed, all radio transmissions are secured and the trucks leave the demolition area, retreating to a safe location. Explosive wastes are primed in the pits, which are 4 feet deep and are covered with a minimum of 2 feet of earth on top. Only approved forklifts and earth moving equipment are allowed within 50 feet of the waste to be detonated.

Electric blasting caps are used to initiate detonation. Blasting caps and firing wires are tested and installed into blasting machines. Prior to circuit wiring, all but two operating personnel leave the area and return to the shelter, a minimum of 500 feet from the pits. The remaining two personnel then place caps into the charge and return to the shelter. The demolition ground and all storage areas are secured. Once the area has been confirmed as clear, a siren is sounded to warn personnel of imminent detonation and all charges are remotely fired from the personnel shelter.

After each detonation, a search is made of the surrounding area for unexploded material. Any such materials are re-treated at the OD unit. Scrap metal and other foreign objects are removed from the area at least daily. All scrap is inspected and certified inert and free from explosives.

Operations at the OD are restricted to daylight hours between one-half hour after sunrise and one-half hour before sunset. Surface average wind speed must be between 3 and 20 miles per hour, with gusts less than 30 miles per hour, and the wind must not be from a direction that will carry emissions over any publicly accessible area within one mile of the OD site. In addition, OD operations have restrictions based on other meteorological factors. Operations may not be conducted if any of the following are occurring or are forecasted:

- Electrical or thunderstorms.
- Periods of precipitation or a forecasted probability of precipitation greater than 50 percent as predicted by the FAA flight service station at McAlester Municipal Airport.
- Periods of reduced visibility to less than one mile.
- Overcast conditions with more than 80 percent cloud cover with a ceiling of less than 2,000 feet.
- Periods of local air quality advisories or alerts.

Attachment 4-1: Process Drawings and Figures

THE CONTENTS OF THIS PAGE HAVE BEEN REDACTED TO PROTECT NATIONAL SECURITY CONCERNS.

THE INFORMATION PRESENTED ON THIS PAGE WAS SUBMITTED AS CONFIDENTIAL BUSINESS INFORMATION BECAUSE DEPARTMENT OF DEFENSE REPRESENTATIVES DETERMINED THAT THE INFORMATION PRESENTED INCLUDED MATERIAL CLASSIFIED AS "CONTROLLED UNCLASSIFIED INFORMATION" (CUI) PURSUANT TO 32 CFR PART 2002.

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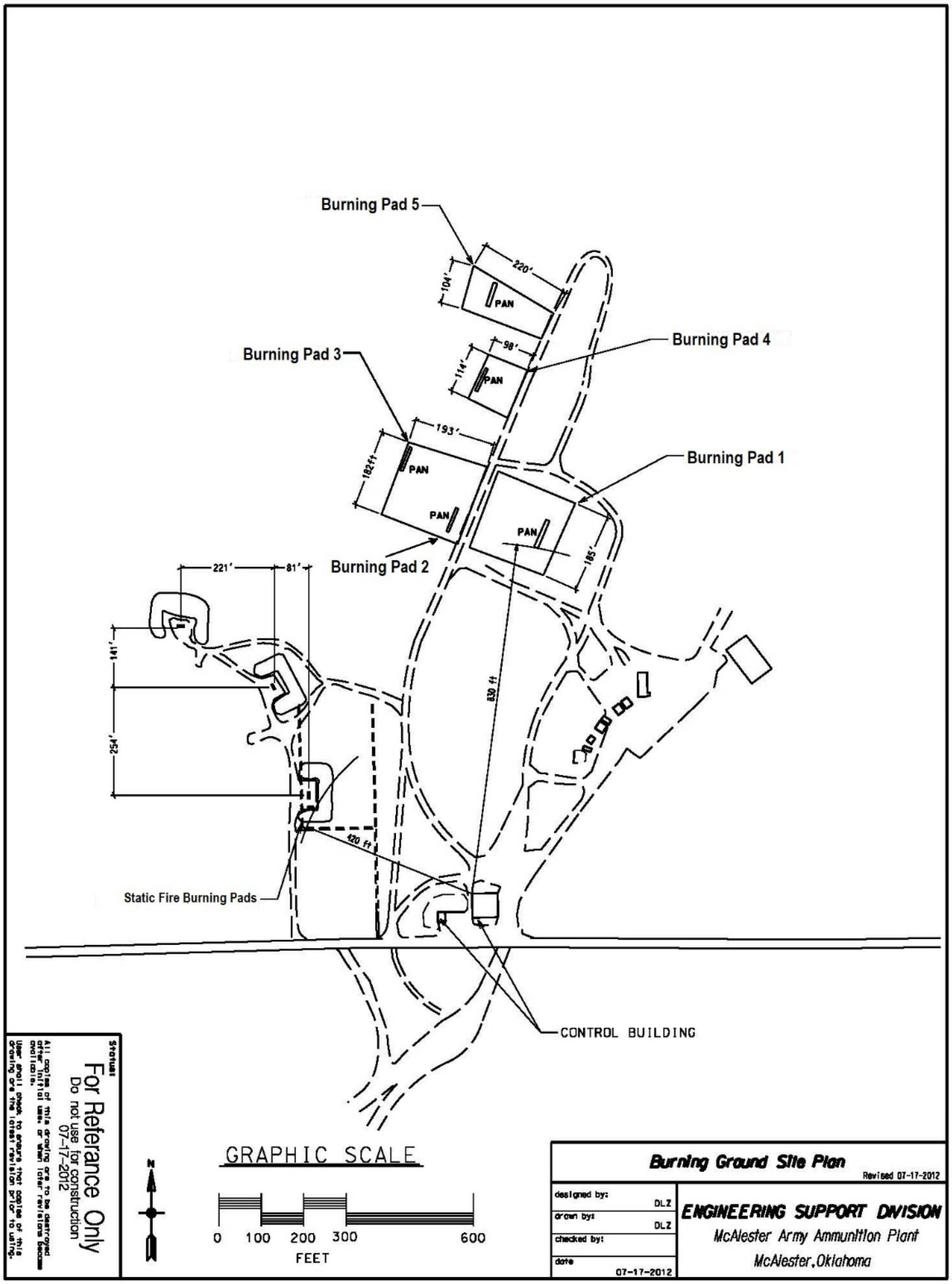
FIGURE 4-3
OB UNIT LAYOUT



THE CONTENTS OF THIS PAGE HAVE BEEN REDACTED TO PROTECT NATIONAL SECURITY CONCERNS.

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FIGURE 4-6
OD AREA 1 UNIT LAYOUT

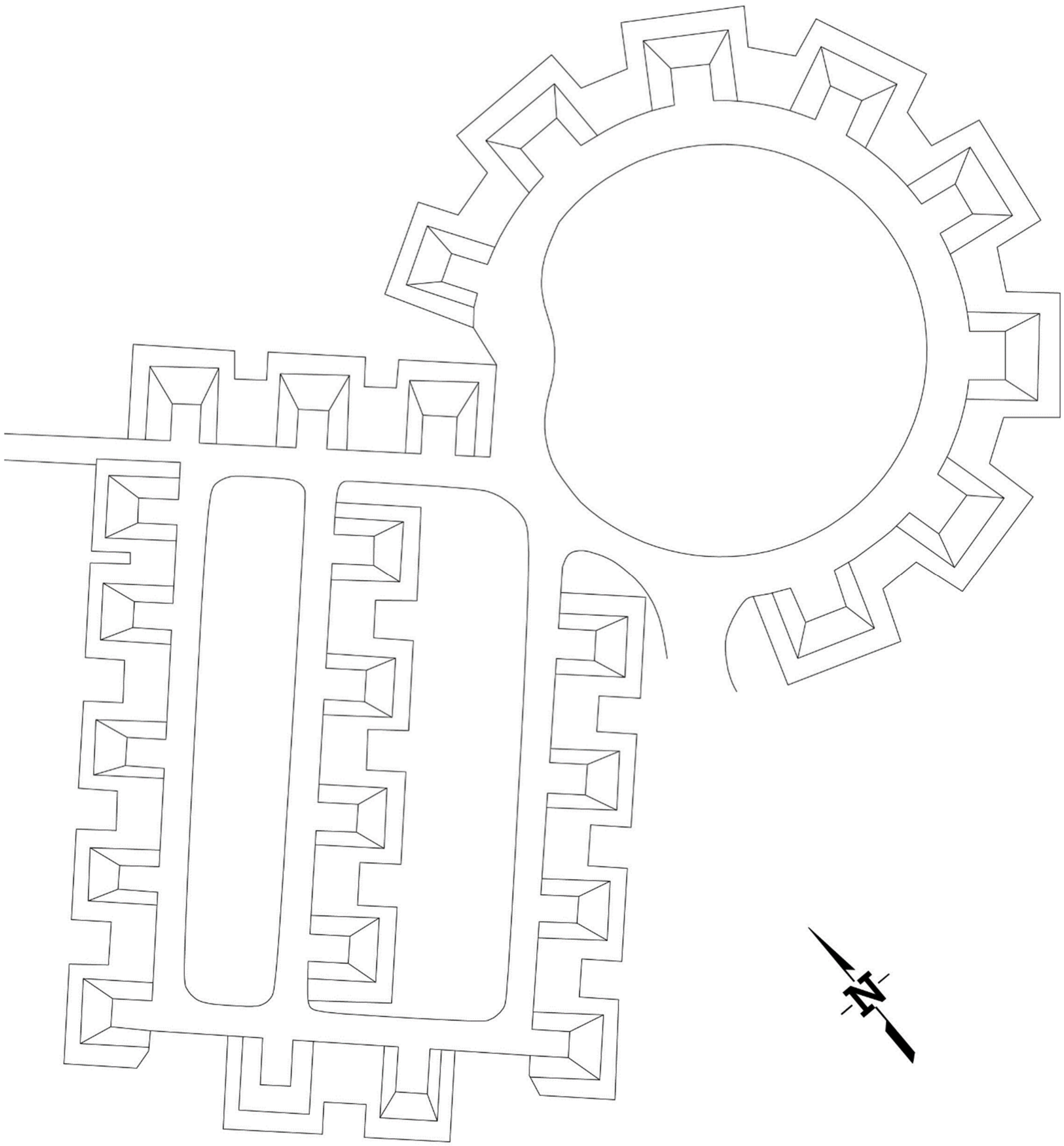
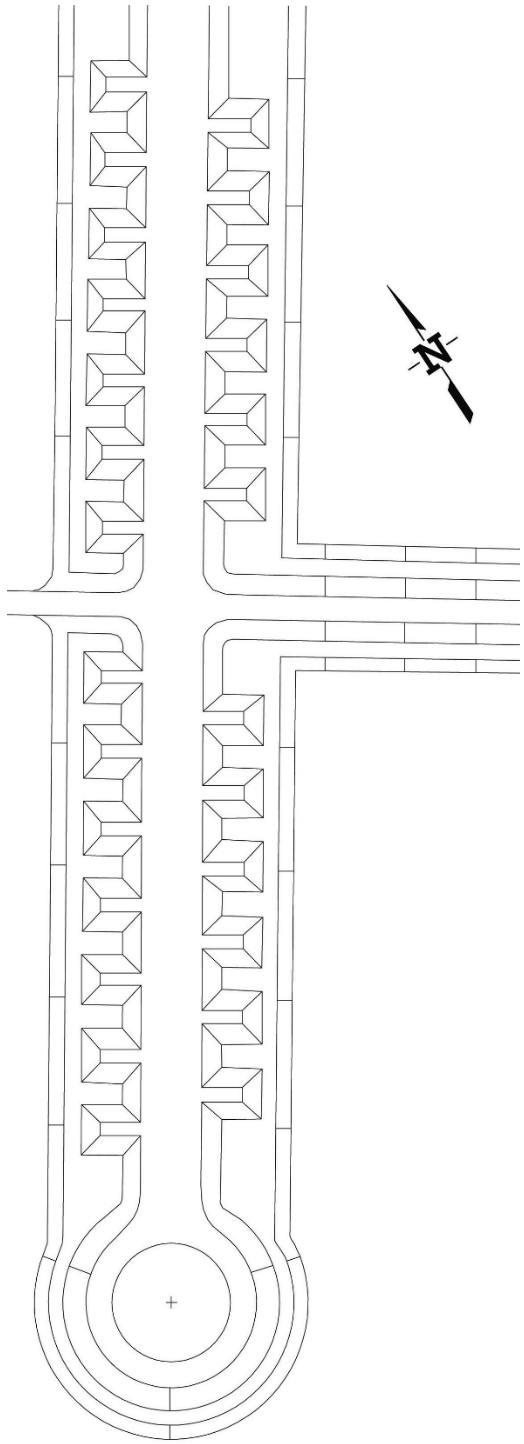


FIGURE 4-7
OD AREA 2 UNIT LAYOUT



5.0 GROUNDWATER MONITORING

[§270.14(c), §264.601(a)]

40 CFR § 270.23(b) requires that detailed hydrologic, geologic, and meteorologic assessments be provided for Subpart X regulated miscellaneous units to demonstrate compliance with each component of the environmental performance standards of 40 CFR § 264.601, which require protection of impacts to groundwater, surface water, and air. (Note that this requirement is only applicable to units regulated under 40 CFR Part 264 Subpart X that do not have specific performance criteria, such as the OB/OD units. It is not applicable to hazardous waste incinerators, including the incinerator at MCAAP, which are regulated under 40 CFR Part 264 Subpart O). For groundwater considerations, permittees must evaluate several items relative to the groundwater and hydrogeologic conditions of the area, including:

- The hydrologic and geologic characteristics of the unit and the surrounding area.
- The existing quality of ground water, including the impacts of any other sources of contamination and their cumulative impact.
- The quantity and direction of groundwater flow.

This section provides the necessary information to assist ODEQ in determination of any site-specific performance standards that are necessary to ensure protection of the groundwater per 40 CFR § 264.601(a).

5.1 HYDROGEOLOGIC CONDITIONS

[§270.14(c) and §§264.601(a) and (b)]

A detailed study of the geological and hydrological conditions at the OB/OD units was conducted by the United States Army Corps of Engineers (USACE) in 2005. The information below is extracted from that report. For further specifics or additional graphical depictions, please consult the 2005 USACE report entitled *Hydrogeologic Study and Groundwater Assessment, Solid Waste Management Units MCAAP-25 (Open Burning Grounds), MCAAP-27 (Old Demolition Area), and MCAAP-28 (New Demolition Area)*.

Three primary geological units underly the OB/OD units at MCAAP: the Lower Krebbs Group, which consists of alternating folded shale, siltstone, and sandstone, the Boggy Formation, which consists of folded shale beds, and the Thurman Sandstone. OD Area 1 lies on the Lower Krebbs Group, and OD Area 2 and the OB unit like on top of the Boggy Formation and Thurman Sandstone. The strike of all units is from northeast to southwest.

The site includes parts of six different draining systems, with the Brown Lake drainage basin located entirely within the confines of MCAAP. All surface water from the central and eastern part of the MCAAP drains to Rocket Lake, Bull Creek, and eventually to Brown Lake, which serves as a source of all water on the installation.

Groundwater in the bedrock occurs primarily in joints and fractures, although some intergranular porosity may exist in the sandstones according to USACE studies. In the unconsolidated deposits of the Gerty Sand, groundwater occurs in the intergranular spaces. The bedrock units at MCAAP have a low permeability with limited storage capacity. The shales are considered “aquitards” or confining beds, which retard the flow of groundwater, allowing only a small amount of liquid to pass and affording a degree of protection against surface contamination. The depth to ground water in the monitoring wells installed during the USACE study was generally less than 50 feet.

The general groundwater flow directions are perpendicular to elevations contours along the ridges and parallel to the streams in the valleys. However, USACE states that there is potential for groundwater flow parallel to bedrock strike or fractures or through intergranular porosity in the OB/OD areas. Figures 5-1 and 5-2 demonstrate the groundwater contour maps established by USACE in their 2005 study. For each area, USACE noted the direction of groundwater flow was as follows:

- At the OB unit, groundwater flow was localized to the northwest and north. South of that in OD Area 2 (referred to in the USACE report as the “new demolition area”), groundwater flow was localized to the northwest and east. USACE predicted discharge to Rocket Lake.
- At OD Area 1 (referred to in the USACE report as the “old demolition area”), groundwater flow was localized to the southeast and the northwest from topographically higher elevations to topographically lower elevations. Groundwater is expected to flow northerly with discharge to Brown Lake.

In their 2005 study, USACE estimated the groundwater flow rates for each area. For the OB unit and OD Area 2, USACE determined an approximate hydraulic conductivity of between 9.01×10^{-2} and 7.61×10^{-1} feet per day (fpd). For OD Area 1, USACE determined an approximate hydraulic conductivity of 3.81×10^{-2} fpd. On an annual basis, USACE estimated an average groundwater flow rate of 3.49 to 46.85 feet per year (fpy) at the OB Unit and OD Area 2 and 0.59 fpy for OD Area 1.

5.2 Groundwater Quality and Contamination

To assess the quality of the groundwater, monitor for potential contamination, and provide information on the flow of groundwater in the area, MCAAP has prepared a Sampling and Analysis Plan (SAP) and a Quality Assurance Project Plan (QAPP) for the OB and OD areas. Figures 5-3 and 5-4 in Attachment 5-1 present the locations of groundwater monitoring wells at the OB and OD units. Attachment 5-2 presents the SAP and Attachment 5-3 presents the QAPP.

Attachment 5-1: GROUNDWATER MAPS

FIGURE 5-1
GROUNDWATER FLOW AT THE OB UNIT AND OD AREA 2

Hydrogeologic Study and Ground Water Assessment No. 38-EH-0355-04
15-24 Feb 2005, 11-16 Jul 2005 and 15-17 Sep 2005

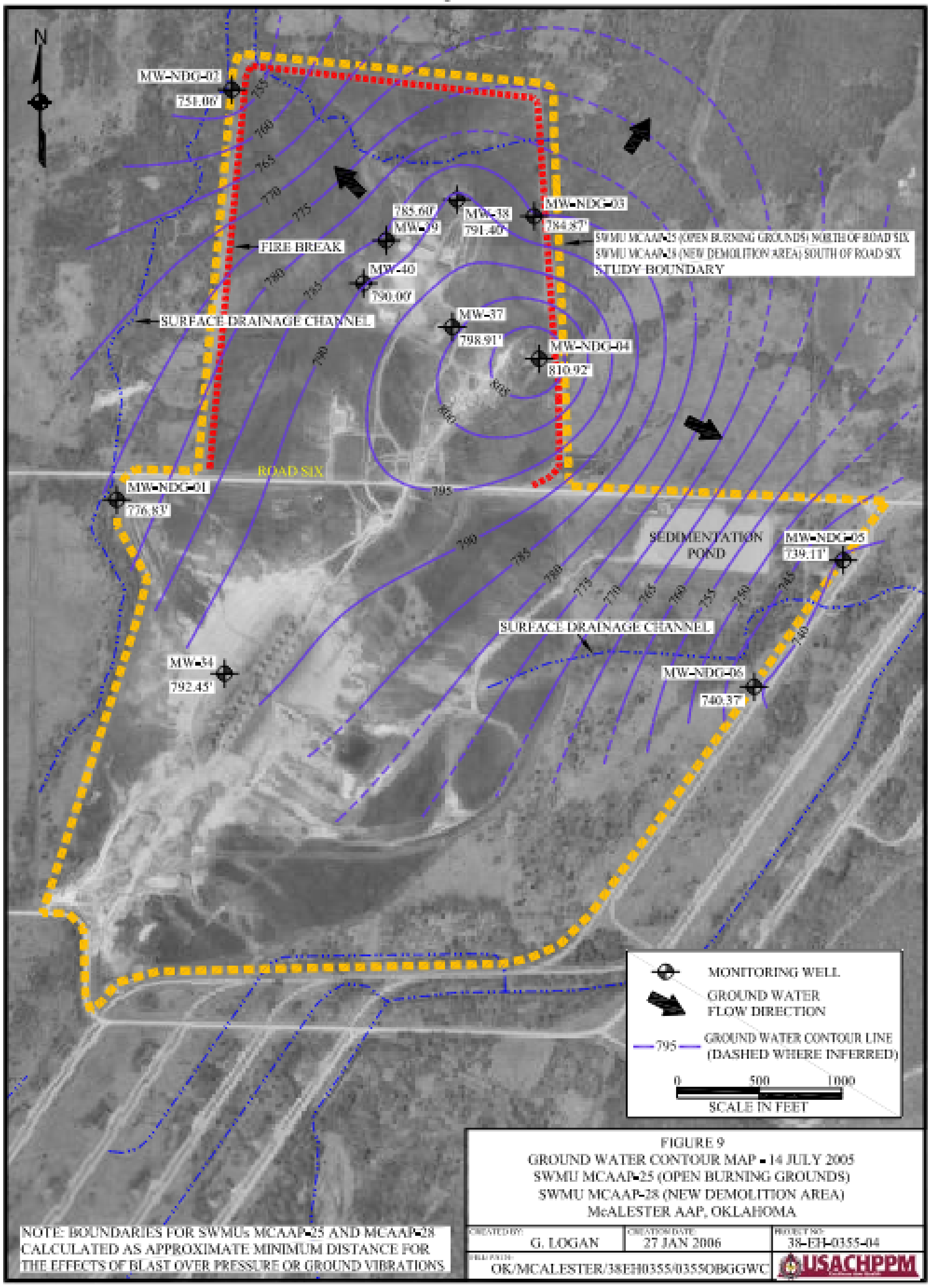


FIGURE 5-2
GROUNDWATER FLOW AT OD AREA 2

Hydrogeologic Study and Ground Water Assessment No. 38-EH-0355-04
15-24 Feb 2005, 11-16 Jul 2005 and 15-17 Sep 2005

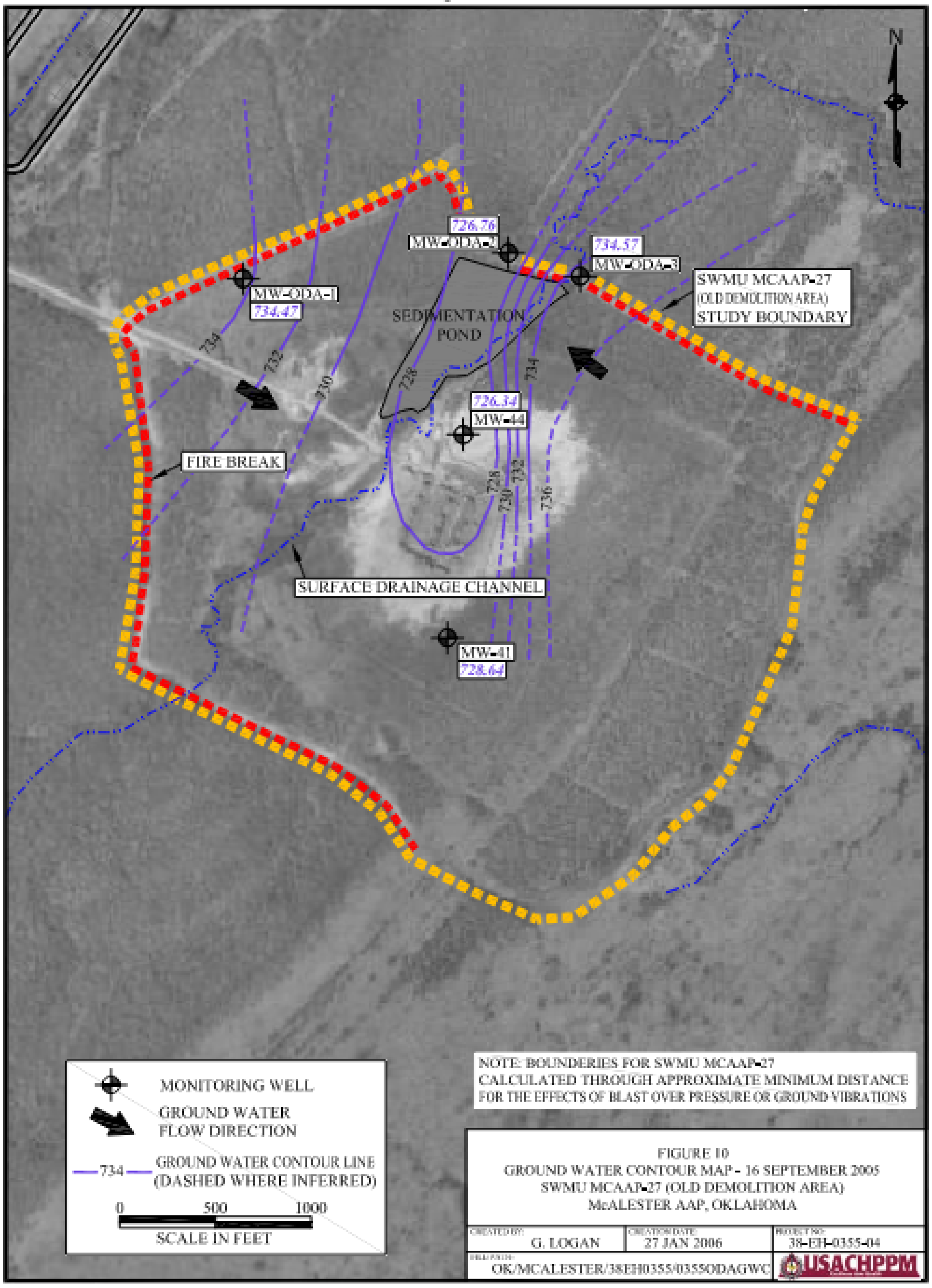


FIGURE 5-3
GROUNDWATER MONITORING WELLS AT OB UNIT AND OD AREA 2

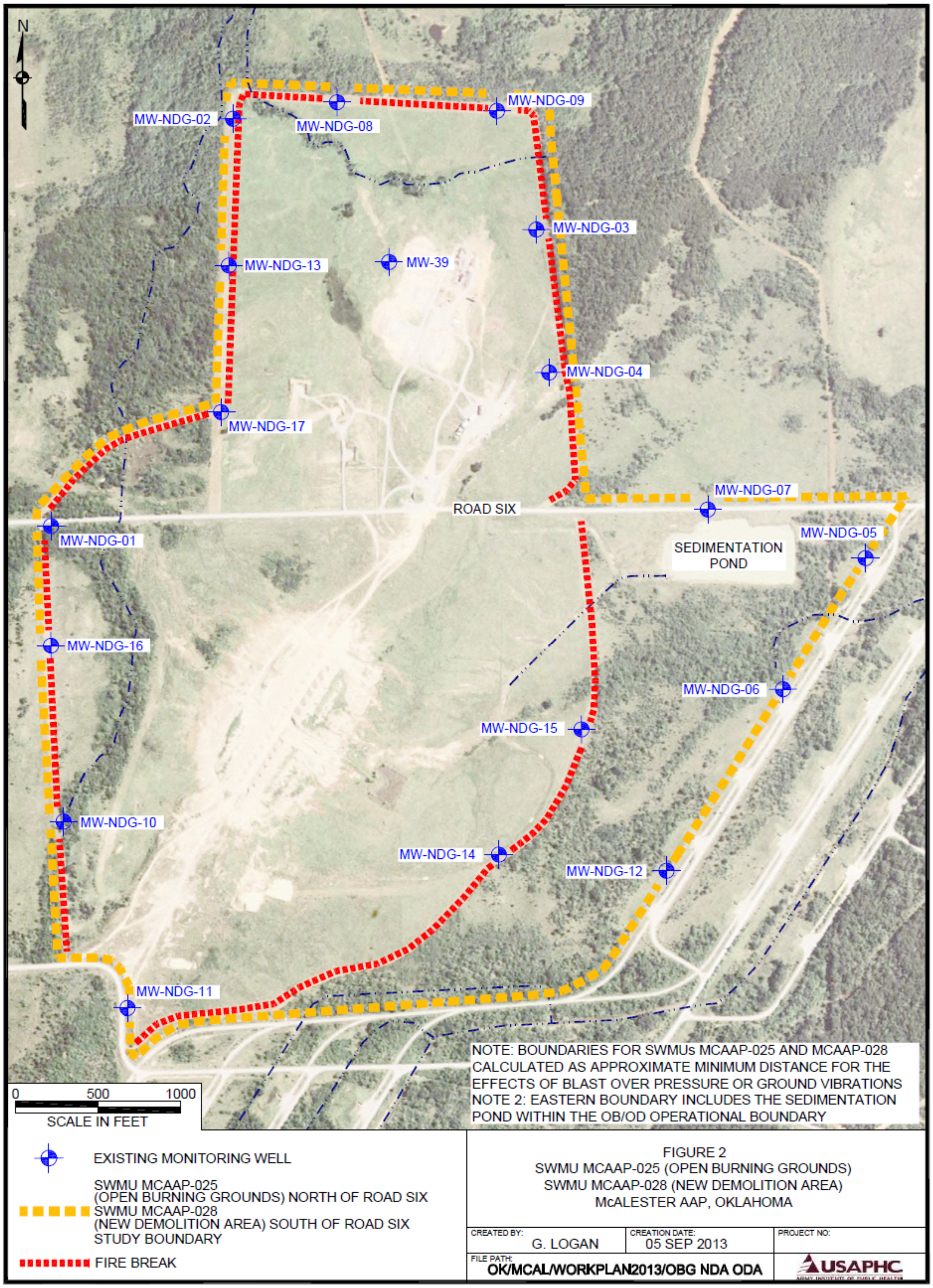
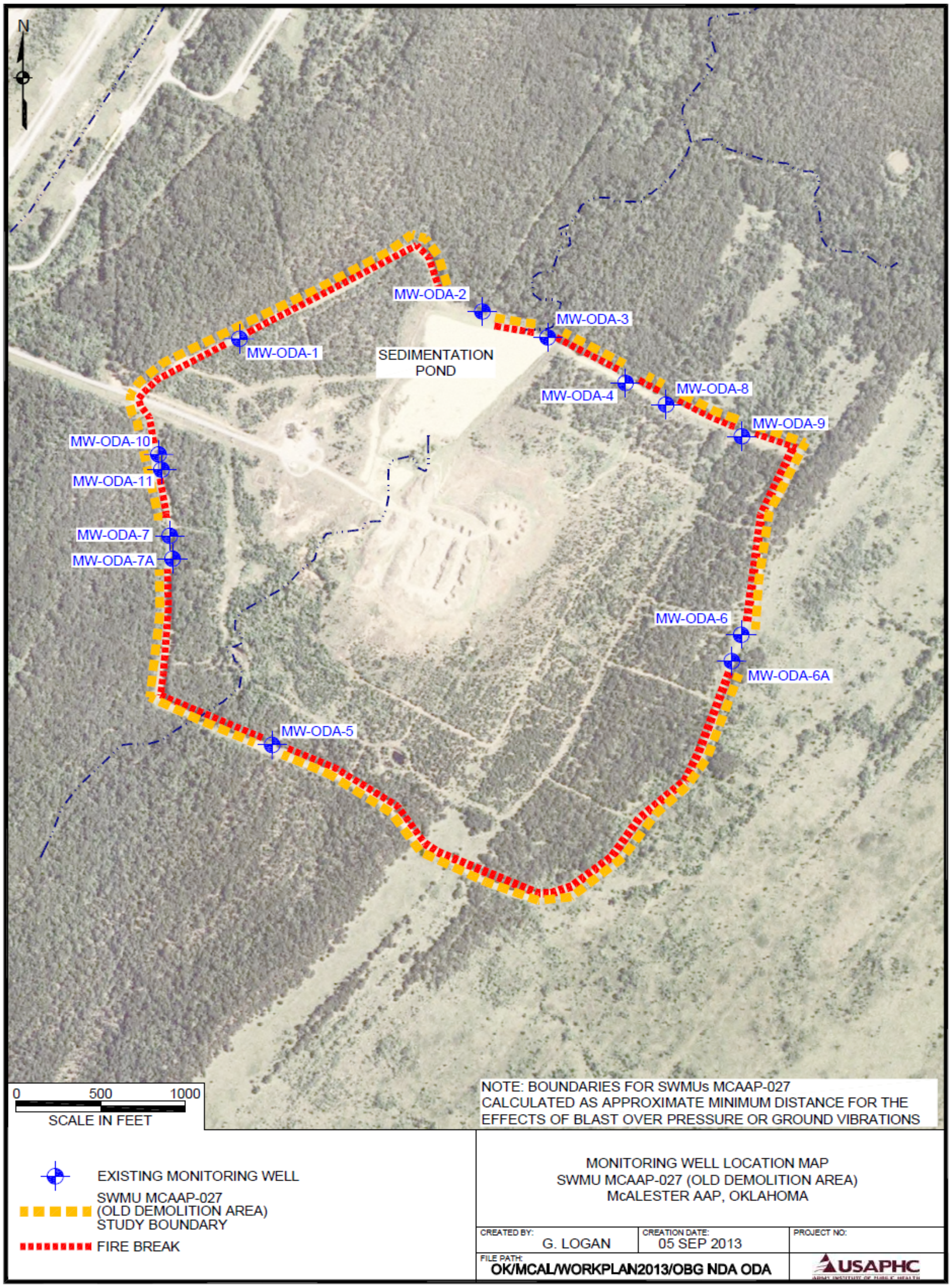


FIGURE 5-4
GROUNDWATER MONITORING WELLS AT OD AREA 1



Attachment 5-2: SAMPLING AND ANALYSIS PLAN

ARMY PUBLIC HEALTH CENTER (Provisional)

5158 Blackhawk Road, Aberdeen Proving Ground, Maryland 21010-5403

SAMPLING AND ANALYSIS PLAN
PERIODIC LONG TERM MULTI-MEDIA MONITORING
OPEN BURN AND OPEN DETONATION SITES
MCALESTER ARMY AMMUNITION PLANT
MCALESTER, OKLAHOMA
APRIL 2016

PHC FORM 433-E (MCHB-CS-IP), NOV12

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General Medical: 500A, Public Health Survey

SAMPLING AND ANALYSIS PLAN
PERIODIC LONG TERM MULTI-MEDIA MONITORING,
OPEN BURN AND OPEN DETONATION SITES,
MCALESTER ARMY AMMUNITION PLANT, OKLAHOMA

USAIPH PROJECT NO. S.0032381

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CONTENTS

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Appendices

Acronym List
APG – Aberdeen Proving Ground
BTL – background threshold levels
C – Centigrade
COPC – chemical of potential concern
DNB – dinitrobenzene
DNT – dinitrotoluene
DO – dissolved oxygen
DOD – Department of Defense
DQO – Data Quality Objectives
DUP - duplicate
EB – equipment blank
EMD – Environmental Management Division
EOD – explosive ordnance disposal
EPA – Environmental Protection Agency
F – Fahrenheit
GIS – Geographic Information System
GPS – Global Positioning System
HHMSSL – Human Health Medium Specific Screening Levels
HMX – octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HWP – Hazardous Waste Program
ID – inner diameter
IDW – investigative derived waste
ISM – Incremental Sample Methodology
IS – Incremental Sampling
ITRC - Interstate Technology Regulatory Council
LCS – laboratory control samples
LCSD – laboratory control sample duplicates
LS – Laboratory Services
MCAAP – McAlester Army Ammunition Plant
MCL – Maximum Contaminant Levels
MS – matrix spike
MSD – matrix spike duplicate
MSL – Medium Specific Screening Levels
NA – not available
NB – nitrobenzene
NG – nitroglycerin
NPDWR - National Primary Drinking Water Regulations
NT – nitrotoluene
NTU – nephelometric turbidity unit
OB/OD – Open Burn/Open Detonation
ODEQ – Oklahoma Department of Environmental Quality

ORP – oxidation reduction potential
PETN - pentaerythritol tetranitrate
PNNL – Pacific Northwest National Laboratory
PPE – Personal Protective Equipment
PRG – Preliminary Remediation Goal
QAPP – Quality Assurance Project Plan
QA/QC – Quality Assurance/Quality Control
RBC – Risk Based Concentration
RCRA – Resource Conservation and Recovery Act
RDX – cyclotrimethylenetrinitramine
RPD – relative percent difference
RSL – Regional Screening Level
SAP – Sample and Analysis Plan
SSL – Soil Screening Level
SVOC – semi-volatile organic compound
SWMU – Solid Waste Management Unit
TB – trip blank
TDS – total dissolved solids
TNB – trinitrobenzene
TSS – total suspended solids
UCL – Upper Confidence Level
ug/L – micrograms per liter
USACE – United States Army Corps of Engineers
USACHPPM – United States Army Center for Health Promotion and Preventive Medicine
USAIPH – United States Army Institute of Public Health
USAPHC – United States Army Public Health Command
UTM – Universal Transverse Mercator
UXO – unexploded ordnance
VOC – volatile organic compound
VSP – Visual Sample Plan
WRP – Water Resources Program

SAMPLING AND ANALYSIS PLAN
PERIODIC LONG TERM MULTI-MEDIA MONITORING
OPEN BURN AND OPEN DETONATION SITES
MCALESTER AAP, OKLAHOMA

1. PROJECT BACKGROUND.

1.1 Objective. The objective of the periodic long-term multi-media monitoring strategy is to generate analytical data sufficient to determine if continuing operation of the open burn / open detonation (OB/OD) sites impact the ground water, soils, surface water and/or sediments at those locations.

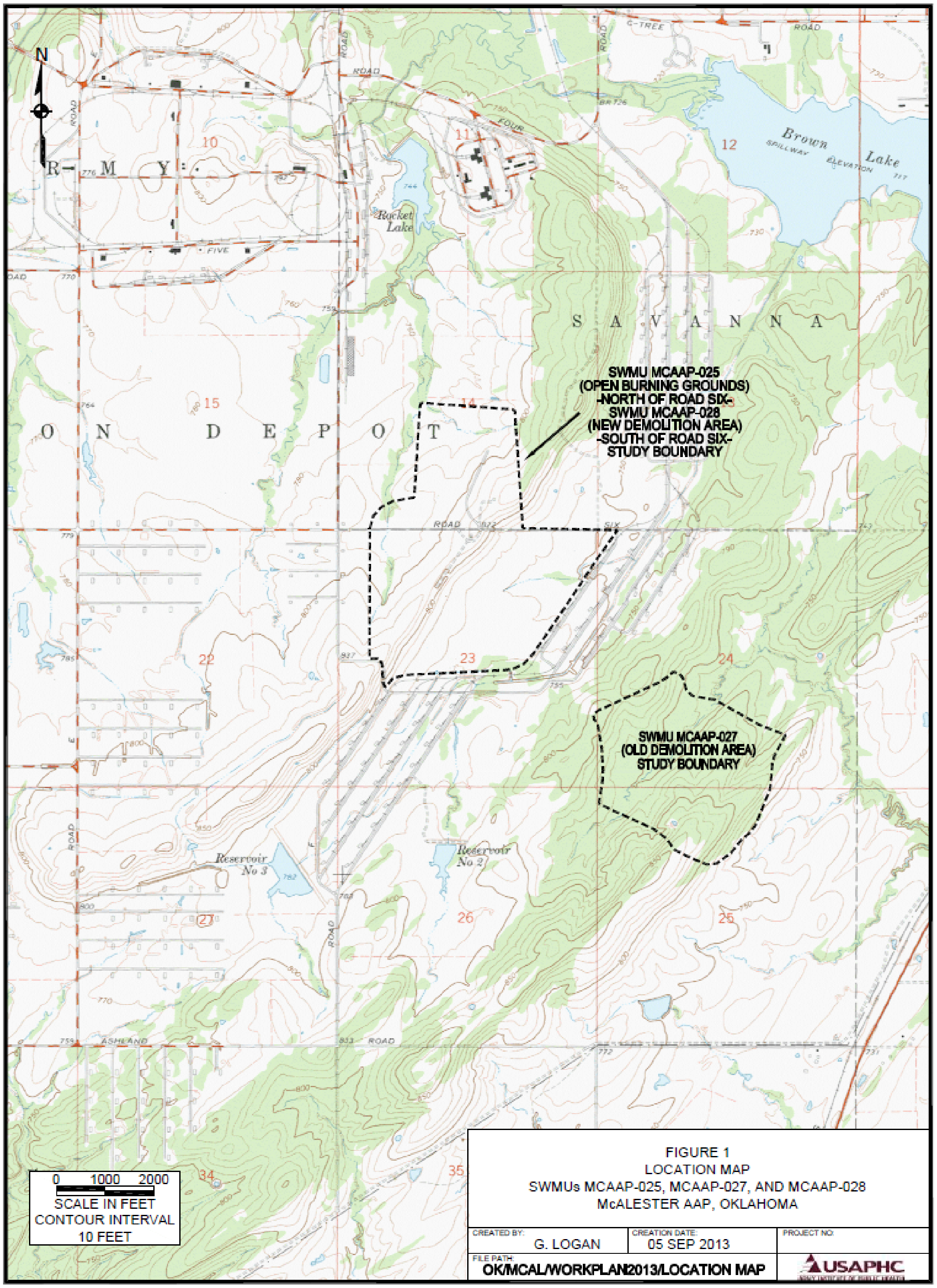
1.2 Location. The McAlester Army Ammunition Plant (MCAAP) is located in southeastern Oklahoma approximately 9 miles southwest of the city of McAlester, the county seat of Pittsburg County. The city of McAlester is located about equidistant from Oklahoma's two largest cities; Tulsa is approximately 113 miles north and Oklahoma City is approximately 120 miles northwest. It occupies approximately 44,965 acres or 70 square miles. The primary mission of MCAAP is to receive, renovate, maintain, store, and issue ammunition, energetics, and expendable ordnance items. The installation is also a production facility with load, assemble, and pack operations.

1.3 General Background, MCAAP OB/OD Sites. The three OB/OD sites consist of Solid Waste Management Units (SWMUs) MCAAP-025 (Open Burning Grounds), MCAAP-027 (Old Demolition Area) and MCAAP-028 (New Demolition Area) (Figure 1-1). The sites are used for the thermal destruction of waste military munitions which typically include cased cartridges, bulk explosives and propellants. A Part B Permit was issued in 1992 by the U.S. Environmental Protection Agency (EPA) Region VI with support of Oklahoma Department of Environmental Quality (ODEQ). A hazardous waste management operation permit was issued to MCAAP on 28 June 2013. Conditions of the permit include periodic multi-media sampling to monitor potential contaminants migrating from the sites.

1.4 Climatology. The climate is generally characterized by rapid temperature changes. The mean annual temperature is 61.7 degrees Fahrenheit. The monthly mean temperatures range from 48 degrees Fahrenheit in February and 89 degrees Fahrenheit in August, respectively. Annual rainfall is 43.92 inches. The prevailing winds are from the south and north with an annual average of 10.3 miles/hour.

Sampling and Analysis Plan, Periodic Long Term Multi-Media Monitoring, Open Burn and Open Detonation Sites, McAlester AAP, OK

Figure 1-1. Location Map, SWMUs MCAAP-025, MCAAP-027 and MCAAP-028, McAlester AAP, Oklahoma



1.5 Geology. The three primary geologic units beneath the OB/OD areas are the Lower Krebbs Group, consisting of alternating folded shale, siltstone and sandstone; the Boggy Formation, consisting of folded shale beds; and the Thurman Sandstone. The Old Demolition Area is located on the Lower Krebbs Group. The New Demolition Area and the Open Burning Grounds are located on the Boggy Formation and Thurman Sandstone. The strike of the units are northeast to southwest. Topographically, three ridges are located within the OB/OD areas and trend northeast to southwest. The Old Demolition Area is roughly contained in the valley between the central and southern ridges. The Open Burning Grounds are located on the northwest side of the northern ridge. The New Demolition Area is located along and to the southeast of the northern ridge.

1.6 Hydrogeology. Groundwater in the bedrock occurs primarily in joints and fractures, although some intergranular porosity may exist in the sandstones. The bedrock units at MCAAP have a low permeability with limited storage capacity. The shales are considered aquitards, and measured permeabilities in the Thurman Sandstone were generally low. There are no public supply wells in the area, and no supply wells at MCAAP. The depth to groundwater in monitoring wells at the installation is generally less than 50 feet.

1.7 Soils. Soils at MCAAP OB/OD fall into one of eight major subtypes: Hector Hartsells Complex, Ennis and Verdigris Soils, Enders-Hector Complex, Dennis loams, Eram clay loam, Bates-Collinsville fine sandy loam, Dennis-Dwight Complex and Talihina-Collinsville Complexs. The Hector Hartsell series is found in gently sloping areas, and is shallow and well drained. The Enders-Hector series is found in moderately sloping areas, and is deep and well drained. The Ennis and Verdigris soils are nearly level and frequently flooded soils. The Eram clay loam and Bates-Collinsville series are found in moderately deep soils on uplands and is moderately well drained. The Dennis series and Dennis-Dwight Complex is found in gently sloping uplands, and is deep and well drained. The Talihina-Collinsville series is found in moderately sloping areas, and is shallow and excessively drained.

1.8 Summary of Existing Site Data. A summary of historic media sampling is found in the U.S. Army Institute of Public Health (USAIPH) report (Reference 1) and EPA 2006 field sampling results (Reference 2). The report documents investigations conducted at the OB/OD areas from 1984 through 2013. Figures 1-2 and 1-3 illustrate general site layout and monitoring well locations. The following is a summary of the USAIPH Groundwater Consultation (Reference 1) conducted in 2013.

Figure1- 2. SWMU MCAAP-025 (Open Burning Grounds) and SWMU MCAAP-028 (New Demolition Area), McAlester AAP, Oklahoma

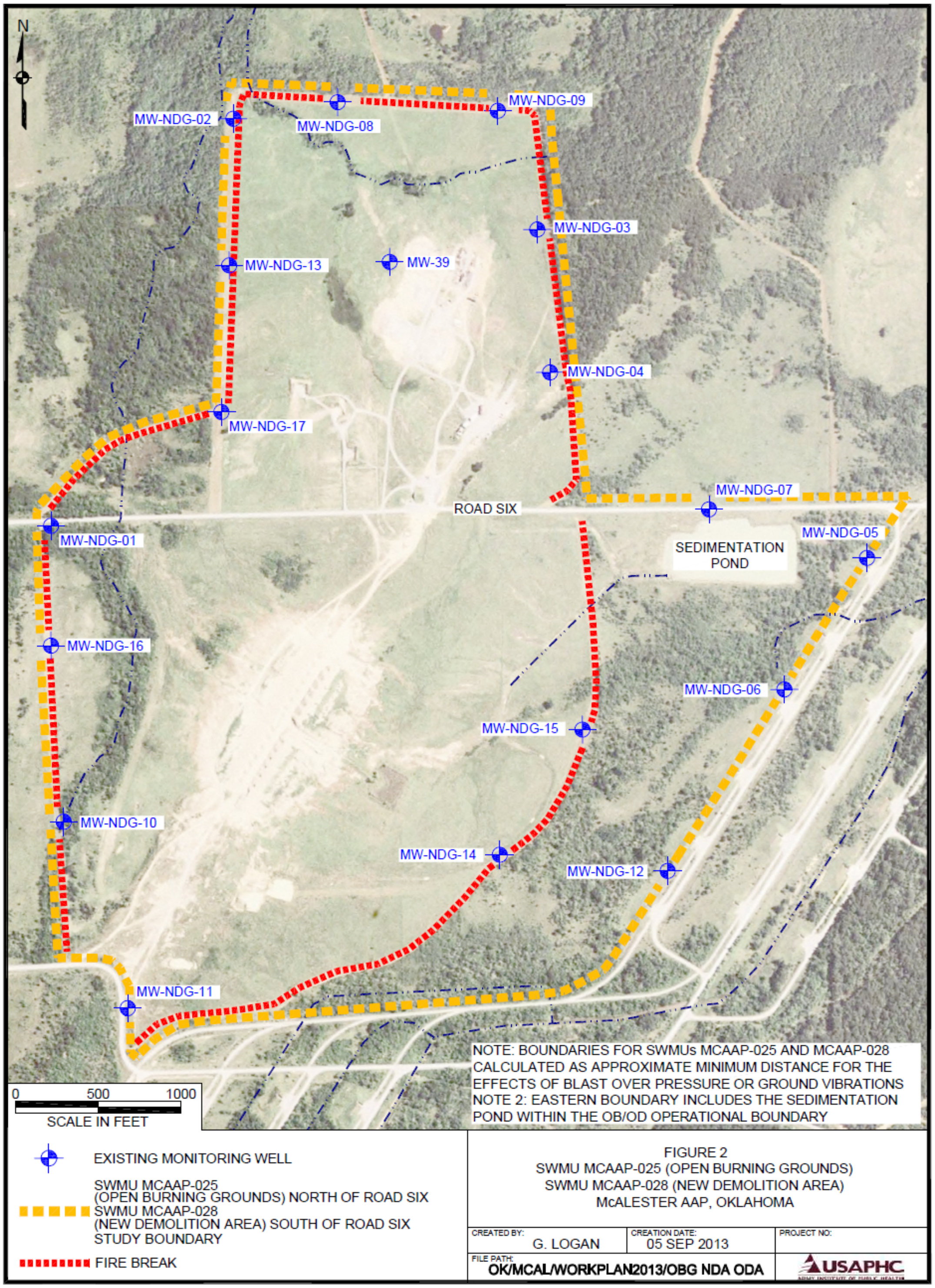
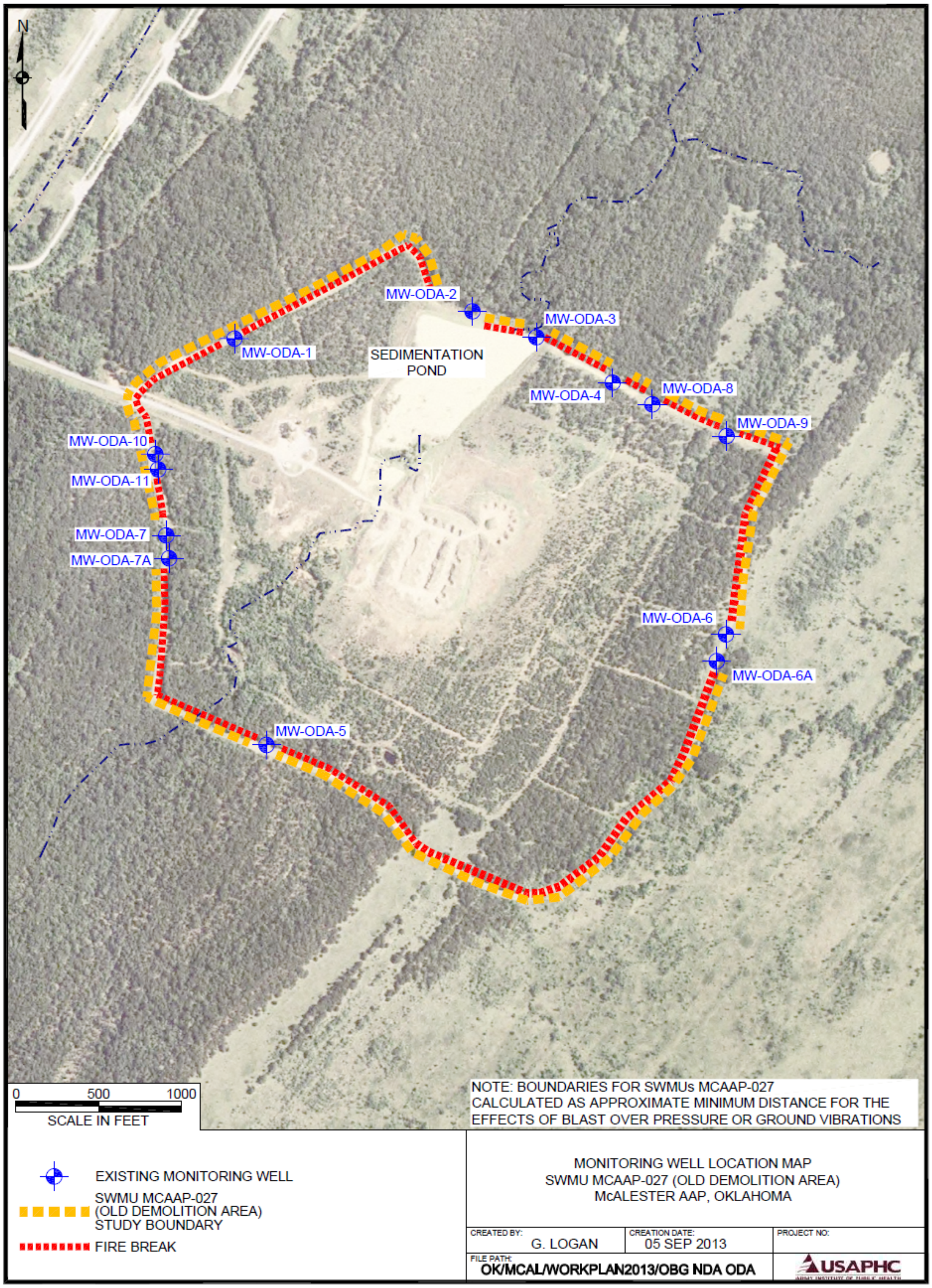


Figure 1-3. SWMU MCAAP-027 (Old Demolition Area), McAlester AAP, Oklahoma.



1.8.1 Open Burning Grounds.

SWMU MCAAP-025 (Open Burning Ground) is located along the north side of Road Six and approximately 3,000 feet east of its intersection with Road F (Figure 1-2). The unit is used to treat bulk explosives, explosive-filled munitions, explosive-contaminated materials, and off-specification items. The unit has been in operation since 1973 and occupies approximately 10 acres. The site consists of five areas designated as Pad 1, Pad 2, Pad 3, Pad 4 and Pad 5, and the flashing trenches.

The flashing trenches are located in the central portion of the Open Burning Ground. Also, a static firing pad is located in the southwest portion of the Open Burning Ground. Four monitoring wells were installed by the U.S. Army Corps of Engineers (USACE) in 1984 and sampled between 1985 and 1986. In June 1988, USACE submitted a report documenting the sampling and analysis of monitoring wells and concluded that no contamination was demonstrated at the Open Burning Grounds.

In June 2003, USACE collected groundwater samples from the four monitoring wells located in the vicinity of the unit. Concentrations of cyclotetramethylenetetranitramine (HMX) and cyclotrimethylenetrinitramine (RDX) were detected in monitoring well MW-39. Selenium was detected above the EPA Maximum Concentration of Constituents for Ground-Water Protection that is given in 40 CFR 264.94 in three of the four wells sampled. However, the elevated values of selenium were attributed to laboratory methods used for analyses. All analytical results for selenium collected during the July 2005 sampling event were below the respective standards.

In July 2005, U.S. Army Center for Health Promotion and Preventive Medicine (USACHPPM) collected groundwater samples from the four monitoring wells located in the vicinity of the unit and three monitoring wells located along the firebreaks. Groundwater sample results within the boundary of the Open Burning Grounds determined that the RDX concentration in MW-39 (7.2 µg/L) was above the EPA Health Advisory for drinking water of 2 µg/L. The concentration of RDX was below the EPA Health Advisory of 2 µg/L at the boundary of the Open Burning Ground monitoring wells MW-NDG-02 and MW-NDG-04. Metals analyses for unfiltered and filtered samples were below respective primary maximum contaminant levels (MCLs).

In August 2007, August 2008 and February 2009, USACHPPM collected groundwater samples from MW-39 and five monitoring wells located along the firebreaks. Groundwater sample results from MW-39 determined that the RDX concentrations were above the EPA Health Advisory for drinking water. In January 2009, EPA issued an Interim Health Advisory Level for perchlorate of 15 µg/L. Groundwater sample results from MW-39 determined that perchlorate concentrations were above the EPA Interim

Health Advisory. Also, during the August 2007 sampling event, low-level RDX concentrations below the EPA Health Advisory were detected in monitoring well MW-NDG-09. In addition, during the August 2008 sampling event, low-level RDX concentrations below the EPA Health Advisory were detected in monitoring well MW-NDG-13.

Between August 2009 and February 2011, U.S. Army Public Health Comand (USAPHC) [Prov] formerly USACHPPM collected groundwater samples from MW-39 and six monitoring wells located along the firebreaks. Groundwater sample results from MW-39 determined that the RDX concentrations were above the EPA Health Advisory for drinking water. Groundwater sample results from MW-39 determined that the perchlorate concentrations were above the EPA Interim Health Advisory Level. Also, during the February 2010, August 2010 and February 2011 sampling events, low-level RDX concentration below the EPA Health Advisory were detected in monitoring well MW-NDG-03.

In July 2011, February 2012 and July 2012, USAIPH collected groundwater samples from MW-39 and seven monitoring wells located along the firebreaks. Groundwater sample results from MW-39 determined that the RDX concentrations were above the EPA Health Advisory for drinking water. Also, groundwater sample results from MW-39 determined that the perchlorate concentrations were above the EPA Interim Health Advisory Level. In July 2013, the ODEQ issued a Final Hazardous Waste Management Operations Permit for the Deactivation Furnace and OB/OD.

1.8.2 Old Demolition Area.

SWMU MCAAP-027 (Old Demolition Area) is located near the southeast corner of the installation, approximately 2 miles south of Brown Lake (Figure 1-1). The unit is used to thermally treat heavier projectiles with steel plate casings of ¼ inch or greater. The unit has been in operation since 1943 and occupies approximately 40 acres. The site consists of 26 pits connected by an access road. Each pit is about 15 feet by 30 feet and surrounded by a horseshoe-shaped berm approximately 15 feet high. Also, a sedimentation retention basin which is approximately 1,100 feet by 400 feet is located along the north-central portion of the area. Prior to detonation, a maximum of 500 pounds net explosive weight is covered by approximately 6 to 9 cubic yards of soil.

Four monitoring wells were installed by USACE in 1984 and sampled between 1984 and 1985. In June 1988, USACE submitted a report documenting the sampling and analysis of monitoring wells and concluded that no contamination was demonstrated at the Old Demolition Area. In June 2003, USACE collected groundwater samples from two monitoring wells located in the vicinity of the unit. The other two monitoring wells (MW-42 and MW-43) were reportedly damaged by site activities and could not be sampled. Analyses of water from monitoring wells MW-41 and MW-44 demonstrated elevated concentrations of selenium above the EPA Maximum Concentration of Constituents for Ground-Water Protection. However, the elevated values of selenium were reportedly attributed to laboratory methods used for analyses. All analytical results for selenium collected during the September 2005 sampling event were below the respective standards. The analyses from monitoring well MW-41 also demonstrated concentrations of lead above the EPA Maximum Concentration of Constituents for Ground-Water Protection.

In September 2005, USACHPPM collected groundwater samples from the two monitoring wells located in the vicinity of the unit and three monitoring wells located along the firebreaks. Groundwater sample results within the boundary of the Old Demolition Area determined that the RDX concentration in MW-44 (4.3 µg/L) was above the EPA Health Advisory for drinking water of 2 µg/L. The concentration of RDX was below the EPA Health Advisory of 2 µg/L at the boundary of the Old Demolition Area monitoring well MW-ODA-3.

In August 2007, August 2008 and February 2009, USACHPPM collected groundwater samples from monitoring wells located along the firebreaks. Generally, groundwater sample results did not detect energetics compounds or perchlorates at the monitoring wells. However, during the August 2008 sampling event, the concentration of RDX was detected below the EPA Health Advisory at monitoring wells MW-ODA-2 and MW-ODA-4. Arsenic concentrations in monitoring well MW-ODA-3 were above the National Primary Drinking Water Regulations (NPDWR) MCL of 10 µg/L in both total and dissolved samples.

Between August 2009 and February 2011, USAPHC (Prov) collected groundwater samples from the six monitoring wells located along the firebreaks. Generally, groundwater sample results did not detect perchlorates or energetics at the monitoring wells. However, during the February 2010 and August 2010 sampling events, very low concentrations of RDX were detected in monitoring well MW-ODA-6A. Arsenic concentrations in monitoring well MW-ODA-3 were above the NPDWR MCL in total and dissolved samples.

In July 2011, February 2012 and July 2012, USAIPH collected groundwater samples from the nine monitoring wells located along the firebreaks. Generally, groundwater sample results did not detect perchlorates or energetics at the monitoring wells. However, during the July 2011 sampling event, low-level RDX concentration below the EPA Health Advisory was detected in monitoring well MW-ODA-3. Arsenic concentrations in monitoring well MW-ODA-3 were above the NPDWR MCL in total and dissolved samples.

1.8.3 New Demolition Area.

SWMU MCAAP-028 (New Demolition Area) is located along the south side of Road 6, approximately 2,000 feet east of the Road F intersection (Figure 1-1). The New Demolition Area is used to thermally treat lighter projectiles with steel plate casings of ¼ inch or less. The unit has been in operation since 1984 and occupies approximately 5 acres. The site consists of 26 pits arranged in two facing rows with an access road between them. Each pit is about 15 feet by 30 feet and surrounded by a horseshoe shaped berm approximately 15 feet high. Prior to detonation, maximum ordnance of 500 pounds net explosive weight is covered by approximately 6 to 9 cubic yards of soil. Also, a Sedimentation Retention Basin (SWMU MCAAP-029) is used to capture runoff from the New Demolition Area. The basin is an unlined earthen lagoon which is 150 feet by 200 feet and is connected to the New Demolition Area by a ditch. Four monitoring wells and three piezometers were installed by USACE in 1984 and sampled in 1985 and 1989. In June 1988, USACE submitted a report documenting the sampling and analysis of monitoring wells and concluded that no contamination was demonstrated at the New Demolition Area. In 1990, USACE submitted a second Ground-Water Assessment Report, which only addressed the New Demolition Area. The report concluded that there was no evidence of contamination and recommended that sampling and testing be continued on a semiannual basis.

In June 2003, USACE collected groundwater samples from four monitoring wells located in the vicinity of the unit. Analyses of water from the four monitoring wells demonstrated elevated concentrations of selenium above the EPA Maximum Concentration of Constituents for Ground-Water Protection in monitoring wells MW-33, MW-35, and MW-36. However, the elevated values of selenium were reportedly attributed to laboratory methods used for analyses.

In July 2005, USACHPPM collected groundwater samples from the one monitoring well located in the vicinity of the unit and three monitoring wells located along the unit boundary. Groundwater sample results did not detect energetics compounds at the monitoring wells. Metals analyses for unfiltered and filtered samples were below respective primary MCLs.

In August 2007, August 2008 and February 2009, USACHPPM collected groundwater samples from five monitoring wells (August 2007) or ten monitoring wells (August 2008 and February 2009) located either along the unit boundaries or within the boundary of the unit. During the August 2007 and February 2009 sampling events, groundwater sample results did not detect energetics compounds or perchlorates at the monitoring wells. However, during the August 2008 sampling event, concentrations of RDX were below the EPA Health Advisory at monitoring wells MW-NDG-14 and MW-NDG-15 located within the boundary of the New Demolition Area. Also, during the August 2008 and February 2009 sampling events, selenium concentrations at the New Demolition Area MW-NDG-07 and MW-NDG-15 were above the NPDWR MCL of 50 ug/L in total and/or dissolved samples.

Between August 2009 and February 2011, USAPHC (Prov) collected groundwater samples from eight monitoring wells located along the unit boundary and two monitoring wells within the boundary of the unit. Groundwater sample results did not detect energetics or perchlorates at the monitoring wells. Also, selenium concentrations at the New Demolition Area MW-NDG-07 and MW-NDG-15 were above the NPDWR MCL of 50 ug/L in total and/or dissolved samples.

In July 2011, February 2012 and July 2012, USAIPH collected groundwater samples from eight monitoring wells located along the unit boundary and two monitoring wells within the boundary of the unit. Groundwater sample results did not detect energetics or perchlorates at the monitoring wells. Selenium concentrations at the New Demolition Area MW-NDG-07 and MW-NDG-15 were above the NPDWR MCL of 50 ug/L in total and dissolved samples.

1.9 Site-Specific Definition of Problems.

The most significant practical constraint on the data collection process is the potential presence of Unexploded Ordnance (UXO). UXO may be present in and around some sampling locations. Prior to sample collection, visual and magnetometer sweeps of the area will be made by qualified Explosive Ordnance Disposal (EOD) personnel. No samples will be collected until the location has been cleared of UXO for sampling. Personnel safety will be a primary concern for all sampling. A Site Safety and Health Plan will be reviewed and signed by field personnel prior to field activities. The project manager and/or media task manager will provide personnel with an up-to-date site sketch that shows emergency routes to the respective hospital. Also, prior to field activities, briefings will be given to field personnel by MCAAP personnel. Another practical constraint is the limited access to the OB/OD areas. Samples can only be taken when the ranges are not operational. This limits the number of sampling days and may reduce the possibility of sampling during ideal weather conditions. All sampling activities will be coordinated with MCAAP range scheduling personnel.

The permit requires sampling primarily during the months of February and August. Every effort will be made to adhere to the sampling plan, but significant variations may be necessary to compensate for the field conditions that exist at sampling time. All samples will be packaged in ice and shipped to the USAIPH Lab at Aberdeen Proving Ground (APG) for analysis and will have a 30 business day turnaround time.

2. PROJECT SCOPE.

2.1 Task Descriptions. The following tasks for periodic long term multi-media monitoring and reporting required for MCAAPs Resource Conservation and Recovery Act (RCRA) permitted OB/OD sites include:

- Task 1. Inspect condition of all monitoring wells. If necessary, repair protective bollards and/or well finish. If monitoring wells are damaged beyond repair, replacement monitoring wells will be installed in close proximity to the original monitoring well. Proper well/excavation/decommission permitting will be required at each location. The permits will be obtained from respective installation and/or county/state agencies.

- Task 2. Measure water levels and collect groundwater samples at monitoring wells located at OB/OD operations at the Open Burning Grounds, New Demolition Area and Old Demolition Area. Groundwater samples will be collected using low-flow technology.

- Task 3. Collect soil samples. Collect soil samples that are representative of explosive and metal constituents resulting from the treatment of munitions within select areas of the OB/OD. Soil samples collected from soil in the immediate area of OB/OD treatment units will be used to assess site worker human health risk from dermal exposure to COPC resulting from treatment activities. Additionally, soil samples collected along the firebreak will be used to assess the transport and migration of COPC.

- Task 4 Collect surface water and sediment samples at sedimentation ponds, drainage ditch and reference location.

- Task 5. Analyze groundwater, soils, for semi-volatile organic compounds (SVOCs), metals to include aluminum, antimony, arsenic, barium, cadmium, copper, chromium, lead, mercury, selenium and silver (total and dissolved), explosives, perchlorates and nitrates/nitrites. Field measurements will include temperature, pH, dissolved oxygen, turbidity, oxidation reduction potential (ORP) and conductivity. Analyze surface water for trace metals to include aluminum, antimony, arsenic, barium, cadmium, copper, chromium, lead, mercury, selenium and silver (dissolved), explosives, perchlorates and nitrates/nitrites. Field measurements will include temperature, pH, dissolved oxygen, turbidity, and conductivity. Analyze sediment for metals to include aluminum, antimony, arsenic, barium, cadmium, copper, chromium, lead, mercury, selenium and silver (total), explosives, and total organic carbon.

- Task 6. Data validation/verification will be conducted on laboratory analytical results.

- Task 7. Historic groundwater, soils, surface water and sediment sampling data will be acquired and utilized during statistical evaluation.

- Task 8. Report the results to ODEQ in accordance with the requirements of the permit.

2.2 Applicable Regulations/Standards.

The periodic long term multi-media monitoring program will comply with all applicable regulations and standards, including installation, Department of Defense (DOD), EPA, ODEQ and Occupational Safety and Health Administration. Data identified as acceptable during the validation process will be compared to previous data collected during MCAAP's OB/OD Groundwater Consultations and the following regulatory criteria:

- EPA Drinking Water Standards and Health Advisories
- EPA Region 6 Human Health Medium-Specific Screening Levels (MSL)
- EPA Guidance for Developing Ecological Soil Screening Levels
- EPA Regional Screening Level Table, Tap Water Criteria, Surface Water Criteria, and Sediment Screening Levels.

Tables 2-1 through 2-5 outline analytical parameters and applicable standards for groundwater, surface water and sediments. Section 3.4.1.2 details analytical parameters and applicable MSLs.

Table 2-1. Chemicals of Potential Concern in Groundwater and Federal Groundwater Quality Standards (Explosives and Perchlorates)

PARAMETER	Federal MCL (ug/L)[1]	USEPA Health Advisory (ug/L)	EPA RSL (ug/L)
Perchlorates	15.0	NA	11
EXPLOSIVES AND DEGRADATES			
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	NA	400.0	780
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	NA	2.0	0.61
2,4,6-Trinitrotoluene (2,4,6-TNT)	NA	2.0	2.2
1,3,5-Trinitrobenzene (1,3,5-TNB)	NA	NA	460
1,3-Dinitrobenzene (1,3-DNB)	NA	1.0	1.5
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	NA	NA	31
Nitrobenzene (NB)	NA	NA	0.12
2-Amino-4,6-dinitrotoluene (2A-4,6-DNT)	NA	5.0	30
4-Amino-2,6-dinitrotoluene (4A-2,6-DNT)	NA	5.0	30
2,6-Dinitrotoluene (2,6-DNT)	NA	5.0	0.042
2,4-Dinitrotoluene (2,4-DNT)	NA	5.0	0.2
2-Nitrotoluene (2-NT)	NA	NA	1.3
3-Nitrotoluene (3-NT)	NA	NA	0.27
4-Nitrotoluene (4-NT)	NA	NA	3.7
Nitroglycerin (NG)	NA	NA	1.5
PETN	NA	NA	16

NA – Not Available
Federal MCL – Federal Drinking Water Maximum Concentration Level
[1] – Perchlorate concentration of 15 ug/L reported as the interim health advisory level
USEPA – United States Environmental Protection Agency
EPA RSL – EPA Regional Screening Level Table, Tap Water Criteria
ug/L – micrograms per liter

Table 2-2. Chemicals of Potential Concern in Groundwater and Federal Groundwater Quality Standards (Metals and Nitrate/Nitrite)

PARAMETER	Federal MCL (ug/L)	USEPA Health Advisory (ug/L)	EPA RSL (ug/L)
Aluminum[1]	50	NA	16000
Antimony	6	6	6
Arsenic	10	2	0.045
Barium	2000	NA	2900
Cadmium	5	5	6.9
Chromium	100	NA	NA
Copper[1]	1300	NA	620
Lead[2]	15	NA	NA
Mercury	2	2	0.63
Selenium	50	50	78
Silver[1]	100	100	71
Nitrate/Nitrite	10	NA	NA

NA – Not Available
Federal MCL – Federal Drinking Water Maximum Concentration Level
USEPA – United States Environmental Protection Agency
EPA RSL – EPA Regional Screening Level Table, Tap Water Criteria
ug/L – micrograms per liter
1 – Aluminum, Copper and Silver MCLs are Secondary Drinking Water Regulations
2 – Lead MCL applies to tap source

Table 2-3. Chemicals of Potential Concern in Groundwater and Federal Groundwater Quality Standards (SVOCs)

PARAMETER	Federal MCL (ug/L)	USEPA Health Advisory (ug/L)	EPA RSL (ug/L)
N-nitrosodimethylamine	NA	NA	0.00042
Bis(2-chloroethyl)ether	NA	NA	0.012
Phenol	NA	2000	4500
2-chlorophenol	NA	40	71
1,3-dichlorobenzene	NA	600	NA
1,4-dichlorobenzene	75	75	0.42
1,2-dichlorobenzene	600	600	280
Benzyl alcohol	NA	NA	1500
Bis(2-chloroisopropyl)ether	NA	300	NA
2-methylphenol	NA	NA	NA
Hexachloroethane	NA	1	0.79
N-nitroso-di-n-propylamine	NA	NA	0.0093
4-methylphenol	NA	NA	NA
Nitrobenzene	NA	NA	0.12
Isophorone	NA	100	67
2,4-dimethylphenol	NA	NA	270
Bis(2-chloroethoxy)methane	NA	NA	46
2,4-dichlorophenol	NA	20	35
1,2,4-trichlorobenzene	70	70	0.99
Naphthalene	NA	100	0.14
4-chloroaniline	NA	NA	0.32
Hexachlorobutadiene	NA	1	0.26
4-chloro-3-methylphenol	NA	NA	NA
2-methylnaphthalene	NA	NA	NA
Hexachlorocyclopentadiene	50	NA	22
2,4,6-trichlorophenol	NA	300	3.5
2,4,5-trichlorophenol	NA	NA	890
2-chloronaphthalene	NA	NA	550
2-nitroaniline	NA	NA	150
Acenaphthylene	NA	NA	400
Dimethylphthalate	NA	2	NA
2,6-dinitrotoluene	NA	5	0.042
Acenaphthene	NA	NA	400
3-nitroaniline	NA	NA	NA
2,4-dinitrophenol	NA	NA	30
Dibenzofuran	NA	NA	5.8
2,4-dinitrotoluene	NA	5	0.2
4-nitrophenol	NA	60	NA
Fluorene	NA	NA	220
4-chlorophenyl-phenylether	NA	NA	NA
Diethylphthalate	6	NA	11000
4-nitroaniline	NA	NA	3.3
4,6-dinitro-2-methylphenol	NA	NA	NA

Table 2-3. Chemicals of Potential Concern in Groundwater and Federal Groundwater Quality Standards (SVOCs) (continued)

PARAMETER	Federal MCL (ug/L)	USEPA Health Advisory (ug/L)	EPA RSL (ug/L)
n-nitrosodiphenylamine	NA	NA	10
4-bromophenyl-phenylether	NA	NA	NA
Hexachlorobenzene	1	2	0.042
Pentachlorophenol	1	30	0.035
Phenanthrene	NA	NA	NA
Anthracene	NA	NA	1300
Di-n-butylphthalate	NA	NA	670
Fluoranthene	NA	NA	630
Pyrene	NA	NA	87
Butylbenzylphthalate	NA	NA	14
Benzo(a)anthracene	NA	NA	0.029
Chrysene	NA	NA	2.9
Bis2-ethylhexyl)phthalate	NA	NA	4.8
Di-n-octylphthalate	NA	NA	160
Benzo(b)fluorantheene	NA	NA	0.029
Benzo(k)fluoranthene	NA	NA	0.29
Benzo(a)pyrene	0.2	0.5	0.0029
Indeno(1,2,3-cd)pyrene	NA	NA	0.029
Dibenz(a,h)anthracene	NA	NA	0.0029
Benzo(g,h,i)perylene	NA	NA	NA

NA – Not Available
Federal MCL – Federal Drinking Water Maximum Concentration Level
USEPA – United States Environmental Protection Agency
EPA RSL – EPA Regional Screening Level Table, Tap Water Criteria
ug/L – micrograms per liter

Table 2-4 Surface Water Analytical Methods, Reporting Limits, and Screening Levels.

Analyte	Laboratory Analysis Method	Reporting Limit (µg/L)*	Screening Levels (µg/L)	
			Potable	Fresh
Explosives-Related Compounds				
HMX	EPA 8095 modified	3	780[a]	150
RDX	EPA 8095 modified	0.1	0.61[a]	190
2,4,6-TNT	EPA 8095 modified	0.03	2.23[a]	90
1,3,5-TNB	EPA 8095 modified	0.03	460[a]	10
1,3-DNB	EPA 8095 modified	0.09	1.5[a]	20
Tetryl	EPA 8095 modified	0.5	31[a]	NA
NB	EPA 8095 modified	0.03	0.12[a]	270
2A-4,6-DNT	EPA 8095 modified	0.1	30[a]	20
4A-2,6-DNT	EPA 8095 modified	0.1	30[a]	NA
2,6-DNT	EPA 8095 modified	0.01	0.042[a]	42
2,4-DNT	EPA 8095 modified	0.02	0.20[a]	44
2-NT	EPA 8095 modified	0.09	0.27[a]	NA
3-NT	EPA 8095 modified	0.09	1.3[a]	750
4-NT	EPA 8095 modified	3.95	3.7[a]	1900
NG	EPA 8095 modified	0.09	1.5[a]	138
Munitions-Related Metals				
Al	EPA 1638 (ICP-MS)	0.1	1600	87[d]
Sb	EPA 1638 (ICP-MS)	0.003	6[a]	30[d]
As			0.045[a]	150[d]
Ba	EPA 1638 (ICP-MS)	0.01	2000[a,b]	3.9[d]
Cd			5[a]	0.094[c,d]
Cr	EPA 1638 (ICP-MS)	0.1	100[a,b]	74[d]
Cu	EPA 1638 (ICP-MS)	0.014	620[a]	2.7[c,d]
Pb	EPA 1638 (ICP-MS)	0.004	15[b]	0.54[c,d]
Hg	EPA 1631-CVAF	0.0005	0.63[a]	0.77[d]
Se			5.0[b]	170[d]
Ag	EPA 1638 (ICP-MS)	0.1	71[a]	0.3[c,d]
Other Compounds and Parameters				
Perchlorate	EPA 6850 or 6860	1.0	15	9300
Hardness-Ca	EPA 200.7 or 6010B	1.52	NA	NA
Hardness-Mg	EPA 200.7 or 6010B	3.79	NA	NA
Nitrate/nitrite-N	EPA Method 353.3		NA	NA
pH	Field	0.01 Unit	NA	NA
Temperature	Field	1^0 C	NA	NA
DO	Field	0.1 mg/L	NA	NA
Conductivity	Field	1 µS/cm	NA	NA
Turbidity	Field	1 NTU	NA	NA

NA – nothing available/not applicable
ICP – inductively coupled plasma
MS - mass spectrometry
CVAF – cold vapor atomic fluorescence
* reporting limit defined as detection limit for metals only
Modifications to EPA 8095 include a liquid-liquid extraction of the compounds of interest into a small volume of a water-immiscible organic solvent (isoamyl acetate).

Metals freshwater criteria and standards based on a hardness of 25 mg/L, site specific hardness will be used when determined.

[a] – EPA Regional Screening Levels (RSL) table – From “Regional Screening Levels for Chemical Contaminants at Superfund Sites,” which is an update for Region 3 RBCs, Region 6 MSSLs, and Region 9 PRGs. From: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/Generic_Tables/index.htm (Nov 2013)

[b]– Federal MCL – Federal Drinking Water Maximum Concentration Level

[c]– EPA Water Quality Criteria for dissolved metals based on a hardness of 25 mg/L

[d]– EPA Water Quality Criteria for dissolved metals

Table 2-5 Sediment Analytical Methods, Reporting Limits, and Screening Levels.

Analyte	Laboratory Analysis Method	Reporting Limit (µg/g)*	Screening Levels** (µg/g)
Explosives-Related Compounds			
HMX	EPA 8095 modified	0.05	0.0047
RDX	EPA 8095 modified	0.01	0.013
2,4,6-TNT	EPA 8095 modified	0.01	0.092
1,3,5-TNB	EPA 8095 modified	0.02	0.0024
1,3-DNB	EPA 8095 modified	0.02	0.0067
Tetryl	EPA 8095 modified	0.02	NA
NB	EPA 8095 modified	0.02	0.488
2A-4,6-DNT	EPA 8095 modified	0.02	NA
4A-2,6-DNT	EPA 8095 modified	0.05	NA
2,6-DNT	EPA 8095 modified	0.01	0.0206
2,4-DNT	EPA 8095 modified	0.02	0.0751
2-NT	EPA 8095 modified	0.02	NA
3-NT	EPA 8095 modified	0.02	NA
4-NT	EPA 8095 modified	0.02	NA
NG	EPA 8095 modified	0.05	NA
Other Compounds			
Total Organic Carbon	MSA 29-3.2***	0.01%	NA
Munitions-Related Metals			
Al	EPA 6020 (ICP-MS)	NA	NA
Sb	EPA 6020 (ICP-MS)	1	12
As	EPA 6020 (ICP-MS)		8.2
Ba	EPA 6020 (ICP-MS)	NA	20
Cd	EPA 6020 (ICP-MS)		1.2
Cr	EPA 6020 (ICP-MS)	NA	81
Cu	EPA 6020 (ICP-MS)	2	34
Pb	EPA 6020 (ICP-MS)	2	47
Hg	EPA 7471 (CVAA)	NA	.15
Se	EPA 6020 (ICP-MS)		NA
Ag	EPA 6020 (ICP-MS)	NA	2

Analytical methods with reporting limits higher than benchmarks are shaded.
NA – nothing available
ICP-MS- Inductively Coupled Plasma-Mass Spectrometry
CVAA- Cold Vapor Atomic Absorption
* - reporting limit defined as detection limit for metals only
**- Explosives screening level from EPA Region 4, Ecological Risk Assessment Bulletin – Supplement to RAGS (EPA 2001) is for 1% TOC. Screening level for each sample result must be multiplied by the % TOC in the sample. Metals screening levels from Office of Science and Technology (4304T), National Recommended Water Quality Criteria, 2006
***- Methods of Soil Analysis (MSA) Part 2, Chemical and Microbiological Properties, 2nd edition, Number 9 (Part 2), Agronomy, 1982, Section 29-3.5.2 (Walkley-Black method).

2.3 Project Schedule. The project field work will be performed primarily during the months of February and August. Table 2-6 outlines the tentative schedule of field work.

Table 2-6. Tentative Schedule of Field Work.

Field Task	Date	Location
Pre-sampling Visit	May 2013	Open Burning Grounds New Demolition Area Old Demolition Area
Well Maintenance (if needed)	February and/or August annually	Open Burning Grounds New Demolition Area Old Demolition Area
Groundwater Sampling (monitoring wells MW-NDG-01 through MW-NDG-17 and MW-ODA-1 through MW-ODA-11)	February and August annually	Open Burning Grounds New Demolition Area Old Demolition Area
Soil Sampling	July sampling at the Reference Site August sampling one time within the units. Quarterly for the first 8 sampling events, then August and February annually along firebreaks.*	Open Burning Grounds New Demolition Area Old Demolition Area Reference Site
Surface Water/Sediment Sampling	Quarterly for the first 8 sampling rounds then August and February annually.*	Open Burning Grounds Drainage Ditch New Demolition Area Sedimentation Pond Old Demolition Area Sedimentation Pond Reference Site

*Note: A permit modification will be requested to address the frequency of sampling following the initial multi-media sampling event.

2.4 Project Organization and Responsibilities. Table 2-7 illustrates key personnel involved in the annual long term groundwater monitoring. Key personnel involved in laboratory analysis are documented in the Quality Assurance Project Plan (QAPP).

Table 2-7. Periodic Long Term Multi-Media Monitoring Personnel List.

Name	Title	Affiliation	Responsibilities	Qualifications
James A. Maio	Geologist	USAIPH/WRP	Project Manager/Task Manager -Ground Water Sampling/Field QA/QC	B.A. Geology and Geography M.S. Geology Registered Professional Geologist
Barbara Vichot	Environmental Scientist	USAIPH/HWP	Task Manager – Soils Monitoring	B.S. Environmental and Soil Sciences Approximately 13 years performing environmental investigations
Carl Bouwkamp	Aquatic Biologist	USAIPH/WRP	Task Manager – Surface Water and Sediment Monitoring	B.S. Fisheries and Wildlife, M.S. Water Resources Development, 40 years performing environmental investigations
Mark E. Farro	Chief Field Technical Services/Site Health and Safety Officer	USAIPH/WRP	Field Tech/Health and Safety Officer	A.A. Computer Programming, CWD, CES 27 years performing environmental investigations
Duane Maners	Senior Engineering Technician	USAIPH/WRP	Field Tech/Alternate Health and Safety Officer	27 years performing environmental investigations
Rocky W. Hoover	Engineering Technician	USAIPH/WRP	Field Tech	Approximately 20 years performing environmental investigations
George Clint Logan	Engineering Technician	USAIPH/WRP	Field Tech	Approximately 10 years performing environmental investigations
Tracy Merchel	Engineering Technician	USAIPH/WRP	Field Tech	Approximately 5 years performing environmental investigations
Heidi Taylor	Chief Sample Laboratory Management	USAIPH/LS	Oversight of sample management	Approximately 20 years performing sample management

WRP – Water Resources Program
QA/QC – Quality Assurance/Quality Control
LS – Laboratory Sciences
HWP – Hazardous Waste Program

3. SAMPLING.

3.1 Rationale. The monitoring wells identified for sampling and analyses are determined through the data gathered from the 2003 through 2013 investigations (Reference 1). Groundwater elevational contour maps for each of the areas from the February 2013 data are displayed on Figures 3-1 through 3-3. Monitoring wells were selected from each of the areas based on groundwater flow directions and historic sampling data. The following section describes the wells to be sampled, water quality constituents, QA/QC samples, field procedures and decontamination procedures to be conducted for groundwater sampling activities.

3.1.1 Monitoring Well Location. Eight monitoring wells are located along firebreaks at the Open Burning Grounds or in the vicinity of the burn pans (MW-39). Nine monitoring wells are located along the firebreaks at the Old Demolition Area. The majority of wells are either hydraulically sidegradient or downgradient of the operations area. Ten monitoring wells are located along firebreaks at the New Demolition Area. There are multiple hydraulically upgradient and sidegradient wells in this area. Table 3-1 shows the location of monitoring wells to be sampled during the periodic long term multi-media monitoring.

3.1.2 Sample Collection and Field and Laboratory Analysis. For wells indicated in Table 3-1, semi-annual groundwater sampling will be conducted during February and August of each year. Quarterly sampling will be conducted for 8 sample events at recently installed monitoring wells. Following 8 sample events, semi-annual groundwater sampling will be conducted during February and August of each year. All field methods, sampling and analytical procedures, and equipment used will be consistent with published EPA methodology (References 3 through 6), 40 CFR (Reference 7) and USAIPH protocols (Reference 8). Groundwater samples will be collected using low-flow sampling techniques as outlined in section 3.3. The samples will be sent to the USAIPH laboratory for analysis outlined in Table 3-2.

Figure 3-1. Groundwater Contour Map-February 2013, Open Burning Grounds, McAlester AAP, Oklahoma

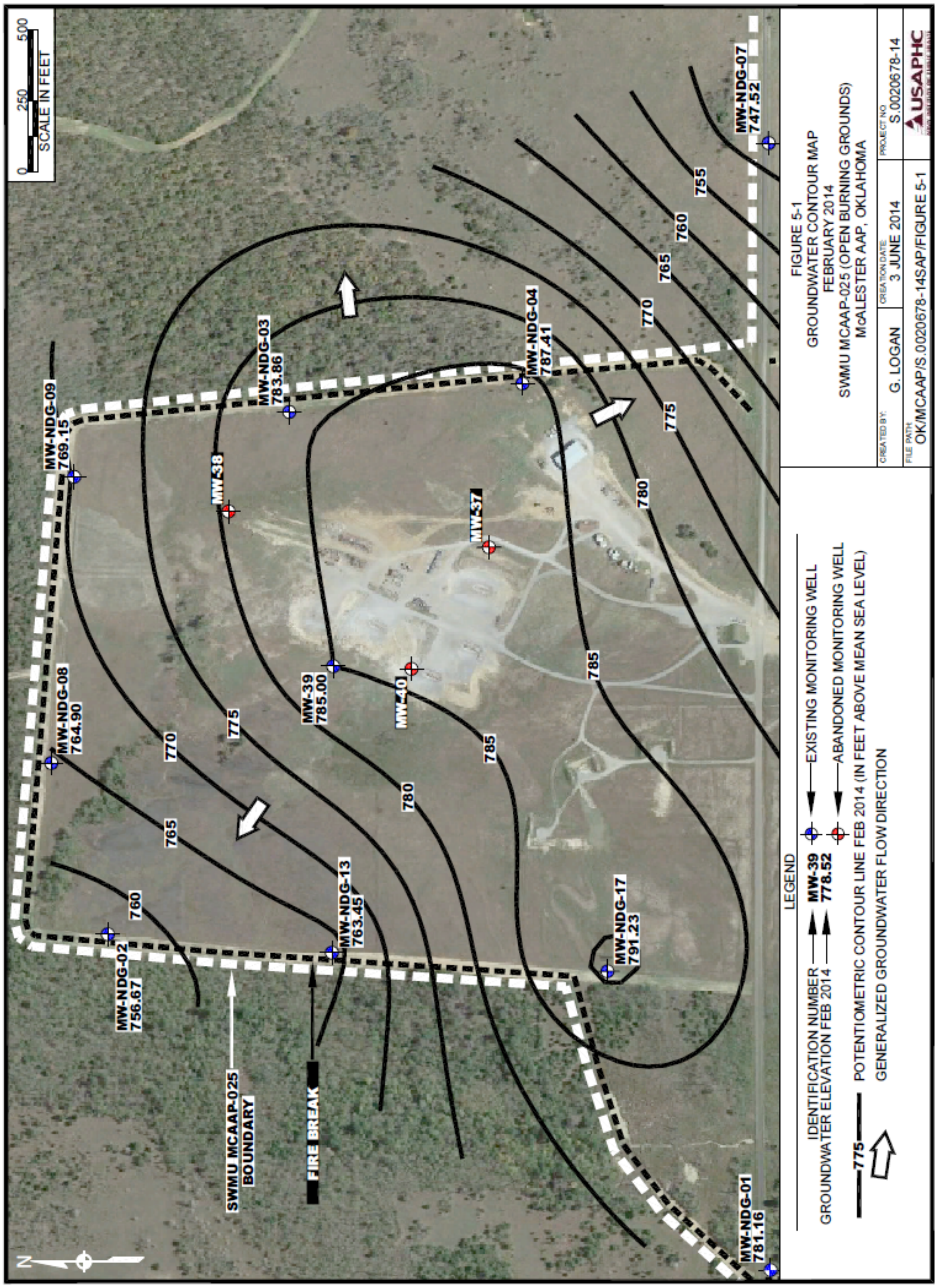


Figure 3-2. Groundwater Contour Map-February 2013, New Demolition Area, McAlester AAP, Oklahoma

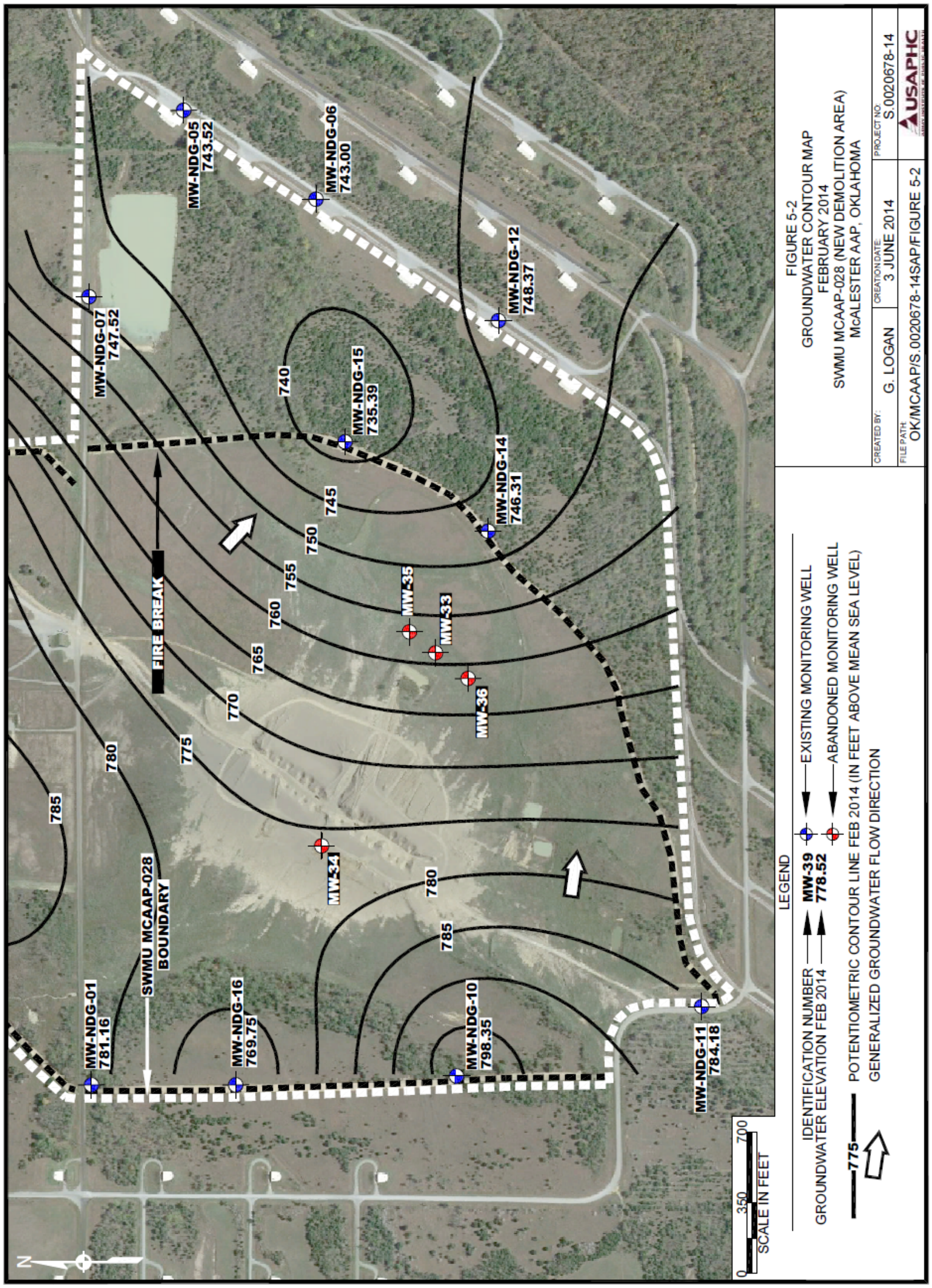


Figure 3-3. Groundwater Contour Map-February 2013, Old Demolition Area, McAlester AAP, Oklahoma

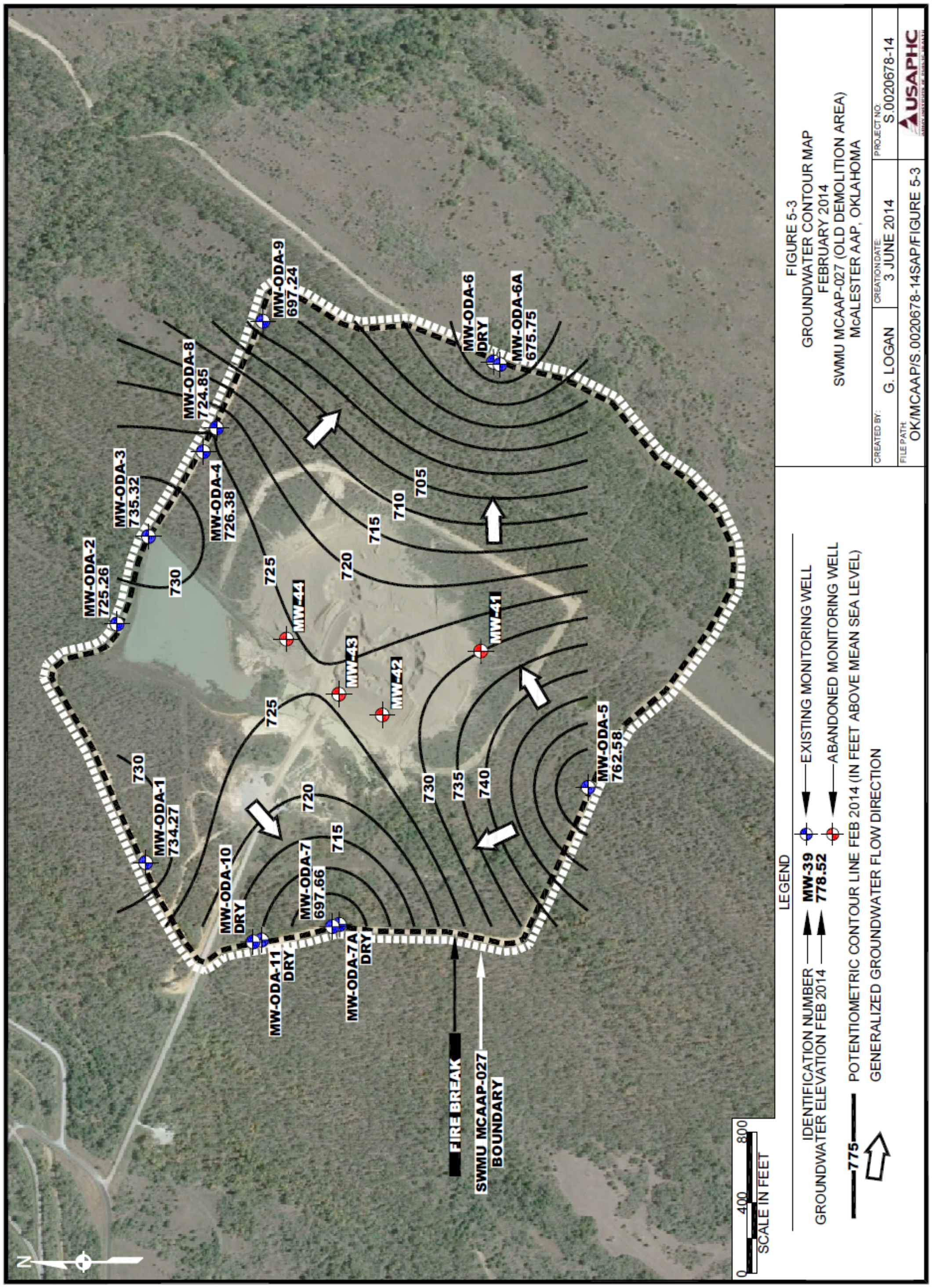


Table 3-1. Monitoring Wells to be Sampled

Location	Monitoring Well	Frequency[2]
Open Burning Grounds	MW-NDG-02	Semi-Annual
Open Burning Grounds	MW-NDG-03	Semi-Annual
Open Burning Grounds	MW-NDG-04	Semi-Annual
Open Burning Grounds	MW-NDG-08	Semi-Annual
Open Burning Grounds	MW-NDG-09	Semi-Annual
Open Burning Grounds	MW-NDG-13	Semi-Annual
Open Burning Grounds	MW-NDG-17	Quarterly for 8 sample events then Semi-Annual
New Demolition Area	MW-NDG-01	Semi-Annual
New Demolition Area	MW-NDG-05	Semi-Annual
New Demolition Area	MW-NDG-06	Semi-Annual
New Demolition Area	MW-NDG-07	Semi-Annual
New Demolition Area	MW-NDG-10	Semi-Annual
New Demolition Area	MW-NDG-11	Semi-Annual
New Demolition Area	MW-NDG-12	Semi-Annual
New Demolition Area	MW-NDG-14	Semi-Annual
New Demolition Area	MW-NDG-15	Semi-Annual
New Demolition Area	MW-NDG-16	Semi-Annual
Old Demolition Area	MW-ODA-1	Semi-Annual
Old Demolition Area	MW-ODA-2	Semi-Annual
Old Demolition Area	MW-ODA-3	Semi-Annual
Old Demolition Area	MW-ODA-4	Semi-Annual
Old Demolition Area	MW-ODA-5	Semi-Annual
Old Demolition Area	MW-ODA-6	Quarterly for 8 sample events then Semi-Annual[1]
Old Demolition Area	MW-ODA-6A	Semi-Annual
Old Demolition Area	MW-ODA-7	Semi-Annual
Old Demolition Area	MW-ODA-7A	Quarterly for 8 sample events then Semi-Annual[1]
Old Demolition Area	MW-ODA-8	Quarterly for 8 sample events then Semi-Annual
Old Demolition Area	MW-ODA-9	Quarterly for 8 sample events then Semi-Annual
Old Demolition Area	MW-ODA-10	Quarterly for 8 sample events then Semi-Annual[1]
Old Demolition Area	MW-ODA-11	Quarterly for 8 sample events then Semi-Annual[1]

[1] Monitoring wells MW-ODA-6, MW-ODA-7A, MW-ODA-10 and MW-ODA-11 have historically not produced sufficient groundwater for sampling.
2 A permit modification will be request following the initial multi-media sampling event.

Table 3-2. Groundwater Sample Analyte List and Analytical Methods

ANALYTE[1]	ANALYTICAL METHOD
Perchlorates	EPA Method 6850
Explosives and Degradates	EPA Method 8095M
Metals – Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se and Ag (Total and Dissolved)	EPA Method 6020/7470A
Semi-Volatile Organic Compounds	EPA Method 8270C
Nitrates/Nitrites	EPA Method 353.2
Other	
Temperature	Field
Turbidity	Field
Oxidation Reduction Potential	Field
pH	Field
Temperature	Field
Dissolved oxygen	Field
Conductivity	Field

1 See Tables 2-1 through 2-4 for a total list of analytes for each analytical method

3.2 Field Measurement Procedures.

The field measurement procedures to be used during groundwater sampling consist of measuring the water level in each well prior to sampling. Prior to groundwater purging and sampling, project personnel will measure the static water level in each monitoring well that will be sampled. These measurements will provide data for determining purge volumes if low stress (low flow) sampling is not possible and for estimating groundwater elevations at each well. The water levels will be measured from the top of the monitoring well casing with a battery-powered water level indicator to the nearest 0.01 foot. Total well depth from top of casing will be recorded utilizing the water level indicator to identify possible well screen silting effect and the need for maintenance. Water levels will be recorded in field books and/or on the appropriate field forms. The water level indicator will be decontaminated after each monitoring well to prevent possible cross-contamination as described in 3.8. Also, physical properties of the water from each well will be measured during pumping of stagnant water from the well as outlined in section 3.3.2.

3.3 Ground Water Sampling Methods.

3.3.1 General. Groundwater sampling will be conducted at the twenty-seven monitoring wells outlined in Table 3-1.

3.3.2 Flowcell. A multiprobe flowcell sampling system will be used to monitor indicator parameters during all well purging. Groundwater will be pumped through the sample tubing to the surface where it will flow into and through a 250-milliliter capacity cell with four inserted probes that monitor pH, conductivity, temperature, dissolved oxygen (DO), and ORP. An in-line bypass valve is located upstream of the flowcell to allow periodic withdrawal of water for turbidity measurements. The cell top is made of medical grade polycarbonate. The cell bottom is made of machined acrylic. The indicator parameters are monitored for stabilization. When the indicator parameters have stabilized (see Section 3.3.3), water samples will be collected directly from the tubing into the sample containers. All water samples will be collected upstream of the flowcell to prevent cross-contamination between monitoring wells.

3.3.3 Purging. Prior to sample collection, personnel will purge monitoring wells of stagnant water to ensure that water that is representative of the groundwater system is collected for analysis. Wells will be purged with peristaltic pumps or submersible electrical pumps. Purging will generally follow procedures outlined in the ASTM Standard D 6771-02, "Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations" (Reference 9). While low-flow pumping is the preferred purge method, cases of inadequate recharge rates or other factors may require the last resort use of disposable bailers. Tubing (and bailers if used), will be dedicated to a single well and disposed of after the well is purged and sampled. The field geologist will determine the purge method used with consideration of site conditions, well recharge rates, and sampling objectives. An adequate purge volume is normally achieved once three successive readings of water quality parameters have stabilized (Reference 9). Field sampling personnel will monitor pH, specific conductance, DO, temperature, and turbidity of the groundwater removed during purging and will record these parameters and the volume of water removed. The parameters may stabilize before three well volumes, negating the need to purge a full three to five well volumes.

The pH will be considered stable when measurements remain constant within a 0.1 standard unit (Reference 9). Specific conductance will be considered stable when it varies no more than 10 percent. Temperature will be considered stable when it remains constant for three consecutive readings. Measurements will be taken on a frequency that is based on the initial calculated purge volume to ensure a sufficient number of readings to evaluate stability.

If chemical parameters have not stabilized by three well volumes according to the above criteria, additional well volumes will be removed. If the parameters have not stabilized within five well volumes, the sample will be collected at that point, unless the field geologist decides that purging should be continued. If a well is purged dry using low flow techniques or manual bailing after the evacuation of one or two well volumes, the well will be considered adequately purged, allowed to recover, and will be sampled within 24 hours.

3.3.4 Groundwater Sample Collection. Where practical, monitoring wells will be sampled using low flow purging and sampling procedures (Reference 9). Samples will be collected with a dedicated PVC centrifugial pump (nitrile and stainless steel components) and dedicated 3/8 inch inner diameter (ID) clear polyethylene tubing. The depth of pumping will be set at the mid screen point if the screen is completely below the water table or, at a depth equal to the middle of the column of water within the well if the top of the water level is below the top of the screen. A controller will regulate the discharge rate as low as practical within a flow range of 150-500ml/min for a 250ml flow block. This will help to reduce turbulence and water level drawdown in the well. The flow rate will be calculated using a graduated beaker and stop watch. All samples will be collected in the appropriate, laboratory supplied containers from the pump discharge line (the tubing).

If conditions dictate that bailers be used for sample collection, decontaminated, disposable bailers with a clean line that allows the bailer to be lowered from the surface into the monitoring well will be used. The bailer will be gently immersed in the top of the water column until just filled. The bailer will then be gently removed and the contents emptied into the appropriate, laboratory supplied sample containers. The bailer and line used to collect samples from each well will be disposed of after each use.

3.3.5 Groundwater Sample Filtering. If groundwater turbidity is above 10 nephelometric turbidity units (NTUs) following purging, both filtered and unfiltered collection of groundwater for metals analysis will be performed. An in-line, 0.45-micron, acrylic copolymer-pleated membrane filter housed in a polyethylene capsule will be attached to the outlet of the bailer or sample tubing to filter water that will be analyzed for dissolved metals. If groundwater turbidity is below 10 NTUs following purging, only unfiltered collection of groundwater for metals analysis will be performed.

3.3.6 Field Equipment Calibration Procedures. The DO, pH, specific conductance, temperature, and turbidity meters will be calibrated each morning prior to use. All calibrations and calibration checks will be documented in the field logbook or AIPH calibration / field check forms. The accuracy of the field measurements of pH, temperature, specific conductance, DO, turbidity, and water levels will be addressed through pre-measurement calibrations and post-measurement verifications in the field. The calibration will be checked after two samples are collected and at the end of the sampling work day.

The pH will be calibrated through performing an automatic calibration utilizing two measurements on two standard buffer solutions per the manufactures SOP. Each measurement will be within ±0.05 standard unit of buffer. The electrode will be withdrawn, rinsed with deionized water, rinsed with the next pH calibration solution and re-immersed between each replicate. The meter will generate a slope of the electrode. The admissible range is -50.0 mV/pH to -62.0 mV/pH. The automatic calculated offset voltage (asymmetry) admissible range is +/- 30 mV. The instrument used will be capable of providing measurements of 0.01 standard units. If an error code is generated or the unit fails to operate within the acceptable ranges, refer to the owner's manual for cleaning, troubleshooting or probe replacement.

Temperature will be measured by using the pH/temperature combination probe with an operating range of -10 to 55º Centigrade (C). Accuracy of measurement will be ±1 ºC. The thermometer will be calibrated against an Army Test, Measurement and Diagnostic Equipment Calibration Team certified mercury thermometer. Temperature may also be measured with a factory-calibrated pH or conductivity meter that is also calibrated to measure temperature.

Specific conductance will be measured using a factory-calibrated conductivity meter. The meter will be read to the nearest 10 μSiemens/cm. An automatic calibration utilizing 0.01 mol/l (1413 uS/cm) KCl control standard solution will be utilized in determining the cell constant. The unit automatically considers the temperature dependence of the control standard solution and stores the determined cell constant. for the conductivity meter. The acceptable cell constant is 0.475 cm¯1 ± 1.5%. Fresh laboratory-prepared conductivity standard will be used for the calibration.

Dissolved oxygen (DO) will be measured using a factory-calibrated DO meter. The meter will be read to the nearest 0.1 mg/L. The meter will be calibrated by an automatic calibration The automatic calibration consist of moistening the sponge located in the OxiCal®-SL, Air Calibration beaker and sealing the probe in it. The unit will then run an auto ranging and develop a relative slope. The admissible range is 0.60 – 1.25, if the unit does not meet the requirement or generates an error code, refer to the owner's manual for cleaning, troubleshooting or probe replacement.

Oxidation/Reduction Potential (ORP) will be measured using a factory calibrated ORP meter. The meter will be read to the nearest 1 mV. The meter will be calibrated with Zobell standard solution. The standard solution's voltage and calibration temperature will be read from the Zobell bottle's chart and compared to the instrument's actual reading. If, the difference is greater than ± 30 mV it is invalid. Refer to the owner's manual for cleaning, troubleshooting or probe replacement.

Turbidity will be measured using a turbidimeter. A autocalibration will be performed with instrument cell standards of 0.01, 10.0 and 1000 NTUs. The calibration sequence outlined in the turbidimeter user's manual will be followed. The sensitivity will be to 0.1 NTUs. Users must ensure that they wipe off excess water and streaks on sample and calibration cells with a non-abrasive lint-free paper or cloth (laboratory wipes preferred). If an error is generated refer to the owner's manual for cleaning or troubleshooting.

All calibrations and calibration checks will be documented on calibration forms (Appendix B).

3.4 Soil Sampling Methods.

3.4.1 Analytical Parameters and Soil Screening Levels (SSLs).

3.4.1.1 Analytical Parameters. The soil monitoring data will be used to evaluate the presence, type, and concentrations of COPC in soil surrounding the demolition pits, burning pans, and rocket static firing pads and to determine the potential transport of COPC released outside of the firebreaks at concentrations that may pose a risk to human health and the environment. This soil monitoring Sample and Analysis Plan (SAP) has been designed in a manner such that statistical comparison can be made between the OB/OD soil sample data and a comparison threshold (i.e. soil screening level or background concentration). Soil monitoring data will be analyzed for the hazardous constituents identified in the Waste Analysis Plan to include: explosives, perchlorate, SVOCs, and select metals. A list of soil sample analytes and analytical methods are provided in Table 3-3.

Table 3-3. Soil Sample Analyte List and Analytical Methods

ANALYTE[1]	ANALYTICAL METHOD
Perchlorates	6850
Explosives and Degradates	EPA 8330B for processing/EPA 8095M (modified) for analysis
Metals – Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se and Ag	6020A 7471B
Semi-Volatile Organic Compounds	8270
Particle Size Distribution	ASTM D422
Total Organic Content	Walkley-Black Method
Percent Moisture	

*Analytical method version subject to change based on Analytical Contract Laboratory Specific Methods

3.4.1.2 RSLs.

EPA Region 6 Regional Screening Levels (RSLs) will be utilized as health-based screening or “comparison values” to characterize hazardous constituents released from the OB/OD units. The EPA RSLs were developed by the Department of Energy's Oak Ridge National Laboratory under an Interagency Agreement as an update of the EPA Region 3 Risk-Based Concentration (RBC) Table, Region 6 Human Health Medium-Specific Screening Levels (HHMSSL) Table, and the Region 9 Preliminary Remediation Goal (PRG) Table. OB/OD soil data will be compared to industrial USEPA RSLs to determine whether site constituents of concern are statistically significantly different than their respective screening criteria. The EPA RSLs do not represent action levels or cleanup levels; rather, they are used to determine if contaminants are present at concentrations that warrant further investigation. A list of analytical parameters and their respective screening levels are provided in Tables 3-4 and 3-5.

Metals analytical data will be compared to soil sample data collected from a “background” or “reference” area if found to be statistically significantly different (greater) from the EPA RSLs.

A Risk Evaluation and Emissions Characterization Program will be implemented in accordance with MCAAP Hazardous Waste Management Operations Permit Section G.10 in the event that the Release Delineation Monitoring samples indicate a release of hazardous constituents outside of the treatment unit boundaries/firebreaks at concentrations statistically significantly greater than the RSLs and/or background threshold levels (BTLs) (metals).

Table 3-4. Soil Screening Levels for Explosives and Metals.

PARAMETER	Analytical Method	EPA RSLs		EPA Region 5 Ecological Screening Levels (ug/kg)
		Industrial Soil (mg/kg)	Residential Soil Screening Levels (mg/kg)	
Explosives				
Perchlorates	EPA 6850	8.2E+02	5.5E+01	NA
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	EPA 8330B	5.7E+04	3.9E+03	NA
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)		2.8E+01	6.1E+00	NA
2,4,6-Trinitrotoluene (2,4,6-TNT)		9.6E+01	2.1E+01	NA
1,3,5-Trinitrobenzene (1,3,5-TNB)		3.2E+04	2.3E+03	3.76E+02
1,3-Dinitrobenzene (1,3-DNB)		8.2E+01	6.3E+00	6.55E+02
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)		2.3E+03	1.6E+02	NA
Nitrobenzene (NB)		2.2E+01	5.1E+00	1.31E+03
2-Amino-4,6-dinitrotoluene (2A-4,6-DNT)		2.3E+03	1.5E+02	NA
4-Amino-2,6-dinitrotoluene (4A-2,6-DNT)		2.3E+02	1.5E+02	NA
2,6-Dinitrotoluene (2,6-DNT)		1.5E+00	3.6E-01	3.28E+01
2,4-Dinitrotoluene (2,4-DNT)		7.4E+00	1.7E+00	1.28E+03
2-Nitrotoluene (2-NT) Nitrotoluene, o-		1.5E+01	3.2E+00	NA
3-Nitrotoluene (3-NT) Nitrotoluene, m-		8.2E+01	6.3E+00	NA
4-Nitrotoluene (4-NT) Nitrotoluene, p-		1.4E+02	3.4E+01	NA
Nitroglycerin (NG)		1.4E+02	6.3E+01	NA
PETN		5.7E+02	1.3E+01	NA
3,5-DNA		NA	NA	NA
Metals				
Aluminum	EPA 6020A	1.1E+06	7.7E+04	NA
Antimony	EPA 6020A	4.7E+02	3.1E+01	1.42E+02
Arsenic	EPA 6020A	3.0E+00	6.8E-01*	5.7E+03
Barium	EPA 6020A	2.2E+05	1.5E+04	1.04E+03
Cadmium	EPA 6020A	9.8E+02	7.1E+01	2.22
Chromium	EPA 6020A	-	-	4E+02
Copper	EPA 6020A	4.1E+03	3.1E+03	5.4E+03
Lead	EPA 6020A	8.0E+02	4.0E+02	5.37E+01
Mercury	EPA 7471A	4.6E+01	1.1E+01	1E+02
Selenium	EPA 6020A	5.8E+03	3.9E+02	2.76E+01
Silver	EPA 6020A	5.8E+03	3.9E+02	4.04E+03

U.S. EPA Risk-Based Screening Table Target Risk (TR) = 1E-06; Target Hazard Quotient (THQ) = 1.0

NA = not available

Table 3-5. Soil Screening Levels for SVOCs.

PARAMETER	EPA Region 6 RSLs (mg/kg)		EPA Region 5 Ecological Screening Levels (ug/kg)
	Industrial Soil (mg/kg)	Residential Soil (mg/kg)	
N-nitrosodimethylamine	9.1E-02	2.0E-03	3.21E-02
Bis(2-chloroethyl)ether	1.0E+00	2.3E-01	2.37E+04
Phenol	2.5E+05	1.9E04	1.2E+05
2-chlorophenol	5.8E+03	3.9E+02	2.43E+02
1,3-dichlorobenzene	6.2E+00	NA	3.77E+04
1,4-dichlorobenzene	1.1E+01	2.6E+00	5.46E+02
1,2-dichlorobenzene	9.3E+02	1.8E+03	2.96E+03
Benzyl alcohol	8.2E+04	6.3E+03	6.58E+04
Bis(2-chloroisopropyl)ether	NA	NA	NA
2-methylphenol	4.1E+04	3.2E+03	NA
Hexachloroethane	8.0E+00	1.8E+00	5.96E+02
N-nitroso-di-n-propylamine	3.3E-01	7.8E-02	NA
4-methylphenol	8.2E+04	6.3E+03	NA
Nitrobenzene	2.2E+01	5.1E+00	1.31E+03
Isophorone	2.4E+03	5.7E+02	1.39E+05
2,4-dimethylphenol	1.6E+04	1.3E+03	1E+01
Bis(2-chloroethoxy)methane	2.5E+03	1.9E+02	3.02E+02
2,4-dichlorophenol	2.5E+03	1.9E+02	8.75E+04
1,2,4-trichlorobenzene	2.7E+01	6.2E+00	1.11E+04
Naphthalene	1.7E+01	3.8E+00	9.94E+01
4-chloroaniline	1.1E+01	2.7E+00	1.1E+03
Hexachlorobutadiene	5.3E+00	1.2E+00	3.98E+01
4-chloro-3-methylphenol	6.2E+03	NA	NA
2-methylnaphthalene	3.0E+03	2.4E+02	3.24E+03
Hexachlorocyclopentadiene	7.5E+00	1.8E+00	7.55E+02
2,4,6-trichlorophenol	2.1E+02	4.9E+01	9.94E+03
2,4,5-trichlorophenol	8.2E+04	6.3E+03	1.41E+04
2-chloronaphthalene	6.0E+04	4.8E+03	1.22E+01
2-nitroaniline [o-]	8.0E+03	6.3E+02	7.41E+04
Acenaphthylene	NA	3.6E+03	6.82E+05
Dimethylphthalate	NA	NA	7.34E+05
2,6-dinitrotoluene	1.5E+00	3.6E-01	3.28E+01
Acenaphthene	4.5E+04	3.6E+03	6.82E+05
3-nitroaniline [m-]	NA	NA	3.16E+03
2,4-dinitrophenol	1.6E+03	1.3E+02	6.09E+01
Dibenzofuran	1.0E+03	7.3E+01	NA
2,4-dinitrotoluene	7.4E+00	1.7E+00	1.28E+03
4-nitrophenol	1.8E+04	NA	5.12E+03
Fluorene	3.0E+04	2.4E+03	1.22E+05
4-chlorophenyl-phenylether	NA	NA	NA
Diethylphthalate	6.6E+05	5.1E+04	2.48E+04
4-nitroaniline [p-]	1.1E+02	2.7E+01	2.19E+04
4,6-dinitro-2-methylphenol	3.1E+03	1.3E+02	NA
n-nitrosodiphenylamine	4.7E+02	1.1E+02	5.45E+02
4-bromophenyl-phenylether	NA	NA	NA
Hexachlorobenzene	1.1E+00	2.1E-01	1.99E+02
Pentachlorophenol	4.0E+00	1E+00	1.19E+02
Phenanthrene	NA	NA	4.57E+04

Table 3-5. Soil Screening Levels for SVOCs (continued).

PARAMETER	EPA Region 6 RSLs (mg/kg) Industrial Soil (mg/kg)	Residential Soil (mg/kg)	Ecological Screening Levels (ug/kg)
Anthracene	2.3E+05	1.8E+04	1.48E+06
Di-n-butylphthalate	8.2E+04	6.3E+03	1.5E+02
Fluoranthene	3.0E+04	2.4E+03	1.22E+05
Pyrene	2.3E+04	1.8E+03	7.85E+04
Butylbenzylphthalate	1.2E+03	2.9E+02	2.39E+02
Benzo(a)anthracene	2.9E+00	1.6E-01	5.21E+03
Chrysene	2.9E+02	1.6E+01	4.73E+03
Bis2-ethylhexyl)phthalate	1.6E+02	3.9E+01	9.25E+02
Di-n-octylphthalate	8.2E+03	6.3E+02	7.09E+05
Benzo(b)fluorantheene	2.9E+00	1.6E-01	5.98E+04
Benzo(k)fluoranthene	2.9E+01	1.6E+00	1.48E+05
Benzo(a)pyrene	2.9E-01	1.6E-02	1.52E+03
Indeno(1,2,3-cd)pyrene	2.9E+00	1.6E-01	1.09E+05
Dibenz(a,h)anthracene	2.9E-01	1.6E-02	1.84E+04
Benzo(g,h,i)perylene	NA	NA	1.19E+05

U.S. EPA Risk-Based Screening Table Target Risk (TR) = 1E-06; Target Hazard Quotient (THQ) = 1.0

NA = not available

3.4.1.3 Background Comparison Data

Soil samples will be collected in an area identified as not having been impacted by site activities to serve as BTLs for comparison to site concentrations to distinguish between concentrations of COPC that are naturally occurring and COPC resulting from site munition treatment activities. Background soil samples will be collected and analyzed in the same manner as the OB/OD site soil samples. Soils within the background location identified for this site investigation are similar to those found OB/OD treatment units and predominantly consist of the silt loam and silty clay loam soil type.

3.4.2 Soil Sampling Rationale and Methodology.

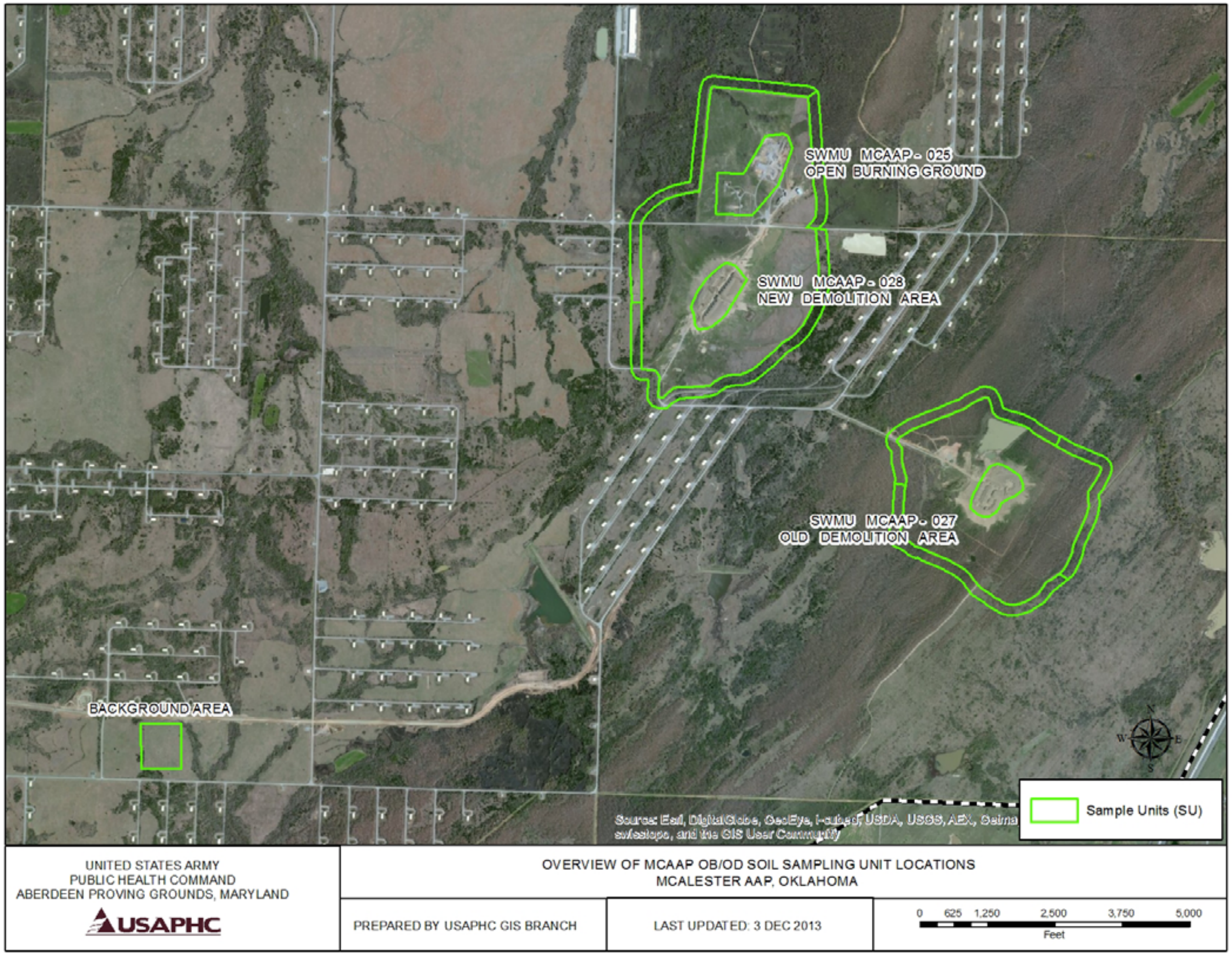
3.4.2.1 Soil Sampling Rationale.

The following section provides the rationale utilized for collecting soil data that is representative of site conditions and scientifically defensible for use in the decision making process. This soil sampling methodology was developed using the EPA Data Quality Objectives (DQO) Process and the most current EPA and industry guidance. This soil monitoring plan has been designed to incorporate both the Tier I (Release Detection Monitoring) and Tier II (Release Delineation Monitoring) requirements identified in MCAAP's Hazardous Waste Management Operations Permit Section G to determine whether a release of hazardous constituents to the environment has occurred, and if so, to delineate the extent of the release beyond the treatment unit designated boundary (i.e., OB/OD firebreaks). The Release Delineation Monitoring will identify COPC releases extending outside the firebreak. Soil sample data that show COPC are nondetect or below screening levels at the firebreak sampling units may be demonstrable evidence that COPC are not migrating outside the OB/OD units through this pathway. Figure 3-4 depicts the OB/OD areas sampled in support of the COPC Release Detection and Release Delineation Monitoring permit requirements along with the background comparison sampling location. A permit modification will be requested to address the frequency of soil monitoring following the initial soil monitoring sampling event. Periodic soil monitoring will be conducted along the firebreak.

3.4.2.1.1 Tier I Release Detection Monitoring.

The Tier I Release Detection Monitoring will consist of collecting soil samples from the Old and New Demolition Area treatment unit pits and the immediate area surrounding the Open Burn pans and rocket static firing pads to determine the type and concentrations of COPC released to the environment through site activities. Appendix C, Figure C-2 and Figure C-6 depict the three sampling units to be evaluated for the Tier I Release Detection Monitoring.

Figure 3-4. MCAAP Release Detection and Delineation Monitoring Sample Units.



3.4.2.1.2 Tier II Release Delineation Monitoring.

Soil samples will be collected from six sampling units surrounding the New OD and Old OB/OD firebreaks to determine the presence and extent of COPC released outside the treatment unit's boundaries. Due to the expansive area encompassing the firebreaks, a focused sampling approach using a stratified systematic sampling design was utilized to identify areas having the highest likelihood of contaminant deposition. Appendix C Figures C-3, C-4, C-5, C-7, C-8, and C-9 depict the six sampling units to be evaluated for the Tier II Release Delineation Monitoring.

3.4.2.2 Soil Sampling Methodology.

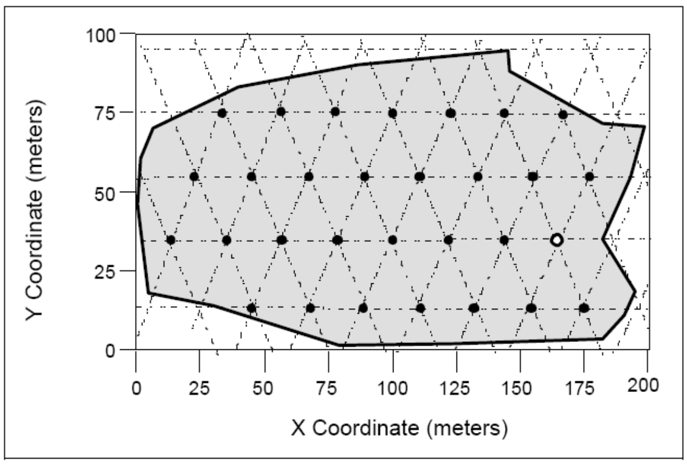
3.4.2.2.1 Stratified Systematic Random Sampling Design.

A focused sampling approach using a stratified systematic-grid random sampling design will be employed to determine the types and concentrations of COPC in the immediate treatment unit soils as well as to delineate COPC release outside the treatment unit firebreaks. A stratified systematic sampling design allows for inferences to be made concerning the fate and transport of COPC resulting from overland soil movement and aerial deposition. This approach incorporates both non-probabilistic (biased) and probabilistic (unbiased) sample design attributes by utilizing professional judgment to identify specific areas having a higher likelihood of containing munition constituents (sampling units) while using an unbiased systematic grid to provide uniform coverage for sample collection over large areas.

In order to develop a site characterization plan that is most representative of site conditions, a site visit was conducted May 2013 to determine whether observations are consistent with the current understanding of the site. Prevailing wind direction, surface water drainage patterns, and topography were factors used to divide areas into sample units having similar anticipated concentrations of COPC. Topographic maps and aerial photographs were utilized to identify sample unit boundaries and mark strata locations. As is often the case, stratification of large areas based upon potential of contamination, similar topographical features, and soil and vegetation conditions have resulted in irregular shaped sample strata. The ArcView Geographic Information System (GIS) and the Pacific Northwest National Laboratory (PNNL) Visual Sample Plan (VSP) software were used to identify strata boundaries, sample grid placement, and incremental sample and subsample locations (and Global Positioning System (GPS) coordinates) for this stratified systematic-grid sampling design.

The use of a systematic-grid design avoids the potential clustering of sample locations that is inherent when using a simple random sampling design. Systematic-grid sampling involves establishing a two-dimensional grid over a stratum or sample unit to allow for the more uniform coverage that is needed to evaluate large areas where there are no identified patterns or regularities of contaminant distribution. A triangular systematic-grid design, with a random start, was used to determine soil sampling locations within each of the identified sample units as this grid design has been shown to provide the uniform coverage needed to collect soil sample data that is most representative of site constituent levels. Figure 3-5 depicts an example triangular grid design.

Figure 3-5. Example Triangular Sampling Grid



(Reference 10)

3.4.2.2.2 Incremental Sampling Approach.

Incremental samples will be collected from each sample unit to address the distributional and compositional heterogeneity associated with COPC concentrations in soil. The collection of incremental samples can reduce the sampling error associated with the heterogeneous distribution of COPC in soil through applying appropriate project planning, field sampling techniques, and laboratory sample preparation and subsampling techniques. The mass of the incremental composite sample depends on the number of increments collected, sample depth, the size of the soil core sampler, the total number and type of analyses planned, and the lab digestion/analysis mass required for each test. A total of 30 incremental samples made up of 45 increments or subsamples (plus QA/QC samples), will be collected from each of the nine sample units and the background comparison location in support of the soil monitoring workplan project objectives. Table 3-6 provides a summary of the number and type of samples to be collected to evaluate the type, concentration, movement of COPC resulting from the Old and New OB/OD treatment unit activities.

Due to the relatively recent use of incremental sampling to assess COPC other than explosives, guidance provided by the following state regulatory agencies, workgroups, and DOD agencies have been reviewed in developing the incremental sampling techniques used to evaluate COPC release to the environment resulting from the MCAAP OB/OD treatment unit activities: Alaska Department of Environmental Conservation, Hawaii Department of Occupational Health, Ohio EPA Volunteer Assessment Program, and the Interstate Technology Regulatory Council (ITRC) Incremental Sampling Methodology (ISM) guidance (References 11 through 14). Several states are represented in ITRC workgroup including Florida, California, Massachusetts, Texas, Oklahoma, Arizona, and New Mexico. The US Army Corps of Engineers Interim Guidance 09-02: *Implementation of Incremental Sampling of Soil for the Military Munitions Response Program* was also reviewed in developing this soil monitoring workplan (Reference 15).

The PNNL VSP Version 6 software was used to identify sampling unit boundaries, sample grid placement, soil sample Universal Transverse Mercator (UTM) coordinate locations, and sample number required to meet study DQOs.

The PNNL VSP software was used to determine the number of samples required to meet the study DQOs of a 95% Confidence Level and a 0.05 false rejection decision error (p=.05) and a 0.80 false acceptance decision error (p=.80). The design parameters input to the VSP software for sample number determination included: confidence level, null hypothesis, false rejection and false acceptance rate (i.e., Type I and Type II errors), data distribution, the estimated standard deviation between sample, and the number of analytical subsamples. Utilizing this software, it was determined that 3 incremental samples consisting of 45 subsamples would provide the data needed to satisfy the identified decision error limits. The 3 incremental samples collected in each sample unit will serve as the replicate sample data needed to calculate the COPC 95% Upper Confidence Level (UCL) for comparison to the SSL or BTL. Additionally, incremental sample replicates provide a measure of the variability of the entire sampling, preparation, and analytical process needed to assess field and laboratory sampling error.

The following Type I and Type II Decision Errors have been identified for this site investigation.

Type I Decision Error (false rejection decision error) for this investigation has established the baseline condition (null hypothesis (H_0)) as the more severe decision error in rejecting the baseline condition or H_0 when in fact it is true. The baseline condition set for this investigation is the assumption that COPC concentrations in the investigation site are greater than or equal to (or significantly differently than) SSLs (i.e., EPA RSLs and background levels). The consequence of making false rejection decision error is considered most severe as determining that site conditions do not exceed SSLs can result in unacceptable human health risk. Therefore, the Type I decision error was set at a 95% probability of making a correct decision. The alternate hypothesis assumes that COPC concentrations in the investigation site are less than SSLs.

H_0: Parameter ≥ SSL; H_a: Parameter < SSL

Type II Decision Error (false acceptance decision error) for this investigation is identified as the less severe decision error in that the baseline condition is accepted when it is false and it is determined that site conditions exceed SSLs when they do not. The consequence of a false acceptance decision error may result in unnecessary further investigation or clean-up costs. The Type II decision error was set at 20% probability of making an incorrect decision.

The following inputs to the VSP software were made to determine the sample number required to meet study DQOs:

- Compare average to a fixed threshold and compare average to a reference average (metals only).

- Assume data will be normally distributed and select multiple increment sampling. The basis for this assumption is that the data distribution for incremental replicate samples tends to be normally distributed.

- The Null Hypothesis, or “baseline condition”, was identified as the more severe condition of assuming that the site is “dirty” (i.e., the Null Hypothesis presumes that COPC are migrating or have migrated outside the treatment unit firebreaks at concentrations greater than the identified SSLs).

- The Type I (false rejection) and Type II (false acceptance) errors were set at 95 percent and 20 percent, respectively.

- The estimated standard deviation between increments and the number of analytical subsamples were set to 2.

3.4.2.2.3 SWMU MCAAP-027 (Old Demolition Area) is located near the southeast corner of the installation. Four separate areas will be characterized to determine the presence, type and concentrations of COPC released from the Old OD treatment unit activities. Following a systematic triangular grid sampling design, three incremental samples, consisting of 45 subsamples, will be collected from the Old OD treatment unit pits and three separate sample units contiguous with the treatment unit firebreak. Appendix C, Figures C-2 through C-5, depicts the incremental composite sample and subsample locations for each of the four sample units assessed for the Old OD COPC Release Detection and Delineation Monitoring soil sampling. UTM coordinates for each incremental composite subsample locations are provided in Appendix D, Tables D-1, D-4, D-5 and D-6.

3.4.2.2.4 SWMU MCAAP-028 (New Demolition Area) and SWMU MCAAP-025 (Open Burning Ground) are located west of the Old Demolition Area. Five separate areas will be characterized to determine the presence, type and concentrations of COPC released from the New OB/OD treatment unit activities. Following a systematic triangular grid design, three incremental composite samples, consisting of 45 subsamples, will be collected from the New OD treatment unit pits, OB area pans and static rocket pads, and three separate sample units contiguous with the treatment unit firebreak. Incremental subsample locations for these sample units are depicted in Appendix C, Figures C-6, C-7, C-8 and C-9. UTM coordinates for each incremental subsample locations are provided in Appendix D, Tables D-2, D-7, D-8, and D-9.

3.4.2.2.5 Background Location. A total of 3 incremental samples, consisting of 45 subsamples, will be collected from a background location to assess constituent concentrations resulting from naturally occurring or anthropogenic sources of COPC other than munition demolition activities. The soil background sample area is located within the MCAAP ammunition bunker storage area, approximately 2.5 miles southwest of the OB/OD treatment units between Road D and Road E and north of Ashland Gate Road. The background location identified for the collection of comparison data has been identified as an area having similar soil type as the OB/OD treatment units. Background soil sample data will be collected in the same manner as the OB/OD site soil samples. A map depicting the identified background location and incremental composite subsample locations is provided in Appendix C, Figure C-10. The UTM coordinates for the background incremental subsample locations are provided in Appendix D, Table D-10.

Table 3-6. Summary of Sampling Objectives for Soil Monitoring

Parameter	Open Burning Grounds	New Demolition Area	Old Demolition Area	Firebreaks		Background	Field QA/QC
				Old OD	New OB/OD		
Perchlorates	3	0	0	0	9	3	2 Duplicate; 2 Split
Explosives	3	3	3	9	9	3	2 Duplicate; 2 Split
Select Metals – Total	3	3	3	9	9	3	2 Duplicate; 2 Split
SVOCs	3	0	0	0	9	3	2 Duplicate; 2 Split
Particle Size	1	1	1	1	1	1	NA
TOC	1	1	1	1	1	1	NA
Percent Moisture	1	1	1	1	1	1	NA

3.4.3 Incremental Soil Sample Collection.

A total of three incremental composite samples, each consisting of 45 subsamples, will be collected from each sampling unit and the background comparison location. A handheld GPS unit will be used to navigate to the UTM coordinates (easting and northing) for each of the 45 incremental subsamples. Figures depicting incremental subsample locations and UTM coordinates are provided in Appendices C and D, respectively. The UTM coordinate system is recommended as it provides a constant distance relationship anywhere on the map. Care must be taken to ensure that the GPS datum is consistent with the datum set of the topographic map used to determine the sample coordinate locations. The incremental composite subsample locations were determined using the World Geodetic System 1984 (WGS 84) datum set. To complete each incremental sample, at each incremental subsample location, a surface soil sample will be collected from a depth of 0 – 4 inches using a stainless steel soil core (with approximate 2 to 3 cm diameter) sampling device and placed into a dedicated sample container. Sample containers will be labeled and managed according to procedures identified in Section 3.4.8.

To prevent cross contamination, non-dedicated sampling equipment will be decontaminated between collecting each incremental composite sample using procedures identified in Section 3.4.6.1. However, sample equipment will not require decontamination between subsample locations. Additionally, sample personnel will don new gloves at each new composite sample location; however, new gloves are not required when collecting incremental subsamples.

Particle size reduction and subsampling will take place in the laboratory to prevent potential sample cross-contamination resulting from an uncontrolled field work environment.

The total sample mass of each incremental sample is calculated based on the number of increments collected per sample, the sampling depth, and the sample core diameter using the following formula (Reference 14):

$Ms = \rho \bullet n \bullet D_s \bullet \pi \bullet (q/ 2)^2$

Ms = Targeted Mass of Sample (g)
Ds = Sampling Depth (cm) = 10.16 cm
n = Number of Increments = 45
ρ = Soil or Sediment Density (g/cm^3) = 1.0 g/cm^3q = Diameter of Sample Core (cm) = 5.08 cm

Total approximate increment sample mass based on the above calculation will be > 9.3 kg. Total increment sample mass may vary slightly at time of sampling based on dimensions and type of sample core device.

3.4.4 Laboratory Sample Preparation and Analysis.

Laboratory incremental composite sample preparation will be in accordance with the USEPA SW 846 Method 8330B, *Nitroaromatics, nitramines, and nitrate esters by high performance liquid chromatography*, Appendix A: Collecting and Processing of Representative Samples for Energetic Residues in Solid Matrices from Military Training Ranges (Reference 16). The incremental sample milling and subsampling processes will take place in the laboratory to provide the more “controlled” working environment needed to address such limitations to field milling as time and labor constraints and the increased need for field equipment decontamination to prevent sample cross contamination. Only the incremental sample collected for explosive analysis will be milled to reduce particle size to the <2mm fraction.

Due to the relatively recent use of incremental sampling methodology for evaluating COPC other than explosives, significant coordination between project managers and the analytical laboratory is required and will continue throughout soil monitoring sampling activities to ensure that the analytical laboratory can meet incremental sample preparation and analytical requirements for all analytical parameters to include SVOCs and metal analyses. At a minimum, in a laboratory setting, SVOC and metals analytical samples will be thoroughly homogenized as to reduce compositional variability and the proper analytical subsampling techniques will be performed to ensure a representative particle size is analyzed. SVOC analytical samples will not require milling since as the grinding temperature may lead to the destruction of organic contaminants.

The milling of metals analytical samples will be conducted in accordance with EPA Method 8330B in a manner to reduce to the release of naturally occurring metals held to soil particles and prevent the potential for metals loss through the grinding process. Further, project managers will coordinate with the analytical laboratory to establish and documented analytical procedures that meet site investigation data requirements. All analytical methods and procedures will be thoroughly documented and detailed in the final report of findings.

3.4.5 QA/QC samples. Field duplicate and field split samples will be collected to assess the precision and accuracy of field sampling techniques and laboratory analytical methodologies. Duplicate samples are defined as samples that are collected simultaneously from the same source under identical conditions. Split samples are defined as samples which are collected as one field sample and then physically split into two representative sample aliquots. Additionally, field equipment rinsate samples will be collected at the end of sampling activities each day to evaluate the efficacy of sample equipment decontamination procedures. Additional, Laboratory QA/QC requirements are identified in the project Quality Assurance Project Plan (QAPP).

3.4.6 Equipment Decontamination and Waste Disposal.

3.4.6.1 Sample Equipment Decontamination.

Non-disposable sample equipment (i.e., soil core device and stainless steel mixing bowl) will be decontaminated between increment sample locations, however, sampling equipment it does not have to be decontaminated between increment composite subsample locations. These items shall be decontaminated thoroughly by washing with an industrial detergent, such as Alconox, scrubbed clean using a brush, and thoroughly rinsed using distilled water. Decontaminated equipment shall be stored in a manner as to prevent possible contamination while not in use (e.g., stored in plastic ziploc bags or wrapped in aluminum foil). Equipment rinsate samples will be collected to evaluate the efficacy of decontamination procedures.

3.4.6.2 Investigation Derived Waste Disposal.

Wastes shall be disposed of in accordance with all applicable Federal, State, and Local laws and regulations. Though COPC are not believed to be present at hazardous waste characteristic levels, proper characterization of wastes shall be made prior to disposal either by using generator knowledge or from laboratory analyses of new waste-streams.

3.4.7 Monitoring Plan Deviations.

The intent of this SAP is to identify the necessary elements that should be performed, documented, and reported during this site investigation in order to provide representative and scientifically defensible data. Every effort will be made to adhere to this SAP; however, significant variations may be necessary to compensate for the field conditions that exist at sampling time. Any deviations from this SAP will be documented in the field logbook.

3.4.8 Sample Labeling. Samples shall be labeled with the date and time of sampling, parameters requested, and initials of the sampler. Samples will be labeled a unique sample number that identifies the sampling unit, incremental composite sample, date and time of sample collection, and sample preservation requirements. The following nomenclature will be used to distinguish between each individual increment composite sample collected within each of the identified sample units. Any deviations to this sample nomenclature during sampling efforts will be documented in the field logbook.

SL-ODAPit-ICS1 (Pit- ICS2; Pit- ICS3)
SL-NDA-Pit- ICS 1 (Pit- ICS2; Pit- ICS3)
SL-OBA- ICS1 (OBA-ICS2; OBA ICS3)
SL-ODA-FBSU2- ICS1 (SU2-ICS2; SU2-ICS3)
SL-ODA-FBSU3- ICS1 (SU3-ICS2; SU3-ICS3)
SL-ODA-FBSU4- ICS1 (SU4-ICS2; SU4-ICS3)
SL-NDA-FBSU7- ICS1 (SU7-ICS2; SU7-ICS3)
SL-NDA-FBSU8- ICS1 (SU8-ICS2; SU8-ICS3)
SL-NDA-FBSU9- ICS1 (SU9-ICS2; SU9-ICS3)
SL-BG- ICS1 (BG-ICS2; BG-ICS3)

Where: SL = soil sampling point.
NDA = New Demolition Area
ODA = Old Demolition Area
OBA = Open Burning Grounds
SU = Sample Unit
FB = Firebreak
ICS = Incremental Composite Sample
BG = Background

3.4.9 Soil Monitoring Data Statistical Evaluation.

This soil monitoring has been designed such that a data comparison can be made to determine whether site constituents are statistically significantly different than SSLs and/or BTLs (metals only). Utilizing the replicate sample data collected from each sampling unit, the EPA ProUCL Version 4.1 software will be used to calculate the 95% UCL of the arithmetic mean for each COPC for comparison to SSLs/BTLs. The constituent 95% UCL will be calculated using the ProUCL 4.1 recommended distribution (e.g., student-t for parametric data distributions and Chebyshev for non-parametric data distributions) (Reference 17). If COPC concentrations are found to be statistically greater than SSLs, additional site investigation may be warranted.

3.4.10 Soil Data Quality Evaluation.

A data quality evaluation will be performed to determine data usability for use in the decision-making process. The data quality indicators to include; precision, accuracy, representativeness, completeness, and comparability parameters will be assessed to determine data usability. Precision, accuracy, and completeness are measured quantitatively. Representativeness and comparability are measured qualitatively.

- Precision and Accuracy. Precision and accuracy were evaluated by the collection and analysis of field and laboratory QC samples. Precision is measured by the relative percent difference (RPD) between individual measurements with the same characteristic. Field split and duplicate samples were used to assess field and laboratory precision. The RPD set for this project was ≤ 30%.

  Accuracy is the degree of agreement between the measured value and the true value. The laboratory QC precision limits for matrix spike (MS) and matrix spike duplicate (MSD) samples, method blanks, surrogate samples, laboratory control samples (LCS), and laboratory control sample duplicates (LCSD) were used to assess accuracy.

- Representativeness. Representativeness reflects the degree to which sample data accurately and precisely portrays the environmental conditions being studied. Representativeness is primarily addressed through designing a sampling plan that will provide data that is most characteristic of site conditions to include ensuring that the number of samples collected and sample locations are sufficient to provide data that is characteristic of site conditions. Once analyzed, actual site data (i.e. standard deviation and sample number) will be utilized to determine whether the number of samples collected were sufficient to provide representative data.

- Completeness. Completeness is the amount of data obtained for a measurement compared to the expected amount of data required for the measurement.

- Comparability. Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. The degree of comparability is directly related to the precision, accuracy, and representativeness of the data in each set. For this project, comparability was measured through the use of standard field sampling procedures and laboratory analytical methods and by ensuring that the concentration units reported for site data (i.e., pg/L or pg/g) were compared to the appropriate health screening criteria concentration units.

3.5 Surface Water and Sediment Sampling Methods.

3.5.1 Rationale. The old detonation area sedimentation pond, the new detonation area sedimentation pond, wetlands area to the west of the static firing pads and the open burning ground drainage ditch receive the majority of the runoff from the three areas. Therefore, sampling the water and sediment from these locations will produce data representative of what is happening at the three areas.

3.5.2 Methods. Surface water and sediment samples will be collected from sedimentation ponds and runoff locations identified in Appendix C, Figures C-11, C-12 and C-12. A small boat will be used to access sample locations on the sedimentation ponds after the UXO technician has cleared the site. Before collecting each sediment sample, the location will be checked for UXO.

3.5.2.1 The surface water will be collected using trace metals collection methods, EPA method 1669 (Reference 18). Samples will be collected using a peristaltic pump and clean *Teflon* and peristaltic tubing. At locations that are less than 3 feet deep, the tubing will be lowered to mid depth and water will be pumped first to purge the tubing and filter (0.2 µ) for perchlorates and then fill the laboratory furnished sample bottle leaving sufficient head space for oxygen exchange. Then the (0.45µ) filter will be purged and the dissolved metals laboratory furnished sample container will be filled and acidified being careful not to contaminate the sample. Then the filter will be removed and the remaining sample containers will be filled. Locations greater than 3 feet deep will have the depth divided equally, filling half of each sample bottle at two thirds the depth and the other half at one third the depth.

3.5.2.2 The multi-parameter meter (temperature, DO, pH, conductivity, and turbidity) will then be used to measure and record the general water quality parameters at each depth and location. The meter will be calibrated at the beginning of each day and checked at the end of each day of sampling.

3.5.3 Sediment Sample Collection. The EPA Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual (Reference 19) will be used as guidance for sediment sampling. The manual discusses issues such as sample volume, the use of replicates and compositing, the optimum depth of sample, the types of sediment samplers available and how to choose the most appropriate, equipment decontamination procedures, recommended field measurements and observations, and sample transport and storage. The sediment will be collected using a stainless steel Petit *Ponar* dredge in the sedimentation ponds and dedicated plastic scoops in the drainage ditch locations. The UXO technician will clear areas to be sampled before dropping the dredge or using the scoop. Only the upper inch in the drainages and three inches in the sedimentation ponds will be selected in areas of fine sediment deposits. Each sample will consist of at least 10 subsamples. The fine sediment that settle out of the runoff is where munition constituents have a tendency to accumulate. Sufficient sample will be collected in a plastic lined stainless steel mixing bowl to fill the different sample containers. Excess water will be carefully removed so as to not lose the fine sediment. A dedicated plastic scoop will be used to thoroughly homogenize the sample and place the sample in the individual sample containers.

3.5.4 Decontamination Procedures. Decontamination will be performed in accordance with ASTM 5088-90 (Standard Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites). All attempts will be made to minimize the need for decontamination by using dedicated sampling equipment when feasible.

3.6 Sample Containers and Preservation Techniques.

The USAIPH LS will provide clean sample containers. Sample containers are expected to be filled directly from the source (from the pump discharge line or from factory decontaminated, disposable bailers). If an intermediate container is required, a laboratory supplied, wide-mouth plastic bottle (500 milliliter capacity) will be used. The bottle will be disposed of after use at a well location. For field analyses (DO, pH, specific conductance, temperature, and turbidity), groundwater will be collected in a 500 milliliter capacity plastic beaker. The sampling team will thoroughly rinse the beaker and probes with distilled or deionized water before and after each sampling.

3.6.1 Sample Container Labeling, Storage and Shipment. Labels will be affixed to each sample container. Information on the sample labels will include the installation name, analytical parameter(s), preservative added, sample identification number, and date-time of collection. Sample containers will be packed in ice-filled coolers immediately after collection, preservation, and labeling. Sample coolers will be sealed with tape and chain-of-custody seals and shipped to the USAIPH laboratory at APG, Maryland.

3.6.2 Sample Preservation. Personnel will add the required preservatives to the appropriate sample containers immediately after the sample is collected and prior to sealing the containers to ensure sample integrity. The USAIPH Laboratory will provide the chemical preservatives and sample containers to the study team. The chemical preservatives will be provided in ampoules at the volume required to preserve the samples in the field. Samples preserved using a pH adjustment will be checked by pouring a small volume of sample over a pH strip. Sample containers will be placed in ice-filled coolers immediately after collection, preservation, and labeling, and will remain with the sampling team until transported to a designated secure area. Sample preservation will be recorded in field books and/or the appropriate field forms.

3.7 Field Quality Control Procedures.

3.7.1 General. Field QA/QC will be used to evaluate the performance of the field collection methods and laboratory analytical techniques. QA/QC samples will be collected as duplicate samples. All QA/QC samples will be submitted to the USAIPH Laboratory. The results of the QA/QC tests will be utilized in the data validation procedures. Tables 3-7 through 3-12 summarizes the number of samples and QA/QC samples to be collected.

3.7.2 Field Duplicate Samples. Sampling precision will be assessed through the collection and evaluation of either duplicate or split samples. Ten percent of the total number of samples collected will be either duplicate or split samples. Duplicate samples are defined as samples that are collected simultaneously from the same source under identical conditions. Split samples are defined as samples which are collected as one field sample and then physically split into two representative sample aliquots. For groundwater and surface water, duplicate samples will be used to evaluate field sample collection and laboratory sample handling techniques. For soils, both duplicate and split samples will be used to evaluate field sample collection and laboratory sample handling techniques.

Table 3-7. Summary of Sampling Objectives for Each Groundwater Monitoring Event at the OB/OD Areas, MCAAP, Oklahoma.

	Open Burning Grounds	New Demolition Area	Old Demolition Area	Field Duplicates
Perchlorates	7	0	0	1
Explosives	7	10	9	3
Select Metals - Total	7	10	9	3
SVOCs	7	0	0	1
Nitrates/Nitrites	7	10	9	3

Table 3-8. Summary of Sampling Objectives for Each Surface Water Monitoring Event at the OB/OD Areas, MCAAP, Oklahoma.

	Open Burning Grounds	New Demolition Area	Old Demolition Area	Field Duplicates	Reference
Perchlorates	2	3	0	1	1
Explosives	2	3	3	1	1
Select Metals - Dissolved	2	3	3	1	1
Nitrates/Nitrites	2	3	3	1	1

Table 3-9. Summary of Sampling Objectives for Each Sediment Monitoring Event at the OB/OD Areas, MCAAP, Oklahoma.

	Open Burning Grounds	New Demolition Area	Old Demolition Area	Field Duplicates	Reference
Explosives	2	3	3	1	1
Total Organic Matter	2	3	3	1	1
Select Metals - Total	2	3	3	1	1

Table 3-10. Summary of Sampling Objectives for Soil Monitoring Event at the OB/OD Areas, MCAAP, Oklahoma.

	Open Burning Grounds/New Demolition Area	Old Demolition Area	Field Duplicates/ Splits	Reference
Perchlorates	12	0	4	3
Explosives	15	12	4	3
Select Metals	15	12	4	3
SVOCs	12	0	4	3

3.7.3 Cooler Temperature Blanks. Cooler temperature blanks will be used for all samples to ensure the temperature has been maintained at 4 ±2º Centigrade during shipping. The temperature blanks will be provided by the USAIPH Laboratory.

3.7.4 Data Validation/Verification. To provide scientific and legal defensibility for the data, data validation/verification will be utilized during each periodic long term multi-media monitoring sampling event.

3.8 Decontamination Procedures.

3.8.1 General Practice. Decontamination procedures will be done in accordance with ASTM 5088-90 (Reference 20) and EPA Region 4 guidance (Reference 4). All attempts will be made to minimize the need for decontamination by using dedicated sampling equipment when feasible.

3.8.2 Decontamination Procedures. The following procedures will be used at each well location to decontaminate all equipment that contacts or potentially could contact samples.

Water level meter: (1) rinse probe with distilled water before use, (2) wipe tape with wetted disposable cloth or paper towel upon retraction from well, (3) clean with laboratory grade detergent, and (4) rinse probe after detergent clean with deionized water.

4. FIELD OPERATIONS DOCUMENTATION.

4.1 Field Log Book.

4.1.1 A record of all field activities will be maintained in a field log book (more than one may be necessary). Entries will be dated and signed by the USAIPH project manager and all entries will be made with a permanent ink pen. If more than one field log book is required, each will have a unique, permanent identifier number. Each page of the field log book will be numbered. A brief table of contents will be maintained in each book. The field logbook will be kept containing a detailed record of each surface water/sediment sample, incremental composite sample, subsample location, date and time the sample was collected, analytes requested, initials of the sampler, and GPS UTM coordinates for any subsample location that has to be altered due to inaccessibility. All modifications/deviations to the SAP will be detailed in the logbook. In addition, site specific information relevant to each sample grid or point will be annotated (e.g., density and type of vegetation, observed erosion) as well as notes or comments relating to any problems or situations encountered throughout the duration of the project. Changes and “scratch-outs” made to the logbook shall be accompanied by the amending individual’s initials and the date of the change.

4.1.2 All sampling information will be kept in either the field log book or field sampling sheets. Description of these activities will include time of day and information regarding problems, anomalies, or circumstances that may affect data quality or assist in interpretation. Other field note entries include well purging, and groundwater sampling activities.

4.1.3 The field log book will also contain a record of daily activities and include notes on phone calls, communication with MCAAP personnel, USAIPH personnel, and regulatory personnel. The log book will also discuss any deviations from the planned investigation activities.

4.2 Sample Identification. Each sample location will be assigned unique field identification according to the following code:

Groundwater Samples

MW-NDG-# or
MW-ODA-#

Where:
MW = monitoring well point.
NDG = Either New Demolition Area or Open Burning Grounds
ODA = Old Demolition Area.
# = Sequential sample number for each monitoring well location.

Existing monitoring wells to be sampled will retain their original well identifications. In addition, the following codes will be used for QA/QC samples:

EB = Equipment Blank
MS = Matrix Spike
MSD = Matrix Spike Duplicate
DUP = Field Duplicate

Soil Samples

SL-ODA-#
SL-NDA-#
SL-OBA-BP
SL-OBA-RP

Where:
SL = soil sampling point.
NDA = New Demolition Area
ODA = Old Demolition Area
OBA = Open Burning Grounds

Surface Water and Sediment Samples

SW/SD-NDA/ODA/NBG/REF--#-DUP/EB/MS/MSD/

Where:
SW=surface water sample
SD=sediment sample
NDA=New Detonation Area
ODA=Old Detonation Area
OBG=Open Burning Ground
REF=Reference Area
# = Sequential sample number for each sample
EB = Equipment Blank
MS = Matrix Spike
MSD = Matrix Spike Duplicate

DUP = Field Duplicate

4.3 Permanent Record Forms. Permanent records of field data for inclusion in the final reports will be recorded on well development summary forms and groundwater sampling summary forms (Appendix B).

5. SAMPLE PACKAGING AND SHIPPING REQUIREMENTS.

5.1 Sample Container Labeling, Storage and Shipment. Labels will be affixed to each sample container. Information on the sample labels will include the installation name, analytical parameter(s), preservative added, sample identification number, and date-time of collection. Sample containers will be packed in ice-filled coolers immediately after collection, preservation, and labeling. Sample coolers will be sealed with tape and chain-of-custody seals and shipped to the USAIPH laboratory at APG, Maryland.

6. INVESTIGATIVE DERIVED WASTES (IDW).

6.1 Types of IDW.

6.1.1 Materials that may become IDW are:

- Personal protective equipment (PPE) (e.g., disposable coveralls, gloves and booties).
- Disposable equipment (e.g., plastic ground and equipment covers, tubing, broken or unused containers, paper towels, and bailers).
- Groundwater obtained from well purging.
- Cleaning fluids such as decontamination washwater for water level probes and field measurement probes.
- Packing and shipping materials.

6.1.2 The IDW will be determined as hazardous or non-hazardous based on analytical testing or knowledge of the waste origin. Table 6-1 provides the disposal options for IDW. The generation of hazardous IDW is not anticipated. However, if laboratory results indicate evidence of groundwater contamination at the monitoring wells, the management of IDW will be reevaluated.

Table 6-1. Disposal of Investigative Derived Wastes

TYPE	Non-Hazardous
PPE-Disposable	Double bag waste. Place in nearest available dumpster.
Groundwater and Decontamination Water	Discharge to the ground surface away from the well. If groundwater demonstrates visual evidence of contamination (unusual odor or sheen), containerize in 55 – gallon drums or 5 - gallon buckets with tight fitting lids. Await waste characterization analyses prior to disposal.
Disposable Sampling Equipment	Double bag waste. Place in nearest available dumpster.
Trash	Double bag waste. Place in nearest available dumpster.

7. FIELD ASSESSMENT.

7.1 Quality Control.

The Project Manager and/or respective Project Officer will be responsible for quality control during the preparatory and initial portions of the project. A Senior Engineering Technician will be responsible for quality control during the sampling phase of the project.

7.2 Sampling Apparatus and Field Instrumentation Checklist.

Prior to sampling activities, the Project Manager will brief the sampling team on sample collection procedures. The sampling team will be required to review the SAP. Field instruments are checked by USAIPH personnel for proper operation (battery and calibration checks) monthly and before transport to a site. Maintenance is performed on field instrumentation in accordance with the manufacturers' recommendations. Calibration and maintenance of field instrumentation is recorded on calibration and maintenance forms that are maintained by USAIPH. Field instruments will also be checked for proper operation (battery and calibration checks) daily and necessary maintenance will be performed in accordance with manufacturers' recommendations during sample collections. Calibration and maintenance will be recorded in the field logbook. All calibrations and calibration checks will be documented on calibration forms (Appendix B). A duplicate set of field instruments will be available during sampling activities. All sample bottles used for groundwater sampling are obtained from the Directorate of Laboratory Sciences.

8. NONCONFORMANCE/CORRECTIVE ACTIONS.

The Project Manager, Project Officers and Senior Engineering Technicians will be responsible for implementation of the SAP. Any deviation from the SAP will be noted in the project field book. Potential deviations in the field may be related to conditions such as slow recharge that limited sample volumes collected from the well. If a monitoring well is damaged prior to sampling activities, the damage will be assessed and a determination made to representativeness of sample collection. Well maintenance will be performed on the well. If a well is damaged beyond repair, a replacement well will be installed, developed, purged and sampled following proper permitting with state and installation agencies.

In the event of sample container breakage or improper preservation applied to samples, a new sample will be collected. Upon receipt of groundwater samples, the laboratory will contact the project manager, who will resolve any discrepancies between the chain of custody (COC) and sample container labels. If necessary, additional samples will be collected as outlined in the SAP. Any other deviations from the SAP will be reported in the monitoring report.

APPENDIX A

REFERENCES

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16. U.S. Environmental Protection Agency (USEPA). 2006b. SW 846 Method 8330B, *Nitroaromatics, nitramines, and nitrate esters by high performance liquid chromatography (HPLC)*, Appendix A: Collecting and Processing of Representative Samples for Energetic Residues in Solid Matrices from Military Training Ranges. November. www.epa.gov/epaoswer/hazwaste/test/pdfs/8330b.pdf

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18. U.S. Environmental Protection Agency, 1996, Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels, Office of Water, Engineering and Analysis Division, Washington, D.C., 1996.

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APPENDIX B

FIELD RECORD FORMS

FIGURE B-1. REDOX AND DISSOLVED OXYGEN METER CALIBRATION FORM

U.S. Army Institute of Public Health
Water Resources Program

Pocket Meter Multiline P3
REDOX and DISSOLVED OXYGEN METER
Calibration Form

Manufacturer: WTW Measurement Systems **Model:______P3________** **Serial No.____________________** **MMCN:________**
3170 Metro Parkway
Ft. Myers, Fl. 33916 **ID.# :________**

Lo Battery Indication ____ No ______ Yes, Replace Batteries **Batteries Replaced ___ No ____Yes, Proceed**

REDOX Calibration

ORP Probe Model No: _Pt 4805 / S7 **ORP Probe Serial No:_____________**

REDOX Buffer Solution Manufacturer: Mettler Toledo GmbH
ProzeBanalytik
D-61449, Steinbach

REDOX Buffer Solution: Expiration Date___________ **Lot No:________________**

Redox Buffer Voltage ____ mV & Temperature Value of Redox Buffer_______
(Both From Bottle Data)

1. Probe full of electrolyte ___ No, Refill w/ KCL Solution ___ Yes, Proceed **2. Rinse probe, (*NEVER WIPE DRY)* ___**

3. Set measuring mode to the Redox mV function. **4. Immerse probe in redox buffer solution. (Wait for stability)**

Calibration Reading _____ mV
(Acceptable Range +/- 30mV)

Dissolved Oxygen Calibration

Dissolved Oxygen Probe Model No:_CELLOX 325_ **Dissolved Oxygen Probe Serial No: --------------**

1. Set measuring mode to dissolved oxygen. **2. Remove sensor from air chamber and moisten sponge_____**

3. Seal probe in air chamber, _____ Press Cal then Run. **4. Record relative slope of the probe_____ (Admissible Range 0.6-1.25)**

Temperature Calibration

Certified Thermometer Serial No. _______________ **Calibration Date:_____________________**

1. Set measuring mode to pH. **2. Place pH probe in distilled water or buffer solution along with thermometer ____ (Wait for a stable reading)**

3. Record Probe Reading _____ **4. Record Thermometer Reading ____**
(Admissible Range +/- 1 digit)

Technicians Signature:____________________ **Date:____________**

FIGURE B-2. CONDUCTIVITY, pH AND TEMPERATURE METER CALIBRATION FORM

U.S. Army Institute of Public Health

Water Resources Program

Pocket Meter Multiline P3
pH - Conductivity-Temperature
Calibration Form

Manufacturer: WTW Measurement Systems **Model:____P3________** **Serial No._____________** **MMCN:_________**
3170 Metro Parkway
Ft. Myers, Fl. 33916 **ID.# :_________**

Lo Battery Indication ____ No ______ Yes, Replace Batteries **Batteries Replaced ___ No ____Yes, Proceed**

pH Electrode Wet(After removing wetting cap) ____ No, Replace electrode or soak in neutral buffer solution for 24 hours
____ Yes, Proceed

pH Buffer Manufacturer: WTW Measurement Systems
3170 Metro Parkway
Ft. Myers, Fl. 33916

pH 4 Buffer Solution: Expiration Date_____________ Lot No.____________________
pH 7 Buffer Solution: Expiration Date_____________ Lot No.____________________

pH Two Point Calibration

pH / Temperature Probe Model No:_SENTIX41____ **pH Probe Serial No:__________**

1st Pt. 1. Rinse pH Probe:_____ 2. Set unit to pH mode and immerse in pH 7 Buffer Solution ____ 3. Press Cal, then Run.

Calibration Reading _______ _______ Adjusted Reading, Press Run _____mV Admissible Asymmetry Range(+/-30mV)

2nd Pt. 1. Rinse pH Probe:___ 2. Set unit to pH mode and immerse in pH 4or10 Buffer Solution ___ 3. Press Cal, then Run.

Calibration Reading ________ ________ Adjusted Reading, Press Run ________mV Slope
Admissible Slope Range (-50.0 mV/pH … -62.0 mV/pH)

One Point Conductivity Calibration

Conductivity Cell Model No:_Tetracon 325_ **Conductivity Cell Serial No:________________**
Conductivity Control Standard Solution Manufacturer: WTW Measurement Systems
3170 Metro Parkway
Ft. Myers, Fl. 33916
Conductivity Control Standard Solution: Expiration Date___________ **Lot No:________________**

1. Rinse Conductivity Cell ____ 2. Set unit to Conductivity measurement
3. Immerse in Control Standard Solution (0.01 mol/L KCL) ____ 4. Press Cal, then Run ____
5. Record Cell Constant ______(Acceptable 0.475/cm +/-0.025 /cm)

Temperature Calibration

Certified Thermometer Serial No. _______________ **Calibration Date:_____________________**

1. Set measuring mode to pH. 2. Place pH probe in distilled water or buffer solution along with thermometer ____
(Wait for a stable reading)
3. Record Probe Reading _____ 4. Record Thermometer Reading ____
(Admissible Range +/- 1 digit)

Technicians Signature:____________________ **Date:____________**

FIGURE B-3. WELL DEVELOPMENT LOG SHEET

U.S. ARMY INSTITUTE OF PUBLIC HEALTH
WELL DEVELOPMENT LOG
McAlester AAP, OK
Periodic Long Term Groundwater Monitoring
Open Burn and Open Detonation Sites

WELL DATA

Well ID: ________________________________ Sampler's Name: ______________________

Well Diameter: ___________________________ (inches)

Water Level from Top of Inner Casing ____________________(ft)

Well Depth: ____________ (feet)

Purge Volumes

Conversion Factor (CF): 4-inch monitoring well = 0.65 gallons per foot (gal/ft)

A well volume = Total well depth from top of inner casing – water level from top of inner casing * CF

One well volume: Three well volumes:

Well Purge & Sampling Method

Development Method(s): Θ Pump Θ Bailer Θ Combination

Type of pump & bailer material

FIELD PARAMETERS DURING DEVELOPMENT

Time	Cumulative Water Removed/ Flow	Temperature (Centigrade)	Conductivity (uS/cm)	pH su)	Turbidity (NTU)	Comments

Figure B-4. Groundwater Sampling Field Log Sheet

U.S. ARMY INSTITUTE OF PUBLIC HEALTH
GROUNDWATER SAMPLING FIELD LOG
McAlester AAP, OK
Periodic Long Term Groundwater Monitoring
Open Burn and Open Detonation Sites

Groundwater Sample ID:	**Sample Date/Time:**

Well Data

Well ID:
1. Well Casing/Open Borehole Diameter: _________
2. Total Well Depth: _________ (feet)
3. Water Level From Top of Well Casing: _________ (feet)
4. Sampler’s Name: ________________

Purge Volumes

Calculate [(2.) – (3.)] * *CF* = ________for 3 PV multiply by 3 = ________ (gallons)
where *CF* = 0.65 for 4-inch well casing [PV is in gallons]

Well Purge & Sampling Method

Purge Method: Θ Bladder Pump Θ Centrifugal Pump Θ Bailer
Sampling Method: Θ Bladder Pump Θ Centrifugal Pump Θ Bailer
FIELD PARAMETERS DURING PURGING

Time	Cumulative Water Removed/ Flow	Temperature (Centigrade)	Conductivity (uS/cm)	pH su)	Dissolved O_2 (ppm)	Turbidity (NTU)	ORP

Water Sampling Record of Analytical Parameters

Θ Explosives Θ Metals (Total) Θ Metals (Dissolved) Θ SVOCs
Θ Perchlorates Θ Nitrates/Nitrites

COMMENTS:

V 1.0

APPENDIX C

PROPOSED SOIL, SURFACE WATER AND SEDIMENT SAMPLING MAPS

Figure C-1. Overview of MCAAP Soil Sampling Unit Locations.

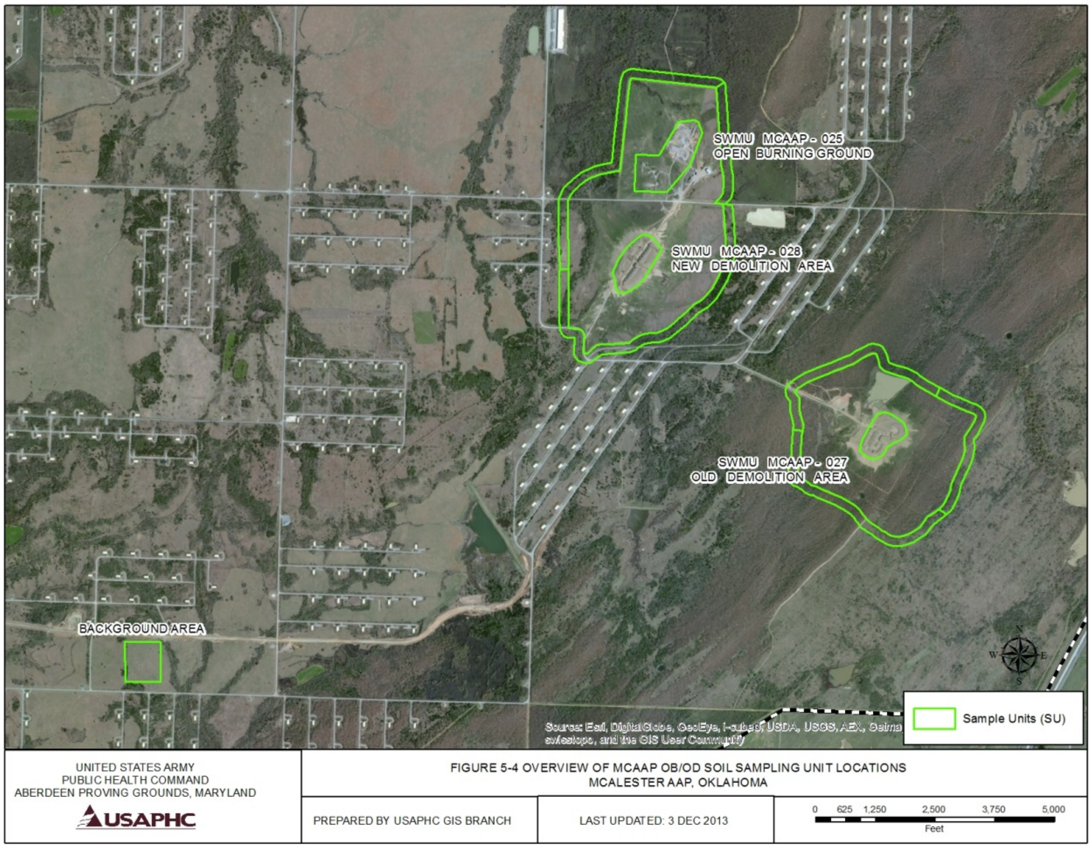


Figure C-2. SWMU MCAAP-027 (Old Demolition Area) Soil Monitoring Detection Sample Unit 1 Incremental Composite Sample Locations.

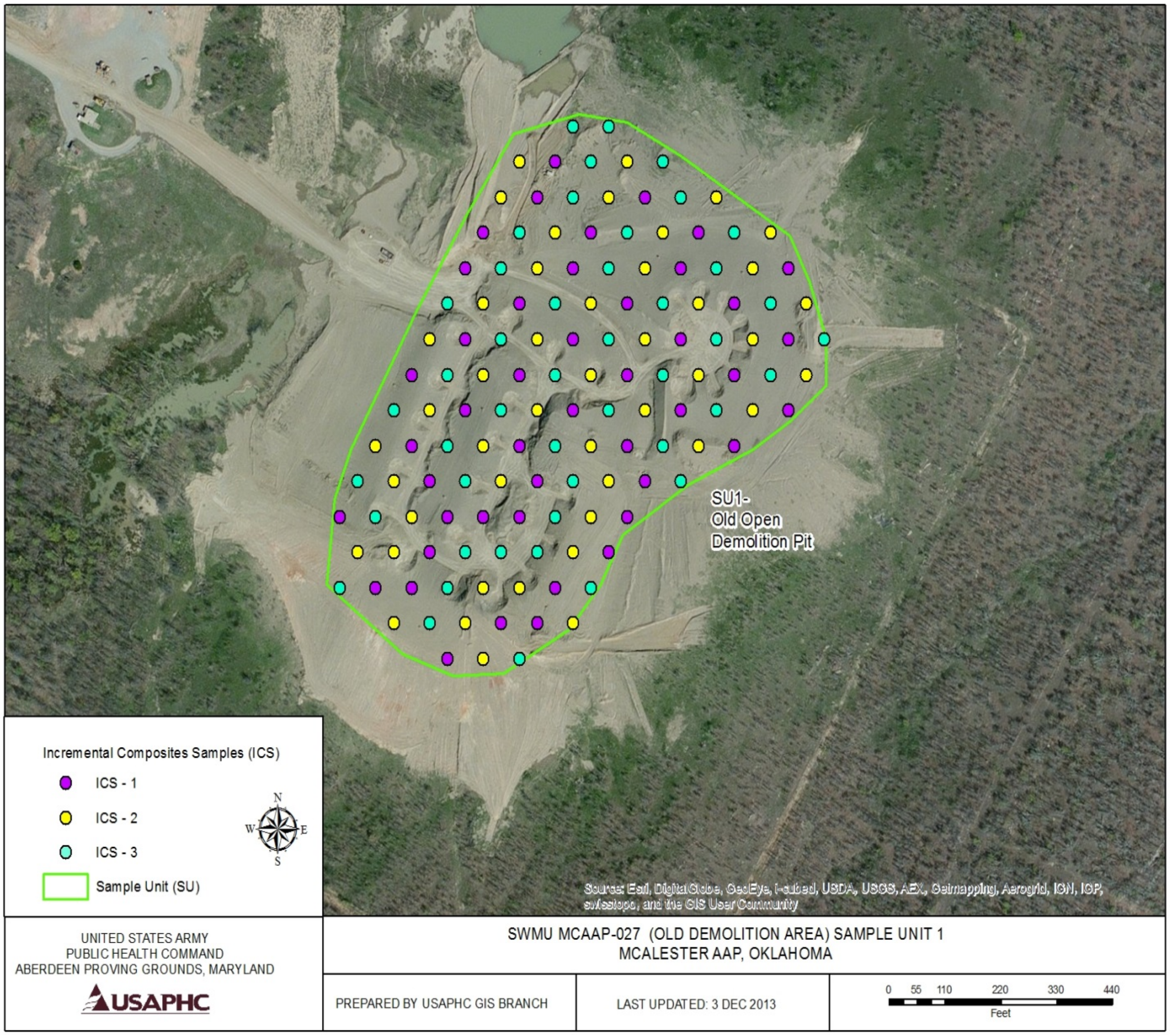
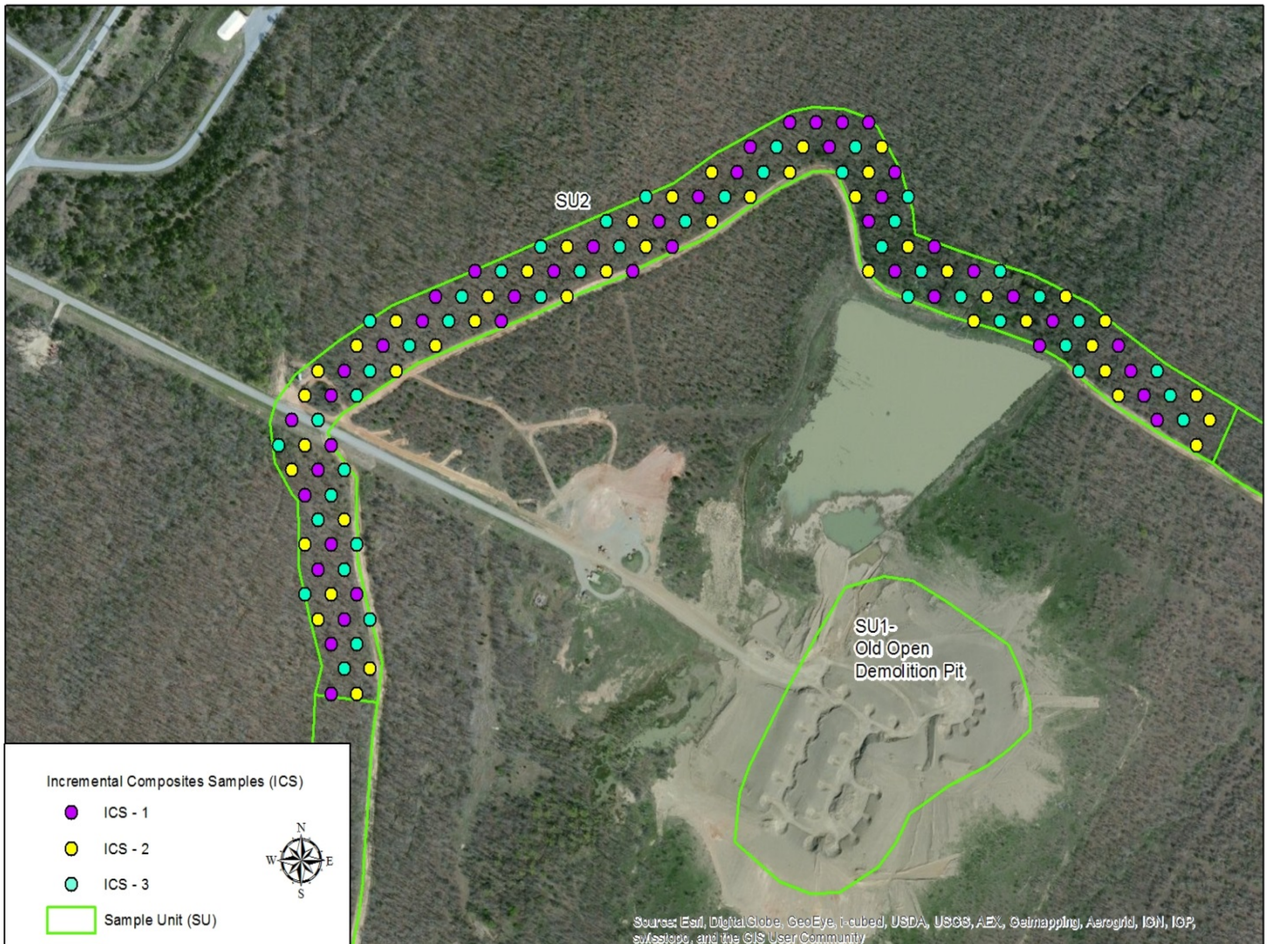


Figure C-3. Old Detonation Area Firebreak Sample Unit 2 Incremental Composite Sample Locations.



UNITED STATES ARMY PUBLIC HEALTH COMMAND ABERDEEN PROVING GROUNDS, MARYLAND USAPHC	SWMU MCAAP-027 (OLD DEMOLITION AREA FIRE BREAK) SAMPLING UNIT 2 MCALESTER AAP, OKLAHOMA	
PREPARED BY USAPHC GIS BRANCH	LAST UPDATED: 3 DEC 2013	0 100 200 400 600 800 Feet

Figure C-4. Old Detonation Area Firebreak Sample Unit 3, Incremental Composite Sample Locations.

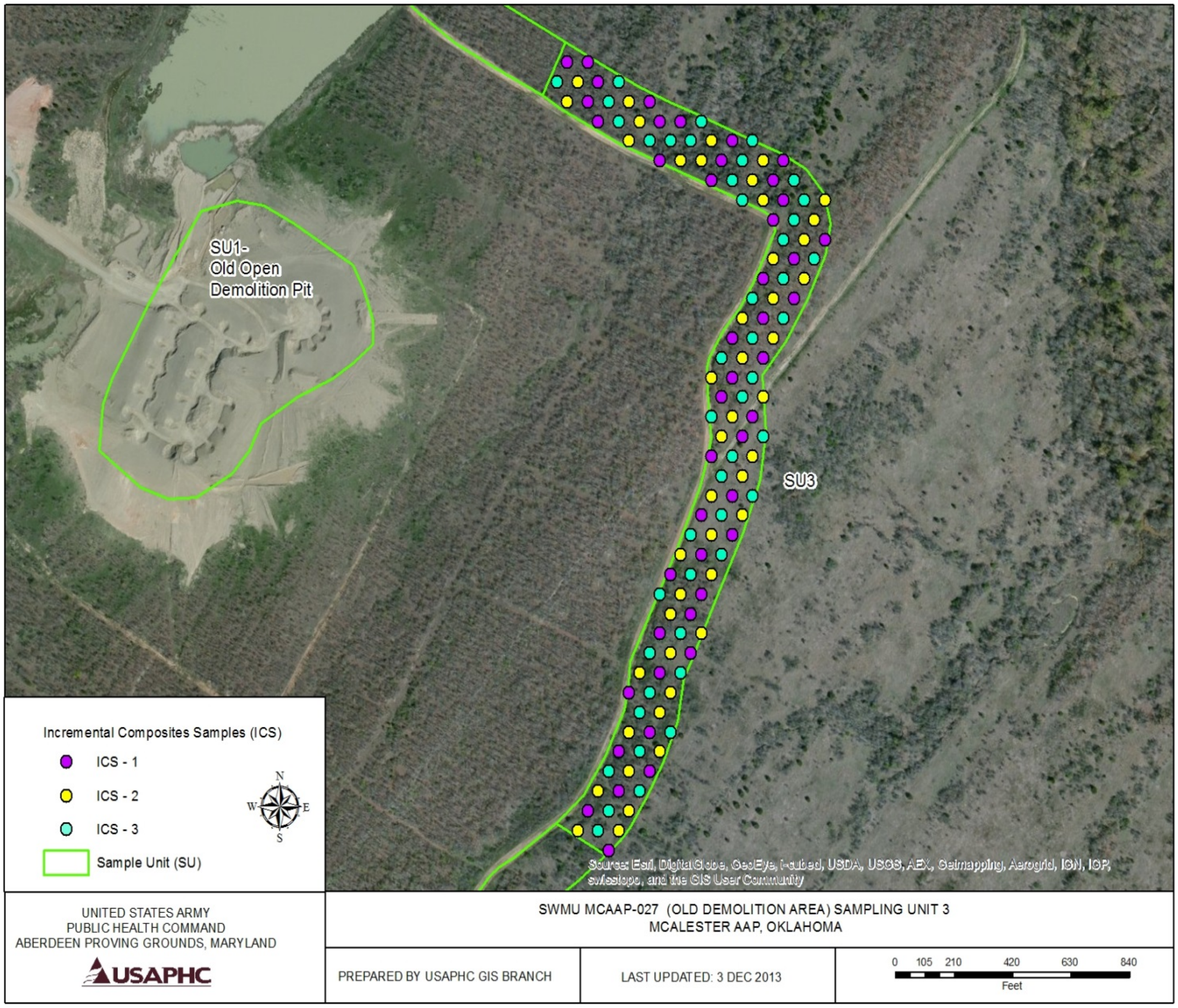


Figure C-5. Old Detonation Area Firebreak Sample Unit 4, Incremental Composite Sample Locations.

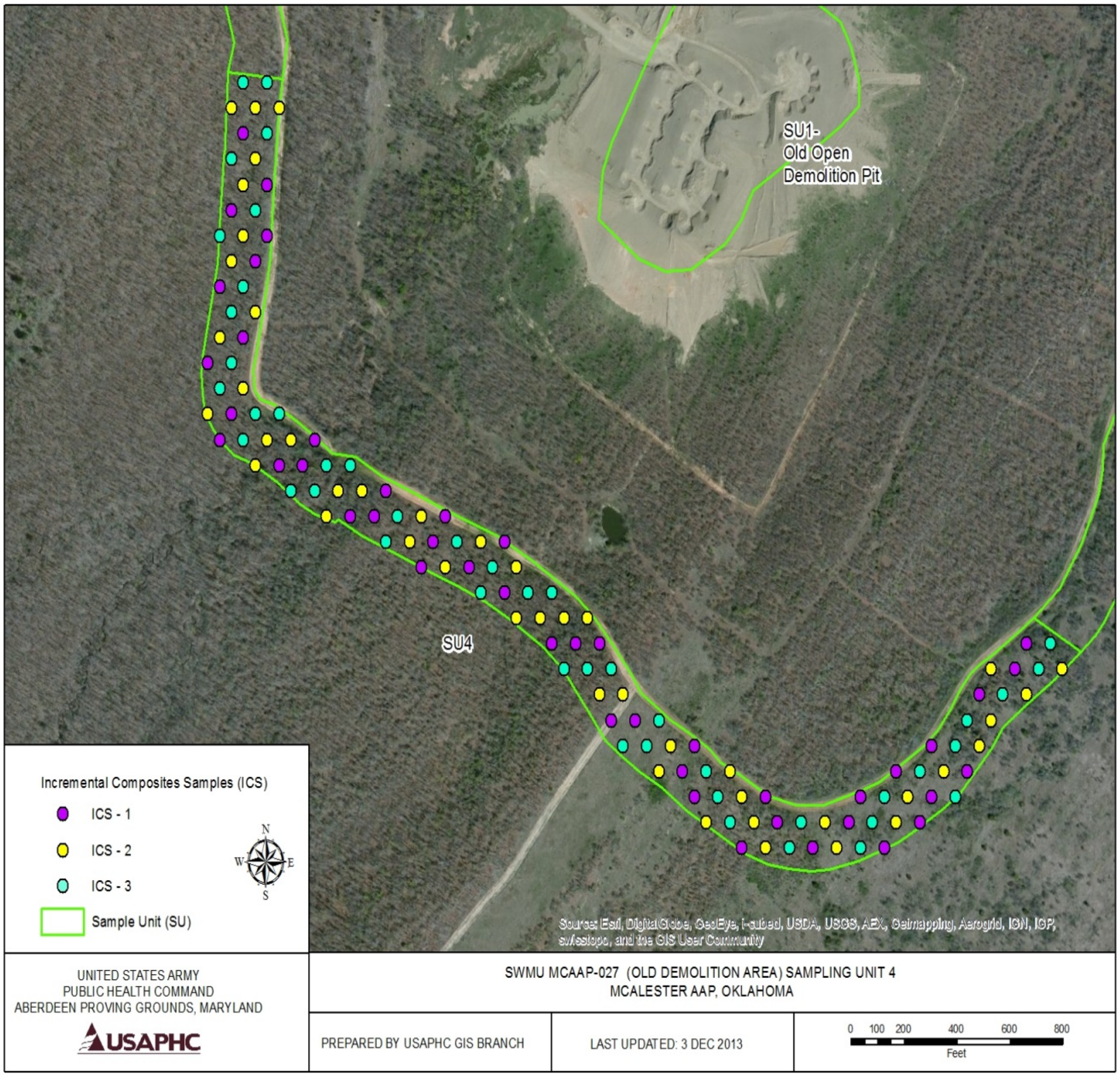


Figure C-6. SWMU MCAAP-025 (Open Burn Area) and SWMU MCAAP-028 (New Demolition Area), New OBOD Area Soil Monitoring Detection Sample Units 5 and 6, Incremental Composite Sample Locations.

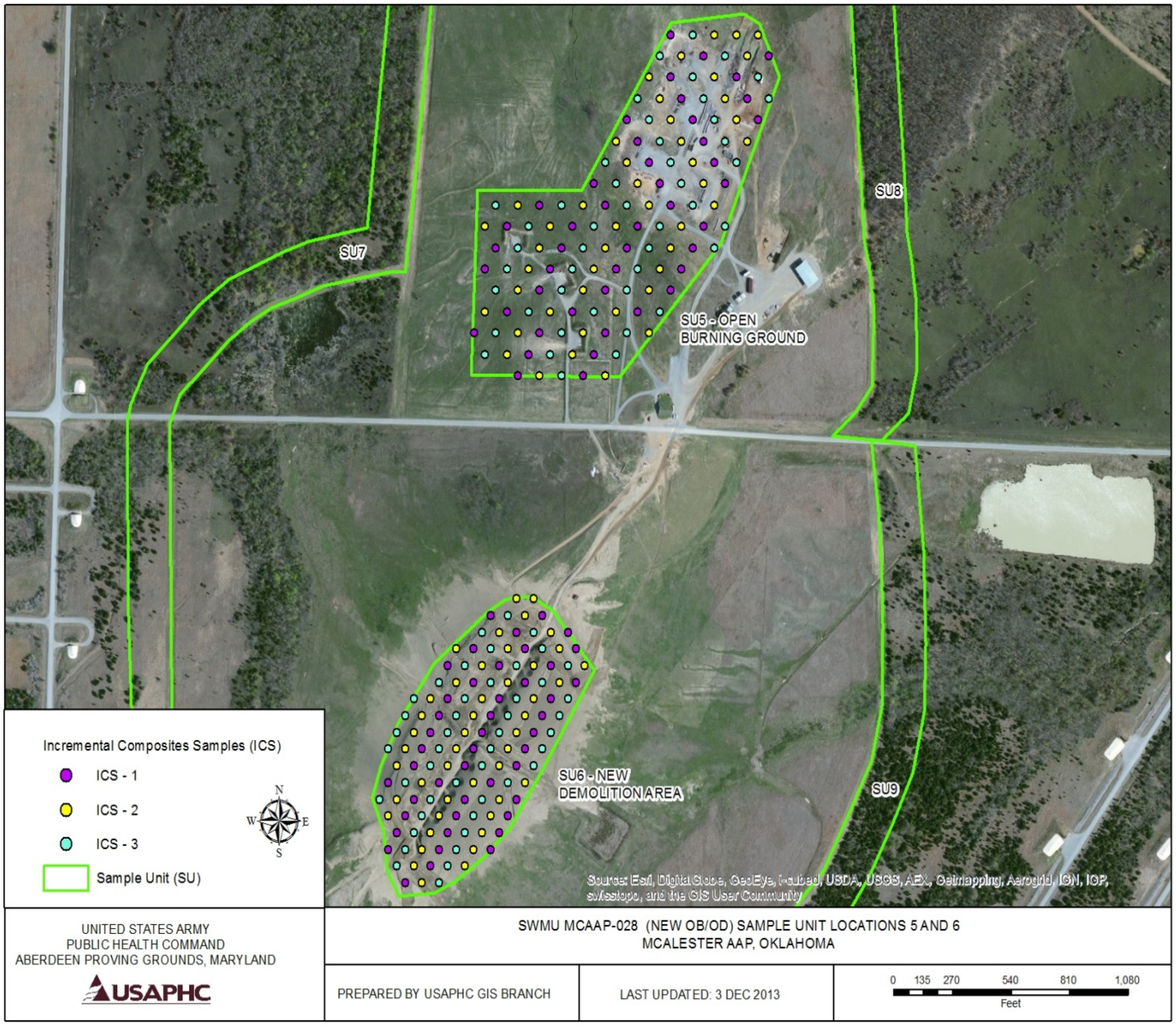


Figure C-7. New Open Burn/Open Detonation Area Firebreak Sample Unit 7, Incremental Composite Sample Locations.

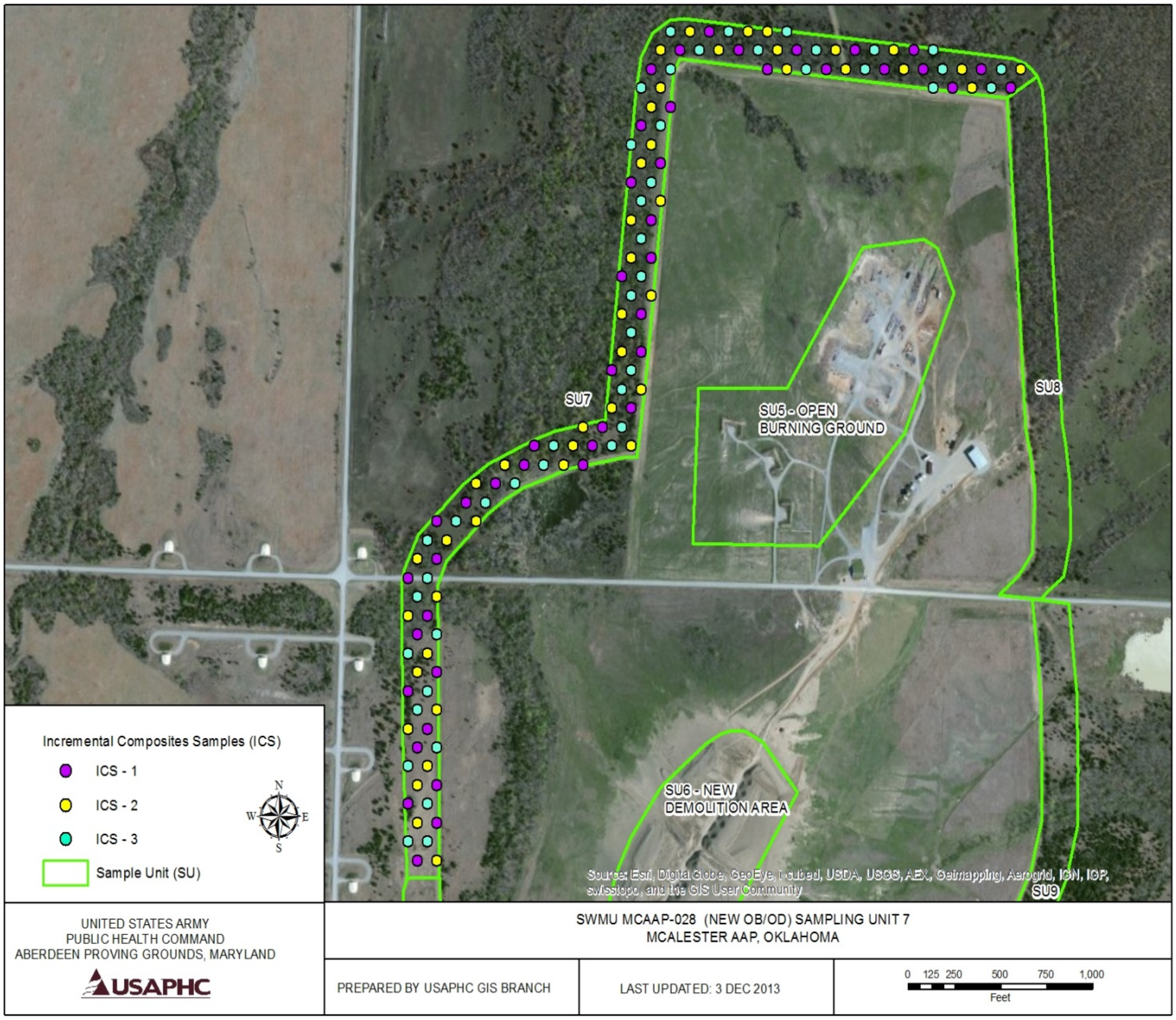


Figure C-8. New Open Burn/Open Detonation Area Firebreak Sample Unit 8, Incremental Composite Sample Locations.

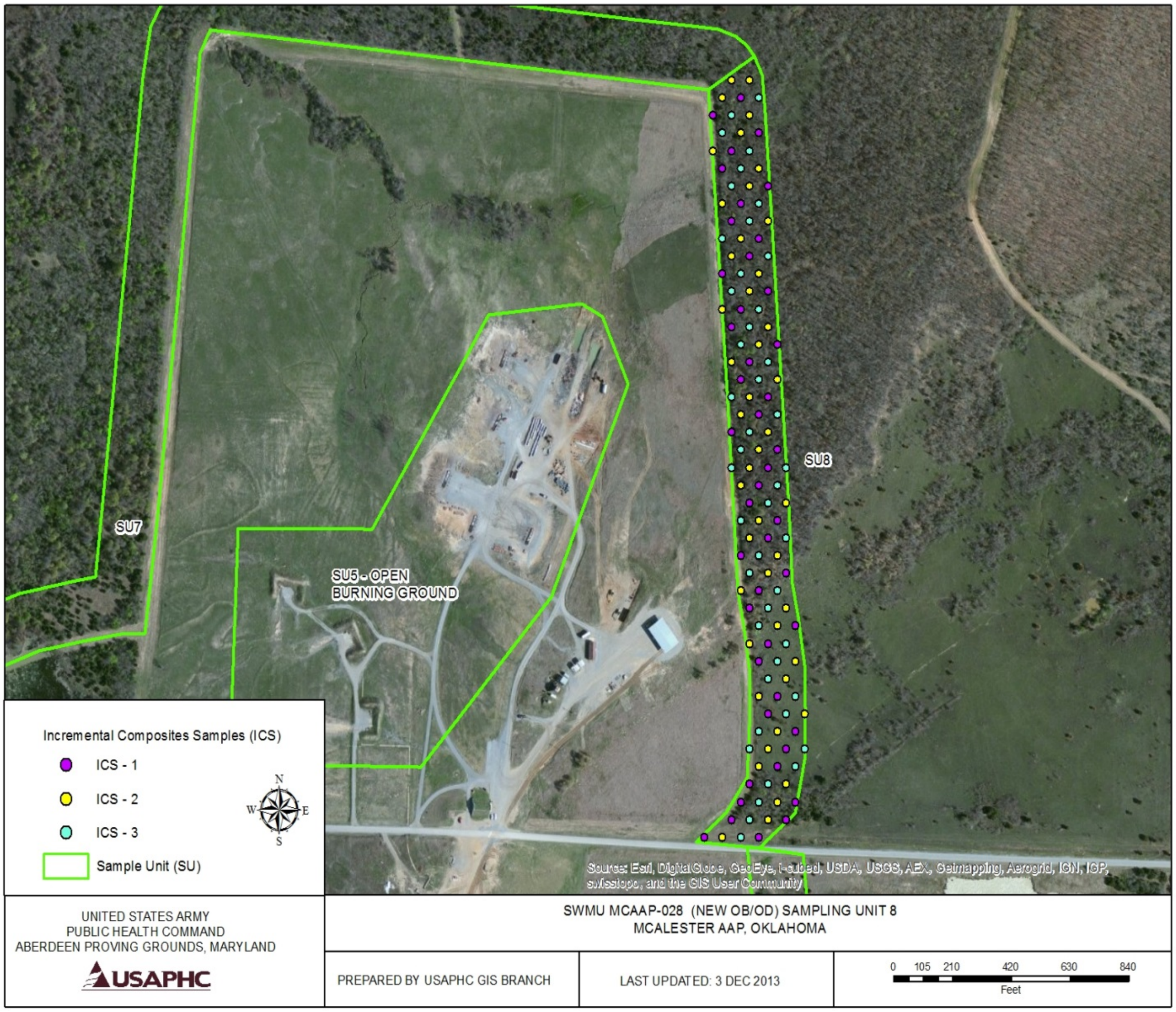


Figure C-9. New Open Burn/Open Detonation Area Firebreak Sample Unit 9, Incremental Composite Sample Locations.

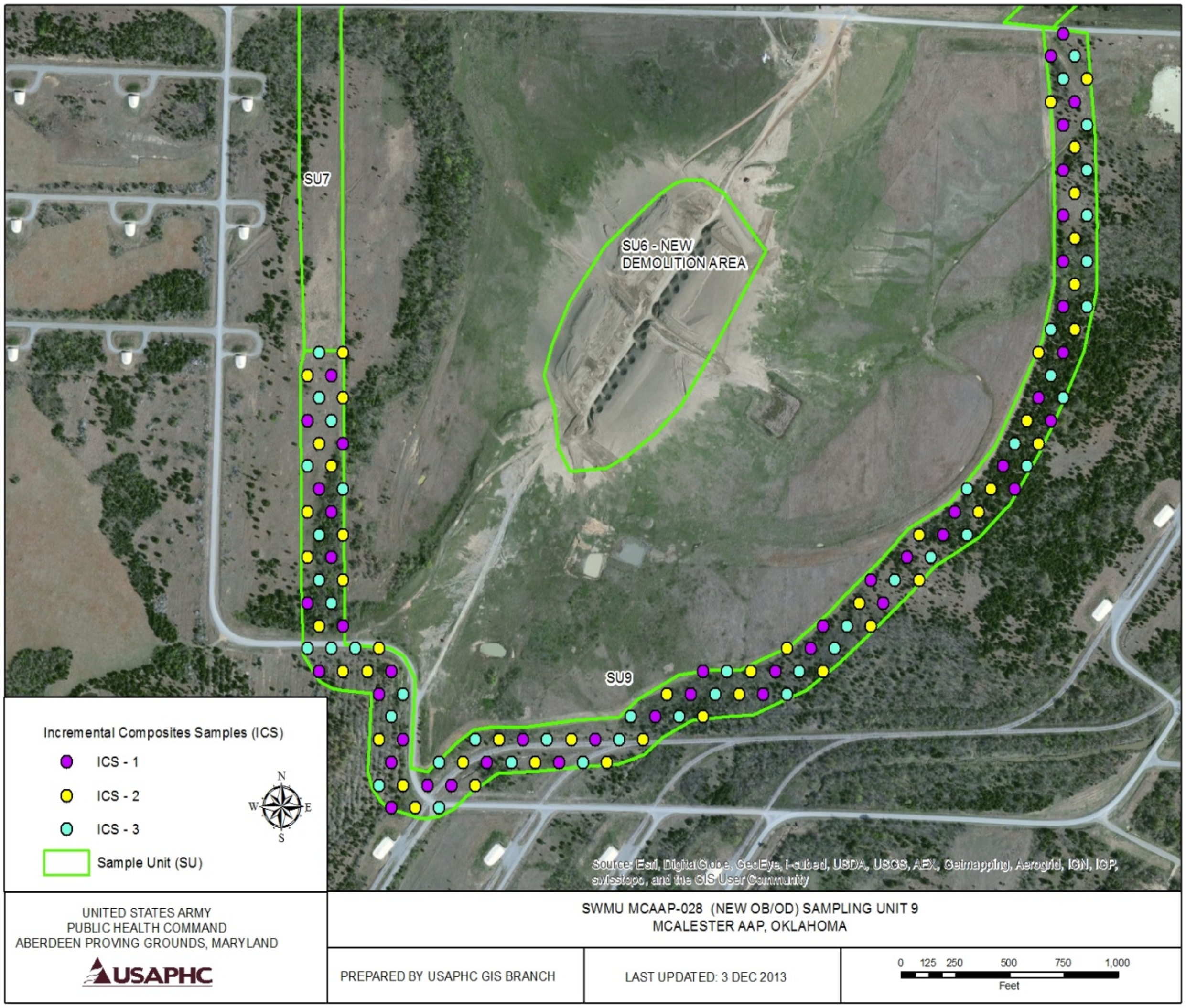


Figure C-10. Background Sample Area. Incremental Composite Sample Locations.

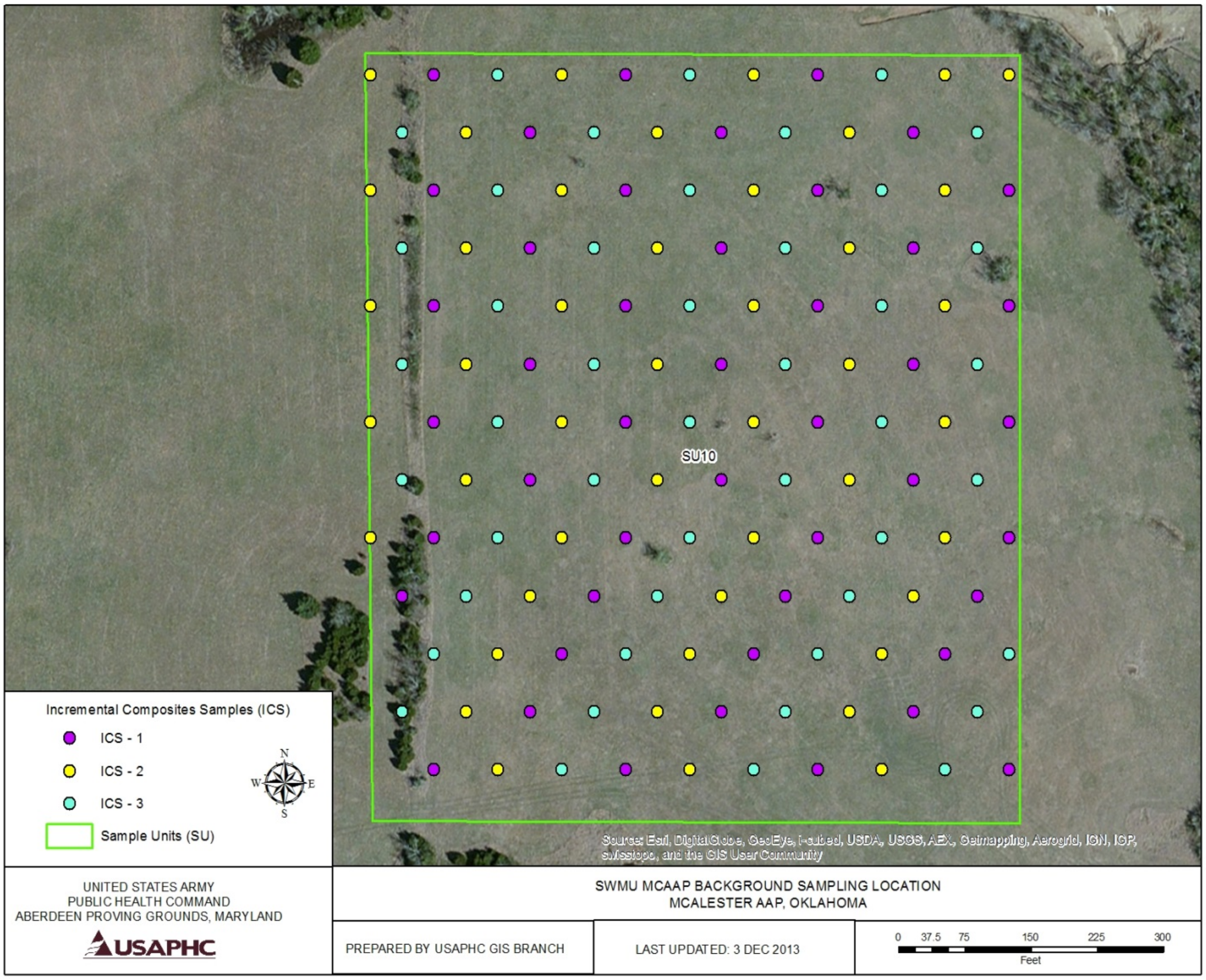


Figure C-11. Proposed Surface Water and Sediment Sample Locations, SWMUs MCAAP-25 (Open Burning Grounds) and MCAAP-028 (New Demolition Area), McAlester AAP, Oklahoma.

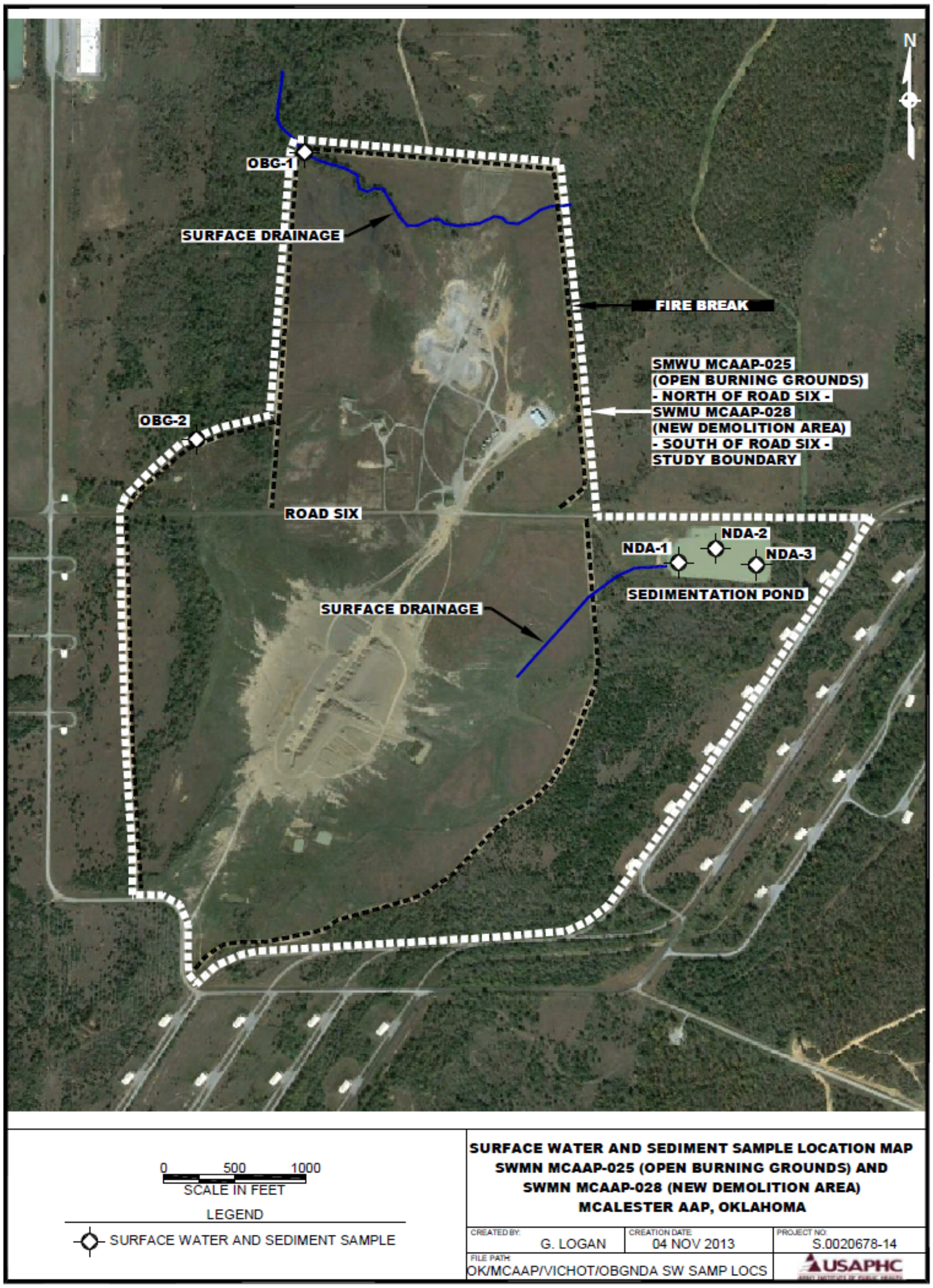
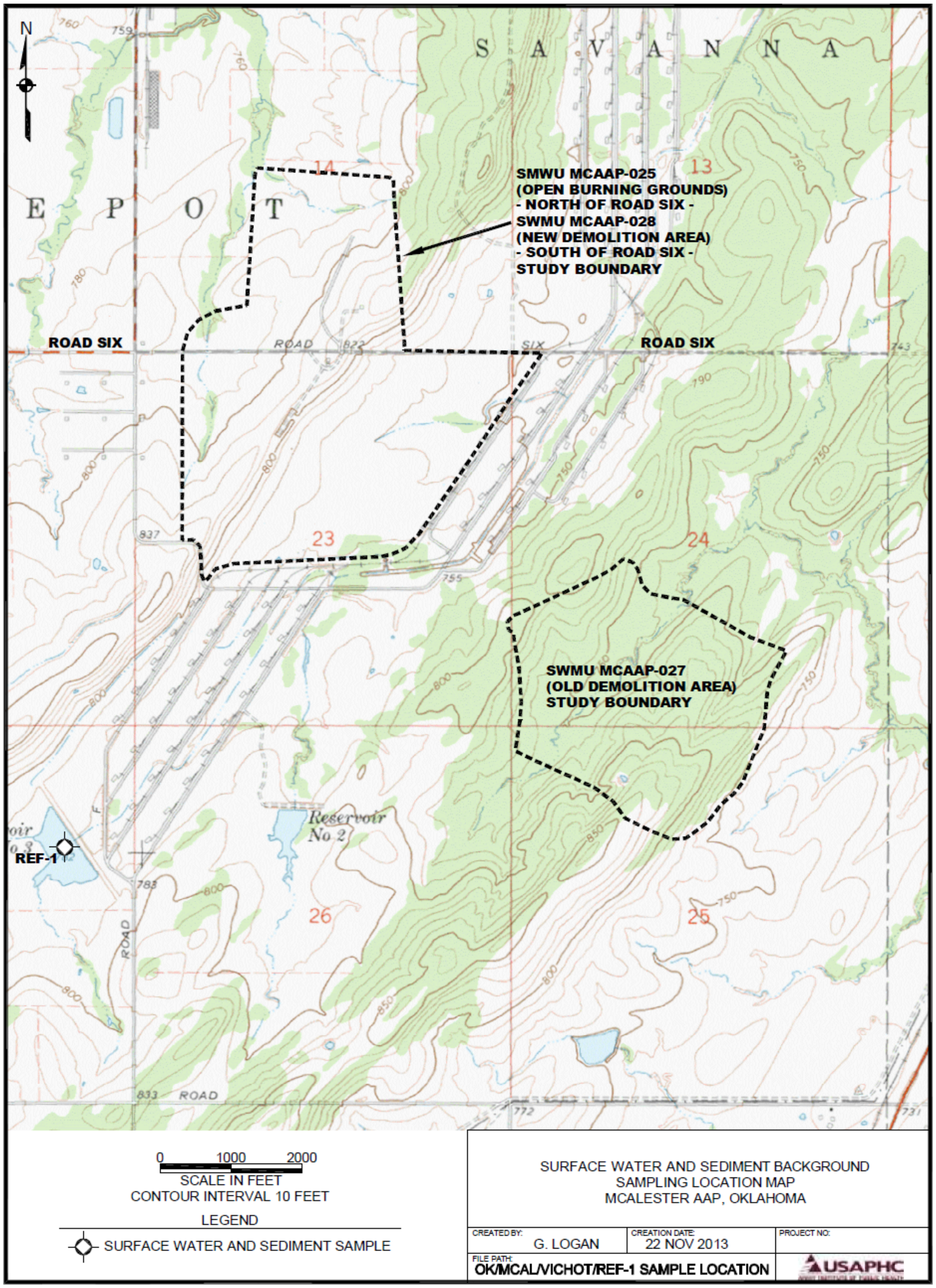


Figure C-12. Proposed Surface Water and Sediment Sample Locations, SWMU MCAAP-27 (Old Demolition Area), McAlester AAP, Oklahoma.

Figure C-13. Background Sample Area. Surface Water and Sediment Sample Location.



APPENDIX D

SOIL SAMPLE COORDINATE TABLES

TABLE D-1. SWMU MCAAP-027 (Old Demolition Area): SOIL MONITORING DETECTION SAMPLE UNIT 1 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-ODAPit-ICS1**		**Incremental Composite Sample**	**SL-ODAPit-ICS2**		**Incremental Composite Sample**	**SL-ODAPit-ICS3**	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	235228.456	13854331.671	Subsample 1	235250.0059	13854331.6707	Subsample 1	235271.556	13854331.671
Subsample 2	235260.781	13854350.333	Subsample 2	235196.132	13854350.333	Subsample 2	235217.681	13854350.333
Subsample 3	235282.330	13854350.333	Subsample 3	235239.231	13854350.333	Subsample 3	235163.807	13854368.996
Subsample 4	235185.357	13854368.996	Subsample 4	235303.880	13854350.333	Subsample 4	235228.456	13854368.996
Subsample 5	235206.907	13854368.996	Subsample 5	235250.006	13854368.996	Subsample 5	235314.655	13854368.996
Subsample 6	235293.105	13854368.996	Subsample 6	235271.556	13854368.996	Subsample 6	235239.231	13854387.658
Subsample 7	235217.681	13854387.658	Subsample 7	235174.582	13854387.658	Subsample 7	235260.781	13854387.658
Subsample 8	235325.430	13854387.658	Subsample 8	235196.132	13854387.658	Subsample 8	235282.330	13854387.658
Subsample 9	235163.807	13854406.321	Subsample 9	235303.880	13854387.658	Subsample 9	235185.357	13854406.321
Subsample 10	235228.456	13854406.321	Subsample 10	235206.907	13854406.321	Subsample 10	235293.105	13854406.321
Subsample 11	235250.006	13854406.321	Subsample 11	235314.655	13854406.321	Subsample 11	235174.582	13854424.983
Subsample 12	235271.556	13854406.321	Subsample 12	235196.132	13854424.983	Subsample 12	235239.231	13854424.983
Subsample 13	235336.205	13854406.321	Subsample 13	235260.781	13854424.983	Subsample 13	235303.880	13854424.983
Subsample 14	235217.681	13854424.983	Subsample 14	235325.430	13854424.983	Subsample 14	235368.529	13854424.983
Subsample 15	235282.330	13854424.983	Subsample 15	235185.357	13854443.646	Subsample 15	235228.456	13854443.646
Subsample 16	235346.979	13854424.983	Subsample 16	235250.006	13854443.646	Subsample 16	235293.105	13854443.646
Subsample 17	235206.907	13854443.646	Subsample 17	235314.655	13854443.646	Subsample 17	235357.754	13854443.646
Subsample 18	235271.556	13854443.646	Subsample 18	235379.304	13854443.646	Subsample 18	235196.132	13854462.309
Subsample 19	235336.205	13854443.646	Subsample 19	235217.681	13854462.309	Subsample 19	235260.781	13854462.309
Subsample 20	235400.853	13854443.646	Subsample 20	235282.330	13854462.309	Subsample 20	235325.430	13854462.309
Subsample 21	235239.231	13854462.309	Subsample 21	235346.979	13854462.309	Subsample 21	235390.079	13854462.309
Subsample 22	235303.880	13854462.309	Subsample 22	235411.628	13854462.309	Subsample 22	235228.456	13854480.971
Subsample 23	235368.529	13854462.309	Subsample 23	235250.006	13854480.971	Subsample 23	235293.105	13854480.971
Subsample 24	235433.178	13854462.309	Subsample 24	235314.655	13854480.971	Subsample 24	235357.754	13854480.971
Subsample 25	235206.907	13854480.971	Subsample 25	235379.304	13854480.971	Subsample 25	235422.403	13854480.971
Subsample 26	235271.556	13854480.971	Subsample 26	235443.953	13854480.971	Subsample 26	235260.781	13854499.634
Subsample 27	235336.205	13854480.971	Subsample 27	235217.681	13854499.634	Subsample 27	235325.430	13854499.634
Subsample 28	235400.853	13854480.971	Subsample 28	235282.330	13854499.634	Subsample 28	235390.079	13854499.634
Subsample 29	235239.231	13854499.634	Subsample 29	235346.979	13854499.634	Subsample 29	235454.728	13854499.634
Subsample 30	235303.880	13854499.634	Subsample 30	235411.628	13854499.634	Subsample 30	235228.456	13854518.296
Subsample 31	235368.529	13854499.634	Subsample 31	235250.006	13854518.296	Subsample 31	235293.105	13854518.296
Subsample 32	235433.178	13854499.634	Subsample 32	235314.655	13854518.296	Subsample 32	235357.754	13854518.296
Subsample 33	235271.556	13854518.296	Subsample 33	235379.304	13854518.296	Subsample 33	235422.403	13854518.296
Subsample 34	235336.205	13854518.296	Subsample 34	235443.953	13854518.296	Subsample 34	235260.781	13854536.959
Subsample 35	235400.853	13854518.296	Subsample 35	235282.330	13854536.959	Subsample 35	235325.430	13854536.959
Subsample 36	235239.231	13854536.959	Subsample 36	235346.979	13854536.959	Subsample 36	235390.079	13854536.959

Subsample 37	235303.880	13854536.959	Subsample 37	235411.628	13854536.959	Subsample 37	235271.556	13854555.621
Subsample 38	235368.529	13854536.959	Subsample 38	235293.105	13854555.621	Subsample 38	235336.205	13854555.621
Subsample 39	235433.178	13854536.959	Subsample 39	235357.754	13854555.621	Subsample 39	235400.853	13854555.621
Subsample 40	235250.006	13854555.621	Subsample 40	235422.403	13854555.621	Subsample 40	235303.880	13854574.284
Subsample 41	235314.655	13854555.621	Subsample 41	235260.781	13854574.284	Subsample 41	235368.529	13854574.284
Subsample 42	235379.304	13854555.621	Subsample 42	235325.430	13854574.284	Subsample 42	235314.655	13854592.946
Subsample 43	235282.330	13854574.284	Subsample 43	235390.079	13854574.284	Subsample 43	235357.754	13854592.946
Subsample 44	235346.979	13854574.284	Subsample 44	235271.556	13854592.946	Subsample 44	235303.880	13854611.609
Subsample 45	235293.105	13854592.946	Subsample 45	235336.205	13854592.946	Subsample 45	235325.430	13854611.609

TABLE D-2. SWMU MCAAP-028 (New Demolition Area): SOIL MONITORING DETECTION SAMPLE UNIT 6 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-NDA-Pit-ICS1**		**Incremental Composite Sample**	**SL-NDA-Pit-ICS2**		**Incremental Composite Sample**	**SL-NDA-Pit-ICS3**	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	233627.615	13855394.008	Subsample 1	233651.695	13855394.008	Subsample 1	233675.775	13855394.008
Subsample 2	233663.735	13855414.862	Subsample 2	233639.655	13855414.862	Subsample 2	233615.575	13855414.862
Subsample 3	233603.535	13855435.716	Subsample 3	233711.895	13855414.862	Subsample 3	233687.815	13855414.862
Subsample 4	233675.775	13855435.716	Subsample 4	233651.695	13855435.716	Subsample 4	233627.615	13855435.716
Subsample 5	233748.016	13855435.716	Subsample 5	233723.935	13855435.716	Subsample 5	233699.855	13855435.716
Subsample 6	233615.575	13855456.570	Subsample 6	233663.735	13855456.570	Subsample 6	233639.655	13855456.570
Subsample 7	233687.815	13855456.570	Subsample 7	233735.976	13855456.570	Subsample 7	233711.895	13855456.570
Subsample 8	233760.056	13855456.570	Subsample 8	233603.535	13855477.424	Subsample 8	233651.695	13855477.424
Subsample 9	233627.615	13855477.424	Subsample 9	233675.775	13855477.424	Subsample 9	233723.935	13855477.424
Subsample 10	233699.855	13855477.424	Subsample 10	233748.016	13855477.424	Subsample 10	233591.495	13855498.278
Subsample 11	233772.096	13855477.424	Subsample 11	233615.575	13855498.278	Subsample 11	233663.735	13855498.278
Subsample 12	233639.655	13855498.278	Subsample 12	233687.815	13855498.278	Subsample 12	233735.976	13855498.278
Subsample 13	233711.895	13855498.278	Subsample 13	233760.056	13855498.278	Subsample 13	233627.615	13855519.132
Subsample 14	233784.136	13855498.278	Subsample 14	233651.695	13855519.132	Subsample 14	233699.855	13855519.132
Subsample 15	233603.535	13855519.132	Subsample 15	233723.935	13855519.132	Subsample 15	233772.096	13855519.132
Subsample 16	233675.775	13855519.132	Subsample 16	233796.176	13855519.132	Subsample 16	233663.735	13855539.986
Subsample 17	233748.016	13855519.132	Subsample 17	233615.575	13855539.986	Subsample 17	233735.976	13855539.986
Subsample 18	233639.655	13855539.986	Subsample 18	233687.815	13855539.986	Subsample 18	233808.216	13855539.986
Subsample 19	233711.895	13855539.986	Subsample 19	233760.056	13855539.986	Subsample 19	233603.535	13855560.840
Subsample 20	233784.136	13855539.986	Subsample 20	233627.615	13855560.840	Subsample 20	233675.775	13855560.840
Subsample 21	233651.695	13855560.840	Subsample 21	233699.855	13855560.840	Subsample 21	233748.016	13855560.840
Subsample 22	233723.935	13855560.840	Subsample 22	233772.096	13855560.840	Subsample 22	233820.256	13855560.840
Subsample 23	233796.176	13855560.840	Subsample 23	233639.655	13855581.694	Subsample 23	233615.575	13855581.694
Subsample 24	233663.735	13855581.694	Subsample 24	233711.895	13855581.694	Subsample 24	233687.815	13855581.694
Subsample 25	233735.976	13855581.694	Subsample 25	233784.136	13855581.694	Subsample 25	233760.056	13855581.694
Subsample 26	233808.216	13855581.694	Subsample 26	233651.695	13855602.548	Subsample 26	233832.296	13855581.694
Subsample 27	233675.775	13855602.548	Subsample 27	233723.935	13855602.548	Subsample 27	233627.615	13855602.548
Subsample 28	233748.016	13855602.548	Subsample 28	233796.176	13855602.548	Subsample 28	233699.855	13855602.548
Subsample 29	233820.256	13855602.548	Subsample 29	233663.735	13855623.402	Subsample 29	233772.096	13855602.548
Subsample 30	233687.815	13855623.402	Subsample 30	233735.976	13855623.402	Subsample 30	233844.336	13855602.548
Subsample 31	233760.056	13855623.402	Subsample 31	233808.216	13855623.402	Subsample 31	233639.655	13855623.402
Subsample 32	233832.296	13855623.402	Subsample 32	233699.855	13855644.256	Subsample 32	233711.895	13855623.402
Subsample 33	233723.935	13855644.256	Subsample 33	233772.096	13855644.256	Subsample 33	233784.136	13855623.402
Subsample 34	233796.176	13855644.256	Subsample 34	233844.336	13855644.256	Subsample 34	233856.376	13855623.402
Subsample 35	233868.416	13855644.256	Subsample 35	233735.976	13855665.110	Subsample 35	233675.775	13855644.256

Subsample 36	233687.815	13855665.110	Subsample 36	233808.216	13855665.110	Subsample 36	233748.016	13855644.256
Subsample 37	233760.056	13855665.110	Subsample 37	233880.456	13855665.110	Subsample 37	233820.256	13855644.256
Subsample 38	233832.296	13855665.110	Subsample 38	233699.855	13855685.964	Subsample 38	233711.895	13855665.110
Subsample 39	233723.935	13855685.964	Subsample 39	233772.096	13855685.964	Subsample 39	233784.136	13855665.110
Subsample 40	233796.176	13855685.964	Subsample 40	233844.336	13855685.964	Subsample 40	233856.376	13855665.110
Subsample 41	233868.416	13855685.964	Subsample 41	233760.056	13855706.818	Subsample 41	233748.016	13855685.964
Subsample 42	233784.136	13855706.818	Subsample 42	233832.296	13855706.818	Subsample 42	233820.256	13855685.964
Subsample 43	233856.376	13855706.818	Subsample 43	233796.176	13855727.672	Subsample 43	233735.976	13855706.818
Subsample 44	233748.016	13855727.672	Subsample 44	233784.136	13855748.526	Subsample 44	233808.216	13855706.818
Subsample 45	233820.256	13855727.672	Subsample 45	233808.216	13855748.526	Subsample 45	233772.096	13855727.672

TABLE D-3. SWMU MCAAP-025 (Open Burning Ground): SOIL MONITORING DETECTION SAMPLE UNIT 5 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-OBA-ICS1**		**Incremental Composite Sample**	**SL-OBA-ICS2**		**Incremental Composite Sample**	**SL-OBA-ICS3**	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	233786.063	13856026.975	Subsample 1	233816.787	13856026.975	Subsample 1	233847.511	13856026.975
Subsample 2	233878.235	13856026.975	Subsample 2	233908.959	13856026.975	Subsample 2	233739.977	13856053.583
Subsample 3	233801.425	13856053.583	Subsample 3	233770.701	13856053.583	Subsample 3	233832.149	13856053.583
Subsample 4	233893.597	13856053.583	Subsample 4	233862.873	13856053.583	Subsample 4	233924.320	13856053.583
Subsample 5	233724.615	13856080.191	Subsample 5	233786.063	13856080.191	Subsample 5	233755.339	13856080.191
Subsample 6	233816.787	13856080.191	Subsample 6	233878.235	13856080.191	Subsample 6	233847.511	13856080.191
Subsample 7	233908.959	13856080.191	Subsample 7	233970.406	13856080.191	Subsample 7	233939.682	13856080.191
Subsample 8	233770.701	13856106.798	Subsample 8	233739.977	13856106.798	Subsample 8	233801.425	13856106.798
Subsample 9	233862.873	13856106.798	Subsample 9	233832.149	13856106.798	Subsample 9	233893.597	13856106.798
Subsample 10	233955.044	13856106.798	Subsample 10	233924.320	13856106.798	Subsample 10	233985.768	13856106.798
Subsample 11	233816.787	13856133.406	Subsample 11	233786.063	13856133.406	Subsample 11	233755.339	13856133.406
Subsample 12	233908.959	13856133.406	Subsample 12	233878.235	13856133.406	Subsample 12	233847.511	13856133.406
Subsample 13	234001.130	13856133.406	Subsample 13	233970.406	13856133.406	Subsample 13	233939.682	13856133.406
Subsample 14	233739.977	13856160.014	Subsample 14	233801.425	13856160.014	Subsample 14	233770.701	13856160.014
Subsample 15	233832.149	13856160.014	Subsample 15	233893.597	13856160.014	Subsample 15	233862.873	13856160.014
Subsample 16	233924.320	13856160.014	Subsample 16	233985.768	13856160.014	Subsample 16	233955.044	13856160.014
Subsample 17	234016.492	13856160.014	Subsample 17	233816.787	13856186.621	Subsample 17	233786.063	13856186.621
Subsample 18	233755.339	13856186.621	Subsample 18	233908.959	13856186.621	Subsample 18	233878.235	13856186.621
Subsample 19	233847.511	13856186.621	Subsample 19	234001.130	13856186.621	Subsample 19	233970.406	13856186.621
Subsample 20	233939.682	13856186.621	Subsample 20	233739.977	13856213.229	Subsample 20	234062.578	13856186.621
Subsample 21	234031.854	13856186.621	Subsample 21	233832.149	13856213.229	Subsample 21	233801.425	13856213.229
Subsample 22	233770.701	13856213.229	Subsample 22	233924.320	13856213.229	Subsample 22	233893.597	13856213.229
Subsample 23	233862.873	13856213.229	Subsample 23	234016.492	13856213.229	Subsample 23	233985.768	13856213.229
Subsample 24	233955.044	13856213.229	Subsample 24	233786.063	13856239.837	Subsample 24	234077.940	13856213.229
Subsample 25	234047.216	13856213.229	Subsample 25	233878.235	13856239.837	Subsample 25	233755.339	13856239.837
Subsample 26	233816.787	13856239.837	Subsample 26	233970.406	13856239.837	Subsample 26	233847.511	13856239.837
Subsample 27	233908.959	13856239.837	Subsample 27	234062.578	13856239.837	Subsample 27	233939.682	13856239.837
Subsample 28	234001.130	13856239.837	Subsample 28	233955.044	13856266.444	Subsample 28	234031.854	13856239.837
Subsample 29	233893.597	13856266.444	Subsample 29	234047.216	13856266.444	Subsample 29	233924.320	13856266.444
Subsample 30	233985.768	13856266.444	Subsample 30	233939.682	13856293.052	Subsample 30	234016.492	13856266.444
Subsample 31	234077.940	13856266.444	Subsample 31	234031.854	13856293.052	Subsample 31	233908.959	13856293.052
Subsample 32	233970.406	13856293.052	Subsample 32	233924.320	13856319.660	Subsample 32	234001.130	13856293.052
Subsample 33	234062.578	13856293.052	Subsample 33	234016.492	13856319.660	Subsample 33	234093.302	13856293.052
Subsample 34	233955.044	13856319.660	Subsample 34	234108.664	13856319.660	Subsample 34	233985.768	13856319.660
Subsample 35	234047.216	13856319.660	Subsample 35	234001.130	13856346.267	Subsample 35	234077.940	13856319.660

Subsample 36	233939.682	13856346.267	Subsample 36	234093.302	13856346.267	Subsample 36	233970.406	13856346.267
Subsample 37	234031.854	13856346.267	Subsample 37	233985.768	13856372.875	Subsample 37	234062.578	13856346.267
Subsample 38	234124.026	13856346.267	Subsample 38	234077.940	13856372.875	Subsample 38	233955.044	13856372.875
Subsample 39	234016.492	13856372.875	Subsample 39	233970.406	13856399.483	Subsample 39	234047.216	13856372.875
Subsample 40	234108.664	13856372.875	Subsample 40	234062.578	13856399.483	Subsample 40	234139.388	13856372.875
Subsample 41	234001.130	13856399.483	Subsample 41	234016.492	13856426.090	Subsample 41	234031.854	13856399.483
Subsample 42	234093.302	13856399.483	Subsample 42	234108.664	13856426.090	Subsample 42	234124.026	13856399.483
Subsample 43	234047.216	13856426.090	Subsample 43	234062.578	13856452.698	Subsample 43	233985.768	13856426.090
Subsample 44	234139.388	13856426.090	Subsample 44	234093.302	13856452.698	Subsample 44	234077.940	13856426.090
Subsample 45	234001.130	13856452.698	Subsample 45	234124.026	13856452.698	Subsample 45	234031.854	13856452.698

TABLE D-4. OLD DETONATION AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 2 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-ODA-FBSU2-ICS1**		**Incremental Composite Sample**	**SL-ODA-FBSU2-ICS2**		**Incremental Composite Sample**	**SL-ODA-FBSU2-ICS3**	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	234745.080	13854508.672	Subsample 1	234771.761	13854508.672	Subsample 1	234758.420	13854531.779
Subsample 2	234745.080	13854554.885	Subsample 2	234785.101	13854531.779	Subsample 2	234771.761	13854554.885
Subsample 3	234758.420	13854577.991	Subsample 3	234731.739	13854577.991	Subsample 3	234785.101	13854577.991
Subsample 4	234771.761	13854601.098	Subsample 4	234745.080	13854601.098	Subsample 4	234718.399	13854601.098
Subsample 5	234731.739	13854624.204	Subsample 5	234718.399	13854647.310	Subsample 5	234758.420	13854624.204
Subsample 6	234745.080	13854647.310	Subsample 6	234758.420	13854670.417	Subsample 6	234771.761	13854647.310
Subsample 7	234718.399	13854693.523	Subsample 7	234705.059	13854716.629	Subsample 7	234731.739	13854670.417
Subsample 8	234731.739	13854716.629	Subsample 8	234718.399	13854739.736	Subsample 8	234745.080	13854693.523
Subsample 9	234745.080	13854739.736	Subsample 9	235625.550	13854739.736	Subsample 9	234758.420	13854716.629
Subsample 10	234705.059	13854762.842	Subsample 10	235638.890	13854762.842	Subsample 10	234691.718	13854739.736
Subsample 11	235585.528	13854762.842	Subsample 11	234718.399	13854785.948	Subsample 11	234731.739	13854762.842
Subsample 12	234745.080	13854785.948	Subsample 12	235545.507	13854785.948	Subsample 12	235612.209	13854762.842
Subsample 13	235572.188	13854785.948	Subsample 13	235625.550	13854785.948	Subsample 13	234771.761	13854785.948
Subsample 14	234758.420	13854809.055	Subsample 14	234731.739	13854809.055	Subsample 14	235598.869	13854785.948
Subsample 15	235558.847	13854809.055	Subsample 15	234811.782	13854809.055	Subsample 15	234785.101	13854809.055
Subsample 16	234798.442	13854832.161	Subsample 16	235532.166	13854809.055	Subsample 16	235505.486	13854809.055
Subsample 17	235465.464	13854832.161	Subsample 17	234771.761	13854832.161	Subsample 17	235585.528	13854809.055
Subsample 18	235545.507	13854832.161	Subsample 18	234851.804	13854832.161	Subsample 18	234825.123	13854832.161
Subsample 19	234838.463	13854855.267	Subsample 19	235518.826	13854832.161	Subsample 19	235492.145	13854832.161
Subsample 20	234918.506	13854855.267	Subsample 20	234811.782	13854855.267	Subsample 20	234785.101	13854855.267
Subsample 21	235478.805	13854855.267	Subsample 21	234891.825	13854855.267	Subsample 21	234865.144	13854855.267
Subsample 22	234851.804	13854878.374	Subsample 22	235398.762	13854855.267	Subsample 22	235425.443	13854855.267
Subsample 23	234931.846	13854878.374	Subsample 23	235452.124	13854855.267	Subsample 23	235505.486	13854855.267
Subsample 24	235358.741	13854878.374	Subsample 24	235532.166	13854855.267	Subsample 24	234878.484	13854878.374
Subsample 25	235438.783	13854878.374	Subsample 25	234905.165	13854878.374	Subsample 25	234958.527	13854878.374
Subsample 26	234891.825	13854901.480	Subsample 26	234985.208	13854878.374	Subsample 26	235332.060	13854878.374
Subsample 27	234971.868	13854901.480	Subsample 27	235412.102	13854878.374	Subsample 27	235385.421	13854878.374
Subsample 28	235051.910	13854901.480	Subsample 28	235492.145	13854878.374	Subsample 28	235465.464	13854878.374
Subsample 29	235318.719	13854901.480	Subsample 29	234945.187	13854901.480	Subsample 29	234918.506	13854901.480
Subsample 30	235398.762	13854901.480	Subsample 30	235025.229	13854901.480	Subsample 30	234998.548	13854901.480
Subsample 31	235011.889	13854924.586	Subsample 31	235292.038	13854901.480	Subsample 31	235345.400	13854901.480
Subsample 32	235091.932	13854924.586	Subsample 32	235372.081	13854901.480	Subsample 32	235425.443	13854901.480
Subsample 33	235358.741	13854924.586	Subsample 33	234985.208	13854924.586	Subsample 33	234958.527	13854924.586
Subsample 34	235078.591	13854947.693	Subsample 34	235065.251	13854924.586	Subsample 34	235038.570	13854924.586
Subsample 35	235292.038	13854947.693	Subsample 35	235332.060	13854924.586	Subsample 35	235305.379	13854924.586

Subsample 36	235118.612	13854970.799	Subsample 36	235051.910	13854947.693	Subsample 36	235025.229	13854947.693
Subsample 37	235305.379	13854970.799	Subsample 37	235131.953	13854947.693	Subsample 37	235105.272	13854947.693
Subsample 38	235158.634	13854993.905	Subsample 38	235091.932	13854970.799	Subsample 38	235318.719	13854947.693
Subsample 39	235318.719	13854993.905	Subsample 39	235171.974	13854970.799	Subsample 39	235065.251	13854970.799
Subsample 40	235171.974	13855017.012	Subsample 40	235278.698	13854970.799	Subsample 40	235145.293	13854970.799
Subsample 41	235252.017	13855017.012	Subsample 41	235131.953	13854993.905	Subsample 41	235332.060	13854970.799
Subsample 42	235211.996	13855040.118	Subsample 42	235211.996	13854993.905	Subsample 42	235185.315	13854993.905
Subsample 43	235238.677	13855040.118	Subsample 43	235292.038	13854993.905	Subsample 43	235265.357	13854993.905
Subsample 44	235265.357	13855040.118	Subsample 44	235225.336	13855017.012	Subsample 44	235198.655	13855017.012
Subsample 45	235292.038	13855040.118	Subsample 45	235305.379	13855017.012	Subsample 45	235278.698	13855017.012

TABLE D-5. OLD DETONATION AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 3 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-ODA-FBSU3-ICS1**		**Incremental Composite Sample**	**SL-ODA-FBSU3-ICS2**		**Incremental Composite Sample**	**SL-ODA-FBSU3-ICS3**	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	235713.701	13853974.304	Subsample 1	235679.876	13853993.833	Subsample 1	235702.426	13853993.833
Subsample 2	235691.151	13854013.362	Subsample 2	235724.976	13853993.833	Subsample 2	235713.701	13854013.362
Subsample 3	235724.976	13854032.891	Subsample 3	235736.251	13854013.362	Subsample 3	235747.526	13854032.891
Subsample 4	235758.801	13854052.420	Subsample 4	235702.426	13854032.891	Subsample 4	235713.701	13854052.420
Subsample 5	235724.976	13854071.949	Subsample 5	235736.251	13854052.420	Subsample 5	235747.526	13854071.949
Subsample 6	235758.801	13854091.478	Subsample 6	235770.076	13854071.949	Subsample 6	235781.351	13854091.478
Subsample 7	235736.251	13854130.536	Subsample 7	235736.251	13854091.478	Subsample 7	235747.526	13854111.007
Subsample 8	235770.076	13854150.065	Subsample 8	235770.076	13854111.007	Subsample 8	235758.801	13854130.536
Subsample 9	235803.902	13854169.594	Subsample 9	235781.351	13854130.536	Subsample 9	235792.626	13854150.065
Subsample 10	235770.076	13854189.123	Subsample 10	235747.526	13854150.065	Subsample 10	235758.801	13854169.594
Subsample 11	235803.902	13854208.652	Subsample 11	235781.351	13854169.594	Subsample 11	235792.626	13854189.123
Subsample 12	235815.177	13854228.181	Subsample 12	235815.177	13854189.123	Subsample 12	235770.076	13854228.181
Subsample 13	235781.351	13854247.710	Subsample 13	235781.351	13854208.652	Subsample 13	235803.902	13854247.710
Subsample 14	235815.177	13854267.239	Subsample 14	235792.626	13854228.181	Subsample 14	235837.727	13854267.239
Subsample 15	235849.002	13854286.768	Subsample 15	235826.452	13854247.710	Subsample 15	235803.902	13854286.768
Subsample 16	235815.177	13854306.297	Subsample 16	235792.626	13854267.239	Subsample 16	235837.727	13854306.297
Subsample 17	235849.002	13854325.826	Subsample 17	235826.452	13854286.768	Subsample 17	235871.552	13854325.826
Subsample 18	235826.452	13854364.884	Subsample 18	235860.277	13854306.297	Subsample 18	235837.727	13854345.355
Subsample 19	235860.277	13854384.413	Subsample 19	235826.452	13854325.826	Subsample 19	235849.002	13854364.884
Subsample 20	235871.552	13854403.942	Subsample 20	235860.277	13854345.355	Subsample 20	235882.827	13854384.413
Subsample 21	235837.727	13854423.471	Subsample 21	235871.552	13854364.884	Subsample 21	235826.452	13854403.942
Subsample 22	235849.002	13854443.000	Subsample 22	235837.727	13854384.413	Subsample 22	235860.277	13854423.471
Subsample 23	235882.827	13854462.529	Subsample 23	235849.002	13854403.942	Subsample 23	235871.552	13854443.000
Subsample 24	235849.002	13854482.058	Subsample 24	235882.827	13854423.471	Subsample 24	235837.727	13854462.529
Subsample 25	235882.827	13854501.587	Subsample 25	235826.452	13854443.000	Subsample 25	235871.552	13854482.058
Subsample 26	235916.652	13854521.116	Subsample 26	235860.277	13854462.529	Subsample 26	235905.377	13854501.587
Subsample 27	235882.827	13854540.645	Subsample 27	235894.102	13854482.058	Subsample 27	235871.552	13854521.116
Subsample 28	235916.652	13854560.174	Subsample 28	235860.277	13854501.587	Subsample 28	235905.377	13854540.645
Subsample 29	235950.477	13854579.703	Subsample 29	235894.102	13854521.116	Subsample 29	235939.202	13854560.174
Subsample 30	235894.102	13854599.232	Subsample 30	235927.927	13854540.645	Subsample 30	235905.377	13854579.703
Subsample 31	235905.377	13854618.761	Subsample 31	235894.102	13854560.174	Subsample 31	235916.652	13854599.232
Subsample 32	235826.452	13854638.290	Subsample 32	235927.927	13854579.703	Subsample 32	235860.277	13854618.761
Subsample 33	235894.102	13854638.290	Subsample 33	235939.202	13854599.232	Subsample 33	235927.927	13854618.761
Subsample 34	235770.076	13854657.819	Subsample 34	235882.827	13854618.761	Subsample 34	235849.002	13854638.290
Subsample 35	235837.727	13854657.819	Subsample 35	235950.477	13854618.761	Subsample 35	235916.652	13854638.290

Subsample 36	235905.377	13854657.819	Subsample 36	235871.552	13854638.290	Subsample 36	235860.277	13854657.819
Subsample 37	235849.002	13854677.348	Subsample 37	235792.626	13854657.819	Subsample 37	235758.801	13854677.348
Subsample 38	235702.426	13854696.877	Subsample 38	235815.177	13854657.819	Subsample 38	235781.351	13854677.348
Subsample 39	235770.076	13854696.877	Subsample 39	235882.827	13854657.819	Subsample 39	235803.902	13854677.348
Subsample 40	235792.626	13854696.877	Subsample 40	235736.251	13854677.348	Subsample 40	235871.552	13854677.348
Subsample 41	235691.151	13854716.406	Subsample 41	235826.452	13854677.348	Subsample 41	235724.976	13854696.877
Subsample 42	235758.801	13854716.406	Subsample 42	235747.526	13854696.877	Subsample 42	235815.177	13854696.877
Subsample 43	235702.426	13854735.935	Subsample 43	235668.601	13854716.406	Subsample 43	235713.701	13854716.406
Subsample 44	235668.601	13854755.464	Subsample 44	235736.251	13854716.406	Subsample 44	235657.326	13854735.935
Subsample 45	235691.151	13854755.464	Subsample 45	235679.876	13854735.935	Subsample 45	235724.976	13854735.935

TABLE D-6. OLD DETONATION AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 4 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	SL-ODA-FBSU4-ICS1		Incremental Composite Sample	SL-ODA-FBSU4-ICS2		Incremental Composite Sample	SL-ODA-FBSU4-ICS3	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	235320.419	13853787.582	Subsample 1	235347.744	13853787.582	Subsample 1	235375.069	13853787.582
Subsample 2	235402.394	13853787.582	Subsample 2	235429.720	13853787.582	Subsample 2	235457.045	13853787.582
Subsample 3	235484.370	13853787.582	Subsample 3	235279.431	13853811.246	Subsample 3	235306.756	13853811.246
Subsample 4	235361.407	13853811.246	Subsample 4	235334.081	13853811.246	Subsample 4	235388.732	13853811.246
Subsample 5	235443.382	13853811.246	Subsample 5	235416.057	13853811.246	Subsample 5	235470.707	13853811.246
Subsample 6	235525.358	13853811.246	Subsample 6	235498.032	13853811.246	Subsample 6	235293.094	13853834.911
Subsample 7	235265.769	13853834.911	Subsample 7	235320.419	13853834.911	Subsample 7	235484.370	13853834.911
Subsample 8	235347.744	13853834.911	Subsample 8	235511.695	13853834.911	Subsample 8	235566.345	13853834.911
Subsample 9	235457.045	13853834.911	Subsample 9	235224.781	13853858.575	Subsample 9	235279.431	13853858.575
Subsample 10	235539.020	13853834.911	Subsample 10	235306.756	13853858.575	Subsample 10	235525.358	13853858.575
Subsample 11	235252.106	13853858.575	Subsample 11	235552.683	13853858.575	Subsample 11	235183.793	13853882.239
Subsample 12	235498.032	13853858.575	Subsample 12	235238.443	13853882.239	Subsample 12	235211.118	13853882.239
Subsample 13	235580.008	13853858.575	Subsample 13	235593.671	13853882.239	Subsample 13	235566.345	13853882.239
Subsample 14	235265.769	13853882.239	Subsample 14	235607.333	13853905.904	Subsample 14	235224.781	13853905.904
Subsample 15	235539.020	13853882.239	Subsample 15	235156.468	13853929.568	Subsample 15	235580.008	13853905.904
Subsample 16	235170.130	13853905.904	Subsample 16	235183.793	13853929.568	Subsample 16	235620.996	13853929.568
Subsample 17	235197.456	13853905.904	Subsample 17	235648.321	13853929.568	Subsample 17	235115.480	13853953.232
Subsample 18	235593.671	13853929.568	Subsample 18	235607.333	13853953.232	Subsample 18	235142.805	13853953.232
Subsample 19	235634.658	13853953.232	Subsample 19	235689.309	13853953.232	Subsample 19	235170.130	13853953.232
Subsample 20	235101.818	13853976.896	Subsample 20	235060.830	13854000.561	Subsample 20	235661.983	13853953.232
Subsample 21	235129.143	13853976.896	Subsample 21	235088.155	13854000.561	Subsample 21	235675.646	13853976.896
Subsample 22	235156.468	13853976.896	Subsample 22	235115.480	13854000.561	Subsample 22	235019.842	13854024.225
Subsample 23	235648.321	13853976.896	Subsample 23	235142.805	13854000.561	Subsample 23	235074.492	13854024.225
Subsample 24	235047.167	13854024.225	Subsample 24	234978.854	13854047.889	Subsample 24	235101.818	13854024.225
Subsample 25	234951.529	13854047.889	Subsample 25	235060.830	13854047.889	Subsample 25	235033.505	13854047.889
Subsample 26	235006.180	13854047.889	Subsample 26	234937.867	13854071.554	Subsample 26	234910.541	13854071.554
Subsample 27	234965.192	13854071.554	Subsample 27	235019.842	13854071.554	Subsample 27	234992.517	13854071.554
Subsample 28	235047.167	13854071.554	Subsample 28	234842.229	13854095.218	Subsample 28	234924.204	13854095.218
Subsample 29	234869.554	13854095.218	Subsample 29	234951.529	13854095.218	Subsample 29	234801.241	13854118.882
Subsample 30	234896.879	13854095.218	Subsample 30	234855.891	13854118.882	Subsample 30	234828.566	13854118.882
Subsample 31	234978.854	13854095.218	Subsample 31	234883.216	13854118.882	Subsample 31	234842.229	13854142.546
Subsample 32	234910.541	13854118.882	Subsample 32	234760.253	13854142.546	Subsample 32	234869.554	13854142.546
Subsample 33	234787.578	13854142.546	Subsample 33	234773.916	13854166.211	Subsample 33	234746.590	13854166.211
Subsample 34	234814.903	13854142.546	Subsample 34	234801.241	13854166.211	Subsample 34	234760.253	13854189.875
Subsample 35	234719.265	13854166.211	Subsample 35	234705.603	13854189.875	Subsample 35	234787.578	13854189.875

Subsample 36	234828.566	13854166.211	Subsample 36	234746.590	13854213.539	Subsample 36	234719.265	13854213.539
Subsample 37	234732.928	13854189.875	Subsample 37	234719.265	13854260.868	Subsample 37	234732.928	13854237.204
Subsample 38	234705.603	13854237.204	Subsample 38	234760.253	13854284.532	Subsample 38	234732.928	13854284.532
Subsample 39	234746.590	13854260.868	Subsample 39	234732.928	13854331.861	Subsample 39	234746.590	13854308.196
Subsample 40	234719.265	13854308.196	Subsample 40	234746.590	13854355.525	Subsample 40	234719.265	13854355.525
Subsample 41	234760.253	13854331.861	Subsample 41	234746.590	13854402.854	Subsample 41	234760.253	13854379.189
Subsample 42	234773.916	13854355.525	Subsample 42	234760.253	13854426.518	Subsample 42	234732.928	13854426.518
Subsample 43	234732.928	13854379.189	Subsample 43	234732.928	13854473.846	Subsample 43	234773.916	13854450.182
Subsample 44	234773.916	13854402.854	Subsample 44	234760.253	13854473.846	Subsample 44	234746.590	13854497.511
Subsample 45	234746.590	13854450.182	Subsample 45	234787.578	13854473.846	Subsample 45	234773.916	13854497.511

TABLE D-7. NEW OBOD AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 7 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-NDA-FBSU7-ICS1**		**Incremental Composite Sample**	**SL-NDA-FBSU7-ICS2**		**Incremental Composite Sample**	**SL-NDA-FBSU7-ICS3**	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	233367.446	13854945.359	Subsample 1	233401.166	13854945.359	Subsample 1	233434.885	13854945.359
Subsample 2	233418.025	13854974.561	Subsample 2	233384.306	13854974.561	Subsample 2	233350.586	13854974.561
Subsample 3	233451.745	13854974.561	Subsample 3	233485.464	13854974.561	Subsample 3	233434.885	13855003.763
Subsample 4	233367.446	13855003.763	Subsample 4	233468.604	13855003.763	Subsample 4	233536.043	13855003.763
Subsample 5	233502.324	13855003.763	Subsample 5	233569.763	13855003.763	Subsample 5	233637.201	13855003.763
Subsample 6	233603.482	13855003.763	Subsample 6	233670.921	13855003.763	Subsample 6	233485.464	13855032.964
Subsample 7	233384.306	13855032.964	Subsample 7	233350.586	13855032.964	Subsample 7	233586.622	13855032.964
Subsample 8	233552.903	13855032.964	Subsample 8	233519.184	13855032.964	Subsample 8	233687.781	13855032.964
Subsample 9	233654.061	13855032.964	Subsample 9	233620.342	13855032.964	Subsample 9	233367.446	13855062.166
Subsample 10	233738.360	13855062.166	Subsample 10	233721.500	13855032.964	Subsample 10	233704.640	13855062.166
Subsample 11	233350.586	13855091.368	Subsample 11	233805.798	13855062.166	Subsample 11	233772.079	13855062.166
Subsample 12	233788.939	13855091.368	Subsample 12	233755.219	13855091.368	Subsample 12	233384.306	13855091.368
Subsample 13	233890.097	13855091.368	Subsample 13	233856.378	13855091.368	Subsample 13	233822.658	13855091.368
Subsample 14	233266.288	13855120.570	Subsample 14	233300.007	13855120.570	Subsample 14	233923.816	13855091.368
Subsample 15	233367.446	13855120.570	Subsample 15	233333.727	13855120.570	Subsample 15	233839.518	13855120.570
Subsample 16	233805.798	13855120.570	Subsample 16	233873.237	13855120.570	Subsample 16	233940.676	13855120.570
Subsample 17	233906.957	13855120.570	Subsample 17	233974.396	13855120.570	Subsample 17	233249.428	13855149.772
Subsample 18	233957.536	13855149.772	Subsample 18	233350.586	13855149.772	Subsample 18	233283.148	13855149.772
Subsample 19	233300.007	13855178.974	Subsample 19	233923.816	13855149.772	Subsample 19	233316.867	13855149.772
Subsample 20	233974.396	13855178.974	Subsample 20	233266.288	13855178.974	Subsample 20	233991.255	13855149.772
Subsample 21	233249.428	13855208.176	Subsample 21	234041.834	13855178.974	Subsample 21	234008.115	13855178.974
Subsample 22	234058.694	13855208.176	Subsample 22	234024.975	13855208.176	Subsample 22	233283.148	13855208.176
Subsample 23	234041.834	13855237.378	Subsample 23	233300.007	13855237.378	Subsample 23	233266.288	13855237.378
Subsample 24	233283.148	13855266.579	Subsample 24	234109.273	13855237.378	Subsample 24	234075.554	13855237.378
Subsample 25	234092.413	13855266.579	Subsample 25	233249.428	13855266.579	Subsample 25	234126.133	13855266.579
Subsample 26	234142.993	13855295.781	Subsample 26	233300.007	13855295.781	Subsample 26	233266.288	13855295.781
Subsample 27	233283.148	13855324.983	Subsample 27	234109.273	13855295.781	Subsample 27	234176.712	13855295.781
Subsample 28	234159.852	13855324.983	Subsample 28	233249.428	13855324.983	Subsample 28	233300.007	13855354.185
Subsample 29	233266.288	13855354.185	Subsample 29	234193.572	13855324.983	Subsample 29	234176.712	13855354.185
Subsample 30	234244.151	13855354.185	Subsample 30	234210.431	13855354.185	Subsample 30	233249.428	13855383.387
Subsample 31	234227.291	13855383.387	Subsample 31	233283.148	13855383.387	Subsample 31	234261.010	13855383.387
Subsample 32	233300.007	13855412.589	Subsample 32	233266.288	13855412.589	Subsample 32	234244.151	13855412.589
Subsample 33	233249.428	13855441.791	Subsample 33	234277.870	13855412.589	Subsample 33	233283.148	13855441.791
Subsample 34	234294.730	13855441.791	Subsample 34	234261.010	13855441.791	Subsample 34	233266.288	13855470.992
Subsample 35	234277.870	13855470.992	Subsample 35	233300.007	13855470.992	Subsample 35	234311.590	13855470.992

Subsample 36	233283.148	13855500.194	Subsample 36	233249.428	13855500.194	Subsample 36	234294.730	13855500.194
Subsample 37	234311.590	13855529.396	Subsample 37	233300.007	13855529.396	Subsample 37	233266.288	13855529.396
Subsample 38	234311.590	13855587.800	Subsample 38	234277.870	13855529.396	Subsample 38	234294.730	13855558.598
Subsample 39	234311.590	13855646.204	Subsample 39	234328.449	13855558.598	Subsample 39	234345.309	13855587.800
Subsample 40	234311.590	13855704.607	Subsample 40	234328.449	13855617.002	Subsample 40	234345.309	13855646.204
Subsample 41	234311.590	13855763.011	Subsample 41	234328.449	13855675.405	Subsample 41	234345.309	13855704.607
Subsample 42	234311.590	13855821.415	Subsample 42	234328.449	13855733.809	Subsample 42	234345.309	13855763.011
Subsample 43	234328.449	13855850.617	Subsample 43	234328.449	13855792.213	Subsample 43	234345.309	13855821.415
Subsample 44	234294.730	13855909.020	Subsample 44	234294.730	13855850.617	Subsample 44	234311.590	13855879.819
Subsample 45	234311.590	13855938.222	Subsample 45	234345.309	13855879.819	Subsample 45	234328.449	13855909.020

TABLE D-8. NEW OBOD AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 8 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-NDA-FBSU8-ICS1**		**Incremental Composite Sample**	**SL-NDA-FBSU8-ICS2**		**Incremental Composite Sample**	**SL-NDA-FBSU8-ICS3**	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	233263.406	13855557.938	Subsample 1	233295.694	13855557.938	Subsample 1	233247.262	13855585.900
Subsample 2	233295.694	13855613.862	Subsample 2	233263.406	13855613.862	Subsample 2	233279.550	13855585.900
Subsample 3	233247.262	13855641.824	Subsample 3	233263.406	13855669.786	Subsample 3	233279.550	13855641.824
Subsample 4	233295.694	13855669.786	Subsample 4	233279.550	13855697.748	Subsample 4	233247.262	13855697.748
Subsample 5	233263.406	13855725.710	Subsample 5	233247.262	13855753.672	Subsample 5	233295.694	13855725.710
Subsample 6	233279.550	13855753.672	Subsample 6	233295.694	13855781.634	Subsample 6	233263.406	13855781.634
Subsample 7	233247.262	13855809.596	Subsample 7	233263.406	13855837.558	Subsample 7	233279.550	13855809.596
Subsample 8	233295.694	13855837.558	Subsample 8	233279.550	13855865.520	Subsample 8	233247.262	13855865.520
Subsample 9	233263.406	13855893.482	Subsample 9	233247.262	13855921.444	Subsample 9	233295.694	13855893.482
Subsample 10	233279.550	13855921.444	Subsample 10	233295.694	13855949.406	Subsample 10	233263.406	13855949.406
Subsample 11	233247.262	13855977.368	Subsample 11	233263.406	13856005.330	Subsample 11	233279.550	13855977.368
Subsample 12	233295.694	13856005.330	Subsample 12	233311.837	13856033.292	Subsample 12	233279.550	13856033.292
Subsample 13	233295.694	13856061.254	Subsample 13	233360.269	13856061.254	Subsample 13	233327.981	13856061.254
Subsample 14	233344.125	13856089.216	Subsample 14	233360.269	13856117.178	Subsample 14	233376.413	13856089.216
Subsample 15	233392.557	13856117.178	Subsample 15	233408.701	13856145.140	Subsample 15	233424.845	13856117.178
Subsample 16	233440.989	13856145.140	Subsample 16	233505.564	13856145.140	Subsample 16	233473.276	13856145.140
Subsample 17	233537.852	13856145.140	Subsample 17	233521.708	13856173.102	Subsample 17	233489.420	13856173.102
Subsample 18	233457.132	13856173.102	Subsample 18	233618.571	13856173.102	Subsample 18	233586.284	13856173.102
Subsample 19	233553.996	13856173.102	Subsample 19	233537.852	13856201.064	Subsample 19	233602.427	13856201.064
Subsample 20	233570.140	13856201.064	Subsample 20	233586.284	13856229.026	Subsample 20	233602.427	13856256.988
Subsample 21	233618.571	13856229.026	Subsample 21	233634.715	13856256.988	Subsample 21	233618.571	13856284.951
Subsample 22	233586.284	13856284.951	Subsample 22	233602.427	13856312.913	Subsample 22	233618.571	13856340.875
Subsample 23	233634.715	13856312.913	Subsample 23	233602.427	13856368.837	Subsample 23	233618.571	13856396.799
Subsample 24	233634.715	13856368.837	Subsample 24	233650.859	13856396.799	Subsample 24	233634.715	13856424.761
Subsample 25	233602.427	13856424.761	Subsample 25	233618.571	13856452.723	Subsample 25	233634.715	13856480.685
Subsample 26	233650.859	13856452.723	Subsample 26	233618.571	13856508.647	Subsample 26	233634.715	13856536.609
Subsample 27	233650.859	13856508.647	Subsample 27	233667.003	13856536.609	Subsample 27	233650.859	13856564.571
Subsample 28	233618.571	13856564.571	Subsample 28	233634.715	13856592.533	Subsample 28	233618.571	13856620.495
Subsample 29	233667.003	13856592.533	Subsample 29	233650.859	13856620.495	Subsample 29	233667.003	13856648.457
Subsample 30	233634.715	13856648.457	Subsample 30	233650.859	13856676.419	Subsample 30	233634.715	13856704.381
Subsample 31	233683.147	13856676.419	Subsample 31	233667.003	13856704.381	Subsample 31	234119.032	13856704.381
Subsample 32	234151.320	13856704.381	Subsample 32	234183.607	13856704.381	Subsample 32	234215.895	13856704.381
Subsample 33	234248.183	13856704.381	Subsample 33	233876.874	13856732.343	Subsample 33	233683.147	13856732.343
Subsample 34	233650.859	13856732.343	Subsample 34	233973.737	13856732.343	Subsample 34	233909.161	13856732.343
Subsample 35	233844.586	13856732.343	Subsample 35	234070.600	13856732.343	Subsample 35	234006.025	13856732.343

Subsample 36	233941.449	13856732.343	Subsample 36	234167.464	13856732.343	Subsample 36	234135.176	13856732.343
Subsample 37	234038.312	13856732.343	Subsample 37	234264.327	13856732.343	Subsample 37	234232.039	13856732.343
Subsample 38	234102.888	13856732.343	Subsample 38	233667.003	13856760.305	Subsample 38	233731.579	13856760.305
Subsample 39	234199.751	13856732.343	Subsample 39	233763.866	13856760.305	Subsample 39	233828.442	13856760.305
Subsample 40	233699.291	13856760.305	Subsample 40	233860.730	13856760.305	Subsample 40	233925.305	13856760.305
Subsample 41	233796.154	13856760.305	Subsample 41	233957.593	13856760.305	Subsample 41	234022.169	13856760.305
Subsample 42	233893.017	13856760.305	Subsample 42	234054.456	13856760.305	Subsample 42	234119.032	13856760.305
Subsample 43	233989.881	13856760.305	Subsample 43	233715.435	13856788.267	Subsample 43	233683.147	13856788.267
Subsample 44	234086.744	13856760.305	Subsample 44	233812.298	13856788.267	Subsample 44	233780.010	13856788.267
Subsample 45	233747.722	13856788.267	Subsample 45	233844.586	13856788.267	Subsample 45	233876.874	13856788.267

TABLE D-9. NEW OBOD AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 9 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	SL-NDA-FBSU9-ICS1		Incremental Composite Sample	SL-NDA-FBSU9-ICS2		Incremental Composite Sample	SL-NDA-FBSU9-ICS3	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	234236.793	13855956.154	Subsample 1	234256.719	13855956.154	Subsample 1	234276.645	13855956.154
Subsample 2	234296.570	13855956.154	Subsample 2	234306.533	13855973.410	Subsample 2	234286.607	13855973.410
Subsample 3	234266.682	13855973.410	Subsample 3	234316.496	13855990.667	Subsample 3	234296.570	13855990.667
Subsample 4	234326.459	13855973.410	Subsample 4	234326.459	13856007.923	Subsample 4	234306.533	13856007.923
Subsample 5	234276.645	13855990.667	Subsample 5	234296.570	13856025.179	Subsample 5	234336.422	13856025.179
Subsample 6	234336.422	13855990.667	Subsample 6	234306.533	13856042.435	Subsample 6	234286.607	13856042.435
Subsample 7	234286.607	13856007.923	Subsample 7	234316.496	13856059.691	Subsample 7	234346.385	13856042.435
Subsample 8	234316.496	13856025.179	Subsample 8	234346.385	13856076.947	Subsample 8	234296.570	13856059.691
Subsample 9	234326.459	13856042.435	Subsample 9	234296.570	13856094.204	Subsample 9	234326.459	13856076.947
Subsample 10	234336.422	13856059.691	Subsample 10	234326.459	13856111.460	Subsample 10	234336.422	13856094.204
Subsample 11	234306.533	13856076.947	Subsample 11	234336.422	13856128.716	Subsample 11	234306.533	13856111.460
Subsample 12	234316.496	13856094.204	Subsample 12	234286.607	13856145.972	Subsample 12	234316.496	13856128.716
Subsample 13	234296.570	13856128.716	Subsample 13	234316.496	13856163.228	Subsample 13	234326.459	13856145.972
Subsample 14	234306.533	13856145.972	Subsample 14	234326.459	13856180.485	Subsample 14	234296.570	13856163.228
Subsample 15	234336.422	13856163.228	Subsample 15	234276.645	13856197.741	Subsample 15	234306.533	13856180.485
Subsample 16	234286.607	13856180.485	Subsample 16	234306.533	13856214.997	Subsample 16	234316.496	13856197.741
Subsample 17	234296.570	13856197.741	Subsample 17	234316.496	13856232.253	Subsample 17	234286.607	13856214.997
Subsample 18	234326.459	13856214.997	Subsample 18	234286.607	13856249.509	Subsample 18	234296.570	13856232.253
Subsample 19	234276.645	13856232.253	Subsample 19	234296.570	13856266.765	Subsample 19	234326.459	13856249.509
Subsample 20	234306.533	13856249.509	Subsample 20	234326.459	13856284.022	Subsample 20	234276.645	13856266.765
Subsample 21	234316.496	13856266.765	Subsample 21	234256.719	13855956.154	Subsample 21	234306.533	13856284.022
Subsample 22	234286.607	13856284.022	Subsample 22	234306.533	13855973.410	Subsample 22	234316.496	13856301.278
Subsample 23	234296.570	13856301.278	Subsample 23	234316.496	13855990.667	Subsample 23	234266.682	13856318.534
Subsample 24	234306.533	13856318.534	Subsample 24	234326.459	13856007.923	Subsample 24	234326.459	13856318.534
Subsample 25	234316.496	13856335.790	Subsample 25	234296.570	13856025.179	Subsample 25	234276.645	13856335.790
Subsample 26	234266.682	13856353.046	Subsample 26	234306.533	13856042.435	Subsample 26	234286.607	13856353.046
Subsample 27	234296.570	13856370.303	Subsample 27	234316.496	13856059.691	Subsample 27	234316.496	13856370.303
Subsample 28	234306.533	13856387.559	Subsample 28	234346.385	13856076.947	Subsample 28	234266.682	13856387.559
Subsample 29	234276.645	13856404.815	Subsample 29	234296.570	13856094.204	Subsample 29	234296.570	13856404.815
Subsample 30	234286.607	13856422.071	Subsample 30	234326.459	13856111.460	Subsample 30	234306.533	13856422.071
Subsample 31	234316.496	13856439.327	Subsample 31	234336.422	13856128.716	Subsample 31	234276.645	13856439.327
Subsample 32	234266.682	13856456.583	Subsample 32	234286.607	13856145.972	Subsample 32	234286.607	13856456.583
Subsample 33	234276.645	13856473.840	Subsample 33	234316.496	13856163.228	Subsample 33	234296.570	13856473.840
Subsample 34	234306.533	13856491.096	Subsample 34	234326.459	13856180.485	Subsample 34	234266.682	13856491.096
Subsample 35	234256.719	13856508.352	Subsample 35	234276.645	13856197.741	Subsample 35	234276.645	13856508.352

Subsample 36	234286.607	13856525.608	Subsample 36	234306.533	13856214.997	Subsample 36	234306.533	13856525.608
Subsample 37	234296.570	13856542.864	Subsample 37	234316.496	13856232.253	Subsample 37	234256.719	13856542.864
Subsample 38	234266.682	13856560.120	Subsample 38	234286.607	13856249.509	Subsample 38	234286.607	13856560.120
Subsample 39	234276.645	13856577.377	Subsample 39	234296.570	13856266.765	Subsample 39	234296.570	13856577.377
Subsample 40	234306.533	13856594.633	Subsample 40	234326.459	13856284.022	Subsample 40	234266.682	13856594.633
Subsample 41	234256.719	13856611.889	Subsample 41	234276.645	13856301.278	Subsample 41	234276.645	13856611.889
Subsample 42	234266.682	13856629.145	Subsample 42	234286.607	13856318.534	Subsample 42	234286.607	13856629.145
Subsample 43	234296.570	13856646.401	Subsample 43	234296.570	13856335.790	Subsample 43	234256.719	13856646.401
Subsample 44	234246.756	13856663.658	Subsample 44	234306.533	13856353.046	Subsample 44	234266.682	13856663.658
Subsample 45	234276.645	13856680.914	Subsample 45	234276.645	13856370.303	Subsample 45	234296.570	13856680.914

TABLE D-10. BACKGROUND LOCATION: SUBSAMPLE UTM COORDINATES

Incremental Composite Sample	**SL-BG-ICS1**		**Incremental Composite Sample**	**SL-BG-ICS2**		**Incremental Composite Sample**	**SL-BG-ICS3**	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	230496.601	13852920.356	Subsample 1	230518.676	13852920.356	Subsample 1	230540.752	13852920.356
Subsample 2	230562.827	13852920.356	Subsample 2	230584.902	13852920.356	Subsample 2	230606.978	13852920.356
Subsample 3	230629.053	13852920.356	Subsample 3	230651.128	13852920.356	Subsample 3	230673.203	13852920.356
Subsample 4	230695.279	13852920.356	Subsample 4	230507.639	13852939.474	Subsample 4	230485.563	13852939.474
Subsample 5	230529.714	13852939.474	Subsample 5	230573.865	13852939.474	Subsample 5	230551.789	13852939.474
Subsample 6	230595.940	13852939.474	Subsample 6	230640.090	13852939.474	Subsample 6	230618.015	13852939.474
Subsample 7	230662.166	13852939.474	Subsample 7	230518.676	13852958.592	Subsample 7	230684.241	13852939.474
Subsample 8	230540.752	13852958.592	Subsample 8	230584.902	13852958.592	Subsample 8	230496.601	13852958.592
Subsample 9	230606.978	13852958.592	Subsample 9	230651.128	13852958.592	Subsample 9	230562.827	13852958.592
Subsample 10	230673.203	13852958.592	Subsample 10	230529.714	13852977.709	Subsample 10	230629.053	13852958.592
Subsample 11	230485.563	13852977.709	Subsample 11	230595.940	13852977.709	Subsample 11	230695.279	13852958.592
Subsample 12	230551.789	13852977.709	Subsample 12	230662.166	13852977.709	Subsample 12	230507.639	13852977.709
Subsample 13	230618.015	13852977.709	Subsample 13	230474.526	13852996.827	Subsample 13	230573.865	13852977.709
Subsample 14	230684.241	13852977.709	Subsample 14	230540.752	13852996.827	Subsample 14	230640.090	13852977.709
Subsample 15	230496.601	13852996.827	Subsample 15	230606.978	13852996.827	Subsample 15	230518.676	13852996.827
Subsample 16	230562.827	13852996.827	Subsample 16	230673.203	13852996.827	Subsample 16	230584.902	13852996.827
Subsample 17	230629.053	13852996.827	Subsample 17	230507.639	13853015.945	Subsample 17	230651.128	13852996.827
Subsample 18	230695.279	13852996.827	Subsample 18	230573.865	13853015.945	Subsample 18	230485.563	13853015.945
Subsample 19	230529.714	13853015.945	Subsample 19	230640.090	13853015.945	Subsample 19	230551.789	13853015.945
Subsample 20	230595.940	13853015.945	Subsample 20	230474.526	13853035.063	Subsample 20	230618.015	13853015.945
Subsample 21	230662.166	13853015.945	Subsample 21	230540.752	13853035.063	Subsample 21	230684.241	13853015.945
Subsample 22	230496.601	13853035.063	Subsample 22	230606.978	13853035.063	Subsample 22	230518.676	13853035.063
Subsample 23	230562.827	13853035.063	Subsample 23	230673.203	13853035.063	Subsample 23	230584.902	13853035.063
Subsample 24	230629.053	13853035.063	Subsample 24	230507.639	13853054.181	Subsample 24	230651.128	13853035.063
Subsample 25	230695.279	13853035.063	Subsample 25	230573.865	13853054.181	Subsample 25	230485.563	13853054.181
Subsample 26	230529.714	13853054.181	Subsample 26	230640.090	13853054.181	Subsample 26	230551.789	13853054.181
Subsample 27	230595.940	13853054.181	Subsample 27	230474.526	13853073.298	Subsample 27	230618.015	13853054.181
Subsample 28	230662.166	13853054.181	Subsample 28	230540.752	13853073.298	Subsample 28	230684.241	13853054.181
Subsample 29	230496.601	13853073.298	Subsample 29	230606.978	13853073.298	Subsample 29	230518.676	13853073.298
Subsample 30	230562.827	13853073.298	Subsample 30	230673.203	13853073.298	Subsample 30	230584.902	13853073.298
Subsample 31	230629.053	13853073.298	Subsample 31	230507.639	13853092.416	Subsample 31	230651.128	13853073.298
Subsample 32	230695.279	13853073.298	Subsample 32	230573.865	13853092.416	Subsample 32	230485.563	13853092.416
Subsample 33	230529.714	13853092.416	Subsample 33	230640.090	13853092.416	Subsample 33	230551.789	13853092.416
Subsample 34	230595.940	13853092.416	Subsample 34	230474.526	13853111.534	Subsample 34	230618.015	13853092.416
Subsample 35	230662.166	13853092.416	Subsample 35	230540.752	13853111.534	Subsample 35	230684.241	13853092.416
Subsample 36	230496.601	13853111.534	Subsample 36	230606.978	13853111.534	Subsample 36	230518.676	13853111.534

Subsample 37	230562.827	13853111.534	Subsample 37	230673.203	13853111.534	Subsample 37	230584.902	13853111.534
Subsample 38	230629.053	13853111.534	Subsample 38	230507.639	13853130.652	Subsample 38	230651.128	13853111.534
Subsample 39	230695.279	13853111.534	Subsample 39	230573.865	13853130.652	Subsample 39	230485.563	13853130.652
Subsample 40	230529.714	13853130.652	Subsample 40	230640.090	13853130.652	Subsample 40	230551.789	13853130.652
Subsample 41	230595.940	13853130.652	Subsample 41	230474.526	13853149.769	Subsample 41	230618.015	13853130.652
Subsample 42	230662.166	13853130.652	Subsample 42	230540.752	13853149.769	Subsample 42	230684.241	13853130.652
Subsample 43	230496.601	13853149.769	Subsample 43	230606.978	13853149.769	Subsample 43	230518.676	13853149.769
Subsample 44	230562.827	13853149.769	Subsample 44	230673.203	13853149.769	Subsample 44	230584.902	13853149.769
Subsample 45	230629.053	13853149.769	Subsample 45	230695.279	13853149.769	Subsample 45	230651.128	13853149.769

Attachment 5-3: QUALITY ASSURANCE PROJECT PLAN

U.S. ARMY PUBLIC HEALTH COMMAND
5158 Blackhawk Road, Aberdeen Proving Ground, Maryland 21010-5403

QUALITY ASSURANCE PROJECT PLAN
PERIODIC LONG TERM MULTI-MEDIA MONITORING
OPEN BURN AND OPEN DETONATION SITES
MCALESTER ARMY AMMUNITION PLANT
MCALESTER, OKLAHOMA

General Medical: 500A, Public Health Survey

PHC FORM 432-E (MCHB-CS-IP), NOV 12

List of QAPP Worksheets

TABLE1. CROSSWALK: UFP-QAPP WORKBOOK TO 2106-G-05 QAPP

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
1 & 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off
3 & 5	Project Organization and QAPP Distribution	2.2.3	Distribution List
		2.2.4	Project Organization and Schedule
4 , 7 & 8	Personnel Qualifications and Sign-off Sheet	2.2.1	Title, Version, and Approval/Sign-Off
		2.2.7	Special Training Requirements and Certification
6	Communication Pathways	2.2.4	Project Organization and Schedule
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data
10	Conceptual Site Model	2.2.5	Project Background, Overview, and Intended Use of Data
11	Project/Data Quality Objectives	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
12	Measurement Performance Criteria	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
13	Secondary Data Uses and Limitations	Chapter 3	QAPP ELEMENTS FOR EVALUATING EXISTING DATA
14 & 16	Project Tasks & Schedule	2.2.4	Project Organization and Schedule
15	Project Action Limits and Laboratory-Specific Detection / Quantitation Limits	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
17	Sampling Design and Rationale	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
18	Sampling Locations and Methods	2.3.1	Sample Collection Procedure , Experimental Design, and Sampling Tasks
		2.3.2	Sampling Procedures and Requirements
19 & 30	Sample Containers, Preservation, and Hold Times	2.3.2	Sampling Procedures and Requirements
20	Field QC	2.3.5	Quality Control Requirements
21	Field SOPs	2.3.2	Sampling Procedures and Requirements
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
23	Analytical SOPs	2.3.4	Analytical Methods Requirements and Task Description
24	Analytical Instrument Calibration	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables

Optimized UFP-QAPP Worksheets		**2106-G-05 QAPP Guidance Section**	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
26 & 27	Sample Handling, Custody, and Disposal	2.3.3	Sample Handling, Custody Procedures, and Documentation
28	Analytical Quality Control and Corrective Action	2.3.5	Quality Control Requirements
29	Project Documents and Records	2.2.8	Documentation and Records Requirements
31, 32 & 33	Assessments and Corrective Action	2.4	ASSESSMENTS AND DATA REVIEW (CHECK)
		2.5.5	Reports to Management
34	Data Verification and Validation Inputs	2.5.1	Data Verification and Validation Targets and Methods
35	Data Verification Procedures	2.5.1	Data Verification and Validation Targets and Methods
36	Data Validation Procedures	2.5.1	Data Verification and Validation Targets and Methods
37	Data Usability Assessment	2.5.2	Quantitative and Qualitative Evaluations of Usability
		2.5.3	Potential Limitations on Data Interpretation
		2.5.4	Reconciliation with Project Requirements

QAPP Worksheet #1 & 2: Title and Approval Page
(UFP-QAPP Manual Section 2.1)
(EPA 2106-G-05 Section 2.2.1)

1. Project Identifying Information
    a. Site name/project name: Long Term Multi-Media Monitoring, Open Burn/Open Detonation Areas
    b. Site location/number: McAlester Army Ammunition Plant, McAlester, Oklahoma
    c. Contract/Work assignment number: S.0031696

2. Lead Organization
    a. Lead Organization Project Manager/Date: [signature] 4/2/05
       Signature

       Printed Name/Organization: James A. Maio/USAIPH

    b. Lead Organization Quality Manager/Date: [signature] for Michael Kefauver 4/3/05
       Signature

       Printed Name/Organization: Michael Kefauver/USAIPH

3. Federal Regulatory Agency/Date:
   Signature

   Printed Name/Organization: U.S. Environmental Protection Agency Region VI

4. State Regulatory Agency/Date:
   Signature

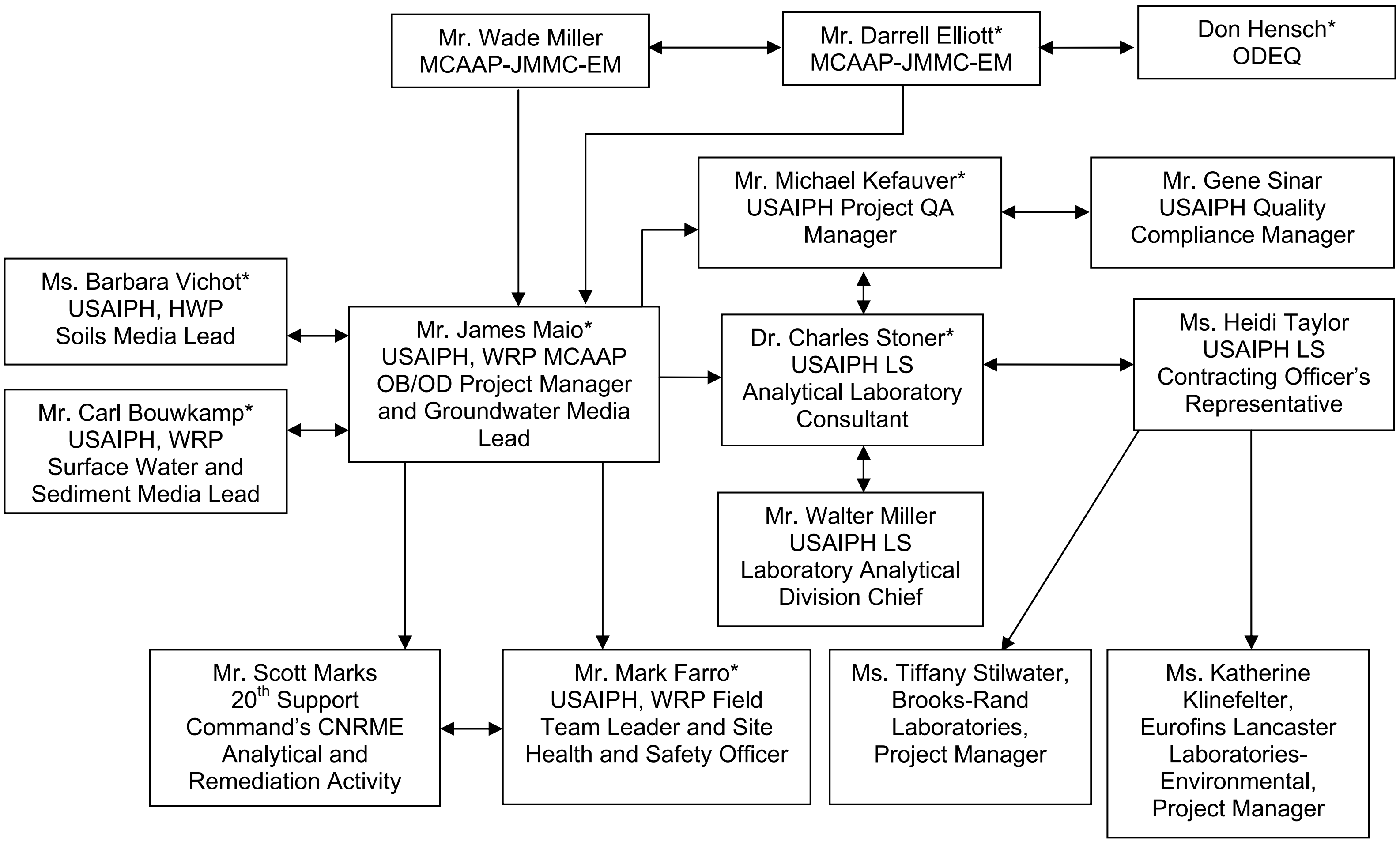
   Printed Name/Organization: Oklahoma Department of Environmental Quality Land Protection Division

5. Other Stakeholders (as needed)

6. List plans and reports from previous investigations relevant to this project

QAPP Worksheet #3 & 5: Project Organization and QAPP Distribution
(UFP-QAPP Manual Section 2.3 and 2.4)
(EPA 2106-G-05 Section 2.2.3 and 2.2.4)

*QAPP recipient　　Lines of authority ___________　　Lines of Communication ___________



How will the QAPP be updated and distributed?

Minor amendments to the QAPP will be referenced where applicable in respective sampling reports. As needed, major revisions to the QAPP such as changes to contract laboratory support will require an updated QAPP be prepared and distributed via electronically and hard copy. The USAIPH Project Manager will be responsible for revisions to the plan and distribution to Army support agencies and McAlester AAP. McAlester AAP will be responsible for distribution of the updated QAPP to ODEQ representatives.

QAPP Worksheet #4, 7 & 8: Personnel Qualifications and Sign-off Sheet
(UFP-QAPP Manual Sections 2.3.2 – 2.3.4)
(EPA 2106-G-05 Section 2.2.1 and 2.2.7)

ORGANIZATION: McAlester Army Ammunition Plant

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Darrell Elliott	Project Sponsor			
Wade Miller	Environmental Scientist			

ORGANIZATION: USAIPH

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Barrett Borry	Section Chief/ Technical Review	B.A., M.S. Geology/35 years	Registered Professional Engineer Registered Professional Geologist	[signature] 2 Apr/15
James Maio	Project Manager/ Submission of QAPP and any QAPP revisions and amendments to appropriate personnel for review and approval. Also responsible for ensuring that the project meets Army objectives, regulatory requirements, and USAIPH quality standards.	M.S. Geology/20 years	Registered Professional Geologist	[signature] / 2 Apr. 2015
Barbara Vichot	Soils Media Lead	B.S. Plant and Soil Science/13 years		Barbara H. Vichot 2 April 15
Carl Bouwkamp	Surface Water and Sediment Media Lead	M.S. Water Resource Management B.S. Fisheries and Wildlife/40 years		Carl Bouwkamp 2 Apr. 15

Mark Farro	Field Team Leader/Project Health and Safety Officer	25 Years	Certified Well Driller, Certified Surface Water and Sediment	Mark E. Farro 4/2/15
Duane Maners	Senior Engineering Technician/ Alternate Health and Safety Officer	25 Years	Certified Well Driller	4-2-15
Rocky Hoover	Engineering Technician	20 Years		4-2-15
Clint Logan	Engineering Technician	10 Years	Certified Environmental Sampler	Mark E. Farro for Clint Logan 4/2/15
Tracey Merchel	Engineering Technician	10 Years	Certified Environmental Sampler	4-2-15

ORGANIZATION: USAIPH Laboratory

Name	Project Title/Role	Education/Experience	Specialized Training/Certifications	Signature/Date
Dr. Charles Stoner	Analytical Laboratory Consultant	Ph.D. Analytical Chemistry/20 years		2Apr2015
Gene Sinar	Analytical Laboratory Quality Manager	B.S. Information Management/25 years		4/3/2015
Michael Kefauver	Project Quality Manager	B.S. General Science/15 years		3APR2015

*Signatures indicate personnel have read and agree to implement this QAPP as written

QAPP Worksheet #6: Communication Pathways
(UFP-QAPP Manual Section 2.4.2)
(EPA 2106-G-05 Section 2.2.4)

Communication Driver	Organization	Name	Contact Information	Procedure (timing, pathway, documentation, etc.)
Regulatory agency interface	ODEQ	Rachel Hanigan	Rachel.hanigan@deq.ok.gov/ 405-702-5196	Regulatory approval authority
POC with MCAAP Environmental Office	MCAAP	Darrell Elliott	Darrell.elliott@us.army.mil/ 918-420-7630	All programmatic information, coordination issues, draft and final reports
Field progress reports	USAIPH	Mark Farro	mark.farro@us.army.mil/ 410-436-4369	Notify Mr. Maio of field related problems by phone, email or fax by COB the next business day
Project Manager and Groundwater sampling responsibilities	USAIPH	James Maio	James.maio@us.army.mil/ 410-436-8166	Mr. Maio is USAIPH's liason to Mr. Elliott
Soil sampling responsibilities	USAIPH	Barbara Vichot	barbara.vichot@us.army.mil/ 410-436-8555	Notify Mr. Maio of field related problems by phone, email or fax by COB the next business day
Surface water and sediment sampling responsibilities	USAIPH	Carl Bouwkamp	carl.bouwkamp@us.army.mil/ 410-436-8124	Notify Mr. Maio of field related problems by phone, email or fax by COB the next business day
Stop work due to safety issues	USAIPH	Mark Farro	mark.farro@us.army.mil/ 410-436-4369	Notify Mr. Maio of field related problems by phone, email or fax by COB the next business day
QAPP changes prior to field work	USAIPH	Dr. Charles Stoner	charles.e.stoner2.civ@mail.mil/ 410-436-8398	Report all modifications in the QAPP to the Project QA Manager
QAPP changes during project execution	USAIPH	James Maio	James.maio@us.army.mil/ 410-436-8166	Coordinate directly with Mr. Elliott of corrective actions
Field corrective actions	USAIPH	Mark Farro	mark.farro@us.army.mil/ 410-436-4369	Notify Mr. Maio of field related problems by phone, email or fax by COB the next business day
Sample receipt variances	USAIPH	James Seeger	james.seeger@us.army.mil/ 410-436-8356	Notify Mr. Maio of field related problems by phone, email or fax by COB the next business day

Communication Driver	Organization	Name	Contact Information	Procedure (timing, pathway, documentation, etc.)
Laboratory quality control variances	USAIPH	Gene Sinar	gene.sinar@us.army.mil/ 410-436-3779	Coordinate directly with the AIPH Laboratory Sciences (LS) Analytical Laboratory Consultant and the QA manager any laboratory performance problems that would effect ensuring that all analytical procedures for the project, to include contract laboratory procedures, are followed
Analytical corrective actions	USAIPH	Dr. Charles Stoner	charles.e.stoner2.civ@mail.mil/ 410-436-8398	Report all modifications in the QAPP and concerns with data quality to the Project QA Manager and Project Manager
Data verification issues, e.g., incomplete records	USAIPH	Michael Kefauver	michael.kefauver@us.army.mil/ 410-436-3752	Report on the adequacy, status, and effectiveness of the QA program to Mr Maio.
Data validation issues, e.g., non-compliance with procedures	USAIPH	Gene Sinar	gene.sinar@us.army.mil/ 410-436-3779	Coordinate directly with the LS Analytical Laboratory Consultant and the QA manager any laboratory performance problems that would effect ensuring that all analytical procedures for the project, to include contract laboratory procedures, are followed
Data review corrective actions	USAIPH	James Maio	James.maio@us.army.mil/ 410-436-8166	Coordinate directly with Mr. Elliott of corrective actions

QAPP Worksheet #9: Project Planning Session Summary
(UFP-QAPP Manual Section 2.5.1 and Figures 9-12)
(EPA 2106-G-05 Section 2.2.5)

Date of planning session: 14 and 15 May 2013
Location: McAlester Army Ammunition Plant
Purpose: Informal project planning discussions

Participants:

Name	Organization	Title/Role	Email/Phone
James Maio	USAIPH	Project Manager	James.maio@us.army.mil/ 410-436-8166
Barbara Vichot	USAIPH	Soils Media Lead	barbara.vichot@us.army.mil/ 410-436-8555
Mark Farro	USAIPH	Supervisory Engineering Technician	mark.farro@us.army.mil/ 410-436-4369
Wade Miller	MCAAP-Env	Environmental Scientist	Robert.w.miller2.civ@mail.mil/ 918-420-6259
Darrell Elliott	MCAAP-Env	Project Sponsor	Darrell.elliott@us.army.mil/ 918-420-7630

Notes/Comments: Site visits to Open Burning Grounds, New Demolition Area and Old Demolition Area. Informal project planning discussions to address project DQOs and logistical issues. Phone discussions with Dr. Lawson representing ODEQ

Consensus decisions made:

Action Items:

Action	Responsible Party	Due Date
Workplan deliverables	USAIPH	16 July 2014

QAPP Worksheet #10: Conceptual Site Model
(UFP-QAPP Manual Section 2.5.2)
(EPA 2106-G-05 Section 2.2.5)

Problem Definition

The problem to be addressed by the project: Site characterization data from 1988 through 2013 identified low level to modest impacts to shallow groundwater underlying burn pans and demolition pits at MCAAP's OB/OD units. Ground water data from 2005 through 2014 have not demonstrated concentrations of explosives or perchlorates above health standards at compliance boundary monitoring wells along firebreaks at the OB/OD units. The nearest drinking water source is Brown Lake located approximately 1 ½ miles to the northeast. The objectives of long-term multi-media sampling are to: • generate analytical data sufficient to identify negative trends in ground water, surface water, sediments and/or soils quality and/or potential off-site migration of munitions constituents from MCAAP's OB/OD units that may impact human health or the environment, and • provide a basis for future decisions regarding potential changes to the monitoring regimen and/or requirement for some level of corrective action.
The environmental questions being asked: Do explosives, perchlorate, metals, nitrates/nitrites and/or semi-volatile organic compounds designated as substances of potential concern (SOPCs) contained in ground water, surface water, sediments and/or soils samples collected from the Open Burning Grounds site exceed background concentrations or selected regulatory thresholds and/or risk-based screening criteria? Do explosives, metals and/or nitrates/nitrites contained in ground water, surface water, sediments and/or soils samples collected from the Old Demolition Area or New Demolition Area sites exceed background concentrations or selected regulatory thresholds and/or risk-based screening criteria? Are there signs of off-site migration?
Observations from any site reconnaissance reports: Not Applicable.
A synopsis of secondary data or information from site reports: McAlester Army Ammunition Plant (MCAAP) has operated three OB/OD sites which consist of SWMUs MCAAP-025 (Open Burning Grounds), MCAAP-027 (Old Demolition Area) and MCAAP-028 (New Demolition Area). A Part B Permit was issued in 1992 by the U.S. Environmental Protection Agency (EPA) Region VI with support of ODEQ. A hazardous waste management operation permit was issued to MCAAP in July 2013. Conditions of the permit include periodic multi-media sampling to monitor potential contaminants migrating from the sites.

The possible classes of contaminants and the affected matrices:

As identified in the Ground Water Consultation reports (USACHPPM, USAPHC and USAIPH, 2005 through 2013) and EPA field sampling results (2006), classes of contaminants within ground water, surface water, sediments and soils may include explosives, perchlorates, metals, SVOCs and/or nitrates/nitrites.

The rationale for inclusion of chemical and nonchemical analyses:

The identified substances of potential concern, total organic carbon, hardness, oxidation-reduction potential, turbidity, temperature, conductivity, pH, and dissolved oxygen are based on the operations conducted and materials treated at each of the sites.

Information concerning various environmental indicators:

Based on previous ground water monitoring reports, relevant ground water environmental indicators include:
- direction of ground water flow at the units
- concentration of SOPCs in ground water within the shallow aquifer

Ground Water Use: The shallow aquifer downgradient of the OB/OD areas is not currently used for ground-water withdraw.

Recreational Use: The OB/OD areas are not used for any recreational use.

Sensitive Environments: A freshwater forested/shrub wetland is located on the north central and northwest portions of the Open Burning Grounds. Also, freshwater forested/shrub wetland is located west and adjacent to the Open Burning Grounds. There are no wetlands classified in the vicinity of the New Demolition Area. However, freshwater forested/shrub wetlands are located directly north and on the southwestern portion of the Old Demolition Area. Also, a small freshwater pond is classified near the southern boundary of the Old Demolition Area.

Habitat Type: The surface of the New Demolition Area and Open Burning Grounds are primarily exposed soil with sparsely vegetated areas surrounding the perimeter of the site. Runoff from the open burn area generally flows northwest through a number of small ditches (erosion channels) to a wooded area south of Rocket Lake. The majority of runoff from the open detonation area flows northeast to a sedimentation lagoon. The overflow from the lagoon discharges to a tributary of Brown Lake. The remaining runoff from the open detonation area sheet flows northwest to a tributary of Rocket Lake. Runoff from the eight conditionally exempt munitions storage facilities flows northeast to a tributary of Brown Lake. The surface of the Old Demolition Area is primarily exposed soil with sparsely vegetated areas surrounding the perimeter of the site. The runoff from the open detonation area flows northeast to a sedimentation lagoon. The overflow from the lagoon discharges to an unnamed tributary of Chun Creek.

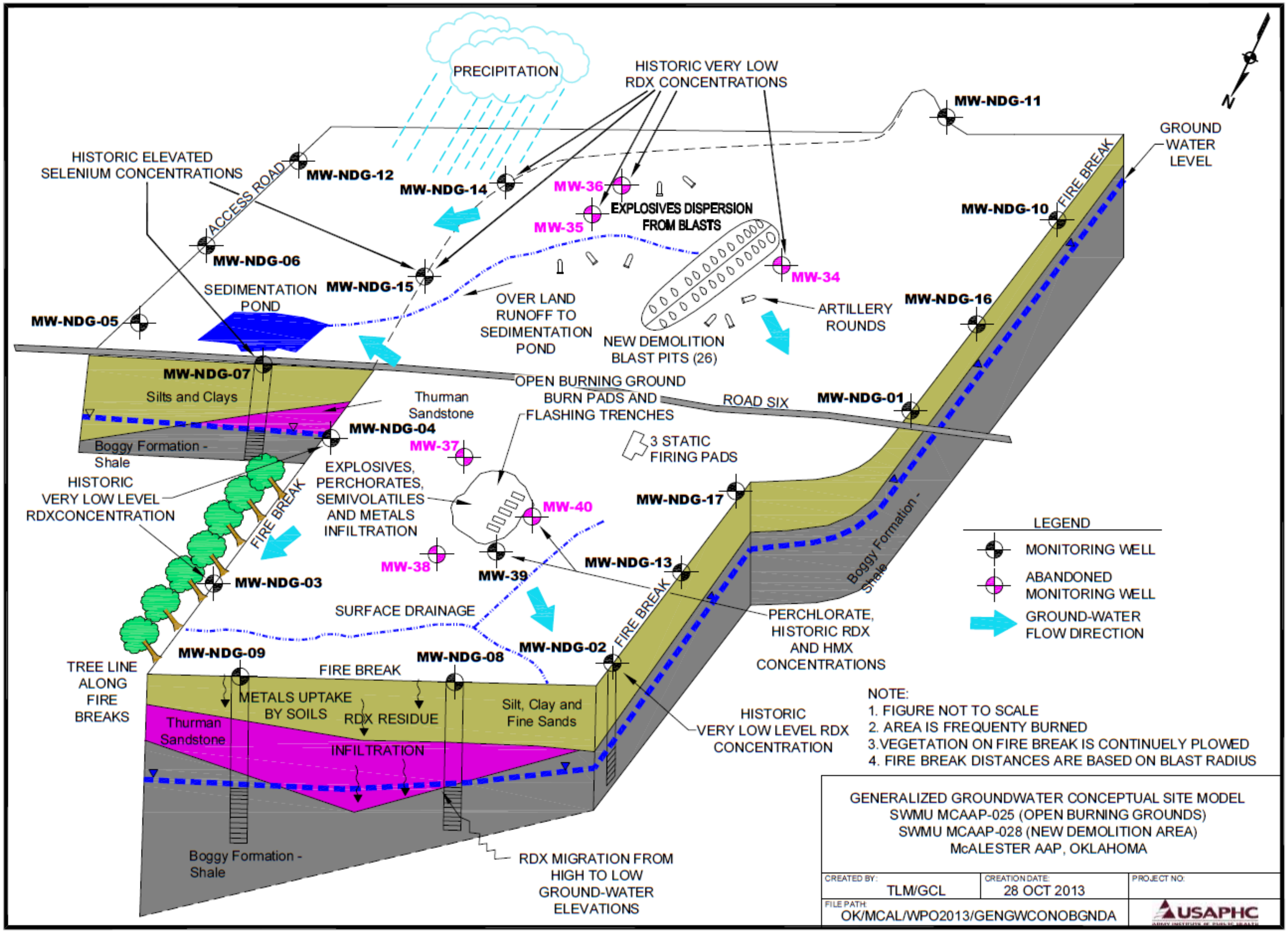
Ecological Receptors: One federally listed rare, threatened, and endangered species (American Burying Beetle) is found on MCAAP but has not been observed to inhabit the three MCAAP OB/OD units, or any nearby areas.

Conceptual Site Model

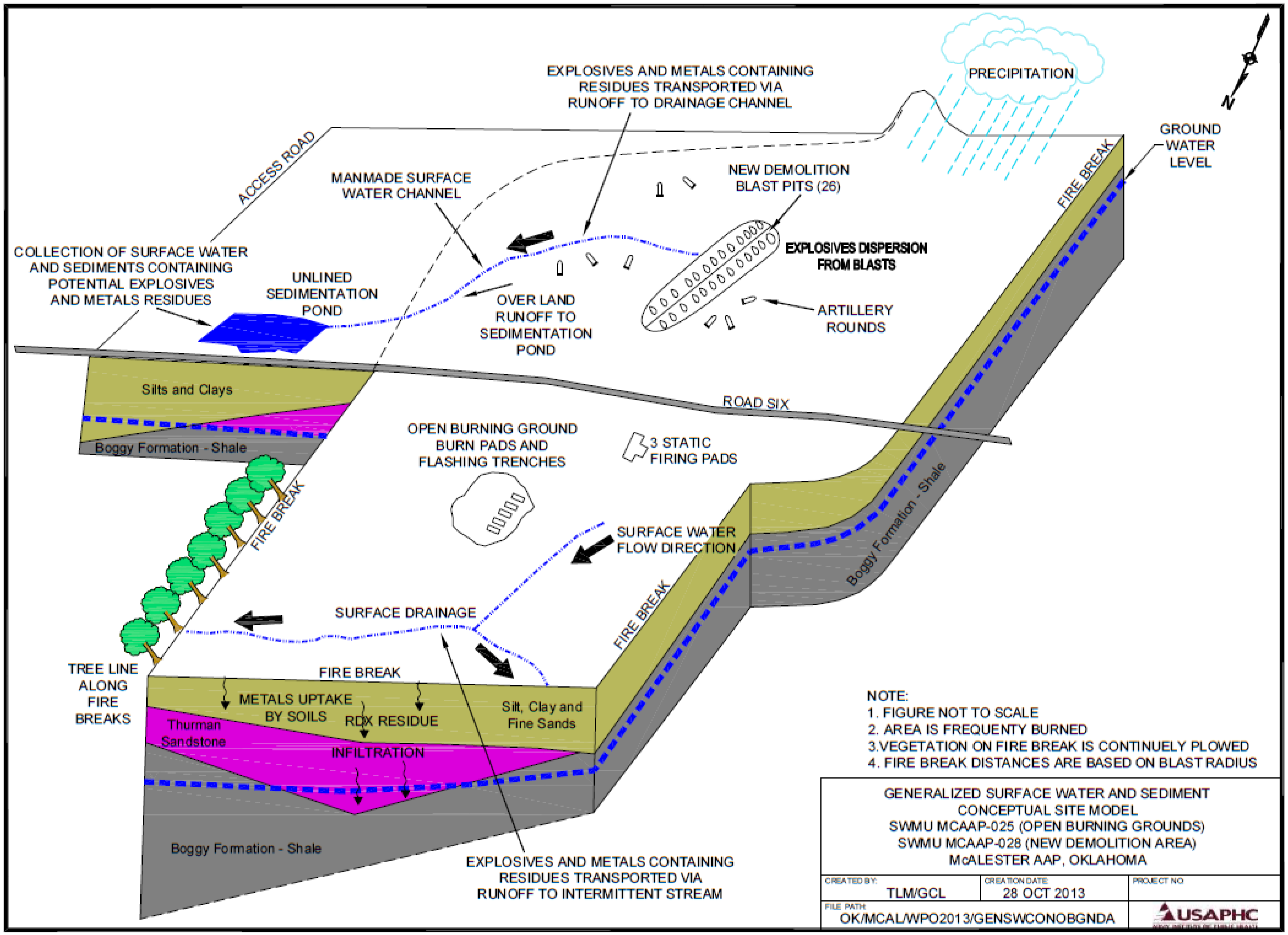
See Generalize Conceptual Site Figures

Project decision conditions (“If..., then...” statements):

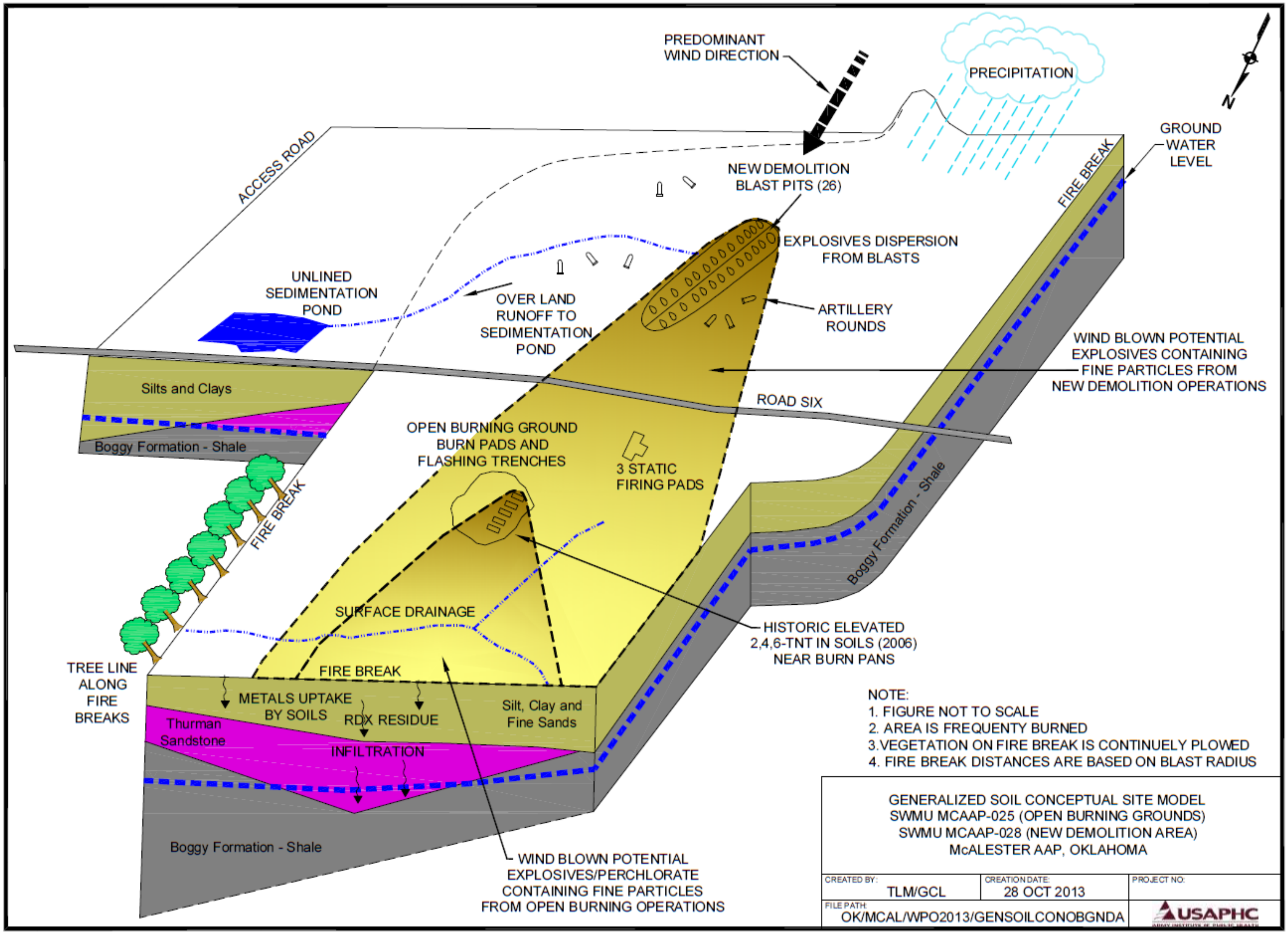
If explosives, perchlorates, metals, nitrates and/or SVOC concentrations are determined to be above background concentrations, and are detected at concentrations above the action levels developed for this study, then further investigation may be needed to more rigorously determine the potential human health risk; otherwise no further evaluation is necessary.

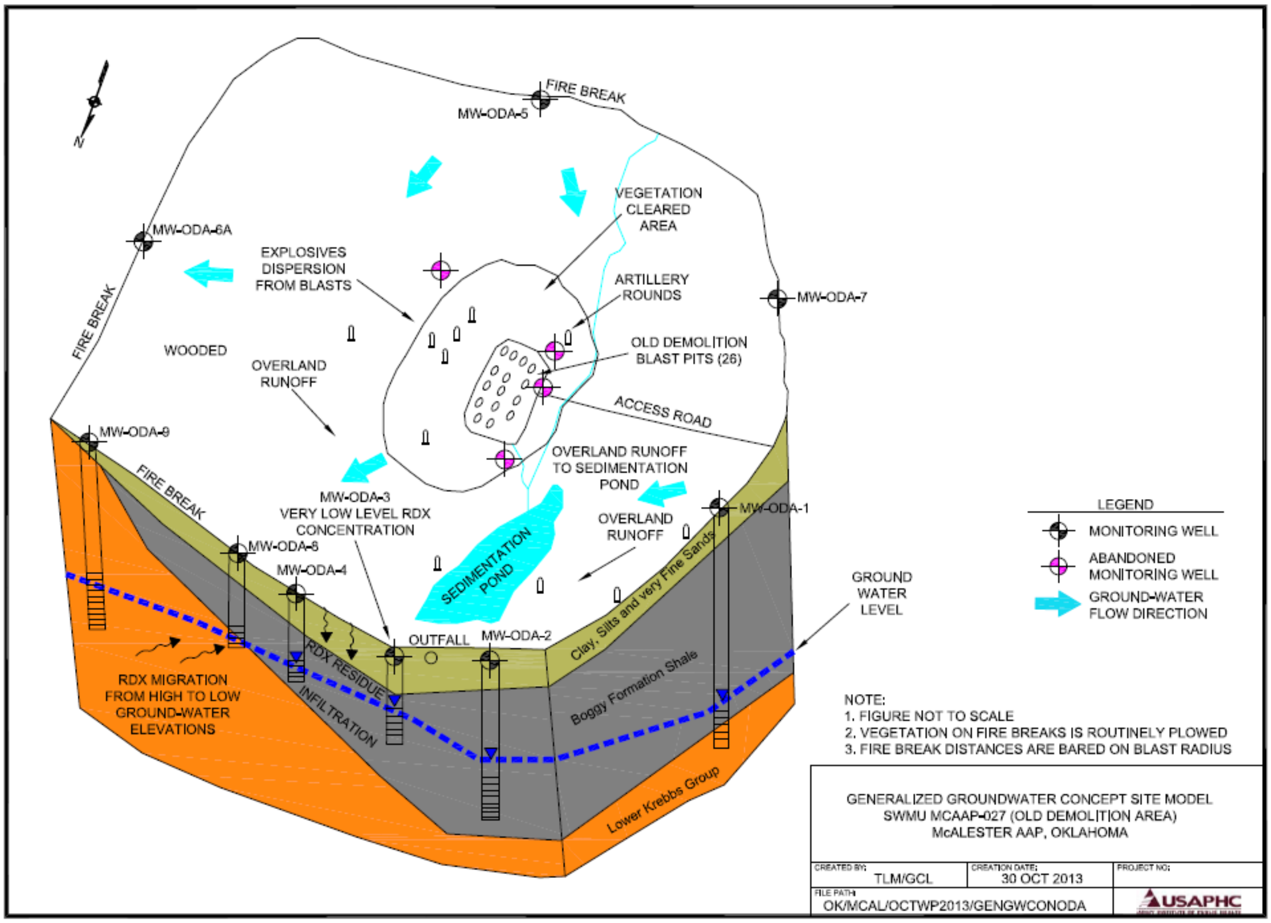

PRECIPITATION
HISTORIC VERY LOW RDX CONCENTRATIONS
HISTORIC ELEVATED SELENIUM CONCENTRATIONS
ACCESS ROAD
MW-NDG-11
MW-NDG-12
MW-NDG-14
MW-36
MW-35
EXPLOSIVES DISPERSION FROM BLASTS
GROUND WATER LEVEL
FIRE BREAK
MW-NDG-10
MW-NDG-06
MW-NDG-15
MW-34
SEDIMENTATION POND
MW-NDG-05
OVER LAND RUNOFF TO SEDIMENTATION POND
ARTILLERY ROUNDS
MW-NDG-16
NEW DEMOLITION BLAST PITS (26)
MW-NDG-07
Silts and Clays
OPEN BURNING GROUND BURN PADS AND FLASHING TRENCHES
Thurman Sandstone
ROAD SIX
MW-NDG-01
MW-NDG-04
Boggy Formation - Shale
MW-37
3 STATIC FIRING PADS
HISTORIC VERY LOW LEVEL RDXCONCENTRATION
EXPLOSIVES, PERCHORATES, SEMIVOLATILES AND METALS INFILTRATION
MW-NDG-17
MW-40
FIRE BREAK
Boggy Formation - Shale
LEGEND
MONITORING WELL
ABANDONED MONITORING WELL
GROUND-WATER FLOW DIRECTION
MW-38
MW-39
MW-NDG-13
MW-NDG-03
SURFACE DRAINAGE
FIRE BREAK
PERCHLORATE, HISTORIC RDX AND HMX CONCENTRATIONS
TREE LINE ALONG FIRE BREAKS
MW-NDG-09
MW-NDG-08
MW-NDG-02
FIRE BREAK
METALS UPTAKE BY SOILS
RDX RESIDUE
Silt, Clay and Fine Sands
Thurman Sandstone
INFILTRATION
HISTORIC VERY LOW LEVEL RDX CONCENTRATION
NOTE:
1. FIGURE NOT TO SCALE
2. AREA IS FREQUENTLY BURNED
3.VEGETATION ON FIRE BREAK IS CONTINUELY PLOWED
4. FIRE BREAK DISTANCES ARE BASED ON BLAST RADIUS
Boggy Formation - Shale
RDX MIGRATION FROM HIGH TO LOW GROUND-WATER ELEVATIONS
GENERALIZED GROUNDWATER CONCEPTUAL SITE MODEL
SWMU MCAAP-025 (OPEN BURNING GROUNDS)
SWMU MCAAP-028 (NEW DEMOLITION AREA)
McALESTER AAP, OKLAHOMA
CREATED BY: TLM/GCL
CREATION DATE: 28 OCT 2013
PROJECT NO:
FILE PATH: OK/MCAL/WPO2013/GENGWCONOBGNDA
USAPHC

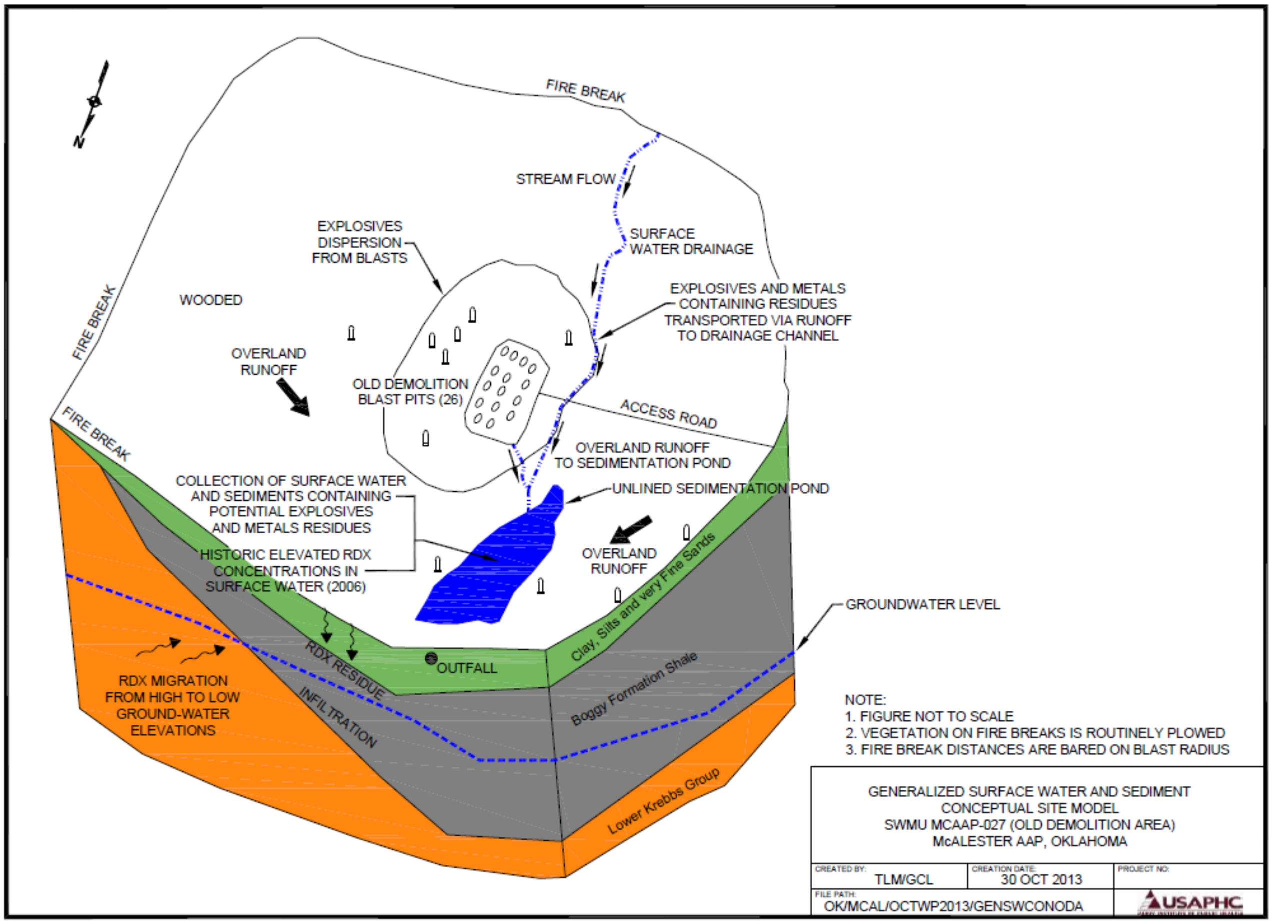
Worksheet #10

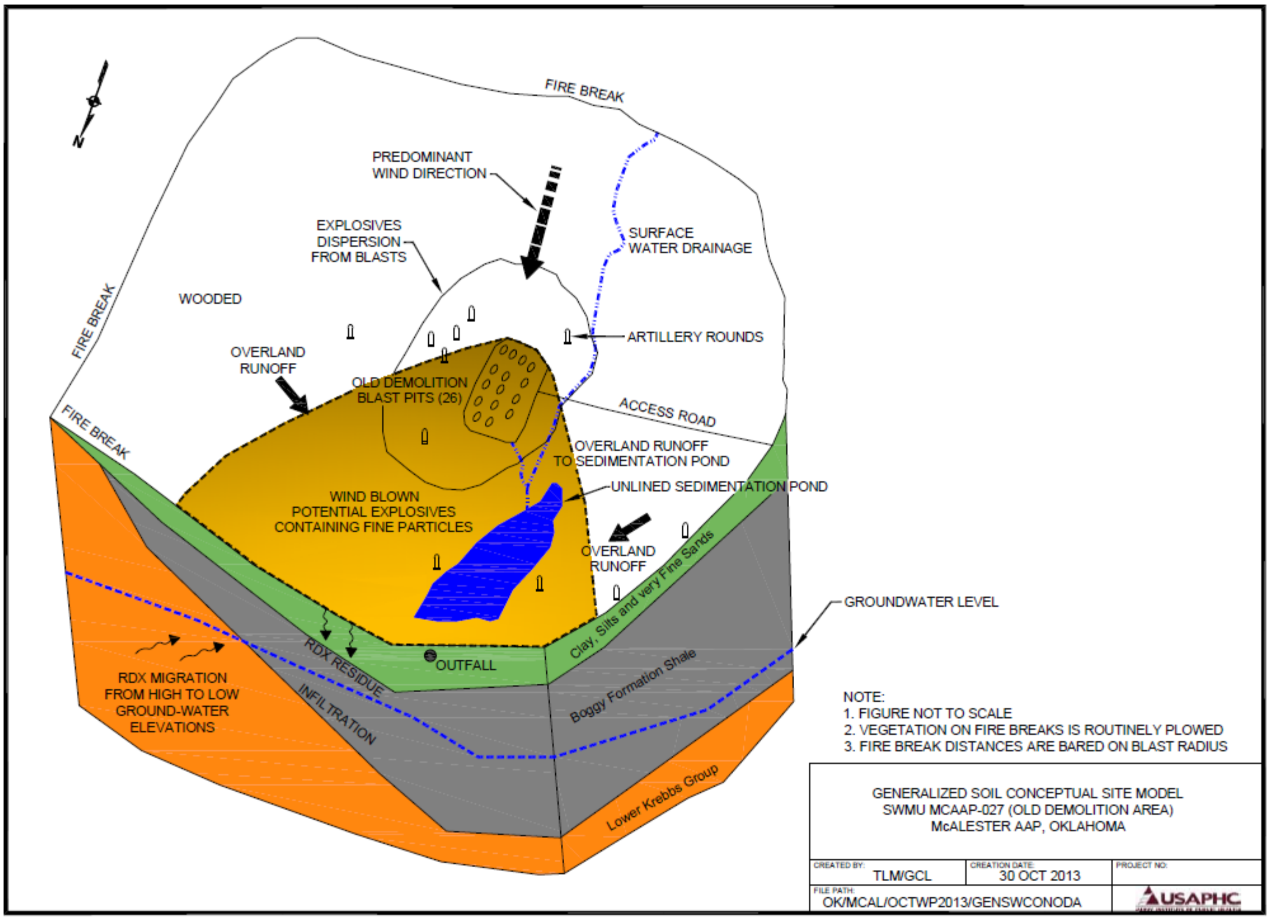


Worksheet #10




FIRE BREAK
MW-ODA-5
MW-ODA-6A
VEGETATION CLEARED AREA
EXPLOSIVES DISPERSION FROM BLASTS
ARTILLERY ROUNDS
MW-ODA-7
FIRE BREAK
WOODED
OVERLAND RUNOFF
OLD DEMOLITION BLAST PITS (26)
ACCESS ROAD
MW-ODA-9
OVERLAND RUNOFF TO SEDIMENTATION POND
FIRE BREAK
MW-ODA-3
VERY LOW LEVEL RDX CONCENTRATION
OVERLAND RUNOFF
MW-ODA-1
MW-ODA-8
MW-ODA-4
SEDIMENTATION POND
Clay, Silts and very Fine Sands
OUTFALL
MW-ODA-2
RDX RESIDUE
INFILTRATION
Boggy Formation Shale
RDX MIGRATION FROM HIGH TO LOW GROUND-WATER ELEVATIONS
Lower Krebbs Group
GROUND WATER LEVEL
LEGEND
MONITORING WELL
ABANDONED MONITORING WELL
GROUND-WATER FLOW DIRECTION
NOTE:
1. FIGURE NOT TO SCALE
2. VEGETATION ON FIRE BREAKS IS ROUTINELY PLOWED
3. FIRE BREAK DISTANCES ARE BARED ON BLAST RADIUS
GENERALIZED GROUNDWATER CONCEPT SITE MODEL
SWMU MCAAP-027 (OLD DEMOLITION AREA)
McALESTER AAP, OKLAHOMA
CREATED BY: TLM/GCL
CREATION DATE: 30 OCT 2013
PROJECT NO:
FILE PATH: OK/MCAL/OCTWP2013/GENGWCONODA
USAPHC


FIRE BREAK
STREAM FLOW
SURFACE WATER DRAINAGE
EXPLOSIVES DISPERSION FROM BLASTS
WOODED
FIRE BREAK
EXPLOSIVES AND METALS CONTAINING RESIDUES TRANSPORTED VIA RUNOFF TO DRAINAGE CHANNEL
OVERLAND RUNOFF
OLD DEMOLITION BLAST PITS (26)
ACCESS ROAD
FIRE BREAK
OVERLAND RUNOFF TO SEDIMENTATION POND
COLLECTION OF SURFACE WATER AND SEDIMENTS CONTAINING POTENTIAL EXPLOSIVES AND METALS RESIDUES
UNLINED SEDIMENTATION POND
HISTORIC ELEVATED RDX CONCENTRATIONS IN SURFACE WATER (2006)
OVERLAND RUNOFF
Clay, Silts and very Fine Sands
GROUNDWATER LEVEL
OUTFALL
RDX RESIDUE
RDX MIGRATION FROM HIGH TO LOW GROUND-WATER ELEVATIONS
INFILTRATION
Boggy Formation Shale
Lower Krebbs Group
NOTE:
1. FIGURE NOT TO SCALE
2. VEGETATION ON FIRE BREAKS IS ROUTINELY PLOWED
3. FIRE BREAK DISTANCES ARE BARED ON BLAST RADIUS
GENERALIZED SURFACE WATER AND SEDIMENT CONCEPTUAL SITE MODEL
SWMU MCAAP-027 (OLD DEMOLITION AREA)
McALESTER AAP, OKLAHOMA
CREATED BY: TLM/GCL
CREATION DATE: 30 OCT 2013
PROJECT NO:
FILE PATH: OK/MCAL/OCTWP2013/GENSWCONODA
USAPHC


FIRE BREAK
PREDOMINANT WIND DIRECTION
EXPLOSIVES DISPERSION FROM BLASTS
SURFACE WATER DRAINAGE
WOODED
FIRE BREAK
ARTILLERY ROUNDS
OVERLAND RUNOFF
OLD DEMOLITION BLAST PITS (26)
ACCESS ROAD
FIRE BREAK
OVERLAND RUNOFF TO SEDIMENTATION POND
UNLINED SEDIMENTATION POND
WIND BLOWN POTENTIAL EXPLOSIVES CONTAINING FINE PARTICLES
OVERLAND RUNOFF
Clay, Silts and very Fine Sands
GROUNDWATER LEVEL
RDX RESIDUE
OUTFALL
Boggy Formation Shale
RDX MIGRATION FROM HIGH TO LOW GROUND-WATER ELEVATIONS
INFILTRATION
Lower Krebbs Group
NOTE:
1. FIGURE NOT TO SCALE
2. VEGETATION ON FIRE BREAKS IS ROUTINELY PLOWED
3. FIRE BREAK DISTANCES ARE BARED ON BLAST RADIUS
GENERALIZED SOIL CONCEPTUAL SITE MODEL
SWMU MCAAP-027 (OLD DEMOLITION AREA)
McALESTER AAP, OKLAHOMA
CREATED BY: TLM/GCL
CREATION DATE: 30 OCT 2013
PROJECT NO:
FILE PATH: OK/MCAL/OCTWP2013/GENSWCONODA
USAPHC

QAPP Worksheet #11: Project/Data Quality Objectives (UFP-QAPP Manual Section 2.6.1)
(EPA 2106-G-05 Section 2.2.6)

Project Quality Objectives /Systematic Planning Process Statements

Who will use the data?

The following organizations will use the data:

- US Army Institute of Public Health (USAIPH)
- Environmental Management Division, McAlester Army Ammunition Plant – Project Sponsor and Site Liaison
- McAlester Army Ammunition Plant – OB/OD Unit Operator
- ODEQ Land Protection Division – Regulatory Approval Authority

What will the data be used for?

Per the requirements of MCAAP's Part B Hazardous Waste Management Operations permit, data obtained from periodic long term ground water, soils, surface water and sediment monitoring will be used to determine if and to what extent continuing operation of the OB/OD units impact respective media underlying those units.

What types of data are needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques)

Concentrations of explosives, perchlorates (only ground water, surface water and soil), total (dissolved for surface water) metals, SVOCs (only ground water and soil), nitrates/nitrites (only ground water and surface water), TOC (only soil and sediment), particle size analysis (only soil), hardness (only surface water) and field quality parameters in ground water, soils, surface water and sediments. In addition, ground water level measurements are needed to confirm ground water flow direction.

Analytical parameters are outlined in Worksheet #18. Parameters and analytical methods are identified in Worksheets #15 and #19.

How "good" do the data need to be in order to support the environmental decision? The data will be collected and analyzed to achieve a limit of quantification (LOQ) that is at least one third but preferably one tenth of the applicable screening value. This is necessary to support the statistical analyses and any human and ecological health risk assessments, if warranted. Analytical Methods, Project Action Levels, and Screening Levels are presented in Worksheets #15. In addition, the data must meet the requirements for at least Level 3 Laboratory Data Deliverable to allow for data validation using this QAPP and the USEPA National Functional Guidelines.
How much data are needed? (number of samples for each analytical group, matrix, and concentration) See Table 1, Sample Summary and Rationale. The MCAAP OB/OD ground water, surface water and sediment sampling will occur during 2 sampling events per year to determine if explosives, perchlorates, total (dissolved for surface water) metals, SVOCs and/or nitrates/nitrites are migrating off-range at a concentration that would present an unacceptable risk to humans or ecological receptors. For soils, the McAAP Soil Detection Monitoring and Soil Delineation Monitoring will be conducted simultaneously during the initial sampling event to evaluate the presence, type, and concentrations of COPC in soil surrounding the demolition pits, burning pans, and rocket static firing pads and to determine the potential transport of COPC released outside of the firebreaks at concentrations that may pose a risk to human health and the environment. The soil monitoring workplan has been designed in a manner such that statistical comparison can be made between the OB/OD soil sample data and a comparison threshold (i.e. soil screening level or background concentration). Twenty-seven incremental composite samples (ICS), each consisting of 45 subsamples, will be collected from surface soil of the OB/OD sites and the surrounding OB/OD treatment unit firebreaks. The purpose of the samples is to obtain data throughout the expected range of conditions at the OB/OD sites. Site statistics will be calculated from the data. Duplicate samples for at least 10 percent of the locations are necessary to provide an indication of the measurement error. Additionally, surface soil samples will be collected from a background comparison area located within the McAAP munition bunker storage area to distinguish between naturally occurring COPC (metals only) concentrations from COPC concentrations resulting from site munition treatment activities. The MCAAP OB/OD groundwater sampling network design, sampling and analytical regimen, and rationale for long-term ground water monitoring were based on historical ground water data collection. This QAPP implements this design and strategy.

Where, when, and how should the data be collected/generated?

Where:

Ground water, soils, surface water and sediments samples will be collected in the vicinity of the OB/OD areas (Figures 2 and 3). Surface soil samples (0 to 4 inches) will be collected from three sampling units located within the OB/OD areas to evaluated COPC concentrations associated with the demolition pits, burning pans, and rocket static firing pads. Additionally, surface soil samples will be collected from six sampling units surrounding the OB/OD treatment unit firebreaks to evaluate COPC releases migrating outside the OB/OD treatment unit boundary.

When: See Worksheet 16 for the project schedule

How: See below

Ground-Water System.

Procedures for Collection of Water Level Data and Ground-Water Samples.

General. Ground-water samples will be collected from monitoring wells identified in Figures 2, 3 and 4.

Water Level Measurements.

Prior to ground-water purging and sampling, project personnel will measure the static water level in each monitoring well that will be sampled. Water level measurements will be taken at each monitoring well. These measurements will provide the data for determining the water table gradient and lateral ground-water flow direction. Water levels will be measured with a battery-powered water level indicator to the nearest 0.01-foot. The water level indicator will be decontaminated between each sampling location to prevent possible cross-contamination. Water levels will be measured from a marked point on top of the monitoring well casing. From these measurements a purge volume of each well will be calculated.

Purging.

A multiprobe flowcell sampling system will be used to monitor indicator parameters during all well purging. Ground water will be pumped through the sample tubing to the surface where it will flow into and through a 250-milliliter capacity cell with four inserted probes that monitor pH, conductivity, temperature, dissolved oxygen (DO), and oxidation reduction potential (ORP). An in-line bypass valve is located upstream of the flowcell to allow periodic withdrawal of water for turbidity measurements. The cell top is made of medical grade polycarbonate. The cell bottom is made of machined acrylic. The indicator parameters are monitored for stabilization. When the indicator parameters have stabilized, water samples will be collected directly from the tubing into the sample containers. All water samples will be collected upstream of the flowcell to prevent cross-contamination between monitoring wells.

Prior to sample collection, personnel will purge monitoring wells of stagnant water to ensure that water that is representative of the ground-water system is collected for analysis. Wells will be purged with peristaltic pumps or submersible electrical pumps. Purging will generally follow procedures outlined in the ASTM Standard D 6771-02, "Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations". While low-flow pumping is the preferred purge method, cases of inadequate recharge rates or other factors may require the last resort use of disposable bailers. Tubing (and bailers if used), will be dedicated to a single well and disposed of after the well is purged and sampled. The field geologist will determine the purge method used with consideration of site conditions, well recharge rates, and sampling objectives. An adequate purge volume is normally achieved once three successive readings of water quality parameters have stabilized. Field sampling personnel will monitor pH, specific conductance, dissolved oxygen, temperature, and turbidity of the ground water removed during purging and will record these parameters and the volume of water removed. The parameters may stabilize before three well volumes, negating the need to purge a full three to five well volumes.

The pH will be considered stable when measurements remain constant within a 0.1 standard unit. Specific conductance will be considered stable when it varies no more than 10 percent. Temperature will be considered stable when it remains constant for three consecutive readings. Measurements will be taken on a frequency that is based on the initial calculated purge volume to ensure a sufficient number of readings to evaluate stability.

If chemical parameters have not stabilized by three well volumes according to the above criteria, additional well volumes will be removed. If the parameters have not stabilized within five well volumes, the sample will be collected at that point, unless the field geologist decides that purging should be continued. If a well is purged dry using low flow techniques or manual bailing after the evacuation of one or two well volumes, the well will be considered adequately purged, allowed to recover, and will be sampled within 24 hours.

Ground-Water Sample Collection. Where practical, monitoring wells will be sampled using low flow purging and sampling procedures. Samples will be collected with a peristaltic pump and dedicated 3/8 inch ID clear polyethylene tubing. Dedicated Whale pumps will be used if the peristaltic pump is unable to retrieve ground-water sample due to deep ground-water levels. The depth of pumping will be set at the mid screen point if the screen is completely below the water table or, at a depth equal to the middle of the column of water within the well if the top of the water level is below the top of the screen. A controller will regulate the discharge rate as low as practical. This will help to reduce turbulence and water level drawdown in the well. All samples will be collected in the appropriate, laboratory supplied containers from the pump discharge line (the tubing).

If conditions dictate that bailers be used for sample collection, decontaminated, disposable bailers with a clean line that allows the bailer to be lowered from the surface into the monitoring well will be used. The bailer will be gently immersed in the top of the water column until just filled. The bailer will then be gently removed and the contents emptied into the appropriate, laboratory supplied sample containers. The bailer and line used to collect samples from each well will be disposed of after each use.

Sample Preservation. Appropriate chemical preservatives will be added to the sample containers (before or after sample collection, as appropriate) and samples will be maintained at 1º - 6º Celsius as a sample preservation technique. The USAIPH Laboratory Operations Division will provide the sample containers to the study team.

Sample Container Labeling, Storage and Shipment. Labels will be affixed to each sample container prior to shipment to the field. Information on the sample labels will include the project manager's name, installation name, analytical parameter, sample identification number (e.g., well identification), and date-time of collection (sample ID and collection date and time sections will be completed in the field). Sample containers will be packed in ice-filled coolers immediately after collection, preservation, and labeling. Sample coolers will be sealed with tape and chain-of-custody seals and shipped to the USAIPH laboratory at Aberdeen Proving Ground, Maryland (or trucked and delivered by USAIPH vehicles).

Analytical Parameters. Ground water will be analyzed on-site for pH, temperature, conductivity, oxidation/reduction potential, and dissolved oxygen. All samples for all parameters will be sent to the USAIPH laboratory and analyzed or sent to the appropriate contract laboratory for analysis. Parameters include (some parameters not for all samples of a particular matrix): 1) Ground water: SVOCs, explosives and related compounds, metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), perchlorate, and total nitrate/nitrite; 2) Surface water: explosives and related compounds, dissolved metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), perchlorate, and total nitrate/nitrite; 3) Soil: SVOCs, explosives and related compounds, metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), perchlorate, total organic carbon (TOC), and particle sizing; and 4) Sediment: explosives and related compounds, metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), and TOC.

Decontamination Procedures.

General Practice. Decontamination procedures will be done in accordance with ASTM 5088-90 (Standard Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites) All attempts will be made to minimize the need for decontamination by using dedicated sampling equipment when feasible. All attempts will be made to minimize the need for decontamination by using dedicated sampling equipment when feasible.

Decontamination Procedures. The following procedures will be used to decontaminate all equipment that contacts or potentially could contact samples.

• Water level meter: (1) rinse probe with distilled water before use (2) wipe tape with wetted disposable cloth or paper towel upon retraction from well then (3) clean with laboratory grade detergent (4) rinse probe after detergent clean with deionized water.

Surface Water System.

Procedures for Collection of Surface Water and Sediment Samples.

General. Surface water and sediment samples will be collected from sedimentation ponds and runoff locations identified in Figures 2, 3 and 4. A small boat will be used to access sample locations on the sedimentation ponds after the unexploded ordnance (UXO) technician has cleared the site. Before collecting each sediment sample, the location will be checked for UXO.

The surface water will be collected using the trace metals method, EPA method 1669 (EPA, 1996). The samples will be collected using a peristaltic pump and clean *Teflon* and peristaltic tubing. At locations that are 3 feet and less deep, the tubing will be lowered to mid depth and water will be pumped first to purge the tubing and filter (0.2 µ) for perchlorates and then fill the laboratory furnished sample bottle leaving sufficient head space for oxygen exchange. Then the (0.45µ) filter will be purged and the dissolved metals laboratory furnished sample container will be filled careful not to contaminate the sample. Then the filter will be removed and the remaining sample containers will be filled. Locations greater than 3 feet deep will have the depth divided equally, filling half of each sample bottle at two thirds the depth and the other half at one third the depth. The multi-parameter meter (temperature, dissolved oxygen, pH, conductivity, and turbidity) will then be used to measure and record the general water quality parameters at each depth and location.

The USEPA Methods for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual (USEPA, 2001) will be used as guidance for sediment sampling. The manual discusses issues such as sample volume, the use of replicates and compositing, the optimum depth of sample, the types of sediment samplers available and how to choose the most appropriate, equipment decontamination procedures, recommended field measurements and observations, and sample transport and storage. The sediment will be collected using a stainless steel Petit *Ponar* dredge in the sedimentation ponds and stainless steel scoops in the drainage location. Sufficient sample will be collected in a *Teflon* lined stainless steel bucket to fill the different sample containers. A stainless steel scoop will be used to thoroughly homogenize the sample and place the sample in the individual sample containers.

Decontamination Procedures.

General Practice. Decontamination procedures will be done in accordance with ASTM 5088-90 (Standard Practice for Decontamination of Field Equipment Used at Nonradioactive Waste Sites). All attempts will be made to minimize the need for decontamination by using dedicated sampling equipment when feasible.

Soil System.

Procedures for Collection of Soil Samples.

General.

A total of 30 individual incremental composite samples, plus QAQC samples, will be collected to support the soil monitoring workplan data quality objectives. Three incremental composite samples, each consisting of 45 increments or “subsamples”, will be collected in each of the ten sample units identified to be sampled in support of the soil monitoring plan.

A handheld GPS unit will be used to navigate to the UTM coordinates (easting and northing) for each of the 45 incremental composite subsamples. To complete each incremental composite sample, at each of the 45 subsample locations, surface soil will be collected from a depth of 0 – 4 inches using a soil core (with approximate 2 to 3 cm diameter) sampling device and placed into a dedicated sample container. Two soil cores will be collected at each incremental composite subsample locations to collect a sufficient amount of soil to analyze for the identified parameters. One soil core will be collected at each of the 45 subsample locations for explosives and metals analysis. Where applicable, a second soil core will be advanced adjacent to the initial core for analysis to include SVOCs, perchlorate, mercury, particle size analysis and/or TOC. Additional soil cores will be collected, following the same sampling procedures at locations identified for field QAQC duplicate sample collection.

For explosives and metals analysis (with the exception of mercury analysis), laboratory incremental composite sample preparation will be in accordance with the USEPA SW 846 Method 8330B, Nitroaromatics, Nitramines, and Nitrate Esters by High Performance Liquid Chromatography (HPLC), Appendix A: Collecting and Processing of Representative Samples for Energetic Residues in Solid Matrices from Military Training Ranges (USEPA, 2006).

Due to the relatively recent use of incremental composite sampling for evaluating COPC other than explosives, significant coordination between project managers and the analytical laboratory is required and will continue throughout soil monitoring sampling activities to ensure that the analytical laboratory can meet incremental sample preparation and analytical requirements for all analytical parameters to include SVOCs, perchlorate and metal analyses. At a minimum, in a laboratory setting, SVOC, perchlorate and mercury analytical samples will be thoroughly homogenized as to reduce compositional variability and the proper analytical subsampling techniques will be performed to ensure a representative particle size is analyzed. SVOC and mercury analytical samples will not require milling since as the grinding temperature may lead to the destruction of contaminants. Further, project managers will coordinate with the analytical laboratory to establish certified and documented analytical procedures that meet site investigation data requirements. All analytical methods and procedures will be thoroughly documented and detailed in the final report of findings.

Due to the relatively recent use of incremental composite sampling to assess COPC other than explosives, guidance provided by the following state regulatory agencies, workgroups, and DOD agencies have been reviewed in developing the incremental composite sampling techniques used to evaluate COPC release to the environment resulting from the McAAP OB/OD treatment unit activities: Alaska Department of Environmental Conservation (DEC), Hawaii Department of Occupational Health (DOH), Ohio EPA Volunteer Assessment Program (VAP), and the Interstate Technology Regulatory Council (ITRC) ISM guidance. Several states are represented in ITRC workgroup including Florida, California, Massachusetts, Texas, Oklahoma, Arizona, and New Mexico. The US Army Corps of Engineers Interim Guidance 09-02: Implementation of Incremental Sampling (IS) of Soil for the Military Munitions Response Program was also reviewed in developing this soil monitoring workplan (USACE, 2009).

Decontamination Procedures.

General Practice. To prevent cross contamination, non-dedicated sampling equipment will be decontaminated between collecting each incremental composite sample. However, sample equipment will not require decontamination between subsample locations. Non-dedicated sample equipment will be decontaminated thoroughly by washing with an industrial detergent, such as Alconox, scrubbed clean using a brush, and thoroughly rinsed using distilled water. Decontaminated equipment shall be stored in a manner as to prevent possible contamination while not in use (e.g., stored in plastic ziploc bags or wrapped in aluminum foil). Equipment rinsate samples will be collected to evaluate the efficacy of decontamination procedures. Additionally, sample personnel will don new gloves at each new composite sample location; however, new gloves are not required when collecting incremental composite subsamples.
Who will collect and generate the data? USAIPH personnel will collect and generate the field data. USAIPH and contracted analytical laboratories (i.e., Brooks-Rand Laboratories and Eurofins Lancaster Laboratories-Environmental) will generate all analytical data for samples submitted for laboratory testing.
How will the data be reported? Data will be reported in the Semi-Annual Long Term Multi-Media Monitoring Report for OB/OD sites at MCAAP and accompanying electronic data deliverable.
How will the data be archived? The field data will be archived in the project file located in the USAIPH SWP for an indefinite time period. The Project Manager is responsible for maintaining the project file. All analytical chemistry reports and raw data (including lab notebooks, maintenance logs etc.) will be archived for 75 years by the USAIPH Laboratory Sciences (LS) using the Army Records Information Management System (ARIMS). Analytical data from contract laboratories is submitted to the USAIPH LS and will be archived by using the ARIMS.

TABLE 1. SAMPLE SUMMARY AND RATIONALE, GROUNDWATER, SURFACE WATER AND SEDIMENT

Sample Location	Sample Type	Sample Frequency	Analytes	QA/QC Samples	Total QA/QC Samples	Total Samples	Sampling Rationale
MW-NDG-01	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Sidegradient of New Demolition Pits
MW-NDG-02	Grab	Semi-Annual	Explosives, Perchlorates, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), SVOCs, Nitrate/Nitrite	none	0	5	Sidegradient of Open Burning Ground Burn Pans
MW-NDG-03	Grab	Semi-Annual	Explosives, Perchlorates, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), SVOCs, Nitrate/Nitrite	Duplicates, MS/MSD	5	10	Downgradient of Open Burning Grounds Burn Pans and Flashing Trenches
MW-NDG-04	Grab	Semi-Annual	Explosives, Perchlorates, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), SVOCs, Nitrate/Nitrite	none	0	5	Sidegradient of Open Burning Ground Burn Pans
MW-NDG-05	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Downgradient of New Demolition Sedimentation Pond
MW-NDG-06	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	Duplicates, MS/MSD	5	10	Downgradient of New Demolition Pits
MW-NDG-07	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Vicinity of New Demolition Sedimentation Pond
MW-NDG-08	Grab	Bi-Annual (August Odd Years)	Explosives, Perchlorates, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), SVOCs, Nitrate/Nitrite	none	0	5	Upgradient of Open Burning Ground Burn Pans
MW-NDG-09	Grab	Bi-Annual (August Odd Years)	Explosives, Perchlorates, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), SVOCs, Nitrate/Nitrite	none	0	5	Downgradient of Open Burning Ground Burn Pans
MW-NDG-10	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Upgradient of New Demolition Pits
MW-NDG-11	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Upgradient of New Demolition Pits
MW-NDG-12	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Sidegradient of New Demolition Pits

MW-NDG-13	Grab	Semi-Annual	Explosives, Perchlorates, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), SVOCs, Nitrate/Nitrite	none	0	5	Downgradient of Open Burning Ground Static Firing Pads and Burn Pans
MW-NDG-14	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Sidegradient of New Demolition Pits
MW-NDG-15	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Downgradient of New Demolition Pits
MW-NDG-16	Grab	Semi-Annual	Explosives, Total Metals (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Downgradient of New Demolition Pits
MW-NDG-17	Grab	Quarterly for 8 sample events then Semi-Annual	Explosives, Perchlorates, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), SVOCs, Nitrate/Nitrite	none	0	5	Downgradient of Open Burning Ground Static Firing Pads
MW-ODA-1	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Upgradient of Old Demolition Pits
MW-ODA-2	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Downgradient of Old Demolition Sedimentation Pond
MW-ODA-3	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Downgradient of Old Demolition Sedimentation Pond
MW-ODA-4	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Sidegradient of Old Demolition Pits
MW-ODA-5	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Upgradient of Old Demolition Pits
MW-ODA-6A	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Downgradient of Old Demolition Pits
MW-ODA-7	Grab	Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Downgradient of Old Demolition Pits
MW-ODA-8	Grab	Quarterly for 8 sample events then	Explosives, Total Metals (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Sidegradient of Old Demolition Pits

		Semi-Annual					
MW-ODA-9	Grab	Quarterly for 8 sample events then Semi-Annual	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite	none	0	5	Sidegradient of Old Demolition Pits
SW-ODA-1	Grab	Bi-Annual (August Odd Years)	Explosives, Dissolved Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite, Hardness	none	0	1	Upper part of Old Demolition Area Sedimentation Pond
SW-ODA-2	Grab	Bi-Annual (August Odd Years)	Explosives, Dissolved Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite, Hardness	none	0	1	Mid way down Old Demolition Area Sedimentation Pond
SW-ODA-3	Grab	Bi-Annual (August Odd Years)	Explosives, Dissolved Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite, Hardness	none	0	1	Lower Part of Old Demolition Area Sedimentation Pond
SD-ODA-1	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Total Organic Carbon	none	0	1	Upper Part of Old Demolition Area Sedimentation Pond
SD-ODA-2	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Total Organic Carbon	none	0	1	Midway down Old Demolition Area Sedimentation Pond
SD-ODA-3	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Total Organic Carbon	none	0	1	Lower Part of Old Demolition Area Sedimentation Pond
SW-NDA-1	Grab	Bi-Annual (August Odd Years)	Explosives, Perchlorate, Dissolved Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite, Hardness	none	0	1	Upper Part of New Demolition Area Sedimentation Pond

SW-NDA-2	Grab	Bi-Annual (August Odd Years)	Explosives, Perchlorate, Dissolved Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite, Hardness	none	0	1	Midway Down New Demolition Area Sedimentation Pond
SW-NDA-3	Grab	Bi-Annual (August Odd Years)	Explosives, Perchlorate, Dissolved Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite, Hardness	none	0	1	Lower Part of New Demolition Area Sedimentation Pond
SD-NDA-1	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Total Organic Carbon	none	0	1	Upper part of New Demolition Area Sedimentation Pond
SD-NDA-2	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Total Organic Carbon	none	0	1	Midway Down New Demolition Area Sedimentation Pond
SD-NDA-3	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Total Organic Carbon	none	0	1	Lower Part of New Demolition Area Sedimentation Pond
SW-OBG-1	Grab	Bi-Annual (August Odd Years)	Explosives, Perchlorate, Dissolved Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite, Hardness	none	0	1	Drainage Leaving Northwest Corner of Open Burning Grounds
SW-OBG-2	Grab	Bi-Annual (August Odd Years)	Explosives, Perchlorate, Dissolved Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite, Hardness	none	0	1	Drainage Leaving Western Portion of Open Burning Grounds
SW-REF-1	Grab	Bi-Annual (August Odd Years)	Explosives, Perchlorate, Dissolved Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Nitrate/Nitrite, Hardness	none	0	1	Reference for New Demolition Area, Old Demolition Area and Open Burning Grounds (reservoir 2)

SD-OBG-1	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Total Organic Carbon	none	0	1	Drainage Leaving Northwest Corner of New Burning Grounds
SD-OBG-2	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Total Organic Carbon	none	0	1	Drainage Leaving Western Portion of Open Burning Grounds
SD-REF-1	Grab	Bi-Annual (August Odd Years)	Explosives, Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, Ag), Total Organic Carbon	none	0	1	Reference for New Demolition Area, Old Demolition Area and Open Burning Grounds

Table 2. Ground/Surface-Water Analytical Methods

ANALYTE	ANALYTICAL METHOD
Total (Dissolved for Surface Water) Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag). Also, Ca and Mg for surface water to determine hardness.	For ground water: EPA Methods 245.1 (Hg) and 200.8. For surface water: EPA 1631E (Hg) and 1638mod
Perchlorate	EPA Method 6850
Semi-Volatile Organic Compounds (Ground water only)	EPA Method 8270C
Explosives and related compounds	EPA Method 8095 (modified)
Total Nitrate/Nitrite	EPA 353.2mod

Table 3. Sediment Analytical Methods

ANALYTE[1]	ANALYTICAL METHOD
Total Metals (Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag)	EPA Methods 6020 and 7471A (Hg)
Explosives and related compounds	EPA Method 8095 (modified)
Total Organic Carbon	EPA 9060A

Table 4. Soil Monitoring Sample Summary.

Parameter	**Open Burning Grounds**	**New Demolition Area**	**Old Demolition Area**	**Firebreaks**		**Background**	**Field QAQC**
				Old OD	**New OB/OD**		
Perchlorates	3	0	0	0	9	3	2 Duplicate; 2 Split
Explosives	3	3	3	9	9	3	2 Duplicate; 2 Split
Select Metals – Total	3	3	3	9	9	3	2 Duplicate; 2 Split
SVOCs	3	0	0	0	9	3	2 Duplicate; 2 Split
Particle Size	1	1	1	1	1	1	NA
TOC	1	1	1	1	1	1	NA
Percent Moisture	1	1	1	1	1	1	NA

Table 5. Soil Analytical Methods.

ANALYTE	ANALYTICAL METHOD
Perchlorate	EPA 6850
Explosives and Related Compounds	EPA 8330B for processing/EPA 8095 (modified) for analysis
Metals – Al, As, Sb, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	EPA 6020 EPA 7471A (Hg)
Semi-Volatile Organic Compounds	EPA 8270C
Particle Size Distribution	ASTM D422
Total Organic Carbon	EPA 9060A
Percent Moisture	Drying to constant weight

QAPP Worksheet #12: Measurement Performance Criteria
(UFP-QAPP Manual Section 2.6.2)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Groundwater

Analytical Group or Method: Semi-volatile organic compounds (SVOC), EPA 8270C

Concentration Level: Low

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Method blank	Less than ½ the quantitation limit
Overall Precision	Field Duplicate	Project assigned limits. RPD ≤ 40%
Accuracy/bias	Laboratory Control Sample (LCS)	Laboratory control limits. See Worksheet #28.
Accuracy/bias Precision	Laboratory Control Sample Duplicate (LCSD)	Laboratory control limits. See Worksheet #28. ≤ 30 % RPD
Accuracy/bias Matrix effects	Matrix Spike (MS)	Laboratory control limits. Same as LCS limits. See Worksheet #28.
Accuracy/bias Precision	Matrix Spike Duplicate (MSD)	Laboratory control limits. Same as LCS limits. See Worksheet #28. ≤ 30 % RPD

Matrix: Groundwater and Surface Water

Analytical Group or Method: Explosives and Related Compounds, EPA 8095modified

Concentration Level: Low

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Method blank	Less than ½ the quantitation limit.
Overall Precision	Field Duplicates	Project assigned limits. RPD ≤ 40%
Accuracy/bias – Representativeness	Container Blank (Surface Water Only)	Project assigned limits. Less than the quantitation limit.
Accuracy/bias – Representativeness	Equipment Blank (Surface Water Only)	Project assigned limits. Less than the quantitation limit.
Accuracy/bias	Laboratory Control Sample (LCS)	Laboratory control limits. See Worksheet #28.
Accuracy/bias Precision	Laboratory Control Sample Duplicate (LCSD)	Laboratory control limits for recovery. See Worksheet #28. RPD ≤ 30%
Accuracy/bias Matrix effects	Matrix Spike (MS)	Laboratory control limits. Same as LCS limits. See Worksheet #28.
Accuracy/bias Precision	Matrix Spike Duplicate (MSD)	Laboratory control limits for recovery. Same as LCS limits. See Worksheet #28. RPD ≤ 30%

Matrix: Groundwater and Surface Water

Analytical Group or Method: Perchlorate by EPA 6850

Concentration Level: Low

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Laboratory Reagent Blank	Less than 1/3 the quantitation limit
Overall Precision	Field Duplicate	Project assigned limits. RPD ≤ 40%
Accuracy/bias – Representativeness	Container Blank (Surface Water Only)	Project assigned limits. Less than the quantitation limit.
Accuracy/bias – Representativeness	Equipment Blank (Surface Water Only)	Project assigned limits. Less than the quantitation limit.
Accuracy/bias	Laboratory Control Sample (LCS) (= Laboratory Fortified Blank (LFB))	Laboratory control limits. 86-108%.
Accuracy/bias Precision	Laboratory Control Sample Duplicate (LCSD) (= Laboratory Fortified Blank Duplicate (LFBD))	Laboratory control limits. 86-108%, and ≤ 20 % RPD
Accuracy/bias Matrix effects	Matrix Spike (MS)	Laboratory assigned limits. 80-120 %
Accuracy/bias Precision	Matrix Spike Duplicate (MSD)	Laboratory assigned limits: 80-120%, and ≤ 20 % RPD

Matrix: Groundwater

Analytical Group or Method: Metals by EPA 200.8 (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Se, Ag) and EPA 245.1 (Hg).

Concentration Level: Low

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Laboratory Reagent Blank	Less than the quantitation limit
Overall Precision	Field Duplicates	Project assigned limits. RPD ≤ 40%
Accuracy/bias	Laboratory Control Sample (LCS)	Laboratory control limits. See worksheet 28.
Accuracy/bias Matrix effects	Matrix Spike (MS)	Laboratory assigned limits. 70-130 % (all metals).
Precision	Matrix Spike Duplicate (MSD)	Laboratory assigned limits. 70-130% recovery and ≤ 20 % RPD (all metals).

Matrix: Surface Water

Analytical Group or Method: Metals by EPA 1638mod (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Se, Ag, Ca, Mg (Ca and Mg for hardness calculation))

Concentration Level: Low/Trace

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Laboratory Reagent/Method Blank	≤ ½ LOQ/MRL or ≤ 10% of any sample. Or ≤ 10% of the project quantitation limit
Accuracy/bias – Representativeness	Container Blank	Project assigned limits. ≤ ½ RL or ≤ 10% of any sample. Or ≤ 10% of regulatory limit
Accuracy/bias – Representativeness	Equipment Blank	Project assigned limits. ≤ ½ RL or ≤ 10% of any sample. Or ≤ 10% of regulatory limit
Overall Precision	Field Duplicate	Project assigned limits. RPD ≤ 40%
Accuracy/bias	Laboratory Control Sample (LCS)	85-115%

Matrix: Surface Water

Analytical Group or Method: EPA 1631E (Hg).

Concentration Level: Low/Trace

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Laboratory Reagent/Method Blank	Laboratory assigned limits. Each MB ≤ 0.5 ng/L and standard deviation ≤ 0.1 ng/L or highest MB < 0.1 times the lowest reported result
Accuracy/bias – Representativeness	Container Blank	Project assigned limits. Less than 0.5 ng/L (or less than 10% of the lowest reported sample result)
Accuracy/bias – Representativeness	Equipment Blank	Project assigned limits. Less than 0.5 ng/L (or less than 10% of the lowest reported sample result)
Overall Precision	Field Duplicate	Project assigned limits. RPD ≤ 40%
Accuracy/bias Matrix effects	Matrix Spike (MS) (run as post digestion spike)	Laboratory assigned limits. 71-125%
Precision	Matrix Spike Duplicate (MSD) (run as post digestions spike duplicate)	Laboratory assigned limits. 71-125%; RPD between MS/MSD ≤ 24%

Matrix: Groundwater and Surface Water

Analytical Group or Method: Nitrate+Nitrite (Total), EPA 353.2mod

Concentration Level: Mid

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Laboratory Reagent Blank	Less than ½ the quantitation limit.
Overall Precision	Field Duplicate	Project assigned limits. RPD $\leq$ 40%
Accuracy/bias – Representativeness	Container Blank (Surface Water Only)	Project assigned limits. Less than the quantitation limit.
Accuracy/bias – Representativeness	Equipment Blank (Surface Water Only)	Project assigned limits. Less than the quantitation limit.
Accuracy/bias	Laboratory Control Sample (LCS) (= Laboratory Fortified Blank, LFB)	80-120% recovery
Accuracy/bias Precision	Laboratory Control Sample Duplicate (LCSD) (= Laboratory Fortified Blank Duplicate, LFBD)	80-120% recovery RPD $\leq$ 20%
Accuracy/bias Matrix effects	Matrix Spike (MS)	80-120% recovery

Matrix: Soil

Analytical Group or Method: Semi-volatile organic compounds (SVOC)

Concentration Level: Low

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Method blank	Less than ½ the quantitation limit
Overall Precision	Field Duplicate	Project assigned limits. RPD ≤ 35%
Accuracy/bias – Representativeness	Equipment Blank (associated water)	Less than the quantitation limit.
Accuracy/bias	Laboratory Control Sample (LCS)	Laboratory control limits. See Worksheet #28.
Accuracy/bias Precision	Laboratory Control Sample Duplicate (LCSD)	Laboratory control limits for recovery. See Worksheet #28. ≤ 40 % RPD
Accuracy/bias Matrix effects	Matrix Spike (MS)	Laboratory control limits. Same as LCS limits. See Worksheet #28.
Accuracy/bias Precision	Matrix Spike Duplicate (MSD)	Laboratory control limits for recovery. Same as LCS limits. See Worksheet #28. ≤ 40 % RPD

Matrix: Sediment

Analytical Group or Method: Explosives and Degradates Using EPA 8095 (Modified)

Concentration Level: Low

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Method blank	Less than ½ the quantitation limit.
Overall Precision	Field Duplicate	Project assigned limits. RPD ≤ 40%
Accuracy/bias – Representativeness	Field Blank (associated water)	Project assigned limits. Less than the quantitation limit.
Accuracy/bias – Representativeness	Equipment Blank (associated water)	Project assigned limits. Less than the quantitation limit.
Accuracy/bias	Laboratory Control Sample (LCS)	Laboratory control limits. See Worksheet #28.
Accuracy/bias Precision	Laboratory Control Sample Duplicate (LCSD)	Laboratory control limits for recovery. See Worksheet #28. RPD ≤ 40%
Accuracy/bias Matrix effects	Matrix Spike (MS)	Laboratory control limits. Same as LCS limits. See Worksheet #28.
Accuracy/bias Precision	Matrix Spike Duplicate (MSD)	Laboratory control limits for recovery. Same as LCS limits. See Worksheet #28. RPD ≤ 40%

Matrix: Soil

Analytical Group or Method: Explosives and Degradates Using Incremental Composite Sampling (ICS), EPA 8330B Sample Processing, and Analysis by EPA 8095 (Modified)

Concentration Level: Low

Reference: DoD Quality Systems Manual, version 5, Appendix B, Table 3

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Overall Precision	Field Duplicate	Project assigned limits. RPD ≤35%
Accuracy/bias – Representativeness	Equipment Blank (associated water)	Less than ½ the quantitation limit.
Accuracy/bias- Representativeness	Soil grinding blank (sand)	Less than ½ the quantitation limit
Precision (soil processing)	Soil sample triplicate	≤ 20% RSD for results above the quantitation limit
Accuracy/bias – Representativeness	Method blank	Less than ½ the quantitation limit.
Accuracy/bias	Laboratory Control Sample (LCS), through all 8330B processing steps	DoD QSM v5 limits. See worksheet 28.
Accuracy/bias	Laboratory Control Sample (LCS), spiked post-8330B processing	Laboratory control limits. See worksheet 28.
Accuracy/bias Precision	Laboratory Control Sample Duplicate (LCSD), spiked post- 8330B processing	Laboratory control limits for recovery. ≤ 40 % RPD
Accuracy/bias Matrix effects	Matrix Spike (MS)	Laboratory control limits. Same as LCS criteria. See worksheet 28.
Accuracy/bias Matrix effects Precision	Matrix Spike Duplicate (MSD)	Laboratory control limits for recovery. ≤ 40 % RPD

Matrix: Sediment and Soil

Analytical Group or Method: Metals by EPA 6020 (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Se, Ag) and EPA 7471A (Hg).

Concentration Level: Low

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Method Blank	DoD Quality Systems Manual Criteria. Less than ½ the quantitation limit.
Overall Precision	Field Duplicate	Project assigned limits. RPD ≤ 40% for sediment RPD ≤ 35% for soil
Accuracy/bias – Representativeness	Equipment Blank (an associated water sample)	Project specified limit. Less than the quantitation limit.
Accuracy/bias – Representativeness	Field Blank (an associated water sample; sediment only)	Project specified limit. Less than the quantitation limit.
Accuracy/bias	Laboratory Control Sample (LCS)	DoD Quality Systems Manual Criteria. See worksheet 28.
Accuracy/bias Matrix effects	Matrix Spike (MS)	DoD Quality Systems Manual Criteria. Same as LCS criteria. See worksheet 28.
Precision	Matrix Spike Duplicate (MSD)	DoD Quality Systems Manual Criteria. ≤ 20 % RPD (all metals)

Matrix: Soil

Analytical Group or Method: Perchlorate

Concentration Level: Low

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Laboratory Reagent Blank/Method Blank	DoD Quality Systems Manual Criteria. Less than ½ the quantitation limit.
Overall Precision	Field Duplicate	Project assigned limits. RPD ≤ 35%
Accuracy/bias – Representativeness	Equipment Blank (associated water)	Project assigned limits. Less than the quantitation limit.
Accuracy/bias	Laboratory Control Sample (LCS)	DoD Quality Systems Manual Criteria. 84-121%
Accuracy/bias Precision	Laboratory Control Sample Duplicate (LCSD)	DoD Quality Systems Manual Criteria for recovery. 84-121% Laboratory assigned limits for RPD. ≤ 25%
Accuracy/bias Matrix effects	Matrix Spike (MS)	DoD Quality Systems Manual LCS Criteria. 84-121%
Accuracy/bias (matrix effects) Precision	Matrix Spike Duplicate (MSD)	DoD Quality Systems Manual LCS Criteria for recovery. 84-121% Laboratory assigned limits for RPD. ≤ 25%

Matrix: Sediment and Soil

Analytical Group or Method: Total Organic Carbon (TOC) by EPA 9060A

Concentration Level: Low

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Accuracy/bias – Representativeness	Batch Blank	Laboratory assigned limits; less than the quantitation limit.
Accuracy/bias	Laboratory Control Sample (LCS)	Laboratory control limits; 47-143%.
Accuracy/bias Matrix effects	Matrix Spike (MS)	Laboratory control limits; 22-155%.
Precision	Sample Duplicate	Laboratory assigned limits; 13% RPD.

Matrix: Soil

Analytical Group or Method: Particle sizing/distribution, ASTM D422

Concentration Level: NA

Data Quality Indicator (DQI)	QC sample or measurement performance activity	Measurement Performance Criteria
Precision	Laboratory Duplicate	20% RPD

QAPP Worksheet #13: Secondary Data Uses and Limitations
(UFP-QAPP Manual Section 2.7)
(EPA 2106-G-05 Chapter 3: QAPP Elements For Evaluating Existing Data)

Data type	Source	Data uses relative to current project	Factors affecting the reliability of data and limitations on data use
Groundwater and Surface Water Data	Groundwater Consultations, SWMUs MCAAP-025 (Open Burning Grounds), MCAAP-027 (Old Demolition Area) and MCAAP-028 (New Demolition Area), McAlester Army Ammunition Plant, Oklahoma May 2006 to July 2013 USAIPH formerly USACHPPM	Assess baseline conditions Statistical analysis	Data is for localized area and represents a specific season and year
Groundwater Data	Ground-Water Re-Evaluation Report of Open Burning Grounds, New Demolition Grounds and Old Demolition Grounds, McAlester Army Ammunition Plant, Oklahoma April 2003 U.S. Army Corps of Engineers	Assess baseline conditions Statistical analysis	Data is for localized area and represents a specific season and year
Groundwater Data	Ground-Water Report of Open Burning Grounds, New Demolition Grounds and Old Demolition Grounds, McAlester Army Ammunition Plant, Oklahoma October 2003 U.S. Army Corps of Engineers	Assess baseline conditions Statistical analysis	Data is for localized area and represents a specific season and year

Surface Water, Ground Water, Soils and Sediments Data	Field Sampling OB/OD units at McAlester Army Ammunition Plant, McAlester, OK August 2006 EPA Region VI	Assess baseline conditions Statistical analysis	Data is for localized area and represents a specific season and year

QAPP Worksheet #14/16: Project Tasks & Schedule
(UFP-QAPP Manual Section 2.8.2)
(EPA 2106-G-05 Section 2.2.4)

Activity	Responsible party	Planned start date	Planned completion date	Deliverable(s)	Deliverable due date
Project Planning	USAIPH	May 2013	1 January 2015	Project QAPP, Sample and Analysis Plan, Health and Safety Plan, Geotechnical Sample Plan	1 January 2015
Mobilization/Demobilization	USAIPH	July 2015	August 2015		
Sample Collection-Reference Site Soils	USAIPH	July 2015	July 2015	All reference site soil samples collected	July 2015
Sample Collection-Groundwater	USAIPH	August 2015	August 2015	All groundwater samples collected	August 2015
Sample Collection-OB/OD Site Soils	USAIPH	August 2015	August 2015	All soil samples collected	August 2015
Sample Collection-Surface Water and Sediments	USAIPH	August 2015	August 2015	All surface water and sediment samples collected	August 2015
Analysis	USAIPH	August 2015	September 2015	Sample Analyses Reports	September 2015
Validation	USAIPH Contract Lab/ Data Validator	September 2015	September 2015	Validation Report	October 2015
Summarize Data	Project Team	September 2015	September 2015	Draft Report	October 2015
Final Report	Project Team	October 2015	October 2015	Final Report	November 2015

Typical Daily Field Schedule

Time	Activity
0630-0700	Check-in with badging office
0700-0715	Brief MCAAP Environmental Staff
0715-0745	Calibrate Field Instruments/ Load Equipment
0745-0800	Proceed to OB/OD Sites
0800-0815	Check-in with Range Foreman and Brief Daily Tasks/Locations
0815-0830	Safety Briefing with Project Personnel/EOD Support
0830-1030	Perform Groundwater/Soils and/or Surface Water/Sediment Sampling
1030-1200	Check-out with Range Foreman due to blasting schedules. Break for lunch.
1200-1230	Range personnel clear ranges, Check-in with Range Foreman and Brief Tasks/Locations
1230-1600	Perform Groundwater/Soils and/or Surface Water/Sediment Sampling
1600-1630	Package samples and chain of custodies for delivery to laboratory. Proceed to package delivery facility in McAlester for pickup.
1630-1700	Delivery sample coolers to package delivery facility.

Procedure to follow if site should be inaccessible? USAIPH personnel will coordinate sampling tasks with MCAAP Environmental and Range personnel 2 weeks in advance of field work. Should scheduling change and based on blasting/burn scheduling, the furthest site from daily operations will be sampled. If a particular site cannot be accessed in the morning and/or early afternoon, late afternoon and/or weekend range downtime will be utilized for access to sample locations. In the event of potential unaccounted for UXO and range restriction until clearances are approved, sampling locations which are approved and cleared will be accessed first. If the range is shut down due to the unaccounted for UXO for extended time (3 days or more), MCAAP will notify ODEQ of the situation and tentative schedule for reentry. The team will remobilize to the site once clearances are obtained.

QAPP Worksheet #15: Project Action Limits and Laboratory-Specific Detection/Quantitation Limits
(UFP-QAPP Manual Section 2.6.2.3 and Figure 15)
(EPA 2106-G-05 Section 2.2.6)

Matrix: Groundwater
Analytical Method: Semivolatile Organic Compounds (SVOC) by EPA 8270C
Concentration level: Low

Analyte	Project Action Limit (PAL), ug/L	PAL Reference	Project Quantitation Limit Goal, ug/L	Laboratory-specific quantitation limit (ug/L)*	Laboratory-specific detection limit(ug/L)**
1,2,4-trichlorobenzene, 120-82-1	70 (0.39 is tap)	Note 1	23	10	5
1,2-dichlorobenzene, 95-50-1	600 (28 is tap)	Note 1	60	10	5
1,3-dichlorobenzene, 541-73-1	NA	NA	Lab LOQ	10	5
1,4-dichlorobenzene, 106-46-7	75 (0.42 is tap)	Note 1	25	10	5
2,4,5-trichlorophenol, 95-95-4	89	Note 2	29	10	5
2,4,6-trichlorophenol, 88-06-2	0.9	Note 2	0.3	10	5
2,4-dichlorophenol, 120-83-2	3.5	Note 2	1.1	10	5
2,4-dimethylphenol, 105-67-9	27	Note 2	9	10	5
2,4-dinitrophenol, 51-28-5	3	Note 2	1	10	5
2,4-dinitrotoluene, 121-14-2	0.2	Note 2	0.06	10	5
2,6-dinitrotoluene, 606-20-2	0.042	Note 2	0.014	10	5
2-chloronaphthalene, 91-58-7	55	Note 2	18	10	5
2-chlorophenol, 95-57-8	7.1	Note 2	2.3	10	5
2-methylnaphthalene, 91-57-6	2.7	Note 2	0.9	10	5
2-methylphenol (cresol, o-), 95-48-7	72	Note 2	24	10	5

2-nitroaniline, 88-74-4	15	Note 2	5	10	5
3+4-methylphenol (cresol, m- + p-), 15831-10-4	72 (based on 3-)	Note 2	24	10	5
3-nitroaniline, 99-09-2	NA	NA	Lab QL	10	5
4,6-dinitro-2-methylphenol, 534-52-1	0.12	Note 2	0.04	10	5
4-bromophenyl-phenylether, 101-55-3	NA	NA	Lab QL	10	5
4-chloro-3-methylphenol, 59-50-7	110	Note 2	11	10	5
4-chloroaniline, 106-47-8	0.32	Note 2	0.1	10	5
4-chlorophenyl-phenylether, 7005-72-3	NA	NA	Lab QL	10	5
4-nitroaniline, 100-01-6	3.3	Note 2	1.1	10	5
4-nitrophenol, 100-02-7	NA	NA	Lab QL	10	5
Acenaphthene, 83-32-9	40	Note 2	13	10	5
Acenaphthylene, 208-96-8	NA	NA	Lab QL	10	5
Anthracene, 120-12-7	130	Note 2	13	10	5
Benzo(a)anthracene, 56-55-3	0.029	Note 2	0.009	10	5
Benzo(a)pyrene, 50-32-8	0.2 (0.0029 is tap)	Note 1	0.06	10	5
Benzo(b)fluoranthene, 205-99-2	0.029	Note 2	0.009	10	5
Benzo(g,h,i)perylene, 191-24-2	NA	NA	Lab QL	10	5
Benzo(k)fluoranthene, 207-08-9	0.29	Note 2	0.09	10	5
Benzyl alcohol, 100-51-6	150	Note 2	15	10	5
Bis(2-chloroethoxy)methane, 111-91-1	4.6	Note 2	1.5	10	5
Bis(2-chloroethyl)ether, 111-44-4	0.012	Note 2	0.004	10	5

Bis(2-chloroisopropyl)ether, 108-60-1 (2,2'-oxybis(1-Chloropropane))	0.31	Note 2	0.1	10	5
Bis(2-ethylhexyl)phthalate, 117-81-7	6 (4.8 is tap)	Note 1	2	10	5
Butylbenzylphthalate, 85-68-7	14	Note 2	4.6	10	5
Chrysene, 218-01-9	2.9	Note 2	0.9	10	5
Dibenz(a,h)anthracene, 53-70-3	0.0029	Note 2	0.0009	10	5
Dibenzofuran, 132-64-9	0.58	Note 2	0.19	10	5
Diethylphthalate, 84-66-2	110	Note 2	11	10	5
Dimethylphthalate, 131-11-3	NA	NA	Lab QL	10	5
Di-n-butylphthalate, 84-74-2	67	Note 2	22	10	5
Di-n-octylphthalate, 117-84-0	16	Note 2	5.3	10	5
Fluoranthene, 206-44-0	63	Note 2	21	10	5
Fluorene, 86-73-7	22	Note 2	7.3	10	5
Hexachlorobenzene, 118-74-1	1.0 (0.042 is tap)	Note 1	0.3	10	5
Hexachlorobutadiene, 87-68-3	0.26	Note 2	0.08	10	5
Hexachlorocyclopentadiene, 77-47-4	50 (2.2 is tap)	Note 1	16	10	5
Hexachloroethane, 67-72-1	0.51	Note 2	0.17	10	5
Indeno(1,2,3exp-cd)pyrene, 193-39-	0.029	Note 2	0.009	10	5
Isophorone, 78-59-1	67	Note 2	22	10	5
Naphthalene, 91-20-3	0.14	Note 2	0.04	10	5
Nitrobenzene, 98-95-3	0.12	Note 2	0.04	10	5
N-nitrosodimethylamine, 62-75-9	0.00042	Note 2	0.00014	10	5
N-nitroso-di-n-propylamine, 621-64-7	0.0093	Note 2	0.0031	10	5
N-nitrosodiphenylamine, 86-30-6	10	Note 2	3.3	10	5

Pentachlorophenol, 87-86-5	1 (0.035 is tap)	Note 1	0.33	10	5
Phenanthrene, 85-01-8	NA	NA	Lab QL	10	5
Phenol, 108-95-2	450	Note 2	45	10	5
Pyrene, 129-00-0	8.7	Note 2	2.9	10	5

Note 1: EPA Maximum Contaminant Levels, National Primary Drinking Water Standards
Note 2: EPA Regional Screening Levels, tapwater criteria
Shaded gray: QL goal is 1/3 the PAL and can be met by the lab QL (1/10 the PAL cannot be met by the lab QL)
Shaded yellow: QL goal is 1/3 the PAL but cannot be met by the lab QL. However, the lab QL is lower than the PAL.
Shaded red: QL goal is 1/3 the PAL but cannot be met by the lab QL. In addition, the lab QL cannot meet the PAL.
*Must be equal to or greater than the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.
**Determined by 40CFR136, Appendix B. Subject to moderate changes over time. SVOC MDLs are determined, then rounded up for consistency in reporting.

Matrix: Groundwater

Analytical Method: Explosives and Related Compounds, EPA 8095 modified

Concentration level: Low

Analyte	Project Action Limit (PAL), ug/L	PAL Reference	Project Quantitation Limit Goal, ug/L	Laboratory-specific quantitation limit (ug/L)*	Laboratory-specific detection limit(ug/L)**
HMX, 2691-41-0	400	Note 1	40	3	**
RDX, 121-82-4	2	Note 1	0.2	0.1	**
2,4,6-Trinitrotoluene (TNT), 118-96-7	2	Note 1	0.2	0.03	**
1,3,5-Trinitrobenzene (TNB), 99-35-4	460	Note 2	46	0.03	**
1,3-Dinitrobenzene (DNB), 99-65-0	1	Note 1	0.1	0.09	**
Tetryl, 479-45-8	31	Note 2	3.1	0.5	**
Nitrobenzene (NB), 98-95-3	0.12	Note 2	0.04	0.03	**
2-amino-4,6-dinitrotoluene (2ADNT), 35572-78-2	3.0	Note 2	0.3	0.1	**
4-amino-2,6-dinitrotoluene (4ADNT), 19406-51-0	3.0	Note 2	0.3	0.1	**
2,6-Dinitrotoluene (26DNT), 606-20-2	5	Note 3	0.5	0.01	**
2,4-Dinitrotoluene (24DNT), 121-14-2	5	Note 3	0.5	0.02	**
2-Nitrotoluene (2NT), 88-72-2	1.3	Note 2	0.13	0.09	**
3-Nitrotoluene (3NT), 99-08-1	0.27	Note 2	0.09	0.09	**
4-Nitrotoluene (4NT), 99-99-0	3.7	Note 2	0.37	0.09	**
Nitroglycerin (NG), 55-63-0	1.5	Note 1	0.15	0.09	**
PETN, 78-11-5	16	Note 2	1.6	0.1	**

Note 1: EPA 2012 Edition of the Drinking Water Standards and Health Advisories, Lifetime Health Advisory.
Note 2: EPA Regional Screening Levels, tapwater criteria.
Note 3: EPA 2012 Edition of the Drinking Water Standards and Health Advisories, 10^{-4} Cancer Risk.

Shaded gray: QL goal is 1/3 the PAL and can be met by the lab QL (1/10 the PAL cannot be met by the lab QL).
Shaded yellow: QL goal is 1/3 the PAL but cannot be met by the lab QL. However, the lab QL is lower than the PAL.
*Must be equal to or greater than the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.
** Detection limits are available. They are not provided because detections (and non-detects) will only be reported to the lab QL (in part, because the lab QL meets the project QL goals).

Matrix: Surface Water

Analytical Method: Explosives and Related Compounds, EPA 8095 modified

Concentration level: Low

Analyte	Project Action Limit (PAL), Potable, ug/L	Project Action Limit (PAL), Fresh, ug/L	PQL Reference (lowest of two PALs)	Project Quantitation Limit Goal, ug/L	Laboratory-specific quantitation limit (ug/L)*	Laboratory-specific detection limit(ug/L)**
HMX, 2691-41-0	400	150	Note 1	15	3	**
RDX, 121-82-4	2	190	Note 2	0.2	0.1	**
2,4,6-Trinitrotoluene (TNT), 118-96-7	2	90	Note 2	0.2	0.03	**
1,3,5-Trinitrobenzene (TNB), 99-35-4	46	10	Note 1	1.0	0.03	**
1,3-Dinitrobenzene (DNB), 99-65-0	1	20	Note 2	0.1	0.09	**
Tetryl, 479-45-8	3.1	NA	Note 3	1.0	0.5	**
Nitrobenzene (NB), 98-95-3	0.12	270	Note 3	0.04	0.03	**
2-amino-4,6-dinitrotoluene (2ADNT), 35572-78-2	3.0	20	Note 3	0.3	0.1	**
4-amino-2,6-dinitrotoluene (4ADNT), 19406-51-0	3.0	NA	Note 3	0.3	0.1	**
2,6-Dinitrotoluene (26DNT), 606-20-2	5	42	Note 4	0.5	0.01	**
2,4-Dinitrotoluene (24DNT), 121-14-2	5	44	Note 4	0.5	0.02	**
2-Nitrotoluene (2NT), 88-72-2	0.27	NA	Note 3	0.09	0.09	**

3-Nitrotoluene (3NT), 99-08-1	0.13	750	Note 3	0.04	0.09	**
4-Nitrotoluene (4NT), 99-99-0	3.7	1900	Note 3	0.37	0.09	**
Nitroglycerin (NG), 55-63-0	5	138	Note 2	0.5	0.09	**
PETN, 78-11-5	3.0	NA	Note 3	0.3	0.1	**

Note 1: Fresh water criteria.
Note 2: EPA 2012 Edition of the Drinking Water Standards and Health Advisories, Lifetime Health Advisory.
Note 3: EPA Regional Screening Levels, tapwater criteria.
Note 4: EPA 2012 Edition of the Drinking Water Standards and Health Advisories, 10^{-4} Cancer Risk.
Shaded gray: QL goal is 1/3 the PAL and can be met by the lab QL (1/10 the PAL cannot be met by the lab QL).
Shaded yellow: QL goal is 1/3 the PAL but cannot be met by the lab QL. However, the lab QL is lower than the PAL.
*Must be equal to or greater than the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.
** Detection limits are available. They are not provided because detections (and non-detects) will only be reported to the lab QL (in part, because the lab QL meets the project QL goals).
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Matrix: Groundwater

Analytical Method: Metals by EPA 200.8 and 245.1 (Hg)

Concentration level: Low

Analyte	Project Action Limit (PAL), ug/L	PAL Reference	Project Quantitation Limit Goal, ug/L	Laboratory-specific quantitation limit (ug/L)*	Laboratory-specific detection limit (ug/L)**
Aluminum (Al), 7429-90-5	50	Note 2 (low end of range)	17	10	**
Antimony (Sb), 7440-36-0	6	Note 1	2	2	**
Arsenic (As), 7440-38-2	40	Note 1	4	2	**
Barium (Ba), 7440-39-3	2000	Note 1	200	2	**
Cadmium (Cd), 7440-43-9	5	Note 1	1.7	1	**
Chromium (Cr), 7440-47-3	100	Note 1	10	2	**
Copper (Cu), 7440-50-8	1000	Note 2 (lower than primary)	100	1	**
Lead (Pb), 7439-92-1	15	Note 1	1.5	1	**
Mercury (Hg), 7439-97-6	2	Note 1	0.2	0.2	**
Selenium (Se), 7782-49-2	50	Note 1	5	1	**
Silver (Ag), 7440-22-4	100	Note 2	10	1	**

Note 1: EPA Maximum Contaminant Levels, National Primary Drinking Water Standards
Note 2: EPA National Secondary Drinking Water Standards
Shaded gray: QL goal is 1/3 the PAL and can be met by the lab QL (1/10 the PAL cannot be met by the lab QL)
*Must be equal to or greater than the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.
**Detection limits are available. They are not provided because detections (and non-detects) will only be reported to the lab QL (in part, because the lab QL meets the QL goals).

Matrix: Surface Water

Analytical Method: Metals (dissolved) by EPA 1638mod and 1631E (Hg); and hardness by SM 2340B

Concentration level: Low/trace

Analyte	Project Action Limit (PAL), Potable, ug/L	Project Action Limit (PAL), Fresh, ug/L	PQL Reference (lowest of two PALs)	Project Quantitation Limit Goal, ug/L	Laboratory-specific quantitation limit (ug/L)*	Laboratory-specific detection limit(ug/L)**
Aluminum (Al), 7429-90-5	50	87	Note 1	5	3.0	1.0
Arsenic (As), 7440-38-2	10	150	Note 1	1	0.03	0.009
Antimony (Sb), 7440-36-0	6	30	Note 1	0.6	0.03	0.012
Barium (Ba), 7440-39-3	2000	3.9	Note 2	0.39	0.06	0.020
Cadmium (Cd), 7440-43-9	5	0.25	Note 2	0.025	0.02	0.007
Chromium (Cr), 7440-47-3	100	74	Note 2	7.4	0.03	0.010
Copper (Cu), 7440-50-8	1000	2.7	Note 2	0.27	0.12	0.04
Lead (Pb), 7439-92-1	15	0.54	Note 2	0.054	0.025	0.006
Mercury (Hg), 7439-97-6	2	0.77	Note 2	0.077	0.0004	0.0001
Selenium (Se), 7782-49-2	5	5	Note 2	0.5	0.07	0.024
Silver (Ag), 7440-22-4	100	3.2	Note 2	0.32	0.02	0.005
Calcium (Ca), 7440-70-2	NA	NA	NA	Lab QL	30	6
Magnesium (Mg), 7439-95-4	NA	NA	NA	Lab QL	15	3
Hardness, E1640416 ^	NA	NA	NA	NA	***	***

Note 1: EPA Maximum Contaminant Level, National Primary Drinking Water Standard (Sb and As); EPA Secondary Drinking Water Criteria (Al).
Note 2: Fresh water criteria.
Shaded yellow: QL goal is 1/3 the PAL but cannot be met by the lab QL. However, the lab QL is lower than the PAL.
*Must be equal to or greater than the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.
**Determined by 40CFR136, Appendix B, or other procedure accepted by the project. Subject to moderate changes over time.
***QL and DL are not directly determined for this parameter; results are based on a calculation using the Ca and Mg concentrations.
^ Calculation based on Ca and Mg concentrations, as per SM 2340B. Hardness QL and MDL based on SM 2340B calculation and Ca and Mg QL and MDL.

Matrix: Groundwater and Surface Water

Analytical Method: Perchlorate by EPA 6850

Concentration level: Low

Analyte	Project Action Limit (PAL), ug/L	PAL Reference ^	Project Quantitation Limit Goal, ug/L	Laboratory-specific quantitation limit (ug/L)*	Laboratory-specific detection limit (ug/L)**
Perchlorate, 14797-73-0	15	EPA Interim Health Advisory Level	1.5	1.0	**

*Must be equal to or greater than the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.
**Detection limits are available. They are not provided because detections (and non-detects) will only be reported to the lab QL (in part, because the lab QL meets the QL goal).
^ Fresh water criterion for perchlorate (applicable to surface water) is 9300 ug/L.

Matrix: Groundwater and Surface Water

Analytical Method: Total Nitrate+Nitrite by EPA 353.2mod

Concentration level : Mid

Analyte	Project Action Limit (PAL), mg/L	PAL Reference	Project Quantitation Limit Goal, mg/L	Laboratory-specific quantitation limit (mg/L)*	Laboratory-specific detection limit(mg/L)**
Nitrate+Nitrite (Total), E701177	10	EPA Regional Screening Level (listed as an MCL)	1	0.1	**

*Must be equal to or greater than the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.
**Detection limits are available. They are not provided because detections (and non-detects) will only be reported to the lab QL (in part, because the lab QL meets the QL goal).

Matrix: Soil

Analytical Method: Semivolatile Organic Compounds (SVOC) by EPA 8270C

Concentration level: Low

Analyte	Project Action Limit (PAL), mg/kg	PAL Reference	Project Quantitation Limit (QL) Goal, mg/kg	Laboratory-specific quantitation limit (QL) (mg/kg)*	Laboratory-specific detection limit (mg/kg)**
1,2,4-trichlorobenzene, 120-82-1	27	Note 1	2.7	0.33	0.17
1,2-dichlorobenzene, 95-50-1	980	Note 1	98	0.33	0.17
1,3-dichlorobenzene, 541-73-1	6.2	Note 1	0.62	0.33	0.17
1,4-dichlorobenzene, 106-46-7	12	Note 1	1.2	0.33	0.17
2,4,5-trichlorophenol, 95-95-4	6200	Note 1	620	0.33	0.17
2,4,6-trichlorophenol, 88-06-2	62	Note 1	6.2	0.33	0.17
2,4-dichlorophenol, 120-83-2	180	Note 1	18	0.33	0.17
2,4-dimethylphenol, 105-67-9	1200	Note 1	120	0.67	0.33
2,4-dinitrophenol, 51-28-5	120	Note 1	12	0.33	0.17
2,4-dinitrotoluene, 121-14-2	5.5	Note 1	0.55	0.33	0.17
2,6-dinitrotoluene, 606-20-2	1.2	Note 1	0.4	0.33	0.17
2-chloronaphthalene, 91-58-7	8200	Note 1	820	0.33	0.17
2-chlorophenol, 95-57-8	510	Note 1	51	0.33	0.17
2-methylnaphthalene, 91-57-6	220	Note 1	22	0.33	0.17
2-methylphenol (cresol, o-), 95-48-7	3100	Note 1	310	0.33	0.17
2-nitroaniline, 88-74-4	600	Note 1	60	0.33	0.17
3+4-methylphenol (cresol, m- + p-), 15831-10-4	3100 (based on 4-)	Note 1	310	0.33	0.17

3-nitroaniline, 99-09-2	NA	NA	Lab QL	0.33	0.17
4,6-dinitro-2-methylphenol, 534-52-1	3100	Note 1	310	0.33	0.17
4-bromophenyl-phenylether, 101-55-3	NA	NA	Lab QL	0.33	0.17
4-chloro-3-methylphenol, 59-50-7	6200	Note 1	620	0.33	0.17
4-chloroaniline, 106-47-8	8.6	Note 1	0.86	0.33	0.17
4-chlorophenyl-phenylether, 7005-72-3	NA	NA	Lab QL	0.33	0.17
4-nitroaniline, 100-01-6	86	Note 1	8.6	0.33	0.17
4-nitrophenol, 100-02-7	18000	Note 1	1800	0.33	0.17
Acenaphthene, 83-32-9	3300	Note 1	330	0.33	0.17
Acenaphthylene, 208-96-8	NA	NA	Lab QL	0.33	0.17
Anthracene, 120-12-7	17000	Note 1	1700	0.33	0.17
Benzo(a)anthracene, 56-55-3	2.1	Note 1	0.7	0.33	0.17
Benzo(a)pyrene, 50-32-8	0.21	Note 1	0.07	0.33	0.17
Benzo(b)fluoranthene, 205-99-2	2.1	Note 1	0.7	0.33	0.17
Benzo(g,h,i)perylene, 191-24-2	NA	NA	Lab QL	0.33	0.17
Benzo(k)fluoranthene, 207-08-9	21	Note 1	2.1	0.33	0.17
Benzyl alcohol, 100-51-6	6200	Note 1	620	0.33	0.17
Bis(2-chloroethoxy)methane, 111-91-1	180	Note 1	18	0.33	0.17
Bis(2-chloroethyl)ether, 111-44-4	1.0	Note 1	0.33	0.33	0.17
Bis(2-chloroisopropyl)ether, 108-60-1 (2,2'-oxybis(1-Chloropropane))	NA	NA	Lab QL	0.33	0.17
Bis(2-ethylhexyl)phthalate, 117-81-7	120	Note 1	12	0.33	0.17

Butylbenzylphthalate, 85-68-7	910	Note 1	91	0.33	0.17
Chrysene, 218-01-9	210	Note 1	21	0.33	0.17
Dibenz(a,h)anthracene, 53-70-3	0.21	Note 1	0.07	0.33	0.17
Dibenzofuran, 132-64-9	100	Note 1	10	0.33	0.17
Diethylphthalate, 84-66-2	49000	Note 1	4900	0.33	0.17
Dimethylphthalate, 131-11-3	NA	NA	Lab QL	0.33	0.17
Di-n-butylphthalate, 84-74-2	6200	Note 1	620	0.33	0.17
Di-n-octylphthalate, 117-84-0	620	Note 1	62	0.33	0.17
Fluoranthene, 206-44-0	2200	Note 1	220	0.33	0.17
Fluorene, 86-73-7	2200	Note 1	220	0.33	0.17
Hexachlorobenzene, 118-74-1	1.1	Note 1	0.36	0.33	0.17
Hexachlorobutadiene, 87-68-3	22	Note 1	2.2	0.33	0.17
Hexachlorocyclopentadiene, 77-47-4	370	Note 1	37	0.33	0.17
Hexachloroethane, 67-72-1	43	Note 1	4.3	0.33	0.17
Indeno(1,2,3-cd)pyrene, 193-39-5	2.1	Note 1	0.7	0.33	0.17
Isophorone, 78-59-1	1800	Note 1	180	0.33	0.17
Naphthalene, 91-20-3	18	Note 1	1.8	0.33	0.17
Nitrobenzene, 98-95-3	24	Note 1	2.4	0.33	0.17
N-nitrosodimethylamine, 62-75-9	0.034	Note 1	0.011	0.33	0.17
N-nitroso-di-n-propylamine, 621-64-7	0.25	Note 1	0.083	0.33	0.17
N-nitrosodiphenylamine, 86-30-6	350	Note 1	35	0.33	0.17
Pentachlorophenol, 87-86-5	2.7	Note 1	0.9	0.33	0.17
Phenanthrene, 85-01-8	NA	NA	Lab QL	0.33	0.17

Phenol, 108-95-2	18000	Note 1	1800	0.33	0.17
Pyrene, 129-00-0	1700	Note 1	170	0.33	0.17

Note 1: EPA Regional Screening Levels (Region 6), Industrial Soil criteria
Shaded gray: QL goal is 1/3 the PAL and can be met by the lab QL (1/10 the PAL cannot be met by the lab QL)
Shaded red: QL goal is 1/3 the PAL but cannot be met by the lab QL. In addition, the lab QL cannot meet the PAL.
*Must be equal to or greater than (after conversion to ug/L) the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time. Quant limits do not consider % moisture (so QLs will increase with moisture content).
**Determined by 40CFR136, Appendix B. Subject to moderate changes over time. SVOC MDLs are determined, then rounded up for consistency in reporting.

Matrix: Soil

Analytical Method: Explosives and Related Compounds by EPA 8095 Modified

Concentration level: Low

Analyte	Project Action Limit (PAL), mg/kg	PAL Reference	Project Quantitation Limit (QL) Goal, mg/kg	Laboratory-specific quantitation limit (QL)(mg/kg)*	Laboratory-specific detection limit (mg/kg)**
HMX, 2691-41-0	4900	Note 1	490	0.04	**
RDX, 121-82-4	24	Note 1	2.4	0.01	**
2,4,6-Trinitrotoluene (TNT), 118-96-7	42	Note 1	4.2	0.01	**
1,3,5-Trinitrobenzene (TNB), 99-35-4	2700	Note 1	270	0.02	**
1,3-Dinitrobenzene (DNB), 99-65-0	6.2	Note 1	0.62	0.02	**
Tetryl, 479-45-8	120	Note 1	12	0.02	**
2-amino-4,6-dinitrotoluene (2ADNT), 35572-78-2	200	Note 1	20	0.02	**
4-amino-2,6-dinitrotoluene (4ADNT), 19406-51-0	190	Note 1	19	0.02	**
2,6-Dinitrotoluene (26DNT), 606-20-2	1.2	Note 1	0.12	0.01	**
2,4-Dinitrotoluene (24DNT), 121-14-2	5.5	Note 1	0.55	0.02	**
Nitroglycerin (NG), 55-63-0	6.2	Note 1	0.62	0.02	**
PETN, 78-11-5	120	Note 1	12	0.02	**

Note 1: EPA Regional Screening Levels, Industrial Soil criteria
All Project QL Goals are at 1/10 the PAL and can be met by the lab QL
*Must be equal to or greater than (after conversion to ug/L) the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time. QLs are based on a 5 gram sample size.
** Detection limits are available. They are not provided because detections (and non-detects) will only be reported to the lab QL (in part, because the lab QL meets the project QL goals).

Matrix: Sediment

Analytical Method: Explosives and Related Compounds by EPA 8095 Modified

Concentration level: Low

Analyte	Project Action Limit (PAL), mg/kg	PAL Reference	Project Quantitation Limit (QL) Goal, mg/kg	Laboratory-specific quantitation limit (QL)(mg/kg)*	Laboratory-specific detection limit (mg/kg)**
HMX, 2691-41-0	0.0047	Note 1	0.00047	0.04	0.0098
RDX, 121-82-4	0.013	Note 1	0.0043	0.01	0.0046
2,4,6-Trinitrotoluene (TNT), 118-96-7	0.092	Note 1	0.031	0.01	0.0032
1,3,5-Trinitrobenzene (TNB), 99-35-4	0.0024	Note 1	0.0008	0.02	0.0045
1,3-Dinitrobenzene (DNB), 99-65-0	0.0067	Note 1	0.0022	0.02	0.0032
Tetryl, 479-45-8	120	Note 2	12	0.02	0.0074
2-amino-4,6-dinitrotoluene (2ADNT), 35572-78-2	200	Note 2	20	0.02	0.0061
4-amino-2,6-dinitrotoluene (4ADNT), 19406-51-0	190	Note 2	19	0.02	0.0089
2,6-Dinitrotoluene (26DNT), 606-20-2	0.0206	Note 1	0.0069	0.01	0.0042
2,4-Dinitrotoluene (24DNT), 121-14-2	0.0751	Note 1	0.025	0.02	0.0042
Nitroglycerin (NG), 55-63-0	6.2	Note 2	0.62	0.02	TBD
PETN, 78-11-5	120	Note 2	12	0.02	0.025

Note 1: Sediment/fresh water screening benchmarks, EPA Region 4, Ecological Risk Assessment Bulletins Supplement to RAGS (EPA 2001).
Note 2: EPA Regional Screening Levels, Industrial Soil criteria.
Shaded gray: QL goal is 1/3 the PAL and can be met by the lab QL (1/10 the PAL cannot be met by the lab QL).
Shaded yellow: QL goal is 1/3 the PAL but cannot be met by the lab QL. However, the lab QL is lower than the PAL.
Shaded red: QL goal is 1/3 the PAL but cannot be met by the lab QL. In addition, the lab QL cannot meet the PAL.
All Project QL Goals are at 1/10 the PAL and can be met by the lab QL.
*Must be equal to or greater than (after conversion to ug/L) the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time. QLs are based on a 5 gram sample size.
**Determined by 40CFR136, Appendix B. Subject to moderate changes over time.

Matrix: Soil

Analytical Method: Metals by EPA 6020 and EPA 7471A (Hg)

Concentration level (if applicable): Low

Analyte	Project Action Limit (PAL), mg/kg	PAL Reference	Project Quantitation Limit (QL) Goal, mg/kg	Laboratory-specific quantitation limit (QL)(mg/kg)*	Laboratory-specific detection limit (mg/kg)**
Aluminum (Al), 7429-90-5	99000	Note 1	9900	20	2.9
Antimony (Sb), 7440-36-0	41	Note 1	4.1	0.2	0.084
Arsenic (As), 7440-38-2	2.4 (listed as 'inorganic arsenic')	Note 1	0.8	0.4	0.086
Barium (Ba), 7440-39-3	19000	Note 1	1900	0.4	0.06
Cadmium (Cd), 7440-43-9	80 (listed as 'cadmium, diet')	Note 1	8	0.1	0.015
Chromium (Cr), 7440-47-3	NA	NA	Lab QL	0.4	0.11
Copper (Cu), 7440-50-8	4100	Note 1	410	0.4	0.15
Lead (Pb), 7439-92-1	800	Note 1	80	0.2	0.013
Mercury (Hg), 7439-97-6	4.3	Note 1	0.43	0.1	0.01
Selenium (Se), 7782-49-2	510	Note 1	51	0.4	0.1
Silver (Ag), 7440-22-4	510	Note 1	51	0.1	0.02

Note 1: EPA Regional Screening Levels, Industrial Soil criteria.
Shaded gray: QL goal is 1/3 the PAL and can be met by the lab QL (1/10 the PAL cannot be met by the lab QL).
Lab quantitation limits do not consider % moisture (so QLs will increase with moisture content). QLs close to the PQL goal may increase above the PQL goal when moisture in the sample is factored into the sample specific QL.
*Must be equal to or greater than (after conversion to ug/L) the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.
**Determined by 40CFR136, Appendix B. Subject to moderate changes over time.

Matrix: Sediment

Analytical Method: Metals by EPA 6020 and EPA 7471B for Hg

Concentration level (if applicable): Low

Analyte	Project Action Limit (PAL), mg/kg	PAL Reference	Project Quantitation Limit (QL) Goal, mg/kg	Laboratory-specific quantitation limit (QL)(mg/kg)*	Laboratory-specific detection limit (mg/kg)**
Aluminum (Al), 7429-90-5	99000	Note 1	9900	20	2.9
Antimony (Sb), 7440-36-0	12	Note 2	1.2	0.2	0.084
Arsenic (As), 7440-38-2	8.2	Note 2	0.82	0.4	0.086
Barium (Ba), 7440-39-3	20	Note 2	2	0.4	0.06
Cadmium (Cd), 7440-43-9	1.2	Note 2	0.12	0.1	0.015
Chromium (Cr), 7440-47-3	81	Note 2	8.1	0.4	0.11
Copper (Cu), 7440-50-8	34	Note 2	3.4	0.4	0.15
Lead (Pb), 7439-92-1	47	Note 2	4.7	0.2	0.013
Mercury (Hg), 7439-97-6	0.15	Note 2	0.05	0.1	0.01
Selenium (Se), 7782-49-2	NA	Note 2	Lab QL	0.4	0.1
Silver (Ag), 7440-22-4	2	Note 2	0.2	0.1	0.02

Note 1: EPA Regional Screening Level, Industrial Soil criteria.
Note 2: Sediment/fresh water screening benchmarks, EPA Office of Solid Waste and Emergency Response Ecotox Thresholds, January 1996.
Shaded yellow: QL goal is 1/3 the PAL but cannot be met by the lab QL. However, the lab QL is lower than the PAL.
Lab quantitation limits do not consider % moisture (so QLs will increase with moisture content). QLs close to the PQL goal may increase above the PQL goal when moisture in the sample is factored into the sample specific QL.
*Must be equal to or greater than (after conversion to ug/L) the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.
**Determined by 40CFR136, Appendix B. Subject to moderate changes over time.

Matrix: Sediment and Soil

Analytical Method: Total Organic Carbon (TOC) by EPA 9060A

Concentration level: Mid

Analyte	Project Action Limit (PAL), mg/kg	PAL Reference	Project Quantitation Limit (QL) Goal, mg/kg	Laboratory-specific quantitation limit (QL)	Laboratory-specific detection limit
TOC	NA	NA	Lab QL	300 mg/kg *	100 mg/kg
Percent Moisture	NA	NA	Lab QL	0.5%	NA

*Must be equal to or greater than the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.

Matrix: Soil

Analytical Method: Perchlorate by EPA 6850

Concentration level: Low

Analyte	Project Action Limit (PAL), mg/kg	PAL Reference	Project Quantitation Limit (QL) Goal, mg/kg	Laboratory-specific quantitation limit (QL)(mg/kg)*	Laboratory-specific detection limit (mg/kg)**
Perchlorate	72	EPA Regional Screening Level, Industrial Soil	7.2	0.01	**

The Project QL Goal is at 1/10 the PAL and can be met by the lab QL

*Must be equal to or greater than (after conversion to ug/L) the concentration of the lowest calibration standard used in the calibration curve. Subject to moderate changes over time.

**Detection limit is available. It is not provided because detections (and non-detects) will only be reported to the lab QL (in part, because the lab QL meets the QL goals).

Matrix: Soil

Analytical Method: Particle Sizing by ASTM D-422

A worksheet 15 table was not created for this method (this worksheet is not applicable to the method).

QAPP Worksheet #17: Sampling Design and Rationale
(UFP-QAPP Manual Section 3.1.1)
(EPA 2106-G-05 Section 2.3.1)

The physical boundaries and descriptions for the area under study:

Refer to Figures 3 and 4.

SWMU MCAAP-025 (Open Burning Ground) is located along the north side of Road Six and approximately 3,000 feet east of its intersection with Road F. The unit is used to treat bulk explosives, explosive-filled munitions, explosive-contaminated materials, and off-specification items. The unit has been in operation since 1973 and occupies approximately 10 acres. The site consists of five areas designated as Pad 1, Pad 2, Pad 3, Pad 4 and Pad 5, and the flashing trenches. The flashing trenches are located in the northeast sector of the Open Burning Ground. Also, a static firing pad is located in the southwest portion of the Open Burning Ground.

SWMU MCAAP-027 (Old Demolition Area) is located near the southeast corner of the installation, approximately 2 miles south of Brown Lake. The unit is used to thermally treat heavier projectiles with steel plate casings of ¼ inch or greater. The unit has been in operation since 1943 and occupies approximately 40 acres. The site consists of 26 pits connected by an access road. Each pit is about 15 feet by 30 feet and surrounded by a horseshoe-shaped berm approximately 15 feet high. Also, a sedimentation retention basin which is approximately 1,100 feet by 400 feet is located along the north-central portion of the area. Prior to detonation, a maximum of 500 pounds net explosive weight is covered by approximately 6 to 9 cubic yards of soil.

SWMU MCAAP-028 (New Demolition Area) is located along the south side of Road 6, approximately 2,000 feet east of the Road F intersection. The New Demolition Area is used to thermally treat lighter projectiles with steel plate casings of ¼ inch or less. The unit has been in operation since 1984 and occupies approximately 5 acres. The site consists of 26 pits arranged in two facing rows with an access road between them. Each pit is about 15 feet by 30 feet and surrounded by a horseshoe shaped berm approximately 15 feet high. Prior to detonation, maximum ordnance of 500 pounds net explosive weight is covered by approximately 6 to 9 cubic yards of soil. Also, a Sedimentation Retention Basin (SWMU MCAAP-029) is used to capture runoff from the New Demolition Area. The basin is an unlined earthen lagoon which is 150 feet by 200 feet and is connected to the New Demolition Area by a ditch.

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):

The MCAAP OB/OD groundwater sampling network design, sampling and analytical regimen, and rationale for long-term groundwater monitoring were established with the Installation's on-going voluntary semi-annual ground water monitoring. Compliance boundary monitoring wells have been sited based on historic ground water flow directions obtained through measurements within the units, topographic low areas, geophysical surveys indicating potential water bearing fractures and blast distances. A 1993 U.S. Bureau of Mines report has been used to calculate the minimum distances for the placement of monitoring wells at the OB/OD units. To calculate the effects of airblast overpressure (AOP) or ground vibrations, the following formula from the U.S. Bureau of Mines study was used:

$$v = 1090 (D / (w^{0.5}))^{-1.82}$$

Where:
v = particle velocity or structural response velocity (in millimeters per second (mm/sec))
D = distance (in meters)
w = explosive weight (in kilograms)

The established low probability damage threshold for ground vibrations and a reasonably safe level criterion for airblasts have been reported as 13 mm/sec. With v equal to 13 mm/sec and w equal to 226.8 kilograms (maximum possible net explosive weight equal to 500 lb), the safe distance based on AOP is calculated to be 565 feet. In addition, various factors that include wind velocity, air temperature, and cloud cover can act to increase the effects of AOP. Also, the ground can act as a reflector which doubles overpressure. Therefore, the calculated safe distance based on the total effects of AOP is 1,130 feet. Based on the research conducted by the U.S. Bureau of Mines, a minimum distance to place groundwater monitoring wells from the OB/OD activities is 1,130 feet, which roughly corresponds to the firebreaks that are constructed around the OB/OD units. This QAPP implements this design and strategy.

Surface Water and Sediment Monitoring Rationale and Methodology.

The MCAAP OB/OD surface water and sediment sampling design rationale and methodology was developed using the USEPA Data Quality Objectives Process and the most current USEPA and industry guidance. Surface water and sediment samples will be collected from areas of overland runoff to include the New Demolition Area Sedimentation Pond, Old Demolition Area Sedimentation Pond and drainage areas to the northwest and west of the Open Burning Grounds where the majority of the munition constituents leaving the treatment unit designated boundary (i,e., OB/OD firebreaks) by surface water runoff and erosion can best be evaluated to determine if concentrations could adversely affect human health or the environment, Three locations equal distance from the beginning of each the sedimentation ponds to the outfall will be sampled to determine the gradient of concentrations as the runoff makes its way through the ponds. Two drainage areas to the northwest and west of the Open Burning Grounds will be sampled to determine if runoff that is not capture in the sedimentation pond has concentration of munition constituents of concern. Since some munition constituents are naturally occurring, a background (reference) pond (Reservoir No. 3) will also be sampled to determine background concentrations for the area.

Soil Monitoring Rationale and Methodology.

The MCAAP OB/OD soil sampling design rationale and methodology was developed using the USEPA Data Quality Objectives Process and the most current USEPA and industry guidance. Soil Samples will be collected from the multiple strata (i.e. sampling units) identified in the Sample and Analysis Plan to determine the presence, types and concentrations of COPC and to delineate the extend of migration of COPC outside the OB/OD firebreaks. The McAAP OB/OD soil monitoring plan has been designed to incorporate both the Tier I (Release Detection Monitoring) and Tier II (Release Delineation Monitoring) requirements identified in McAAP's Hazardous Waste Management Operations Permit Section G to determine whether a release of hazardous constituents to the environment has occurred, and if so, to delineate the extent of the release beyond the treatment unit designated boundary (i.e., OB/OD firebreaks). The Release Delineation Monitoring will identify COPC releases extending outside the OB/OD firebreaks.

A focused sampling approach using a stratified systematic-grid random sampling design will be employed to determine the types and concentrations of COPC in the immediate treatment unit soils and to delineate COPC release outside the treatment unit firebreaks. This approach incorporates both non-probabilistic (biased) and probabilistic (unbiased) sample design attributes by utilizing professional judgment to identify specific areas having higher likelihood munition constituents (sampling units) while using an unbiased systematic grid to provide uniform coverage for sample collection over large areas. As part of the focused sampling approach, environmental factors such as prevailing wind direction, surface water drainage patterns, and topographical features were used to define sampling units having higher likelihood of COPC resulting from site munition treatment activities.

Based on the stratified sampling design approach, the following ten sampling units (to include a background comparison area) were delineated to characterize COPC resulting from munition treatment activities for the release detection and delineation monitoring.

SWMU MCAAP-027 (Old Demolition Area) is located near the southeast corner of the installation. Four separate areas will be characterized to determine the presence, type and concentrations of COPC released from the Old OD treatment unit activities. Following a systematic triangular grid sampling design, three incremental composite samples, consisting of 45 subsamples, will be collected from the Old OD treatment unit pits and three separate sample units contiguous with the treatment unit firebreak. Sample unit boundaries and incremental composite subsample locations for the Old OD treatment area sample units are depicted in Sample and Analysis Plan. UTM coordinates for each incremental composite subsample location identified for the Old OD treatment area sampling units are provided the Sample and Analysis Plan.

SWMU MCAAP-028 (New Demolition Area) and SWMU MCAAP-025 (Open Burning Ground) are located west of the Old Demolition Area. Five separate areas will be characterized to determine the presence, type and concentrations of COPC released from the New OB/OD treatment unit activities. Following a systematic triangular grid design, three incremental composite samples, consisting of 45 subsamples, will be collected from the New OD treatment unit pits, OB area pans and static rocket pads, and three separate sample units contiguous with the treatment unit firebreak. Sample unit boundaries and incremental composite subsample locations for the New OB/OD treatment area sample units are depicted in the Sample and Analysis Plan. UTM coordinates for each incremental composite subsample location identified for the New OB/OD treatment area sampling units are provided in the Sample and Analysis Plan .

A total of 3 incremental samples, consisting of 45 subsamples, will be collected from the background comparison area to assess constituent concentrations resulting from naturally occurring or anthropogenic sources of COPC other than munition demolition activities. The soil background sample area is located within the McAAP ammunition bunker storage area, approximately 2.5 miles southwest of the OB/OD treatment units between Road D and Road E and north of Ashland Gate Road. The background location identified for the collection of comparison data has been identified as an area having similar soil type as the OB/OD treatment units. Background soil sample data will be collected in the same manner as the OB/OD site soil samples.

The use of a systematic-grid design avoids the potential clustering of sample locations that is inherent when using a simple random sampling design. Systematic-grid sampling involves establishing a two-dimensional grid over a stratum or sample unit to allow for the more uniform coverage that is needed to evaluate large areas where there are no identified patterns or regularities of contaminant distribution. A triangular systematic-grid design will be used to determine soil sampling locations within each of the identified sample units as this grid design has been shown to provide the uniform coverage needed to collect soil sample data that is most representative of site constituent levels.

The Pacific Northwest National Laboratory (PNNL) Visual Sample Plan (VSP) Version 6 software was used to identify sampling unit boundaries, sample grid placement, soil sample UTM coordinate locations, and sample number required to meet study DQOs. The PNNL VSP software was used to determine the number of samples required to meet the study DQOs of a 95% Confidence Level and a 0.05 false rejection decision error (p=.05) and a 0.80 false acceptance decision error (p=.80). The design parameters input to the VSP software for sample number determination included: confidence level, null hypothesis, false rejection and false acceptance rate (i.e., Type I and Type II errors), data distribution, the estimated standard deviation between sample, and the number of analytical subsamples. Utilizing this software, it was determined that 3 incremental samples consisting of 45 subsamples would provide the data needed to satisfy the identified decision error limits.

The 3 incremental composite samples collected in each of the ten sample units identified to be sampled in support of the soil monitoring plan. The three incremental composite samples collected from each sample unit will serve as the replicate sample data needed to calculate the COPC 95% UCL for comparison to the SSL or BTL. Additionally, incremental composite sample replicates provide a measure of the variability of the entire sampling, preparation, and analytical process needed to assess field and laboratory sampling error. Therefore, a total of 30 individual composite samples, plus QAQC samples, will be collected to support the soil monitoring workplan data quality objectives. Field duplicate and field split samples will be collected to assess the precision and accuracy of field sampling techniques and laboratory analytical methodologies.

The following Type I and Type II Decision Errors have been identified for this site investigation.

Type I Decision Error (false rejection decision error) for this investigation has established the baseline condition (null hypothesis (H0)) as the more severe decision error in rejecting the baseline condition or H0 when in fact it is true. The baseline condition set for this investigation is the assumption that COPC concentrations in the investigation site are greater than or equal to (or significantly differently than) SSLs (i.e., USEPA RSLs and background levels). The consequence of making false rejection decision error is considered most severe as determining that site conditions do not exceed SSLs can result unacceptable human health risk. Therefore, the Type I decision error was set at a 95% probability of making a correct decision. The alternate hypothesis assumes that COPC concentrations in the investigation site are less than SSLs.

H0: Parameter ≥ SSL; Ha: Parameter < SSL

Type II Decision Error (false acceptance decision error) for this investigation is identified as the less severe decision error in that the baseline condition is accepted when it is false and it is determined that site conditions exceed SSLs when they do not. The consequence of a false acceptance decision error may result in unnecessary further investigation or clean-up costs. The Type II decision error was set at 20% probability of making an incorrect decision.

The following inputs to the VSP software were made to determine the sample number required to meet study DQOs:

- Compare average to a fixed threshold and compare average to a reference average (metals only).

- Assume data will be normally distributed and select multiple increment sampling. The basis for this assumption is that the data distribution for incremental replicate samples tends to be normally distributed.

- The Null Hypothesis, or “baseline condition”, was identified as the more severe condition of assuming that the site is “dirty” (i.e., the Null Hypothesis presumes that COPC are migrating or have migrated outside the treatment unit firebreaks at concentrations greater than the identified SSLs).

- The Type I (false rejection) and Type II (false acceptance) errors were set at 95 percent and 20 percent, respectively.

- The estimated standard deviation between increments and the number of analytical subsamples were set to 2.

A handheld GPS unit will be used to navigate to the UTM coordinates (easting and northing) for each of the 45 incremental composite subsamples. To complete each incremental composite sample, at each incremental subsample location, a surface soil sample will be collected from a depth of 0 – 4 inches using a stainless steel soil core (with approximate 2 to 3 cm diameter) sampling device and placed into a dedicated sample container. To prevent cross contamination, non-dedicated sampling equipment will be decontaminated between collecting each incremental. However, sample equipment will not require decontamination between subsample locations. Non-dedicated sample equipment will be decontaminated thoroughly by washing with an industrial detergent, such as Alconox, scrubbed clean using a brush, and thoroughly rinsed using distilled water. Decontaminated equipment shall be stored in a manner as to prevent possible contamination while not in use (e.g., stored in plastic ziploc bags or wrapped in aluminum foil). Equipment rinsate samples will be collected to evaluate the efficacy of decontamination procedures. Additionally, sample personnel will don new gloves at each new composite sample location; however, new gloves are not required when collecting incremental composite subsamples.

Particle size reduction and subsampling will take place in the laboratory to prevent potential sample cross-contamination resulting from an uncontrolled field work environment.

The total sample mass of each incremental composite sample is calculated based on the number of increments collected per sample, the sampling depth, and the sample core diameter using the following formula (ITRC, 2012):

Ms = r ● n ● Ds ● p ● (q/ 2) 2

Ms = Targeted Mass of Sample (g)
Ds = Sampling Depth (cm) = 10.62 cm
n = Number of Increments = 45
r = Soil or Sediment Density (g/cc) = 0.75 g/cm3
q = Diameter of Sample Corer (cm) = 2 cm

Total approximate increment sample mass based on the above calculation will be > 2.8 kg. Total increment sample mass may vary slightly at time of sampling based on dimensions and type of sample core device.

Laboratory incremental composite sample preparation will be in accordance with the USEPA SW 846 Method 8330B, Nitroaromatics, nitramines, and nitrate esters by high performance liquid chromatography (HPLC), Appendix A: Collecting and Processing of Representative Samples for Energetic Residues in Solid Matrices from Military Training Ranges (USEPA, 2006). The incremental composite sample milling and subsampling processes will take place in the laboratory to provide the more “controlled” working environment needed to address such limitations to field milling as time and labor constraints and the increased need for field equipment decontamination to prevent sample cross contamination. Only the incremental composite sample collected for explosive analysis will be milled to reduce particle size to the <2mm fraction.

Due to the relatively recent use of incremental composite sampling for evaluating COPC other than explosives, significant coordination between project managers and the analytical laboratory is required and will continue throughout soil monitoring sampling activities to ensure that the analytical laboratory can meet incremental sample preparation and analytical requirements for all analytical parameters to include SVOCs and metal analyses. At a minimum, in a laboratory setting, SVOC and metals analytical samples will be thoroughly homogenized as to reduce compositional variability and the proper analytical subsampling techniques will be performed to ensure a representative particle size is analyzed. SVOC analytical samples will not require milling since as the grinding temperature may lead to the destruction of organic contaminants.

The milling of metals analytical samples will be conducted in accordance with USEPA Method 8330B in a manner to reduce to the release of naturally occurring metals held to soil particles and prevent the potential for metals loss through the grinding process. Further, project managers will coordinate with the analytical laboratory to establish certified and documented analytical procedures that meet site investigation data requirements. All analytical methods and procedures will be thoroughly documented and detailed in the final report of findings.

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations):

Groundwater/Surface Water and Sediment pathway:

Refer to Table 1, Worksheet #11.

Soil pathway:

Refer to Table 4, Worksheet #11.

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

Sample ID	Matrix[1]	Depth (ft BGS)	Type	Analyte/ Analytical Group	Sampling SOP[2]	Comments
MW-NDG-01	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-02	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-03	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-03 DUP	GW		Field Duplicate	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-04	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-05	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-05 DUP	GW		Field Duplicate	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-06	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-07	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-08	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-09	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-10	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-11	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-12	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-13	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-14	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-15	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-16	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	

Sample ID	Matrix[1]	Depth (ft BGS)	Type	Analyte/ Analytical Group	Sampling SOP[2]	Comments
MW-NDG-17	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-ODA-1	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-ODA-2	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-ODA-3	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-ODA-3 DUP	GW		Field Duplicate	Explosives	S-3, S-4, S-5, and S-8	
MW-ODA-4	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-ODA-5	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-ODA-6A	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-ODA-7	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-ODA-8	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-ODA-9	GW		Normal	Explosives	S-3, S-4, S-5, and S-8	
MW-NDG-01	GW		Normal	Perchlorates	S-3, S-4, S-5, and S-8	
MW-NDG-02	GW		Normal	Perchlorates	S-3, S-4, S-5, and S-8	
MW-NDG-03	GW		Normal	Perchlorates	S-3, S-4, S-5, and S-8	
MW-NDG-03 DUP	GW		Field Duplicate	Perchlorates	S-3, S-4, S-5, and S-8	
MW-NDG-04	GW		Normal	Perchlorates	S-3, S-4, S-5, and S-8	
MW-NDG-08	GW		Normal	Perchlorates	S-3, S-4, S-5, and S-8	
MW-NDG-09	GW		Normal	Perchlorates	S-3, S-4, S-5, and S-8	
MW-NDG-13	GW		Normal	Perchlorates	S-3, S-4, S-5, and S-8	
MW-NDG-17	GW		Normal	Perchlorates	S-3, S-4, S-5, and S-8	
MW-NDG-01	GW		Normal	Semi-volatile organic compounds	S-3, S-4, S-5, and S-8	
MW-NDG-02	GW		Normal	Semi-volatile organic compounds	S-3, S-4, S-5, and S-8	

Sample ID	Matrix[1]	Depth (ft BGS)	Type	Analyte/ Analytical Group	Sampling SOP[2]	Comments
MW-NDG-03	GW		Normal	Semi-volatile organic compounds	S-3, S-4, S-5, and S-8	
MW-NDG-03 DUP	GW		Field Duplicate	Semi-volatile organic compounds	S-3, S-4, S-5, and S-8	
MW-NDG-04	GW		Normal	Semi-volatile organic compounds	S-3, S-4, S-5, and S-8	
MW-NDG-08	GW		Normal	Semi-volatile organic compounds	S-3, S-4, S-5, and S-8	
MW-NDG-09	GW		Normal	Semi-volatile organic compounds	S-3, S-4, S-5, and S-8	
MW-NDG-13	GW		Normal	Semi-volatile organic compounds	S-3, S-4, S-5, and S-8	
MW-NDG-17	GW		Normal	Semi-volatile organic compounds	S-3, S-4, S-5, and S-8	
MW-NDG-01	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-02	GW		Normal	Total Metals- Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-03	GW		Normal	Total Metals- Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-03 DUP	GW		Field Duplicate	Total Metals- Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-04	GW		Normal	Total Metals- Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-05	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-05 DUP	GW		Field Duplicate	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-06	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-07	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-08	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-09	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-10	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	

Sample ID	Matrix[1]	Depth (ft BGS)	Type	Analyte/ Analytical Group	Sampling SOP[2]	Comments
MW-NDG-11	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-12	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-13	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-14	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-15	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-16	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-17	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-ODA-1	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-ODA-2	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-ODA-3	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-ODA-3 DUP	GW		Field Duplicate	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-ODA-4	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-ODA-5	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-ODA-6A	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-ODA-7	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-ODA-8	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-ODA-9	GW		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-3, S-4, S-5, and S-8	
MW-NDG-01	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	

Sample ID	Matrix[1]	Depth (ft BGS)	Type	Analyte/ Analytical Group	Sampling SOP[2]	Comments
MW-NDG-02	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-03	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-03 DUP	GW		Field Duplicate	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-04	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-05	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-05 DUP	GW		Field Duplicate	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-06	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-07	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-08	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-09	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-10	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-11	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-12	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-13	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-14	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-15	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-16	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-NDG-17	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-ODA-1	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-ODA-2	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-ODA-3	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-ODA-3 DUP	GW		Field Duplicate	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	

Sample ID	Matrix[1]	Depth (ft BGS)	Type	Analyte/ Analytical Group	Sampling SOP[2]	Comments
MW-ODA-4	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-ODA-5	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-ODA-6A	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-ODA-7	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-ODA-8	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
MW-ODA-9	GW		Normal	Nitrates/Nitrites	S-3, S-4, S-5, and S-8	
SW-ODA-1 DUP	SW		Field Duplicate	Explosives, Nitrate/Nitrite	S-12	
SW-ODA-1	SW		Normal	Explosives, Nitrate/Nitrite	S-12	
SW-ODA-2	SW		Normal	Explosives, Nitrate/Nitrite	S-12	
SW-ODA-3	SW		Normal	Explosives, Nitrate/Nitrite	S-12	
SD-ODA-1 DUP	SD		Field Duplicate	Explosives	S-13	
SD-ODA-1	SD		Normal	Explosives	S-13	
SD-ODA-2	SD		Normal	Explosives	S-13	
SD-ODA-3	SD		Normal	Explosives	S-13	
SW-NDA-1	SW		Normal	Explosives, Perchlorates, Nitrate/Nitrite	S-12	
SW-NDA-2	SW		Normal	Explosives, Perchlorates, Nitrate/Nitrite	S-12	
SW-NDA-3	SW		Normal	Explosives, Perchlorates, Nitrate/Nitrite	S-12	
SD-NDA-1	SD		Normal	Explosives	S-13	
SD-NDA-2	SD		Normal	Explosives	S-13	
SD-NDA-3	SD		Normal	Explosives	S-13	
SW-OBG-1	SW		Normal	Explosives, Perchlorates, Nitrate/Nitrite	S-12	
SW-OBG-2	SW		Normal	Explosives, Perchlorates, Nitrate/Nitrite	S-12	

Sample ID	Matrix[1]	Depth (ft BGS)	Type	Analyte/ Analytical Group	Sampling SOP[2]	Comments
SW-REF-1	SW		Normal	Explosives, Perchlorates, Nitrate/Nitrite	S-12	
SD-OBG-1	SD		Normal	Explosives	S-13	
SD-OBG-2	SD		Normal	Explosives	S-13	
SD-REF-1	SD		Normal	Explosives	S-13	
SW-ODA-1	SW		Normal	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-11	
SW-ODA-1 DUP	SW		Field Duplicate	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-11	
SW-ODA-2	SW		Normal	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-11	
SW-ODA-3	SW		Normal	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-11	
SD-ODA-1 DUP	SD		Field Duplicate	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-13	
SD-ODA-1	SD		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-13	
SD-ODA-2	SD		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-13	
SD-ODA-3	SD		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-13	
SW-NDA-1	SW		Normal	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-11	
SW-NDA-2	SW		Normal	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-11	
SW-NDA-3	SW		Normal	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-11	
SD-NDA-1	SD		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-13	
SD-NDA-2	SD		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-13	
SD-NDA-3	SD		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-13	
SW-OBG-1	SW		Normal	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-11	

Sample ID	Matrix[1]	Depth (ft BGS)	Type	Analyte/ Analytical Group	Sampling SOP[2]	Comments
SW-OBG-2	SW		Normal	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-11	
SW-REF-1	SW		Normal	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-11	
SD-OBG-1	SD		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-13	
SD-OBG-2	SD		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-13	
SD-REF-1	SD		Normal	Total Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se, and Ag	S-13	

[1]Key: SS = surface soil, S = soil, SD = sediment, GW = groundwater, SW = surface water
[2]Specify the appropriate reference letter or number from the Field SOP Reference table (Worksheet #21).

TABLE. SWMU MCAAP-027 (Old Demolition Area): SOIL MONITORING DETECTION SAMPLE UNIT 1 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-ODAPit-ICS1**		**Incremental Composite Sample**	**SL-ODAPit-ICS2**		**Incremental Composite Sample**	**SL-ODAPit-ICS3**	
Incremental Composite Subsample	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	235228.456	13854331.671	**Subsample 1**	235250.0059	13854331.6707	**Subsample 1**	235271.556	13854331.671
Subsample 2	235260.781	13854350.333	**Subsample 2**	235196.132	13854350.333	**Subsample 2**	235217.681	13854350.333
Subsample 3	235282.330	13854350.333	**Subsample 3**	235239.231	13854350.333	**Subsample 3**	235163.807	13854368.996
Subsample 4	235185.357	13854368.996	**Subsample 4**	235303.880	13854350.333	**Subsample 4**	235228.456	13854368.996
Subsample 5	235206.907	13854368.996	**Subsample 5**	235250.006	13854368.996	**Subsample 5**	235314.655	13854368.996
Subsample 6	235293.105	13854368.996	**Subsample 6**	235271.556	13854368.996	**Subsample 6**	235239.231	13854387.658
Subsample 7	235217.681	13854387.658	**Subsample 7**	235174.582	13854387.658	**Subsample 7**	235260.781	13854387.658
Subsample 8	235325.430	13854387.658	**Subsample 8**	235196.132	13854387.658	**Subsample 8**	235282.330	13854387.658
Subsample 9	235163.807	13854406.321	**Subsample 9**	235303.880	13854387.658	**Subsample 9**	235185.357	13854406.321
Subsample 10	235228.456	13854406.321	**Subsample 10**	235206.907	13854406.321	**Subsample 10**	235293.105	13854406.321
Subsample 11	235250.006	13854406.321	**Subsample 11**	235314.655	13854406.321	**Subsample 11**	235174.582	13854424.983
Subsample 12	235271.556	13854406.321	**Subsample 12**	235196.132	13854424.983	**Subsample 12**	235239.231	13854424.983
Subsample 13	235336.205	13854406.321	**Subsample 13**	235260.781	13854424.983	**Subsample 13**	235303.880	13854424.983
Subsample 14	235217.681	13854424.983	**Subsample 14**	235325.430	13854424.983	**Subsample 14**	235368.529	13854424.983
Subsample 15	235282.330	13854424.983	**Subsample 15**	235185.357	13854443.646	**Subsample 15**	235228.456	13854443.646

Subsample 16	235346.979	13854424.983	**Subsample 16**	235250.006	13854443.646	**Subsample 16**	235293.105	13854443.646
Subsample 17	235206.907	13854443.646	**Subsample 17**	235314.655	13854443.646	**Subsample 17**	235357.754	13854443.646
Subsample 18	235271.556	13854443.646	**Subsample 18**	235379.304	13854443.646	**Subsample 18**	235196.132	13854462.309
Subsample 19	235336.205	13854443.646	**Subsample 19**	235217.681	13854462.309	**Subsample 19**	235260.781	13854462.309
Subsample 20	235400.853	13854443.646	**Subsample 20**	235282.330	13854462.309	**Subsample 20**	235325.430	13854462.309
Subsample 21	235239.231	13854462.309	**Subsample 21**	235346.979	13854462.309	**Subsample 21**	235390.079	13854462.309
Subsample 22	235303.880	13854462.309	**Subsample 22**	235411.628	13854462.309	**Subsample 22**	235228.456	13854480.971
Subsample 23	235368.529	13854462.309	**Subsample 23**	235250.006	13854480.971	**Subsample 23**	235293.105	13854480.971
Subsample 24	235433.178	13854462.309	**Subsample 24**	235314.655	13854480.971	**Subsample 24**	235357.754	13854480.971
Subsample 25	235206.907	13854480.971	**Subsample 25**	235379.304	13854480.971	**Subsample 25**	235422.403	13854480.971
Subsample 26	235271.556	13854480.971	**Subsample 26**	235443.953	13854480.971	**Subsample 26**	235260.781	13854499.634
Subsample 27	235336.205	13854480.971	**Subsample 27**	235217.681	13854499.634	**Subsample 27**	235325.430	13854499.634
Subsample 28	235400.853	13854480.971	**Subsample 28**	235282.330	13854499.634	**Subsample 28**	235390.079	13854499.634
Subsample 29	235239.231	13854499.634	**Subsample 29**	235346.979	13854499.634	**Subsample 29**	235454.728	13854499.634
Subsample 30	235303.880	13854499.634	**Subsample 30**	235411.628	13854499.634	**Subsample 30**	235228.456	13854518.296
Subsample 31	235368.529	13854499.634	**Subsample 31**	235250.006	13854518.296	**Subsample 31**	235293.105	13854518.296
Subsample 32	235433.178	13854499.634	**Subsample 32**	235314.655	13854518.296	**Subsample 32**	235357.754	13854518.296
Subsample 33	235271.556	13854518.296	**Subsample 33**	235379.304	13854518.296	**Subsample 33**	235422.403	13854518.296
Subsample 34	235336.205	13854518.296	**Subsample 34**	235443.953	13854518.296	**Subsample 34**	235260.781	13854536.959
Subsample 35	235400.853	13854518.296	**Subsample 35**	235282.330	13854536.959	**Subsample 35**	235325.430	13854536.959
Subsample 36	235239.231	13854536.959	**Subsample 36**	235346.979	13854536.959	**Subsample 36**	235390.079	13854536.959
Subsample 37	235303.880	13854536.959	**Subsample 37**	235411.628	13854536.959	**Subsample 37**	235271.556	13854555.621
Subsample 38	235368.529	13854536.959	**Subsample 38**	235293.105	13854555.621	**Subsample 38**	235336.205	13854555.621
Subsample 39	235433.178	13854536.959	**Subsample 39**	235357.754	13854555.621	**Subsample 39**	235400.853	13854555.621
Subsample 40	235250.006	13854555.621	**Subsample 40**	235422.403	13854555.621	**Subsample 40**	235303.880	13854574.284
Subsample 41	235314.655	13854555.621	**Subsample 41**	235260.781	13854574.284	**Subsample 41**	235368.529	13854574.284
Subsample 42	235379.304	13854555.621	**Subsample 42**	235325.430	13854574.284	**Subsample 42**	235314.655	13854592.946
Subsample 43	235282.330	13854574.284	**Subsample 43**	235390.079	13854574.284	**Subsample 43**	235357.754	13854592.946
Subsample 44	235346.979	13854574.284	**Subsample 44**	235271.556	13854592.946	**Subsample 44**	235303.880	13854611.609
Subsample 45	235293.105	13854592.946	**Subsample 45**	235336.205	13854592.946	**Subsample 45**	235325.430	13854611.609

TABLE. SWMU MCAAP-028 (New Demolition Area): SOIL MONITORING DETECTION SAMPLE UNIT 6 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-NDA-Pit-ICS1**		**Incremental Composite Sample**	**SL-NDA-Pit-ICS2**		**Incremental Composite Sample**	**SL-NDA-Pit-ICS3**	
Incremental Composite Subsample	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	233627.615	13855394.008	**Subsample 1**	233651.695	13855394.008	**Subsample 1**	233675.775	13855394.008
Subsample 2	233663.735	13855414.862	**Subsample 2**	233639.655	13855414.862	**Subsample 2**	233615.575	13855414.862
Subsample 3	233603.535	13855435.716	**Subsample 3**	233711.895	13855414.862	**Subsample 3**	233687.815	13855414.862
Subsample 4	233675.775	13855435.716	**Subsample 4**	233651.695	13855435.716	**Subsample 4**	233627.615	13855435.716
Subsample 5	233748.016	13855435.716	**Subsample 5**	233723.935	13855435.716	**Subsample 5**	233699.855	13855435.716
Subsample 6	233615.575	13855456.570	**Subsample 6**	233663.735	13855456.570	**Subsample 6**	233639.655	13855456.570
Subsample 7	233687.815	13855456.570	**Subsample 7**	233735.976	13855456.570	**Subsample 7**	233711.895	13855456.570
Subsample 8	233760.056	13855456.570	**Subsample 8**	233603.535	13855477.424	**Subsample 8**	233651.695	13855477.424
Subsample 9	233627.615	13855477.424	**Subsample 9**	233675.775	13855477.424	**Subsample 9**	233723.935	13855477.424
Subsample 10	233699.855	13855477.424	**Subsample 10**	233748.016	13855477.424	**Subsample 10**	233591.495	13855498.278

Subsample 11	233772.096	13855477.424	**Subsample 11**	233615.575	13855498.278	**Subsample 11**	233663.735	13855498.278
Subsample 12	233639.655	13855498.278	**Subsample 12**	233687.815	13855498.278	**Subsample 12**	233735.976	13855498.278
Subsample 13	233711.895	13855498.278	**Subsample 13**	233760.056	13855498.278	**Subsample 13**	233627.615	13855519.132
Subsample 14	233784.136	13855498.278	**Subsample 14**	233651.695	13855519.132	**Subsample 14**	233699.855	13855519.132
Subsample 15	233603.535	13855519.132	**Subsample 15**	233723.935	13855519.132	**Subsample 15**	233772.096	13855519.132
Subsample 16	233675.775	13855519.132	**Subsample 16**	233796.176	13855519.132	**Subsample 16**	233663.735	13855539.986
Subsample 17	233748.016	13855519.132	**Subsample 17**	233615.575	13855539.986	**Subsample 17**	233735.976	13855539.986
Subsample 18	233639.655	13855539.986	**Subsample 18**	233687.815	13855539.986	**Subsample 18**	233808.216	13855539.986
Subsample 19	233711.895	13855539.986	**Subsample 19**	233760.056	13855539.986	**Subsample 19**	233603.535	13855560.840
Subsample 20	233784.136	13855539.986	**Subsample 20**	233627.615	13855560.840	**Subsample 20**	233675.775	13855560.840
Subsample 21	233651.695	13855560.840	**Subsample 21**	233699.855	13855560.840	**Subsample 21**	233748.016	13855560.840
Subsample 22	233723.935	13855560.840	**Subsample 22**	233772.096	13855560.840	**Subsample 22**	233820.256	13855560.840
Subsample 23	233796.176	13855560.840	**Subsample 23**	233639.655	13855581.694	**Subsample 23**	233615.575	13855581.694
Subsample 24	233663.735	13855581.694	**Subsample 24**	233711.895	13855581.694	**Subsample 24**	233687.815	13855581.694
Subsample 25	233735.976	13855581.694	**Subsample 25**	233784.136	13855581.694	**Subsample 25**	233760.056	13855581.694
Subsample 26	233808.216	13855581.694	**Subsample 26**	233651.695	13855602.548	**Subsample 26**	233832.296	13855581.694
Subsample 27	233675.775	13855602.548	**Subsample 27**	233723.935	13855602.548	**Subsample 27**	233627.615	13855602.548
Subsample 28	233748.016	13855602.548	**Subsample 28**	233796.176	13855602.548	**Subsample 28**	233699.855	13855602.548
Subsample 29	233820.256	13855602.548	**Subsample 29**	233663.735	13855623.402	**Subsample 29**	233772.096	13855602.548
Subsample 30	233687.815	13855623.402	**Subsample 30**	233735.976	13855623.402	**Subsample 30**	233844.336	13855602.548
Subsample 31	233760.056	13855623.402	**Subsample 31**	233808.216	13855623.402	**Subsample 31**	233639.655	13855623.402
Subsample 32	233832.296	13855623.402	**Subsample 32**	233699.855	13855644.256	**Subsample 32**	233711.895	13855623.402
Subsample 33	233723.935	13855644.256	**Subsample 33**	233772.096	13855644.256	**Subsample 33**	233784.136	13855623.402
Subsample 34	233796.176	13855644.256	**Subsample 34**	233844.336	13855644.256	**Subsample 34**	233856.376	13855623.402
Subsample 35	233868.416	13855644.256	**Subsample 35**	233735.976	13855665.110	**Subsample 35**	233675.775	13855644.256
Subsample 36	233687.815	13855665.110	**Subsample 36**	233808.216	13855665.110	**Subsample 36**	233748.016	13855644.256
Subsample 37	233760.056	13855665.110	**Subsample 37**	233880.456	13855665.110	**Subsample 37**	233820.256	13855644.256
Subsample 38	233832.296	13855665.110	**Subsample 38**	233699.855	13855685.964	**Subsample 38**	233711.895	13855665.110
Subsample 39	233723.935	13855685.964	**Subsample 39**	233772.096	13855685.964	**Subsample 39**	233784.136	13855665.110
Subsample 40	233796.176	13855685.964	**Subsample 40**	233844.336	13855685.964	**Subsample 40**	233856.376	13855665.110
Subsample 41	233868.416	13855685.964	**Subsample 41**	233760.056	13855706.818	**Subsample 41**	233748.016	13855685.964
Subsample 42	233784.136	13855706.818	**Subsample 42**	233832.296	13855706.818	**Subsample 42**	233820.256	13855685.964
Subsample 43	233856.376	13855706.818	**Subsample 43**	233796.176	13855727.672	**Subsample 43**	233735.976	13855706.818
Subsample 44	233748.016	13855727.672	**Subsample 44**	233784.136	13855748.526	**Subsample 44**	233808.216	13855706.818
Subsample 45	233820.256	13855727.672	**Subsample 45**	233808.216	13855748.526	**Subsample 45**	233772.096	13855727.672

TABLE. SWMU MCAAP-025 (Open Burning Ground): SOIL MONITORING DETECTION SAMPLE UNIT 5 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-OBA-ICS1**		**Incremental Composite Sample**	**SL-OBA-ICS2**		**Incremental Composite Sample**	**SL-OBA-ICS3**	
Incremental Composite Subsample	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	233786.063	13856026.975	**Subsample 1**	233816.787	13856026.975	**Subsample 1**	233847.511	13856026.975
Subsample 2	233878.235	13856026.975	**Subsample 2**	233908.959	13856026.975	**Subsample 2**	233739.977	13856053.583
Subsample 3	233801.425	13856053.583	**Subsample 3**	233770.701	13856053.583	**Subsample 3**	233832.149	13856053.583

Subsample 4	233893.597	13856053.583	**Subsample 4**	233862.873	13856053.583	**Subsample 4**	233924.320	13856053.583
Subsample 5	233724.615	13856080.191	**Subsample 5**	233786.063	13856080.191	**Subsample 5**	233755.339	13856080.191
Subsample 6	233816.787	13856080.191	**Subsample 6**	233878.235	13856080.191	**Subsample 6**	233847.511	13856080.191
Subsample 7	233908.959	13856080.191	**Subsample 7**	233970.406	13856080.191	**Subsample 7**	233939.682	13856080.191
Subsample 8	233770.701	13856106.798	**Subsample 8**	233739.977	13856106.798	**Subsample 8**	233801.425	13856106.798
Subsample 9	233862.873	13856106.798	**Subsample 9**	233832.149	13856106.798	**Subsample 9**	233893.597	13856106.798
Subsample 10	233955.044	13856106.798	**Subsample 10**	233924.320	13856106.798	**Subsample 10**	233985.768	13856106.798
Subsample 11	233816.787	13856133.406	**Subsample 11**	233786.063	13856133.406	**Subsample 11**	233755.339	13856133.406
Subsample 12	233908.959	13856133.406	**Subsample 12**	233878.235	13856133.406	**Subsample 12**	233847.511	13856133.406
Subsample 13	234001.130	13856133.406	**Subsample 13**	233970.406	13856133.406	**Subsample 13**	233939.682	13856133.406
Subsample 14	233739.977	13856160.014	**Subsample 14**	233801.425	13856160.014	**Subsample 14**	233770.701	13856160.014
Subsample 15	233832.149	13856160.014	**Subsample 15**	233893.597	13856160.014	**Subsample 15**	233862.873	13856160.014
Subsample 16	233924.320	13856160.014	**Subsample 16**	233985.768	13856160.014	**Subsample 16**	233955.044	13856160.014
Subsample 17	234016.492	13856160.014	**Subsample 17**	233816.787	13856186.621	**Subsample 17**	233786.063	13856186.621
Subsample 18	233755.339	13856186.621	**Subsample 18**	233908.959	13856186.621	**Subsample 18**	233878.235	13856186.621
Subsample 19	233847.511	13856186.621	**Subsample 19**	234001.130	13856186.621	**Subsample 19**	233970.406	13856186.621
Subsample 20	233939.682	13856186.621	**Subsample 20**	233739.977	13856213.229	**Subsample 20**	234062.578	13856186.621
Subsample 21	234031.854	13856186.621	**Subsample 21**	233832.149	13856213.229	**Subsample 21**	233801.425	13856213.229
Subsample 22	233770.701	13856213.229	**Subsample 22**	233924.320	13856213.229	**Subsample 22**	233893.597	13856213.229
Subsample 23	233862.873	13856213.229	**Subsample 23**	234016.492	13856213.229	**Subsample 23**	233985.768	13856213.229
Subsample 24	233955.044	13856213.229	**Subsample 24**	233786.063	13856239.837	**Subsample 24**	234077.940	13856213.229
Subsample 25	234047.216	13856213.229	**Subsample 25**	233878.235	13856239.837	**Subsample 25**	233755.339	13856239.837
Subsample 26	233816.787	13856239.837	**Subsample 26**	233970.406	13856239.837	**Subsample 26**	233847.511	13856239.837
Subsample 27	233908.959	13856239.837	**Subsample 27**	234062.578	13856239.837	**Subsample 27**	233939.682	13856239.837
Subsample 28	234001.130	13856239.837	**Subsample 28**	233955.044	13856266.444	**Subsample 28**	234031.854	13856239.837
Subsample 29	233893.597	13856266.444	**Subsample 29**	234047.216	13856266.444	**Subsample 29**	233924.320	13856266.444
Subsample 30	233985.768	13856266.444	**Subsample 30**	233939.682	13856293.052	**Subsample 30**	234016.492	13856266.444
Subsample 31	234077.940	13856266.444	**Subsample 31**	234031.854	13856293.052	**Subsample 31**	233908.959	13856293.052
Subsample 32	233970.406	13856293.052	**Subsample 32**	233924.320	13856319.660	**Subsample 32**	234001.130	13856293.052
Subsample 33	234062.578	13856293.052	**Subsample 33**	234016.492	13856319.660	**Subsample 33**	234093.302	13856293.052
Subsample 34	233955.044	13856319.660	**Subsample 34**	234108.664	13856319.660	**Subsample 34**	233985.768	13856319.660
Subsample 35	234047.216	13856319.660	**Subsample 35**	234001.130	13856346.267	**Subsample 35**	234077.940	13856319.660
Subsample 36	233939.682	13856346.267	**Subsample 36**	234093.302	13856346.267	**Subsample 36**	233970.406	13856346.267
Subsample 37	234031.854	13856346.267	**Subsample 37**	233985.768	13856372.875	**Subsample 37**	234062.578	13856346.267
Subsample 38	234124.026	13856346.267	**Subsample 38**	234077.940	13856372.875	**Subsample 38**	233955.044	13856372.875
Subsample 39	234016.492	13856372.875	**Subsample 39**	233970.406	13856399.483	**Subsample 39**	234047.216	13856372.875
Subsample 40	234108.664	13856372.875	**Subsample 40**	234062.578	13856399.483	**Subsample 40**	234139.388	13856372.875
Subsample 41	234001.130	13856399.483	**Subsample 41**	234016.492	13856426.090	**Subsample 41**	234031.854	13856399.483
Subsample 42	234093.302	13856399.483	**Subsample 42**	234108.664	13856426.090	**Subsample 42**	234124.026	13856399.483
Subsample 43	234047.216	13856426.090	**Subsample 43**	234062.578	13856452.698	**Subsample 43**	233985.768	13856426.090
Subsample 44	234139.388	13856426.090	**Subsample 44**	234093.302	13856452.698	**Subsample 44**	234077.940	13856426.090
Subsample 45	234001.130	13856452.698	**Subsample 45**	234124.026	13856452.698	**Subsample 45**	234031.854	13856452.698

TABLE. OLD DETONATION AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 2 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-ODA-FBSU2-ICS1**	**Incremental Composite Sample**	**SL-ODA-FBSU2-ICS2**	**Incremental Composite Sample**	**SL-ODA-FBSU2-ICS3**
Incremental	UTM Coordinates	**Incremental**	UTM Coordinates	**Incremental**	UTM Coordinates

Composite Subsample	Northing	Easting	Composite Subsample	Northing	Easting	Composite Subsample	Northing	Easting
Subsample 1	234745.080	13854508.672	Subsample 1	234771.761	13854508.672	Subsample 1	234758.420	13854531.779
Subsample 2	234745.080	13854554.885	Subsample 2	234785.101	13854531.779	Subsample 2	234771.761	13854554.885
Subsample 3	234758.420	13854577.991	Subsample 3	234731.739	13854577.991	Subsample 3	234785.101	13854577.991
Subsample 4	234771.761	13854601.098	Subsample 4	234745.080	13854601.098	Subsample 4	234718.399	13854601.098
Subsample 5	234731.739	13854624.204	Subsample 5	234718.399	13854647.310	Subsample 5	234758.420	13854624.204
Subsample 6	234745.080	13854647.310	Subsample 6	234758.420	13854670.417	Subsample 6	234771.761	13854647.310
Subsample 7	234718.399	13854693.523	Subsample 7	234705.059	13854716.629	Subsample 7	234731.739	13854670.417
Subsample 8	234731.739	13854716.629	Subsample 8	234718.399	13854739.736	Subsample 8	234745.080	13854693.523
Subsample 9	234745.080	13854739.736	Subsample 9	235625.550	13854739.736	Subsample 9	234758.420	13854716.629
Subsample 10	234705.059	13854762.842	Subsample 10	235638.890	13854762.842	Subsample 10	234691.718	13854739.736
Subsample 11	235585.528	13854762.842	Subsample 11	234718.399	13854785.948	Subsample 11	234731.739	13854762.842
Subsample 12	234745.080	13854785.948	Subsample 12	235545.507	13854785.948	Subsample 12	235612.209	13854762.842
Subsample 13	235572.188	13854785.948	Subsample 13	235625.550	13854785.948	Subsample 13	234771.761	13854785.948
Subsample 14	234758.420	13854809.055	Subsample 14	234731.739	13854809.055	Subsample 14	235598.869	13854785.948
Subsample 15	235558.847	13854809.055	Subsample 15	234811.782	13854809.055	Subsample 15	234785.101	13854809.055
Subsample 16	234798.442	13854832.161	Subsample 16	235532.166	13854809.055	Subsample 16	235505.486	13854809.055
Subsample 17	235465.464	13854832.161	Subsample 17	234771.761	13854832.161	Subsample 17	235585.528	13854809.055
Subsample 18	235545.507	13854832.161	Subsample 18	234851.804	13854832.161	Subsample 18	234825.123	13854832.161
Subsample 19	234838.463	13854855.267	Subsample 19	235518.826	13854832.161	Subsample 19	235492.145	13854832.161
Subsample 20	234918.506	13854855.267	Subsample 20	234811.782	13854855.267	Subsample 20	234785.101	13854855.267
Subsample 21	235478.805	13854855.267	Subsample 21	234891.825	13854855.267	Subsample 21	234865.144	13854855.267
Subsample 22	234851.804	13854878.374	Subsample 22	235398.762	13854855.267	Subsample 22	235425.443	13854855.267
Subsample 23	234931.846	13854878.374	Subsample 23	235452.124	13854855.267	Subsample 23	235505.486	13854855.267
Subsample 24	235358.741	13854878.374	Subsample 24	235532.166	13854855.267	Subsample 24	234878.484	13854878.374
Subsample 25	235438.783	13854878.374	Subsample 25	234905.165	13854878.374	Subsample 25	234958.527	13854878.374
Subsample 26	234891.825	13854901.480	Subsample 26	234985.208	13854878.374	Subsample 26	235332.060	13854878.374
Subsample 27	234971.868	13854901.480	Subsample 27	235412.102	13854878.374	Subsample 27	235385.421	13854878.374
Subsample 28	235051.910	13854901.480	Subsample 28	235492.145	13854878.374	Subsample 28	235465.464	13854878.374
Subsample 29	235318.719	13854901.480	Subsample 29	234945.187	13854901.480	Subsample 29	234918.506	13854901.480
Subsample 30	235398.762	13854901.480	Subsample 30	235025.229	13854901.480	Subsample 30	234998.548	13854901.480
Subsample 31	235011.889	13854924.586	Subsample 31	235292.038	13854901.480	Subsample 31	235345.400	13854901.480
Subsample 32	235091.932	13854924.586	Subsample 32	235372.081	13854901.480	Subsample 32	235425.443	13854901.480
Subsample 33	235358.741	13854924.586	Subsample 33	234985.208	13854924.586	Subsample 33	234958.527	13854924.586
Subsample 34	235078.591	13854947.693	Subsample 34	235065.251	13854924.586	Subsample 34	235038.570	13854924.586
Subsample 35	235292.038	13854947.693	Subsample 35	235332.060	13854924.586	Subsample 35	235305.379	13854924.586
Subsample 36	235118.612	13854970.799	Subsample 36	235051.910	13854947.693	Subsample 36	235025.229	13854947.693
Subsample 37	235305.379	13854970.799	Subsample 37	235131.953	13854947.693	Subsample 37	235105.272	13854947.693
Subsample 38	235158.634	13854993.905	Subsample 38	235091.932	13854970.799	Subsample 38	235318.719	13854947.693
Subsample 39	235318.719	13854993.905	Subsample 39	235171.974	13854970.799	Subsample 39	235065.251	13854970.799
Subsample 40	235171.974	13855017.012	Subsample 40	235278.698	13854970.799	Subsample 40	235145.293	13854970.799
Subsample 41	235252.017	13855017.012	Subsample 41	235131.953	13854993.905	Subsample 41	235332.060	13854970.799
Subsample 42	235211.996	13855040.118	Subsample 42	235211.996	13854993.905	Subsample 42	235185.315	13854993.905
Subsample 43	235238.677	13855040.118	Subsample 43	235292.038	13854993.905	Subsample 43	235265.357	13854993.905
Subsample 44	235265.357	13855040.118	Subsample 44	235225.336	13855017.012	Subsample 44	235198.655	13855017.012
Subsample 45	235292.038	13855040.118	Subsample 45	235305.379	13855017.012	Subsample 45	235278.698	13855017.012

TABLE. OLD DETONATION AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 3 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	SL-ODA-FBSU3-ICS1		Incremental Composite Sample	SL-ODA-FBSU3-ICS2		Incremental Composite Sample	SL-ODA-FBSU3-ICS3	
Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates		Incremental Composite Subsample	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	235713.701	13853974.304	**Subsample 1**	235679.876	13853993.833	**Subsample 1**	235702.426	13853993.833
Subsample 2	235691.151	13854013.362	**Subsample 2**	235724.976	13853993.833	**Subsample 2**	235713.701	13854013.362
Subsample 3	235724.976	13854032.891	**Subsample 3**	235736.251	13854013.362	**Subsample 3**	235747.526	13854032.891
Subsample 4	235758.801	13854052.420	**Subsample 4**	235702.426	13854032.891	**Subsample 4**	235713.701	13854052.420
Subsample 5	235724.976	13854071.949	**Subsample 5**	235736.251	13854052.420	**Subsample 5**	235747.526	13854071.949
Subsample 6	235758.801	13854091.478	**Subsample 6**	235770.076	13854071.949	**Subsample 6**	235781.351	13854091.478
Subsample 7	235736.251	13854130.536	**Subsample 7**	235736.251	13854091.478	**Subsample 7**	235747.526	13854111.007
Subsample 8	235770.076	13854150.065	**Subsample 8**	235770.076	13854111.007	**Subsample 8**	235758.801	13854130.536
Subsample 9	235803.902	13854169.594	**Subsample 9**	235781.351	13854130.536	**Subsample 9**	235792.626	13854150.065
Subsample 10	235770.076	13854189.123	**Subsample 10**	235747.526	13854150.065	**Subsample 10**	235758.801	13854169.594
Subsample 11	235803.902	13854208.652	**Subsample 11**	235781.351	13854169.594	**Subsample 11**	235792.626	13854189.123
Subsample 12	235815.177	13854228.181	**Subsample 12**	235815.177	13854189.123	**Subsample 12**	235770.076	13854228.181
Subsample 13	235781.351	13854247.710	**Subsample 13**	235781.351	13854208.652	**Subsample 13**	235803.902	13854247.710
Subsample 14	235815.177	13854267.239	**Subsample 14**	235792.626	13854228.181	**Subsample 14**	235837.727	13854267.239
Subsample 15	235849.002	13854286.768	**Subsample 15**	235826.452	13854247.710	**Subsample 15**	235803.902	13854286.768
Subsample 16	235815.177	13854306.297	**Subsample 16**	235792.626	13854267.239	**Subsample 16**	235837.727	13854306.297
Subsample 17	235849.002	13854325.826	**Subsample 17**	235826.452	13854286.768	**Subsample 17**	235871.552	13854325.826
Subsample 18	235826.452	13854364.884	**Subsample 18**	235860.277	13854306.297	**Subsample 18**	235837.727	13854345.355
Subsample 19	235860.277	13854384.413	**Subsample 19**	235826.452	13854325.826	**Subsample 19**	235849.002	13854364.884
Subsample 20	235871.552	13854403.942	**Subsample 20**	235860.277	13854345.355	**Subsample 20**	235882.827	13854384.413
Subsample 21	235837.727	13854423.471	**Subsample 21**	235871.552	13854364.884	**Subsample 21**	235826.452	13854403.942
Subsample 22	235849.002	13854443.000	**Subsample 22**	235837.727	13854384.413	**Subsample 22**	235860.277	13854423.471
Subsample 23	235882.827	13854462.529	**Subsample 23**	235849.002	13854403.942	**Subsample 23**	235871.552	13854443.000
Subsample 24	235849.002	13854482.058	**Subsample 24**	235882.827	13854423.471	**Subsample 24**	235837.727	13854462.529
Subsample 25	235882.827	13854501.587	**Subsample 25**	235826.452	13854443.000	**Subsample 25**	235871.552	13854482.058
Subsample 26	235916.652	13854521.116	**Subsample 26**	235860.277	13854462.529	**Subsample 26**	235905.377	13854501.587
Subsample 27	235882.827	13854540.645	**Subsample 27**	235894.102	13854482.058	**Subsample 27**	235871.552	13854521.116
Subsample 28	235916.652	13854560.174	**Subsample 28**	235860.277	13854501.587	**Subsample 28**	235905.377	13854540.645
Subsample 29	235950.477	13854579.703	**Subsample 29**	235894.102	13854521.116	**Subsample 29**	235939.202	13854560.174
Subsample 30	235894.102	13854599.232	**Subsample 30**	235927.927	13854540.645	**Subsample 30**	235905.377	13854579.703
Subsample 31	235905.377	13854618.761	**Subsample 31**	235894.102	13854560.174	**Subsample 31**	235916.652	13854599.232
Subsample 32	235826.452	13854638.290	**Subsample 32**	235927.927	13854579.703	**Subsample 32**	235860.277	13854618.761
Subsample 33	235894.102	13854638.290	**Subsample 33**	235939.202	13854599.232	**Subsample 33**	235927.927	13854618.761
Subsample 34	235770.076	13854657.819	**Subsample 34**	235882.827	13854618.761	**Subsample 34**	235849.002	13854638.290
Subsample 35	235837.727	13854657.819	**Subsample 35**	235950.477	13854618.761	**Subsample 35**	235916.652	13854638.290
Subsample 36	235905.377	13854657.819	**Subsample 36**	235871.552	13854638.290	**Subsample 36**	235860.277	13854657.819
Subsample 37	235849.002	13854677.348	**Subsample 37**	235792.626	13854657.819	**Subsample 37**	235758.801	13854677.348
Subsample 38	235702.426	13854696.877	**Subsample 38**	235815.177	13854657.819	**Subsample 38**	235781.351	13854677.348
Subsample 39	235770.076	13854696.877	**Subsample 39**	235882.827	13854657.819	**Subsample 39**	235803.902	13854677.348
Subsample 40	235792.626	13854696.877	**Subsample 40**	235736.251	13854677.348	**Subsample 40**	235871.552	13854677.348
Subsample 41	235691.151	13854716.406	**Subsample 41**	235826.452	13854677.348	**Subsample 41**	235724.976	13854696.877

Subsample 42	235758.801	13854716.406	**Subsample 42**	235747.526	13854696.877	**Subsample 42**	235815.177	13854696.877
Subsample 43	235702.426	13854735.935	**Subsample 43**	235668.601	13854716.406	**Subsample 43**	235713.701	13854716.406
Subsample 44	235668.601	13854755.464	**Subsample 44**	235736.251	13854716.406	**Subsample 44**	235657.326	13854735.935
Subsample 45	235691.151	13854755.464	**Subsample 45**	235679.876	13854735.935	**Subsample 45**	235724.976	13854735.935

TABLE. OLD DETONATION AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 4 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-ODA-FBSU4-ICS1**		**Incremental Composite Sample**	**SL-ODA-FBSU4-ICS2**		**Incremental Composite Sample**	**SL-ODA-FBSU4-ICS3**	
Incremental Composite Subsample	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	235320.419	13853787.582	**Subsample 1**	235347.744	13853787.582	**Subsample 1**	235375.069	13853787.582
Subsample 2	235402.394	13853787.582	**Subsample 2**	235429.720	13853787.582	**Subsample 2**	235457.045	13853787.582
Subsample 3	235484.370	13853787.582	**Subsample 3**	235279.431	13853811.246	**Subsample 3**	235306.756	13853811.246
Subsample 4	235361.407	13853811.246	**Subsample 4**	235334.081	13853811.246	**Subsample 4**	235388.732	13853811.246
Subsample 5	235443.382	13853811.246	**Subsample 5**	235416.057	13853811.246	**Subsample 5**	235470.707	13853811.246
Subsample 6	235525.358	13853811.246	**Subsample 6**	235498.032	13853811.246	**Subsample 6**	235293.094	13853834.911
Subsample 7	235265.769	13853834.911	**Subsample 7**	235320.419	13853834.911	**Subsample 7**	235484.370	13853834.911
Subsample 8	235347.744	13853834.911	**Subsample 8**	235511.695	13853834.911	**Subsample 8**	235566.345	13853834.911
Subsample 9	235457.045	13853834.911	**Subsample 9**	235224.781	13853858.575	**Subsample 9**	235279.431	13853858.575
Subsample 10	235539.020	13853834.911	**Subsample 10**	235306.756	13853858.575	**Subsample 10**	235525.358	13853858.575
Subsample 11	235252.106	13853858.575	**Subsample 11**	235552.683	13853858.575	**Subsample 11**	235183.793	13853882.239
Subsample 12	235498.032	13853858.575	**Subsample 12**	235238.443	13853882.239	**Subsample 12**	235211.118	13853882.239
Subsample 13	235580.008	13853858.575	**Subsample 13**	235593.671	13853882.239	**Subsample 13**	235566.345	13853882.239
Subsample 14	235265.769	13853882.239	**Subsample 14**	235607.333	13853905.904	**Subsample 14**	235224.781	13853905.904
Subsample 15	235539.020	13853882.239	**Subsample 15**	235156.468	13853929.568	**Subsample 15**	235580.008	13853905.904
Subsample 16	235170.130	13853905.904	**Subsample 16**	235183.793	13853929.568	**Subsample 16**	235620.996	13853929.568
Subsample 17	235197.456	13853905.904	**Subsample 17**	235648.321	13853929.568	**Subsample 17**	235115.480	13853953.232
Subsample 18	235593.671	13853929.568	**Subsample 18**	235607.333	13853953.232	**Subsample 18**	235142.805	13853953.232
Subsample 19	235634.658	13853953.232	**Subsample 19**	235689.309	13853953.232	**Subsample 19**	235170.130	13853953.232
Subsample 20	235101.818	13853976.896	**Subsample 20**	235060.830	13854000.561	**Subsample 20**	235661.983	13853953.232
Subsample 21	235129.143	13853976.896	**Subsample 21**	235088.155	13854000.561	**Subsample 21**	235675.646	13853976.896
Subsample 22	235156.468	13853976.896	**Subsample 22**	235115.480	13854000.561	**Subsample 22**	235019.842	13854024.225
Subsample 23	235648.321	13853976.896	**Subsample 23**	235142.805	13854000.561	**Subsample 23**	235074.492	13854024.225
Subsample 24	235047.167	13854024.225	**Subsample 24**	234978.854	13854047.889	**Subsample 24**	235101.818	13854024.225
Subsample 25	234951.529	13854047.889	**Subsample 25**	235060.830	13854047.889	**Subsample 25**	235033.505	13854047.889
Subsample 26	235006.180	13854047.889	**Subsample 26**	234937.867	13854071.554	**Subsample 26**	234910.541	13854071.554
Subsample 27	234965.192	13854071.554	**Subsample 27**	235019.842	13854071.554	**Subsample 27**	234992.517	13854071.554
Subsample 28	235047.167	13854071.554	**Subsample 28**	234842.229	13854095.218	**Subsample 28**	234924.204	13854095.218
Subsample 29	234869.554	13854095.218	**Subsample 29**	234951.529	13854095.218	**Subsample 29**	234801.241	13854118.882
Subsample 30	234896.879	13854095.218	**Subsample 30**	234855.891	13854118.882	**Subsample 30**	234828.566	13854118.882
Subsample 31	234978.854	13854095.218	**Subsample 31**	234883.216	13854118.882	**Subsample 31**	234842.229	13854142.546
Subsample 32	234910.541	13854118.882	**Subsample 32**	234760.253	13854142.546	**Subsample 32**	234869.554	13854142.546
Subsample 33	234787.578	13854142.546	**Subsample 33**	234773.916	13854166.211	**Subsample 33**	234746.590	13854166.211
Subsample 34	234814.903	13854142.546	**Subsample 34**	234801.241	13854166.211	**Subsample 34**	234760.253	13854189.875
Subsample 35	234719.265	13854166.211	**Subsample 35**	234705.603	13854189.875	**Subsample 35**	234787.578	13854189.875
Subsample 36	234828.566	13854166.211	**Subsample 36**	234746.590	13854213.539	**Subsample 36**	234719.265	13854213.539

Subsample 37	234732.928	13854189.875	**Subsample 37**	234719.265	13854260.868	**Subsample 37**	234732.928	13854237.204
Subsample 38	234705.603	13854237.204	**Subsample 38**	234760.253	13854284.532	**Subsample 38**	234732.928	13854284.532
Subsample 39	234746.590	13854260.868	**Subsample 39**	234732.928	13854331.861	**Subsample 39**	234746.590	13854308.196
Subsample 40	234719.265	13854308.196	**Subsample 40**	234746.590	13854355.525	**Subsample 40**	234719.265	13854355.525
Subsample 41	234760.253	13854331.861	**Subsample 41**	234746.590	13854402.854	**Subsample 41**	234760.253	13854379.189
Subsample 42	234773.916	13854355.525	**Subsample 42**	234760.253	13854426.518	**Subsample 42**	234732.928	13854426.518
Subsample 43	234732.928	13854379.189	**Subsample 43**	234732.928	13854473.846	**Subsample 43**	234773.916	13854450.182
Subsample 44	234773.916	13854402.854	**Subsample 44**	234760.253	13854473.846	**Subsample 44**	234746.590	13854497.511
Subsample 45	234746.590	13854450.182	**Subsample 45**	234787.578	13854473.846	**Subsample 45**	234773.916	13854497.511

TABLE. NEW OBOD AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 7 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-NDA-FBSU7-ICS1**		**Incremental Composite Sample**	**SL-NDA-FBSU7-ICS2**		**Incremental Composite Sample**	**SL-NDA-FBSU7-ICS3**	
Incremental Composite Subsample	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	233367.446	13854945.359	**Subsample 1**	233401.166	13854945.359	**Subsample 1**	233434.885	13854945.359
Subsample 2	233418.025	13854974.561	**Subsample 2**	233384.306	13854974.561	**Subsample 2**	233350.586	13854974.561
Subsample 3	233451.745	13854974.561	**Subsample 3**	233485.464	13854974.561	**Subsample 3**	233434.885	13855003.763
Subsample 4	233367.446	13855003.763	**Subsample 4**	233468.604	13855003.763	**Subsample 4**	233536.043	13855003.763
Subsample 5	233502.324	13855003.763	**Subsample 5**	233569.763	13855003.763	**Subsample 5**	233637.201	13855003.763
Subsample 6	233603.482	13855003.763	**Subsample 6**	233670.921	13855003.763	**Subsample 6**	233485.464	13855032.964
Subsample 7	233384.306	13855032.964	**Subsample 7**	233350.586	13855032.964	**Subsample 7**	233586.622	13855032.964
Subsample 8	233552.903	13855032.964	**Subsample 8**	233519.184	13855032.964	**Subsample 8**	233687.781	13855032.964
Subsample 9	233654.061	13855032.964	**Subsample 9**	233620.342	13855032.964	**Subsample 9**	233367.446	13855062.166
Subsample 10	233738.360	13855062.166	**Subsample 10**	233721.500	13855032.964	**Subsample 10**	233704.640	13855062.166
Subsample 11	233350.586	13855091.368	**Subsample 11**	233805.798	13855062.166	**Subsample 11**	233772.079	13855062.166
Subsample 12	233788.939	13855091.368	**Subsample 12**	233755.219	13855091.368	**Subsample 12**	233384.306	13855091.368
Subsample 13	233890.097	13855091.368	**Subsample 13**	233856.378	13855091.368	**Subsample 13**	233822.658	13855091.368
Subsample 14	233266.288	13855120.570	**Subsample 14**	233300.007	13855120.570	**Subsample 14**	233923.816	13855091.368
Subsample 15	233367.446	13855120.570	**Subsample 15**	233333.727	13855120.570	**Subsample 15**	233839.518	13855120.570
Subsample 16	233805.798	13855120.570	**Subsample 16**	233873.237	13855120.570	**Subsample 16**	233940.676	13855120.570
Subsample 17	233906.957	13855120.570	**Subsample 17**	233974.396	13855120.570	**Subsample 17**	233249.428	13855149.772
Subsample 18	233957.536	13855149.772	**Subsample 18**	233350.586	13855149.772	**Subsample 18**	233283.148	13855149.772
Subsample 19	233300.007	13855178.974	**Subsample 19**	233923.816	13855149.772	**Subsample 19**	233316.867	13855149.772
Subsample 20	233974.396	13855178.974	**Subsample 20**	233266.288	13855178.974	**Subsample 20**	233991.255	13855149.772
Subsample 21	233249.428	13855208.176	**Subsample 21**	234041.834	13855178.974	**Subsample 21**	234008.115	13855178.974
Subsample 22	234058.694	13855208.176	**Subsample 22**	234024.975	13855208.176	**Subsample 22**	233283.148	13855208.176
Subsample 23	234041.834	13855237.378	**Subsample 23**	233300.007	13855237.378	**Subsample 23**	233266.288	13855237.378
Subsample 24	233283.148	13855266.579	**Subsample 24**	234109.273	13855237.378	**Subsample 24**	234075.554	13855237.378
Subsample 25	234092.413	13855266.579	**Subsample 25**	233249.428	13855266.579	**Subsample 25**	234126.133	13855266.579
Subsample 26	234142.993	13855295.781	**Subsample 26**	233300.007	13855295.781	**Subsample 26**	233266.288	13855295.781
Subsample 27	233283.148	13855324.983	**Subsample 27**	234109.273	13855295.781	**Subsample 27**	234176.712	13855295.781
Subsample 28	234159.852	13855324.983	**Subsample 28**	233249.428	13855324.983	**Subsample 28**	233300.007	13855354.185
Subsample 29	233266.288	13855354.185	**Subsample 29**	234193.572	13855324.983	**Subsample 29**	234176.712	13855354.185
Subsample 30	234244.151	13855354.185	**Subsample 30**	234210.431	13855354.185	**Subsample 30**	233249.428	13855383.387
Subsample 31	234227.291	13855383.387	**Subsample 31**	233283.148	13855383.387	**Subsample 31**	234261.010	13855383.387

Subsample 32	233300.007	13855412.589	**Subsample 32**	233266.288	13855412.589	**Subsample 32**	234244.151	13855412.589
Subsample 33	233249.428	13855441.791	**Subsample 33**	234277.870	13855412.589	**Subsample 33**	233283.148	13855441.791
Subsample 34	234294.730	13855441.791	**Subsample 34**	234261.010	13855441.791	**Subsample 34**	233266.288	13855470.992
Subsample 35	234277.870	13855470.992	**Subsample 35**	233300.007	13855470.992	**Subsample 35**	234311.590	13855470.992
Subsample 36	233283.148	13855500.194	**Subsample 36**	233249.428	13855500.194	**Subsample 36**	234294.730	13855500.194
Subsample 37	234311.590	13855529.396	**Subsample 37**	233300.007	13855529.396	**Subsample 37**	233266.288	13855529.396
Subsample 38	234311.590	13855587.800	**Subsample 38**	234277.870	13855529.396	**Subsample 38**	234294.730	13855558.598
Subsample 39	234311.590	13855646.204	**Subsample 39**	234328.449	13855558.598	**Subsample 39**	234345.309	13855587.800
Subsample 40	234311.590	13855704.607	**Subsample 40**	234328.449	13855617.002	**Subsample 40**	234345.309	13855646.204
Subsample 41	234311.590	13855763.011	**Subsample 41**	234328.449	13855675.405	**Subsample 41**	234345.309	13855704.607
Subsample 42	234311.590	13855821.415	**Subsample 42**	234328.449	13855733.809	**Subsample 42**	234345.309	13855763.011
Subsample 43	234328.449	13855850.617	**Subsample 43**	234328.449	13855792.213	**Subsample 43**	234345.309	13855821.415
Subsample 44	234294.730	13855909.020	**Subsample 44**	234294.730	13855850.617	**Subsample 44**	234311.590	13855879.819
Subsample 45	234311.590	13855938.222	**Subsample 45**	234345.309	13855879.819	**Subsample 45**	234328.449	13855909.020

TABLE. NEW OBOD AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 8 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-NDA-FBSU8-ICS1**		**Incremental Composite Sample**	**SL-NDA-FBSU8-ICS2**		**Incremental Composite Sample**	**SL-NDA-FBSU8-ICS3**	
Incremental Composite Subsample	UTM Coordinates		**Incremental Composite Subsample**	**UTM Coordinates**		**Incremental Composite Subsample**	UTM Coordinates	
	Northing	Easting		Northing	**Easting**		Northing	Easting
Subsample 1	233263.406	13855557.938	**Subsample 1**	233295.694	13855557.938	**Subsample 1**	233247.262	13855585.900
Subsample 2	233295.694	13855613.862	**Subsample 2**	233263.406	13855613.862	**Subsample 2**	233279.550	13855585.900
Subsample 3	233247.262	13855641.824	**Subsample 3**	233263.406	13855669.786	**Subsample 3**	233279.550	13855641.824
Subsample 4	233295.694	13855669.786	**Subsample 4**	233279.550	13855697.748	**Subsample 4**	233247.262	13855697.748
Subsample 5	233263.406	13855725.710	**Subsample 5**	233247.262	13855753.672	**Subsample 5**	233295.694	13855725.710
Subsample 6	233279.550	13855753.672	**Subsample 6**	233295.694	13855781.634	**Subsample 6**	233263.406	13855781.634
Subsample 7	233247.262	13855809.596	**Subsample 7**	233263.406	13855837.558	**Subsample 7**	233279.550	13855809.596
Subsample 8	233295.694	13855837.558	**Subsample 8**	233279.550	13855865.520	**Subsample 8**	233247.262	13855865.520
Subsample 9	233263.406	13855893.482	**Subsample 9**	233247.262	13855921.444	**Subsample 9**	233295.694	13855893.482
Subsample 10	233279.550	13855921.444	**Subsample 10**	233295.694	13855949.406	**Subsample 10**	233263.406	13855949.406
Subsample 11	233247.262	13855977.368	**Subsample 11**	233263.406	13856005.330	**Subsample 11**	233279.550	13855977.368
Subsample 12	233295.694	13856005.330	**Subsample 12**	233311.837	13856033.292	**Subsample 12**	233279.550	13856033.292
Subsample 13	233295.694	13856061.254	**Subsample 13**	233360.269	13856061.254	**Subsample 13**	233327.981	13856061.254
Subsample 14	233344.125	13856089.216	**Subsample 14**	233360.269	13856117.178	**Subsample 14**	233376.413	13856089.216
Subsample 15	233392.557	13856117.178	**Subsample 15**	233408.701	13856145.140	**Subsample 15**	233424.845	13856117.178
Subsample 16	233440.989	13856145.140	**Subsample 16**	233505.564	13856145.140	**Subsample 16**	233473.276	13856145.140
Subsample 17	233537.852	13856145.140	**Subsample 17**	233521.708	13856173.102	**Subsample 17**	233489.420	13856173.102
Subsample 18	233457.132	13856173.102	**Subsample 18**	233618.571	13856173.102	**Subsample 18**	233586.284	13856173.102
Subsample 19	233553.996	13856173.102	**Subsample 19**	233537.852	13856201.064	**Subsample 19**	233602.427	13856201.064
Subsample 20	233570.140	13856201.064	**Subsample 20**	233586.284	13856229.026	**Subsample 20**	233602.427	13856256.988
Subsample 21	233618.571	13856229.026	**Subsample 21**	233634.715	13856256.988	**Subsample 21**	233618.571	13856284.951
Subsample 22	233586.284	13856284.951	**Subsample 22**	233602.427	13856312.913	**Subsample 22**	233618.571	13856340.875
Subsample 23	233634.715	13856312.913	**Subsample 23**	233602.427	13856368.837	**Subsample 23**	233618.571	13856396.799
Subsample 24	233634.715	13856368.837	**Subsample 24**	233650.859	13856396.799	**Subsample 24**	233634.715	13856424.761
Subsample 25	233602.427	13856424.761	**Subsample 25**	233618.571	13856452.723	**Subsample 25**	233634.715	13856480.685
Subsample 26	233650.859	13856452.723	**Subsample 26**	233618.571	13856508.647	**Subsample 26**	233634.715	13856536.609

Subsample 27	233650.859	13856508.647	**Subsample 27**	233667.003	13856536.609	**Subsample 27**	233650.859	13856564.571
Subsample 28	233618.571	13856564.571	**Subsample 28**	233634.715	13856592.533	**Subsample 28**	233618.571	13856620.495
Subsample 29	233667.003	13856592.533	**Subsample 29**	233650.859	13856620.495	**Subsample 29**	233667.003	13856648.457
Subsample 30	233634.715	13856648.457	**Subsample 30**	233650.859	13856676.419	**Subsample 30**	233634.715	13856704.381
Subsample 31	233683.147	13856676.419	**Subsample 31**	233667.003	13856704.381	**Subsample 31**	234119.032	13856704.381
Subsample 32	234151.320	13856704.381	**Subsample 32**	234183.607	13856704.381	**Subsample 32**	234215.895	13856704.381
Subsample 33	234248.183	13856704.381	**Subsample 33**	233876.874	13856732.343	**Subsample 33**	233683.147	13856732.343
Subsample 34	233650.859	13856732.343	**Subsample 34**	233973.737	13856732.343	**Subsample 34**	233909.161	13856732.343
Subsample 35	233844.586	13856732.343	**Subsample 35**	234070.600	13856732.343	**Subsample 35**	234006.025	13856732.343
Subsample 36	233941.449	13856732.343	**Subsample 36**	234167.464	13856732.343	**Subsample 36**	234135.176	13856732.343
Subsample 37	234038.312	13856732.343	**Subsample 37**	234264.327	13856732.343	**Subsample 37**	234232.039	13856732.343
Subsample 38	234102.888	13856732.343	**Subsample 38**	233667.003	13856760.305	**Subsample 38**	233731.579	13856760.305
Subsample 39	234199.751	13856732.343	**Subsample 39**	233763.866	13856760.305	**Subsample 39**	233828.442	13856760.305
Subsample 40	233699.291	13856760.305	**Subsample 40**	233860.730	13856760.305	**Subsample 40**	233925.305	13856760.305
Subsample 41	233796.154	13856760.305	**Subsample 41**	233957.593	13856760.305	**Subsample 41**	234022.169	13856760.305
Subsample 42	233893.017	13856760.305	**Subsample 42**	234054.456	13856760.305	**Subsample 42**	234119.032	13856760.305
Subsample 43	233989.881	13856760.305	**Subsample 43**	233715.435	13856788.267	**Subsample 43**	233683.147	13856788.267
Subsample 44	234086.744	13856760.305	**Subsample 44**	233812.298	13856788.267	**Subsample 44**	233780.010	13856788.267
Subsample 45	233747.722	13856788.267	**Subsample 45**	233844.586	13856788.267	**Subsample 45**	233876.874	13856788.267

TABLE. NEW OBOD AREA: SOIL MONITORING DELINEATION FIREBREAK SAMPLE UNIT 9 SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-NDA-FBSU9-ICS1**		**Incremental Composite Sample**	**SL-NDA-FBSU9-ICS2**		**Incremental Composite Sample**	**SL-NDA-FBSU9-ICS3**	
Incremental Composite Subsample	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	234236.793	13855956.154	**Subsample 1**	234256.719	13855956.154	**Subsample 1**	234276.645	13855956.154
Subsample 2	234296.570	13855956.154	**Subsample 2**	234306.533	13855973.410	**Subsample 2**	234286.607	13855973.410
Subsample 3	234266.682	13855973.410	**Subsample 3**	234316.496	13855990.667	**Subsample 3**	234296.570	13855990.667
Subsample 4	234326.459	13855973.410	**Subsample 4**	234326.459	13856007.923	**Subsample 4**	234306.533	13856007.923
Subsample 5	234276.645	13855990.667	**Subsample 5**	234296.570	13856025.179	**Subsample 5**	234336.422	13856025.179
Subsample 6	234336.422	13855990.667	**Subsample 6**	234306.533	13856042.435	**Subsample 6**	234286.607	13856042.435
Subsample 7	234286.607	13856007.923	**Subsample 7**	234316.496	13856059.691	**Subsample 7**	234346.385	13856042.435
Subsample 8	234316.496	13856025.179	**Subsample 8**	234346.385	13856076.947	**Subsample 8**	234296.570	13856059.691
Subsample 9	234326.459	13856042.435	**Subsample 9**	234296.570	13856094.204	**Subsample 9**	234326.459	13856076.947
Subsample 10	234336.422	13856059.691	**Subsample 10**	234326.459	13856111.460	**Subsample 10**	234336.422	13856094.204
Subsample 11	234306.533	13856076.947	**Subsample 11**	234336.422	13856128.716	**Subsample 11**	234306.533	13856111.460
Subsample 12	234316.496	13856094.204	**Subsample 12**	234286.607	13856145.972	**Subsample 12**	234316.496	13856128.716
Subsample 13	234296.570	13856128.716	**Subsample 13**	234316.496	13856163.228	**Subsample 13**	234326.459	13856145.972
Subsample 14	234306.533	13856145.972	**Subsample 14**	234326.459	13856180.485	**Subsample 14**	234296.570	13856163.228
Subsample 15	234336.422	13856163.228	**Subsample 15**	234276.645	13856197.741	**Subsample 15**	234306.533	13856180.485
Subsample 16	234286.607	13856180.485	**Subsample 16**	234306.533	13856214.997	**Subsample 16**	234316.496	13856197.741
Subsample 17	234296.570	13856197.741	**Subsample 17**	234316.496	13856232.253	**Subsample 17**	234286.607	13856214.997
Subsample 18	234326.459	13856214.997	**Subsample 18**	234286.607	13856249.509	**Subsample 18**	234296.570	13856232.253
Subsample 19	234276.645	13856232.253	**Subsample 19**	234296.570	13856266.765	**Subsample 19**	234326.459	13856249.509
Subsample 20	234306.533	13856249.509	**Subsample 20**	234326.459	13856284.022	**Subsample 20**	234276.645	13856266.765
Subsample 21	234316.496	13856266.765	**Subsample 21**	234256.719	13855956.154	**Subsample 21**	234306.533	13856284.022

Subsample 22	234286.607	13856284.022	**Subsample 22**	234306.533	13855973.410	**Subsample 22**	234316.496	13856301.278
Subsample 23	234296.570	13856301.278	**Subsample 23**	234316.496	13855990.667	**Subsample 23**	234266.682	13856318.534
Subsample 24	234306.533	13856318.534	**Subsample 24**	234326.459	13856007.923	**Subsample 24**	234326.459	13856318.534
Subsample 25	234316.496	13856335.790	**Subsample 25**	234296.570	13856025.179	**Subsample 25**	234276.645	13856335.790
Subsample 26	234266.682	13856353.046	**Subsample 26**	234306.533	13856042.435	**Subsample 26**	234286.607	13856353.046
Subsample 27	234296.570	13856370.303	**Subsample 27**	234316.496	13856059.691	**Subsample 27**	234316.496	13856370.303
Subsample 28	234306.533	13856387.559	**Subsample 28**	234346.385	13856076.947	**Subsample 28**	234266.682	13856387.559
Subsample 29	234276.645	13856404.815	**Subsample 29**	234296.570	13856094.204	**Subsample 29**	234296.570	13856404.815
Subsample 30	234286.607	13856422.071	**Subsample 30**	234326.459	13856111.460	**Subsample 30**	234306.533	13856422.071
Subsample 31	234316.496	13856439.327	**Subsample 31**	234336.422	13856128.716	**Subsample 31**	234276.645	13856439.327
Subsample 32	234266.682	13856456.583	**Subsample 32**	234286.607	13856145.972	**Subsample 32**	234286.607	13856456.583
Subsample 33	234276.645	13856473.840	**Subsample 33**	234316.496	13856163.228	**Subsample 33**	234296.570	13856473.840
Subsample 34	234306.533	13856491.096	**Subsample 34**	234326.459	13856180.485	**Subsample 34**	234266.682	13856491.096
Subsample 35	234256.719	13856508.352	**Subsample 35**	234276.645	13856197.741	**Subsample 35**	234276.645	13856508.352
Subsample 36	234286.607	13856525.608	**Subsample 36**	234306.533	13856214.997	**Subsample 36**	234306.533	13856525.608
Subsample 37	234296.570	13856542.864	**Subsample 37**	234316.496	13856232.253	**Subsample 37**	234256.719	13856542.864
Subsample 38	234266.682	13856560.120	**Subsample 38**	234286.607	13856249.509	**Subsample 38**	234286.607	13856560.120
Subsample 39	234276.645	13856577.377	**Subsample 39**	234296.570	13856266.765	**Subsample 39**	234296.570	13856577.377
Subsample 40	234306.533	13856594.633	**Subsample 40**	234326.459	13856284.022	**Subsample 40**	234266.682	13856594.633
Subsample 41	234256.719	13856611.889	**Subsample 41**	234276.645	13856301.278	**Subsample 41**	234276.645	13856611.889
Subsample 42	234266.682	13856629.145	**Subsample 42**	234286.607	13856318.534	**Subsample 42**	234286.607	13856629.145
Subsample 43	234296.570	13856646.401	**Subsample 43**	234296.570	13856335.790	**Subsample 43**	234256.719	13856646.401
Subsample 44	234246.756	13856663.658	**Subsample 44**	234306.533	13856353.046	**Subsample 44**	234266.682	13856663.658
Subsample 45	234276.645	13856680.914	**Subsample 45**	234276.645	13856370.303	**Subsample 45**	234296.570	13856680.914

TABLE SOIL BACKGROUND LOCATION: SUBSAMPLE UTM COORDINATES.

Incremental Composite Sample	**SL-BG-ICS1**		**Incremental Composite Sample**	**SL-BG-ICS2**		**Incremental Composite Sample**	**SL-BG-ICS3**	
Incremental Composite Subsample	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates		**Incremental Composite Subsample**	UTM Coordinates	
	Northing	Easting		Northing	Easting		Northing	Easting
Subsample 1	230496.601	13852920.356	**Subsample 1**	230518.676	13852920.356	**Subsample 1**	230540.752	13852920.356
Subsample 2	230562.827	13852920.356	**Subsample 2**	230584.902	13852920.356	**Subsample 2**	230606.978	13852920.356
Subsample 3	230629.053	13852920.356	**Subsample 3**	230651.128	13852920.356	**Subsample 3**	230673.203	13852920.356
Subsample 4	230695.279	13852920.356	**Subsample 4**	230507.639	13852939.474	**Subsample 4**	230485.563	13852939.474
Subsample 5	230529.714	13852939.474	**Subsample 5**	230573.865	13852939.474	**Subsample 5**	230551.789	13852939.474
Subsample 6	230595.940	13852939.474	**Subsample 6**	230640.090	13852939.474	**Subsample 6**	230618.015	13852939.474
Subsample 7	230662.166	13852939.474	**Subsample 7**	230518.676	13852958.592	**Subsample 7**	230684.241	13852939.474
Subsample 8	230540.752	13852958.592	**Subsample 8**	230584.902	13852958.592	**Subsample 8**	230496.601	13852958.592
Subsample 9	230606.978	13852958.592	**Subsample 9**	230651.128	13852958.592	**Subsample 9**	230562.827	13852958.592
Subsample 10	230673.203	13852958.592	**Subsample 10**	230529.714	13852977.709	**Subsample 10**	230629.053	13852958.592
Subsample 11	230485.563	13852977.709	**Subsample 11**	230595.940	13852977.709	**Subsample 11**	230695.279	13852958.592
Subsample 12	230551.789	13852977.709	**Subsample 12**	230662.166	13852977.709	**Subsample 12**	230507.639	13852977.709
Subsample 13	230618.015	13852977.709	**Subsample 13**	230474.526	13852996.827	**Subsample 13**	230573.865	13852977.709
Subsample 14	230684.241	13852977.709	**Subsample 14**	230540.752	13852996.827	**Subsample 14**	230640.090	13852977.709
Subsample 15	230496.601	13852996.827	**Subsample 15**	230606.978	13852996.827	**Subsample 15**	230518.676	13852996.827
Subsample 16	230562.827	13852996.827	**Subsample 16**	230673.203	13852996.827	**Subsample 16**	230584.902	13852996.827

Subsample 17	230629.053	13852996.827	**Subsample 17**	230507.639	13853015.945	**Subsample 17**	230651.128	13852996.827
Subsample 18	230695.279	13852996.827	**Subsample 18**	230573.865	13853015.945	**Subsample 18**	230485.563	13853015.945
Subsample 19	230529.714	13853015.945	**Subsample 19**	230640.090	13853015.945	**Subsample 19**	230551.789	13853015.945
Subsample 20	230595.940	13853015.945	**Subsample 20**	230474.526	13853035.063	**Subsample 20**	230618.015	13853015.945
Subsample 21	230662.166	13853015.945	**Subsample 21**	230540.752	13853035.063	**Subsample 21**	230684.241	13853015.945
Subsample 22	230496.601	13853035.063	**Subsample 22**	230606.978	13853035.063	**Subsample 22**	230518.676	13853035.063
Subsample 23	230562.827	13853035.063	**Subsample 23**	230673.203	13853035.063	**Subsample 23**	230584.902	13853035.063
Subsample 24	230629.053	13853035.063	**Subsample 24**	230507.639	13853054.181	**Subsample 24**	230651.128	13853035.063
Subsample 25	230695.279	13853035.063	**Subsample 25**	230573.865	13853054.181	**Subsample 25**	230485.563	13853054.181
Subsample 26	230529.714	13853054.181	**Subsample 26**	230640.090	13853054.181	**Subsample 26**	230551.789	13853054.181
Subsample 27	230595.940	13853054.181	**Subsample 27**	230474.526	13853073.298	**Subsample 27**	230618.015	13853054.181
Subsample 28	230662.166	13853054.181	**Subsample 28**	230540.752	13853073.298	**Subsample 28**	230684.241	13853054.181
Subsample 29	230496.601	13853073.298	**Subsample 29**	230606.978	13853073.298	**Subsample 29**	230518.676	13853073.298
Subsample 30	230562.827	13853073.298	**Subsample 30**	230673.203	13853073.298	**Subsample 30**	230584.902	13853073.298
Subsample 31	230629.053	13853073.298	**Subsample 31**	230507.639	13853092.416	**Subsample 31**	230651.128	13853073.298
Subsample 32	230695.279	13853073.298	**Subsample 32**	230573.865	13853092.416	**Subsample 32**	230485.563	13853092.416
Subsample 33	230529.714	13853092.416	**Subsample 33**	230640.090	13853092.416	**Subsample 33**	230551.789	13853092.416
Subsample 34	230595.940	13853092.416	**Subsample 34**	230474.526	13853111.534	**Subsample 34**	230618.015	13853092.416
Subsample 35	230662.166	13853092.416	**Subsample 35**	230540.752	13853111.534	**Subsample 35**	230684.241	13853092.416
Subsample 36	230496.601	13853111.534	**Subsample 36**	230606.978	13853111.534	**Subsample 36**	230518.676	13853111.534
Subsample 37	230562.827	13853111.534	**Subsample 37**	230673.203	13853111.534	**Subsample 37**	230584.902	13853111.534
Subsample 38	230629.053	13853111.534	**Subsample 38**	230507.639	13853130.652	**Subsample 38**	230651.128	13853111.534
Subsample 39	230695.279	13853111.534	**Subsample 39**	230573.865	13853130.652	**Subsample 39**	230485.563	13853130.652
Subsample 40	230529.714	13853130.652	**Subsample 40**	230640.090	13853130.652	**Subsample 40**	230551.789	13853130.652
Subsample 41	230595.940	13853130.652	**Subsample 41**	230474.526	13853149.769	**Subsample 41**	230618.015	13853130.652
Subsample 42	230662.166	13853130.652	**Subsample 42**	230540.752	13853149.769	**Subsample 42**	230684.241	13853130.652
Subsample 43	230496.601	13853149.769	**Subsample 43**	230606.978	13853149.769	**Subsample 43**	230518.676	13853149.769
Subsample 44	230562.827	13853149.769	**Subsample 44**	230673.203	13853149.769	**Subsample 44**	230584.902	13853149.769
Subsample 45	230629.053	13853149.769	**Subsample 45**	230695.279	13853149.769	**Subsample 45**	230651.128	13853149.769

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times
(UFP-QAPP Manual Section 3.1.2.2)
(EPA 2106-G-05 Section 2.3.2)

Laboratories: 1. Metals in surface water: Brooks-Rand Laboratories; 3958 6th Ave NW, Seattle, WA 98107; Tiffany Stilwater, tiffany@brooksrand.com, 206-632-6206. 2. Metals in soil and sediment by ICP-MS; TOC in soil and sediment by EPA 9060A; particle sizing in soil by ASTM D422; and soil processing for explosives analysis (but not the analysis itself) by EPA 8330B: Eurofins Lancaster Laboratories Environmental, LLC; 2425 New Holland Pike, Lancaster, PA 17601; Katherine Klinefelter, katherineklinefelter@eurofinsus.com, 717-556-7256. 3. Other parameters/methods: U.S. Army Institute of Public Health laboratory; Building E-2100, Bush River Road, Aberdeen Proving Ground, MD 21010; Chuck Stoner, charles.e.stoner2.civ@mail.mil, 410-436-8398.
Required accreditations/certifications: ISO 17025 accredited quality system. Project methods must be on the performing laboratory's ISO 17025 scope of accreditation (NELAP or other 3rd party accrediting body) or DoD Environmental Laboratory Accreditation Program (ELAP) scope of accreditation. EPA 8330B Incremental Composite Sampling soil processing must be on the laboratory's DoD ELAP scope.
Back-up Laboratory: None assigned
Sample Delivery Method: Commercial carrier (overnight, most likely Fedex) or trucked and hand delivered.

Analyte/ Analyte Group	Matrix	Method/ SOP	Accreditation Expiration Date	Container(s) (number, size & type per sample)	Preservation	Preparation Holding Time	Analytical Holding Time	Data Package Turnaround

Explosives	Groundwater Surface water	EPA 8095M	31 March 2016	1-500 mL amber glass bottle	4 ± 2°C	7 days	40 days	30 days
Explosives	Sediment	EPA 8095M	31 March 2016	1-4 oz wide mouth glass jar	4 ± 2°C	14 days	40 days	30 days
Explosives	Soil	EPA 8330B processing (dry, grind, sieve)	30 November 2016	1-2 kg sample in large plastic, sealable bag or other appropriate container[1] (estimate 15 g final sample)	4 ± 2°C	14 days	NA	NA
Explosives	Soil	EPA 8095M analysis	31 March 2016	Glass jars or plastic, sealable bags.	4 ± 2°C	NA	40 days	30 days after processed samples arrive at laboratory (estimate 45 days total)
Perchlorates	Groundwater Surface water	EPA 6850	31 March 2016	1-125 or 250mL plastic bottle	Leave 1/3 container head space; field filter; 4 ± 2°C	NA	28 days	30 days

Perchlorates	Soil	EPA 6850	31 March 2016	1-2 kg sample in large plastic, sealable bag or other appropriate container[2] (estimate 15 g final sample)	4 ± 2°C	NA	28 days	30 days
Metals	Groundwater	EPA 200.8/ 245.1	31 March 2016	1-500 mL plastic bottle	HNO_3 to pH<2	NA	28 days for mercury; 6 months for others	30 days
Dissolved Metals (and hardness)	Surface water	EPA 1638mod/1631E	30 June 2015 (will be updated)	1-125 or 250 mL HDPE bottle and 1-250 or 500 mL PTFE bottle for Hg	Field filter; 4 ± 2°C	28 days for acid preservation (in the laboratory)	6 months and 90 days for Hg	30 days
Metals	Sediment	EPA 6020/7471A	30 November 2016	1-4 oz wide mouth glass jar	4 ± 2°C	NA	28 days for mercury; 6 months for others	30 days

Metals	Soil	EPA 6020/7471A	30 November 2016	1-2 kg sample in large plastic, sealable bag or other appropriate container[1,2] (estimate 15 g final sample)	4 ± 2°C	NA	28 days for mercury; 6 months for others	30 days
SVOCs	Groundwater	EPA 8270C	31 March 2016	2-1L amber glass bottles	4 ± 2°C	7 days	40 days	30 days
SVOCs	Soil	EPA 8270C	31 March 2016	1-2 kg sample in large plastic, sealable bag or other appropriate container[2] (estimate 30 g final sample)	4 ± 2°C	14 days	40 days	30 days
Nitrate/Nitrite	Groundwater Surface Water	EPA 353.2	31 March 2016 (in the process of being added to scope)	1-250mL plastic bottle	pH<2 w/ H_2SO_4; 4 ± 2°C	NA	28 days	30 days
Total Organic Carbon (TOC)	Sediment	EPA 9060A	30 November 2016	1-2 or 4 oz wide mouth glass jar	4 ± 2°C	NA	28 days	30 days

Total Organic Carbon (TOC)	Soil	EPA 9060A	30 November 2016	1-2 kg sample in large plastic, sealable bag or other appropriate container[2] (estimate 15 g final sample)	4 ± 2°C	NA	28 days	30 days
Particle Sizing	Soil	ASTM D422	30 November 2016	1-2 kg sample in large plastic, sealable bag or other appropriate container[2] (estimate 500 g final sample)	4 ± 2°C	NA	Not specified	30 days

1 Incremental sample #1: for explosives and metals (except mercury) in soil.

2 Incremental sample #2: for semivolatiles, mercury, perchlorate, TOC and particle sizing (not all parameters from every sample).

QAPP Worksheet #20: Field QC Summary
(UFP-QAPP Section 3.1.1 and 3.1.2)
(EPA 2106-G-05 Section 2.3.5)

Biannual August Odd Year Sampling Events

Matrix	Analyte/Analytical Group	Field Samples	Field Duplicates	Matrix Spikes[a]	Matrix Spike Duplicates[a]	Con-tainer Blank	Equip-ment Blanks	Trip Blanks	Other	Total # analyses
Groundwater	Explosives	26	3	2	2	0	0	0	0	29
Groundwater	Perchlorates	8	1	1	1	0	0	0	0	9
Groundwater	Semi-volatile organic	8	1	1	1	0	0	0	0	11
Groundwater	Total Metals - Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se and Ag	26	3	2	2	0	0	0	0	29
Groundwater	Nitrates/Nitrites	26	3	1	0	0	0	0	0	29
Surface Water	Explosives	9	1	1	1	1	1	0	0	12
Surface Water	Perchlorates	9	1	1	1	1	1	0	0	12
Surface Water	Dissolved Metals-Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se	9	1	1	1	1	1	0	0	12
Surface Water	Nitrates/Nitrites	9	1	1	0	1	1	0	0	12

Sediment	Total Metals - Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se and Ag	9	1	1	1	1	1	0	0	12
Sediment	Explosives	9	1	1	1	1	1	0	0	12
Sediment	TOC	9	0	1	0	0	0	0	0	9

[a] In some cases, matrix spike (MS) and matrix spike duplicate aliquots are taken from the native sample container; in others, there are separate containers for MS and MSD aliquots.

Semi-Annual February/August Even Year and Semi-Annual February Odd Year Sampling Events

Matrix	Analyte/Analytical Group	Field Samples	Field Duplicates	Matrix Spikes	Matrix Spike Duplicates	Field Blanks	Equipment Blanks	Trip Blanks	Other	Total # analyses
Groundwater	Explosives	20	3	0	0	0	0	0	0	29
Groundwater	Perchlorates	8	1	0	0	0	0	0	0	9
Groundwater	Semi-volatile organic compounds	8	1	1	1	0	0	0	0	11
Groundwater	Total Metals - Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se and Ag	26	3	0	0	0	0	0	0	29
Groundwater	Nitrates/Nitrites	26	3	0	0	0	0	0	0	29

Initial Soil Sampling Event

Matrix	Analyte/Analytical Group	Field Samples	Field Duplicates	Matrix Spikes	Matrix Spike Duplicates	Field Blanks	Equipment Blanks	Trip Blanks	Other	Total # analyses
Soil	Explosives	30	2	2	2	0	1 per day	0	2 Field Split Samples	40
Soil	Perchlorates	15	2	2	2	0	1 per day	0	2 Field Split Samples	40
Soil	Semi-volatile organic compounds	15	2	2	2	0	1 per day	0	2 Field Split Samples	41
Soil	Total Metals - Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Hg, Se and Ag	30	2	2	2	0	1 per day	0	2 Field Split Samples	40
Soil	Particle Size	6	0	0	0	0	0	0	0	6
Soil	TOC	6	0	1	0	0	0	0	0	6
Soil	Percent Moisture	6	0	0	0	0	0	0	0	6

5 Year Soil Sampling Events

Matrix	Analyte/Analytical Group	Field Samples	Field Duplicates	Matrix Spikes	Matrix Spike Duplicates	Field Blanks	Equipment Blanks	Trip Blanks	Other	Total # analyses
Soil	Explosives	21	2	2	2	0	1 per day	0	2 Field Split Samples	40
Soil	Perchlorates	12	2	2	2	0	1 per day	0	2 Field Split Samples	40
Soil	Semi-volatile organic compounds	12	2	2	2	0	1 per day	0	2 Field Split Samples	41

Soil	Total Metals - Al, Sb, Ba, Cr, Cu, Pb, Hg and Ag	21	2	2	2	0	1 per day	0	2 Field Split Samples	40
Soil	Particle Size	6	0	0	0	0	0	0	0	6
Soil	TOC	6	0	0	0	0	0	0	0	6
Soil	Percent Moisture	6	0	0	0	0	0	0	0	6

QAPP Worksheet #21: Field SOPs
(UFP-QAPP Manual Section 3.1.2)
(EPA 2106-G-05 Section 2.3.2)

SOP # or reference	Title, Revision, Date, and URL (if available)	Originating Organization	SOP option or Equipment Type (if SOP provides different options)	Modified for Project? Y/N	Comments
S-1	Standard Practice for Design and Installation of Ground Water Monitoring Wells D 5092-04 Jan 04	ASTM	Drill Rig & Direct Push Machine	N	
S-2	Standard Practice for Monitoring Well Protection D 5787-95 (Reapproved 2000), Jan 96	ASTM		N	
S-3	Standard Guide for Purging Methods for Wells Used for Ground-Water Quality Investigations D6452-99(Reapproved 2005) Jan 05	ASTM	Water Pumps and Bailers	N	
S-4	Standard Guide for Sampling Ground-Water Monitoring Wells D 4448-01 Aug 01	ASTM	Water Pumps and Bailers	N	
S-5	Standard Practice for Low-Flow Purging and Sampling for Wells and Devices Used for Ground-Water Quality Investigations D 6771-02 Feb 02	ASTM	Water Pumps and Water Quality Monitoring Instruments	N	
S-6	Standard Test Method for Determining Subsurface Liquid Levels in a Borehole of Monitoring Well (Observation Well) D4750-87(Reapproved 2001) Nov 87	ASTM	Water Level Indicator	N	
S-7	USACHPPM SOP 008, Decontamination and Cleaning of Sampling Equipment, Feb 2003	USACHPPM		N	
S-8	USACHPPM SOP for Low Flow Sampling Systems, 2008	USACHPPM	Water Pumps and Water Quality Monitoring Instruments	N	

S-9	Standard Guide for the Development of Ground-Water Monitoring Wells in Granular Aquifers D5521-05 Nov 05	ASTM	Water Pumps and Bailers	N	
S-10	Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures, EPA/540/5-95/504. 1996	USEPA	Water Pumps, Water Quality Monitoring Instruments and Water Level Indicator	N	
S-11	Method 1669, Sampling Ambient Water for Trace Metals at EPA Water Quality Criteria Levels, Office of Water, Engineering and Analysis Division, Washington, D.C. 1996	USEPA		N	
S-12	Draft National Guidance for Permitting, Monitoring, and Enforcement of Water Quality Based Effluent Limitations Set Below Analytical Detection/Quantitation Levels,1994	USEPA		N	
S-13	Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual, EPA-823-B-01-002, Office of Water, Washington D.C., 2001	USEPA		N	

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection
(UFP-QAPP Manual Section 3.1.2.4)
(EPA 2106-G-05 Section 2.3.6)

Field Equipment	Activity	SOP Reference	Title or position of responsible person	Frequency	Acceptance Criteria	Corrective Action
Electric Water Level Indicator, Durham Geo Slope Indicator	Press test button	F-1, S-6	Lead field engineering technician	Daily before use	Response	Replace battery if no response during test button check. If battery does not correct problem,
pH meter 340i Bedienungsanleitung	Calibrate electrode with 2 standards (temperature equilibrated) 7.00-0.05 and 4.01	F-2, S-8	Lead field engineering technician	Daily before use with calibration check every 4 hours or whenever unstable readings occur Calibration check at end of day	Slope range - 50mV/pH to - 62mV/pH	If probe reading does not stabilize, replace with new probe and recalibrate. If new probe does not correct problem, replace meter with backup pH meter
Conductivity meter 340i Bedienungsanleitung	Calibrate electrode with 0.01 mol/L KCL solution	F-2, S-8	Lead field engineering technician	Daily before use Calibration check at end of day	No error reading by instrument	If probe reading does not stabilize, replace with new probe and recalibrate. If new probe does not correct problem, replace meter with backup pH meter
Oxygen meter CellOx 325 Bedienungsanleitung	Calibrate with Redox Buffer Solution and moist sponge inside D/O cover chamber	F-3, S-8	Lead field engineering technician	Daily before use. Calibration check at end of day	(+/-) 30 mV No error reading by instrument	If probe reading does not stabilize, replace with new probe and recalibrate. If new probe does not correct problem, replace meter with backup pH meter
Thermometer	Calibrate against certified thermometer	F-3, S-8	Lead field engineering technician	Before use	± 1.5 ºC of certified thermometer	Replace with new thermometer

Turbidity Meter	Cailibrate with 2 stds within expected range of sample turbidity (1-10 NTU)	F-4, S-8	Lead field engineering technician	Daily before use with calibration check every 4 hours or whenever unstable readings	± 1%	Replace with backup meter if meter does not calibrate properly
YSI 650 MDS multiparameter meter	Calibrate daily according to manufactures specifications and check daily after use.	F-5, S-16.	Lead Surface Water person	Calibrate daily before use and check daily after use	Manufacturers specifications	Replace probes or use backup meter.

QAPP Worksheet #23: Analytical SOP's
(UFP-QAPP Manual Section 3.2.1)
(EPA 2106-G-05 Section 2.3.4)

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP Option or Equipment Type	‡Modified for Project? Y/N
F-1	Water Level Indicator with Laser-Marked Cable (http://www.slopeindicator.com/pdf/manuals/water-level-indicator-laser-marked.pdf)	Definitive	water level	Geo Slope Indicator	N
F-2	Operation Manual, pH/Cond 340i, 06/2001	Definitive	pH	Bedienungsanleitung pH/Cond 340i	N
F-3	Operation Manual, pH/Oxi 340i, 06/2001	Definitive	Specific Conductance	Bedienungsanleitung pH/Oxi 340i	N
F-4	Instruction Manual, 2020 Turbidimeter	Definitive	Turbidity	Lamotte 2020 Turbidimeter	N
F-5	Instruction Manual , YSI 650 Multiparameter Meter	Definitive	Temperature, pH, Conductivity, Dissolved Oxygen, and Turbidity	YSI Instruction Manual	N
1.1	Sample Preparation Procedure for Spectrochemical Determination of Total Recoverable Elements (EPA 200.2)/DLS 322.3	Definitive	Ground Water; AIPH/LAD-Inorganic	Hotplate/Hotblock	N
1.2	Determination of Metals and Trace Elements by Inductively Coupled Plasma-Mass Spectrometry by 200.8/DLS308.4	Definitive	Ground Water; AIPH/LAD-Inorganic	Inductively Coupled Plasma/Mass Spectrometer	N
1.3	Preparation & Analysis Of Mercury In Water by Cold Vapor Atomic Absorption Spectrometry, EPA 245.1/DLS 305.3	Definitive	Ground Water; AIPH/LAD-Inorganic	Flow Injection Mercury System (FIMS)	N
2.1	Sample Prep of Sediments, Sludges, Soils and Fish Tissue for Analysis of Metals by ICP and ICP-MS (EPA 3050B)/1-P-QM-WI-9015160, Rev. 21	Definitive	Soil, Sediment; Eurofins Lancaster Laboratories	Hotblock	N
2.2	Metals by Inductively Coupled Plasma Mass Spectrometry for SW-846 Methods 6020/6020A (aqueous, solid, tissue), CLP 5.2 (aqueous, solid, tissue) and EPA 200.8 (aqueous)/1-P-QM-WI-9018443, Rev. 5	Definitive	Soil, Sediment; Eurofins Lancaster Laboratories	Inductively Coupled Plasma/Mass Spectrometer	N

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP Option or Equipment Type	‡Modified for Project? Y/N
2.3	Sample Preparation of Soil, Sediment, Sludge, Oils, and Fish Tissue for Total Mercury Analysis by Atomic Absorption Cold Vapor Technique (EPA 7471A)/1-P-QM-WI-9015161, Rev. 17	Definitive	Soil, Sediment; Eurofins Lancaster Laboratories	Hotblock	N
2.4	Mercury in Aqueous, Solid, and Tissue Samples by Cold Vapor AA (EPA 7471A)/1-P-QM-WI-9015067, Rev. 14	Definitive	Soil, Sediment; Eurofins Lancaster Laboratories	Hydra II Mercury Analyzer	N
3.1	Determination of Trace Elements by Inductively Coupled Plasma-Mass Spectrometry Using a Perkin-Elmer ELAN DRC II/BR-0060, Rev 003d	Definitive	Surface Water; Brooks-Rand Laboratory	Inductively Coupled Plasma/Mass Spectrometer	N
3.2	Determination of Hardness in Water by Calculation /BR-1502	Definitive	Surface Water; Brooks-Rand Laboratory	Calculation Only	N
3.3	Procedure for EPA Method 1631, Revision E: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry/BR-0006, Rev 004h	Definitive	Surface Water; Brooks-Rand Laboratory	Cold Vapor Atomic Fluorescence (CVAF)	N
4.1	Analysis of Water for Nitroaromatics and Nitramines by Electron Capture Gas Chromatography/DLS 102.2	Definitive	Ground Water, Surface Water; AIPH/LAD-Organic	Gas Chromatograph/ Electron Capture Detector	N
4.2	Analysis of Solids for Nitroaromatics and Nitramines by Electron Capture Gas Chromatography/DLS 120.1	Definitive	Soil (analysis only), Sediment; AIPH/LAD-Organic	Gas Chromatograph/ Electron Capture Detector	Y (soil samples will be pre-dried, sieved, ground)
5.1	Sample Preparation of Solid Samples for Extraction and Analysis by SW-846 8330B/1-P-QM-PRO-9030806, Rev. 1	Definitive	Soil; Eurofins Lancaster Laboratories	multiple sieves,	Y (processed soils will be sent to AIPH for analysis)
6.1	Separatory Funnel Liquid-Liquid Extraction of Semivolatiles in Water (BNA)/DLS 208.3	Definitive	Ground Water; AIPH/LAD-Organic	NA	N
6.2	Extraction of SVOCs in Soil and Sediments Using EPA 3545A/DLS 210.3	Definitive	Soil; AIPH/LAD-Organic	Accelerated Solvent Extractor	N
6.3	Analysis of SW 846 Samples by EPA 8270C/DLS 205.6	Definitive	Ground Water, Soil; AIPH/LAD-Organic	Gas Chromatograph/ Mass Spectrometer	N

SOP #	Title, Date, and URL (if available)	Definitive or Screening Data	Matrix/Analytical Group	SOP Option or Equipment Type	‡Modified for Project? Y/N
7.1	Perchlorate Analysis of Water, Soil, and Biota by LCMS/DLS 525.5	Definitive	Ground Water, Surface Water, Soil; AIPH/LAD-Inorganic	Liquid Chromatograph/ Mass Spectrometer	N
8.1	The Determination Of Nitrite-Nitrate as Nitrogen by Automated Colorimetry Using a Discreet Analyzer/DLS 550.0	Definitive	Ground Water, Surface Water; AIPH/LAD-Inorganic	Chinchilla Scientific Discreet Analyzer	N
9.1	Determination of TOC and TC in Solids and Sludges by Combustion/1-P-QM-WI-9013418, Rev. 15	Definitive	Soil, Sediment; Eurofins-Lancaster Laboratories	Solids Combustion Module	N
10.1	Particle Size Distribution of Soils and Solids/Grain Size Classifications by ASTM D422-63 (re-approved 2007)/1-P-QM-WI-9014165, Rev. 9	Definitive	Soil; Eurofins-Lancaster Laboratories	Hydrometer/shaker	N

‡ A brief summary of project-specific SOP modifications must be provided on this worksheet or referenced.

QAPP Worksheet #24: Analytical Instrument Calibration
(UFP-QAPP Manual Section 3.2.2)
(EPA 2106-G-05 Section 2.3.6)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Gas Chromatograph/ Mass Spectrometer (GC/MS); EPA 8270C for groundwater and soil	Reference SOP DLS 205.	10 – 160 ug/L (water) and 0.33-5.33 mg/Kg (soil)	See SOP DLS 205, Appendix C. Summary: Tuning and other pre-cal/pre-analysis: prior to calibration and/or sample analysis and at the start of each 12 hr window. Initial calibration (ICAL), using 6 standards: prior to sample analysis as required. Second source initial calibration verification (ICV); immediately after ICAL. Continuing calibration verification (CCV); prior to sample analysis if no ICAL required.	See SOP DLS 205, Appendix C. Partial Summary: Tuning/pre-cal: see DLS 205. ICAL: SPCCs minimum RRF of 0.05; CCCs %RSD of < 30%; %RSD of RRFs < 15% to use RRF for quantitation; if not, r2 must be > 0.99 for linear or quadratic. ICV: < 20% D CCV: < 20% D	See SOP DLS 205, Appendix C. Partial Summary: Tuning/pre-cal: see DLS 205. ICAL: see DLS 205. ICV: If immediate re-analysis does not meet criteria, repeat ICAL. CCV: If immediate re-analysis does not meet criteria, repeat ICAL. No flagging for any failed ICV or CCV without project approval.	Analyst, in consultation with supervisor as needed	Reference SOP DLS 205 (SOP 6.3 in WS 23)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Inductively Coupled Plasma/Mass Spectrometry (ICP/MS) by EPA 200.8 for groundwater (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Se, Ag)	Reference SOP DLS 308.	1-200 ug/L in terms of the final sample concentration.	See SOP DLS 308, Table 6. Summary: Pre-cal/tuning: prior to calibration. Initial calibration (ICAL) using the calibration blank and 5 standards: daily; prior to sample analysis. Second source initial calibration verification (ICV); immediately after ICAL. Initial calibration blank (ICB): immediately after ICV. Continuing calibration verification (CCV) and continuing calibration blank (CCB) every 10 samples and at the end of the run. LOQ standard: before samples are analyzed. Linear Dynamic Range standard: beginning or end of a run.	See SOP DLS 308, Table 6. Partial Summary: Pre-cal: See SOP 308 ICAL: Curve coefficient of correlation: >0.995. ICV: +/-10%. ICB: < LOQ. CCV: +/- 10%. CCB: < LOQ. LOQ check: +/- 30% LDR +/- 10% at 1 mg/L	See SOP DLS 308, Tbl 6. Summary: Pre-cal: Repeat pre-cal. If still fails, maintenance or service is required. ICAL: If anomaly cannot be identified (one bad standard that can be re-made and analyzed), repeat pre-cal routine and calibration. ICV and CCV: If immediate re-analysis does not meet criteria, repeat ICAL. Rerun affected samples since last acceptable CV. No flagging for failed CV without project approval. ICB and CCB: If immediate re-analysis does not meet criteria, repeat ICAL. No flagging for failed (bracketing) CB without project approval. LOQ standard: If immediate re-analysis does not meet criteria, raise LOQ as appropriate only if project criteria (project quantitation limit; see WS 15) is still met. Otherwise, re-calibrate. Linear Dynamic Range standard: If immediate re-analysis does not meet criteria, results cannot be reported above the highest ICAL standard. Dilute samples within calibration range.	Analyst, in consultation with supervisor as needed	Reference SOP DLS 308 (SOP 1.2 in WS 23)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Inductively Coupled Plasma/Mass Spectrometry (ICP/MS) by EPA 1638 mod for surface waters (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Se, Ag)	Reference SOP BR-0060.	All in ug/L (and in units at the instrument): Al: 1-10,000 As: 0.2-200 Sb: 0.02-20 Ba: 0.05-500 Cd: 0.01-20 Cr: 0.15-500 Cu: 0.1-200 Pb: 0.025-50 Se: 0.2-200 Ag: 0.02-40 Ca: 30-40,000 Mg: 3-40,000	**Tuning:** daily, prior to ICAL. **Calibration (ICAL):** daily, using at least 5 standards. **Internal Standards:** Each standard, blank, & sample is spiked with internal standard. **ICS-A & ICS-AB:** At the beginning of each run. **Independent calibration verification (ICV):** 1 following instrument calibration. **Continuing calibration verification (CCV):** at the beginning & end of the run, & 1 per 10 sample preparations. **Continuing calibration blank (CCB):** at the beginning & end of the run, & 1 per 10 sample preparations.	**Tuning:** Mass Cal ≤ 0.1 amu from true; resolution < 0.9 amu full width at 10% peak height; stability, RSD ≤ 5% for 4 replicates. **ICAL:** Correlation coefficient ≥ 0.995, 1st standard ≤ LOQ/MRL 70-125% recovery (other standards 80-120% recovery). **Internal Standards:** 30-120%; compared to calibration blanks. **ICS-A:** All non-spiked analytes < LOD. **ICS-AB:** Spiked analytes within ± 20% or ± LOQ/MRL if 5x MRL. **ICV:** 90-110% **CCV:** 90-110% **CCB:** < LOD	**Tuning:** Retune. Flagging of data is not acceptable. No analysis may be performed without a valid MS tune. **ICAL: R**eanalyze suspect calibration standard. If criteria still not met, then reprepare standard & recalibrate. **Internal Standards:** If the responses of the internal standards in the following CCB are within the limit, rerun the sample at an additional 2x dilution. If not, re-calibrate and re-analyze affected samples. **ICS-A & ICS-AB:** Halt analysis, identify & correct problem, recalibrate if necessary, & reanalyze affected samples. **ICV:** Correct problem prior to continuing analysis, recalibrate if necessary. **CCV:** Halt analysis, correct problem, recalibrate, & reanalyze affected samples. **CCB:** Determine & eliminate cause of contamination. Affected samples must be reanalyzed.	Analyst, in consultation with supervisor as needed	Reference SOP BR-0060 (SOP 3.1 in WS 23)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Inductively Coupled Plasma/Mass Spectrometer (ICP/MS); EPA 6020 for soils and sediments (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Se, Ag)	Reference 1-P-QM-WI-9018443	Al: 0-10,000 ug/l Sb, Cd, Pb, Se, Ag: 0-100 ug/l As, Ba, Cr, Cu: 0-1000 ug/l (provided in instrument units, not final solid concentration units).	All of the below as per DoD QSM, version 5 (July, 2013): Tuning. Initial calibration (ICAL) using the calibration blank and 1 standard. Second source initial calibration verification (ICV). Low-level ICV (LLC). Initial calibration blank (ICB). Continuing calibration verification (CCV). Continuing calibration blank (CCB). ICS-A. ICS-AB.	Tuning: see QSMv5. ICAL: $r^2 \geq 0.99$. ICV: +/- 10%. LLC: +/- 20%. ICB: $\leq$ 3X IDL. CCV: +/- 10%.. CCB: < +/- 3X IDL. ICS-A: < 2X LOQ. ICS-AB: +/- 20%.	All of the below as per DoD QSM, version 5 (July, 2013): Tuning: Re-tune; perform maintenance/service as needed. ICAL: Perform maintenance/service as needed, re-calibrate. ICV: correct problem; repeat ICAL. LLC: correct problem; perform maintenance if needed; repeat ICAL. ICB: correct problem and repeat ICAL CCB: correct problem and re-analyze all samples since last acceptable CCB. CCV: correct problem and re-analyze all samples since last acceptable CCV. ICS-A and ICS-AB: correct problem; re-analyze ICS-A and ICS-AB.	Analyst, in consultation with supervisor as needed	Reference SOP 1-P-QM-WI-9018443 (SOP 2.2 in WS 23)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Flow Injection Mercury System (FIMS) by EPA 245.1 for groundwater	Reference SOP DLS 305.	0.2-10 ug/L in terms of the final sample concentration.	See SOP DLS 305, Tables 1 and 2. Summary: Optimization w/ 10 ug/L std: prior to calibration. Initial calibration (ICAL) using the calibration blank and 5 standards: daily; prior to sample analysis. Second source initial calibration verification (ICV); immediately after ICAL. Initial calibration blank (ICB): immediately after ICV. Continuing calibration verification (CCV) and continuing calibration blank (CCB) every 10 samples and at the end of the run. LOQ standard: before samples are analyzed.	See SOP DLS 305, Tables 1 and 2. Partial Summary: Optimization: 0.09-0.1999 abs. ICAL: Curve coefficient of correlation: >0.999. ICV: +/-5%. ICB: < LOQ. CCV: +/- 10%. CCB: < LOQ. LOQ check: +/- 30%	See SOP DLS 305, Tables 1 and 2. Partial Summary: Optimization: correct problem and re-optimize. If still fails, maintenance or service is required. ICAL: If anomaly cannot be identified (one bad standard that can be re-made and analyzed), repeat optimization and/or re-prepare standards, then re-calibrate. ICV and CCV: If immediate re-analysis does not meet criteria, repeat ICAL. Rerun affected samples since last acceptable CV. No flagging for failed CV without project approval. ICB and CCB: If immediate re-analysis does not meet criteria, repeat ICAL. No flagging for failed (bracketing) CB without project approval. LOQ standard: If immediate re-analysis does not meet criteria, raise LOQ as appropriate only if project criteria (project quantitation limit; see WS 15) is still met. Otherwise, re-calibrate.	Analyst, in consultation with supervisor as needed	Reference SOP DLS 305 (SOP 1.3 in WS 23)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Oxidation/Purge and Trap/Cold Vapor Atomic Fluorescence Spectrometry; EPA 1631E for surface waters	Reference SOP BR-0006.	The standards typically used to calibrate the instrument are: 10 pg, 25 pg, 100 pg, 500 pg, 2500 pg, & 10000 pg (when converted to final sample concentrations, = 0.4 ng/L, 1 ng/L, 4 ng/L, 20 ng/L, 100 ng/L, 400 ng/L)	**Calibration Blanks (IBLs):** a set of 4 prior to analysis. **Initial calibration (ICAL):** Daily (first batch of the day) or when ICV/CCV fail. **Independent Calibration Verification (ICV):** After ICAL/prior to samples. **Continuing calibration verification (CCV):** at the beginning & end of the run, & 1 per 10 sample preparations. **Continuing calibration blank (CCB):** at the beginning & end of the run, & 1 per 10 sample preparations.	**Calibration Blanks:** ≤ 10 pg **ICAL/Calibration Standards:** RSD of response factors ≤ 15%; recovery of low standard = 75-125%; other standards 80-120% recovery. **ICV:** 85-115% **CCV:** 77-123% **CCB:** ≤ 10 pg or <1/10 the concentration of associated samples.	**Calibration Blanks:** clean & test split bottles/bubblers until criteria met; prior to any further analysis. **ICAL/Calibration Standards:** Reanalyze suspect calibration standard w/ different trap/bubbler. If criteria still not met, then remake standards, & recalibrate the instrument. **ICV:** Identify/correct problem prior to continuing analysis. Otherwise, recalibrate system. **CCV:** identify and resolve problem. Reanalyze samples bracketed by failing CCV. **CCB:** remake & condition the soda-lime trap. Clean & continue to test bubbler/trap combo until criteria met, prior to further use. Samples analyzed using same bubbler and/or trap following a result ≥ 20000 pg must be reanalyzed.	Analyst, in consultation with supervisor as needed	Reference SOP BR-0006 (SOP 3.3 in WS 23)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Flow Injection Mercury System (FIMS); EPA 7471A for soils and sediments	Reference SOP 1-P-QM-WI-9015067	0-0.005 mg/L (provided in instrument units, not final solid concentration units).	All of the below as per DoD QSM, version 5 (July, 2013): Initial calibration (ICAL) using the calibration blank and 5 standards. Second source initial calibration verification (ICV). Initial calibration blank (ICB). Continuing calibration blank (CCB). Continuing calibration verification (CCV).	All of the below as per DoD QSM, version 5 (July, 2013): ICAL: $r^2 \geq 0.99$. ICV: +/- 10%. ICB: < LOQ. CCB: < LOQ. CCV: +/- 10%.	All of the below as per DoD QSM, version 5 (July, 2013): ICAL: correct problem (maintenance, service, etc.), then repeat ICAL. ICV: correct problem and repeat ICAL. ICB: Correct problem and repeat ICAL. CCB: Correct problem and re-analyze all samples since the last acceptable CCB. CCV: Correct problem and re-analyze all samples since the last acceptable CCV.	Analyst, in consultation with supervisor as needed	Reference SOP 1-P-QM-WI-9015067 (SOP 2.4 in WS 23)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Gas Chromatography/ Electron Capture Detection (GC/ECD) by AIPH SOP DLS 102 (EPA 8095modified) for Explosives in Groundwater and Surface Water; and SOP DLS 120 (EPA 8095modified) for Explosives in Soils and Sediments	Reference SOP DLS 102 (water) and DLS 120 (soil/sediment)	Reference SOP DLS 102 (water) and DLS 120 (soil/sediment). (Calibration range varies by compound.)	See SOP DLS 102 (water), Appendix B; and DLS 120 (soil/sediment). Summary: Initial calibration (ICAL), using 6 standards (water)/7 standards (soil/sediment): prior to sample analysis, as required. Second source initial calibration verification (ICV): immediately after ICAL. Continuing calibration verification (CCV); prior to sample analysis if ICAL not required. Otherwise, after every 10 samples	See SOP DLS 102 (water), Appendix B; and DLS 120 (soil/sediment). Partial Summary: ICAL: $R^2 \geq 0.995$ for linear/quadratic. ICV (water): See LCS limits, WS 28. ICV (soil/sediment): +/- 20%. CCV: $\leq$ 20% D.	See SOP DLS 102 (water), Appendix B; and DLS 120 (soil/sediment). Partial Summary: ICAL: If anomaly cannot be identified (one bad standard that can be re-made and analyzed), perform maintenance/service and repeat ICAL. ICV: If immediate re-analysis does not meet criteria, repeat ICAL. CCV: If immediate re-analysis does not meet criteria, repeat ICAL. No flagging for any failed ICV or (bracketing) CCV without project approval.	Analyst, in consultation with supervisor as needed	Reference SOP DLS 102 for water (SOP 4.1 in WS 23) and DLS 120 for soil/sediment (SOP 4.2 in WS 23)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Liquid Chormatograph/ Mass Spectrometer (LC/MS); EPA 6850 for Groundwater, Surface Water, and Soil	Reference SOP DLS 525 and EPA 331.	Water: 1-20 ug/L in terms of the final sample concentration. Soil: 0.01-0.2 mg/kg in terms of the final sample concentration	See SOP DLS 525, Table in Section 9.3. Summary: Tuning: prior to calibration. Initial calibration (ICAL) daily using 5 standards. Second source initial calibration verification (ICV): immediately after ICAL. Continuing calibration verifications (CCVs): every 10 samples and end of run (alternating medium and high concentrations). LSSMB (from EPA 331): once in each run. LFSSM (from EPA 331): once in each run.	See SOP DLS 525, Table in Section 9.3. Partial Summary: Tuning: See SOP, Section 8.2.3. ICAL: Curve correlation coefficient of $\geq$0.995; cal standards within 80-120% of curve (50-150% for low standard). ICV: +/-15%. CCV: +/- 15%. LSSMB: < 1/3 LOQ. LFSSM: 80-120% recovery.	See SOP DLS 525, Table in Section 9.3. Partial Summary: Tuning: Perform AUTOTUNE. If still fails, maintenance or service is required. ICAL: Investigate and correct problem, repeat tune and ICAL. ICV and CCV: Repeat ICAL. Rerun affected samples since last acceptable CV. No flagging for failed CV without project approval. LSSMB: identify source of contamination; repeat ICAL and sample analysis. LFSSM: identify problem, maintain system, repeat ICAL and sample analysis.	Analyst, in consultation with supervisor as needed	Reference SOP DLS 525 (SOP 7.1 in WS 23)

Instrument	Calibration Procedure	Calibration Range	Frequency	Acceptance Criteria	Corrective Action (CA)	Title/position responsible for Corrective Action	SOP Reference
Discreet Analyzer by AIPH SOP DLS 550 (EPA 353.2mod) for Total Nitrate/Nitrite in Groundwater and Surface Water	Reference SOP DLS 550 (Section 8.4 and Table 1)	Reference SOP DLS 550. Calibration blank and 6 additional standards, from 0.1 mg/L to 12.5 mg/L.	See SOP DLS 550 (incl. Table 2). Summary: Initial calibration (ICAL): daily, prior to sample analysis. Second source initial calibration verification (ICV): after ICAL and before samples. Instrument performance check (IPC): after ICAL/before samples. Continuing calibration verification (CCV): after every 10 samples and at end of run. Continuing calibration blank (CCB) (=laboratory reagent blank): every 10 samples and at end of run.	See SOP DLS 550, Table 3. Partial Summary: ICAL: $R^2 \geq 0.995$; standards must be within 10% of the curve (25% for low standard). ICV: +/- 10%. IPC: +/ 10%. CCV: +/- 10%. CCB: $\leq$ LOQ	See SOP DLS 550, Table 3. Partial Summary: ICAL: examine data to potentially identify one bad standard; if so, re-analyze. Otherwise, correct problem and repeat ICAL. ICV: If immediate re-analysis does not meet criteria, repeat ICAL. IPC: If immediate re-analysis does not meet criteria, repeat ICAL CCV and CCB: If immediate re-analysis does not meet criteria, repeat ICAL. No flagging for any failed ICV or (bracketing) CCV without project approval.	Analyst, in consultation with supervisor as needed	Reference SOP DLS 550 (SOP 8.1 in WS 23)
Solids Combustion Module; EPA 9060A for Total Organic Carbon (TOC) in Soils and Sediments	Reference SOP 1-P-QM-WI-9013418.	0-6 mg C (provided in instrument units, not final solid concentration units).	Calibration (ICAL): Every 30 days ICV: After ICAL and before samples. CCV: Every 10 samples and at end of run. ICB: After ICAL and before samples. CCB: Every 10 samples and at end of run.	ICAL: R = 0.995 or greater. ICV: +/- 10%. CCV: +/- 10%. ICB: < LOQ. CCB: < LOQ.	ICAL: If this criteria not met, the instrument must be recalibrated. ICV: correct problem and repeat ICAL. CCV: Correct problem and re-analyze all samples since the last acceptable CCV. ICB: Correct problem and repeat ICAL. CCB: Correct problem and re-analyze all samples since the last acceptable CCB.	Analyst, in consultation with supervisor as needed	Reference SOP 1-P-QM-WI-9013418 (SOP 9.1 in WS 23)

WS 24 does not apply to particle size/distribution, so a table was not created for this method (ASTM D422).

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection (UFP-QAPP Manual Section 3.2.3) (EPA 2106-G-05 Section 2.3.6)

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title/position responsible for corrective action	Reference
Gas Chromatograph/ Mass Spectrometer (GC/MS); EPA 8270C for determination of SVOCs in groundwater and soil.	See SOP DLS 205. Cut a section of guard column, clean injection port, replace inlet liner and O-ring, septa, and seal. As/if needed, remove and sonicate injection syringe.	AIPH LAD-Organic	Column 2 maintenance items are performed when DFTPP tune criterion is not met. DFTPP tune is performed prior to sample analysis, and every 12 hours.	DFTPP tune is performed daily and every 12 run hours. Maintenance is most likely performed following the analysis of dirty samples. Also, otherwise, as needed.	See DLS 205, section 8.3.4.3. PCP tailing must be < 5 and benzidine tailing must be < 3. DDT peak area breakdown must not exceed 20%.	Replace column and re-calibrate if column 2 maintenance procedures do not correct DFTPP failure. If acceptance criteria is still not met, more in-depth service may be required (in-house or manufacturer).	Analyst, in consultation with supervisor as needed	Reference SOP DLS 205 (SOP 6.3 in WS 23)

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title/position responsible for corrective action	Reference
Inductively Coupled Plasma/Mass Spectrometer (ICP/MS) for groundwater analysis	Replace pump tubing, filters, and O-Rings as needed. As needed, clean or replace torches, spray chambers, injectors, purge windows and lenses, igniters and load coils.	AIPH LAD-Inorganic	The ICP/MS operator daily checks and records the argon supply pressure, the operating vacuum, the temperature of the cooling chiller, and the nebulizer flow-rate. Gas supplies are monitored. Pump tubing, filters, and O-Rings are examined. Torches, spray chambers, injectors, purge windows and lenses, igniters, and load coils are examined.	Daily, prior to ICAL, and otherwise as needed.	See pre-cal and ICAL criteria in WS 24 for metals in groundwater by ICP-MS.	Corrective action may include changing the auto sampler pump tubing, cleaning or changing cones, and/or adjusting the nebulizer flow. See maintenance activity column for more information. If problem is not resolved, vendor provided service may be required.	Analyst, in consultation with supervisor as needed	Reference SOP DLS 308 (SOP 1.2 in WS 23)

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title/position responsible for corrective action	Reference
Inductively Coupled Plasma/Mass Spectrometer (ICP/MS) in Surface water by EPA 1638mod.	Monitor Gas supplies, examine and replace pump tubing, filters, and O-Rings as needed. Monitor and clean or replace torches, spray chambers, injectors, purge windows and lenses, and igniters and load coils.	Brooks-Rand Labs	The ICP/MS operator daily checks and records the argon supply pressure, the operating vacuum, the tubing, the peristaltic pump, the temperature of the cooling chiller, and the nebulizer flow-rate. The oil level of the vacuum pump is checked.	Daily, prior to ICAL, and otherwise as needed.	See tuning and ICAL criteria in WS 24 for metals in surface water by ICP-MS.	Corrective action may include changing the auto sampler pump tubing, cleaning or changing cones, and adjusting the nebulizer flow. If problem is not resolved, perform a full optimization. Contacting the service vendor may be required.	Analyst, in consultation with supervisor as needed	Reference SOP BR-1205-006 (Lab Preventive Maintenance SOP (not listed in WS 23))
Inductively Coupled Plasma/Mass Spectrometer (ICP/MS) for Metals in Soils and Sediments by EPA 6020.	Monitor Gas supplies, examine and replace pump tubing, filters, and O-Rings as needed. Monitor and clean or replace torches, spray chambers, injectors, lenses, and igniters and load coils.	Eurofins Lancaster Laboratories Environmental	The ICP/MS operator daily checks the argon supply pressure, the operating vacuum, the the temperature of the cooling chiller, and the nebulizer flow-rate.	Daily, prior to ICAL, and otherwise as needed.	See tuning and ICAL criteria in WS 24 for metals in soil and sediment by ICP-MS.	Corrective action may include changing the auto sampler pump tubing, cleaning or changing cones, adjusting the nebulizer flow. If problem is not resolved vendor provided service may be required.	Analyst, in consultation with supervisor as needed	Reference SOP 1-P-QM-WI-9018443 (SOP 2.2 in WS 23)

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title/position responsible for corrective action	Reference
Flow Injection Mercury System (FIMS) by EPA 245.1 for groundwater	Change filter daily. Change tubing as needed.	AIPH LAD-Inorganic	Inspect tubing and filter.	Daily, prior to ICAL, and otherwise as needed.	See optimization and ICAL criteria in WS 24 for mercury in groundwater by FIMS.	Change tubing. Call for service may be needed if problem is not resolved.	Analyst, in consultation with supervisor as needed	Reference SOP DLS 305 (SOP 1.3 in WS 23)
Purge and Trap/Cold Vapor Atomic Fluorescence Spectrometer; EPA 1631E for surface water	Change filter and tubing as needed. Ensure system meets criteria.	Brooks-Rand Labs	Inspect all fittings to make sure they are secure and not leaking. Prepare new soda lime traps. Blank each analytical trap.	Perform as frequently as necessary to meet ICAL criteria.	See ICAL criteria in WS 24 for mercury in surface water by CVAF.	Change tubing. Replace/retire analytical traps. Re-clean purge vessels. Inspect calibration standards. If need be, contact service vendor.	Analyst, in consultation with supervisor as needed	Reference SOP BR-1205-006 (Lab Preventive Maintenance SOP (not listed in WS 23))
Flow Injection Mercury System (FIMS) by EPA 7471A for soil and sediment	Change tubing as needed.	Eurofins Lancaster Laboratories Environmental	Inspect tubing	Daily, prior to ICAL, and otherwise as needed.	See ICAL criteria in WS 24 for mercury in soil and sediment by FIMS.	Change tubing.	Analyst, in consultation with supervisor as needed	Reference SOP 1-P-QM-WI-9015067 (SOP 2.4 in WS 23)

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title/position responsible for corrective action	Reference
Gas Chromatography/Electron Capture Detection (GC/ECD) by AIPH SOP DLS 102 (EPA 8095modified) for Explosives in Groundwater and Surface Water; and SOP DLS 120 (EPA 8095modified) for Explosives in Soils and Sediments	Clip a section of guard column. Replace column if needed. Clean or replace injector liner. Replace seal and/or septum.	AIPH LAD-Organic	Examine chromatography: tailing, broadening, etc. of peaks; appearance of artifact peaks; a decrease in response or an inconsistent response	Inspect daily. Maintenance when ICAL fails and no anomaly is identified. Possibly following the analysis of dirty samples. Otherwise, as needed.	See calibration criteria in WS 24 for explosives in water and soil/sediment.	The corrective action is often performing the maintenance procedures themselves. If acceptance criteria is not met after maintenance, more in-depth service may be required (in-house or manufacturer).	Analyst, in consultation with supervisor as needed	Reference SOP DLS 102 for water (SOP 4.1 in WS 23) and DLS 120 for soil/sediment (SOP 4.2 in WS 23)
Liquid Chromatograph/ Mass Spectrometer (LC/MS); EPA 6850 for Groundwater, Surface Water, and Soil	Check tubing, column, and autosampler to find clog/source of pressure fluctuation. Replace consumables as needed. Replace column if instrument performance dictates.	AIPH LAD-Inorganic	Check LC pump pressure daily at instrument setup. Pressure should be approximately 20 psi. If high, a clog is suspected.	Daily, before tune, and otherwise as needed.	Pump pressure approximately 20 psi. Also, see tuning and ICAL criteria in WS 24 for perchlorate by LC-MS.	See maintenance activities in this table. Perform AUTOTUNE as needed. If acceptance criteria still not met, vendor service may be required.	Analyst, in consultation with supervisor as needed	Reference SOP DLS 525.5 (SOP 7.1 in WS 23)

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Title/position responsible for corrective action	Reference
Discreet Analyzer by AIPH SOP DLS 550 (EPA 353.2mod) for Total Nitrate/Nitrite in Groundwater and Surface Water	Replace pump tubing as needed.	AIPH LAD-Inorganic	See SOP DLS 550. Perform system equilibration/ function checks daily. Ensure lamp is on.	Inspect daily.	See SOP DLS 550; Section 8.3.	Make adjustments in order to pass functions checks as per SOP DLS 550. Replace lamp.	Analyst, in consultation with supervisor as needed	Reference SOP DLS 550 (SOP 8.1 in WS 23)
Solids Combustion Module; EPA 9060A for Total Organic Carbon (TOC) in Soil and Sediment	Visually inspect: Combustion tube, halide scrubber, permeation tube,particulate filter, quartz stem,tubing, quartz sample cups, loader o-rings.	Eurofins Lancaster Laboratories Environmental	Visually inspect items (see maintenance activities).	As needed.	Compliant ICAL post-maintenance	Replace appropriate item(s) as needed.	Analyst, in consultation with supervisor as needed	Reference SOP 1-P-QM-WI-9013418 (SOP 9.1 in WS 23)

WS 25 does not apply to particle size/distribution, so a table was not created for this method (ASTM D422).

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal
(UFP-QAPP Manual Section 3.3)
(EPA 2106-G-05 Section 2.3.3)

Sampling Organization: USAIPH

Laboratory: USAIPH

Method of sample delivery (shipper/carrier): FEDEX

Number of days from reporting until sample disposal:

Activity	Organization and title or position of person responsible for the activity	SOP reference
Sample labeling	USAIPH Field Team Leader	Not Applicable
Chain-of-custody form completion	USAIPH Field Team Leader	Not Applicable
Packaging	USAIPH Field Team Leader	Not Applicable
Shipping coordination	USAIPH Field Team Leader	Not Applicable
Sample receipt, inspection, & log-in	USAIPH LS	To be competed at a later date
Sample custody and storage	USAIPH LS	To be competed at a later date
Sample disposal	USAIPH LS	To be competed at a later date

QAPP Worksheet #28: Analytical Quality Control and Corrective Action
(UFP-QAPP Manual Section 3.4 and Tables 4, 5, and 6)
(EPA 2106-G-05 Section 2.3.5)

Matrix: Groundwater
Analytical Group: Semivolatile Organic Compounds
Analytical Method/SOP: EPA 8270C/DLS 205

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Method blank	1 per batch or 20 samples	Less than ½ the quantitation limit	Qualify if analyte is not detected in samples. If detected, identify source of contamination before further analysis and qualify only if necessary.	Analyst	Less than ½ the quantitation limit
Surrogates	Add surrogates to all samples.	2-Fluorophenol 49-110%; Phenol-d5 20-61%; Nitrobenzene-d5 82-110% 2-Fluorobiphenyl 80-110%; 2,4,6-Tribromophenol 73-120%; Terphenyl-d14 74-123%	Depending on the degree of failure, samples may be re-prepared/re-analyzed, or data qualified (hold times must also be considered). Contact client for discussion.	Analyst	2-Fluorophenol 49-110%; Phenol-d5 20-61%; Nitrobenzene-d5 82-110% 2-Fluorobiphenyl 80-110%; 2,4,6-Tribromophenol 73-120%; Terphenyl-d14 74-123%
Laboratory Control Sample (LCS)	1 per batch or 20 samples	See attached table below for analyte specific criteria	If LCS is outside control limits, Contact client. Depending on degree of failure (and hold time status), re-prepare/re-analyze affected batch of samples. Qualify only if necessary.	Analyst	See attached table below for analyte specific criteria.
Laboratory Control Sample Duplicate (LCSD)	1 per batch or 20 samples	Recovery: see attached table below for analyte specific criteria. RPD $\leq$ 30%	Recovery: see LCS corrective action. RPD: if LCS/LCSD recoveries are acceptable, discuss with client for possible re-analysis or data qualification.	Analyst	Recovery: see attached table below for analyte specific criteria. RPD $\leq$ 30%.
Matrix Spike (MS)	1 per batch or 20 samples	Same as LCS criteria; see attached table below for analyte specific criteria	If the recovery falls outside the designated range and the LCS for that analyte is in control, matrix related problems will be noted and the data will be qualified.	Analyst	Same as LCS criteria; see attached table below for analyte specific criteria

Matrix Spike Duplicate (MSD)	1 per batch or 20 samples	Recovery: see attached table below for analyte specific criteria. RPD $\leq$ 30%	Recovery: see MS corrective action. RPD: if LCS/LCSD recoveries/RPD are acceptable, alert client and qualify data as appropriate.	Analyst	Recovery: see attached table below for analyte specific criteria. RPD $\leq$ 30%

Project (Army IPH) Laboratory Control Sample (LCS) and Matrix Spike (MS) Acceptance Criteria (Limits) for EPA 8270C for groundwater.

Compound Name	Lower Limit	Upper Limit
1,2,4-Trichlorobenzene	**63.5**	**110**
1,2-Dichlorobenzene	**59.1**	**110**
1,3-Dichlorobenzene	**55.5**	**110**
1,4-Dichlorobenzene	**55.7**	**110**
2,2’-oxybis(1-chloropropane)	**71**	**134**
2,4,5-Trichlorophenol	**74.9**	**110**
2,4,6-Trichlorophenol	**80.4**	**110**
2,4-Dichlorophenol	**79.9**	**110**
2,4-Dimethylphenol	**47.9**	**124**
2,4-Dinitrophenol	**55**	**131**
2,4-Dinitrotoluene	**83.5**	**110**
2,6-Dinitrotoluene	**84.5**	**110**
2-Chloronaphthalene	**75.4**	**110**
2-Chlorophenol	**79.1**	**110**
2-Methylnaphthalene	**70.6**	**110**
2-Methylphenol	**70.4**	**110**
2-Nitroaniline	**69.6**	**121**
2-Nitrophenol	**49.9**	**130**
3- + 4-Methylphenol	**56.5**	**110**
3-Nitroaniline	**62.2**	**129**

4,6-Dinitro-2-methylphenol	**61.8**	**124**
4-Bromophenyl-phenylether	**77.9**	**112**
4-Chloro-3-methylphenol	**79.1**	**110**
4-Chloroaniline	**33.9**	**141**
4-Chlorophenyl-phenylether	**75.3**	**119**
4-Nitroaniline	**31.5**	**123**
4-Nitrophenol	**17.9**	**110**
Acenaphthene	**76.7**	**114**
Acenaphthylene	**73.7**	**113**
Anthracene	**75.1**	**121**
Benzo[a]anthracene	**86.9**	**115**
Benzo[a]pyrene	**71**	**128**
Benzo[b]fluoranthene	**73.3**	**131**
Benzo[g,h,i]perylene	**52.5**	**138**
Benzo[k]fluoranthene	**72.1**	**123**
Benzyl alcohol	**73.3**	**110**
bis(2-Chloroethoxy)methane	**76.4**	**113**
bis(2-Chloroethyl)ether	**79.3**	**111**
Butylbenzylphthalate	**69.3**	**128**
Chrysene	**74.7**	**113**
Di(2-Ethylhexyl)phthalate	**76.6**	**133**
Dibenz[a,h]anthracene	**5**	**151**
Dibenzofuran	**76.9**	**110**
Diethylphthalate	**78.6**	**116**
Dimethylphthalate	**83.3**	**114**
Di-n-butylphthalate	**46.3**	**143**
Di-n-octylphthalate	**55.6**	**148**
Fluoranthene	**74.8**	**124**

Fluorene	**78.7**	**110**
Hexachlorobenzene	**73.5**	**110**
Hexachlorobutadiene	**55.3**	**110**
Hexachlorocyclopentadiene	**47.7**	**114**
Hexachloroethane	**53.7**	**110**
Indeno[1,2,3-cd]pyrene	**55.5**	**134**
Isophorone	**75**	**110**
Naphthalene	**70.1**	**110**
Nitrobenzene	**75.4**	**110**
N-Nitrosodimethylamine	**51.5**	**110**
N-Nitroso-di-n-propylamine	**83.9**	**115**
n-Nitrosodiphenylamine	**72.7**	**137**
Pentachlorophenol	**70.2**	**126**
Phenanthrene	**73.9**	**117**
Phenol	**20.5**	**65**
Pyrene	**74.6**	**128**

Matrix: Groundwater and Surface Water
Analytical Group: Explosives and Degradates
Analytical Method/SOP: EPA 8095M/DLS 102

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Method blank	1 per batch or 20 Samples	Less than ½ the quantitation limit (or < 10% of any sample concentration)	Note failure/report if analyte detected in blank is not detected in samples. If detected in samples, identify source of contamination before further analysis and qualify only if necessary, informing client prior to reporting.	Analyst	Less than ½ the quantitation limit (or < 10% of any sample concentration)
Surrogates	3,4-Dinitrotoluene; added to all samples	79-121%	Re-extraction/re-analysis. Contact client if hold times have elapsed prior to second extraction.	Analyst	79-121%
Laboratory Control Sample (LCS)	1 per batch or 20 samples	See attached table	If LCS is outside control limits, contact client. Depending on degree and type of failure (and hold time status), re-prepare/re-analyze affected batch of samples. Qualify only if necessary.	Analyst	See attached table
Laboratory Control Sample Duplicate (LCSD)	1 per batch or 20 samples	See attached table for recovery criteria. ≤ 30 % RPD	For recovery failure, see LCS corrective action. For RPD failure, discuss with client for possible re-analysis or data qualification.	Analyst	See attached table for recovery criteria. ≤ 30 % RPD
Matrix Spike (MS)	1 per batch or 20 samples	Same criteria as LCS; see attached table.	If the recovery falls outside the acceptance range and the LCS for that analyte is in control, matrix related problems will be noted and the data will be qualified.	Analyst	Same criteria as LCS; see attached table.
Matrix Spike Duplicate (MSD)	1 per batch or 20 samples	≤ 30 % RPD	If Dup is outside RPD limits and the LCS is in control, discuss with client for possible re-analysis or data qualification.	Analyst	≤ 30 % RPD

Project (Army IPH) Laboratory Control Sample (LCS) and Matrix Spike (MS) Acceptance Criteria (Limits) for Explosives Analysis by DLS 102.1 (EPA 8095M) for Groundwater and Surface Water

PARAMETER	ACCURACY (%R) (LCS)
1,3,5-Trinitrobenzene	80-110
1,3-Dinitrobenzene	89-110
2,4,6-Trinitrotoluene	76-111
2,4-Dinitrotoluene	89-110
2,6-Dinitrotoluene	81-111
2-Amino-4,6-dinitrotoluene	75-111
2-Nitrotoluene	87-110
3-Nitrotoluene	85-110
4-Amino-2,6-dinitrotoluene	82-116
4-Nitrotoluene	86-110
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	90-120
Nitrobenzene	90-111
Nitroglycerin	71-134
N-Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	32-121
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	81-119
PETN	90-117

Matrix: Groundwater and Surface Water
Analytical Group: Perchlorate
Analytical Method/SOP: EPA 6850/DLS 525.5

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Laboratory Reagent blank	1 per batch of 20, using reagent water	Less than 1/3 the quantitation limit	Note blank contamination in report if analyte is not detected in samples. Otherwise, identify source of contamination, then reanalyze affected batch of samples.	Analyst	Less than the 1/3 the quantitation limit
Laboratory Control Sample (LCS) (= Laboratory Fortified Blank (LFB))	1 per batch or 20 samples	86 – 108 % recovery	If LCS is outside control limits, re-prepare/re-analyze affected batch of samples. Qualify data only if this cannot be done or if approved by client.	Analyst	86 – 108 % recovery
Laboratory Control Sample Duplicate (LCSD) (= Laboratory Fortified Blank Duplicate (LFBD))	1 per batch or 20 samples	86 – 108 % recovery; ≤ 20% RPD	If LCSD is outside recovery limits, see LCS corrective action. If RPD fails, contact client for decision on re-extraction/analysis or data qualification.	Analyst	86 – 108 % recovery; ≤ 20% RPD
Matrix Spike (MS)	1 per batch or 20 samples	80 – 120 % recovery	If the LCS is within criteria, matrix related problems will be noted and the data will be qualified.	Analyst	80 – 120 % recovery
Matrix Spike Duplicate (MSD)	1 per batch or 20 samples	80 – 120 % recovery; ≤ 20% RPD	For recovery failure, see MS corrective action. If RPD failure, contact client for decision on re-extraction/analysis or data qualification.	Analyst	80 – 120 % recovery; ≤ 20% RPD
Isotopic Ratio, mass 83/85	Monitor for all field and QC samples	Ratio = 2.31-3.85	Identify/resolve problem; reanalyze affected samples.	Analyst	Ratio = 2.31-3.85
Relative retention time (RRT)	Monitor for all field and QC samples	RRT = 0.98-1.02 compared to ICAL standards.	Identify/resolve problem; reanalyze affected samples.	Analyst	RRT = 0.98-1.02 compared to ICAL standards.

Matrix: Groundwater
Analytical Group: Metals (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Se, Ag and Hg).
Analytical Method/SOP: EPA 200.8/SOP DLS 308 and EPA 245.1/SOP DLS 305.

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Laboratory Reagent Blank	1 per batch or 20 samples	Less than the quantitation limit (or < 10 % of the analyte level in the field sample)	Qualify if analyte is not detected in samples. If detected in any sample, identify source of contamination before further analysis and qualify only if necessary.	Analyst	Less than the quantitation limit (or < 10 % of the analyte level in the field sample)
Laboratory Control Sample (LCS)	1 per batch or 20 samples	See attached table for metals specific limits	If LCS is outside control limits, contact client. Depending on degree of failure, re-prepare/re-analyze affected batch of samples. Qualify only if necessary.	Analyst	See attached table for metals specific limits
Laboratory Control Sample Duplicate (LCSD)	1 per batch or 20 samples	See attached table for metals specific limits (recovery); $\leq$ 20% RPD (all metals)	If either are outside control limits, contact client. Depending on degree of failure, re-prepare/re-analyze affected batch of samples. Qualify only if necessary.	Analyst	See attached table for metals specific limits (recovery); $\leq$ 20% RPD (all metals)
Matrix Spike (MS)	1 per batch or 20 samples	70-130% recovery (all metals)	If the recovery falls outside the acceptance range and the LCS for that analyte is in control, matrix related problems will be [illegible]	Analyst	70-130% recovery (all metals)
Matrix Spike Duplicate (MSD)	1 per batch or 20 samples	70-130% recovery (all metals); $\leq$ 20 % RPD (all metals)	If recovery falls outside the acceptance criteria, see MS corrective action. If duplicate is outside RPD limits and the LCS is in control, discuss with client for possible re-analysis or data qualification.	Analyst	70-130% recovery (all metals); $\leq$ 20 % RPD (all metals)
Instrument Spike/Post Digestion Spike (PDS)	1 per batch or 10 samples (all metals)	70-130% recovery	If the recovery falls outside the designated range and the LCS for that analyte is in control, matrix related problems will be noted and the data will be qualified.	Analyst	70-130% recovery
Dilution Test	1 per prep batch or 10 samples, if a sample is > 50x LOQ (both ICP-MS and FIMS)	At a 5-fold dilution (or other dilution), within 10% of original measurement.	None. To confirm matrix effect and proper flagging.	Analyst	At a 5-fold dilution (or other dilution), within 10% of original measurement.

Matrix: Surface Water
Analytical Group: Metals (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Se, Ag).
Analytical Method/SOP: EPA 1638mod/SOP BR-0060.

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Method Blank	3 per prep batch or 20 samples	Less than ½ the LOQ (or ≤ 1/10 the amount in any sample or ≤ 1/10 the project quantitation limit).	Determine and eliminate cause of contamination. Affected samples must be reanalyzed.	Analyst	Less than ½ the LOQ (or ≤ 1/10 the amount in any sample or ≤ 1/10 the project quantitation limit).
Method Duplicate (MD)	1 per prep batch or 10 samples	RPD ≤ 20% or results within the LOQ of each other if <5x LOQ	Contact client for discussion. Options are data qualification in report, reanalysis, and/or a post-digestion duplicate to evaluate instrument precision.	Analyst	RPD < 20% or results within the LOQ of each other if <5x LOQ
Laboratory Control Sample (LCS) / Blank Spike (BS)	1 per prep batch containing all analytes to be reported	85-115% (all metals)	Identify/correct problem; then reanalyze affected batch (at least for failed metals). Flag data only if samples cannot be re-analyzed. Contact client before flagging for failed LCS.	Analyst	85-115% (all metals)
Dilution Test	1 per prep batch or 10 samples, if a sample is > 50x LOQ (MRL)	At a 5-fold dilution, within ± 10% of original measurement.	Perform post-digestion spike addition	Analyst	At a 5-fold dilution, within ± 10% of original measurement.
Standard Reference Material (SRM)	1 per prep batch	75-125% or SRM-specific limits	If SRM is ≥ 5X LOQ and if the recovery is outside of the control limits, then the batch must be reanalyzed	Analyst	75-125% or SRM-specific limits
Instrument Spike/Post Digestion Spike (PDS)	One per prep batch, if dilution test fails or if all sample results <100x MDL.	75-125%	Apply J qualifier to all samples with same matrix for the specific analytes associated with the post-digestion spike failure.	Analyst	75-125%

Instrument Spike/Post Digestion Spike Duplicate (PDSD)	One per prep batch, if dilution test fails or if all sample results <100x MDL.	75-125% +/- 20% RPD	Apply J qualifier to all samples with same matrix for the specific analytes associated with the post-digestion spike or RPD failure.	Analyst	75-125% +/- 20% RPD

Matrix: Surface Water
Analytical Group: Mercury (Hg).
Analytical Method/SOP: EPA 1631E/SOP BR-0006

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Method Blank	3 per prep batch or 20 samples	≤ 0.5 ng/L and SD < 0.1 ng/L (or highest MB ≤ 0.1x lowest sample result)	Determine and eliminate cause of contamination. Contact client to determine if affected samples must be reanalyzed.	Analyst	≤ 0.5 ng/L and SD < 0.1 ng/L (or highest MB ≤ 0.1x lowest sample result)
Method Duplicate	1 per prep batch or 10 samples	RPD ≤ 24% or for results <5x the LOQ/MRL, then ± 1X the LOQ/MRL of one another	Contact client for discussion. Options are data qualification in report or reanalysis.	Analyst	RPD ≤ 24% or for results <5x the LOQ/MRL, then ± 1X the LOQ/MRL of one another
Instrument Spike/Post Digestion Spike (PDS)	1 per prep batch or 10 samples	Recovery 71-125%; RPD ≤ 24%	If recoveries are similar but fail recovery criteria, a matrix interference is present in the sample and the result must be qualified. If RPD criteria not met, qualify data in the report narrative.	Analyst	Recovery 71-125%; RPD ≤ 24%
Instrument Spike/Post Digestion Spike Duplicate (PDSD)	1 per prep batch or 10 samples			Analyst	

Matrix: Groundwater and Surface Water

Analytical Group: Nitrate+Nitrite (Total)

Analytical Method/SOP: EPA 353.2mod/DLS 550

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Laboratory Reagent Blank (LRB)	1 per batch or 20 Samples	Less than ½ the quantitation limit.	Immediately re-analyze the LRB. If it still fails, correct problem and contact client for likely re-analysis. In certain situations (sample concentrations >10X blank), re-analysis may not be necessary (in that case, only note blank failure in the report).	Analyst	Less than ½ the quantitation limit.
Laboratory Control Sample, LCS (= Laboratory Fortified Blank, LFB)	1 per batch or 20 samples	80-120% recovery	If LCS is outside control limits, contact client. Depending on degree and type of failure, re-prepare/re-analyze affected batch of samples. Qualify only if necessary.	Analyst	80-120% recovery
Laboratory Control Sample Duplicate, LCSD (= Laboratory Fortified Blank Duplicate, LFBD)	1 per batch or 20 samples	80-120% recovery $\leq$ 20 % RPD	For recovery failure, see LCS corrective action. For RPD failure, discuss with client for possible re-analysis or data qualification.	Analyst	80-120% recovery $\leq$ 20 % RPD
Matrix Spike (MS)	1 per batch or 10 samples	80-120% recovery	If the recovery falls outside the acceptance range and the LCS for that analyte is in control, matrix related problems will be noted and the data will be qualified.	Analyst	80-120% recovery

Matrix: Soil
Analytical Group: SVOCs
Analytical Method/SOP: EPA 8270C/DLS 205

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Method blank	1 per batch or 20 samples	Less than ½ the quantitation limit	Qualify if analyte is not detected in samples. If detected, identify source of contamination before further analysis and qualify only if necessary.	Analyst	Less than ½ the quantitation limit
Surrogates	Add surrogates to all samples.	2-Fluorophenol 51-118%; Phenol-d5 63-110%; Nitrobenzene-d5 50-110% 2-Fluorobiphenyl 65-110%; 2,4,6-Tribromophenol 63-110%; Terphenyl-d14 61-110%	Depending on the degree of failure, samples may be re-prepared/re-analyzed, or data qualified (hold times must also be considered). Contact client for discussion.	Analyst	2-Fluorophenol 51-118%; Phenol-d5 63-110%; Nitrobenzene-d5 50-110% 2-Fluorobiphenyl 65-110%; 2,4,6-Tribromophenol 63-110%; Terphenyl-d14 61-110%
Laboratory Control Sample (LCS)	1 per batch or 20 samples	See attached table below for analyte specific criteria	If LCS is outside control limits, Contact client. Depending on degree of failure (and hold time status), re-prepare/re-analyze affected batch of samples. Qualify only if necessary.	Analyst	See attached table below for analyte specific criteria.
Laboratory Control Sample Duplicate (LCSD)	1 per batch or 20 samples	Recovery: see attached table below for analyte specific criteria. RPD $\leq$ 40%	Recovery: see LCS corrective action. RPD: if LCS/LCSD recoveries are acceptable, discuss with client for possible re-analysis or data qualification.	Analyst	Recovery: see attached table below for analyte specific criteria. RPD $\leq$ 40%.
Matrix Spike (MS)	1 per batch or 20 samples	Same as LCS criteria; see attached table below for analyte specific criteria	If the recovery falls outside the designated range and the LCS for that analyte is in control, matrix related problems will be noted and the data will be qualified.	Analyst	Same as LCS criteria; see attached table below for analyte specific criteria
Matrix Spike Duplicate (MSD)	1 per batch or 20 samples	Recovery: see attached table below for analyte specific criteria. RPD $\leq$ 40%	Recovery: see MS corrective action. RPD: if LCS/LCSD recoveries/RPD are acceptable, alert client and qualify data as appropriate.	Analyst	Recovery: see attached table below for analyte specific criteria. RPD $\leq$ 40%

Project (Army IPH) Laboratory Control Sample (LCS) and Matrix Spike (MS) Acceptance Criteria (Limits) for EPA 8270C for soil.

Compound Name	Lower Limit	Upper Limit
1,2,4-Trichlorobenzene	47	110
1,2-Dichlorobenzene	44	110
1,3-Dichlorobenzene	38	110
1,4-Dichlorobenzene	41	110
2,2’-oxybis(1-chloropropane)	39	129
2,4,5-Trichlorophenol	68	110
2,4,6-Trichlorophenol	67	110
2,4-Dichlorophenol	57	116
2,4-Dimethylphenol	50	124
2,4-Dinitrophenol	24	110
2,4-Dinitrotoluene	71	111
2,6-Dinitrotoluene	74	110
2-Chloronaphthalene	68	110
2-Chlorophenol	58	114
2-Methylnaphthalene	44	132
2-Methylphenol	65	112
2-Nitroaniline	70	129
2-Nitrophenol	51	110
3- + 4-Methylphenol	53	124
3-Nitroaniline	36	166
4,6-Dinitro-2-methylphenol	48	110
4-Bromophenyl-phenylether	68	110
4-Chloro-3-methylphenol	60	114
4-Chloroaniline	5	110
4-Chlorophenyl-phenylether	65	115

4-Nitroaniline	**34**	**229**
4-Nitrophenol	**61**	**114**
Acenaphthene	**68**	**113**
Acenaphthylene	**70**	**112**
Anthracene	**68**	**116**
Benzo[a]anthracene	**76**	**121**
Benzo[a]pyrene	**72**	**111**
Benzo[b]fluoranthene	**68**	**118**
Benzo[g,h,i]perylene	**51**	**133**
Benzo[k]fluoranthene	**70**	**125**
Benzyl alcohol	**61**	**126**
bis(2-Chloroethoxy)methane	**56**	**110**
bis(2-Chloroethyl)ether	**51**	**110**
Butylbenzylphthalate	**62**	**117**
Chrysene	**72**	**114**
Di(2-Ethylhexyl)phthalate	**70**	**115**
Dibenz[a,h]anthracene	**36**	**141**
Dibenzofuran	**61**	**132**
Diethylphthalate	**67**	**125**
Dimethylphthalate	**76**	**118**
Di-n-butylphthalate	**66**	**116**
Di-n-octylphthalate	**54**	**128**
Fluoranthene	**68**	**117**
Fluorene	**65**	**118**
Hexachlorobenzene	**67**	**111**
Hexachlorobutadiene	**42**	**110**
Hexachlorocyclopentadiene	**42**	**110**
Hexachloroethane	**39**	**110**

Indeno[1,2,3-cd]pyrene	**62**	**129**
Isophorone	**54**	**110**
Naphthalene	**48**	**110**
Nitrobenzene	**48**	**110**
N-Nitrosodimethylamine	**33**	**110**
N-Nitroso-di-n-propylamine	**62**	**120**
n-Nitrosodiphenylamine	**73**	**145**
Pentachlorophenol	**52**	**113**
Phenanthrene	**67**	**115**
Phenol	**61**	**113**
Pyrene	**71**	**110**

Matrix: Soil and Sediment
Analytical Group: Explosives and Related Compounds
Analytical Method/SOP: EPA 8095M/DLS 120

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Method blank	1 per batch or 20 Samples	Less than ½ the quantitation limit (or < 10% of any sample concentration)	Note failure/report if analyte detected in blank is not detected in samples. If detected in samples, identify source of contamination before further analysis and qualify only if necessary, informing client prior to reporting.	Analyst	Less than ½ the quantitation limit (or < 10% of any sample concentration)
Laboratory Control Sample (LCS); for soils only; processed through all 8330B steps	1 per batch or 20 samples	See attached table with DoD QSM limits	If LCS is outside control limits, contact client. Depending on degree and type of failure (and hold time status), re-prepare/re-analyze affected batch of samples. Qualify only if necessary.	Analyst	See attached table with DoD QSM limits
Surrogates	3,4-Dinitrotoluene; added to all samples	70-130%	Re-extraction/re-analysis. Contact client if hold times have elapsed prior to second extraction.	Analyst	70-130%
Laboratory Control Sample (LCS); for soils, spiked post 8330B processing	1 per batch or 20 samples	See attached table	If LCS is outside control limits, contact client. Depending on degree and type of failure (and hold time status), re-prepare/re-analyze affected batch of samples. Qualify only if necessary.	Analyst	See attached table
Laboratory Control Sample Duplicate (LCSD)- for soils, spiked post 8330B processing	1 per batch or 20 samples	See attached table for recovery criteria. RPD $\leq$ 40%	Recovery: see LCS corrective action. RPD: if LCS/LCSD recoveries are acceptable, discuss with client for possible re-analysis or data qualification.	Analyst	See attached table for recovery criteria. RPD $\leq$ 40%

Matrix Spike	1 per batch or 20 samples	Same criteria as LCS; see attached table	If the recovery falls outside the acceptance range and the LCS for that analyte is in control, matrix related problems will be noted and the data will be qualified.	Analyst	Same criteria as LCS; see attached table
Matrix Spike Duplicate (MSD)	1 per batch or 20 samples	≤ 40 % RPD	If Dup is outside RPD limits and the LCS is in control, discuss with client for possible re-analysis or data qualification.	Analyst	≤ 40 % RPD

Project (Army IPH) Laboratory Control Sample (LCS) and Matrix Spike (MS) Acceptance Criteria (Limits) for Explosives Analysis by DLS 120 (EPA 8095M) for Soil and Sediment (for soil, applies to the LCS spiked post 8330 processing)

PARAMETER	ACCURACY (%R) (LCS)
1,3,5-Trinitrobenzene	64-110
1,3-Dinitrobenzene	79-110
2,4,6-Trinitrotoluene	77-110
2,4-Dinitrotoluene	81-110
2,6-Dinitrotoluene	81-110
2-Amino-4,6-dinitrotoluene	80-118
4-Amino-2,6-dinitrotoluene	81-113
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	67-111
Nitroglycerin	63-123
N-Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	67-128
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	71-131
PETN	70-130

Project (DoD QSM) Laboratory Control Sample (LCS) Acceptance Criteria (Limits) for Explosives Analysis for Soil (Only Applies to LCS Carried Through the Entire 8330B Processing Procedure)

PARAMETER	ACCURACY (%R) (LCS) LS IN-HOUSE/DOD
1,3,5-Trinitrobenzene	80-116
1,3-Dinitrobenzene	73-119
2,4,6-Trinitrotoluene	71-120
2,4-Dinitrotoluene	75-121
2,6-Dinitrotoluene	79-117
2-Amino-4,6-dinitrotoluene	71-123
4-Amino-2,6-dinitrotoluene	64-127
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	67-129
Nitroglycerin	73-124
N-Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	68-135
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	74-124
PETN	72-128

Matrix: Soil and Sediment
Analytical Group: Metals (Al, Sb, As, Ba, Cd, Cr, Cu, Pb, Se, Ag, and Hg).
Analytical Method/SOP: EPA 6020 and EPA 7471A (Hg)/SOPs 1-P-QM-WI-9018443 and 1-P-QM-WI-9015067.
WS 28 Criteria based on the DoD QSM, Version 5.0, Appendix B, Table 9.

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Method Blank (Laboratory Reagent Blank)	1 per prep batch or 20 samples	Less than ½ the LOQ (or < 1/10 the amount in any sample).	Identify problem. Contact client. If required, reprep and reanalyze method blank and samples processed with the contaminated blank.	Analyst	Less than ½ the LOQ (or < 1/10 the amount in any sample).
Laboratory Control Sample (LCS)	1 per prep batch or 20 samples	See attached table, as per DoD QSM.	Identify/correct problem; then reprep and reanalyze in affected batch (at least for failed metals). Contact client before flagging for failed LCS.	Analyst	See attached table, as per DoD QSM.
Matrix Spike (MS)	1 per prep batch or 20 samples	Same as LCS. See attached table, as per DoD QSM.	If the recovery falls outside the designated range and the LCS for that analyte is in control, matrix related problems will be noted and the data will be qualified.	Analyst	Same as LCS. See attached table, as per DoD QSM.
Matrix Spike Duplicate (MSD)	1 per prep batch or 20 samples	Same as LCS for recovery. See attached table, as per DoD QSM. .≤ 20 % RPD (all metals)	If Duplicate is outside control and the LCS is in control, discuss with client for possible re-analysis or data qualification.	Analyst	≤ 20 % RPD (all metals)
Dilution Test (ICP-MS only)	1 per batch only if MS or MSD fails	At a 5-fold dilution, within 10% of original measurement.	None. To confirm matrix effect and proper flagging.	Analyst	At a 5-fold dilution, within 10% of original measurement.
Internal Standards (IS) (ICP-MS only)	Every field sample, standard and QC sample.	IS intensity 30-120% of IS in the ICAL blank.	If IS fail in QC samples, correct problem and re-analyze field samples associated with failure. If IS fails in only field samples, dilute as appropriate. Only flag data after [illegible]	Analyst	IS intensity 30-120% of IS in the ICAL blank.
Instrument Spike/Post Digestion Spike (PDS) (ICP-MS only)	One per prep batch, only if MS or MSD fails (use same sample as used for MS/MSD if possible).	80-120%	None. To confirm matrix effect and proper flagging.	Analyst	80-120%

Project (DoD QSM v5) LCS, MS, and MSD recovery limits for Metals in Sediment and Soil by EPA 6020 and 7471A (Hg).

Compound Name	Lower Limit	Upper Limit
Aluminum (Al)	**78**	**124**
Antimony (Sb)	**72**	**124**
Arsenic (As)	**82**	**118**
Barium (Ba)	**86**	**116**
Cadmium (Cd)	**84**	**116**
Chromium (Cr)	**83**	**119**
Copper (Cu)	**84**	**119**
Lead (Pb)	**84**	**118**
Selenium (Se)	**80**	**119**
Silver (Ag)	**83**	**118**
Mercury (Hg) (EPA 7471A)	**80**	**124**

Matrix: Soil and Sediment
Analytical Group: Total Organic Carbon (TOC)
Analytical Method/SOP: EPA 9060A/1-P-QM-WI-9013418

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Batch Blank	1 per batch or 20 samples	Less than the quantitation limit	Qualify if analyte is not detected in samples. If detected, identify source of contamination before further analysis and qualify only if necessary.	Analyst	Less than the quantitation limit
Laboratory Control Sample (LCS)	1 per batch or 20 samples	47-143 %	Identify/correct problem; then re-prep and reanalyze in affected batch Contact client before flagging for failed LCS.	Analyst	47-143 %
Matrix Spike (MS)	1 per batch or 20 samples	22-155%	If the recovery falls outside the designated range and the LCS for that analyte is in control, matrix related problems will be noted and the data will be qualified.	Analyst	22-155%
Sample Duplicate	1 every 10 samples	< 13 % RPD	Matrix related problems will be noted and the data will be qualified.	Analyst	< 13 % RPD

Matrix: Soil
Analytical Group: Perchlorate
Analytical Method/SOP: EPA 6850/DLS 525.5

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Laboratory Reagent blank	1 per batch of 20, using reagent water	Less than 1/3 the quantitation limit	Note blank contamination in report if analyte is not detected in samples. Otherwise, identify source of contamination, then reanalyze affected batch of samples.	Analyst	Less than 1/3 the quantitation limit
Laboratory Control Sample (LCS)	1 per batch or 20 samples	84 – 121% recovery	If LCS is outside control limits, re-prepare/re-analyze affected batch of samples. Qualify data only if this cannot be done or if approved by client.	Analyst	84 – 121% recovery
Laboratory Control Sample Duplicate (LCSD)	1 per batch or 20 samples	84 – 121% recovery; ≤ 25% RPD	If LCSD is outside recovery limits, see LCS corrective action. If RPD fails, contact client for decision on re-extraction/analysis or data qualification.	Analyst	84 – 121% recovery; ≤ 25% RPD
Matrix Spike (MS)	1 per batch or 20 samples	84 – 121 % recovery	If the LCS is within criteria, matrix related problems will be noted and the data will be qualified.	Analyst	84 – 121 % recovery
Matrix Spike Duplicate (MSD)	1 per batch or 20 samples	84 – 121 % recovery; ≤ 25% RPD	For recovery failure, see MS corrective action. If RPD failure, contact client for decision on re-extraction/analysis or data qualification.	Analyst	84 – 121 % recovery; ≤ 25% RPD
Isotopic Ratio, mass 83/85	Monitor for all field and QC samples	Ratio = 2.31-3.85	Identify/resolve problem; reanalyze affected samples.	Analyst	Ratio = 2.31-3.85
Relative retention time (RRT)	Monitor for all field and QC samples	RRT = 0.98-1.02 compared to ICAL standards.	Identify/resolve problem; reanalyze affected samples.	Analyst	RRT = 0.98-1.02 compared to ICAL standards.

Matrix: Soil
Analytical Group: Particle Sizing/Distribution
Analytical Method/SOP: ASTM D422/SOP 1-P-QM-WI-014165

QC Sample	Number/Frequency	Method/SOP Acceptance Criteria	Corrective Action	Title/position of person responsible for corrective action	Project-Specific MPC
Sample Duplicate	1 per batch or 20 samples	20% RPD	None. Note failure in report narrative.	Analyst	20% RPD

QAPP Worksheet #29: Project Documents and Records
(UFP-QAPP Manual Section 3.5.1)
(EPA 2106-G-05 Section 2.2.8)

Sample Collection and Field Records			
Record	Generation	Verification	Storage location/archival
Field logbook	James Maio (Groundwater Lead) Barbara Vichot (Soils Lead) Carl Bouwkamp (Surface Water and Sediments Lead)	Project Manager - James Maio	Project File
Groundwater sample purge logs	James Maio (Groundwater Lead)	Project Manager - James Maio	Project File
Chain-of-Custody Forms	Field Team Leader - Mark Farro	QA Project Manager	Project File
Air Bills	Field Team Leader - Mark Farro	Project Manager - James Maio	Project File
Corrective Action Reports	As Needed	Project Manager - James Maio	Project File
Correspondence	As Needed	Project Manager - James Maio	Project File

Project Assessments			
Record	Generation	Verification	Storage location/archival
Field audit checklists	QA Project Manager	QA Project Manager	Project File
Data verification checklists	QA Project Manager	QA Project Manager	Project File
Data validation report	3rd Party Data Validator	QA Project Manager	Project File
Data usability assessment report	QA Project Manager	QA Project Manager	Project File

Laboratory Records			
Record	Generation	Verification	Storage location/archival
Analytical Reports	Respective Lab – Turnaround of 28 days from sample receipt.	USAIPH Lab Consultant	Project file

Laboratory Data Deliverables						
Record	SVOCs	Explosives	Perchlorates	Metals	Nitrates/Nitrites	Other
Narrative	x	x	x	x	x	
COC	x	x	x	x	x	
Summary Results	x	x	x	x	x	
QC Results	x	x	x	x	x	
Chromatograms	x					

QAPP Worksheet #31, 32 & 33: Assessments and Corrective Action
(UFP-QAPP Manual Sections 4.1.1 and 4.1.2)
(EPA 2106-G-05 Section 2.4 and 2.5.5)

Assessments:

Assessment Type	Responsible Party & Organization	Number/Frequency	Estimated Dates	Assessment Deliverable	Deliverable due date
General Corrective Actions	Project Manager	As needed	As needed	Readiness Review	As needed
Sampling Activities	Project QA Manager or designee	At least one per media	February and August of Each Year	Field Sampling TSA	February and August of Each Year
On-site Laboratories	n/a	There are no on site labs for this project	n/a	On-site Analytical TSA	n/a
Laboratory Activities	Project QA Manager or designee and laboratory QA manager or designee	As Stated in the Laboratory QA manual	February and August of Each Year	Off-site Laboratory TSA	February and August of Each Year
QA Management Reports	Project QA Manager or designee	At least two	February and August of Each Year	Duplicate Sampling and Analysis Audit	March and September of Each Year
Data Validation	Project QA Manager or designee	At least one per media	February and August of Each Year	PT Sample Tracking and Analysis	March and September of Each Year
Data Package Review	Project QA Manager or designee	As needed	March and September of Each Year	Management Systems Review (MSR)	April and October of Each Year

Assessment Response and Corrective Action:

Assessment Type	Responsibility for responding to assessment findings	Assessment Response Documentation	Timeframe for Response	Responsibility for Implementing Corrective Action	Responsible for monitoring Corrective Action implementation
Sampling Activities	On-Site Field Team Leader	Respond to the finding on site with documentation in the field notebook. Written corrective action reports with appropriate timeframe	Immediately if possible appropriate timeframe if not	On-Site Field Team Leader	The Project QA Manager, or designee
Laboratory Activities	Laboratory QA Manager and the Project Manager	Respond to the finding at the time with documentation in the laboratory notebook. Written corrective action reports with appropriate timeframe	Immediately if possible appropriate timeframe if not	Laboratory QA Manager and the Project Manager	The Project QA Manager, or designee
Data Validation	Project Manager and USAIPH LS Laboratory Consultant	Respond to the finding at the time with documentation. Written corrective action reports with appropriate timeframe	Immediately if possible appropriate timeframe if not	Project Manager and USAIPH LS Laboratory Consultant	The Project QA Manager, or designee
Data Package Review	Project Manager, Project QA Manager, and the appropriate supervisor of the analytical laboratory generating the data package	Respond to the finding at the time with documentation. Written corrective action reports with appropriate timeframe	Immediately if possible appropriate timeframe if not	Project Manager, Project QA Manager, and the appropriate supervisor of the analytical laboratory generating the data package	USAIPH LS Laboratory Consultant

Assessment Type	Responsibility for responding to assessment findings	Assessment Response Documentation	Timeframe for Response	Responsibility for Implementing Corrective Action	Responsible for monitoring Corrective Action implementation
General Corrective Actions	Appropriate the area above the findings fall under	Respond to the finding at the time with documentation. Written corrective action reports with appropriate timeframe	Immediately if possible appropriate timeframe if not	Appropriate the area above the findings fall under	Appropriate the area above the findings fall under
QA Management Reports	Project Manager	Respond to the finding at the time with documentation. Written corrective action reports with appropriate timeframe	Immediately if possible appropriate timeframe if not	Project Manager	Project Manager and Project QA Manager

QAPP Worksheet #34: Data Verification and Validation Inputs
(UFP-QAPP Manual Section 5.2.1 and Table 9)
(EPA 2106-G-05 Section 2.5.1)

Item	Description	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records			
1	Approved QAPP	X	
2	Contract	X	
4	Field SOPs	X	
5	Laboratory SOPs	X	
Field Records			
6	Field logbooks	X	X
7	Equipment calibration records	X	X
8	Chain-of-Custody Forms	X	X
9	Sampling diagrams/surveys	X	X
10	Relevant Correspondence	X	X
11	Change orders/deviations	X	X
12	Field audit reports	X	X
13	Field corrective action reports	X	X
Analytical Data Package			
14	Cover sheet (laboratory identifying information)	X	X
15	Case narrative	X	X
16	Internal laboratory chain-of-custody	X	X
17	Sample receipt records	X	X
18	Sample chronology (i.e. dates and times of receipt, preparation & analysis)	X	X
19	Communication records	X	X
20	Project-specific PT sample results	X	X
21	LOD/LOQ establishment and verification	X	X
22	Standards Traceability	X	X

Item	Description	Verification (completeness)	Validation (conformance to specifications)
23	Instrument calibration records	X	X
24	Definition of laboratory qualifiers	X	X
25	Results reporting forms	X	X
26	QC sample results	X	X
27	Corrective action reports	X	X
28	Raw data	X	X
29	Electronic data deliverable	X	X

QAPP Worksheet #35: Data Verification Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Records Reviewed	Requirement Documents	Process Description	Responsible Person, Organization
Field logbook	QAPP, SOP Field 02	Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. Verify that any required field monitoring was performed and results are documented.	Daily - Project Manager At conclusion of field activities - Project QA Manager
Chain-of-custody forms	QAPP, SOP Field 02	Verify the completeness of chain-of-custody records. Examine entries for consistency with the field logbook. Check that appropriate methods and sample preservation have been recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for QC samples (e.g., MS/MSD). Verify that all required signatures and dates are present. Check for transcription errors.	Daily - Field Crew Chief At conclusion of field activities - Project Chemist

Laboratory Deliverable	QAPP	Verify that the laboratory deliverable contains all records specified in the QAPP. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported according to plan. Compare the data package with the CoCs to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. Check for evidence that any required notifications were provided to project personnel as specified in the QAPP. Verify that necessary signatures and dates are present.	Before release - Laboratory QAM Upon receipt - Project Chemist
Audit Reports, Corrective Action Reports	QAPP	Verify that all planned audits were conducted. Examine audit reports. For any deficiencies noted, verify that corrective action was implemented according to plan.	Project QAM

QAPP Worksheet #36
Data Validation Procedures
(UFP-QAPP Manual Section 5.2.2)
(EPA 2106-G-05 Section 2.5.1)

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa and IIb	Groundwater	Explosives	Low	USEPA 8095M and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Groundwater	Perchlorate	Low	USEPA 6850 and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Groundwater	Metals	Low	USEPA 200.8/245.1 and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Groundwater	SVOCs	Low	USEPA 8270C and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Groundwater	Nitrates/Nitrites	Low	EPA 353.2 and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Surface water	Explosives	Low	USEPA 8095M and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Surface water	Perchlorate	Low	USEPA 6850 and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Surface water	Metals	Low	USEPA 1638/1631E and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Surface water	Nitrates/Nitrites	Low	EPA 353.2 and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Sediment	Explosives	Low	USEPA 8095M and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Sediment	Metals	Low	USEPA 6020/7471A and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Sediment	TOC	Low	EPA 9060A and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.

IIa and IIb	Soils	Explosives	Low	USEPA 8330B Processing/8095M Analysis and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Soils	Perchlorate	Low	USEPA 6850 and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Soils	Metals	Low	USEPA 6020/7471A and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Soils	SVOCs	Low	USEPA 8270C and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Soils	Particle Size Distribution	Low	ASTM D422 and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.
IIa and IIb	Soils	TOC	Low	EPA 9060A and QAPP Worksheets 12, 15, 24 and 28	Project QA/QC Manager, Laboratory QA Manager, and USAIPH Data Validator.

QAPP Worksheet #37: Data Usability Assessment
(UFP-QAPP Manual Section 5.2.3 including Table 12)
(EPA 2106-G-05 Section 2.5.2, 2.5.3, and 2.5.4)

The usability assessment will consider whether data meet project quality objectives as they relate to the decision to be made, and evaluates whether data are suitable for making that decision. The usability assessment is a data review and will be performed only on data of known and documented quality (i.e., verified and validated data). To accomplish this step of data review, the project team will do the following:

- Summarize the usability assessment process and all usability assessment procedures, including interim steps and any statistics, equations, and computer algorithms that will be used to assess data.
- Describe the documentation that will be generated during usability assessment.
- Identify the personnel (by title and organizational affiliation) responsible for performing the usability assessment.
- Describe how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies.
- Describe the evaluative procedures used to assess overall measurement error associated with the project and include the Data Quality Indicators.

Summary of Data Quality Indicators

A description of how each Data Quality Indicator should be incorporated into the usability report is found under each parameter heading. Precision, accuracy/bias, representativeness, comparability, completeness, and sensitivity are the Data Quality Indicators used to validate and assess the data produced during the project. Each Data Quality Indicator is described below including a definition of the terminology, the referenced process for calculating the indicator, and the referenced measurement performance criteria for this project. Following the discussion for each Data Quality Indicator, the usability report documentation resulting from that particular Data Quality Indicator assessment is detailed following the process description.

Precision

Precision is the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves. Precision is usually expressed as standard deviation, variance, percent difference, or range, in either absolute or relative terms. QC measures for precision include field duplicates, laboratory duplicates, MSDs, analytical replicates, and surrogates. In order to meet the needs of the data users, project data must meet the measurement performance criteria for precision specified in QAPP Worksheet #28, Measurement Performance Criteria, and supporting worksheets. Precision may be the result of one or more of the following: field instrument variation, analytical measurement variation, poor sampling technique, sample transport problems, or spatial variation (heterogeneous sample matrices). To identify the cause of imprecision, the field sampling design rationale and sampling techniques will be evaluated by the reviewer, and both field and

analytical duplicate/replicate sample results will be reviewed. The process for calculating precision is detailed in and will be in accordance with the UFP-QAPP Manual, Section 2.6.2.1. If poor precision is indicated in both the field and analytical duplicates/replicates, then the laboratory may be the source of error. If poor precision is limited to the field duplicate/replicate results, then the sampling technique, field instrument variation, sample transport, and/or spatial variability may be the source of error. If data validation reports indicate that analytical imprecision exists for a particular data set or sample delivery group (SDG), then the impact of that imprecision on usability will be discussed in the usability report.
The usability report will:

- Discuss and compare overall field duplicate precision data from multiple data sets collected for the project for each matrix, analytical group, and concentration level.
- Discuss and describe the limitations on the use of project data when overall precision is poor or when poor precision is limited to a specific sampling or laboratory (analytical) group, data set or SDG, matrix, analytical group, or concentration level.

Accuracy/Bias

Accuracy is the degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) that are due to sampling and analytical operations. Examples of QC measures for accuracy include matrix spikes, laboratory control samples (LCSs), and equipment blanks. In order to meet the needs of the data users, project data must meet the measurement performance criteria for accuracy/bias specified in QAPP Worksheet #28, Measurement Performance Criteria. The process for calculating accuracy/bias is detailed in and will be in accordance with the UFP-QAPP Manual, Section 2.6.2.2.
The usability report will:

- Discuss and compare overall contamination and accuracy/bias data from multiple data sets collected for the project for each matrix, analytical group, and concentration level.
- Describe the limitations on the use of project data if extensive contamination and/or inaccuracy or bias exists, or when inaccuracy is limited to a specific sampling or laboratory group, data set or SDG, matrix, analytical group, or concentration level.
- Identify qualitative and/or quantitative bias trends in multiple proficiency testing (PT) sample results for each matrix, analytical group, and concentration level.
- Discuss the impact of any qualitative and quantitative trends in bias on the sample data.
- Any PT samples that have false positive or false negative results will be reported, and the impact on usability will be discussed in the usability report.

Representativeness

Representativeness is the measure of the degree to which data accurately and precisely represent a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition. In order to meet the needs of the data users, project data must meet the measurement performance criteria for sample representativeness specified in the QAPP Worksheet #28, Measurement Performance Criteria. The process for calculating representativeness is detailed in and will be in accordance with the UFP-QAPP Manual, Section 2.6.2.4.

The QAPP discusses how the QA/QC activities (review of sampling design and SOPs, field sampling Technical Systems Audit [TSAs], split sampling and analysis audits, etc.) and QC sample data will be reviewed to assess sample representativeness.

If field duplicate precision checks indicate potential spatial variability, additional scoping meetings and subsequent re-sampling may be needed in order to collect data that are more representative of a nonhomogeneous site.

The usability report will:

- Discuss and compare overall sample representativeness for each matrix, analytical group, and concentration level.
- Will describe the limitations on the use of project data when overall non-representative sampling has occurred, or when non-representative sampling is limited to a specific sampling, group, data set or SDG, matrix, analytical group, or concentration level.

Comparability

Comparability is the degree to which different methods, data sets, and decisions agree or can be represented as similar. Comparability describes the confidence (expressed qualitatively or quantitatively) that two data sets can contribute to a common analysis and interpolation. In order to meet the needs of the data users, project data must meet the measurement performance criteria for comparability specified in QAPP Worksheet #28, Measurement Performance Criteria. The QAPP includes methods and formulas for assessing data comparability for each matrix, analytical group, and concentration level. Additional detail regarding the process of assessing comparability is detailed in and will be in accordance with UFP-QAPP Manual, Section 2.6.2.5. Different situations require different assessments of comparability, as in the following:

- If two or more sampling procedures or sampling teams will be used to collect samples, describe how comparability will be assessed for each matrix, analytical group, and concentration level.
- If two or more analytical methods or SOPs will be used to analyze samples of the same matrix and concentration level for the same analytical group, the comparability will be assessed between the two data sets and discussed.
- If split samples are analyzed, the specific method and percent difference formula that will be used to assess split sample comparability for individual data points will be discussed.
- To document overall comparability, the procedures used to perform overall assessment of oversight split sampling comparability and include mathematical and statistical will be discussed.

The usability report will:

- Discuss and compare overall comparability between multiple data sets collected for the project for each matrix, analytical group, and concentration level.
- Discuss if screening data will be confirmed by definitive methods, document the specific method and percent difference formula that will be used to assess comparability for individual data points.
- Document overall comparability, describe the procedures used to perform overall assessment of comparability and include mathematical and statistical formulas for evaluating screening and confirmatory data comparability.

- Discuss if the project is long-term monitoring, project data should be compared with previously generated data to ascertain the possibility of false positives and false negatives, and positive and negative trends in bias. Data comparability is extremely important in these situations.
- Discuss anomalies detected in the data that may reflect a changing environment or indicate sampling and/or analytical error. Comparability criteria should be established to evaluate these data sets to identify outliers and the need for re-sampling as warranted.
- Describe the limitations on the use of project data when project-required data comparability is not achieved for the overall project or when comparability is limited to a specific sampling or laboratory group, data set or SDG, matrix, analytical group, or concentration level.
- Document the failure to meet screening/confirmatory comparability criteria and discuss the impact on usability.
- Document the failure to meet split sampling comparability criteria and discuss the impact on usability.
- If data are not usable to adequately address environmental questions or support project decisionmaking, address how this problem will be resolved and discuss the potential need for re-sampling.
- If long-term monitoring data are not comparable, address whether the data indicate a changing environment or are a result of sampling or analytical error.

Sensitivity and Quantitation Limits

Sensitivity is the capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest. Examples of QC measures for determining sensitivity include laboratory fortified blanks, a method detection limit study, and calibration standards at the quantitation limit (QL). In order to meet the needs of the data users, project data must meet the measurement performance criteria for sensitivity and project QLs specified in QAPP Worksheet #28, Measurement Performance Criteria. The process for assessing sensitivity is detailed in the UFP-QAPP Manual, Section 2.6.2.3.

The QAPP also includes the following:

- Methods and formulas for calculating analytical sensitivity that ensure QLs are achieved (e.g., percent recovery of laboratory fortified blank compounds)
- Procedures for calculating method detection limits (MDLs), QLs, and sample quantitation limits (SQLs)
- Procedures for evaluating low-point calibration standards run at the QL.

The usability report will:

- Discuss and compare overall sensitivity and QLs from multiple data sets collected for the project for each matrix, analytical group, and concentration level.
- Discuss the impact of that lack of sensitivity or higher QLs on data usability, if validation reports indicate that sensitivity or QLs were not achieved.
- Describe the limitations on the use of project data if project-required sensitivity and QLs are not achieved for all project data, or when sensitivity is limited to a specific sampling or laboratory group, data set or SDG, matrix, analytical group, or concentration level.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under correct, normal circumstances. In order to meet the needs of the data users, project data must meet the measurement performance criteria for data completeness specified in QAPP Worksheet #28, Measurement Performance Criteria. A completeness check will be done on all of the data generated by the laboratory. Completeness criteria are presented on Worksheet #28. Completeness will be calculated for each analyte as follows (UFPQAPP Manual Section 2.6.2.6: For each analyte, completeness will be calculated as the number of data points for each analyte that meets the measurement performance criteria for precision, accuracy/bias, and sensitivity, divided by the total number of data points for each analyte. A discussion will follow summarizing the calculation of data completeness. Any conclusions about the completeness of the data for each analyte will be drawn and any limitations on the use of the data will be described.

The QAPP will:

- Include the methods and formulas for calculating data completeness.
- Describe how the amount of valid data will be determined as a percentage of the number of valid measurements that are specified in the QAPP for each matrix, analytical group, and concentration level.
- Describe how critical data will be assessed for completeness when certain sample locations or analytes and matrices are more critical than others in making project decisions.

The usability report will:

- Discuss and compare overall completeness of multiple data sets collected for the project for each matrix, analytical group, and concentration level.
- Describe the limitations on the use of project data if project-required completeness is not achieved for the overall project, or when completeness is limited to a specific sampling or laboratory group, data set or SDG, matrix, analytical group, or concentration level.

Activities

The entire project team will reconvene to perform the usability assessment to ensure that the Project Quality Objective (PQOs) are understood and the full scope is considered. If, for whatever reason, (Precision, Accuracy/Bias, Comparability, Sensitivity, Completeness) Measurement Performance Criteria are not achieved and it has been determined that certain project data are not usable, then the project team will determine if it is necessary to take further action, such as, re-sampling, to ensure that data quality objectives have been met.

The items listed under **Considerations for Usability Assessment** are examples of specific items that will be considered during the project under the usability assessment.

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

- Precision - The precision of the data will be determined by comparing to other similar data, as well as, with field duplicates, lab duplicates and matrix spike duplicates.
- Accuracy/Bias - The accuracy of data will be assessed by comparing observed values with reference value to ensure that random and systematic errors are minimized by comparing samples with matrix spikes, laboratory control samples, and equipment blanks.

- Representativeness - Although sample size somewhat limits the statistical confidence for apply contaminant levels to the entire population; it does conform to currently accepted methods.
- Comparability - The results of this study will be used as a benchmark for determining comparability for data collected during any future sampling events using the same or similar sampling and analytical SOPs.
- Completeness – A completeness check will be done on all of the data generated by the laboratory. Completeness criteria are presented on QAPP WS #28. Completeness will be calculated for each analyte as follows. For each analyte, completeness will be calculated as the number of data points for each analyte that meets the measurement performance criteria for precision, accuracy/bias, and sensitivity, divided by the total number of data points for each analyte. A discussion will follow summarizing the calculation of data completeness. Any conclusions about the completeness of the data for each analyte will be drawn and any limitations on the use of the data will be described.
- Reconciliation – Each of the PQOs presented on Worksheet #28 will be examined to determine if the objective was met. This examination will include a combined overall assessment of the results of each analysis pertinent to an objective. Each analysis will first be evaluated separately in terms of the major impacts observed from the Data Validation, Data Quality Indicators, and measurement performance criteria assessments. Based on the results of these assessments, the quality of the data will be determined. Based on the quality determined, the usability of the data for each analysis will be determined. Based on the combined usability of the data from all analyses for an objective, it will be determined if the PQO was met and whether project action limits were exceeded. The final report will include a summary of all the points that went into the reconciliation of each objective. As part of the reconciliation of each objective, conclusions will be drawn and any limitations on the usability of any of the data will be described.

Identify the personnel responsible for performing the usability assessment: Laboratory Project Manager designee, Third Party Data Validation, USAIPH Analytical Data Manager, and Project QA/QC Manager.

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

A usability report will be written that discusses precision, accuracy/bias, representativeness, comparability, and completeness as detailed within this worksheet. This narrative report will include worksheets and supporting documentation to assess the PQO's and any conclusions and limitations of the associated data. The specific details of each section of the usability assessment documentation can be found above under the individual data quality indicators.

Considerations for Usability Assessment:

Data Deliverables and QAPP, Deviation: Ensure that all necessary information was provided, including but not limited to validation results.

Deviations: Determine the impact of deviations on the usability of data.

Sampling Locations: Determine if alterations to sample locations continue to satisfy the project objectives.

Chain-of-Custody: Establish that any problems with documentation or custody procedures do not prevent the data from being used for the intended purpose.

Holding Times: Determine the acceptability of data where holding times were exceeded.

Damaged Samples: Determine whether the data from damaged samples are usable. If the data cannot be used, determine whether resampling is necessary.
SOPs and Methods: Evaluate the impact of deviations from SOPs and specified methods on data.
QC Samples: Evaluate the implications of unacceptable QC sample results on the data usability for the associated samples. For example, consider the effects of observed blank contamination.
Matrix: Evaluate matrix effects (interference or bias).
Meteorological Data and Site Conditions: Evaluate the possible effects of meteorological (e.g., wind, rain, temperature) and site conditions on sample results. Review field reports to identify whether any unusual conditions were present and how the sampling plan was executed.
Comparability: Ensure that results from different data collection activities achieve an acceptable level of agreement.
Completeness: Evaluate the impact of missing information. Ensure that enough information was obtained for the data to be usable (completeness as defined in PQOs documented in the QAPP).
Background: Determine if background levels have been adequately established (if appropriate).
Critical Samples: Establish that critical samples and critical target analytes/contaminants of concern, as defined in the QAPP, were collected and analyzed. Determine if the results meet criteria specified in the QAPP.
Data Restrictions: Describe the exact process for handling data that do not meet PQOs (i.e., when measurement performance criteria are not met). Depending on how those data will be used, specify the restrictions on use of those data for environmental decision-making.
Usability Decision: Determine if the data can be used to make a specific decision considering the implications of all deviations and corrective actions.
Usability Report: Discuss and compare overall precision, accuracy/bias, representativeness, comparability, completeness, and sensitivity for each matrix, analytical group, and concentration level. Describe limitations on the use of project data if criteria for data quality indicators are not met.

6.0 PROCEDURES TO PREVENT HAZARDS

The MCAAP operations are designed and operated to minimize the potential for the hazardous wastes managed onsite to cause harm to human health or the environment. Exposure potential is minimized, and safe operations are maximized through proper equipment selection, unit design, and operating procedures. The general procedures used to prevent the threat of hazardous occurrences in the incinerator and the OB/OD units are described herein. Additional information on the design and operation of the incinerator and OB/OD units are provided in Section 4 of this application. This information, along with the information provided in this section, is intended to satisfy the applicable requirements on preventing hazards from the incinerator and OB/OD operations specified in 40 CFR Part 270 Subpart B, 40 CFR Part 264 Subpart C.

6.1 SECURITY

[§270.14(b)(4) and §264.14]

MCAAP is a fully secured US Army installation. Nearly all of the 45,000 acres is totally enclosed with a four-strand barbed wire fence with steel posts and cross ties for stretch posts. The property boundary is posted at frequent intervals with signs reading "U.S. Government Property - Keep Out". Security forces patrol a 50-foot-wide fireguard clearing bordering the installation at a minimum of once per week to check the fence for needed repairs. The fireguard clearing is not an all-weather road; therefore, during periods of wet weather the road patrol may exceed one-week intervals. The plant entrance is controlled through two gates. The main entrance on the east boundary, C-Tree Road, is manned 24 hours per day by installation security forces. The second entrance, located along the north boundary at Haywood, is manned during scheduled hours. A locked gate prevents entry at all other times.

The plant has two levels of security. The first and lowest level of security is the controlled area (headquarters, maintenance, and industrial area). The second and tighter level of security is referred to as the restricted area. Entrance into the restricted area is through manned guard stations. Personnel entering this area must have proper identification badges and vehicle passes. The restricted area is a no-smoking area and security guards check for prohibited items such as spark producing devices, firearms, matches, lighters, and citizen band radios.

Within the treatment units themselves, security is provided via a combination of surveillance cameras and operator patrols. The OB/OD areas each have 24-hour surveillance cameras that are transmitted into the bunkers. These cameras are monitored by area operators during unit operations. The incinerator has process cameras that cover certain external portions of the unit and are monitored by the area operators during unit operations.

6.1.1 24-Hour Surveillance System

[§264.14(b)(1)]

MCAAP's onsite security forces provide continuous, 24-hour controlled entry to the active portion of the entire installation. All entrances are staffed 24-hours per day and proper identification is required for entry. All visitors must register and receive a pass prior to admittance to the base.

The incinerator and the OB/OD units are all located completely within the fenced and secured area of MCAAP. The entrances to the OB/OD units are monitored by video camera. These cameras, as well as the process cameras at the incinerator are monitored during unit operations. In addition, Security Police patrol all units, control entry onto the active portion of the facility, and check the fence line and buildings year-round. Upon detection of any intruder, unit personnel notify Security Police.

6.1.2 Barrier and Means to Control Entry

[§§264.14(b)(2)(i) and (ii)]

The incinerator is located within the restricted area and all doors to the unit control rooms and the MCDF operation are closed and locked when the unit not in operation. The key is maintained by the Ammunition Production Control and a logbook is kept to document issuance and return of the building keys. On the north side of the building, a barrier prevents vehicle entry from behind the retort and into the area.

The OB and OD units are also located within the restricted area. Steel gates across Road 6 control access into the OB/OD units themselves as shown in Figure 6-1. These gates are closed at all times, except when authorized activity at the units is in progress. During burns at the OB unit, the gates to the units are locked and guarded by personnel; at the OD areas, the roads are blocked and guarded by personnel during detonation operations. The Operations Area Supervisor controls the keys to the buildings located in the OB/OD area. The key-control unit maintains a master key for use in making duplicate keys. Master keys are locked in a metal box and cannot be checked out.

6.1.3 Warning Signs

[§264.14(c)]

Warning signs that state "U.S. Government Property – Keep Out" are posted at frequent intervals along the MCAAP property boundary.

At the incinerator, warning signs are posted outside the unit indicating the admittance of authorized personnel only and read, "Danger, Hazardous Waste Management Area – Unauthorized Personnel Keep Out". Figure 6-2 contains a photo of this signage. A red warning light is also illuminated at the incinerator anytime that wastes are actively being processed at the facility.

At the gated entrance to the OB and OD units, there are also warning signs posted at the gate indicating the admittance of authorized personnel only and read, "Danger, Hazardous Waste Management Area – Unauthorized Personnel Keep Out". In addition, a red warning light is illuminated during OB/OD operations indicating a burn or detonation is in process. Figure 6-3 shows an example of the warning signs and light at the OB/OD units.

6.2 INSPECTION SCHEDULES

[§270.14(b)(5), §270.23, §264.15, and §264.602]

MCAAP has established a program to inspect all components of the permitted units (*i.e.,* incinerator and OB/OD units) for malfunctions/deterioration of monitoring equipment, safety/emergency equipment, security devices and operating/structural equipment. These inspections are necessary to prevent, detect, and respond to situations that may pose a risk to human health or the environment. Inspection frequencies are provided within each unit's specific checklist. The frequency depends upon equipment deterioration, environmental or human health incidences, or equipment malfunction between inspections.

For all inspections, should any problems or deficiencies be observed during an inspection, that observation will be recorded on the appropriate inspection form. Any necessary remedial actions will also be noted on the form and the problem or deficiency will be brought to the attention of the appropriate supervisor. When repairs or remedial actions have been completed, the date and nature of the repairs will be also recorded on the inspection form on which the problem or deficiency was originally noted.

Should any problems or deficiencies be observed that could lead to a release of hazardous waste or that could threaten personnel safety, operations will cease until the problem or deficiency is rectified. In no case will operations resume until all spill and emergency response equipment is operable and adequately stocked.

6.2.1 INSPECTIONS AT THE INCINERATOR

Inspections of the incinerator equipment are performed pursuant to the HWC NESHAP and are not regulated under this permit per 40 CFR § 264.340(b). Inspections of the emergency equipment at the incinerator is, however, still subject to regulation under the RCRA program. The following emergency equipment inspections are performed when the incinerator buildings are operating:

- Monthly, the emergency spill kits are checked to confirm they are properly stocked.
- Monthly, the fire extinguishers are checked to make sure they are operational and fully charged.
- Weekly, the emergency eyewash station is checked to verify that it is operating properly.

These inspections are recorded in the incinerator operating record and are kept onsite for at least three years. Information recorded includes the date and time of inspection, the name of the inspector, the items inspected, a notation of the observations made, and the date and nature of any repairs or other remedial actions. Copies of completed versions of any inspection checklists will be maintained onsite and will be readily available for review and inspection upon request.

6.2.2 INSPECTIONS AT THE OB UNIT

MCAAP has developed inspection schedules designed to ensure that the OB unit is maintained and operated in accordance with all applicable Federal, State, and local regulatory requirements, and any special provisions of the Part B permit. Inspections are intended to assist in identifying equipment deterioration and malfunctions, to ensure the effectiveness of the treatment process, and to protect human health and the environment. An employee trained in hazardous waste management procedures conducts inspections of the OB unit in accordance with Table 6-1. This table also includes a summary of the anticipated problems and the frequency with which inspections are performed.

TABLE 6-1
INSPECTIONS AT THE OB UNIT

TYPE	ITEM	TYPES OF PROBLEMS	FREQUENCY OF INSPECTION[1]
General	OB burning pads	Displacement or erosion of soil; growth of vegetation	Daily
	Perimeter fire guard	Vegetation growth	
	Roads	Potholes, washouts, rutting	
	Personnel shelter	Structural deterioration of concrete in walls, road, or floor; erosion or displacement of earth barricades	
	Blasting circuitry	Deterioration or damage of wires; corrosion	
	Electrical testing meters	Out of calibration	
	Weather monitoring equipment	Out of calibration	
	Warning signs, lights, sirens	Not properly displayed or inoperative	
Emergency equipment	Fire extinguishers	Incompletely charged or inoperative	Monthly
	Emergency spill kits	Emergency spill kits not complete	Monthly
	Emergency eye-wash	Emergency eye-wash functioning properly	Weekly
Cleaning and securing unit	Areas surrounding pans	Search for unburned ammunition or explosives. Collect and place in marked container for retreatment	After each use
	Empty containers	Verify all containers previously containing explosive items are inspected and certified free of explosive hazards	After each use

1 All daily inspections are performed as part of pre-operation inspection each day when the unit is in operation.

Records of the inspections performed in accordance with Table 6-1 are maintained in the operating record and are kept onsite for at least three years. Information recorded includes the date and time of inspection, the name of the inspector, the items inspected, a notation of the observations made, and the date and nature of any repairs or other remedial actions. Copies of completed versions of the inspection checklists will be maintained onsite and will be readily available for review and inspection upon request.

6.2.3 INSPECTIONS AT THE OD UNITS

MCAAP has developed inspection schedules designed to ensure that the OD units are maintained and operated in accordance with all applicable Federal, State, and local regulatory requirements, and any special provisions of the Part B permit. Inspections are intended to assist in identifying equipment deterioration and malfunctions, to ensure the effectiveness of the treatment process, and to protect human health and the environment. An employee trained in hazardous waste management procedures conducts inspections of the OD unit in accordance with Table 6-2. This table also includes a summary of the anticipated problems and the frequency with which inspections are performed.

TABLE 6-2
INSPECTIONS AT THE OD UNIT

TYPE	ITEM	TYPES OF PROBLEMS	FREQUENCY OF INSPECTION[1]
General	Demolition pits	Rounding out of pits or change in dimension due to explosions	Daily
	Demolition area	Potholes, washouts, soft areas, rutting, erosion	
	Personnel shelter	Structural deterioration of concrete in roof, walls, or floor; erosion or displacement of earth barricade	
	Blasting circuitry	Deterioration or damage of wires; corrosion	
	Electrical testing meters	Out of calibration	
	Weather monitoring equipment	Out of calibration	
	Warning signs, lights, sirens	Not properly displayed; inoperative	
	Sedimentation lagoon	Loss of integrity; ineffective retention	
Emergency equipment	Fire extinguishers	Incompletely charged or inoperative	Monthly
	Emergency spill kits	Emergency spill kits not complete	Monthly
	Emergency eye-wash	Emergency eye-wash functioning properly	Weekly
Cleaning and securing unit	Areas surrounding each pit	Energetic components not successfully treated; search for unexploded material	After each use
	Roadways	Clean of scrap and debris using dozer or front-end loader	Daily
	Road, pit, cover dirt	Use magnet to remove metallic debris	Daily
	Entire OD Unit	Remove scrap metal	Daily

1 All daily inspections are performed as part of pre-operation inspections. These are performed once each day when the unit is in operation.

Records of the inspections performed in accordance with Table 6-2 are maintained in the operating record and are kept onsite for at least three years. Information recorded includes the date and time of inspection, the name of the inspector, the items inspected, a notation of the observations made, and the date and nature of any repairs or other remedial actions. Copies of completed versions of the inspection checklists will be maintained onsite and will be readily available for review and inspection upon request.

6.3 DOCUMENTATION OF PREPAREDNESS AND PREVENTION

[§270.14(b)(6) and §264.30]

MCAAP does not wish to request a waiver of the preparedness and prevention requirements under 40 CFR Part 264 Subpart C. Documentation of preparedness and prevention in effect at each unit is described herein.

6.3.1 EQUIPMENT FOR PREVENTION OR MITIGATION OF HAZARDS

[§270.14(b) and §264.32]

MCAAP meets the equipment requirements for preparedness and prevention by maintaining communication, emergency response, and spill cleanup equipment as specified in the sections that follow.

6.3.1.1 INTERNAL COMMUNICATIONS

[§270.14(b), §264.32(a), and §264.34]

Internal communications consist primarily of land-line telephones. Hand-held radios are also available at the OD units. Onsite emergency services can be summoned by dialing 9-1-1 on any plant phone. The radio network(s) operated by the Fire Protection and Prevention Division, Security Office, and Directorate of Public Works, Operations and Maintenance, are also means for communication. During an emergency, a mass notification system is utilized that sends automated messages to every desk phone and email address. Each desk phone must be picked-up to verify receipt.

Additionally, all building fire alarms are connected directly to the MCAAP fire department, triggering a signal at the fire department if the alarm is activated. Lights and sirens are utilized at the OB/OD units to warn of imminent burn/detonation.

6.3.1.2 EXTERNAL COMMUNICATIONS

[§270.14(b) and §264.32(b)]

In general, the resources of MCAAP, including fire protection, medical facilities, and security personnel, are sufficient to respond to any potential emergency presented by hazardous wastes stored or processed onsite. However, coordination agreements are in place with several local agencies as described in Section 6.3.3. All contact with outside organizations will be made by or coordinated through the Fire Chief.

6.3.1.3 EMERGENCY EQUIPMENT

[§270.14(b) and §264.32(c)]

A fire hydrant, fire extinguishers, and a small spill kit are provided at each of the permitted units. Warning lights are also provided at all units indicating anytime that waste is being processed. The OB/OD units also maintain weather monitoring equipment and sirens. The MCAAP Fire Station has additional emergency response equipment (on trucks and at the Fire Station) that is available in the event of emergencies. Additional emergency spill equipment is maintained on the spill response trailer, currently located at the central accumulation area building. The RCRA Contingency Plan provided in Section 7 includes further information on the types of emergency equipment maintained by MCAAP and provides details on plant emergency response procedures. This equipment is inspected and maintained as necessary per plant-specific protocols to ensure its functionality and reliability.

6.3.1.4 WATER AND FIRE CONTROL

[§270.14(b) and §264.32(d)]

A fire hydrant and fire extinguishers are provided at each of the thermal treatment units. In addition, the incinerator building is equipped with an automatic sprinkler system. The MCAAP Fire Station maintains, inspects, and test this equipment periodically. The RCRA Contingency Plan provided in Section 7 includes further information on these systems.

6.3.1.5 TESTING AND MAINTENANCE OF EQUIPMENT

[§270.14(b) and §264.33]

All equipment specified herein is tested and maintained as necessary to ensure its continued proper operation. Emergency equipment specific to each treatment unit is tested as specified on the inspection schedules provided in Section 6.2. Additional information on the testing and maintenance of emergency equipment is provided in the RCRA Contingency Plan provided in Section 7.

6.3.2 AISLE SPACE

[§270.14(b) and §264.35]

The incinerator and OB/OD units are arranged to allow the unobstructed movement of personnel. In addition, the equipment arrangement allows for necessary access for fire protection, spill control, and decontamination equipment to the units during an emergency.

The incinerator is accessible to fire and emergency equipment by paved roads. A driveway circling the building and a concrete pad also serve to facilitate access for emergency equipment. Within the incinerator control room and the furnace barricade there is sufficient lateral clearance between equipment and the walls to allow for firefighting and other emergency operations. Hazardous waste is not generally stored at the unit; however, treatment residues, including residues from the kiln and air pollution control system, as well as mine press residues destined for treatment in the DHS are temporarily held at the unit. Kiln residues are held on the conveyor in the barrel room at the discharge end of the kiln. These residues are stored in a single-line configuration and are readily accessible for inspection, provided that no wastes are actively being processed in the kiln. (Access to the barrel room is prohibited if wastes are processing in the kiln due to explosive safety concerns). At the DHS, drum heater residues are removed by forklift to a debris inspection station before being transported to the appropriate conditionally exempt storage area.

Thermal treatment of military munitions at the OB/OD units is conducted in an outdoor setting where space is not a constraint to the unobstructed movement of personnel and emergency equipment to any area of the facility. Military munitions and energetic materials brought to the units are not stored or stacked in piles at the thermal treatment units but are treated immediately after unloading. Treatment residues are temporarily stored at the units. These residues are segregated by each as type and arranged in such a way to provide adequate aisle space and ready access and inspection of each drum of material.

6.3.3 Documentation of Arrangements

[§270.14(b) and §264.37]

MCAAP has entered into mutual aid agreements and emergency response arrangements with several emergency response agencies. All of these agencies would, in general, serve in a supporting role to MCAAP firefighting and emergency personnel. These arrangements are detailed in the Contingency Plan included in Attachment 7-1.

6.4 Preventive Procedures, Structures, and Equipment

[§270.14(b)(8)]

MCAAP uses the appropriate procedures, structures, and equipment to prevent the occurrence of adverse conditions at the incinerator and the OB/OD units. These preventative measures vary between each unit based on the location of the units, the operations conducted, and the facilities provided at each. The sections that follow describe the preventive measures taken at the thermal treatment units.

6.4.1 Prevention of Hazards While Unloading Wastes

[§270.14(b)(8)(i)]

At the incinerator, wastes arrive by railcar or flatbed truck and are unloaded using a forklift that is equipped with a fire extinguisher. The railcar must have the brake set and the wheels chocked. Any vehicles delivering waste must have the engine off, the brakes set, and the wheels chocked. The palletized wastes are transferred immediately to either a temporary holding area or directly to the depalletization area within the furnace feed room. All of the wastes that are shipped to the incinerator are containerized in some fashion, generally either within stacked and palleted ammunition cans, or within sealed wooden boxes.

At the OB unit, dry grass, leaves, and other extraneous combustible material in amounts sufficient to spread fire are removed within a 200-foot radius from the point of destruction. The grounds are kept free from large stones and deep cracks in which explosives might lodge. Only approved vehicles and material handling equipment are allowed within the units; all such vehicles must be equipped with portable fire extinguishers. Waste containers are unloaded from the transport trucks via forklift or SkyTrak for transport to the burn pads. Any personnel involved in unloading the wastes must leave their transport vehicles at least 150 feet from the burn pans. Spotters are utilized during the unloading process. At the OD units, the transport trucks distribute the wastes directly to the sub-unit for treatment.

Once all items have been removed from the transport vehicles, all waste transport vehicles are inspected to ensure there are no remaining wastes on the truck. The trucks leave the OB or OD area and retreat to a safe location, after which, the waste containers are opened. The wastes are manually loaded into the pans or on the firing pad saddles at the OB unit and into the detonation pit at the OD units. An Ammunition Surveillance Representative performs routine inspections on the unloading process including visual inspections of the integrity of the waste boxes and of the area for spills and ensuring all prescribed safety measures are performed.

6.4.2 Prevention of Run-Off and Water Supply Contamination from Waste Treatment Areas *[§§270.14(b)(8)(ii) and (iii)]*

There is no stormwater system associated with the incinerator or the OB/OD units. However, there are measures in place to prevent run-off from the areas contaminating the surrounding area. A description of the run-off prevention measures for each of these units is provided below.

6.4.2.1 Prevention of Run-Off and Water Supply Contamination from the Incinerator

All wastes are containerized prior to their arrival at the incinerator. Any residues generated from the treatment process are containerized directly from the process equipment – no manual transfer of residues is necessary from equipment to the holding container. Wastes are not removed from their transport containers until they are within the furnace feed room or MCDF download room, which are fully enclosed buildings. Containers of kiln treatment residues are held in the barrel room, which is a three-sided structure, with the “open” side being closed off with a thick, plastic curtain that prevents rainfall from entering the area. The drums themselves are stored on an elevated roller conveyor, which is installed on top of a concrete floor that is routinely inspected for any debris. Containers of APC residues remain closed at all times, are connected directly to the process equipment, and are stored on top of concrete that can be easily cleaned in the event of a spill during container changeout.

6.4.2.2 Prevention of Run-Off and Water Supply Contamination from the OB Unit

The OB unit is within the drainage basin and approximately 4,000 feet upstream of Rocket Lake. No other perennial surface water bodies lie between the OB unit and Rocket Lake. Runoff from the OB Grounds currently flows northwest to a wooded area adjacent to the site and eventually into Rocket Lake. However, unit design features and operating procedures prevent this run-off from being contaminated by the hazardous waste or treatment residues. All burning is conducted in pans or inside the missile itself (in the case of the static fire pad) during favorable meteorological conditions as described in Section 4. Waste unloading procedures detailed previously are designed to prevent materials from contacting the ground surface. However, should any PEP or residue fall on the ground it will be removed immediately. After each use, the pans and static fire pads are cleaned, and the areas are inspected and cleared of debris and any unreacted wastes.

The OB pans themselves are of sufficient depth to contain the PEP material during burning. Each pan is elevated above the ground using two I-beams to allow complete visual integrity inspection around the pans prior to and after each treatment event. When the unit is not operating, the pans are protected from precipitation accumulation through the use of precipitation covers. Each cover is equipped with handles to allow operations personnel to place it on the pan and remove it. The covers are tight fitting and remain on the burn pans during all non-operational periods. The static-fire skids are located on concrete pads surrounded by 10-foot dirt berms, making it easy to locate and remove any debris.

6.4.2.3 Prevention of Run-Off and Water Supply Contamination from the OD Units

Both OD units consist of sites with exposed soil with sparsely vegetated areas at the perimeters. At OD Area 1, the runoff is channeled to a sedimentation lagoon on the north end of the site and discharges into an unnamed tributary of Chun Creek. At OD Area 2, the majority of the water is channeled to a sedimentation lagoon on the northeast end of the site and eventually into a tributary of Brown Lake. The remaining water is sheet flow to the west edge of the site, which eventually flows into a tributary of Rocket Lake. Quarterly visual observations of stormwater quality are conducted at outfalls at each of the named areas. In addition, annual samples of stormwater runoff are collected and tested for explosives and other analytical parameters as required by MCAAP's industrial stormwater permit from the State of Oklahoma.

OD operations are conducted only during favorable meteorological conditions as described in Section 4. The materials treated by OD are highly reactive and the explosions result in near complete destruction of the energetic components. Only very small amounts of ash residues are generated. The majority of the surface residues remaining after detonation consist of discrete metallic fragments and occasional pieces of PEP, which were not destroyed during the explosion. These visible fragments of PEP are immediately collected following each demolition event, reducing the amount of residue remaining in contact with the soil, and reducing the amount of material that can be transported via run-off to the sedimentation basins.

6.4.3 Mitigation of Impacts from Equipment and Power Failure at the Incinerator *[§270.14(b)(8)(iv)]*

Procedures for mitigating the impacts of equipment and power failures at the incinerator are detailed in the startup, shutdown, and malfunction plan (SSMP) required by the HWC NESHAP, which serves as the primary regulatory mechanism for these events. However, multiple controls are provided to minimize the impact to the environment in the case of a power failure. In the event of a power failure, the waste feeds will automatically stop and all equipment, such as the burners, retort, combustion and ID fans, water pumps, etc., will de-energize. The baghouse will bypass and the emergency quench will be activated. The diesel generator will start, allowing operators to clear out residual munitions and safely and securely shut down the system. Absent potential air emissions increases, which are covered under the HWC NESHAP, the only potential release point for hazardous waste to the environment is via activation of the emergency quench. MCAAP has installed a receiving tank adjacent to the cooler to capture water discharge from the cooler and provided secondary containment to contain any water that escapes.

Power failures at the OB/OD units have no mechanism to impact human health and the environment, as each event is a manually wired operation and operates independent of the main power grid.

6.4.4 Protection Against Personnel Exposure

[§270.14(b)(8)(v)]

In general, personnel are protected from exposure via the enforcement of explosive safety limitations, the use of quantity-distance standards and/or protective structure design, proper training, and the use of personnel protective equipment.

At the incinerator, operations are under the direct control of an experienced and trained supervisor. All operators and personnel are trained in the hazards of the process, wastes, and materials as described in Section 8. During operations, the number of personnel exposed to any hazard is minimized by building occupancy limits enforced through explosive safety limitations. However, at all times, at least two operators must be present in the area when hazardous wastes are present. When wastes are being processed, all personnel are protected via explosive safety barricades that surround the rotary kiln; no personnel are permitted within the barricaded area while wastes are processing (or for some time thereafter). When waste is being processed, operators are required to wear the following PPE to assist in their protection: eye protection, conductive shoes, fire-retardant coveralls, gloves, and head covers.

At the OB/OD units all operators and personnel are trained in the hazards of the process, wastes, and materials as provided in Section 8. During operations, the area is isolated with posted road guards are road blockages. A siren is used to alert that a burn or detonation is imminent. Once ignition charges are set, all but two personnel are removed from the area and return to the shelter, which is minimum of 300 feet from the OB site and 500 feet from the detonation pits. The remaining two personnel prepare the units for ignition or detonation. Once the ignition is set or blasting caps are placed, the remaining two operators also retreat to the shelter. Once ignited, the OB operators observe the burn via surveillance cameras. After any burn or detonation, a minimum wait time of 30 minutes is required prior to re-entry to the burn or detonation location. PPE for the area is task dependent and may include eye protection, conductive shoes, fire-retardant coveralls, gloves, head covers, and safety vests.

6.4.5 Minimizing Unplanned Releases to the Atmosphere

[§270.14(b)(8)(vi)]

Pursuant to 40 CFR §§ 264.340(b) and 270.19(e), detailed information on unplanned releases to the atmosphere from the incinerator is no longer required in the Part B permit application. Procedures for mitigating the impacts of unplanned releases are detailed in the OMP and SSMP required by the HWC NESHAP.

The OB/OD units are open units and therefore all releases to the atmosphere are planned releases.

6.5 Preventing Accidental Ignition or Reaction of Ignitable, Reactive, or Incompatible Waste

[§270.14(b)(9) and §264.17]

MCAAP has in place the measures identified in the sections that follow to prevent the accidental ignition or reaction of those wastes managed at the incinerator and OB/OD units.

6.5.1 Precautions to Prevent Ignition or Reaction of Ignitable or Reactive Waste

[§270.14(b)(9) and §264.17]

The very nature of the thermal treatment process results in reactions that produce heat, explosion, fire, and/or dust. However, appropriate procedures and precautions are in place to ensure that all reactions are controlled and do not threaten either human health or the environment, nor damage the structural integrity of the treatment units. These precautions include:

- No incompatible wastes are managed at any of the thermal treatment facilities.
- Smoking and open flames are prohibited within the restricted area of the facility, which includes the incinerator and OB/OD units.
- Motor vehicles and equipment employing internal combustion engines used in the vicinity of explosive areas or for transporting waste military munitions and energetic materials are equipped with exhaust systems fitted with effective spark and flame arresting devices in the exhaust lines. Vehicles are kept a safe distance from all active treatment operations at all times.
- Blasting caps for the OD operations are stored in approved containers only and are kept separate from explosives.
- Explosive materials to be used during the treatment process at the OD grounds are located in the Explosives Ready-Service Bunker where they remain dry, cool, and out of the direct rays of the sun.
- A lightning protection system has been installed around the incinerator unit to ensure that incidental ignition of the wastes cannot occur due to a lighting strike at the unit.
- Burning and detonation operations at the OB/OD units are not conducted during or upon the approach of an electrical storm.
- The maximum allowable quantities of explosives in the incinerator area, in the furnace itself, and treated during any OB and/or OD event are controlled via explosive safety limits and are never exceeded.
- The ignition train used to initiate the burning of propellants at the OB ground is arranged to lead downwind to the material to be burned.
- A thorough search of the treatment area is made after each use of the OB and OD units for any material that may not have burned or detonated as described in Section 6.2.2.

6.5.2 Precautions to Prevent Reactions of Incompatible Wastes

[§270.14(b)(9), §264.17]

No incompatible wastes are managed at the incinerator or OB/OD thermal treatment facilities. All materials are segregated per explosive safety requirements.

Attachment 6-1: BARRIER AND WARNING SIGN FIGURES

FIGURE 6-1
OB/OD UNITS ACCESS GATE

FIGURE 6-2
INCINERATOR WARNING SIGN

FIGURE 6-3
OB/OD WARNING SIGN AND LIGHT

7.0 RCRA CONTINGENCY PLAN

This section describes the Contingency Plan for the incinerator and the OB/OD units and is being provided pursuant to the requirements specified in 40 CFR Part 270 Subpart B and 40 CFR Part 264 Subparts C and D. This contingency plan is also intended to satisfy the additional requirements of OAC § 252:205-13-1. The actual contingency plan is provided as a stand-alone document in Attachment 7-1 to facilitate distribution of the plan to emergency response personnel and local authorities.

7.1 GENERAL INFORMATION

[§270.14(b)(7)]

Section 1 of the Contingency Plan in Attachment 7-1 provides general information that may be required for emergency responders to respond to events within the MCAAP. Information is provided on the incinerator and OB/OD units, the wastes managed, and potential emergency situations that could arise.

7.2 EMERGENCY COORDINATORS

[§270.14(b)(7), §264.52(d), and §264.55]

The designated emergency coordinators for hazardous waste emergencies are identified in Section 2 of the Contingency Plan in Attachment 7-1. Responsibilities for the designated individuals are also presented.

7.3 IMPLEMENTATION

[§270.14(b)(7), §264.52(a), and §264.56(d)]

The provisions of the Contingency Plan in Attachment 7-1 will be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents at the incinerator or the OB/OD units that could threaten human health or the environment. Information on plan implementation and the potential emergency situations that could arise is presented in Section 3 of the Contingency Plan.

7.4 EMERGENCY ACTIONS

[§270.14(b)(7), §264.56, and OAC §252:205-13-1]

The actions that will be taken in case of an emergency at the incinerator or OB/OD units are detailed in Section 4 of the Contingency Plan in Attachment 7-1.

7.5 EMERGENCY EQUIPMENT

[§270.14(b)(7) and §264.52(e)]

Section 5 of the Contingency Plan in Attachment 7-1 identifies the emergency response equipment in the proximity of the incinerator and OB/OD units and provides a listing of where such equipment is located.

7.6 ARRANGEMENTS WITH LOCAL AUTHORITIES

[§270.14(b)(7), §264.37, and §264.52(c)]

Arrangements with local authorities are described in Section 6 of the Contingency Plan in Attachment 7-1.

7.7 EVACUATION PLAN FOR MCAAP PERSONNEL

[§270.14(b)(7) and §264.52(f)]

The evacuation plans for the incinerator and OB/OD units are described in Section 7 of the Contingency Plan in Attachment 7-1. Due to the isolation of the units, evacuation beyond the immediate area is not anticipated to be necessary.

7.8 REQUIRED REPORT PROCEDURES FOR RECORDKEEPING AND REPORTING TO FEDERAL AUTHORITY

[§270.14(b)(7), §264.56(i), and OAC §252:205-13-1]

Recordkeeping and reporting procedures are described in Section 8 of the Contingency Plan in Attachment 7-1.

7.9 AMENDMENT OF THE CONTINGENCY PLAN

[§270.14(b)(7) and §264.53]

Conditions under which the Contingency Plan will be updated and information on the location and distribution of the plan is detailed in Section 9 of the Contingency Plan in Attachment 7-1.

Attachment 7-1: RCRA CONTINGENCY PLAN

MCALESTER ARMY AMMUNITION PLANT
MCALESTER, OKLAHOMA

HAZARDOUS WASTE CONTINGENCY PLAN FOR AMMUNITION PECULIAR EQUIPMENT 1236M2 DEACTIVATION FURNACE AND OPEN BURN/OPEN DETONATION UNITS

DECEMBER 2022

Coterie ENVIRONMENTAL
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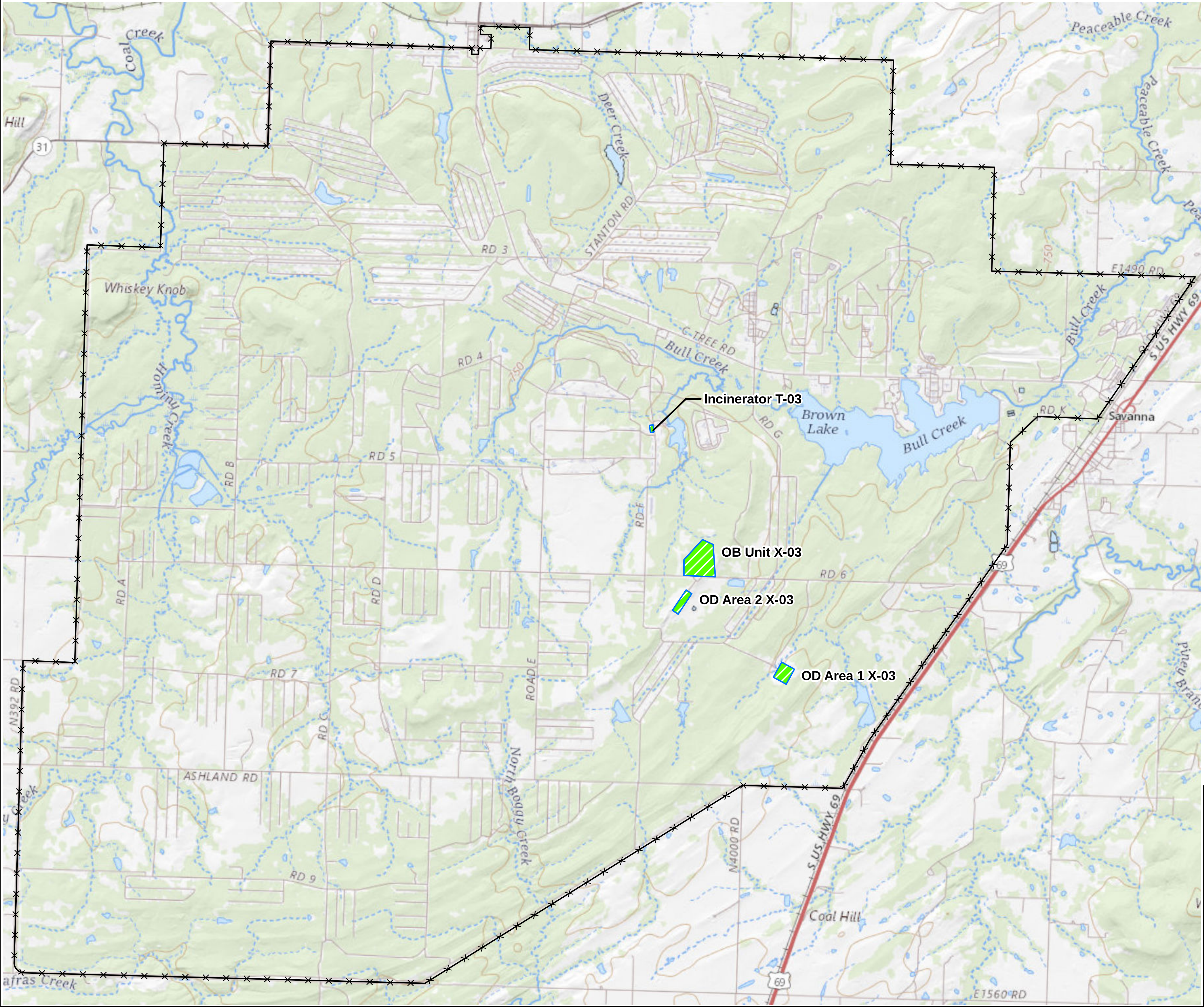
1.0 GENERAL INFORMATION

This Contingency Plan has been prepared for the Ammunition Peculiar Equipment 1236M2 Deactivation Furnace (herein referred to as the incinerator) and the Open Burn/Open Detonation (OB/OD) units operated at the McAlester Army Ammunition Plant (MCAAP) in McAlester, Oklahoma. This plan is intended to satisfy the requirements of 40 CFR Part 270 Subpart B, 40 CFR Part 264 Subpart D and the Oklahoma Administrative Code (OAC) Title 252, Chapter 205-13-1. This stand-alone plan has been prepared to facilitate distribution to the various agencies that may assist with emergency response activities. Administratively, the Contingency Plan resides in Section 7 of the facility's RCRA Part B permit application.

The objective of this Contingency Plan is to minimize hazards to human health and the environment from fires, explosions, or any unplanned sudden or non-sudden releases of hazardous waste or hazardous waste constituents to the air, soil, or surface water from the incinerator and the OB/OD units. This plan defines the actions to be taken in the event of an incinerator or OB/OD emergency that could threaten human health or the environment.

The incinerator and OB/OD units at the MCAAP are used to thermally treat energetic and explosive waste material. Treatment operations at the incinerator are performed in a rotary kiln that is equipped with an afterburner and air pollution control (APC) system. Wastes are fed into the incinerator from one of two feed systems: the conventional feed system and the positive feed system (PFS) from the Munitions Cryofracture Demilitarization Facility (MCDF). The OB unit consists of five burning pads and three static-firing pads. Wastes treated at the burning pads are placed in elevated, refractory lined steel pans for burning. Each burn pad at the OB unit contains five separate burn pans. At the rocket static-fire pads, the rocket is placed onto the saddle of the pad, strapped down, and burned out. The concrete firing pads and burning pads are located in a leveled open area that is cleared of all vegetation. The firing pads are located approximately 300 feet from the burning pads. There are two OD units (OD Area 1 and OD Area 2), each consisting of a series of 26 pits connected by an access road. Explosive items are placed in the pits, wired for detonation, and covered with a minimum of two feet of dirt. Detonations are initiated by remote firing from inside a shelter. Both the pits and the access roads are excavated to approximately 10-15 feet below grade and are constructed of the naturally occurring soil.

The incinerator is located in the central portion of the MCAAP. The OB unit and OD Area 1 are located in the east-central portion of the facility and OD Area 2 lies in the southeast section. The overall location of these units relative to the MCAAP fence-line and surrounding area are shown in Figure 1-1 of this attachment. MCAAP is located in the southwest section of Pittsburg County, Oklahoma. Each of the thermal treatment units are located outside of the 100-year flood plain.



Legend

- Facility Boundary / Fence line
- Thermal Treatment Units

0 2,500 5,000 FEET

1" = 5,000 FEET
1:60,000

MCALESTER ARMY AMMUNITION PLANT (MCAAP)
1 C TREE ROAD
MCALESTER, OK 74501

ATTACHMENT 7-1, FIGURE 1-1
LOCATION OF INCINERATOR AND OB/OD UNITS

DRAWN BY:	L WILSON	SCALE:		PROJ. NO.	RCRA 2022
CHECKED BY:	P HARRELL		AS NOTED	FILE NO.	Project.mxd
APPROVED BY:	P HARRELL	DATE PRINTED:			
DATE:	December 2022		12/13/2022		

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2.0 EMERGENCY COORDINATORS

[§264.52(d) and §264.55]

The Emergency Coordinator (EC) has the responsibility for coordinating all emergency incidents at the incinerator and the OB/OD. The Fire Chief is the primary EC at MCAAP for fire related emergencies, with the Assistant Fire Chief being the secondary EC. The Federal On-Scene Coordinator is designated as the primary EC at MCAAP for spill related emergencies. In accordance with 40 CFR § 264.55, the assigned EC for each type of emergency is familiar with all aspects of this Contingency Plan, all operations and activities of the facility, the location and characteristics of the hazardous wastes, the locations of all hazardous waste records, and the facility layout. The ECs have the authority to utilize resources, such as emergency equipment, and the authority to mobilize personnel to carry out the Contingency Plan.

In the event of an emergency, the EC or their designee is responsible for providing all necessary internal and external notifications, assisting with the characterization, management, and mitigation of the emergency and associated releases, performing all post-incident notifications, and ensuring for proper handling and disposal of all hazardous wastes and other materials generated during the emergency response effort. The EC may be assisted by various subject matter experts in these response efforts. In the case of explosive wastes, the Duty Supervisor will provide support and expertise during a fire response effort. The Duty Supervisor is considered a technical expert for munitions incidents in accordance with 29 CFR § 1910.120 and 40 CFR Part 311.

An emergency contact list, including phone numbers for key emergency contacts, is provided in Table 2-1 of this Contingency Plan. Names and addresses of personnel identified in this table are protected for security reasons. This information is maintained on-site and is readily accessible by the security and human resource departments. At all times, there is at least one employee either on the facility premises or on call (*e.g.*, available to reach the facility within a short period of time) with the responsibility for coordinating all emergency response measures.

ATTACHMENT 7-1, TABLE 2-1
MCAAP EMERGENCY CONTACT INFORMATION

EMERGENCY CONTACT[1]	POSITION	24- HOUR PHONE NUMBER
Fire Chief	Fire Emergency Coordinator	From Cell Phone or Off-Site Phone: 918-420-6221 From On-Site Phone: 911
Assistant Fire Chief – Fire Emergency Coordinator	Alternate Fire Emergency Coordinator	918-420-6221
Duty Supervisor (Senior Fire Officer)	Technical expert	918-420-6221
Federal On-Scene Coordinator	Spill Emergency Coordinator	From Cell Phone or Off-Site Phone: 918-420-6551 From On-Site Phone: 911
Environmental Representative	Plant environmental representative	918-420-6551
Safety Representative	Plant safety representative	918-420-7233

1 In order to enhance the protection of defense services and articles and to protect the unauthorized export of defense information under the International Traffic in Arms Regulations (ITAR), promulgated in 22 CFR Parts 120 through 130, the actual contact information of individual persons in the employ of MCAAP have been withheld from this Permit. This information is readily available for review and inspection at the facility upon request. The relevant data is also readily available to facility security and supervision to respond to an emergency.

3.0 IMPLEMENTATION

[§264.52(a) and §264.56]

The provisions of this Contingency Plan shall be immediately implemented whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents from the incinerator or OB/OD units that could threaten human health or the environment. The decision of whether to implement this plan shall rest on the EC. Small releases that do not substantially threaten human health or the environment do not activate this RCRA contingency plan.

3.1 TYPES AND IMPACTS OF EMERGENCIES

The primary hazards associated with the management and handling of hazardous waste at the incinerator and the OB/OD are fires, explosions, and spills of material. In addition to the primary hazards of fires and explosions, there does remain a potential for flooding at the site.

3.1.1 FIRES AND EXPLOSIONS

Under reasonably foreseeable conditions, the types and quantities of materials treated at the incinerator and the OB/OD units would not result in a significant environmental release that could spread beyond the MCAAP boundary. In the event of fires, the combination of natural firebreaks, paved roads, and man-made firebreaks will keep fires from spreading beyond the units themselves. In the case of explosions, individual operations at MCAAP are separated by appropriate distances for the rated quantity of explosives such that an incident at one unit should not propagate to other surrounding units.

In the event of a fire or explosion at the incinerator or OB/OD units, the Contingency Plan will be implemented if any of the following should occur:

- A fire causes the release of toxic fumes.
- The fire spreads and could possibly ignite materials at other locations on site or could cause heat-induced explosions.
- The fire has the potential to spread to off-site areas.
- The use of water or a water and chemical fire suppressant could result in contaminated runoff.
- An imminent danger exists that an explosion could occur, causing a safety hazard from flying fragments or shock waves.
- An imminent danger exists that an explosion could ignite other hazardous wastes at the unit.
- An imminent danger exists that an explosion could result in the release of a toxic material.
- An explosion has occurred.

3.1.2 SPILLS

In the event of a spill at the incinerator or OB/OD units, the Contingency Plan will be implemented if any of the following should occur:

- The spill could result in a release of flammable liquids or vapors, thus causing a fire or gas explosion hazard.
- The spill could cause the release of toxic liquids or fumes.
- The spill can be contained on-site, but the potential exists for groundwater contamination.
- The spill cannot be contained on-site and will likely result in off-site soil contamination and/or ground or surface water contamination. Note this potential is extremely unlikely given the nature of the managed wastes and the location of the treatment units.

3.1.3 FLOODING

The incinerator and OB/OD units are not located within the 100-year floodplain and the potential for a release due to flood is small. However, in the event of a major flood, the contingency plan may be implemented if the potential exists for surface water contamination from wastes or residues within the units themselves.

4.0 EMERGENCY RESPONSE PROCEDURES

[§264.52(a), §264.56, and OAC §252:205-13-1]

The actions that will be conducted in case of an emergency situation at the incinerator or OB/OD are detailed herein.

4.1 NOTIFICATION

For emergency events at the incinerator or OB/OD units, the person discovering the incident shall activate emergency response procedures using the 9-1-1 system and promptly notify the Duty Supervisor. The Duty Supervisor will confirm the incident and provide notification to the appropriate EC (*i.e.,* fire or spill emergency coordinator) and emergency response personnel. The EC is responsible for notification of appropriate internal response teams as well as local response agencies, when appropriate. Notifications may also be made to the Oklahoma Department of Environmental Quality (ODEQ) if necessary.

4.2 ASSESSMENT OF HAZARDS

The EC will immediately identify the character, exact source, amount, and areal extent of the hazardous waste release by interviewing site personnel and visually inspecting the location of the release (to the extent possible). The EC will assess potential hazards, both direct and indirect, to human health and the environment. The Duty Supervisor will provide support for the assessment of hazards in situations involving waste explosives.

4.3 CONTROL MEASURES AND RESPONSE PROCEDURES

The primary emergencies that may arise at the incinerator or the OB/OD units are fires, explosions, and spills. A secondary type of emergency could exist in the event of flooding. The sections that follow present the measures that will be taken to mitigate the potential hazard and impact of an emergency event at the incinerator or the OB/OD units.

4.3.1 FIRES AND EXPLOSIONS

Actions appropriate to controlling and preventing the spread of fires will be selected and implemented by the EC and trained, professional MCAAP fire fighters. MCAAP will rely upon their professional, on-scene judgment in selecting a course of action that is most protective of human health and the environment. Similarly, the knowledge and training of on-scene ordnance experts will be used in determining the most appropriate response to actual or potential uncontrolled explosions or releases of reactive hazardous wastes.

During an emergency event, the following measures will be taken as appropriate to mitigate the potential hazard and impact of the emergency:

- Operations at the affected unit will be interrupted or suspended.
- The Duty Supervisor will immediately notify the Fire EC and MCAAP emergency response personnel.
- An assessment will be made of any potential or imminent threat to human health or the environment.
- The affected area will be delineated and evacuated as determined by the EC.
- Traffic will be rerouted around the affected unit, if deemed necessary by the EC.
- Emergency response personnel will contain the fire or explosion using appropriate available emergency equipment to the degree it is safe to do so.
- The area will be cleaned of all hazardous wastes and materials using emergency equipment.
- Contaminated materials will be placed in appropriate containers and removed from the site.
- All equipment utilized in the response will be cleaned and serviced prior to the resumption of operations in the affected area.
- The Safety Officer and EC will certify the affected area as clean.
- The EC will determine the cause of the incident and define the actions to be taken to prevent or minimize the potential for future recurrence.
- Any required follow-up reports will be filed by the Environmental Office.

4.3.2 Spills of Hazardous Waste or Materials

Small spills that do not substantially threaten human health or the environment do not activate this RCRA contingency plan. For major spills or releases, the initial response will be to protect human health and the environment. Actions appropriate to containing a spill or release of hazardous waste or materials will be selected and implement by the EC. During such an event, the following measures will be taken to mitigate the potential hazard and impact of the emergency:

- The Duty Supervisor will immediately notify the Spill EC and MCAAP emergency response personnel.
- The EC will deploy the necessary emergency response personnel to the affected unit.
- The area supervisor of the affected unit will provide information regarding the type, quantity and rate of materials spilled, and the extent of any injuries or exposures that may have occurred.
- The EC will assess the potential for fire or explosions that may be likely to result from the spill. The area supervisor and Duty Supervisor will provide support in this assessment.
- The EC will initiate an evacuation of the area of all unnecessary personnel, if appropriate.
- The EC will direct the emergency response personnel in the spill containment response or in measures to stop the release of any leaking waste material.

Hazardous wastes at the thermal treatment units are primarily solids. The following guidelines will be used in case of an accidental release of hazardous wastes. These are general guidelines and circumstances may dictate some alterations to these procedures.

- All surrounding materials that may react with the spill will be removed.
- Spilled hazardous wastes will be placed into compatible containers.
- The area will be triple flushed with water and the water will be pumped into compatible containers. The hazards of the wash-water will be characterized and managed accordingly.
- Waste materials from damaged or leaking containers will be placed into new compatible containers or the damaged drum will be placed into an over-pack. These containers will be managed and disposed in accordance with applicable environmental requirements.
- All containment and cleanup materials, and any recovered liquid wastes or contaminated soil, will be placed in appropriate, compatible containers for proper waste characterization.
- All emergency equipment used must be cleaned and fit for future use, prior to resumption of operations in the affected area.

4.3.3 Floods

All thermal treatment areas are outside of the 100-year floodplain. However, should flooding become imminent at any of the thermal treatment areas, the EC will identify a temporary storage location(s) outside of the potential flood zone with the capacity for all hazardous wastes and residues within the potentially impacted area. All hazardous waste will be relocated to this temporary location. Should a new central accumulation area be necessary to hold these wastes during the flooding event, MCAAP will notify ODEQ. In the event that wastes cannot be removed in time, any potential release resulting from the flooding will be managed consistent with the procedures provided above for spill responses.

4.4 Post-Emergency Actions

Should any event occur that would require implementation of this Contingency Plan, MCAAP will perform a post-emergency evaluation to determine the potential for mitigating or preventing future recurrences. At a minimum, future operations at the unit will be suspended and an investigation of the incident will be conducted to determine the reasons for the occurrence. Based on the results of the investigation, any appropriate changes will be instituted prior to resumption of operations. In addition, the following post-emergency response actions will be taken:

- Immediately after an emergency, the Environmental Office will arrangements for treatment, storage, or disposal of recovered wastes, contaminated soil, surface water, or any other contaminated material.
- The EC and personnel from the Environmental Office will ensure that wastes that may be incompatible with the released material are not treated, stored, or disposed of in the affected area(s) of the unit.
- All emergency equipment will be cleaned so that it is fit for use, or it will be replaced. Before operations are resumed, an inspection of all safety equipment will be conducted.

5.0 EMERGENCY EQUIPMENT

[§264.52(e)]

Various types of emergency equipment, such as fire extinguishing systems, spill control and cleanup equipment, and communication and alarm systems, may be used to respond to emergency situations at the incinerator and OB/OD units. A summary of the available equipment is provided in Table 5-1. The location of each type of equipment that can be employed across the MCAAP facility is shown on Figures 5-1 through 5-4 of this attachment.

Please note that these maps have been declared controlled unclassified information (CUI) by the DoD and require protection from dissemination under 32 CFR Part 2002. These maps have been redacted from all public versions of this application to protect National security concerns. Access to and dissemination of those items marked CUI shall be allowed as necessary and permissible to any individual(s), organization(s), or grouping(s) of users, provided such access or dissemination is consistent with or in furtherance of a Lawful Government Purpose and in a manner consistent with applicable law, regulations, and Government-wide policies

ATTACHMENT 7-1, TABLE 5-1
SUMMARY OF AVAILABLE EMERGENCY EQUIPMENT

TYPE	EQUIPMENT	DESCRIPTION
	FIRE DEPARTMENT	
Vehicles	Class A pumper (3)	Fire truck
	Brush pumper – 4WD (2)	
	Mini pumper – 4WD	
	Fire truck	
	200-gallon tanker	
	Pumper – 4WD	
	Ambulance (2)	Emergency Vehicle
	All-terrain vehicles (2)	
	Suburban 4-WD	
Communications	Two-way radio	Two-way radio communications device
Personal Protective Equipment	Gloves, booties, chemical boots, Level A and Level B suits, SCBA	Emergency personal protective equipment
Spill Response	Absorbent pads	Absorbent materials
	Booms, bags, drum puncture kits, sealing putty, plug and wedge kit, 85-gallon overpack drums	Containment and drum repair
	Caution tape, brooms, drum liners, non-sparking shovels	Spill clean-up materials

Attachment 7-1, Table 5-1 (continued)
Summary of Available Emergency Equipment

Type	Equipment	Description
Central Accumulation Areas		
Personal Protective Equipment	Gloves, polyethylene coveralls, eye/face protection	Emergency personal protective equipment
Spill Response	Absorbent pads, rolls, sorbents	Absorbent materials
	Booms, socks, secondary containment pallet, 55-gallon drums, 85 to 110-gallon overpack drums	Containment
	Brooms, shovels	Spill clean-up materials
Emergency Response	Emergency shower, emergency eye-wash station	Emergency response and decontamination
Other	Hazardous waste labels, DOT labels, markers, Emergency Response Guidebook (ERG)	Marking and labeling
Spill Response Trailer		
Personal Protective Equipment	Gloves, booties, level B/C coveralls, polyethylene coveralls	Emergency personal protective equipment
Spill Response	Absorbent pads, rolls, sorbents	Absorbent materials
	Booms, socks, epoxy putty, hazardous material bags, overpack drums	Containment
	Brooms, dust pans, hand pump	Spill clean-up materials
Emergency Response	Hand wipes, Uvex bionic shield, saline eye wash bottles	Emergency response and decontamination
Other	Chemical classifier kit, sample jars, pipets with bulb	Characterization and sampling
Incinerator, OB, and OD Units		
Spill Kit	Absorbent pillows, sorbents	Absorbent materials

THE CONTENTS OF THIS PAGE HAVE BEEN REDACTED TO PROTECT NATIONAL SECURITY CONCERNS.

THE INFORMATION PRESENTED ON THIS PAGE WAS SUBMITTED AS CONFIDENTIAL BUSINESS INFORMATION BECAUSE DEPARTMENT OF DEFENSE REPRESENTATIVES DETERMINED THAT THE INFORMATION PRESENTED INCLUDED MATERIAL CLASSIFIED AS "CONTROLLED UNCLASSIFIED INFORMATION" (CUI) PURSUANT TO 32 CFR PART 2002.

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6.0 ARRANGEMENTS WITH LOCAL AUTHORITIES

[264.37, §264.52(c)]

In general, the resources of MCAAP, including fire protection, medical facilities, and security personnel, are sufficient to respond to any potential emergency presented by hazardous wastes stored or processed on-site. However, MCAAP has provided necessary coordination with local officials regarding emergency response as required by 40 CFR § 264.37. Any off-site local emergency units assisting with an incident will work under the direct supervision and advice of the MCAAP Fire Department, Security Force, or the EC.

Coordination agreements for mutual aid in fire prevention and hazardous materials incident response, in the protection of life and property from fire and hazardous materials incident, and in firefighting have been made with the following organizations:

- City of McAlester Fire Department
- Pittsburg County Emergency Management
- Stuart Communities
- City of Savanna
- Haywood/Arpelar Communities

Coordination agreements for emergency medical response have been made with the following organization:

- McAlester Regional Health (MRHC)

These agreements will be updated as necessary and maintained onsite for review and inspection.

7.0 EVACUATION PLAN FOR FACILITY PERSONNEL

[§264.52(f)]

In the event that one of the permitted units or a nearby area the MCAAP must be evacuated, the following procedures will be followed:

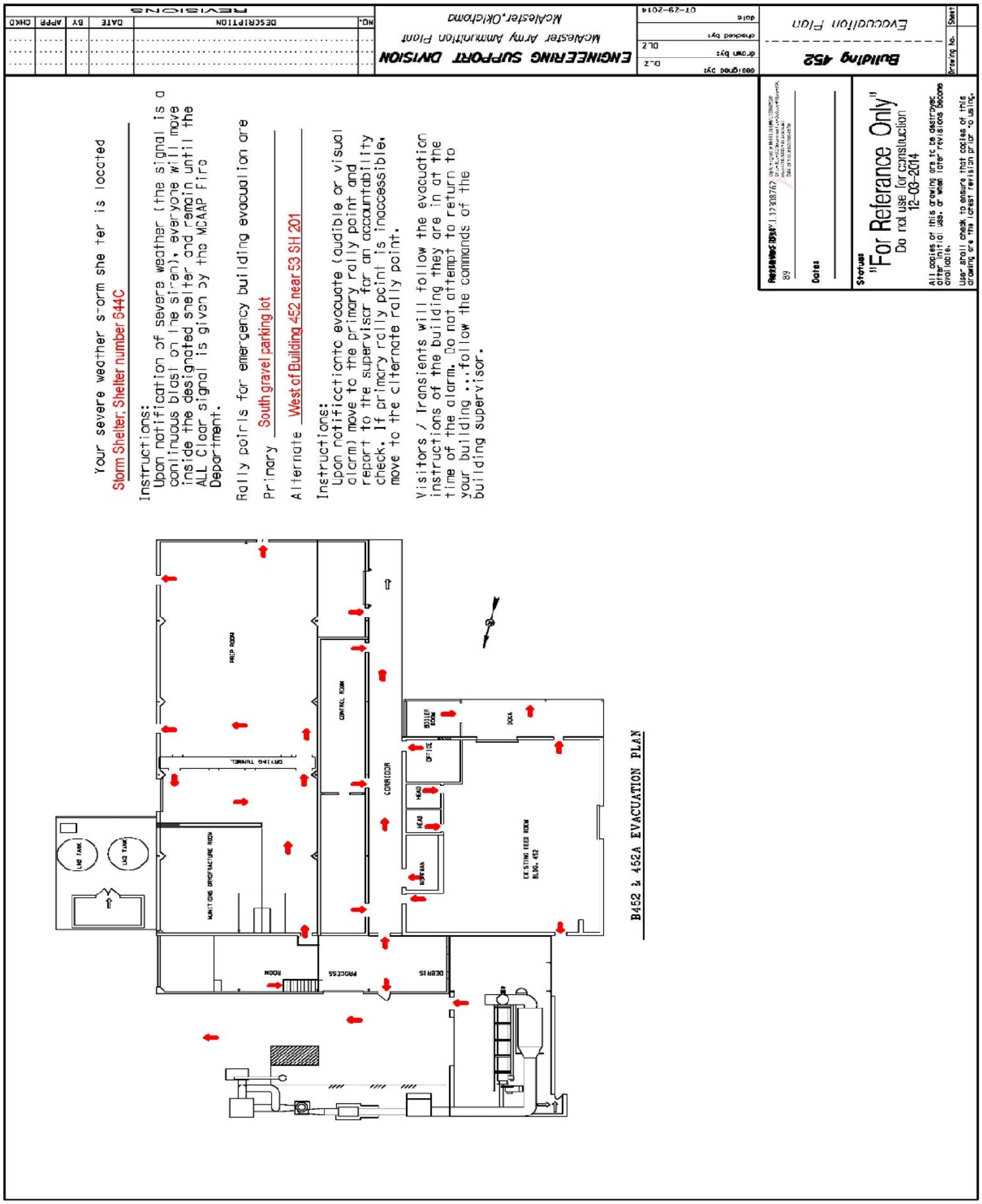
- Notification to evacuate will be provided via either an audible or visual alarm.
- All transient workers will follow the evacuation instructions of the building they are in at the time of the alarm.
- All visitors will be escorted or otherwise directed by their plant contact.
- Upon notification to evacuate, personnel will move to the rally point following the primary evacuation route.
- If the primary rally point is inaccessible, personnel will move to the alternate rally point.
- The area supervisor will coordinate a post-evacuation employee and visitor roll call. The visitor sign in/out register will be utilized to verify the presence of all area visitors.
- All personnel will remain at the rally point until the all clear signal is given.

In addition, evacuations may be required for severe weather, as it has the potential to lead to an event requiring implementation of this Contingency Plan. For severe weather, the following procedures will be followed:

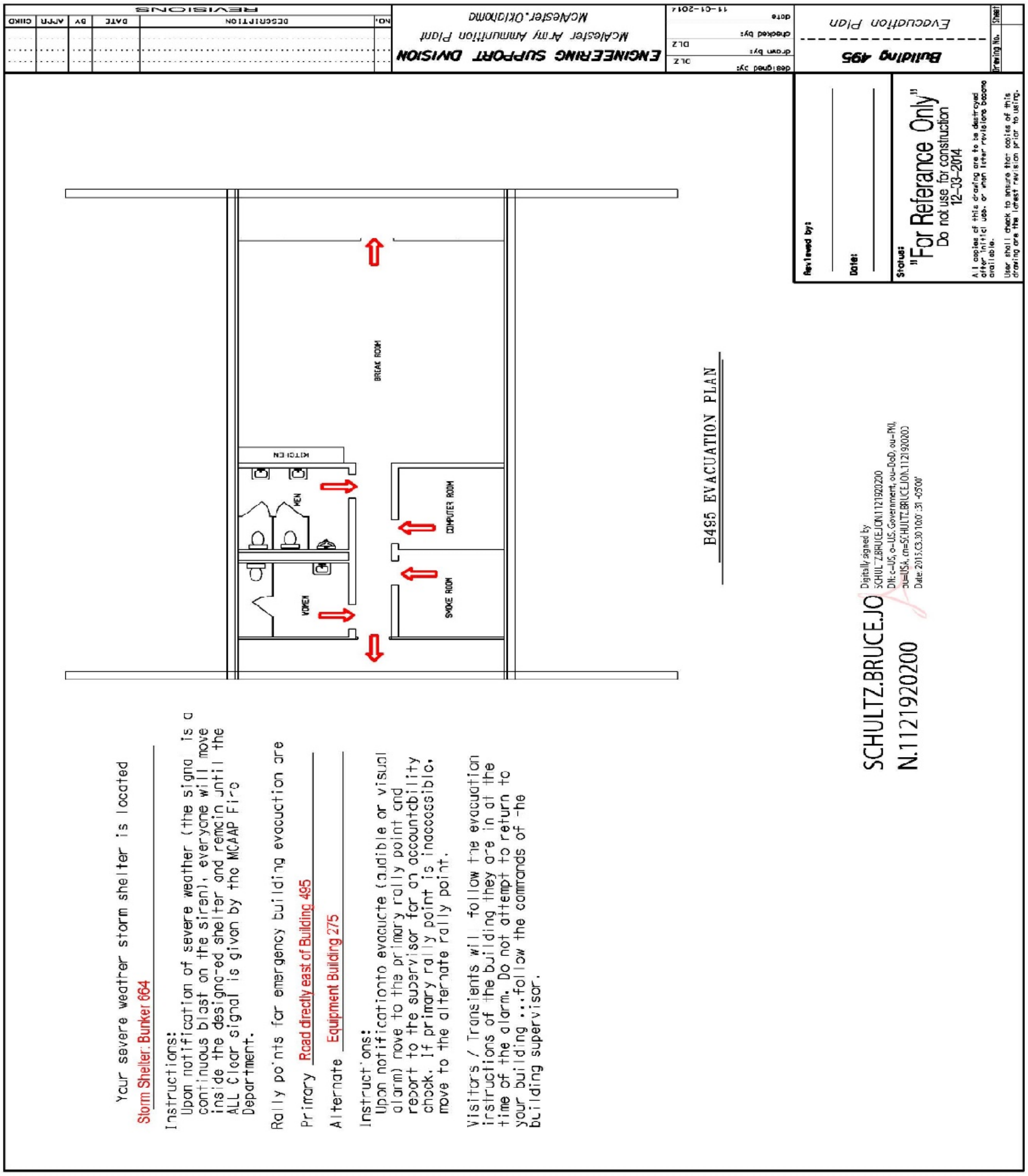
- The severe weather notification will be provided by a continuous blast of the outdoor civil defense siren.
- Plant personnel will evacuate to the designated storm shelter for the area.
- All personnel will remain in the shelter until the all clear signal is gen by the MCAAP Fire Department.

Evacuation routes for each of the thermal treatment areas are provided in Figures 7-1 through 7-3 of this attachment.

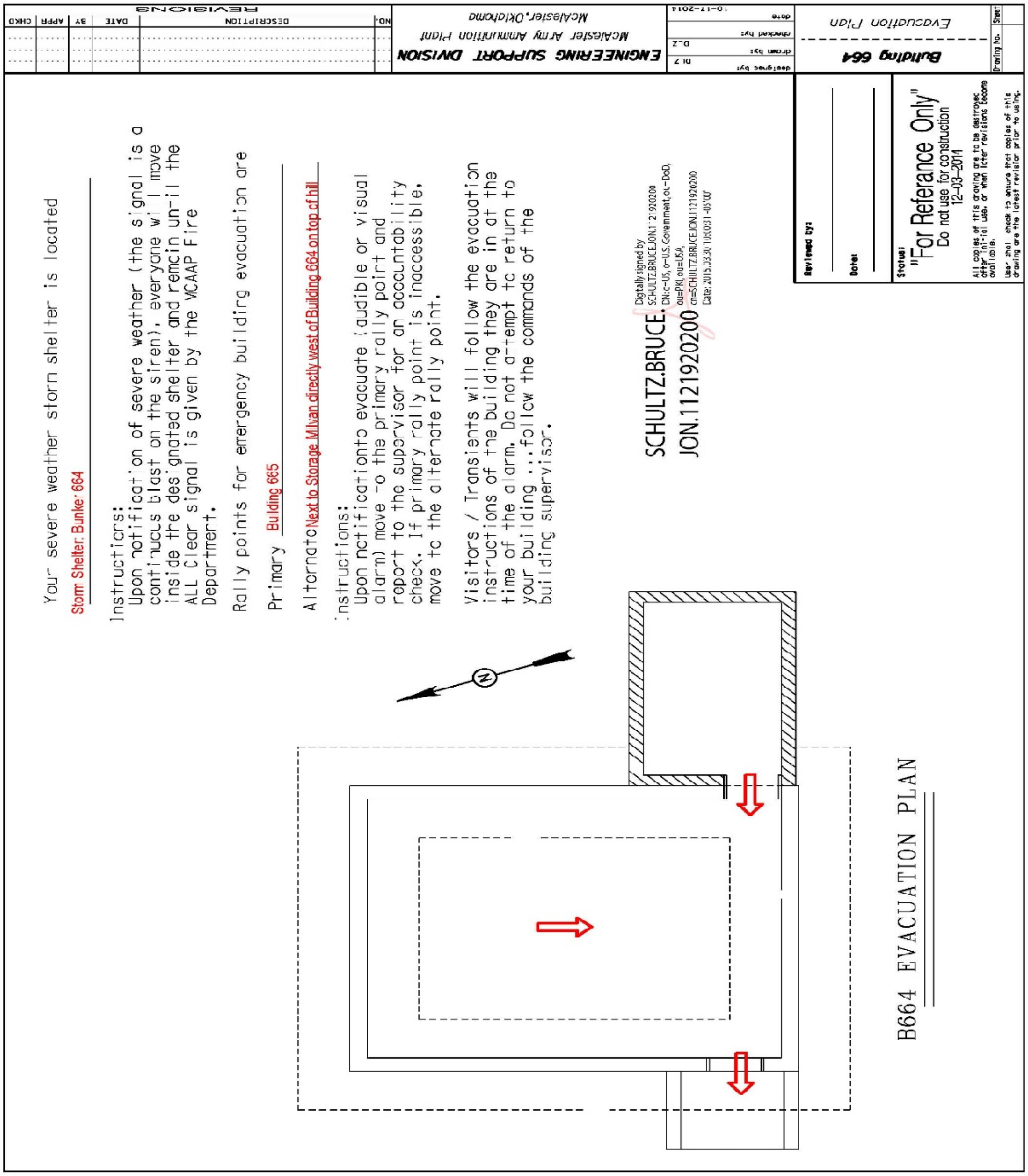
ATTACHMENT 7-1, FIGURE 7-1
EVACUATION ROUTES FOR THE INCINERATOR



ATTACHMENT 7-1, FIGURE 7-2
EVACUATION ROUTES FOR THE OB UNIT AND OD AREA 2



ATTACHMENT 7-1, FIGURE 7-3
EVACUATION ROUTES FOR OD AREA 1



8.0 REPORTING REQUIREMENTS

[§264.56(i) and OAC §252:205-13-1]

The Environmental Office is responsible for all reports to the ODEQ or to the National Response Center (NRC) that may be required upon activation of the Contingency Plan. Upon a release of hazardous waste that may threaten human health or the environment, except, pursuant to OAC § 252:205-13-1, those that are completely contained in a secondary containment area, an immediate notification will be made to ODEQ. In addition, if a notification is required to the NRC, the ODEQ will also be immediately notified. Contact information for these agencies is as follows:

- ODEQ Reporting: (800) 522-0206
- NRC Phone Hotline: (800) 424-8802

Within 15 days after an incident requiring the implementation of this Contingency Plan, the Environmental Office will submit a written report on the incident to the ODEQ. The report will include the following information:

- Name, address, and telephone number of the owner or operator.
- Name, address, and telephone number of the facility.
- Date, time, location, and type of incident (*i.e.*, fire, explosion).
- Name and quantity of material(s) involved.
- The extent of injuries, if any.
- An assessment of actual or potential hazards to human health or the environment, where this is applicable.
- Estimated quantity and disposition of recovered material that resulted from the incident.

9.0 AMENDMENT OF THE CONTINGENCY PLAN

[§264.53]

This contingency plan will be reviewed annually and amended whenever any of the following occurs:

- The facility permit is revised.
- The plan fails during an emergency.
- The facility changes in its design, construction, operation, maintenance, or other circumstances in a way that materially increases the potential for fires, explosions, or releases of hazardous waste or hazardous waste constituents, or changes the response necessary in an emergency.
- The list of emergency coordinators or contact points changes.

Whenever the plan is modified, it will be distributed to relevant on-site offices for review. Copies of this plan are maintained at the Fire Department and the office of the Installation Commander. Electronic copies are available to all MCAAP personnel through the facility intranet.

8.0 PERSONNEL TRAINING

This section presents a description of the training program for MCAAP personnel involved in the operation of the incinerator and the OB/OD units and is being provided pursuant to the requirements specified in 40 CFR Part 270 and Part 264.

8.1 OUTLINE OF PERSONNEL TRAINING PROGRAM

[§270.14(b)(12) and §264.16]

The purpose of the MCAAP hazardous waste training program is to train personnel who are responsible for implementing the hazardous waste management program in accordance with 40 CFR § 264.16. Personnel who handle hazardous waste at the permitted units must successfully complete a program of classroom instruction to prepare them to operate and maintain the facility in a safe manner and ensure the facility's compliance with 40 CFR Part 264. The amount and level of training will be tailored to each individual's job and duties and level of responsibility. Personnel will receive both introductory and continuing training through classroom instruction and on-the-job training in hazardous waste management. No employee works unsupervised until they have completed the formal training.

The sections that follow describe the individuals that are included in the training program, the topics that are addressed, and the frequency with which training is completed.

8.1.1 JOB TITLE/JOB DESCRIPTION

[§270.14(b)(12) and §264.16(d)]

40 CFR § 264.16(d) requires MCAAP to maintain the job title for each position at the facility related to hazardous waste management and the name of the employee filling each job. The complete written job description for each employee performing hazardous waste duties is maintained at the Environmental Coordinator's office.

8.1.2 TRAINING CONTENT AND TECHNIQUES

[§270.14(b)(12) and §§264.16(a) and (c)]

The sections below provide an overview of the training topics and methods used to administer training to personnel with waste handling duties.

8.1.2.1 INITIAL TRAINING

All personnel assigned hazardous waste duties at the incinerator and OB/OD units will complete the Defense Hazardous Waste Course initial training within six months of their hazardous waste management assignment or date of employment, whichever is later. The purpose of this training is to familiarize personnel with the hazardous waste units and operations at MCAAP and to outline emergency procedures.

The initial training consists of an approximate 24 hours of classroom instruction in hazardous waste operations and covers the following topics:

- Hazardous material (HM) and hazardous waste (HW) challenges
- Pollution prevention
- HM/HW laws and regulations
- Classifying HM and HW
- Health effects
- Identifying and labeling
- Accumulation management
- Contingency planning

The course meets initial general training requirements for HM/HW managers in accordance with 40 CFR §§ 262.16 and 262.17.

In addition, all personnel working at the incinerator and OB/OD units receive detailed training on procedures related to the proper operation of the unit. Employee training in automatic waste feed cut-off systems at the incinerator is included in an initial and annual refresher training course under the HWC NESHAP.

8.1.2.2 Annual Refresher Training

All hazardous waste handling personnel will receive continuing training on an annual basis. Continuing training will consist of an approximate 8-hour review of the initial training program, followed by discussions and reviews on the following:

- Current hazardous waste types being handled by MCAAP including characteristics, volume, source, and location.
- Current treatment, storage, operating conditions and procedures relating to these wastes. This includes identification of current or potential problems in treatment, storage, operating conditions, procedures, and handling with special emphasis placed on employee participation in identifying problem areas and seeking effective solutions.
- Requirements contained in the facility's RCRA permit are discussed. Existing and potential problem areas are identified, and effective solutions are sought.
- A review of the Contingency Plan and emergencies that occurred and actions taken in the past year. This includes identifying causes of the incident, and preventive measures to be taken to avoid recurrence. Potentials for emergencies that existed are also discussed. Current or potential problems with the facility's contingency plan are identified, and effective solutions are sought, together with preventive measures to be taken to avoid recurrence.

8.1.2.3 Emergency Response Training

Training in emergency response procedures will be covered in the initial training session received by all hazardous waste handling personnel. These procedures will be reviewed and updated annually in continuing sessions. All emergency procedures and contingency plan training required by 40 CFR § 264.16 are included within the initial and annual refresher training courses.

Those personnel that work on the MCAAP Emergency Response Team and response to major spills, fires, *etc.*, are trained to the appropriate level of Hazardous Waste Operations and Emergency Response (HAZWOPER) as determined by the Occupational Safety and Health Administration requirements under 29 CFR § 1910.120.

8.1.3 Training Frequency

[§270.14(b)(12) and §§264.16(b) and (c)]

Classroom and on-the-job training are provided initially to all new employees involved in hazardous waste transportation, incinerator operations, and OB/OD operations within the first six months of assignment to their position. New or newly assigned workers will not work unsupervised prior to completion of the initial training program. Refresher training occurs annually.

8.1.4 Training Administration

[§270.14(b)(12) and §264.16(a)(2)]

The Training Director is responsible for overseeing training of all hazardous waste handling personnel in hazardous waste handling procedures. Training received by the hazardous waste handling personnel is tailored to offer specific training for specific duties performed under various job descriptions. For example, the foreman of facilities requires more training in administrative details, such as recordkeeping, while other employees at the same facilities require more training in normal and emergency operating procedures.

The Environmental Protection Specialist/Environmental Scientist for the hazardous waste management program serves as the hazardous waste management Training Director. This person is trained in hazardous waste management procedures and meets the educational requirements stated in the position job description. The Training Director designates appropriate personnel to assure training for the personnel handling hazardous wastes.

8.2 Maintenance of Training Records

[§270.14(b)(12) and §§264.16(b), (d), and (e)]

Training records for all hazardous waste handling personnel are maintained at the office of the MCAAP Training and Employee Development Branch and the Environmental Management Office. The training records include the type, date, and amount of hazardous waste training received for each person holding a hazardous waste handling position at MCAAP. All initial training, continuing training, and specialized waste handling sessions are documented. Training records are kept for a minimum of 3 years, or until closure of the hazardous waste unit that the individual is associated with, whichever is the longer period of time.

9.0 CLOSURE

This section presents information on the Closure Plan for the incinerator and the OB and OD units and is being provided pursuant to the requirements of 40 CFR Part 270 Subpart A and 40 CFR Part 264.

9.1 CLOSURE PLAN REQUIREMENTS

[§270.14(b)(13), §264.112, §264.603]

Owners and operators of hazardous waste management facilities are required by 40 CFR § 264.112 to develop a written closure plan that identifies the necessary steps for partially or completely closing either of the treatment units included in this application at any point during their active life. The purpose of this plan is to ensure that the MCAAP treatment units will be closed in a manner that minimizes the need for future maintenance of the site, and controls, minimizes, or eliminates post-closure escape of hazardous waste and hazardous constituents as necessary to protect human health and the environment.

MCAAP will amend the closure plan whenever any of the following occurs:

- Changes in the operating plan or unit design affect the closure procedures.
- There is a change in the expected year of unit closure.
- Modifications to the plan become necessary due to partial or final closure activities.

Any proposed changes will be promptly submitted to ODEQ for approval in accordance with 40 CFR § 264.112(c). If an unexpected event occurs during the partial or final closure period, MCAAP will request a permit modification no later than 30 days after the unexpected event.

A current copy of the closure plan for each treatment unit is provided in Attachment 9-1. A copy of the current plan and all plan revisions will be maintained at MCAAP until certification of closure completeness has been submitted to and approved by ODEQ.

9.2 UNIT CLOSURE

Closure of the incinerator and OB/OD units will be conducted as described in Attachment 9-1 to the standards specified therein. Prior to initiating closure of a unit, MCAAP will review and update the details of the closure plan, specify additional procedural requirements as necessary, and update the estimated time and activities required to complete closure.

9.3 CERTIFICATION OF CLOSURE

[§264.115]

Within 60 days of completion of the closure process, MCAAP will submit a closure report and accompanying certification that the specified unit has been closed in accordance with the approved Closure Plan for the unit. The certification will be signed by an independent, Oklahoma registered professional engineer. The certification will also be signed by the Installation Commander or a duly authorized representative(s) pursuant to 40 CFR § 264.115. The closure report that accompanies the certification will summarize the closure activities and the results of any sampling and analysis activities that were conducted.

9.4 POST-CLOSURE PLANS

[§270.14(b)(13) and §264.603]

It is the intent of MCAAP to close the RCRA units such that there is unrestricted future land use of the unit. As clean closure of the active unit is the ultimate goal, no specific provisions for site monitoring, land restrictions, *etc*., have been included in the Closure Plan for any unit. Should the results of the closure-period soil sampling necessitate a change in the closure approach or should limited land use restrictions be required, post-closure care and monitoring may be warranted. If necessary, details of such activities will be developed in a future amendment to the Closure Plan.

9.5 CLOSURE COST ESTIMATE AND FINANCIAL ASSURANCE REQUIREMENTS (*not applicable*)

[§§270.14(b)(15)-(18), §§264.140-151, and OAC §252:205-9-5]

Federal facilities are exempted from the RCRA financial assurance requirements, including those requirements for developing a closure cost estimate, documenting financial assurance mechanisms, and liability requirements. MCAAP is a federal facility and therefore these requirements are not applicable. As such, information that would otherwise be required to substantiate the closure cost estimate, such as the number and type of containers for removed materials, or the number of personnel required to complete the closure activities, is not necessary.

Attachment 9-1: CLOSURE PLAN FOR THE MCAAP INCINERATOR AND OB/OD UNITS

MCALESTER ARMY AMMUNITION PLANT
MCALESTER, OKLAHOMA

CLOSURE PLAN
FOR
AMMUNITION PECULIAR EQUIPMENT
MODEL 1236M2
DEACTIVATION FURNACE
AND
OPEN BURN/OPEN DETONATION UNITS

DECEMBER 2022

Coterie ENVIRONMENTAL
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1.0 INTRODUCTION

This closure plan has been prepared for the incinerator and open burning and open detonation units (OB/OD units) operated at the McAlester Army Ammunition Plant (MCAAP) in McAlester, Oklahoma, to satisfy the requirements of 40 CFR §264.112. While not required to be a stand-alone document, this closure plan has been prepared as such to facilitate distribution to the various departments that may need to reference it. Administratively, the Closure Plan resides in Section 9 of the RCRA Part B permit application.

The purpose of this plan is to ensure that the permitted hazardous waste treatment units at the MCAAP will be closed in a manner that minimizes the need for future maintenance of the site and controls, minimizes, or eliminates post-closure escape of hazardous waste and hazardous constituents as necessary to protect human health and the environment. The information required for the Closure Plan is distributed throughout this plan as follows:

- Section 2 provides the closure performance standard.
- Section 3 provides an estimate of the maximum inventory of hazardous wastes present in the units at any time.
- Section 4 describes the procedures that will be used to close the units.
- Section 5 provides an estimate of the time required for closure each unit.
- Section 6 addresses amendments to the plan.

Please note that because the MCAAP is a federal facility, the closure financial requirements, including those requirements for developing a closure cost estimate and the details required to do so (*e.g.,* estimate of closure equipment and labor requirements), documenting financial assurance mechanisms, and meeting liability requirements do not apply and are therefore not included in this closure plan.

2.0 CLOSURE PERFORMANCE STANDARDS

[§264.111]

MCAAP intends to close the incinerator and the OB/OD units as required by 40 CFR § 264.111. Pursuant to the closure performance standard in 40 CFR § 264.112, such closure will be designed to:

- Minimize the need for further maintenance.
- Eliminate the potential for any post-closure escape of hazardous waste or hazardous constituents to the environment.
- Comply with the requirements in 40 CFR Part 264 Subpart G and unit-specific closure standards specified in 40 CFR Part 264 Subparts O and/or X.

To satisfy this objective, MCAAP will target to achieve "clean closure" of each of the units. As explained in a memorandum from Ms. Elizabeth Cotsworth, Acting Director of the United States Environmental Protection Agency (USEPA) Office of Solid Waste (OSW) dated 16 March 1998, "as part of meeting the closure performance standard…for clean closure, facility owners/operators must remove all wastes from the closing unit and remove or decontaminate all waste residues, contaminated containment system components, contaminated soils…and structures and equipment contaminated with hazardous waste…" [1] Ms. Cotsworth further goes onto explain that it has generally been USEPA's interpretation that the terms "remove and decontaminate" do not require facilities to completely remove all contamination from the site. It has been considered acceptable for some limited quantity of hazardous constituents to remain on the site "provided they are not at levels that may pose a risk to human health and the environment."

This determination is made by comparing the media concentrations of regulated constituents to available constituent-specific limits or factors that have undergone USEPA review. For closure of the incinerator and the OB/OD units, MCAAP will take this "risk-based" approach to the clean closure performance standard. MCAAP will compare media concentrations of appropriate underlying hazardous constituents (UHCs) from 40 CFR 268 to the USEPA Regional Screening Levels (RSLs) (https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables) for a risk of 1×10^{-6} and a total hazard quotient (THQ) of 1.0. These RSLs provide comparison values for exposure to soil, air, and drinking water. Should media concentrations exceed the RSLs for any constituent, MCAAP will either remove the contaminated portion of the site, remediate it, or will work with ODEQ to adjust the closure criteria using either a site-specific risk-based approach or by placing landuse restrictions on the site.

The procedures for accomplishing clean closure of the units according to these performance standards are specified in Section 4 of this closure plan.

[1] Cotsworth, E. March 1998. Memorandum to RCRA Senior Policy Advisors entitled "Risk Based Clean Closure" and available online at: https://archive.epa.gov/epawaste/hazard/web/pdf/cclosfnl.pdf.

At this time, no partial closure of any of the units is being considered. Therefore, this closure plan has been designed to assume closure of each unit in its entirety, as defined in the RCRA permit application. Should MCAAP at some time conduct a partial closure of one of the units (*e.g.,* altering the unit design or operation such that more or less waste is managed at the site or permanently reducing the number of active burning pans or detonation pits), MCAAP will review this closure plan and update as necessary to reflect the modified scope of associated closure activities.

3.0 MAXIMUM WASTE INVENTORY

[§264.112(b)(3)]

40 CFR § 264.112(b)(3) requires that the closure plan specify the maximum inventory of hazardous wastes on site over the active life of each hazardous waste management unit. This basis is required to determine the extent of closure activities required.

There is no permitted storage for hazardous wastes at the incinerator or OB/OD units. However, net explosive weight (NEW) limits have been established at each unit that limit the amount of explosives that can be present at any unit at any one time for safety reasons. Given that wastes are not stored at any of the units for any longer than an operating day or treatment cycle, these safety-based NEW limits, while not permitted environmental limits, have been used to determine the maximum amount of hazardous wastes that could be at a unit awaiting treatment.

For each unit, the NEW safety limitations are:

- Incinerator: 2.88 tons NEW per day
- OB Burn Pads: 20,000 pounds or 10 tons NEW across all five pads per burn
- OB Static Fire Pads: 2,000 pounds at each of the three static firing pads per burn, totaling 6,000 pounds across all three pads.
- OD Area 1: Between 320 to 500 pounds NEW per pit per detonation event for each of the 26 pits, totaling no more than 11,283 pounds or 5.6 tons across the entire unit.
- OD Area 2: 500 pounds NEW per pit per detonation event for each of the 26 pits, totaling 13,000 pounds or 6.5 tons across the entire unit.

We do note that these limitations are extremely conservative and in most cases are far greater than the true capability of a given unit. For example, the incinerator can process approximately 240 pounds of NEW per hour through the incinerator. To reach the specified NEW limit, the incinerator would need to process this amount of waste every hour for an entire 24-hour period. With time periods allotted for safety and environmental inspections, equipment startup and shutdown, *etc.*, this is in no way feasible.

Should these units be closed, however, all waste will be treated prior to initiating closure activities. Therefore, the maximum untreated waste inventory at the incinerator or the OB/OD units at the time of closure is zero. However, some treatment residues may be present at each site when closure is initiated. Therefore, for purposes of determining the necessary procedures for closure of the unit, a maximum waste inventory has been established based on the maximum amount of treatment residue that may be present at each thermal treatment unit.

The total amount of treatment residues that could be present at each treatment unit are as follows:

- Incinerator – Approximately 8 to 10 drums of retort treatment residues, as well as 2 to 3 drums of treatment residues from the APC are estimated. (Note that DHS treatment residues are not stored locally at the incinerator and are therefore not included in the total).
- OB residue – Approximately 500 drums of hazardous waste ash treatment residues held adjacent to the burn pans in the pending analysis staging area.
- OD residue – No hazardous waste residue is generated from thermal treatment at the OD unit. Therefore, the maximum inventory of hazardous waste residues at the time of closure is zero.

4.0 CLOSURE PROCEDURES

[§264.52(e)]

Procedures have been established to close or partially close the thermal treatment units in accordance with the closure performance standards described in Section 2 of this closure plan. Pursuant to 40 CFR §§ 264.112(b)(4) and 114, these procedures include the steps necessary to remove or decontaminate all hazardous waste residues and contaminated containment systems components, equipment, structures, and soils during the closure process, including, but not limited to:

- Procedures for cleaning equipment and removing contaminated soils.
- Methods for sampling and testing surrounding soils.
- Criteria for determining the extent of decontamination required to satisfy the closure performance standard.

Procedures related to the certification of closure and assessment of post-closure care for the units are discussed later in this plan. In terms of post-closure care, no specific provisions for site monitoring, land use restrictions, *etc*., have been included, as clean closure is the ultimate goal for the units. Should data develop during unit operation or during the closure process itself that suggests that additional post-closure care will be required, this closure plan will be modified to include such procedures.

4.1 CLOSURE OF THE INCINERATOR

At this time, the entirety of the incinerator is expected to remain in service throughout its active life and the procedures provided herein reflect that expectation. Closure of the incinerator will be a multi-step process, consisting of the following:

- Inventory removal
- Site preparation
- Equipment decontamination and removal
- Verification of proper decontamination
- Evaluation of surface and subsurface impacts
- Soil excavation and/or treatment (if necessary)
- Management and disposal of miscellaneous materials
- Site restoration

The sections that follow describe each step in this process. We note that in the process of completing closure of the incinerator per the procedures described below, additional hazardous wastes may be generated. In these instances, in addition to meeting the requirements specified herein, MCAAP will meet all applicable requirements for hazardous waste generators provided under 40 CFR Part 262.

4.1.1 INVENTORY REMOVAL

Prior to closure of the incinerator, all remaining hazardous waste will be treated during normal unit operations, any unreacted waste will be retreated, equipment burnout will be completed as per Section 4.1.3.1, and all treatment residues will be removed from the incinerator area and placed into a designated central accumulation area. Grab samples of the residues will then be taken to confirm the residues no longer contain energetics and to collect data necessary to facilitate subsequent off-site transfer. Samples will be collected using a thief sampling technique that is similar to that described in American Society for Testing and Materials (ASTM) Method D5680.

Should any of the treatment residues demonstrate the reactivity characteristic, they will be transferred to the OB unit or another on-site treatment system and processed in a similar manner. No energetic reactive materials will be sent off-site if another on-site treatment option is available. If the treatment residues exceed the regulatory thresholds for any toxicity characteristics, the residue will be shipped to an authorized incinerator or stabilization facility for further treatment. If the treatment residue analytical results are below the regulatory thresholds for all constituents, the treatment residue will be land disposed at an off-site non-hazardous waste landfill.

4.1.2 SITE PREPARATION

Once the remaining hazardous waste inventory is treated and the residues are removed from the incinerator area, a series of preparatory activities will be performed prior to the start of actual unit closure. These activities will include the following:

- Delineation of exclusion zones around the various work areas as needed for safety of workers involved with the closure operations and those of MCAAP staff in surrounding areas. Specific items will be addressed as part of MCAAP safety policies and health and safety plans developed by any subcontractors involved in the closure operations.
- Establishment of decontamination areas for personnel and equipment involved in the closure operations.
- Designation or construction of a lined decontamination pad designed to prevent run-off and allow for collection of all decontamination fluids.
- Establishment of staging areas for uncontaminated demolition debris, contaminated scrap/debris, contained liquids, and other waste streams including containers for any contaminated material. No waste or contaminated material shall be placed on the ground without a liner.
- Establishment of temporary facilities required for closure activities (*e.g.,* storage trailers, field office, *etc.*).
- Visual inspection of all concrete pads, sumps, and building floor surfaces for cracks or gaps. All such cracks or gaps will be sealed to assure that the wash solution will not migrate into or through the material.
- Other permitting that may be required (*e.g.,* modification of NPDES permit for treatment of wastes generated as part of the closure activities, NPDES storm water permit for construction activities, *etc.*).

4.1.3 Equipment Decontamination and Removal

Procedures used for decontamination and removal of equipment will be accomplished in several stages, from decontamination of the incinerator, a burn-out process for the incineration system, and decontamination of the incineration equipment and subsequent verification. The steps associated with each of these stages are described below. All wastes generated during closure will be properly manifested, labeled, and shipped as required by hazardous waste management and Department of Transportation (DOT) regulations.

4.1.3.1 Burn Out Process

After incineration of the final quantity of hazardous waste, the incinerator, afterburner, and drum heating system (DHS) will be operated at or above the minimum operating temperature for a period of not less than eight hours. During this period, only natural gas fuel will be burned and only clean water will be fed to the cooling water systems. It is the intent of this burn-out process to destroy any residual waste explosives that may remain within the unit.

After the burnout period, the incinerator, afterburner, DHS, and downstream air pollution control (APC) equipment will be visually inspected for the presence of any accumulated solid residues. If detected, such residue will be removed and characterized as necessary for transfer off-site. Wastes that may be generated during the burnout period include:

- Ash residue (consisting of the ash and incinerated solids that accumulate in the incinerator, cyclone, DHS piping, afterburner, evaporative cooler, and baghouse).
- Excess water from the evaporative cooler in the containment tank.
- Fabric filter bags from the baghouse and filters from the high efficiency particulate air filter (HEPA) (after the burn-out process is complete).

These wastes will be managed as follows:

- All ash exiting the system will be managed as described previously for the treatment residues in place when closure is initiated.
- The excess water from the evaporative cooler will be removed from the containment tank and collected in drums. This waste will be analyzed as needed for characterization and transfer off-site. If determined to be a hazardous waste via analysis or treated as such through an abundance of caution, the materials will be sent to an appropriately regulated facility for either further treatment or disposal.
- The fabric filter bags and the HEPA filters will be analyzed as required for off-site disposal and sent to an appropriately permitted facility. If determined to be hazardous waste via analysis or treated as such through an abundance of caution, the bags and filters will be sent to a properly permitted RCRA facility.

4.1.3.2 Decontamination of Furnace Feed Room, MCDF Building, and Retort Barrel Room

After all liquid nitrogen has been removed from the MCDF cryo-bath and after all hazardous waste treatment residues and other solid waste materials have been removed from the incineration system, including the furnace feed room, the retort barrel room, the MCDF barrel room, and the MCDF positive feed system (PFS), the equipment within these areas that contacted hazardous waste will be decontaminated. This includes:

- The feed box, feed conveyor and feed chute for the conventional feed system.
- The MCDF download equipment, the cryo-bath, the press, the residue separation system, the drum loading system, and the associated conveyance systems.
- The shuttle boxes and feed mechanisms in the MCDF positive feed system (PFS).
- The retort discharge conveyor system and associated barrel conveyance system.

All such equipment will be cleaned and decontaminated prior to dismantling. To the extent possible after disassembly, the equipment will be thermally decontaminated on-site in a properly permitted unit. Treatment via this means involves elevating the temperature of the metal items above the autoignition system of the explosive materials that were handled in the equipment. If thermal decontamination is not possible, the decontamination will be performed in accordance with various MCAAP operating procedures and will include the steps noted below:

- Equipment will be cleaned using properly grounded and inspected pressure washers or steam sprayers until contamination is visibly removed or adequately softened for subsequent scraping and cleaning.
- Remaining material will be removed by scraping, dipping parts in caustic solutions, *etc.*
- Equipment bays and /or adjacent areas will be washed down.
- Any floor sumps will be cleaned out.

All wash water will be contained into drums. This waste will be analyzed as needed for characterization and off-site transfer. If determined to be a hazardous waste via analysis or treated as such through an abundance of caution, the wash water will be sent for to an appropriate off-site facility for either further treatment or disposal.

The wash downs and analysis of the wash water will continue until the decontamination process is complete. Complete decontamination will be demonstrated by the achievement of the numerical limits of concentration in wash water for the UHCs from 40 CFR § 268.48. Alternatively, complete decontamination may be demonstrated using a statistical comparison of clean, pre-rinse, water with the post-rinse wash water.

After the decontamination equipment is removed from the area, the following process will be used to wash down and decontaminate all floors, sumps, and containment structures.

- Any spilled liquids and solids will be removed for disposal.
- All surfaces will be visually inspected for the presence of additional cracks or gaps discovered upon removal of decontaminated equipment. All such cracks or gaps will be sealed to assure that wash solution will not migrate into or through the material.

- All surfaces will be washed at least three times with a high pressure, low volume water spray. Wash water will be collected after each rinse and collected separately for each area undergoing cleaning.
- All collected wash water from each area will then be contained into drums and managed in accordance with all other wash water from the decontamination process.

As before, the wash downs and analysis of the wash water will continue until decontamination is complete. Complete decontamination will be demonstrated by the achievement of the numerical limits of concentration in wash water for the UHCs from 40 CFR § 268.48. Alternatively, complete decontamination may be demonstrated using a statistical comparison of clean, pre-rinse, water with the post-rinse wash water.

4.1.3.3 Decontamination Verification for Incineration Equipment

Samples will be collected from the decontaminated incineration process equipment to verify that the decontamination process has been successful before it is dismantled. Wipe samples will be taken from the following locations:

- Internal surfaces of the retort, the afterburner, and the DHS.
- Gas ducts
- Internal surfaces of the evaporative cooler
- Internal surfaces of the baghouse
- Internal surfaces of the HEPA housing
- Internal surfaces of the exhaust stack
- Sumps and containment areas in the hazardous waste areas of the retort and APC areas.

The actual number and location of the wipe samples, including the methodology for collecting them will be determined after visual inspection of the equipment and conference with ODEQ. The wipe samples will be analyzed for the appropriate UHCs from 40 CFR § 268.48. Methods for each analysis will be consistent the latest edition of SW-846. All applicable sample handling and preservation procedures of SW-846 Chapter Three will be observed.

Lack of contamination will be adequately demonstrated if the concentration of a constituent in a wipe sample is equivalent to or less than the average background concentration. Those areas from which wipe samples exhibit a concentration of greater than the average background concentration will require further decontamination. Alternatively, in lieu of further decontaminating the item, the contaminated item will be disposed off-site as hazardous waste at an appropriately regulated facility.

If performed, further decontamination will consist of a high-pressure spray wash or will involve scrubbing with an appropriate and compatible cleaning solution. After further decontamination, the subject areas will again be sampled with wipes, analyzed as before, and compared to background. This process will be repeated until all sampled areas are adequately decontaminated or until the decision is made to declare the piece of equipment a hazardous waste and dispose of it accordingly. Wash water will be handled in the same manner as the other decontamination wastes described herein.

4.1.4 Evaluation of Surface and Subsurface Impacts

As stated previously, all concrete pads, secondary containment, and building floors and sump and catch basin surfaces will be surveyed for visible signs of a material release or potential release routes (*i.e*., cracks, gaps, etc.). During site preparation, all such cracks or gaps will be sealed with an epoxy sealant to assure that the decontamination wash solution will not migrate into or through the material.

Any cracks or gaps in areas that managed hazardous waste that were sealed with epoxy prior to decontamination shall be investigated at the time of demolition to determine whether they fully penetrate the concrete to the soil. Where such cracks are observed to be fully penetrating, a sampling and analysis program will be undertaken to determine the extent of impact. A comprehensive soil sampling and analysis plan will be prepared at the time of closure if necessary and submitted to ODEQ for approval. It is anticipated that the program would progress as follows:

- Collect soil samples from the locations that had fully penetrating cracks. Survey these locations prior to demolition of the structure.
- Following demolition and removal of the concrete, relocate the original sample locations using the survey information. These original locations will be the starting points for sampling grids to delineate the horizontal and vertical extent of any impacts.
- Analyze the soil samples for appropriate UHCs from 40 CFR § 268.48 using the analytical methods specified in the latest version of SW-846 at the time of closure.

Given that most of the hazardous waste handling areas are located indoors, it is unlikely that any soil sampling and analysis will be required. However, if it is, the results of that sampling will be used to determine the final disposition of the contaminated soil. In all cases, however, the contaminated soil will be removed until such time that the soil concentrations are consistent with other background levels.

4.1.5 Management and Disposal of Miscellaneous Materials

The cleanup operations will likely result in the generation of other miscellaneous materials that may be contaminated during the cleanup process. Such materials may include but are not limited to the following:

- Brushes, brooms, mops, buckets, and related cleaning supplies.
- Used hazardous waste containers either containing or having contained hazardous waste.
- Shovels, absorbents, and other tools.
- Plastic sheeting.
- Personal protective equipment.

All such waste materials will be characterized as required to facilitate off-site disposal; no attempt at decontamination will be made. Based upon these characterizations, the wastes will be transferred off-site for treatment or disposal at a properly permitted facility in accordance with state and local laws. Liquid wastes will be containerized into drums and disposed as a hazardous or non-hazardous waste based on an evaluation of the level of contamination and the container contents.

Should any vehicles or heavy equipment, such as trucks, backhoes, or bulldozers, be used in the closure process, the equipment will be decontaminated on the decontamination pad prior to leaving the site using steam cleaning with a high-pressure washer.

After all decontamination is complete, the decontamination pad liner will be steam cleaned and the rinsate will be collected and containerized. The liner will then be properly disposed, and the pad will be removed.

4.1.6 Site Restoration

Once the waste materials and decontaminated equipment have been removed from the site, the area within the incineration complex will be restored. If demolished foundation structures and/or other materials must be excavated for disposal off-site, site restoration will include backfill and compaction of any excavations, grading, and revegetation of the affected area(s). All backfill material must be analyzed before use at the site to ensure that it is “clean fill.” The backfill material will be analyzed for the UHCs from 40 CFR § 268.48 by appropriate methods from SW-846, latest edition. If it becomes necessary to conduct excavations at the time of closure, a detailed plan of the proposed excavation and site restoration activities will be submitted to the ODEQ for approval.

4.2 Closure of the OB Unit

At this time, the entirety of the OB unit is expected to remain in service throughout the active life of the MCAAP and the procedures provided herein reflect that expectation. From time to time, one or more of the burn pans at the OB unit may be taken out of service for repair or replacement. However, this is not considered a closure or partial closure activity; instead, such activity is considered necessary and routine repair and replacement.

When the OB unit is closed, the process will involve multiple steps, including the following:

- Inventory removal
- Disposal and/or decontamination of equipment
- Evaluation of surface and subsurface impacts
- Soil excavation and/or treatment (if necessary)
- Management and disposal of miscellaneous materials
- Site restoration

The sections that follow describe each step in this process. We note that in the process of completing closure of the OB unit per the procedures described below, additional hazardous wastes may be generated. In these instances, in addition to meeting the requirements specified herein, MCAAP will meet all applicable requirements for hazardous waste generators provided under 40 CFR Part 262.

4.2.1 Waste Inventory Removal

Prior to closure of the OB unit, all remaining hazardous waste will be treated during normal unit operations, including performing an inspection of the burn pans, static firing units, and the concrete pads beneath the units for the presence of any ejected unreacted waste. Any ejected waste found will be placed into the burn pans and retreated until all wastes have reacted. In addition, all treatment residues will be placed into appropriate containers, sampled and analyzed in accordance with the Waste Analysis Plan in Attachment 3-1, and sent off-site for further treatment or disposal as appropriate.

4.2.2 Disposal and Decontamination Procedures

The equipment at the OB unit consists of the burn pans and covers, the ignition system, and the static fire saddles. The following steps will be taken to decontaminate and remove these systems:

- The ignition system will be made inoperative, and the above-ground portions of the system will be removed. It is not expected that this system will have been contaminated during unit operation, as routine inspections would identify any ejected materials on the ignition system immediately prior to or after any burn, and those materials would be removed before another burn is processed.
- The burn pans, firing saddles, and pan covers will be thermally decontaminated on-site if possible by elevating the temperatures of the metal items above the autoignition temperature of the explosive materials that were treated within them. If they cannot be thermally decontaminated, the decontamination will be performed in accordance with various MCAAP operating procedures and will include the steps noted below:
    - Equipment will be cleaned using properly grounded and inspected pressure washers or steam sprayers until contamination is visibly removed or adequately softened for subsequent scraping and cleaning.
    - Remaining material will be removed by scraping, dipping parts in caustic solutions, *etc.*
    - All wash water will be collected and containerized into drums. This waste will be analyzed as needed for characterization and transfer off-site. If determined to be a hazardous waste via analysis or treated as such through an abundance of caution, the materials will be sent to an appropriately regulated facility for either further treatment or disposal.
    - The wash downs and analysis of the wash water will continue until the decontamination process is complete. Complete decontamination will be demonstrated by the achievement of the numerical limits of concentration in wash water for the UHCs from 40 CFR § 268.48. Alternatively, complete decontamination may be demonstrated using a statistical comparison of clean, pre-rinse, water with the post-rinse wash water.

After this equipment has been decontaminated, it will be visually inspected and sold for recycle as metallic scrap or sent to an appropriately regulated landfill for disposal.

4.2.3 Evaluation of Surface and Subsurface Impacts

As stated previously, all concrete pads at the OB unit will be surveyed for visible signs of a material release or potential release routes (*i.e*., cracks, gaps, etc.). During site preparation, all such cracks or gaps will be sealed with an epoxy sealant to assure that the decontamination wash solution will not migrate into or through the material.

Any cracks or gaps in areas that managed hazardous waste that were sealed with epoxy prior to decontamination shall be investigated at the time of demolition to determine whether they fully penetrate the concrete to the soil. Where such cracks are observed to be fully penetrating, a sampling and analysis program will be undertaken to determine the extent of impact. A comprehensive soil sampling and analysis plan will be prepared at the time of closure if necessary and submitted to ODEQ for approval. It is anticipated that the program would progress as follows:

- Collect soil samples from the locations that had fully penetrating cracks. Survey these locations prior to demolition of the structure.
- Following demolition and removal of the concrete, relocate the original sample locations using the survey information. These original locations will be the starting points for sampling grids to delineate the horizontal and vertical extent of any impacts.
- Analyze the soil samples for appropriate UHCs from 40 CFR § 268.48 using the analytical methods specified in the latest version of SW-846 at the time of closure.

If there is no apparent release or potential for release observed, a simplified sampling program will be implemented to confirm that a release has not occurred. The results of that sampling will be used to determine the final disposition of the contaminated soil. In all cases, however, the contaminated soil will be removed until such time that the soil concentrations are consistent with other background levels.

4.2.4 Management and Disposal of Miscellaneous Materials

The cleanup operations will likely result in the generation of other miscellaneous materials that may be contaminated during the cleanup process. Such materials may include but may not be limited to the following:

- Brushes, brooms, mops, buckets, and related cleaning supplies
- Used hazardous waste containers either containing or having contained hazardous waste
- Shovels, absorbents, and other tools
- Plastic sheeting
- Personal protective equipment

All such waste materials will be characterized as required to facilitate transfer off-site; no attempt at decontamination will be made. Based upon these characterizations, the wastes will be transferred to a properly permitted facility for either further treatment or disposal in accordance with state and local laws. Liquid wastes will be containerized into drums and as a hazardous or non-hazardous waste based on an evaluation of the level of contamination and the container contents.

Should any vehicles or heavy equipment, such as trucks, backhoes, or bulldozers, be used in the closure process, the equipment will be decontaminated on the decontamination pad prior to leaving the site using steam cleaning with a high-pressure washer.

After all decontamination is complete, the decontamination pad liner will be steam cleaned and the rinsate will be collected and containerized. The liner will then be properly disposed, and the pad will be removed.

4.2.5 Site Restoration

Once the waste materials and decontaminated equipment have been removed from the site, the area within the OB unit will be restored. If demolished foundation structures and/or other materials must be excavated for disposal off-site, site restoration will include backfill and compaction of any excavations, grading, and revegetation of the affected area(s). All backfill material must be analyzed before use at the site to ensure that it is "clean fill." The backfill material will be analyzed for the UHCs from 40 CFR § 268.48 by appropriate methods from SW-846, latest edition. If it becomes necessary to conduct excavations at the time of closure, a detailed plan of the proposed excavation and site restoration activities will be submitted to the ODEQ for approval.

4.3 Closure of the OD Units

At this time, the entirety of each of the OD units is expected to remain in service throughout the active life of the MCAAP and the procedures provided herein reflect that expectation. While the closure plan for each OD unit is identical, the units may not necessarily be closed at the same time. Each unit will be closed separately and the procedures described herein will be applied to the unit being closed. Closure of one of the OD units will be a multi-step process, consisting of the following:

- Inventory removal
- Evaluation of surface and subsurface impacts
- Soil excavation and/or treatment (if necessary)
- Management and disposal of miscellaneous materials
- Site restoration

The sections that follow describe each step in this process. Note that no specific procedures are provided for decontamination of equipment or structures, as no such equipment or physical structures exist at the OD units.

In the process of completing closure of one of the OD units per the procedures described below, additional hazardous wastes may be generated. In these instances, in addition to meeting the requirements specified herein, MCAAP will meet all applicable requirements for hazardous waste generators provided under 40 CFR Part 262.

4.3.1 Waste Inventory Removal

Prior to closure of the OD unit, all remaining hazardous waste will be treated during normal unit operations, including performing an inspection of the detonation pits and surrounding area for the presence of any ejected, unreacted waste. Any unreacted waste found will be retreated until no reactive materials remain. The only treatment residue from the OD process is metallic shrapnel. Site personnel will collect and remove all metallic shrapnel from the OD unit as per the procedures described in Section 4 of this permit application.

4.3.2 Evaluation of Surface and Subsurface impacts

Once all waste treatment has been completed and the metal shrapnel has been removed, the underlying soil within the OD unit will be sampled to determine the extent of horizontal and vertical contamination, if any, within the OD unit. The soil samples will be analyzed for total energetics and toxicity characteristics and select UHCs from 40 CFR § 268.48, as appropriate.

Given that immediate closure is not anticipated at this time, specifying the exact locations of soil sampling would be inappropriate, as the nature of any incidents at the OD unit that could influence that sampling is not fully known given that operation of the units is still ongoing. However, a general discussion can be supplied on the sampling strategy and methods that will be employed and the analytical procedures that will be used. Prior to execution of the closure process, MCAAP will prepare a detailed soil sampling plan for review and approval by ODEQ.

4.3.2.1 Soil Sampling Procedures

Soil sampling in the closure process will be conducted to assess the OD unit's impact on the surrounding soils. A series of phased samples will be taken from throughout the OD unit to first screen for contamination and then to determine the horizontal and vertical extent of any contamination that is found.

In general, the following guidelines, which are based on a stratified systematic sampling design and the methodologies employed in the Sampling and Analysis Plan (SAP) in Attachment 5-2 of the permit application, will be used in determining soil sampling locations:

- In Phase I, a total of 9 of the 26 pits within the OD unit being closed will be selected for sampling. Historical knowledge of the OD unit operations, as well as results from previous soil sampling events within the OD unit will be used to determine which pits will be sampled.
- Each pit will be divided into a triangular grid with three sections, similar to that shown in Figure 4-1.
- Within each section, a total of 5 incremental surface samples will be taken throughout the grid to identify the extent of any horizontal contamination. Each surface sample will be collected from a depth between zero and 4 inches using a spade or another appropriate sampling tool.
- Within each of the sections, another set of five sub-surface core samples will be taken through the grid to determine the extent of vertical contamination. Each sub-surface core sample will be collected to a depth of 8 inches using a hand auger or another similar soil core sampling device.

- If contamination above documented background levels is found in any of the 9 pits, samples will similarly be collected in Phase II of the sampling event from the other 15 pits in the OD unit being closed.

For any pit in which contamination is found, the initial layer of soil within the pit will be removed from an area extending four inches beyond all horizontal contamination that is found to an area extending eight inches below any vertical contamination that is found. The contaminated soil will then be placed in a covered, lined roll-off container as described below in Section 4.3.2.3.

Phase III of the sampling will then be instituted to determine if additional soil within the pit is contaminated. This sampling will be conducted similar to Phase I above, segregating the newly exposed soil into sections and increments and collecting surface and sub-surface samples as described. Sampling will continue in Phases IV, V, *etc*., until no additional contamination is detected above documented background levels.

4.3.2.2 Analytical procedures

Each sample that is collected as part of the soil sampling program will be analyzed using USEPA SW-846 Method 8330 or an approved equivalent method for reactive material. If historical records indicate the potential for other contaminants to be present as a result of OD unit activities, those contaminants will also be determined using the appropriate SW-846 method or approved alternative.

4.3.2.3 Excavation of Contaminated Soils

Based upon the analytical results of the soil sampling, any contaminated soil between the existing grade of the OD unit and the final grade of the underlying SWMU will be excavated using small excavation equipment (*e.g.,* shovels and rakes) or heavy machinery (*e.g.,* backhoes or bulldozers) and will be properly disposed.

Removal will continue until either:

- Clean closure of the OD unit is achieved.
- The final grade of the underlying SWMU is reached.
- The OD unit has been decontaminated to a restricted-use standard. If this occurs, the unit will be placed in monitored status, and will be subject to management under the facility Installation Action Plan (IAP). With this plan, managed sites are summarized, the boundary of the sites is defined, and the restrictions they are subject to per the Statement of Basis at the time of closure are identified.

During any excavation, contaminated native soils will be removed from the OD unit and will be brought to a temporary staging area and placed into a covered, lined roll-off container, where they will be held while being characterized and prepared for shipment.

4.3.3 Management and Disposal of Miscellaneous Materials

The cleanup operations will likely result in the generation of other miscellaneous materials that may be contaminated during the cleanup process. Such materials may include but may not be limited to the following:

- Brushes, brooms, mops, buckets, and related cleaning supplies
- Used hazardous waste containers either containing or having contained hazardous waste
- Shovels, absorbents, and other tools
- Plastic sheeting
- Personal protective equipment

All such waste materials will be characterized as required to facilitate off-site transfer; no attempt at decontamination will be made. Based upon these characterizations, the wastes will be sent off-site to a permitted treatment facility or will be disposed at a properly permitted facility in accordance with state and local laws. In the instance of used hazardous waste containers, the containers will be disposed as a hazardous or non-hazardous waste based on an evaluation of the level of contamination and the container contents. Alternatively, the containers may be thermally decontaminated if facilities are available to do so.

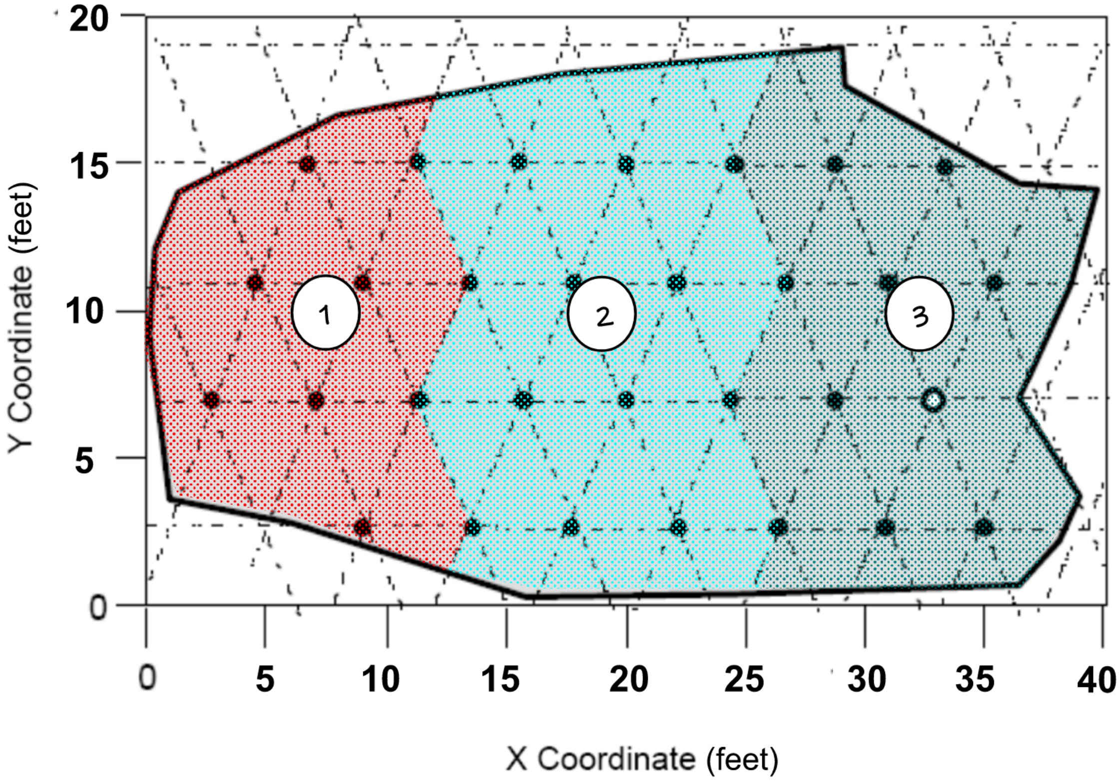
Should any vehicles or heavy equipment, such as trucks, backhoes, or bulldozers, be used in the closure process, the equipment will be decontaminated on the decontamination pad prior to leaving the site using steam cleaning with a high-pressure washer.

After all decontamination is complete, the decontamination pad liner will be steam cleaned and the rinsate will be collected and containerized. The liner will then be properly disposed, and the pad will be removed.

4.3.4 Site Restoration

Once the waste materials and decontaminated equipment have been removed from the site, the area within the OD unit will be restored. If demolished foundation structures and/or other materials must be excavated for disposal off-site, site restoration will include backfill and compaction of any excavations, grading, and revegetation of the affected area(s). All backfill material must be analyzed before use at the site to ensure that it is “clean fill.” The backfill material will be analyzed for the UHCs from 40 CFR § 268.48 by appropriate methods from SW-846, latest edition. If it becomes necessary to conduct excavations at the time of closure, a detailed plan of the proposed excavation and site restoration activities will be submitted to the ODEQ for approval.

ATTACHMENT 9-1, FIGURE 4-1
EXAMPLE TRIANGULAR SAMPLING GRID



5.0 SCHEDULE FOR CLOSURE

[264.37, §264.52(c)]

This section provides a schedule for closure of each of the treatment units as required by 40 CFR § 264.112(b)(6). As required, the schedule presented herein includes an estimate of the total time required to close the units and the time required for intervening closure activities, which will allow tracking of the progress of partial and final closure.

Currently, there is no anticipated date for commencement of closure activities on any of the treatment units. When such a date is established, however, MCAAP will notify ODEQ according to the requirements provided in 40 CFR § 264.112(d) at least 45 days prior to the initiation of closure activities. In addition to providing official notice of unit closure, this notification will also identify the individual who will be responsible for overseeing and certifying the closure under 40 CFR § 264.11. Once started, complete closure of the treatment unit will be performed within the timeframes set forth in 40 CFR § 264.113.

An estimated schedule for this closure process is provided in Table 5-1 below for each unit. Key milestones in this schedule include:

1. The receipt of the final volume of hazardous waste and treatment of it.
2. Disassembly and decontamination of all treatment equipment.
3. Investigation of underlying soils.
4. Remediation, if necessary, of any contamination found in Step 3 above.
5. Certification of closure as required by 40 CFR § 264.115.

If during closure it becomes apparent that an extension to the closure schedule presented below will be necessary, an application for extension will be made to ODEQ in accordance with 40 CFR § 264.113(c). Any request for an extension of the closure period will be made, at the latest, 30 days prior to expiration of the 180-day time period allowed for closure.

ATTACHMENT 9-1, TABLE 5-1
SCHEDULE FOR UNIT CLOSURE

STEP	DESCRIPTION	TIME (DAYS) [1]		
		INCINERATOR	OB UNIT	OD UNIT
1	Notify Department	- 45	- 45	- 45
2	Receipt of final volume of hazardous waste	0	0	0
3	Treat final volume of hazardous waste and collect samples of treatment residues	0 - 7	0 – 14	0 - 14
4	Disassemble, clean, and decontaminate process equipment	14 – 90	14 – 90	- - -
5	Site investigation (identify sampling locations, complete analysis of all samples, and identify areas for further action)	60 – 120 [2]	60 – 120 [2]	14-100 [2]
6	Site remediation and soil removal (if necessary)	120 – 180 [2]	120 – 180 [2]	100 – 180 [2]
7	Complete closure activities	180 [2]	180 [2]	180 [2]
8	U.S. Army certification that closure is completed in accordance with plan	240	240	240
9	Certification by independent, registered professional engineer that closure has been completed in accordance with plan	240	240	240

[1] Time from the date upon which closure begins.

[2] Longer, as approved, if large quantities of contaminated soil are encountered during closure.

6.0 AMENDMENT OF CLOSURE PLAN

[§264.112(c)]

MCAAP will amend this closure plan whenever any of the following occurs:

- Changes in the operating plan or unit design affect the closure procedures.
- There is a change in the expected year of unit closure.
- Modifications to the plan become necessary due to partial or final closure activities.

Any proposed changes will be promptly submitted to ODEQ for approval in accordance with 40 CFR § 264.112(c). If an unexpected event occurs during the partial or final closure period, MCAAP will request a permit modification no later than 30 days after the unexpected event.

10.0 CORRECTIVE ACTION FOR SOLID WASTE MANAGEMENT UNITS

[§270.14(d) and §264.101]

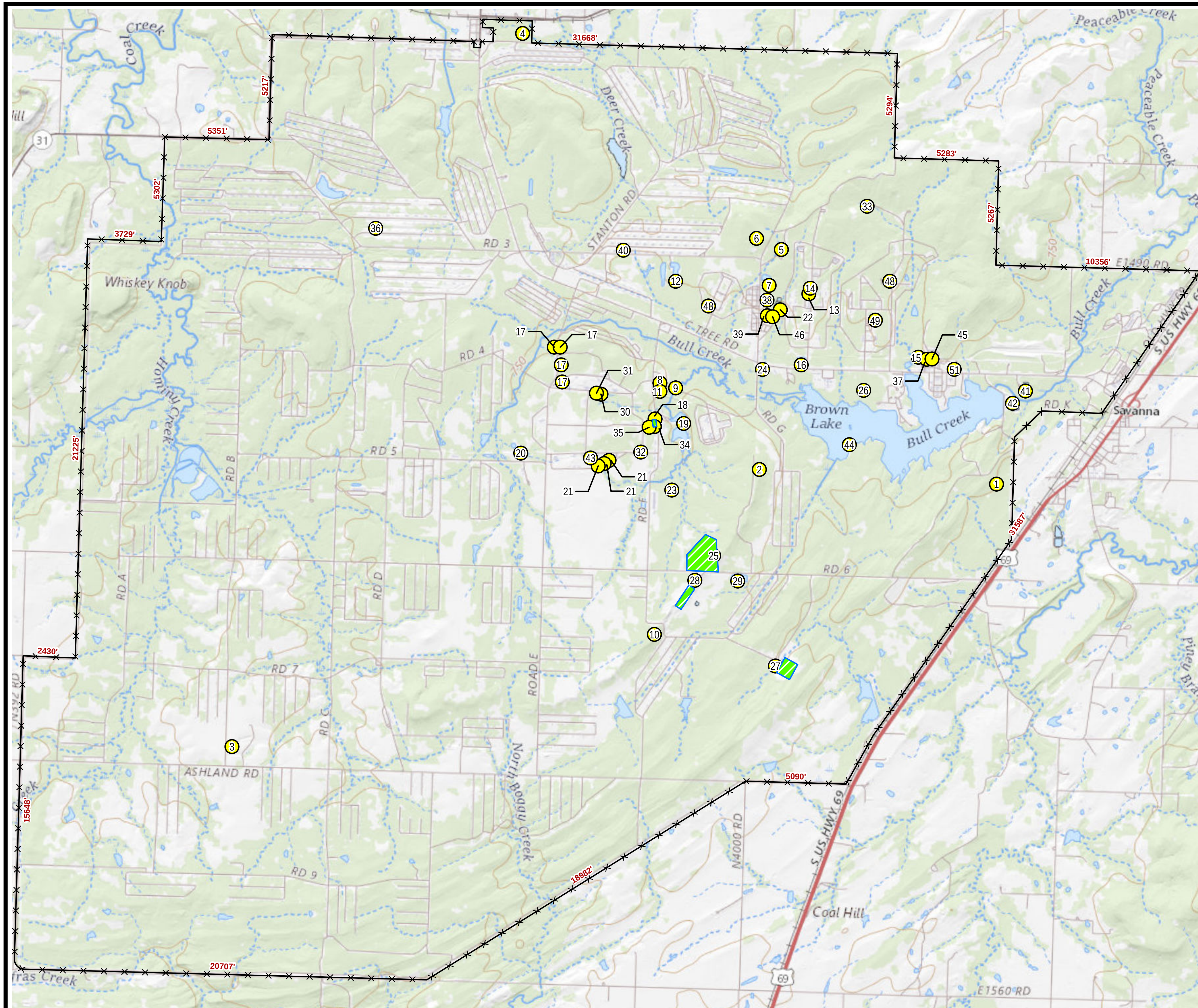
This section provides an overview of the contamination assessments performed at MCAAP and summarizes the current status of all identified solid waste management units (SWMUs).

In 1987, the USEPA performed a RCRA Facility Assessment (RFA) and identified eight SWMUs at the MCAAP site. Three years later, the United States Army Environmental Hygiene Agency (USAEHA) performed an additional assessment and identified another forty-two potential SWMUs at MCAAP. Negotiations between the Army and the USEPA resulted in the designation of nine SWMUs requiring further investigation. In 1992, MCAAP requested that the Army Environmental Center (AEC) conduct the RCRA Facility Investigation (RFI) for the nine SWMUs that had been identified. Since that time, six additional SWMUs have been identified. Of these, only two SWMUs currently require further investigation under the RCRA program. These are as follows:

- SWMU No. 46. Baler Site, identified in 1999. This site is inactive. Based on the Corrective Measures Study (CMS) work plan prepared and submitted by MCAAP, the ODEQ has determined that corrective measures are warranted for this SWMU. The CMI workplan dated 2010 has been approved by ODEQ.
- SWMU No. 48. Miscellaneous Tanks, identified in 2001. This site is inactive. Based on the CMS work plan prepared and submitted by MCAAP, the ODEQ has determined that corrective measures are warranted for this SWMU. The CMI workplan dated 2010 has been approved by ODEQ.

The location of all of SWMUs at MCAAP, including those that are classified as no further action (NFA), is shown in Attachment 10-1. More detailed information about each of these sites can be obtained in the MCAAP Installation Action Plan (IAP). The IAP document is updated annually with the most recent dated September 2022 and titled, *McAlester Army Ammunition Plant, Army Cleanup Program, Final*. A copy of the plan can be found on the Army Environmental Center website at https://aec.army.mil/application/files/5616/6466/1609/FY22IAP-OK-MCAAP.pdf

Attachment 10-1: SOLID WASTE MANAGEMENT UNIT LOCATIONS



Legend

- Facility Boundary / Fence line
- Thermal Treatment Units
- Solid Waste Management Unit (SWMU)

(See following page for numerical legend)

Approximate Boundary Dimensions:
Incinerator T-03 = 27' x 22'
OB Unit X-03 = 573' x 694'
OD Area 1 X-03 = 1899' x 1453'
OD Area 2 X-03 = 1674' x 1235'

N

0 2,500 5,000 FEET

1" = 5,000 FEET
1:60,000

MCALESTER ARMY AMMUNITION PLANT (MCAAP)
1 C TREE ROAD
MCALESTER, OK 74501

FIGURE 10-1
SOLID WASTE MANAGEMENT UNIT LOCATIONS

DRAWN BY: L WILSON	SCALE:	PROJ. NO. RCRA 2022
CHECKED BY: P HARRELL	AS NOTED	FILE NO. Project.mxd
APPROVED BY: P HARRELL	DATE PRINTED:	
DATE: December 2022	12/13/2022	

Coterie ENVIRONMENTAL

1150 First Ave., Ste 501
King of Prussia, PA 19406

J:\Prj\MCAAP\2022\Project.aprx

LEGEND FOR FIGURE 10-1

SWMU No.	Unit Name	Current Status
1	Landfill	NFA
2	Landfill Southwest of Brown Lake	NFA
3	Active Landfill	NFA
4	Suspected Abandoned Landfill	NFA
5	Scrap Metal Disposal Area	NFA
6	Suspected Abandoned Landfill	NFA
7	Suspected Disposal Area	NFA
8	Wood Scrap Yard	NFA
9	Landfill	NFA
10	Abandoned Landfill	NFA
11	Abandoned Landfill	NFA
12	Group 41 LC Lagoon	NFA
13	Concrete Bomb Settling Ponds	NFA
14	Concrete Bomb Settling Ponds	NFA
15	Roundhouse Lagoons	NFA
16	Sewage Retention Ponds	NFA
17	Ponds and Lagoons	NFA
18	Deactivation Furnace Lagoon	NFA
19	Rocket Lake	NFA
20	B Plant West Lagoon	NFA
21	B Plant East Lagoon	NFA
22	Medium Caliber Lagoons	NFA
23	Special Weapons Lagoon	NFA
24	C-Tree Lagoon	NFA
25	Active Open Burning Ground	NFA
26	Burn Area 2	NFA
27	Old Demolition Area	NFA
28	New Demolition Area	NFA
29	Sedimentation Retention Basis	NFA
30	Pink Water Treatment System	NFA
31	Pink Water Treatment Collection System	NFA
32	Bldg 209, Pallet Dipping Operation	NFA
33	Bldg 471, Pallet Dipping Operation	NFA
34	Deactivation Furnace	NFA
35	Suspected Acid Neutralization Pit	NFA
36	Burial Site	NFA
37	Former Waste Oil Storage Tanks	NFA
38	DRMO Yard	NFA
39	Hazardous Waste Storage Area, Building 669	NFA
40	Hazardous Waste Storage Bunkers, Buildings 41 LC 103 A, B, C	NFA
41	Sewage Treatment Plant	NFA
42	Water Treatment Plant	NFA
43	Minol Building 664	NFA
44	Brown Lake	NFA
45	Roundhouse	NFA
46	Baler Site	Under Investigation
47	PCB Contamination Area	NFA. Clean Closed under TSCA
48	Miscellaneous Tank Sites	Under Investigation
49	Soils Around Case Load Building	NFA
51	PCP Contamination Ind. Area	NFA

11.0 ADDITIONAL PART B REQUIREMENTS FOR MISCELLANEOUS UNITS

[§270.23, §264.601]

40 CFR Part 264, Subpart X provides additional requirements for Miscellaneous Units that must be satisfied in the hazardous waste management application. These requirements include the identification of potential pathways of exposure and the demonstration of treatment effectiveness.

11.1 POTENTIAL PATHWAYS OF EXPOSURE

[§270.23(c) and §264.601]

To evaluate the potential pathways of exposure and to demonstrate the impact of those exposures on human health and the environment, MCAAP has performed a Health Risk Assessment (HRA) for the OB/OD units. This HRA was performed using the Draft Risk Assessment Protocol (DRAP) approved by ODEQ on July 28, 2020. The HRA was completed per the DRAP, and the HRA report was submitted to ODEQ on December 27, 2021. The HRA report describes the human health receptors that were evaluated, the potential pathways of exposure for those receptors, and the air, fate and transport, and risk modeling methodologies that were employed to determine the risk to each receptor.

Following ODEQ's review and approval of the HRA report and subsequent negotiation of any permit limitations that are required, this section will be updated to reflect the results of the risk assessment. This update will take the form of a Class 1 permit modification, as it will administratively incorporate the findings of and, if necessary, resulting limitations determined from the risk assessment.

11.2 DEMONSTRATION OF TREATMENT EFFECTIVENESS

[§270.23(d) and §264.600]

The intent of the OB/OD treatment process is to destroy the ignitable and reactive energetic components of the hazardous wastes. The effectiveness of this treatment process is measured by analysis of the treatment residues. As explained in Section 3, metallic shrapnel is the only treatment residue generated from the OD process. Shrapnel is visually inspected for evidence of successful treatment of energetic components and retreated if observed or suspected to contain unreacted energetics. Also described in Section 3, the OB treatment residue is sampled and analyzed for energetics and the toxicity characteristic for metals that have the potential to be present in the residues based on chemicals used in the manufacturing processes. The energetic analysis is intended to provide the required demonstration of treatment effectiveness for this process. Should any of the OB/OD treatment residues contain measurable levels of energetics, they will be re-processed through the OB/OD unit until no evidence of energetic components remain.

12.0 OTHER FEDERAL LAWS

This section presents information on other Federal laws applicable to MCAAP's incinerator and OB/OD units and is being provided pursuant to the general Part B permitting requirements specified in 40 CFR § 270.14(b)(20). At this time, MCAAP is subject to regulation under the following Federal laws:

- Resource Conservation and Recovery Act
- Clean Water Act
- Clean Air Act
- The Wild and Scenic Rivers Act
- The National Historic Preservation Act
- The Endangered Species Act
- The Fish and Wildlife Coordination Act

Specific information regarding compliance with the applicable Federal laws will be provided at the request of the USEPA Regional Administrator or the Oklahoma Department of Environmental Quality.

13.0 PART B CERTIFICATION

The following statement is being provided and signed by a responsible corporate officer of MCAAP per 40 CFR §270.11) for the renewal of the MCAAP Oklahoma Hazardous Waste Management Operations Permit (EPA ID No. OK6213822798).

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.

Owner/Operator

[signature] 21 Dec 22

Signature | Date

Colonel, Michael F. Hammond

Printed Name

MCAAP Commander

Title

14.0 HISTORY OF PERMIT APPLICATION MODIFICATIONS

The table below identifies modifications to this permit application that happen over the term of this Permit. It is intended to serve as a guide for those modifications and to provide open and transparent record of all modifications made over the Permit term.

TABLE 14-1
HISTORY OF PERMIT APPLICATION MODIFICATIONS

MODIFICATION NO.	CLASS OF PERMIT MODIFICATION (1, 2, OR 3)	MCAAP SUBMITTAL DATE	ODEQ APPROVAL DATE (IF REQUIRED)	DESCRIPTION OF PERMIT APPLICATION MODIFICATION

15.0 DOCUMENT CROSS-REFERENCE TABLE

To aide in the review of this renewal application, MCAAP has prepared cross-reference tables for the applicable regulatory requirements. These cross-reference tables cite each applicable application requirement from 40 CFR Part 270 or the OAC and specifies the location within this document where the requirement is satisfied. Chapter 252 of the Oklahoma Administrative Code incorporates 40 CFR Part 270 by reference at OAC §252:205-3-2. There are, however, several additional requirements that are applicable to MCAAP that are covered within this application. Table 15-1 provides the cross-reference for the Federal requirements, and Table 15-2 provides a cross-reference table for the OAC sections that contain different or additional requirements to the associated Federal standard.

The regulatory citations provided herein are current through November 2022.

TABLE 15-1
CROSS-REFERENCE FOR APPLICABLE FEDERAL REQUIREMENTS FROM TITLE 40 OF THE CFR

40 CFR CITATION	DESCRIPTION	SECTION(S) IN APPLICATION
270.14	Contents of Part B: General Requirements	**As per below**
270.14(a)	Provide general requirements specified in 40 CFR Part 270.14(b) as well as specific information for covered processes identified in 40 CFR Part 270.15 through 270.29 as applicable.	3.7 (not applicable)
270.14(b)	Provide the following general information for the facility:	As per below
270.14(b)(1)	A general description of the facility.	2.1
270.14(b)(2)	Chemical and physical analyses of the hazardous waste and hazardous debris to be handled at the facility as required to treat, store, and/or dispose of the wastes under 40 CFR Part 264.	3.1, 3.2
270.14(b)(3)	A waste analysis plan as described in 40 CFR Part 264.13(b) and (c), if applicable.	3.4, 3.5, 3.6, Attachment 3-1
270.14(b)(4)	A description of the security procedures and equipment required by 40 CFR Part 264.14 or a justification as to why this information is not necessary.	6.1, Attachment 6-1
270.14(b)(5)	An inspection schedule meeting the requirements of 40 CFR Part 264.15(b), as well as any other specific requirements for regulated equipment as specified in individual subparts of 40 CFR Part 264.	6.2
270.14(b)(6)	A justification of any waiver requests for the preparedness and prevention requirements of 40 CFR Part 264 Subpart C.	6.3
270.14(b)(7)	A contingency plan meeting the requirements of 40 CFR Part 264, Subpart D, as well as any specific requirements from 40 CFR Parts 264.227, 264.255 and 264.200, if applicable.	7, Attachment 7-1
270.14(b)(8)	Information on the procedures, structures, or equipment used to control releases, including those used to…*[see below]*	6.4 and as per below
270.14(b)(8)(i)	Prevent hazards in unloading operations	6.4.1
270.14(b)(8)(ii)	Prevent runoff from waste handling areas and methods used to prevent flooding	6.4.2
270.14(b)(8)(iii)	Prevent contamination of water supplies	6.4.2
270.14(b)(8)(iv)	Mitigate the effects of equipment failure and power outages	6.4.3

Table 15-1
Cross-Reference for Applicable Federal Requirements from Title 40 of the CFR

40 CFR Citation	Description	Section(s) in Application
270.14(b)(8)(v)	Prevent undue exposure of personnel to hazardous wastes	6.4.4
270.14(b)(8)(vi)	Prevent releases to the atmosphere	6.4.5
270.14(b)(9)	Information on precautions taken to prevent accidental ignition or reaction of ignitable, reactive, or incompatible wastes as required by 40 CFR Part 264.17, including 264.17(c).	6.5
270.14(b)(10)	Details on traffic patterns, volumes, controls and roadway design.	2.4, Attachment 2-1
270.14(b)(11)	The following information on the location of the facility…[*see below*]	As per below
270.14(b)(11)(i)	The political jurisdiction, as required to demonstrate applicability of the seismic standard in 40 CFR Part 264.18(a)	2.3.2
270.14(b)(11)(ii)	The information required to demonstrate compliance with the seismic standard of 40 CFR Part 264.18(a), if determined to be applicable. This information shall provide details necessary to determine whether or not faults that have displacement in the Holocene time are present within 3,000 feet of the facility.	2.3.2
270.14(b)(11)(iii)	Information and supporting data for determining whether the facility is located within a 100-year floodplain.	2.3.3, Attachment 2-1
270.14(b)(11)(iv)	If within the 100-year floodplain, engineering analyses and studies to demonstrate that the facility is designed to prevent washout from a 100-year flood, including, if appropriate, procedures for removing the wastes from the flood zone consistent with the requirements of 40 CFR Part 264.18(b).	Not applicable
270.14(b)(11)(v)	A compliance plan for meeting the requirements of 40 CFR Part 264.18(b) if the facility is within a 100-year floodplain and does not otherwise meet the applicable requirements.	Not applicable
270.14(b)(12)	An outline of the training programs required to demonstrate compliance with 40 CFR Part 264.16, including a description on how training will be designed to meet job tasks pursuant to 40 CFR Part 264.16(a)(3).	8
270.14(b)(13)	The closure and, if applicable, post-closure plans required by 40 CFR Part 264.112, 264.118, and 264.197, including, where applicable specific requirements for regulated equipment as specified in individual subparts of 40 CFR Part 264.	9, Attachment 9-1

TABLE 15-1
CROSS-REFERENCE FOR APPLICABLE FEDERAL REQUIREMENTS FROM TITLE 40 OF THE CFR

40 CFR CITATION	DESCRIPTION	SECTION(S) IN APPLICATION
270.14(b)(14)	If the hazardous waste unit has been closed, documentation showing that the notices required by 40 CFR Part 264.119 have been filed.	Not applicable. No closed hazardous waste management units are included in the permit application.
270.14(b)(15)	A closure cost estimate for the facility in accordance with 40 CFR Part 264.142, and a copy of the documentation required to demonstrate financial assurance under 40 CFR Part 264.143.	9.5 (Not applicable, MCAAP is a federal facility)
270.14(b)(16)	A post-closure cost estimate meeting the requirements of 40 CFR Part 264.144, and a copy of the documentation required to demonstrate financial assurance under 40 CFR Part 264.145. (Where applicable)	9.5 (Not applicable MCAAP is a federal facility)
270.14(b)(17)	A copy of the insurance policy or other documentation meeting the requirements of 40 CFR Part 264.147 including, if applicable, a request for a variance in the amount of required coverage pursuant to 40 CFR Part 264.147(c). (Where applicable)	9.5 (Not applicable MCAAP is a federal facility)
270.14(b)(18)	Proof of coverage by a State financial mechanism meeting 40 CFR Part 264.149 or Part 264.150, if appropriate.	9.5 (Not applicable MCAAP is a federal facility)
270.14(b)(19)	A topographic map showing a distance of 1,000 feet around the facility at a scale of 2.5 centimeters (1 inch) equal to not more than 61.0 meters (200 feet) at a contour interval sufficient to clearly show the pattern of surface water flow in the vicinity of and from each operational unit of the facility. In addition, the topographic map shall show…[*see below*]	2.2, Attachment 2-1, and as per below
270.14(b)(19)(i)	The map scale and date	2.2.1, Attachment 2-1
270.14(b)(19)(ii)	The 100-year floodplain area	2.2.1, Attachment 2-1
270.14(b)(19)(iii)	Surface waters	2.2.1, Attachment 2-1
270.14(b)(19)(iv)	Surrounding land uses	2.2.1, Attachment 2-1
270.14(b)(19)(v)	A wind rose	2.2.1, Attachment 2-1
270.14(b)(19)(vi)	Map orientation	2.2.1, Attachment 2-1
270.14(b)(19)(vii)	Legal boundaries of the hazardous waste facility	2.2.1, Attachment 2-1
270.14(b)(19)(viii)	Access control	2.2.1, Attachment 2-1

TABLE 15-1
CROSS-REFERENCE FOR APPLICABLE FEDERAL REQUIREMENTS FROM TITLE 40 OF THE CFR

40 CFR CITATION	DESCRIPTION	SECTION(S) IN APPLICATION
270.14(b)(19)(ix)	On-site and off-site Injection and withdrawal wells	Not applicable
270.14(b)(19)(x)	Buildings, treatment, storage, or disposal operations, or other structures	2.2.1, Attachment 2-1
270.14(b)(19)(xi)	Barriers for drainage or flood control	2.2.1, Attachment 2-1
270.14(b)(19)(xii)	Location of operational units within the hazardous waste facility where waste is treated, stored, or disposed	2.2.1, Attachment 2-1
270.14(b)(20)	Other information as deemed necessary by the Regional Administrator to carry out his duties under other Federal laws as required in 40 CFR Part 270.3.	12
270.14(b)(21)	For land disposal facilities, a copy of the notice of approval for the extension or petition is if approved under 40 CFR Part 268.5 or 268.6.	Not applicable
270.14(b)(22)	A summary of the pre-application meeting, including information on attendees and copies of any written comments or materials submitted at the meeting, as required under 40 CFR Part 124.31(c).	Not applicable
270.14(c)	Provide the following additional information necessary to protect groundwater, unless exempt per 40 CFR Part 264.90(b).	5, Attachment 5-1, Attachment 5-2, Attachment 5-3
270.14(d)	Provide additional information for solid waste management units.	10, Attachment 10-1
270.19(a)	Provide documentation as necessary if seeking an exemption under 264.340(b) or (c) for ignitable, corrosive, or reactive wastes.	Not applicable (no such exemption sought)
270.19(b)	Provide a trial burn plan pursuant to 270.62	Not applicable
270.19(c)	Provide design and operating data on the incinerator in lieu of a trial burn plan or trial burn results.	Not applicable
270.19(d)	Alternative approvals for applications without a trial burn plan.	Not applicable
270.19(e)	Waiver of specific requirements for incinerators for units permitted after October 12, 2005	2.1, 4.1, 6.4.5
270.62	Deference of hazardous waste incinerator permit requirements to 40 CFR Part 63, Subpart EEE (HWC NESHAP)	2.1

TABLE 15-1
CROSS-REFERENCE FOR APPLICABLE FEDERAL REQUIREMENTS FROM TITLE 40 OF THE CFR

40 CFR CITATION	DESCRIPTION	SECTION(S) IN APPLICATION
270.23	Owners and operators that treat, store, or dispose of hazardous waste in miscellaneous units, provide the following additional information [*see below*]	As per below
270.23(a)	Detailed description of the unit being used	4.2, 4.3, Attachment 4-1, 6.2
270.23(b)	Detailed hydrologic, geologic, and meteorologic assessments and land use maps for the region surrounding the site that address and ensure compliance of the unit with each factor in the environmental performance standards of 40 CFR Part 264.601.	2.3.1, Attachment 2-1, 5
270.23(c)	Information on potential pathways of exposure of humans or environmental receptors to hazardous waste or hazardous constituents.	11.1
270.23(d)	Report on a demonstration of effectiveness of the treatment based on laboratory or field data.	11.2
270.23(e)	Additional information determined by the Director to be necessary for evaluation of compliance of the unit with the environmental performance standards of 40 CFR Part 264.601.	Not applicable

TABLE 15-2
CROSS-REFERENCE FOR APPLICABLE OKLAHOMA REQUIREMENTS FROM TITLE 252 OF THE OAC

OAC TITLE 252 CITATION	DESCRIPTION	SECTION(S) IN APPLICATION
205-9-6(a)	Prior to receipt of HW the TSD must obtain detailed chemical and physical analysis of waste to include all information necessary to appropriately treat, store, dispose, or recycle the waste	3.5, Attachment 3-1
205-13-1(a)	Upon release of materials that are or become hazardous waste whether by spillage, leakage, or discharge to soils or to air or to surface or ground waters (outside the limits of a discharge permit), or by other means, and which could threaten human health or the environment, the owner or operator shall immediately notify the DEQ and take all necessary action to contain, remediate, and mitigate hazards from the release	7.4, 7.8, Attachment 7-1
205-13-1(b)	The owner/operator is not required to notify the DEQ of a release if it is completely contained in a secondary containment area.	7.4, 7.8, Attachment 7-1
205-13-1(c)	When a report is required to be made to the National Response Center pursuant to 40 CFR 262.16(b), 262.17(a)(6) (which references 262 Subpart M), or 264.56(d)(2) or 265.56(d)(2), a report must also be made immediately to the DEQ at 1-800-522-0206.	7.4, 7.8, Attachment 7-1
205-13-1(d)	Spilled or leaked materials and soils and other matter that may be contaminated with such materials shall be tested by the responsible person to determine whether they are hazardous waste, nonhazardous industrial waste or solid waste.	7, Attachment 7-1
205-13-1(e)	Waste materials resulting from a release shall be properly disposed of in accordance with the applicable rules.	7, Attachment 7-1
205-13-1(f)	Materials that are to be recycled shall be collected and properly stored to prevent further contamination of the environment.	7, Attachment 7-1