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FINAL SAMPLING AND ANALYSIS PLAN ADDENDUM 2 FOR THE REMEDIAL
INVESTIGATION AT UNEXPLODED ORDNANCE 15 (UXO 15) ATLANTIC FLEET WEAPONS
TRAINING AREA FORMER VIEQUES NAVAL TRAINING RANGE VIEQUES ISLAND PUERTO
RICO
07/01/2015
CH2M HILL

Final

Sampling and Analysis Plan Addendum 2 for the Remedial Investigation at UXO 15

Atlantic Fleet Weapons Training Area – Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

Contract Task Order 037

July 2015

Prepared for

Department of the Navy
Naval Facilities Engineering Command
Atlantic Division

Under the

NAVFAC CLEAN 1000 Program
Contract N62470-08-D-1000

Prepared by



Virginia Beach, Virginia

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Executive Summary

Remedial Investigation (RI) activities to evaluate the nature and extent of potential munitions and explosives of concern (MEC) and associated contamination at UXO 15 was conducted in 2012 and 2013. The RI activities included visual inspections, geophysical surveying, removing debris piles and munitions-related items, and conducting sampling in areas of potential contamination. Based on the findings of these RI activities, it was determined additional data is warranted to complete the RI.

This document is an addendum to the Final Expanded Site Inspection Sampling and Analysis Plan (CH2M HILL, 2011) and the associated Final Expanded Site Inspection Sampling and Analysis Plan Addendum for the Remedial Investigation (CH2MHILL, 2012b). This RI Sampling and Analysis Plan (SAP) Addendum 2 identifies the characterization approach and analytical methods jointly developed by the Environmental Protection Agency (EPA), Puerto Rico Environmental Quality Board (PREQB), Puerto Rico Department of Natural and Environmental Resources (PRDNER), U.S. Fish and Wildlife Service (USFWS), and the Navy to complete the RI. The additional characterization will consist of the following activities:

- Berms identified during initial RI activities – The berms (**Figure ES-1**) will be surveyed using digital geophysical mapping (DGM) equipment to identify whether there are buried metallic items. If identified, various locations will be dug up to identify the type of the buried material. Soil samples will be collected to determine if the buried material is a source of contamination.
- Drums identified during initial RI activities - Soil samples will be collected from the locations where deteriorated drums were identified on the ground surface (**Figure ES-1**).
- Potential Detonation Areas – Visual inspection of the areas suggest they may not have been used for detonation activities. However, to confirm, DGM will be conducted throughout the areas (**Figure ES-1**) and any subsurface anomaly identified will be dug up. Based on the DGM findings, soil sampling will be conducted in these areas to determine if contamination is present.
- Former Debris Piles – These piles were removed during the initial RI activities and soil samples were collected. Additional soil samples will be collected in the vicinity of the former piles (**Figure ES-2**) to help evaluate the inorganics data.

The information gathered during the additional characterization will be evaluated comprehensively with the previously-collected data and provided in an RI Report. The RI Report will summarize the nature and extent of contamination, results of human health and ecological risk assessments conducted using the sample data, and the recommended path forward for the site.

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- Legend**
- Deteriorated Drum
 - ⊕ Possible Detonation Area
 - Former Debris Pile
 - Approximate Berm Location
 - PI Site
 - UXO15

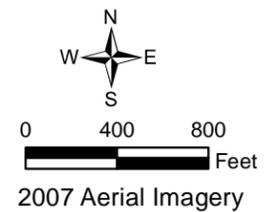
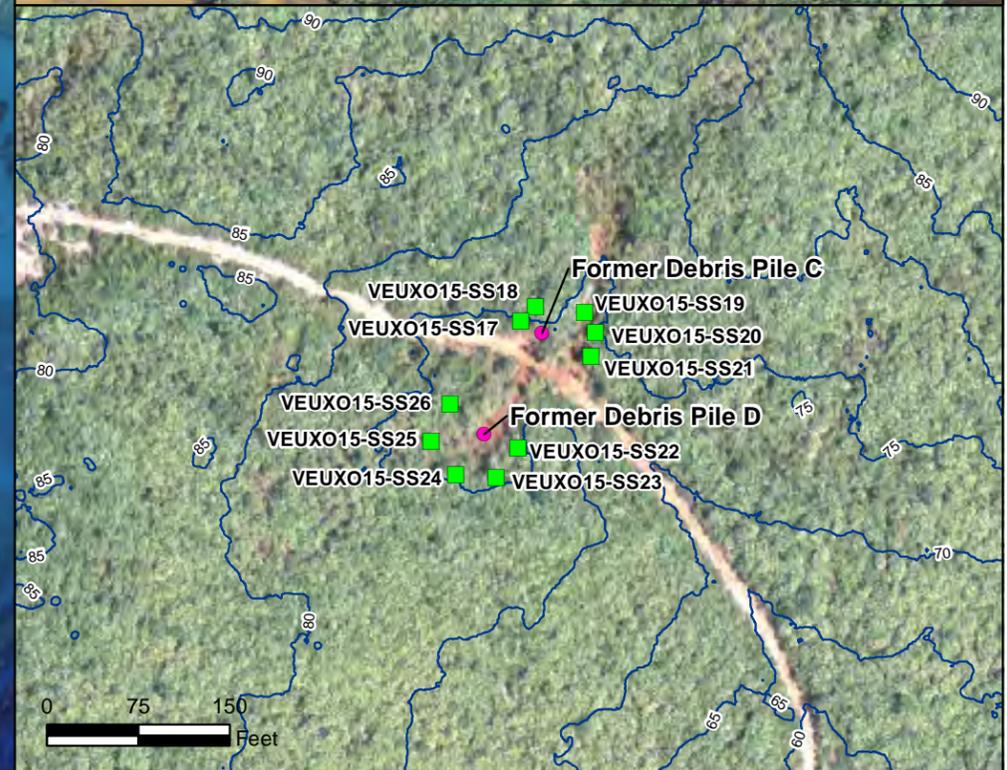
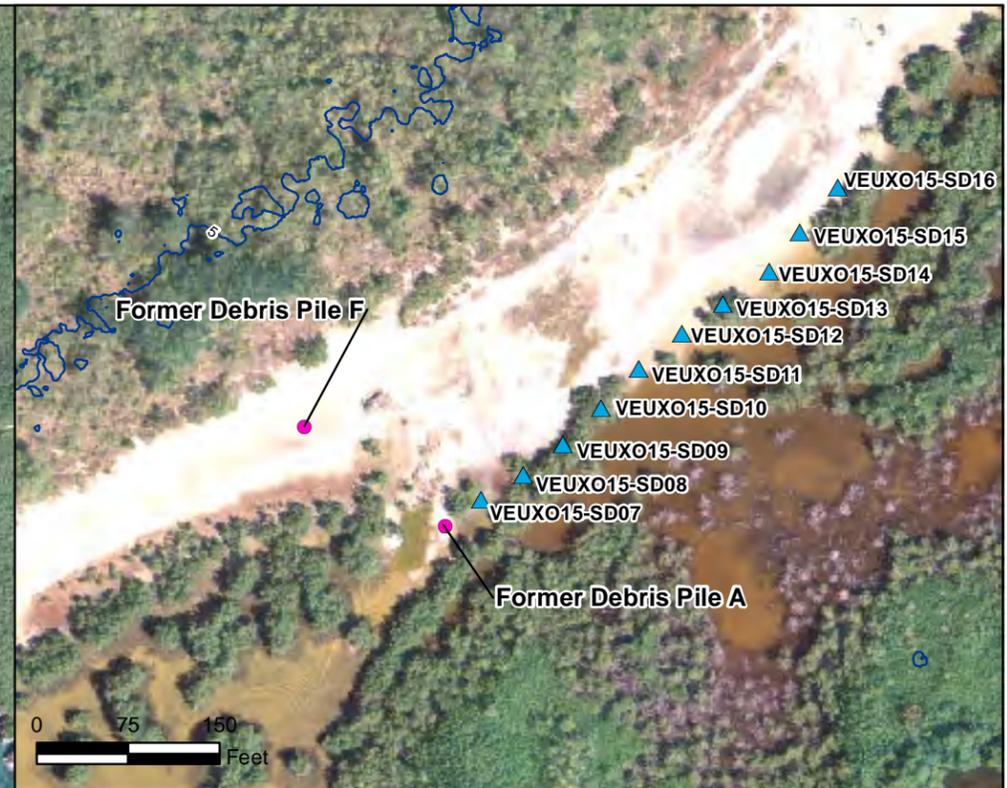


Figure ES-1
Site Features, UXO 15
 UXO 15 Addendum 2 Sampling and Analysis Plan
 Former Vieques Naval Training Range
 Vieques, Puerto Rico



- Legend**
- Proposed Inorganics Confirmation Sample, Piles C & D
 - ▲ Proposed Inorganics Confirmation Sample, Piles A & F
 - Former Debris Pile
 - Lidar Derived Ground Surface Elevation, 5-ft Contour Interval
 - ▭ UXO15

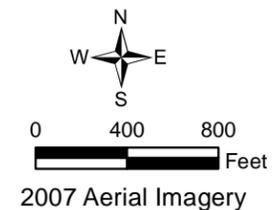


Figure ES-2
Sample Locations at Former Debris Piles
 UXO 15 Addendum 2 Sampling and Analysis Plan
 Former Vieques Naval Training Range
 Vieques, Puerto Rico

Resumen Ejecutivo

Las actividades de la Investigación de Remediación (RI, por sus siglas en inglés) para evaluar la naturaleza y la extensión de municiones y explosivos de preocupación (MEC, por sus siglas en inglés) potenciales y la contaminación asociada en UXO 15 se llevaron a cabo en el 2012 y 2013. Las actividades de la RI incluyeron inspecciones visuales, estudios geofísicos, remoción de montículos de escombros y artículos relacionados a municiones, y la ejecución de un muestreo en áreas de contaminación potencial. Basado en los resultados de estas actividades de la RI, se determinó que se necesitaban datos adicionales para completar la RI.

Este documento es un Apéndice al Plan Final de Muestreo y Análisis de la Inspección Expandida del Sitio (CH2M HILL, 2011) y el Apéndice asociado al Plan Final de Muestreo y Análisis de la Inspección Expandida del Sitio para la Investigación de Remediación (CH2M HILL, 2012b). Este Apéndice 2 al SAP de la RI identifica el enfoque de caracterización y los métodos analíticos desarrollados en conjunto por la Agencia de Protección Ambiental de los Estados Unidos (EPA, por sus siglas en inglés), la Junta de Calidad Ambiental de Puerto Rico (JCA), el Departamento de Recursos Naturales y Ambientales de Puerto Rico (DRNA), el Servicio de Pesca y Vida Silvestre de los Estados Unidos (FWS, por sus siglas en inglés) y la Marina, para completar la RI. La caracterización adicional consistirá de las siguientes actividades:

- Bermas identificadas durante las actividades iniciales de la RI – Las bermas (**Figura ES-1**) serán inspeccionadas utilizando equipos de cartografía digital geofísica (DGM, por sus siglas en inglés) para identificar si se encuentran artículos metálicos enterrados. Si se identifican dichos artículos, varios puntos serán excavados para identificar el tipo de material enterrado. Muestras de suelo se tomarán para determinar si el material enterrado es una fuente de contaminación.
- Barriles identificados durante las actividades iniciales de RI – Se tomarán muestras de suelo en los lugares donde se identificaron barriles deteriorados en la superficie del suelo (**Figura ES-1**).
- Áreas Potenciales de Detonación – La inspección visual de las áreas sugiere que es posible que no se hayan utilizado para actividades de detonación. Sin embargo, para confirmar, se llevará a cabo un análisis con DGM a través de las áreas (**Figura ES-1**) y cualquier anomalía bajo la superficie que se identifique será excavada. Basado en los resultados del DGM, se llevará a cabo un muestreo de suelo en dichas áreas para determinar si existe contaminación.
- Antiguos montículos de escombros – Estos montículos fueron removidos durante las actividades iniciales de la RI y se tomaron muestras de suelo. Muestras adicionales de suelo se tomarán en las zonas aledañas a los antiguos montículos (**Figura ES-2**) para ayudar a evaluar los datos de los compuestos inorgánicos.

La información recopilada durante la caracterización adicional será evaluada exhaustivamente en conjunto a los datos previamente recolectados y provistos en un Informe del RI. El Informe del RI resumirá la naturaleza y la extensión de la contaminación, los resultados de las evaluaciones de riesgos a la salud humana y ecológica que se llevaron a cabo utilizando los datos de las muestras, y el proceso a seguir recomendado para el sitio.

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- 5 Potential Former Detonation Areas
- 6 Sample Locations at Former Debris Piles
- 7 Remedial Investigation Evaluation Decision Tree

Attachments

- A Former Debris Pile Photos
- B Relevant Standard Operating Procedures
- C Laboratory DoD ELAP Accreditation Letters
- D Responses to Regulatory Agency Comments

Acronyms and Abbreviations

BA	Biological Assessment
bgs	below ground surface
°C	degrees Celsius
CA	corrective action
CAS	chemical abstract services
CCB	continuing calibration blank
CCC	calibration check compound
CCP	Comprehensive Conservation Plan
CCV	continuing calibration verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLEAN	Comprehensive Long-term Environmental Action—Navy
CSM	Conceptual Site Model
CTO	Contract Task Order
DDT	dichlorodiphenyltrichloroethane
DGM	digital geophysical mapping
DL	detection limit
DoD	United States Department of Defense
DOI	Department of the Interior
DQI	data quality indicator
DRO	diesel range organics
DV	data validator
EBS	Environmental Baseline Survey
ECA	Eastern Conservation Area
EICP	extracted ion current profile
ELAP	Environmental Laboratory Accreditation Program
EMA	Eastern Maneuver Area
EPA	Environmental Protection Agency
ERA	Ecological Risk Assessment
ERA/SI	Expanded Range Assessment/Site Inspection
ERP	Environmental Restoration Program
ESI	Expanded Site Inspection
ft	feet/foot
FTL	Field Team Leader
GC	gas chromatograph
GPS	Global Positioning System
HHRA	Human Health Risk Assessment
ICAL	initial calibration
ICB	initial calibration blank
ICV	initial calibration verification
ID	identification
IDW	investigation-derived waste
IR	installation restoration
IS	incremental sampling
IS	Internal Standards

LCL	lower control limit
LCS	laboratory control sample
LDR	linear dynamic range
LIA	Live Impact Area
LOD	limit of detection
LOQ	limit of quantitation
LRB	laboratory reagent blank
LTM	long-term monitoring
µg/L	microgram(s) per liter
MB	method blank
MCL	maximum contaminant level
MD	munitions debris
MEC	munitions and explosives of concern
ml	milliliter(s)
MPC	measurement performance criteria
MRA	Munitions Response Area
MRP	Munitions Response Program
MS	matrix spike
MSD	matrix spike duplicate
N/A	not applicable
NASD	Naval Ammunition Support Detachment
NAVFAC	Naval Facilities Engineering Command
Navy	Department of the Navy
NIRIS	Navy Installation Restoration Information System
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NTCRA	Non-Time Critical Removal Action
OB/OD	open burn/open detonation
ORP	oxidation-reduction potential
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PAL	project action limit
PC	Project Chemist
PCBs	polychlorinated biphenyls
PI	Photo Identified
PIL	project indicator limits
PM	Project Manager
POC	Point of Contact
PPE	personal protective equipment
PQO	project quality objective
PRDNER	Puerto Rico Department of Natural and Environmental Resources
PREQB	Puerto Rico Environmental Quality Board
QA	quality assurance
QAMS	Quality Assurance Management Section
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
QSM	Quality Systems Manual

RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation
RPD	relative percent difference
RPM	Remedial Project Manager
RRD	range-related debris
RRT	relative retention times
RSD	relative standard deviation
RSL	regional screening level
RT	retention time
RTK	real time kinematic
SAP	Sampling and Analysis Plan
SI	Site Inspection
SIA	Surface Impact Area
SIM	selected ion monitoring
SMP	Site Management Plan
SOP	Standard Operating Procedure
SSC	Site Safety Coordinator
SSL	soil screening level
SVOC	semivolatile organic compound
TAT	turnaround time
TBD	to be determined
TOC	total organic carbon
TRC	Engineering Services, Inc.
TRV	toxicity reference values
U.S.	United States
UCL	upper confidence limit
UFP	Uniform Federal Policy
USFWS	United States Fish and Wildlife Service
UTL	upper tolerance limit
UXO	unexploded ordnance
VNTR	Vieques Naval Training Range
VOA	volatile organic analysis
VOC	volatile organic compound
WCHEM	wet chemistry

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SAP Worksheet #1—Title and Approval Page

Final
Sampling and Analysis Plan Addendum 2 for the
Remedial Investigation at UXO 15

Atlantic Fleet Weapons Training Area – Vieques
Former Vieques Naval Training Range
Vieques, Puerto Rico

July 2015

Prepared for:
Department of the Navy
Naval Facilities Engineering Command
Atlantic Division
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Prepared under:
Navy CLEAN 1000 Program
Contract N62470-08-D-1000
Contract Task Order – 037

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Wilmarie Rivera
PREQB – Remedial Project Manager

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Susan Slander
U.S. Fish and Wildlife Service

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SAP Worksheet #2—Identifying Information

Site Name/Number: UXO 15 Atlantic Fleet Weapons Training Area – Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico

Operable Unit (OU):

Contractor Name: CH2M HILL

Contract Number: N62470-08-D-1000

Contract Title: Navy Comprehensive Long-term Environmental Action— Navy (CLEAN) Program 1000

Work Assignment

Number (optional): Contract Task Order (CTO) 037

1. Sampling and Analysis Plan (SAP) Requirements: This SAP was prepared in general accordance with the requirements of the Uniform Federal Policy (UFP) for Quality Assurance Project Plans (QAPPs) (Intergovernmental Data Quality Task Force, 2005) and United States (U.S.) Environmental Protection Agency (EPA) for QAPPs, EPA Quality Assurance (QA)/G-5, Quality Assurance Management Section (QAMS) (EPA, 2002).
2. Regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).
3. Type of SAP: This SAP is prepared as an addendum to the Expanded Site Inspection (ESI) Sampling and Analysis Plan (SAP) at UXO 15 (CH2M HILL, 2011) hereafter referred to as the ESI SAP, and the ESI SAP Addendum for the Remedial Investigation (RI) at UXO 15 (CH2M HILL, 2012a) hereafter referred to as the RI SAP Addendum, and it is project-specific.
4. Dates of scoping sessions:

Title	Date
Environmental Restoration Program (ERP)/Munitions Response Program (MRP) Subcommittee Meeting – Vieques Superfund Site	June 18, 2014

5. Dates and titles of any SAP documents written for previous site work that are relevant to the current investigation:

Title	Date
Master Standard Operating Procedures, Protocols, and Plans, Environmental Restoration Program, Vieques, Puerto Rico, April 2010 (CH2M HILL, 2010a)	April 2010
Final Expanded Site Inspection Sampling and Analysis Plan UXO 15, Former Vieques Naval Training Range Vieques, Puerto Rico, May 2011 (CH2M HILL, 2011)	May 2011
Final Biological Assessment for PI 9, PI 13, and Debris Piles within UXO 15, Vieques, Puerto Rico, March 2012 (CH2M HILL, 2012a)	October 2011
Final Expanded Site Inspection Sampling and Analysis Plan Addendum for the Remedial Investigation at UXO 15, Former Vieques Naval Training Range Vieques, Puerto Rico, July 2012 (CH2M HILL, 2012b)	July 2012
Final Master Sampling and Analysis Plan, East Vieques Terrestrial UXO Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico, January 2013 (CH2M HILL, 2013a)	January 2013

SAP Worksheet #2—Identifying Information (continued)

6. Organizational partners (stakeholders) and connection with lead organization:
 - EPA Region 2 – Federal regulatory stakeholder overseeing CERCLA Vieques ERP implemented by lead organization.
 - Puerto Rico Environmental Quality Board (PREQB) – Commonwealth regulatory stakeholder overseeing CERCLA Vieques ERP implemented by lead organization.
 - Puerto Rico Department of Natural and Environmental Resources (PRDNER) – The agency responsible for protecting natural resources, Commonwealth-owned conservation areas, submerged lands, and the coastal zone in the Commonwealth of Puerto Rico. The Puerto Rico Territorial Sea out to 9 nautical miles (10.35 statute miles) from the shore, submerged lands within the Puerto Rico Territorial Sea, associated islands, cayos, and otherwise islets within the Puerto Rico Territorial Sea, and the Maritime Terrestrial Zone (one kilometer inland from the shoreline or additional distances needed to protect key coastal natural systems).
 - United States Fish and Wildlife Service (USFWS) – Land owner of land transferred from lead organization and on which UXO 15 ERP activities are conducted.
 - National Oceanic and Atmospheric Administration (NOAA) – Marine habitat stakeholder and technical advisor to EPA.
7. Lead organization (see Worksheet #7 for detailed list of data users):
 - U.S. Department of the Navy (Navy).
8. Applicable SAP elements: Because this document is a SAP addendum, it includes only those worksheets revised as a result of the June 18, 2014 SAP scoping session and procurement of a new analytical laboratory. The remaining worksheets from the ESI SAP (CH2M HILL, 2011) and the RI SAP Addendum (CH2MHILL, 2012b) are still applicable and are therefore not included herein.

SAP Worksheet #3—Distribution List

SAP Recipients	Title	Organization	Telephone Number (optional)	E-mail Address or Mailing Address	Draft	Draft Final	Final
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SAP Worksheet #3—Distribution List (continued)

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SAP Worksheet #3—Distribution List (continued)

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Notes:

A=All
 D=Draft
 DF=Draft Final
 F=Final
 CL=Cover Letter
 CD=Compact Disc
 HC=Hard Copy
 N=None

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SAP Worksheet #4—Project Personnel Sign-Off Sheet (used for internal distribution)

Name	Organization/Title/Project Role	Telephone Number (optional)	Signature/email receipt	SAP Section Reviewed	Date SAP Read
Anita Dodson	CH2M HILL/Navy Program Chemist/ SAP review	757-671-6218			
Brett Doerr	CH2M HILL/ Contractor Activity Manager/ Navy contractor primary POC, Quality Assurance Officer (QAO)/SAP review	757-671-6219			
John Swenfurth	CH2M HILL/Contractor PM/Logistics and Administration	813-281-7762 813-390-4734 (c)			
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Ronny Fields or TBD	FTL/SSC	423-310-6556 or TBD			
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Howard Holmes	ALS – Kelso (Laboratory wet chem ORP only)/Project Manager	360-577-7222			
TBD	Data Validator/Project Manager	TBD			
Bhavana Reddy	CH2M HILL/Data Manager	703-608-1488			

Note: CH2MHILL will maintain the signed signature page with the project files.

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SAP Worksheet #9-1—Project Scoping Session Participants Sheet

Project Name: Addendum 2 Sampling for the Remedial Investigation at UXO 15				
Projected Date(s) of Sampling: TBD		Site Name: UXO 15		
PM: John Swenfurth		Site Location: Former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico		
Dates of Session: June 18, 2014, San Juan, Puerto Rico.				
Scoping Session Purpose: UXO 15 RI SAP Addendum 2 Scoping Session.				
Name	Title/Role	Affiliation	Phone #	E-mail Address
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SAP Worksheet #9-1—Project Scoping Session Participants Sheet (continued)

Discussion Objective

Conduct a scoping session and discuss the proposed approach for the supplemental RI at UXO 15.

Key Discussion Points

Bill Hannah/CH2M HILL gave a presentation on the results of the UXO 15 RI Status Report finalized in May 2014 and the planned path forward and approach for the UXO 15 RI SAP Addendum 2. The previous RI activities characterized the potential of subsurface munitions in Photo-Identified (PI) Site 9 West/PI 13, removed debris piles and characterized the potential for release, inspected the community suggested areas of potential munitions, and visually inspected the encrusted munitions extent at PI-9 East.

The RI within PI 9 West focused on subsurface munitions and explosives of concern (MEC); however, during the RI, nine man-made berms were identified that ranged up to 6 feet high, 10 feet wide, and up to hundreds of feet in length. The digital geophysical mapping (DGM) results indicated that the berms were primarily soil, but sizeable buried objects were also identified. The exact locations of the berms were not previously mapped. In addition, drum debris was identified at several berms and several isolated drums were identified on the ground surface. Based on these findings, the objectives of this RI SAP Addendum 2 is to further characterize the nature and potential contamination associated with the berms at PI 9 West. The approach includes a field reconnaissance and general mapping of the berms, conduct DGM along the berms where feasible (some areas have steep slopes), conduct intrusive investigations by UXO personnel at select locations to characterize the nature of the berm material (soil sampling based on findings), and collect one surface and subsurface soil sample adjacent to each of the 8 drum locations previously identified, in accordance with the Vieques Protocols (analyzed for volatile organic compounds [VOCs], semi-volatile organic compounds [SVOCs], pesticides, polychlorinated biphenyls (PCBs), inorganic constituents, and explosives).

In addition, the RI identified two potential detonation areas identified south of the lagoon in the western portion. The objectives of this RI Addendum activities will be to characterize the nature and extent of contamination at the potential former detonation area. The approach will be to conduct DGM and intrusive investigation in the immediate vicinity, and collect one surface and subsurface soil sample at each potential detonation area for explosives and inorganics, in accordance with Vieques Protocols.

During the removal of the five debris piles, soil samples were collected from the center of each pile. Debris Pile A (200 ft²) was primarily wood and cultural debris; arsenic was observed above background values and screening criteria. Debris Pile B (several ft²) was discarded auto-related tools and supplies; inorganics were determined to be attributable to background. Debris Pile C (400 ft²) and Debris Pile D (600 ft²) were primarily rusted metal debris; 12 inorganics (aluminum, arsenic, chromium, cobalt, iron, lead, manganese, selenium, silver, thallium, vanadium, and zinc) exceeded both background and screening criteria at each debris pile. Debris Pile F (16 ft²) was primarily small arms debris; antimony, copper, lead, and zinc exceeded both background and screening criteria. The objective of this RI Addendum activities will be to confirm inorganics associated with the debris piles are attributable to background. The approach includes the collection of four additional surface soil samples topographically up or side gradient of the former debris pile and analyze only for the inorganics that exceeded both background and screening criteria.

Katarina Rutkowski/TRC Engineering Services, Inc. (TRC) suggested collecting additional soil samples to help demonstrate if geochemical conditions are contributing to concentrations greater than background.

Consensus Decisions

The team agreed on the general approach for UXO 15 RI SAP Addendum 2.

SAP Worksheet #10—Conceptual Site Model

This worksheet provides a summary of site background and key elements of the CSM followed by a narrative description of the problems to be addressed during the proposed RI sampling activities.

Site Background

The former VNTR consists of approximately 14,600 acres and is divided operationally into four Munitions Response Areas (MRAs) that from west to east comprise: the 11,000-acre Eastern Maneuver Area (EMA); the 2,500-acre Surface Impact Area (SIA); the 900-acre Live Impact Area (LIA); and the 133-acre Eastern Conservation Area (ECA) (**Figure 1**). The former VNTR was transferred from the Navy to the Department of Interior (DOI) in 2003 to be managed by USFWS as part of the National Wildlife Refuge System. While all military activities have ceased at the former VNTR, the Navy retains responsibility for any MEC and/or environmental contaminant concerns attributable to past navy activities that may exist.

UXO 15 is located within the EMA and includes PI 9 and PI 13 (**Figure 1**). Interviews conducted during the Environmental Baseline Survey (EBS) (ERM, 2003) suggest PI 9 was used for munitions storage and disposal and small open burn/open detonation (OB/OD). Two possible OB/OD locations were identified during the RI south of PI 9 west (**Figure 2**). It was documented in the EBS that PI 13 may have been the firing point from which rocket-related ordnance was launched to the LIA/SIA (ERM, 2003). However, no evidence of this use has been observed at the site during the site visits.

Investigation History

In 2005, the VNTR was placed on the National Priorities List (NPL) and response activities are conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The NPL requires environmental restoration activities for Navy Installation Restoration (IR) sites on Vieques be conducted under CERCLA unless and until removed from CERCLA authority.

A Preliminary Range Assessment (CH2M HILL, 2003) identified PI 9 as a potential munitions response site based on aerial photograph analysis (ERI, 2000). The Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report recommended PI 9 for further evaluation for munitions and munitions constituents under the MRP and an inspection of potential MEC at PI 13 (CH2M HILL, 2004).

The Expanded Range Assessment/Site Inspection (ERA/SI) identified five debris piles at UXO 15 based on transect and aerial survey results (CH2M HILL, 2007a). Small caliber casings and surface debris were located during visual evaluation of the debris piles.

RI activities were initiated in August 2012, which included surface clearance of metallic debris, DGM, and subsequent excavation and identification of subsurface anomalies along transects to determine if munitions had been buried within the subsurface. During these initial RI activities, more Range-Related Debris (RRD) was encountered than expected and multiple berms likely containing buried debris were identified (**Figure 2**), which altered the conceptual site model and, ultimately, the necessary approach to sufficiently characterize the site. As a result, the RI field activities were suspended in September 2012 and the findings were presented to the ERP Technical Subcommittee. After discussing the findings and potential options, the Subcommittee concurred that the remainder of the RI activities as presented in the RI SAP Addendum would be conducted, and that the associated findings, including the information regarding the RRD and berms, would be used to prepare an RI SAP Addendum 2 to address any additional data needs identified. Based on this consensus, the activities defined in the RI SAP Addendum resumed and were completed in April 2013. Results were presented in a Technical Memorandum entitled *Remedial Investigation Status Report and Path Forward* (CH2M HILL, 2014a), hereafter referred to as the RI Status Report in this SAP Addendum 2. The RI Status Report recommended additional characterization of the berms, drums, the potential former detonation area, and to confirm inorganics associated with debris piles are attributable to background.

SAP Worksheet #10—Conceptual Site Model (continued)

Conceptual Site Model

Figure 3 presents the generalized conceptual site model (CSM) of UXO 15, the key elements of which are described below. The purpose of this RI is to evaluate whether there have been contaminant releases at UXO 15 warranting further investigation or action. The elements of the CSM presented below are pertinent to developing the RI approach and therefore include the physical characteristics, potential release mechanisms, potential constituents released, future land use, and potential receptors.

Physical Characteristics

Most of UXO 15 is characterized as rocky land where rock outcrops exist on 50 to 70 percent of the surface. Bedrock is at or near the ground surface over the majority of PI 9 and 13. Loose stones with very thin soil are found between the outcrops. PI 9 additionally contains tidal flats and mangrove wetlands. The tidal flats are slightly above sea level, affected by sea water at high tide, and have a high salt concentration. The mangrove wetlands are covered with thick mangroves and immersed in salt water the majority of the year. UXO 15 is characterized by the TI geological zone of marine sedimentary rocks. In topographically elevated areas, such as in the central area of the peninsula and at the far eastern portion of PI 9 (**Figure 3**), limestone and dolomite are exposed at the ground surface (CH2M HILL, 2011).

Surface water bodies bound three sides of UXO 15. Puerto Mosquito is located to the west and Puerto Ferro to the east. The ocean is to the south. There is also a small lagoon between the two PI 9 areas, a small lagoon in the southwest portion of UXO 15 near the two possible detonation areas, and a small lagoon adjacent to locations of former Debris Piles A and F (**Figure 2**). Former Debris Pile F is located on soil/sediment within the intertidal zone of the lagoon.

Groundwater likely exists solely or primarily in bedrock. Groundwater may exist in overburden closer to the surface water bodies if there is a sufficient thickness of overburden. Groundwater likely discharges to Puerto Mosquito and Puerto Ferro to the east and west, and to the ocean to the south. Discharge is likely to be tidally influenced. Based on conditions encountered at similar sites around Vieques, the general groundwater geochemistry is likely brackish to saline and hard.

A variety of habitat types occur at UXO 15 including dry scrub forest, mangrove forest, secondary growth forest, evergreen scrub, areas of mixed native/naturalized and invasive vegetation, and areas of entirely invasive species.

The dry scrub forest is located on hilltops and ridges and is dominated by small diameter trees and shrubs. Dominant plant species include calambreña (*Coccoloba venosa*), corcho bobo (*Pisonia subcordata*), gumbo limbo (*Bursera simaruba*), muñeco (*Cordia collococca*), torchwood (*Amyris elemifera*), silver palm (*Coccothrinax sp.*), and tamarind (*Tamarindus indica*). Dominant species associated with the mangrove forests, which occur along the northern and western shorelines, include black mangrove (*Avicennia germinans*), red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*), buttonwood (*Conocarpus erectus*), and portia tree (*Thespesia populnea*). Secondary growth forests contain pink trumpet tree (*Tabebuia heterophylla*), cassia (*Senna bicapsularis*), torchwood (*Amyris elemifera*), and gumbo limbo (*Bursera simaruba*). Evergreen scrub habitat generally consists of very dense low-growing, or dwarf, drought-resistant shrubs and palms found on rocky coasts and limestone formations. Common species at UXO 15 include *Thrinax morrisii*, *Erithalis fruticosa*, beach creeper (*Ernodea littoralis*), *Coccoloba krugi*, *Coccothrinax sp.*, buttonsage (*Lantana involucrata*), seagrape (*Coccoloba uvifera*), sea-oxeye (*Borrichia arborescens*), slender seapurslane (*Sesuvium portulacastrum*), and blacktorch (*Erithalis fruticosa*). Mixed native and naturalized species included pink trumpet tree (*Tabebuia heterophylla*), cassia (*Senna bicapsularis*), torchwood (*Amyris elemifera*), gumbo limbo (*Bursera simaruba*), sapwood (*Comocladia dodonaea*), silver palm (*Coccothrinax sp.*), and multiple monk orchids (*Oeceoclades maculata*) on the forest floor. Invasive or introduced species including acacia (*Acacia tortuosa*), tan tan (*Leucaena leucocephala*), and mesquite (*Prosopis juliflora*). Additional details are provided in the Biological Assessment in Attachment A of the RI SAP Addendum.

SAP Worksheet #10—Conceptual Site Model (continued)

Terrestrial wildlife include land crab (*Cardisoma guanhumii*) colonies, greater Antillean grackle (*Quiscalus niger*), white-winged dove (*Zenaida asiatica*), yellow warbler (*Dendroica petechia*), mangrove cuckoo (*Coccyzus minor*), clapper rail (*Rallus longirostris*), bananaquit (*Coereba flaveola*), pearly-eyed thrasher (*Margarops fuscatus*), grey kingbird (*Tyrannus dominicensis*), black-necked stilt (*Himantopus mexicanus*), black-bellied plover (*Pluvialis squatarola*), Wilson's plover (*Charadrius wilsonia*), fulvous whistling duck (*Dendrocygna bicolor*), and Antillean nighthawks (*Chordeiles gundlachii*) nesting on exposed limestone. A wide variety of organisms can occur in the coastal marine habitat, and though not specifically surveyed in relation to UXO 15, would likely include a diverse community of marine fish (damsels, gobies, blennies, snapper, mullet, snook, tarpon), invertebrates (polychaetes, bivalves, gastropods, crustaceans, sponges, gorgonians, corals), and plants (seagrasses, marine algae).

Potential Source of a CERCLA Releases and Release Mechanisms

Potential sources of release at UXO 15 include the berms, drums, potential former detonation areas, and the debris piles (CH2M HILL, 2014a), as shown in **Figures 2 and 3**.

Berms

Several manmade berms and a mound were identified within PI 9 West (**Figure 2**). The berms are up to about 6 feet high, 20 feet wide, and up to hundreds of feet in length. Although the berms and mound appear to be primarily soil, debris was encountered both on the surface and within the subsurface and included:

- Berm A – barbed wire, cut-off fence posts, and nails
- Berms B, C, and D – aircraft/supply pallets, 55 gallon drum debris, and range related debris
- Berm E – metal pallets, wire, fence material, and railroad spikes
- Berm F – no debris identified
- Mound G – isolated manmade earthen pile with fence material identified
- Berm H – no debris identified, smaller in size and isolated
- Berm I – cultural debris

The debris within the berms are a potential source of release at UXO 15. Potential contaminants of interest in soil beneath and within the debris comprise VOCs, SVOCs, pesticides, PCBs, explosives, perchlorate, and inorganic constituents due to the relatively unknown nature of the material within the berms. Until the data is collected, it is not possible to know the amount of data necessary to achieve the project goals. Within the berms, the anomalies selected for intrusive investigation will be presented to the Technical Subcommittee for consideration. Professional interpretation will be used to select specific anomalies to intrusively investigate, such as by the geophysical signature, shape, and size.

Drums

Also within PI 9 West, eight deteriorated drums were identified on the surface (**Figure 2**) that may be a source of release at UXO 15. The former contents of the drums are unknown. Therefore, potential contaminants of interest in soil directly beneath these drums comprise VOCs, SVOCs, pesticides, PCBs, explosives, perchlorate, and inorganic constituents.

Potential Detonation Areas

Two potential detonation areas, approximately 12 ft by 12 ft each, are located in the southwestern portion of UXO 15 (**Figure 2**). Remnants of 3.5-inch rockets were identified within these pits and classified as munitions debris (MD). Residual explosives from munitions remaining at the potential detonation areas may be a source of release at UXO 15. Potential contaminants of interest in soil at the potential detonation areas comprise explosives and inorganic constituents.

SAP Worksheet #10—Conceptual Site Model (continued)

Debris Piles

Four of the five historic debris piles (Piles A through D) were located and removed; however, while the location of Pile E (previously noted as a small arms pile less than 16 square feet) was found, there was no small arms pile present (**Figure 2**). The area around the previously recorded Global Positioning System (GPS) location of Pile E was inspected visually and with a hand-held magnetometer. Although Pile E is not present, another small arms debris pile (denoted as Pile F in **Figure 2**) was identified and removed. Descriptions of the debris piles are summarized below.

- Pile A – Located within a periodically flooded area adjacent to a lagoon on the western end of Puerto Ferro. The pile was approximately 20 feet long and 10 feet wide (200 square feet). The pile contained wood pilings and assorted cultural debris. Photo 6A and 6B in **Attachment A** show the Debris Pile A area pre- and post-debris removal.
- Pile B – Located near the center of UXO 15 in an upland area. Debris covered less than several square feet and consisted of various tools, a small tool bag, and a few small vehicle-related pieces such as a spark plug. Photos 7A and 7B in **Attachment A** show the Debris Pile B area pre- and post-debris removal.
- Pile C – Located near the center of UXO 15 in an upland area. Debris consisted of rusted metal debris including pallet banding, pieces of 55 gallon drums, and recoilless rifle casings. The pile covered an area of approximately 400 square feet. Photos 8A and 8B in **Attachment A** show the Debris Pile C area pre- and post-debris removal.
- Pile D – Located near the center of UXO 15 in an upland area. Debris consisted of rusted metal debris including pallet banding, pieces of 55 gallon drums, and recoilless rifle casings along with some small arms shell casings and rubber spacers. The pile covered an area of approximately 600 square feet. Photos 9A and 9B in **Attachment A** show the Debris Pile D area pre- and post-debris removal.
- Pile F – Located within a periodically flooded area adjacent to a lagoon on the western end of Puerto Ferro. Debris contained expended small arms shell casing and was approximately 16 square feet in size. Photos 10A through 10C in **Attachment A** show the debris found at Debris Pile F and the debris removal process.

Surface soil samples were collected from a depth of 0 to 6 inches below ground surface beneath the approximate center of Piles A, B, C, D, and F in accordance with the RI SAP Addendum. Because Piles A and F are within an ecological setting that is intermittently inundated with water from the adjacent lagoon, these soil samples were denoted as sediment samples for the purposes of ecological characterization (CH2MHILL, 2014a).

Debris pile surface soil/sediment samples were analyzed for inorganics and explosives, as summarized in the RI Status Report (CH2M HILL, 2014a). No explosives were detected. Inorganic constituents detected above background and screening criteria comprise:

- Pile A – arsenic
- Pile C – aluminum, arsenic, chromium, cobalt, iron, lead, manganese, selenium, silver, thallium, vanadium, and zinc
- Pile D – aluminum, arsenic, cadmium, chromium, cobalt, iron, lead, manganese, selenium, thallium, vanadium, and zinc
- Pile F – antimony, copper, lead, and zinc

Future Land Use

The former VNTR was transferred to the DOI in 2003 to be managed by USFWS as part of the National Wildlife Refuge System, pursuant to Section 1049 of the National Defense Authorization Act for Fiscal Year 2002 (Public Law 107-107).

SAP Worksheet #10—Conceptual Site Model (continued)

A Comprehensive Conservation Plan (CCP) for the Vieques National Wildlife Refuge was completed by USFWS, which outlines the land use plan for managing the former VNTR as a wildlife refuge (DOI, 2007). Since the initiation of the RI activities, the Commonwealth of Puerto Rico and USFWS indicated that public access to the area around the historic Spanish lighthouse (Faro Veridales; **Figure 2**) is desirable by the community. As a result, the Navy implemented a Non-Time Critical Removal Action (NTCRA) in August 2014 that included the installation of hazard warning signs, educational kiosks, and munitions clearance of the planned parking area, the area around the historic lighthouse, the beaches, and trails.

Receptors

Potential receptors at the site include both human and ecological, as discussed below.

Human Health

Recreational users and trespassers may access UXO 15 by sea in some areas where steep cliffs are not present; recreational users and trespassers may also access UXO 15 by land. In addition, USFWS workers may be present at the site to conduct law enforcement activities and refuge management activities.

Ecological

Potentially complete exposure pathways exist for terrestrial receptors exposed to surface soil, and aquatic receptors exposed to surface sediment. The receptors include:

- Terrestrial – plants, soil invertebrates, birds, mammals, and reptiles exposed to surface soil
- Aquatic – benthic invertebrates, aquatic plants (e.g., mangroves), birds, fish, and mammals exposed to surface sediment in mangrove wetland habitat

Problem Statement

An RI is warranted to determine if there has been a release(s) of hazardous constituents from the debris piles, potential former detonation areas, possible munitions, or surface or subsurface debris to environmental media and, if so, whether further investigation or action is warranted.

The Technical Subcommittee met on June 18, 2014 to discuss the rationale and follow-on RI approach for UXO 15, based on information presented in the RI Status Report. While the additional information (i.e., berms, drum debris, possible detonation areas, and inorganics results underneath select debris piles) only slightly alters the problem statement provided in the RI SAP Addendum, it does add additional environmental questions to be answered in order to meet the project objective.

Environmental Questions to be Answered by the RI Sampling

To address the Problem Statement defined above, the following environmental questions will be answered via implementation of this SAP Addendum 2:

1. Is there subsurface debris present in the berms within PI 9, and has there been a release of VOCs, SVOCs, pesticides, PCBs, inorganics or explosives to the surrounding soil?

Vegetation will be cleared on and surrounding the berms to conduct DGM (where possible) across the berms (**Figure 4**). Select anomalies will be intrusively investigated by UXO personnel to sufficiently evaluate debris within the berms. Subsurface soil samples will be collected directly below debris considered a potential release of contamination (i.e., drums, munitions, etc.). Intrusive investigation findings and proposed sample locations will be presented to the Technical Subcommittee via a conference call or meeting. Soil sample depth intervals will be in accordance with the Modified Soil Sample Depth Selection Protocol (**Attachment B**), and as

SAP Worksheet #10—Conceptual Site Model (continued)

described in Worksheet #17. Worksheet #18 provides the anticipated sampling nomenclature and analytical parameters. Until the data is collected, it is not possible to know the amount of data necessary to achieve the project goals. Within the berms, the anomalies selected for intrusive investigation will be presented to the Technical Subcommittee for consideration. Professional interpretation will be used to select specific anomalies to intrusively investigate, such as by the geophysical signature, shape, and size.

2. Have there been releases of VOCs, SVOCs, pesticides, PCBs, inorganics, or explosives from the deteriorated drums to the surrounding soils?

Following removal of the drum, one surface and one subsurface soil sample will be collected underneath each of the drum locations (**Figure 4**). Soil sample depth intervals will be in accordance with the Modified Soil Sample Depth Selection Protocol (**Attachment B**), and as described in Worksheet #17. Worksheet #18 provides the anticipated sampling nomenclature and analytical parameters. Soil samples from the drum locations will be compared to the East Vieques background values.

3. Have there been releases of inorganics or explosives from debris or MD to the surrounding soil at the two potential detonation areas, and are there subsurface debris items in those two areas that could release inorganics or explosives to the surrounding soil?

Vegetation will be cleared on and around the two potential detonation areas to allow DGM coverage over the foot print of each of these areas (**Figure 5**). The horizontal extent of each individual potential detonation pit will be defined visually, with the aid of the DGM findings and intrusive investigation of the associated subsurface anomalies. One hundred percent of anomalies will be intrusively investigated. The boundaries of each potential detonation area will constitute a sampling unit because, as has been observed at SWMU 4 on the former NASD, OB/OD pits represent the most conservative sampling areas based on density of munitions-related items found. Within each sampling unit, one surface soil and a minimum of one subsurface soil sample will be collected. The surface soil samples will be incremental samples (0 – approximately 2 inches bgs, 30 increments per sampling unit).

If no subsurface anomalies are identified, one subsurface soil sample will be collected from the center of each sampling unit following the Modified Soil Sample Depth Selection Protocol for subsurface soil samples (**Attachment B**). If subsurface MEC or MD is identified, the subsurface soil sample(s) will be collected from directly beneath, if safe to do so. Additional subsurface soil samples may be added to ensure sufficient characterization of the subsurface soil based on identification of the subsurface anomalies. The number of samples collected to sufficiently characterize the subsurface soil within the detonation area is subjective, and will be based on professional judgment. The rationale for the subsurface sample collection will be provided for regulatory consideration in the RI Report. Soil sample depth intervals will be in accordance with the Modified Soil Sample Depth Selection Protocol (**Attachment B**), and as described in Worksheet #17. Soil samples from the potential detonation area will be compared to the East Vieques background values.

4. Are the inorganic constituents observed in soil associated with the former debris piles attributable to background?

Based on the results of soil sampling associated with the five debris piles, significant releases from the debris piles is not suspected. Although some inorganics concentrations above background were identified, it is not uncommon for this circumstance to still be representative of background, especially if localized variability exists. To confirm if inorganics associated with debris piles are attributable to background, ten additional surface soil samples will be collected topographically up- or side-gradient of the former debris piles from the same depth profile (0-6 inches bgs) and analyzed for those inorganics whose concentrations exceeded both

SAP Worksheet #10—Conceptual Site Model (continued)

background and screening criteria as the original samples (**Figure 6**). Ten soil samples collected topographically up- or side-gradient of Debris Piles A and F and will be analyzed for antimony, arsenic, copper, lead, and zinc. Due to the close proximity of former Debris Piles C and D and similar inorganics observed above background and screening criteria, ten soil samples will be topographically up- or side-gradient of these debris piles and analyzed for aluminum, arsenic, cadmium, chromium, cobalt, iron, lead, manganese, selenium, silver, thallium, vanadium, and zinc. Similar to the evaluation in the RI Status Report, soil samples adjacent to Debris Piles A and F will be denoted as sediment samples for the purposes of ecological characterization, since these areas are located within an ecological setting that is intermittently inundated with water from the adjacent lagoon. Background soil samples collected adjacent to the former debris piles will not be compared to PALs; a 95% upper tolerance limit (UTL) will be calculated, and the previous former debris pile soil samples will be compared to the 95% UTL and the minimum and maximum concentration range observed. Soil samples collected adjacent to the former debris piles will be used for comparison to the previous soil samples collected from the former debris piles.

5. If releases to soil are identified, what are the appropriate next steps?

This determination will be made based on screening the data using the 4-step decision tree (**Figure 7**) and conferring with the Vieques Technical Subcommittee regarding the findings, conclusions, and recommendations. With regards to decision processes associated with data evaluation, **Figure 7** is the standard RI process, which has inherent data evaluation and decision processes that are subjective, based on professional judgment, and common to RIs conducted throughout the industry. The regulatory agencies will have the opportunity to review the findings, evaluations, and conclusions drawn by the Navy. With respect to the potential for additional sampling, it will be conducted under this SAP (and any SAP upon which this SAP is based), unless the type of sampling has not been covered by the SAP. In this case, a SAP addendum would be submitted.

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SAP Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements

Project Quality Objectives/Systematic Planning Process Statements.

1. For what and by whom will the data be used?

The Navy, EPA, PREQB, PRDNER, and USFWS will use the data collected during the RI Sampling (as well as relevant historical data) at UXO 15 to make determinations of whether CERCLA-related releases took place and, if so, whether further investigation or action is warranted. Site-specific data uses are defined in Item 5 of this worksheet.

2. What are the Project Action Limits (PALs)?

The PALs are defined in the Master SOPPPs (CH2M HILL, 2010a) and are listed, by constituent group and medium, in Worksheet #15. In general, the PALs are:

- Vieques human health screening values for soil are the current (as of the time the RI is being conducted and will be updated as new screening values are published) Regional Screening Levels (RSLs) (adjusted for a hazard quotient [HQ] of 0.1 for non-carcinogens) provided by USEPA.
- Vieques ecological screening values for soil (soil toxicity reference values [TRVs]), and for marine sediment, which are listed in the *Vieques Master Ecological Risk Assessment Protocol* (CH2M HILL, 2010a) and associated *Master ERA Protocol Update 1* (CH2M HILL, 2013b).
- Vieques soil-to-groundwater leaching screening values provided by USEPA.
- Vieques discrete surface soil inorganics screening values are the East Vieques background soil inorganics UTLs (CH2M HILL, 2007b).
- Where a specific PAL deviates from the above, it is footnoted in the applicable Worksheet #15 table.
- Results for screening data (i.e., general chemistry parameter pH) collected to support the interpretation of ecological risk results will not be compared to strictly-defined PALs, but will be evaluated qualitatively. This parameter is identified in Worksheet #15. There are no project indicator limits (PILs); pH, ORP, and total organic carbon (TOC) results will be the only screening data generated.
- In addition to listing the particular analytes, PALs, and limits of quantitation (LOQs), Worksheet #15 identifies where limits of detection (LODs) are greater than PALs. Even though LODs may be greater than certain PALs, detection limits (DLs) may be closer to or less than PALs. When this occurs, and if a constituent is detected in a sample at or at greater than the PAL, then it is reported, qualified as applicable. The majority of the constituents have LODs less than PALs. Detections less than the LOD that are qualified as estimated will be used as reported, as this is industry-standard practice for these types of results. For the following groups of constituents, the DL is still greater than the PAL: 8 VOCs (exceeded Soil Screening Level [SSL]), 22 SVOCs (exceeded SSLs and one exceeded SSL and TRV), 7 pesticides/PCBs (exceeded SSLs), 12 explosives (exceeded SSLs), and one inorganic (exceeded SSLs).
- As noted above, with exception of one SVOC (atrazine), all occurrences of the DL being greater than the PAL are for SSLs. The Vieques screening values on which the PALs are based are not of equal importance. Therefore, decisions with respect to a particular constituent can still be made when the DL is greater than the PAL. The SSLs are more qualitative than human health and ecological screening values. Past experience at Vieques has demonstrated that SSLs are not reliable predictors of leaching to groundwater; they are overly conservative (see multiple site-specific SSL discussions contained in the *Site Inspection/Expanded Site Inspection Report* [CH2M HILL, 2010b]). While atrazine's TRV is less than the DL, that the remaining SVOCs (and pesticides) have PALs above the DL is sufficient to address any potential uncertainty associated with non-detect results for atrazine (i.e., it is unlikely atrazine would be present in the absence of other SVOCs and pesticides).

SAP Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements (continued)

3. What types of data are needed (matrix, target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques)?
 - Soil samples will be submitted to an offsite laboratory for analysis (APPL, Inc., Clovis, CA and ALS, Kelso, WA).
 - Chemicals of interest for drum samples consist of VOCs, SVOCs, pesticides PCBs, explosives, and inorganics and berm debris samples consist of VOCs, SVOCs, pesticides/PCBs, explosives, and inorganics; for the potential detonation areas they consist of inorganics and explosives; and for the former debris piles they consist of select inorganics, as shown in Worksheet #15.
 - Worksheets #15 and #18 define the matrices, analytical groups, and, where applicable, specific target analytes for UXO 15.
4. How “good” does the data need to be in order to support the environmental decision?
 - The data will be of the quantity and quality necessary to provide technically sound and defensible assessments of the site conditions and potential risks at UXO 15. Laboratory methods will meet CERCLA, EPA Region 2, and Navy guidance and the data will be validated by a third-party validator using national functional guidance, methodology, and laboratory Standard Operating Procedures (SOPs) as described in Worksheet #36.
 - The laboratory will follow the Measurement Performance Criteria (MPC) in Worksheet #28 for field and laboratory QC samples. These MPC are consistent with the U.S. Department of Defense (DoD) Quality Systems Manual (QSM) as applicable and laboratory in-house limits where the QSM does not apply.
5. How much data should be collected (number of samples for each analytical group, matrix, and concentration)?

Worksheet #18 contains the number of samples per matrix per analytical group for UXO 15. Worksheets #15 contain the particular analytes, PALs, and quantitation limits (QLs). Worksheet #17 provides the rationale for the particular sampling at each area.

- Berm debris samples (**Figure 4**): Following intrusive anomaly investigation of the berms, surface soil samples and subsurface soil samples will be collected from underneath select debris removed from the berms, with concurrence among the Vieques Technical Subcommittee. Surface and subsurface soil samples will be analyzed for VOCs, SVOCs, pesticides/PCBs, explosives, inorganics, and pH, TOC, and ORP.
- Drum samples (**Figure 4**): The eight drums will be removed, and one surface soil sample will be collected from underneath each of the eight locations. In addition, one subsurface soil sample will be collected following the Modified Soil Sample Depth Selection Protocol (**Attachment B**). Surface and subsurface soil samples will be analyzed for VOCs, SVOCs, pesticides, PCBs, explosives, inorganics, and pH, TOC, and ORP. If other drums are identified during the investigation, an additional surface and subsurface soil sample will be collected beneath each.
- Possible detonation areas (**Figure 5**): One surface soil and subsurface soil sample will be collected from each of the possible detonation areas and analyzed for explosives and inorganics.

SAP Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements (continued)

- Debris pile samples (**Figure 6**): Ten background soil samples will be collected up- or side-gradient of former Debris Pile A and analyzed for antimony, arsenic, copper, lead, and zinc, pH, TOC, and ORP. Ten background soil samples will be collected at UXO 15 up gradient and side gradient of former Debris Piles C and D and analyzed for aluminum, arsenic, cadmium, chromium, cobalt, iron, lead, manganese, selenium, silver, thallium, vanadium, and zinc. . The background soil samples are being collected to confirm if inorganics associated with the debris piles are attributable to background. A background set will be created listing the 95% UTL value and additionally the minimum and maximum value of the data set will be used for screening purposes. This background set will not be included as part of the East Vieques background soil inorganics UTLs, but will be used as site-specific background because the data is representative of site-specific conditions not affected by potential releases from the small debris piles.

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

- Samples will be collected during one field mobilization planned to start in May 2015.
- Data will be collected and generated in accordance with the procedures outlined in the UFP-SAP. Specifically see the SOPs in Appendix A of the ESI SAP (CH2M HILL, 2011), the RI SAP Addendum (CH2M HILL, 2012b) and **Appendix B** of this document for more details.

7. Who will collect and generate the data? How will the data be reported?

- CH2M HILL field staff will collect the samples.
- Laboratory analysis will be performed by APPL, Inc. of Clovis, California and ALS – Kelso, Washington (for ORP only).
- The data will be evaluated and documented in an RI Report.

8. How will the data be archived?

The data will be archived in accordance to procedures dictated in the Navy CLEAN program/contract. At the end of the project, archived data will be returned to the Navy.

9. List the project quality objectives (PQOs) in the form of if/then qualitative and quantitative statements.

The decision analysis process shown in **Figure 7** represents the PQOs for the UXO 15 work in this RI and as discussed in detail in the ESI SAP (CH2M HILL, 2011) and the RI SAP Addendum (CH2M HILL, 2012b). With regards to decision processes associated with data evaluation, Figure 7 is the standard RI process, which has inherent data evaluation and decision processes that are subjective, based on professional judgment, and common to RIs conducted throughout the industry. The regulatory agencies will have the opportunity to review the findings, evaluations, and conclusions drawn by the Navy. With respect to the potential for additional sampling, it will be conducted under this SAP (and any SAP upon which this SAP is based), unless the type of sampling has not been covered by the SAP. In this case, a SAP addendum would be submitted.

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SAP Worksheet #12—Measurement Performance Criteria Table for Field QC Samples

As requested by EPA Region 2 for another site in Puerto Rico, all field QC sample information is provided within Worksheet #28 and Worksheet #12 is not applicable.

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SAP Worksheet #13—Secondary Data Criteria and Limitations Table

The table below provides general information on how secondary data will be used in meeting the current project objectives and the limitations on their use in developing the SAP. Secondary data criteria and limitations tables are presented for each site where historical analytical data exist (applicable to the scope of work covered by this SAP), specifically to address the use and limitations of the historical analytical data.

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Debris pile soil samples	CH2MHILL. Remedial Investigation Status Report and Path Forward, UXO 15, Atlantic Fleet Weapons Training Area-Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico May 2014	Surface soil samples from below debris piles after debris removed (0-6-in. bgs)	Data will be compared to 10 side gradient/up gradient surface soil samples also collected from 0-6-in. bgs to determine if inorganic exceedances are actually localized background geochemistry	No limitations

Note:

See Worksheet #10 for discussion of historical documents pertaining to the site, the data from which will be used for historical perspective for the site and not for making decisions for the project.

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SAP Worksheet #14—Summary of Project Tasks

The technical approach for the proposed field activities at UXO 15 is detailed below. The *Master Standard Operating Procedures, Protocols, and Plans* (CH2M HILL, 2010a) address the protocols and SOPs to be used for the field activities. Specifically, SOPs A-2, and A-3 provide the protocols and SOPs for soil sampling activities. The Modified Soil Sample Depth Selection Protocol is provided in **Attachment B**. The sample design rationale is presented in Worksheet #17.

In general, work will be performed in accordance with the *Health and Safety Plan, Vieques Environmental Restoration Program, Former Vieques Naval Training Range and Former Naval Ammunition Support Detachment Vieques, Puerto Rico* (CH2M HILL, 2014b). All activities will be conducted with UXO avoidance support.

Mobilization

Mobilization for the field effort includes scheduling support staff, as well as procurement of necessary field equipment and initial transport to the site. Equipment and supplies will be brought to the site when the CH2M HILL field team mobilizes for field activities.

Prior to mobilization, Naval Facilities Engineering Command (NAVFAC) Atlantic, EPA, PREQB, PRDNER, and USFWS will be notified to allow for appropriate oversight and coordination. Additionally, CH2M HILL has/will procure the following subcontractors to support investigation activities:

- Vegetation removal - USA Environmental, Inc.
- Analytical laboratory - APPL, Inc., and ALS-Kelso
- Data validation - TBD
- Investigation Derived Waste (IDW) disposal contractor - TBD

Vegetation Removal

Vegetation removal at UXO 15 is required to support related DGM activities at each of the berms and around the potential detonation areas. A Biological Assessment (BA) of sensitive species and habitats was conducted in April 2011. A copy of the Final BA report is included with the RI SAP Addendum (CH2MHILL, 2012b) as Attachment A. The results of the BA indicated that no threatened or endangered plant or bird species were observed during the survey; however, 63.5 acres of important habitats were identified within PI 9 and PI 13.

Vegetation will be removed in accordance with the Vegetation Removal Standard Operating Procedure (SOP MR-1) in the *Master Sampling and Analysis Plan East Vieques Terrestrial UXO Sites, Former Vieques Naval Training Range, Vieques, Puerto Rico* (CH2M HILL, 2013a), with the following modifications:

- A Schonstedt GA-52CX magnetometer (or comparable) will be used to assist in identifying potential surface munitions and explosives of concern (MEC) during the vegetation clearance.

A site reconnaissance will be conducted prior (if feasible) or simultaneously with the vegetation team to map the locations of the berms using GPS.

Surface Clearance

Surface clearance of MEC and debris will be conducted using a Schonstedt GA-52 CX magnetometer (or comparable) at the berms and potential detonation areas. The horizontal extent of each individual potential detonation pit will be defined visually, with the aid of the DGM findings and intrusive investigation of the associated subsurface anomalies.

Digital Geophysical Mapping

The DGM survey at UXO 15 will be performed along the berms (**Figure 4**) and at the two potential detonation areas (**Figure 5**) where feasible. The geophysical operations will be conducted using procedures defined in the RI SAP Addendum (CH2M HILL, 2012b).

SAP Worksheet #14—Summary of Project Tasks (continued)

Excavation of Subsurface Anomalies

The excavation of subsurface anomalies will be conducted using procedures defined in the RI SAP Addendum (CH2M HILL, 2012b). Select anomalies will be intrusively investigated by UXO personnel to sufficiently evaluate debris within the berms. MEC removal at each of the potential detonation areas will be conducted to the total subsurface depth of MEC identified using DGM. If the subsurface excavation prohibits confirmation of removal using DGM equipment, the excavation bottom and sidewalls will be checked with a Schonstedt GA-52 CX magnetometer (or comparable) to see if an anomaly source is still present.

Positions and information on any sources of anomalies not removed from the subsurface will be recorded, and the reasons for not removing them will be documented in accordance with the *Non-Time Critical Removal Action Work Plan, Surface Munitions and Explosives of Concern at Munitions Response Area-Surface Impact Area Munitions Response Sites 1-7, Former Vieques Naval Training Range (VNTR), Vieques, Puerto Rico* (CH2M HILL, 2009). Reasons for not removing the source of an anomaly include not finding the source (e.g., magnetic spot in bedrock), an object is below the water table and the hole will not remain open to continue excavation, etc. If encountered, these will be recorded in the field logbook and included in the RI report.

QC will be conducted according to Section 10 and Appendix B of the *Work Plan for Munitions and Explosives of Concern Subsurface Interim Removal Action Beaches and Select Roadways* (CH2M HILL, 2008).

Sample Location Recording

The sampling locations will be recorded using Real Time Kinematic (RTK) GPS coordinates, accurate to approximately 2 centimeters, depending on ambient conditions such as canopy cover. Each sampling point will be walked by anomaly avoidance personnel/subcontractors prior to coordinate establishment and sampling for anomaly avoidance.

Soil Sampling

Soil samples will be collected in accordance with Vieques Protocols and the Modified Soil Sample Depth Selection Protocol (**Attachment B**). Surface soil samples collected beneath debris within a berm, drums, or adjacent to the former debris piles will be collected from 0-6 inches bgs. Surface soil samples at the potential detonation areas will be collected from 0-1 foot bgs (0-2 feet bgs if in a land crab habitat). Subsurface soil samples will be collected in accordance with the Modified Soil Sample Depth Selection Protocol. Samples will be collected with a hand auger or similar.

Sample Management and Shipment

Samples will be collected in laboratory prepared sample containers and packed on ice. QA/QC samples will be collected in accordance with Worksheet #20. All samples for off-site analysis will be shipped in accordance with the Master SOP H-9, "Packaging and Shipping Procedures for Low-Concentration Samples."

Documentation

Pertinent field observations will be recorded in a field notebook in accordance with applicable SOPs referenced on Worksheet #21.

Equipment Decontamination

All non-disposable sampling equipment will be decontaminated before sampling activities at each location in accordance with applicable SOPs referenced in Worksheet #21. Disposable equipment and personal protective equipment (PPE) that comes in contact with environmental media at the site will be decontaminated in accordance with SOP E-1 and disposed of with normal trash.

SAP Worksheet #14—Summary of Project Tasks (continued)

Investigation-Derived Waste Management

IDW will be managed and disposed of in accordance with the Master Waste Management Plan (CH2M HILL, 2010a). The only liquid IDW anticipated is relatively small amounts of decontamination fluids. If practical, the liquid IDW will be allowed to evaporate; otherwise, it will be containerized, characterized, and disposed of in general accordance with the Master Waste Management Plan of the Master Protocols (CH2M HILL, 2010a).

Quality Control

In reference to the field tasks, all field work will be overseen by the FTL, or his/her delegate, who is responsible for the QC of the sampling task.

Sample Analysis

The laboratory will analyze samples for various groups of parameters as shown on Worksheets #15 and #18. The laboratory will maintain, test, inspect, and calibrate analytical instruments (Worksheets #24 and #25).

Data Management

The Project Chemist, Michael Zamboni (or other qualified personnel), is responsible for data tracking and storage. In addition a third party data validator (DV) will receive all analytical data from the laboratory and the data will be validated prior to its use by the Navy. All validated analytical data will be loaded into the Navy Installation Restoration Information System (NIRIS) database.

Procedures for Recording and Correcting Data

Field data will be recorded in field logbooks.

Project Assessment/Audit: Worksheets #31 and #32

Data Validation: Worksheets #34-36

Data Usability Assessment: Worksheet #37, ESI SAP, UXO 15 (CH2MHILL, 2011)

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SAP Worksheet #15-1—Reference Limits and Evaluation Table

Matrix: SB, SS

Analytical Group: VOC

Analyte	CAS # ¹	RSLs Residential Soil Adjusted ² (µg/kg)	SSLs ² (µg/kg)	Soil TRVs ² (µg/kg)	Project QL Goal ³ (µg/kg)	Laboratory Limits ^{4,5} (µg/kg)			LCS and MS/MSD Recovery Limits and RPD ⁴ (%)		
						LOQ	LOD	DL	LCL	UCL	RPD
1,1,1-Trichloroethane	71-55-6	640,000	70	1,025	35	5	2	0.81	73	130	20
1,1,2,2-Tetrachloroethane	79-34-5	600	0.03	5,000	0.015	5	2	1.24	70	124	
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	76-13-1	910,000	140,000	NC	70,000	10	2	0.83	66	136	
1,1,2-Trichloroethane	79-00-5	150	1.6	2,000	0.8	5	2	0.96	78	121	
1,1-Dichloroethane	75-34-3	3,600	0.78	548	0.39	5	2	1.13	76	125	
1,1-Dichloroethene	75-35-4	23,000	2.5	173	1.25	5	2	0.79	70	131	
1,2,3-Trichlorobenzene	87-61-6	4,900	21	1,150	10.5	5	2	0.5	66	130	
1,2,4-Trichlorobenzene	120-82-1	5,800	200	1,270	100	5	2	0.52	67	129	
1,2-Dibromo-3-chloropropane	96-12-8	5.3	0.086	NC	0.043	10	5	2.19	61	132	
1,2-Dibromoethane	106-93-4	36	0.014	300	0.007	5	2	0.6	78	122	
1,2-Dichlorobenzene	95-50-1	180,000	580	1,000	290	5	2	0.95	78	121	
1,2-Dichloroethane	107-06-2	460	1.4	2,190	0.7	5	2	0.77	73	128	
1,2-Dichloropropane	78-87-5	1,000	1.7	38,800	0.85	5	2	0.72	76	123	
1,3-Dichlorobenzene	541-73-1	NC	NC	1,000	500	5	2	0.6	77	121	
1,4-Dichlorobenzene	106-46-7	2,600	72	1,280	36	5	2	0.67	75	120	
2-Butanone	78-93-3	2,700,000	1,200	NC	600	10	3	2.79	51	148	
2-Hexanone	591-78-6	20,000	8.8	NC	4.4	10	2	0.89	53	145	
4-Methyl-2-pentanone	108-10-1	530,000	280	NC	140	10	2	0.93	65	135	
Acetone	67-64-1	6,100,000	2,900	NC	1,450	10	5	2.8	36	164	
Benzene	71-43-2	1,200	2.6	7	1.3	5	2	0.63	77	121	
Bromochloromethane	74-97-5	15,000	21	NC	10.5	10	2	0.81	78	125	
Bromodichloromethane	75-27-4	290	22	NC	11	5	2	0.69	75	127	
Bromoform	75-25-2	67,000	21	300	10.5	5	2	0.8	67	132	
Bromomethane	74-83-9	680	1.9	NC	0.95	5	2	1.6	53	143	
Carbon disulfide	75-15-0	77,000	240	NC	120	5	2	1.08	63	132	
Carbon tetrachloride	56-23-5	650	1.9	3,400	0.95	5	2	0.8	70	135	
Chlorobenzene	108-90-7	28,000	68	2,400	34	5	2	0.49	79	120	
Chloroethane	75-00-3	1,400,000	5,900	5,000	2,500	5	2	1.55	59	139	

SAP Worksheet #15-1—Reference Limits and Evaluation Table (continued)

Matrix: SB, SS

Analytical Group: VOC

Analyte	CAS # ¹	RSLs Residential Soil Adjusted ² (µg/kg)	SSLs ² (µg/kg)	Soil TRVs ² (µg/kg)	Project QL Goal ³ (µg/kg)	Laboratory Limits ^{4,5} (µg/kg)			LCS and MS/MSD Recovery Limits and RPD ⁴ (%)		
						LOQ	LOD	DL	LCL	UCL	RPD
Chloroform	67-66-3	320	22	1,844	11	5	2	1.43	78	123	20
Chloromethane	74-87-3	11,000	49	5,000	24.5	10	5	1.82	50	136	
cis-1,2-Dichloroethene	156-59-2	16,000	21	447	10.5	5	2	1.07	77	123	
cis-1,3-Dichloropropene	10061-01-5	1,800	0.17	5,000	0.085	5	2	0.93	74	126	
Cyclohexane	110-82-7	120,000	13,000	6,000	3,000	5	2	0.82	67	131	
Dibromochloromethane	124-48-1	730	21	NC	10.5	5	2	0.85	74	126	
Dichlorodifluoromethane (Freon-12)	75-71-8	8,700	300	NC	150	10	2	1.31	29	149	
Ethylbenzene	100-41-4	5,800	780	18	9	5	2	1.01	76	122	
Isopropylbenzene	98-82-8	190,000	740	NC	370	5	2	1.11	68	134	
m- and p-Xylene	m&pXYLENE	55,000	190	2,400	95	10	5	2.35	77	124	
Methyl acetate	79-20-9	7,800,000	4,100	NC	2,050	10	2	1	53	144	
Methylcyclohexane	108-87-2	NC	NC	NC	5	20	5	2	66	133	
Methylene chloride	75-09-2	35,000	1.3	1,250	0.65	20	10	4.58	70	128	
Methyl-tert-butyl ether (MTBE)	1634-04-4	47,000	3.2	NC	1.6	5	2	0.89	73	125	
o-Xylene	95-47-6	65,000	190	2,400	95	5	2	1.02	77	123	
Styrene	100-42-5	600,000	110	64,000	55	5	2	1.21	76	124	
Tetrachloroethene	127-18-4	8,100	2.3	200	1.15	5	2	0.54	73	128	
Toluene	108-88-3	490,000	690	40,000	345	5	2	1.3	77	121	
trans-1,2-Dichloroethene	156-60-5	160,000	29	447	14.5	5	2	1.35	74	125	
trans-1,3-Dichloropropene	10061-02-6	1,800	0.17	5,000	0.085	5	2	0.78	71	130	
Trichloroethene	79-01-6	410	1.8	10	0.9	5	2	0.98	77	123	
Trichlorofluoromethane(Freon-11)	75-69-4	73,000	730	NC	365	5	2	1.56	62	140	
Vinyl chloride	75-01-4	59	0.69	412	0.345	5	2	1.68	56	135	

Notes: NC indicates that there is no criterion for an analyte.

Shading represents instances where the PAL is less than the laboratory LOD. Non-detects will not be treated as exceedances, although they will be reported at a value greater than the PAL.

¹ Some CAS numbers are contractor-specific.

² Refer to Worksheet #11 for specific identification of PALs by matrix. RSLs values are current as of January 2015. SSLs are Risk-Based when an MCL-based value does not exist and are current as of January 2015. Soil TRVs are applicable to surface soil only.

³ The PQL Goal is 1/2 the lesser of the applicable screening levels.

⁴ DoD QSM v5.0 is the basis for LCS and MS/MSD limits. Bolded values indicate analytes for which DoD QSM v5.0 does not provide limits and laboratory in-house limits are used.

⁵ Results for non-aqueous samples are reported on a dry-weight basis.

SAP Worksheet #15-2—Reference Limits and Evaluation Table

Matrix: SB, SS

Analytical Group: SVOC

Analyte	CAS # ¹	Full Scan or SIM	RSLs Residential Soil Adjusted ² (µg/kg)	SSLs ² (µg/kg)	Soil TRVs ^{2,3} (µg/kg)	Project QL Goal ⁴ (µg/kg)	Laboratory Limits ^{5,6} (µg/kg)			LCS and MS/MSD Recovery Limits and RPD ⁵ (%)		
							LOQ	LOD	DL	LCL	UCL	RPD
1,1-Biphenyl	92-52-4	Full Scan	4,700	8.7	13,600	4.4	330	167	90	40	117	20
1,2,4,5-Tetrachlorobenzene	95-94-3	Full Scan	1,800	7.9	1,000	4.0	330	167	66	37	119	
2,2'-Oxybis(1-chloropropane)	108-60-1	Full Scan	4,900	0.13	NC	0.1	330	167	47.3	33	131	
2,3,4,6-Tetrachlorophenol	58-90-2	Full Scan	180,000	1,500	500	250	330	167	66	44	125	
2,4,5-Trichlorophenol	95-95-4	Full Scan	620,000	4,400	1,350	675	330	167	60.1	41	124	
2,4,6-Trichlorophenol	88-06-2	Full Scan	6,200	15	580	7.5	330	167	48.3	39	126	
2,4-Dichlorophenol	120-83-2	Full Scan	18,000	54	500	27	330	167	50.5	40	122	
2,4-Dimethylphenol	105-67-9	Full Scan	120,000	420	1,000	210	330	167	43.9	30	127	
2,4-Dinitrophenol	51-28-5	Full Scan	12,000	44	20,000	22	660	167	53.7	15	130	
2,4-Dinitrotoluene	121-14-2	Full Scan	1,700	0.32	11,000	0.2	660	167	63.8	48	126	
2,6-Dinitrotoluene	606-20-2	Full Scan	360	0.067	8,500	0	660	167	60.6	46	124	
2-Chloronaphthalene	91-58-7	Full Scan	630,000	3,800	NC	1,900	330	167	52.4	41	114	
2-Chlorophenol	95-57-8	Full Scan	39,000	74	500	37	330	167	44.3	34	121	
2-Methylnaphthalene	91-57-6	SIM	23,000	190	NC	95	5	1.67	0.94	39	114	
2-Methylphenol	95-48-7	Full Scan	310,000	750	1,000	375	330	167	45.2	32	122	
2-Nitroaniline	88-74-4	Full Scan	61,000	80	NC	40	660	167	62.4	44	127	
2-Nitrophenol	88-75-5	Full Scan	NC	NC	1,000	500	330	167	47.8	36	123	
3,3'-Dichlorobenzidine	91-94-1	Full Scan	1,200	0.81	NC	0.4	660	167	56.3	22	121	
3-Nitroaniline	99-09-2	Full Scan	NC	NC	NC	0	660	167	61.1	33	119	
4,6-Dinitro-2-methylphenol	534-52-1	Full Scan	490	2.6	1,000	1.3	660	167	56.4	29	132	
4-Bromophenyl-phenylether	101-55-3	Full Scan	NC	NC	NC	0	330	167	56.6	46	124	
4-Chloro-3-methylphenol	59-50-7	Full Scan	620,000	1,700	500	250	330	167	58.8	45	122	
4-Chloroaniline	106-47-8	Full Scan	2,700	0.16	500	0.1	330	167	16.5	17	106	
4-Chlorophenyl-phenylether	7005-72-3	Full Scan	NC	NC	NC	167	330	167	60.7	45	121	
3- and 4-Methylphenol	m&pCRESOL	Full Scan	620,000	1,500	1,000	500	330	167	46.4	34	119	
4-Nitroaniline	100-01-6	Full Scan	25,000	1.6	NC	0.8	330	167	72.8	35	115	

SAP Worksheet #15-2—Reference Limits and Evaluation Table (continued)

Matrix: SB, SS

Analytical Group: SVOC

Analyte	CAS # ¹	Full Scan or SIM	RSLs Residential Soil Adjusted ² (µg/kg)	SSLs ² (µg/kg)	Soil TRVs ^{2,3} (µg/kg)	Project QL Goal ⁴ (µg/kg)	Laboratory Limits ^{5,6} (µg/kg)			LCS and MS/MSD Recovery Limits and RPD ⁵ (%)		
							LOQ	LOD	DL	LCL	UCL	RPD
4-Nitrophenol	100-02-7	Full Scan	NC	NC	380	190	660	167	59.8	30	132	20
Acenaphthene	83-32-9	SIM	350,000	5,500	NC	2,750	5	1.67	0.97	44	111	
Acenaphthylene	208-96-8	SIM	350,000	5,500	NC	2,750	5	1.67	0.89	39	116	
Acetophenone	98-86-2	Full Scan	780,000	580	NC	290	330	167	90	33	115	
Anthracene	120-12-7	SIM	1,700,000	58,000	NC	29,000	5	1.67	0.83	50	114	
Atrazine	1912-24-9	Full Scan	2,300	1.9	11.9	1	330	167	90	47	127	
Benzaldehyde	100-52-7	Full Scan	780,000	430	NC	215	330	167	90	20	140	
Benzo(a)anthracene	56-55-3	SIM	150	12	NC	6	5	1.67	0.91	54	122	
Benzo(a)pyrene	50-32-8	SIM	15	240	NC	7.5	5	1.67	0.93	50	125	
Benzo(b)fluoranthene	205-99-2	SIM	150	41	NC	20.5	5	1.67	1.11	53	128	
Benzo(g,h,i)perylene	191-24-2	SIM	NC	NC	NC	2	5	1.67	1.34	49	127	
Benzo(k)fluoranthene	207-08-9	SIM	1,500	400	NC	200	5	1.67	1.04	56	123	
bis(2-Chloroethoxy)methane	111-91-1	Full Scan	18,000	13	NC	6.5	330	167	49.9	36	121	
bis(2-Chloroethyl)ether	111-44-4	Full Scan	230	0.0036	NC	0	330	167	50	31	120	
bis(2-Ethylhexyl)phthalate	117-81-7	Full Scan	38,000	1,400	30,000	700	660	167	61.6	51	133	
Butylbenzylphthalate	85-68-7	Full Scan	280,000	230	30,000	115	330	167	55.5	48	132	
Caprolactam	105-60-2	Full Scan	3,100,000	2,500	NC	1,250	330	167	90	46	117	
Carbazole	86-74-8	Full Scan	NC	NC	NC	0	330	167	81.6	50	123	
Chrysene	218-01-9	SIM	15,000	1,200	NC	600	5	1.67	0.85	57	118	
Dibenz(a,h)anthracene	53-70-3	SIM	15	13	NC	6.5	5	1.67	0.92	50	129	
Dibenzofuran	132-64-9	Full Scan	7,200	150	NC	75	660	167	57.3	44	120	
Diethylphthalate	84-66-2	Full Scan	4,900,000	6,100	26,800	3,050	330	167	62.1	50	124	
Dimethyl phthalate	131-11-3	Full Scan	NC	NC	10,640	5,320	330	167	63.3	48	124	
Di-n-butylphthalate	84-74-2	Full Scan	620,000	2,300	40,000	1,150	330	167	65.9	51	128	
Di-n-octylphthalate	117-84-0	Full Scan	62,000	57,000	30,000	15,000	330	167	58.4	45	140	
Fluoranthene	206-44-0	SIM	230,000	89,000	NC	44,500	5	1.67	1.2	55	119	
Fluorene	86-73-7	SIM	230,000	5,400	NC	2,700	5	1.67	1	47	114	

SAP Worksheet #15-2—Reference Limits and Evaluation Table (continued)

Matrix: SB, SS

Analytical Group: SVOC

Analyte	CAS # ¹	Full Scan or SIM	RSLs Residential Soil Adjusted ² (µg/kg)	SSLs ² (µg/kg)	Soil TRVs ^{2,3} (µg/kg)	Project QL Goal ⁴ (µg/kg)	Laboratory Limits ^{5,6} (µg/kg)			LCS and MS/MSD Recovery Limits and RPD ⁵ (%)		
							LOQ	LOD	DL	LCL	UCL	RPD
Hexachlorobenzene	118-74-1	Full Scan	330	13	1,000	6.5	660	167	60.3	45	122	20
Hexachlorobutadiene	87-68-3	Full Scan	6,200	0.57	NC	0.3	330	167	51.7	32	123	
Hexachlorocyclopentadiene	77-47-4	Full Scan	37,000	160	2,000	80	330	167	44	10	126	
Hexachloroethane	67-72-1	Full Scan	4,300	0.55	NC	0.3	330	167	49.9	28	117	
Indeno(1,2,3-cd)pyrene	193-39-5	SIM	150	240	NC	75	5	1.67	0.9	49	130	
Isophorone	78-59-1	Full Scan	560,000	26	NC	13	330	167	57	30	122	
Naphthalene	91-20-3	SIM	3,800	0.54	NC	0.3	5	1.67	0.89	38	111	
Nitrobenzene	98-95-3	Full Scan	5,100	0.092	2,260	0	330	167	49.8	34	122	
n-Nitroso-di-n-propylamine	621-64-7	Full Scan	76	0.0081	NC	0	330	167	54.9	36	120	
n-Nitrosodiphenylamine	86-30-6	Full Scan	110,000	66	1,090	33	330	167	50.6	38	127	
Pentachlorophenol	87-86-5	Full Scan	990	10	2,100	5.0	660	167	58.7	25	133	
Phenanthrene	85-01-8	SIM	NC	NC	NC	0	5	1.67	1.1	49	113	
Phenol	108-95-2	Full Scan	1,800,000	3,300	1,880	940	330	167	43	34	121	
Pyrene	129-00-0	SIM	170,000	13,000	NC	6,500	5	1.67	1.24	55	117	

Notes:

Shading represents instances where the PAL is less than the laboratory LOD. Non-detects will not be treated as exceedances, although they will be reported at a value greater than the PAL.

- ¹ Some CAS numbers are contractor-specific.
 - ² Refer to Worksheet #11 for specific identification of PALs by matrix. RSLs values are current as of January 2015. SSLs are Risk-Based when an MCL-based value does not exist and are current as of January 2015. The Soil TRV screening level for Total HMW PAHs is 1,100 µg/kg and the screening level for Total LMW PAHs is 29,000 µg/kg. Soil TRVs are applicable to surface soil only.
 - ³ For Soil TRVs, the lowest of the Eco-SSLs was used as the PAL.
 - ⁴ The PQL Goal is 1/2 the lesser of the applicable screening levels.
 - ⁵ DoD QSM v5.0 is the basis for LCS and MS/MSD limits. Bolded values indicate analytes for which DoD QSM v5.0 does not provide limits and laboratory in-house limits are used.
 - ⁶ Results for non-aqueous samples are reported on a dry-weight basis.
- NC indicates that there is no criterion for an analyte.

SAP Worksheet #15-3—Reference Limits and Evaluation Table

Matrix: SB, SS

Analytical Group: PEST/PCB

Analyte	CAS # ¹	RSLs Residential Soil Adjusted ² (µg/kg)	SSLs ² (µg/kg)	Soil TRVs ^{2,3} (µg/kg)	Project QL Goal ⁴ (µg/kg)	Laboratory Limits ^{5,6} (µg/kg)			LCS and MS/MSD Recovery Limits and RPD ⁵ (%)		
						LOQ	LOD	DL	LCL	UCL	RPD
4,4'-DDD	72-54-8	2,200	7.20	583	3.60	5	4	1.8	56	139	30
4,4'-DDE	72-55-9	1,600	54	114	27	5	4	1.6	56	134	
4,4'-DDT	50-29-3	1,900	77	21	10.5	5	1.6	0.4	50	141	
Aldrin	309-00-2	31	0.75	3.63	0.38	5	1.6	1.4	45	136	
alpha-BHC	319-84-6	85	0.04	226	0.02	5	1.6	0.5	45	137	
alpha-Chlordane	5103-71-9	1,800	15	11	5.50	5	1.6	0.9	54	133	
Aroclor-1016	12674-11-2	400	110	8,000	55	50	20	10	47	134	
Aroclor-1221	11104-28-2	150	0.08	8,000	0.04	50	20	6	NA	NA	
Aroclor-1232	11141-16-5	150	0.08	8,000	0.04	50	10	3.6	NA	NA	
Aroclor-1242	53469-21-9	240	6.10	8,000	3.05	50	10	3.6	NA	NA	
Aroclor-1248	12672-29-6	240	6	8,000	3	50	10	3.6	NA	NA	
Aroclor-1254	11097-69-1	110	10	8,000	5	50	10	3.6	NA	NA	
Aroclor-1260	11096-82-5	240	27	8,000	13.50	50	10	3.6	53	140	
Aroclor-1262	37384-23-5	NC	NC	NC	12	50	12	11	NA	NA	
Aroclor-1268	11100-14-4	NC	NC	NC	12	50	12	11	NA	NA	
beta-BHC	319-85-7	300	0.14	342	0.07	5	1.6	1	50	136	
delta-BHC	319-86-8	300	0.14	226	0.07	5	1.6	1.1	47	139	
Dieldrin	60-57-1	33	0.07	4.9	0.0345	5	1.6	1.1	56	136	
Endosulfan I	959-98-8	37,000	1,400	6.32	3	5	1.6	0.44	53	132	
Endosulfan II	33213-65-9	37,000	1,400	6.32	3	5	1.6	0.44	53	134	
Endosulfan sulfate	1031-07-8	37,000	1,400	6.32	3	5	1.6	1.1	55	136	
Endrin	72-20-8	1,800	81	1.95	0.98	5	1.6	1.1	57	140	
Endrin aldehyde	7421-93-4	1,800	92	1.95	1	5	4	2.9	35	137	

SAP Worksheet #15-3—Reference Limits and Evaluation Table (continued)

Matrix: SB, SS

Analytical Group: PEST/PCB

Analyte	CAS # ¹	RSLs Residential Soil Adjusted ² (µg/kg)	SSLs ² (µg/kg)	Soil TRVs ^{2,3} (µg/kg)	Project QL Goal ⁴ (µg/kg)	Laboratory Limits ^{5,6} (µg/kg)			LCS and MS/MSD Recovery Limits and RPD ⁵ (%)		
						LOQ	LOD	DL	LCL	UCL	RPD
Endrin ketone	53494-70-5	1,800	92	1.95	1	5	4	3.5	55	136	30
gamma-BHC (Lindane)	58-89-9	560	1.2	7.75	0.60	5	1.6	0.9	49	135	
gamma-Chlordane	5103-74-2	1,800	15	11	5.50	5	1.6	1.1	53	135	
Heptachlor	76-44-8	120	33	52.9	16.50	5	1.6	1.1	47	136	
Heptachlor epoxide	1024-57-3	59	4.1	52.9	2.05	5	1.6	1.1	52	136	
Methoxychlor	72-43-5	31,000	2,200	500	250	5	1.6	1.4	52	143	
Toxaphene	8001-35-2	480	460	500	230	1,000	50	15.7	33	141	

Notes:

Shading represents instances where the PAL is less than the laboratory LOD. Non-detects will not be treated as exceedances, although they will be reported at a value greater than the PAL.

- ¹ Some CAS numbers are contractor-specific.
 - ² Refer to Worksheet #11 for specific identification of PALs by matrix. RSLs values are current as of January 2015. SSLs are Risk-Based when an MCL-based value does not exist and are current as of January 2015. Soil TRVs are applicable to surface soil only.
 - ³ For Soil TRVs, the lowest of the Eco-SSLs was used as the PAL.
 - ⁴ The PQL Goal is 1/2 the lesser of the applicable screening levels.
 - ⁵ DoD QSM v5.0 is the basis for LCS and MS/MSD limits. Bolded values indicate analytes for which DoD QSM v5.0 does not provide limits and laboratory in-house limits are used.
 - ⁶ Results for non-aqueous samples are reported on a dry-weight basis.
- NC indicates that there is no criterion for an analyte.
 NA indicates that QC samples will not be spiked with this analyte, therefore the recovery limits are not applicable.

SAP Worksheet #15-4—Reference Limits and Evaluation Table

Matrix: SB, SS, SMI

Analytical Group: EXPLO

Analyte ¹	CAS #	RSLs Residential Soil Adjusted ³ (µg/kg)	SSLs ² (µg/kg)	Soil TRVs ² (µg/kg)	Project QL Goal ³ (µg/kg)	Laboratory Limits ^{4,5} (µg/kg)			LCS and MS/MSD Recovery Limits and RPD ⁴ (%)		
						LOQ	LOD	DL	LCL	UCL	RPD
1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	220,000	2,100	NC	1,050	500	200	79	80	116	20
1,3-Dinitrobenzene (1,3-DNB)	99-65-0	620	2	NC	1	450	200	63	73	119	
2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	3,600	15	10,000	8	500	200	83	71	120	
2,4-Dinitrotoluene (2,4-DNT)	121-14-2	1,700	0.32	11,000	0.16	500	200	83	75	121	
2,6-Dinitrotoluene (2,6-DNT)	606-20-2	360	0.07	8,500	0.0335	500	200	83	79	117	
2-Amino-4,6-dinitrotoluene (2-Am-DNT)	35572-78-2	15,000	30	80,000	15	500	200	75	71	123	
2-Nitrotoluene (2-NT)	88-72-2	3,200	NC	NC	1,600	500	200	66	70	124	
3,5-Dinitroaniline (3,5-DNA)	618-87-1	NC	NC	NC	200	500	200	80	86	118	
3-Nitrotoluene (3-NT)	99-08-1	620	1.6	NC	0.8	500	200	71	67	129	
4-Amino-2,6-dinitrotoluene (4-Am-DNT)	19406-51-0	15,000	30	NC	15	500	200	75	64	127	
4-Nitrotoluene (4-NT)	99-99-0	25,000	4	NC	2	500	200	80	71	124	
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	6,000	0.27	10,000	0.135	500	200	80	67	129	
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	12,000	370	10,000	185	500	200	91	68	135	
Nitrobenzene (NB)	98-95-3	5,100	0.092	2,260	0.046	500	200	75	67	129	
Nitroglycerin (NG)	55-63-0	620	0.85	NC	0.425	500	200	85	73	124	
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	380,000	1,300	10,000	650	500	200	80	74	124	
Pentaerythritol tetranitrate (PETN)	78-11-5	12,000	28	NC	14	2500	1000	579	72	128	
Picric Acid ⁶	88-89-1	NC	NC	NC	120	200	120	60	30	130	
Perchlorate	14797-73-0	5,500	NC	1,000	500	6	4	2	84	121	

Notes: NC indicates that there is no criterion for an analyte.

Shading represents instances where the PAL is less than the laboratory LOD. Non-detects will not be treated as exceedances, although they will be reported at a value greater than the PAL.

¹ Full 8330B-list plus Picric Acid and Perchlorate.

² Refer to Worksheet #11 for specific identification of PALs by matrix. RSLs values are current as of January 2015. SSLs are Risk-Based when an MCL-based value does not exist and are current as of January 2015. Soil TRVs are applicable to surface soil only.

³ The PQL Goal is 1/2 the lesser of the applicable screening levels.

⁴ DoD QSM v5.0 is the basis for LCS and MS/MSD limits. Bolded values indicate analytes for which DoD QSM v5.0 does not provide limits and laboratory in-house limits are used.

⁵ Results for non-aqueous samples are reported on a dry-weight basis.

⁶ Results are expressed as picric acid.

SAP Worksheet #15-5—Reference Limits and Evaluation Table

Matrix: SB, SS (Drum Area and Detonation Area), SMI

Analytical Group: METAL

Analyte	CAS #	Method	East Vieques Surface Soil Background (TI) ¹ (mg/kg)	East Vieques Subsurface Soil Background (TI) ¹ (mg/kg)	RSLs Residential Soil Adjusted ¹ (mg/kg)	SSLs ¹ (mg/kg)	Soil TRVs ^{1,2} (mg/kg)	Project QL Goal ³ (mg/kg)	Laboratory Limits ^{4,5} (mg/Kg)			LCS and MS/MSD Recovery Limits and RPD ⁴ (%)		
									LOQ	LOD	DL	LCL	UCL	RPD
Aluminum	7429-90-5	6010C	35,000	35,000	7,700	30,000	NC	3,850	50	4	1.98	74	119	20
Antimony	7440-36-0	6020A	NC	NC	3.1	0.27	0.27	0.135	0.2	0.2	0.1	72	124	
Arsenic	7440-38-2	6020A	9.17	9.17	0.67	0.29	18	0.145	0.5	0.3	0.08	82	118	
Barium	7440-39-3	6010C	212	212	1,500	82	330	41	2	0.4	0.07	83	113	
Beryllium	7440-41-7	6010C	0.95	0.95	16	3	21	0.475	0.5	0.2	0.04	83	113	
Cadmium	7440-43-9	6020A	2.36	2.36	7	0.38	0.36	0.18	0.1	0.08	0.03	84	116	
Calcium	7440-70-2	6010C	417,000	417,000	NC	NC	NC	208,500	100	20	12	81	116	
Chromium	7440-47-3	6020A	70.1	70.1	0.3	100,000	26	0.15	0.5	0.2	0.07	83	119	
Chromium (hexavalent)	18540-29-9	7199	NC	NC	0.3	0.00067	NC	0.000335	0.6	0.4	0.3	80	120	
Cobalt	7440-48-4	6020A	15.8	15.8	2.3	0.27	13	0.135	0.1	0.08	0.02	84	115	
Copper	7440-50-8	6010C	94.2	94.2	310	46	28	14	5	0.4	0.21	81	117	
Iron	7439-89-6	6010C	38,100	38,100	5,500	350	NC	175	80	4	3.5	81	118	
Lead	7439-92-1	6010C	16	7.7	400	14	11	3.85	0.9	0.8	0.25	81	112	
Magnesium	7439-95-4	6010C	22,200	22,200	NC	NC	NC	11,100	30	4	3.5	78	115	
Manganese	7439-96-5	6010C	1,630	1,630	180	28	220	14	4.5	0.4	0.13	84	114	
Nickel	7440-02-0	6010C	41	41	150	26	38	13	4	0.4	0.11	83	113	
Potassium	7440-09-7	6010C	10,800	10,800	NC	NC	NC	5,400	300	50	40	81	116	
Selenium	7782-49-2	6020A	1.3	1.3	39	0.26	0.52	0.13	0.5	0.1	0.1	80	119	
Silver	7440-22-4	6020A	0.22	0.22	39	0.8	4.2	0.11	0.1	0.05	0.02	83	118	
Sodium	7440-23-5	6010C	1,590	2,250	NC	NC	NC	795	500	50	45	83	118	
Thallium	7440-28-0	6020A	0.13	0.13	0.078	0.14	1	0.039	0.1	0.05	0.02	83	118	
Vanadium	7440-62-2	6010C	55.7	55.7	39	86	7.8	3.9	2	0.4	0.1	82	114	
Zinc	7440-66-6	6010C	32	32	2,300	370	46	16	8	4	1.15	82	113	

SAP Worksheet #15-5—Reference Limits and Evaluation Table (continued)

Notes:

Shading represents instances where the PAL is less than the laboratory LOD. Non-detects will not be treated as exceedances, although they will be reported at a value greater than the PAL.

- ¹ Refer to Worksheet #11 for specific identification of PALs by matrix. RSLs values are current as of January 2015. SSLs are Risk-Based when an MCL-based value does not exist and are current as of January 2015. Soil TRVs are applicable to surface soil only.
 - ² For Soil TRVs, the lowest of the Eco-SSLs was used as the PAL. The chromium value of 26 mg/kg represents chromium (III).
 - ³ The PQL Goal is 1/2 the lesser of the applicable screening levels.
 - ⁴ DoD QSM v5.0 is the basis for LCS and MS/MSD limits. Bolded values indicate analytes for which DoD QSM v5.0 does not provide limits and laboratory in-house limits are used.
 - ⁵ Results for non-aqueous samples are reported on a dry-weight basis.
- NC indicates that there is no criterion for an analyte.

SAP Worksheet #15-6—Reference Limits and Evaluation Table

Matrix: SD (Debris Piles A and F)

Analytical Group: METAL

Analyte	CAS #	Method	RSLs Residential Soil Adjusted ¹ (mg/kg)	Marine Sediment TRVs ¹ (mg/kg)	Project QL Goal ² (mg/kg)	Laboratory Limits ^{3,4} (mg/Kg)			LCS and MS/MSD Recovery Limits and RPD ³ (%)		
						LOQ	LOD	DL	LCL	UCL	RPD
Antimony	7440-36-0	6020A	3.1	2	1	0.2	0.2	0.1	72	124	20
Arsenic	7440-38-2	6020A	0.67	8.2	0.34	0.5	0.3	0.08	82	118	
Copper	7440-50-8	6010C	310	34	17	5	0.4	0.21	81	117	
Lead	7439-92-1	6010C	400	46.7	23.35	0.9	0.8	0.25	81	112	
Zinc	7440-66-6	6010C	2,300	150	75	8	4	1.15	82	113	

Notes:

Shading represents instances where the PAL is less than the laboratory LOD. Non-detects will not be treated as exceedances, although they will be reported at a value greater than the PAL.

¹ Refer to Worksheet #11 for specific identification of PALs by matrix. RSLs values are current as of January 2015.

² The PQL Goal is 1/2 the lesser of the applicable screening levels.

³ DoD QSM v5.0 is the basis for LCS and MS/MSD limits. Bolded values indicate analytes for which DoD QSM v5.0 does not provide limits and laboratory in-house limits are used.

⁴ Results for non-aqueous samples are reported on a dry-weight basis.

SAP Worksheet #15-7—Reference Limits and Evaluation Table

Matrix: SS (Debris Piles C and D)

Analytical Group: METAL

Analyte	CAS #	Method	East Vieques Surface Soil Background (TI) ¹ (mg/kg)	RSLs Residential Soil Adjusted ¹ (mg/kg)	SSLs ¹ (mg/kg)	Soil TRVs ^{1,2} (mg/kg)	Project QL Goal ³ (mg/kg)	Laboratory Limits ^{4,5} (mg/Kg)			LCS and MS/MSD Recovery Limits and RPD ⁴ (%)		
								LOQ	LOD	DL	LCL	UCL	RPD
Aluminum	7429-90-5	6010C	35,000	7,700	30,000	NC	3,850	50	4	1.98	74	119	20
Arsenic	7440-38-2	6020A	9.17	0.67	0.29	18	0.145	0.5	0.3	0.08	82	118	
Cadmium	7440-43-9	6020A	2.36	7	0.38	0.36	0.18	0.1	0.08	0.03	84	116	
Chromium	7440-47-3	6020A	70.1	0.3	100,000	26	0.15	0.5	0.2	0.07	83	119	
Cobalt	7440-48-4	6020A	15.8	2.3	0.27	13	0.135	0.1	0.08	0.02	84	115	
Iron	7439-89-6	6010C	38,100	5,500	350	NC	175	80	4	3.5	81	118	
Lead	7439-92-1	6010C	16	400	14	11	5.5	0.9	0.8	0.25	81	112	
Manganese	7439-96-5	6010C	1,630	180	28	220	14	4.5	0.4	0.13	84	114	
Selenium	7782-49-2	6020A	1.3	39	0.26	0.52	0.13	0.5	0.1	0.1	80	119	
Silver	7440-22-4	6020A	0.22	39	0.8	4.2	0.11	0.1	0.05	0.02	83	118	
Thallium	7440-28-0	6020A	0.13	0.078	0.14	1	0.039	0.1	0.05	0.02	83	118	
Vanadium	7440-62-2	6010C	55.7	39	86	7.8	3.9	2	0.4	0.1	82	114	
Zinc	7440-66-6	6010C	32	2,300	370	46	16	8	4	1.15	82	113	

Notes:

Shading represents instances where the PAL is less than the laboratory LOD. Non-detects will not be treated as exceedances, although they will be reported at a value greater than the PAL.

- ¹ Refer to Worksheet #11 for specific identification of PALs by matrix. RSLs values are current as of January 2015. SSLs are Risk-Based when an MCL-based value does not exist and are current as of January 2015.
 - ² For Soil TRVs, the lowest of the Eco-SSLs was used as the PAL. The chromium value of 26 mg/kg represents chromium (III).
 - ³ The PQL Goal is 1/2 the lesser of the applicable screening levels.
 - ⁴ DoD QSM v5.0 is the basis for LCS and MS/MSD limits. Bolded values indicate analytes for which DoD QSM v5.0 does not provide limits and laboratory in-house limits are used.
 - ⁵ Results for non-aqueous samples are reported on a dry-weight basis.
- NC indicates that there is no criterion for an analyte.

SAP Worksheet #15-8—Reference Limits and Evaluation Table

Matrix: SB, SS, SD, SMI

Analytical Group: WCHEM

Analyte	CAS # ¹	Units	Project Indicator Limit ²	Project QL Goal ²	Laboratory Limits		
					LOQ	LOD	DL
pH	PH	pH units	NA	NA	NA	NA	NA
Redox (MV) (ORP)	REDOX	MV	NA	NA	NA	NA	NA
Total Organic Carbon (TOC)	TOC	MG/KG	NA	NA	200	150	100

Notes:

¹ Some CAS numbers are contractor-specific.

² There are not project indicator limits for these WCHEM data. pH data are used to help interpret metals data for ecological receptors. TOC data may be used to create site-specific leaching factors. ORP and pH data are used to help interpret hexavalent chromium results.

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SAP Worksheet #16—Project Schedule / Timeline

The field activities are anticipated to occur in May 2015. The official schedule is in the Site Management Plan (SMP) schedule that is distributed and updated separately.

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SAP Worksheet #17—Sampling Design and Rationale

This RI SAP Addendum 2 reflects the analytical protocol jointly developed and concurred upon in the scoping session by EPA, PREQB, PRDNER, USFWS, and the Navy. The rationale for the matrices to be sampled, the number of samples per matrix, the analytical groups, and the concentration levels is discussed in Worksheets #10, #11, #14, and #15. Depth intervals for surface and subsurface soil samples are based on the Vieques Modified Soil Sample Depth Selection Protocol. Sample location figures are provided in **Figures 4, 5, and 6**.

The following bullets further identify the sampling design and rationale.

Berms

- Soil sampling locations at the berms will be based on the results of the DGM and subsequent intrusive investigations. If debris are identified that could be a potential release of contamination (i.e., drums, munitions, etc.), soil samples will only be collected in these areas. Intrusive investigation findings and proposed sample locations will be presented to the Technical Subcommittee via a conference call or meeting. Soil samples will be analyzed for VOCs, SVOCs, pesticides/PCBs, explosives, inorganics, and pH, TOC, and ORP (to help interpret the potential contaminant data). Until the data is collected, it is not possible to know the amount of data necessary to achieve the project goals. Within the berms, the anomalies selected for intrusive investigation will be presented to the Technical Subcommittee for consideration. Professional interpretation will be used to select specific anomalies to intrusively investigate, such as by the geophysical signature, shape, and size.

Drums

- One surface and subsurface soil sample will be collected from the eight locations where deteriorated drums were previously identified on the surface (**Figure 4**). The analytical protocol reflects the potential uncertainty associated with the drums (VOCs, SVOCs, pesticides, PCBs, explosives, inorganics, pH, TOC, and ORP). Soil samples from the drum locations will be compared to the East Vieques background values.

Potential Detonation Areas

- One surface and one subsurface soil sample will be collected at each of the two potential former detonation areas (**Figure 5**). The sample location will be selected near the center of the former detonation area (where 3.5-inch rockets were previously identified) or field adjusted if MEC or MD is identified during the surface clearance/MEC subsurface clearance. The sample matrix is based on the conceptual understanding of release (i.e., detonation of MEC and possible subsurface deterioration of MEC and leaching into underlying medium). Each soil sample will be analyzed for explosives, inorganics, pH, and TOC; explosives and inorganics are the potential contaminants released from detonation activities. Explosive D (picric acid) will also be analyzed since the types of armaments likely used on Vieques contained this constituent. Although there are no widely accepted human health or ecological screening levels for this analyte, the laboratory will report the result at its reporting limit. The determination of whether groundwater evaluation is warranted will be deferred until after the soil samples have been collected and their data evaluated in the context of the conceptual site model. Evaluation of the data will include multiple lines of evidence including comparison to background concentrations, proximity to groundwater and/or surface water bodies, potential source materials identified, etc. Soil samples from the potential detonation area will be compared to the East Vieques background values.

SAP Worksheet #17—Sampling Design and Rationale (continued)

Former Debris Piles

- Soil samples were collected under the former debris piles as part of the previous phase of work at UXO 15. Sample locations for that area are biased to similar geochemical locations as the former debris piles, but in areas likely outside the potential for contamination from those piles. Because soils in the vicinity of Debris Piles A and F are located in areas that are periodically inundated with water, these soil samples will be collected using soil sample methodology, but will be denoted as sediment samples for the purposes of ecological characterization. Soil samples to be collected will be used to determine if inorganic exceedances of background and screening criteria are naturally occurring localized variations in geochemistry. To accomplish that objective, samples will be collected from a similar depth as the original samples (0-6-inches), and will be analyzed for the select inorganics that exceeded both background and screening criteria in the original samples. Ten soil samples are selected to create a statistically significant data set for each location; eight samples or above is a statistically representative number when determining background upper tolerance limits (UTLs) for individual inorganics. However, in addition to determining UTLs, the minimum and maximum values will also be used for comparison. Samples for former Debris Piles C and D have been combined because of similar inorganic exceedances, close proximity, and similar geochemical conditions. Ten soil samples will be collected from up or side gradient of former Debris Piles C and D. Ten soil samples will be collected from side gradient of former Debris Piles A and F in the similar lagoon margin (**Figure 6**). Soil samples collected adjacent to the former debris piles will be used for comparison to the previous soil samples collected from the former debris piles.

SAP Worksheet #18—Sampling Locations and Methods/SOP Requirements Table

Station ID	Sample ID ¹	Matrix	Depth ²	Analytical Group ³	Number of Samples	Sampling SOP Reference	
Berm Area (Contingency Samples)⁴							
VEUXO15-SO25	VEUXO15-SB25-TDBD-MMY	SB	4 - 6' bgs	VOC, SVOC, PEST/PCB, EXPLO, METAL, WCHEM	2 (FD)	See Worksheet #21	
	VEUXO15-SB25P-TDBD-MMY				1		
VEUXO15-SO26	VEUXO15-SB26-TDBD-MMY	SB	4 - 6' bgs		3 (MS/MSD)		
VEUXO15-SO27	VEUXO15-SB27-TDBD-MMY	SB	4 - 6' bgs		1		
	VEUXO15-SB27-TDBD-MMY-MS				1		
	VEUXO15-SB27-TDBD-MMY-SD				1		
Drum Area							
VEUXO15-SO15	VEUXO15-SS15-000H-MMY	SS	0 - 0.5' bgs	VOC, SVOC, PEST/PCB, EXPLO, METAL, WCHEM	2 (FD)	See Worksheet #21	
	VEUXO15-SS15P-000H-MMY	SB	4 - 6' bgs		1		
	VEUXO15-SB15-TDBD-MMY				SS		0 - 0.5' bgs
VEUXO15-SO16	VEUXO15-SS16-000H-MMY	SS	0 - 0.5' bgs		1		
	VEUXO15-SB16-TDBD-MMY	SB	4 - 6' bgs		1		
VEUXO15-SO17	VEUXO15-SS17-000H-MMY	SS	0 - 0.5' bgs		3 (MS/MSD)		
	VEUXO15-SS17-000H-MMY-MS				1		
	VEUXO15-SS17-000H-MMY-SD				1		
	VEUXO15-SB17-TDBD-MMY	SB	4 - 6' bgs		1		
VEUXO15-SO18	VEUXO15-SS18-000H-MMY	SS	0 - 0.5' bgs		1		
	VEUXO15-SB18-TDBD-MMY	SB	4 - 6' bgs		1		
VEUXO15-SO19	VEUXO15-SS19-000H-MMY	SS	0 - 0.5' bgs		1		
	VEUXO15-SB19-TDBD-MMY	SB	4 - 6' bgs		1		
VEUXO15-SO20	VEUXO15-SS20-000H-MMY	SS	0 - 0.5' bgs		1		
	VEUXO15-SB20-TDBD-MMY	SB	4 - 6' bgs		1		
VEUXO15-SO21	VEUXO15-SS21-000H-MMY	SS	0 - 0.5' bgs		1		
	VEUXO15-SB21-TDBD-MMY				SB		4 - 6' bgs
	VEUXO15-SB21P-TDBD-MMY						
VEUXO15-SO22	VEUXO15-SS22-000H-MMY	SS	0 - 0.5' bgs		1		
	VEUXO15-SB22-TDBD-MMY	SB	4 - 6' bgs		1		

SAP Worksheet #18—Sampling Locations and Methods/SOP Requirements Table (continued)

Station ID	Sample ID ¹	Matrix	Depth ²	Analytical Group ³	Number of Samples	Sampling SOP Reference
Detonation Area						
VEUXO15-DU01	VEUXO15-SMI01-MMY	SMI	0 - 2.5" bgs	EXPLO, METAL, WCHEM	3 (MS/MSD)	See Worksheet #21
	VEUXO15-SMI01-MMY-MS					
	VEUXO15-SMI01-MMY-SD					
VEUXO15-SO23	VEUXO15-SB23-TDBD-MMY	SB	4 - 6' bgs		3 (MS/MSD)	
	VEUXO15-SB23-TDBD-MMY-MS					
	VEUXO15-SB23-TDBD-MMY-SD					
VEUXO15-DU02	VEUXO15-SMI02-MMY	SMI	0 - 2.5" bgs		3 (Field TriPLICATE)	
	VEUXO15-SMI02T-MMY					
	VEUXO15-SMI02TT-MMY					
VEUXO15-SO24	VEUXO15-SB24-TDBD-MMY	SB	4 - 6' bgs		2 (FD)	
	VEUXO15-SB24P-TDBD-MMY					
Debris Pile A and F (VEUXO15-TAA01)						
VEUXO15-TAA01-01	VEUXO15-SD07-000H-MMY	SD	0 - 0.5' bgs	Select METAL, WCHEM	1	See Worksheet #21
VEUXO15-TAA01-02	VEUXO15-SD08-000H-MMY				1	
VEUXO15-TAA01-03	VEUXO15-SD09-000H-MMY				1	
VEUXO15-TAA01-04	VEUXO15-SD10-000H-MMY				2 (FD)	
	VEUXO15-SD10P-000H-MMY					
VEUXO15-TAA01-05	VEUXO15-SD11-000H-MMY				1	
VEUXO15-TAA01-06	VEUXO15-SD12-000H-MMY				1	
VEUXO15-TAA01-07	VEUXO15-SD13-000H-MMY				1	
VEUXO15-TAA01-08	VEUXO15-SD14-000H-MMY				3 (MS/MSD)	
	VEUXO15-SD14-000H-MMY-MS					
	VEUXO15-SD14-000H-MMY-SD					
VEUXO15-TAA01-09	VEUXO15-SD15-000H-MMY	1				
VEUXO15-TAA01-10	VEUXO15-SD16-000H-MMY	1				

SAP Worksheet #18—Sampling Locations and Methods/SOP Requirements Table (continued)

Station ID	Sample ID ¹	Matrix	Depth ²	Analytical Group ³	Number of Samples	Sampling SOP Reference
Debris Pile C and D (VEUXO15-TAA03 and VEUXO15-TAA04)						
VEUXO15-TAA03-01	VEUXO15-SS05-000H-MMY	SS	0 - 0.5' bgs	Select METAL, WCHEM	1	See Worksheet #21
VEUXO15-TAA03-02	VEUXO15-SS06-000H-MMY				1	
VEUXO15-TAA03-03	VEUXO15-SS07-000H-MMY				1	
VEUXO15-TAA03-04	VEUXO15-SS08-000H-MMY				1	
VEUXO15-TAA03-05	VEUXO15-SS09-000H-MMY				1	
VEUXO15-TAA04-01	VEUXO15-SS10-000H-MMY				3 (MS/MSD)	
	VEUXO15-SS10-000H-MMY-MS					
	VEUXO15-SS10-000H-MMY-SD					
VEUXO15-TAA04-02	VEUXO15-SS11-000H-MMY				1	
VEUXO15-TAA04-03	VEUXO15-SS12-000H-MMY				1	
VEUXO15-TAA04-04	VEUXO15-SS13-000H-MMY				2 (FD)	
	VEUXO15-SS13P-000H-MMY					
VEUXO15-TAA04-05	VEUXO15-SS14-000H-MMY				1	

- Notes:
- ¹ MMY = Two digit month and year of sampling date
 TBD = Top depth, bottom depth in feet (i.e. 0-6" is 000H)
 - ² For the drum and detonation area, subsurface soil samples will be collected in accordance with the Modified Soil Sample Depth Selection Protocol (Attachment B). The 4-6' bgs interval listed in the table is included as the place holder and not necessarily the depth the sample will be collected. For the detonation area, surface soil samples will be collected from 0-1' bgs or 0-2' bgs if in land crab habitat.
 - ³Field QC samples will not be analyzed for WCHEM.
 - ⁴Exact number of berm samples will be determined based on DGM results.

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SAP Worksheet #19—Field Sampling Requirements Table

Matrix	Analytical Group ^{1,2}	Analytical and Preparation Method / SOP Reference	Containers ²	Sample Volume ³	Preservation Requirements	Maximum Holding Time	
SS, SB	VOC	SW-846 5035A, SW-846 8260C / ANA8260	3 x 40 mL VOA vials (collected with Terracores)	5 g	≤ 6°C but not frozen, 2 x Vials with 5mL DI water, 1 x Vial with 5mL methanol	48 hours to freezing / 7 days	
	SVOC	SW-846 3550C, SW-846 8270D, SW-846 8270D_SIM/ SON009, ANA8270, ANA8270SIM	1 x 8 oz amber glass wide-mouth jar with Teflon lined screw cap	30 g	≤ 6°C but not frozen	14 days / 40 days	
	PEST/PCB	SW-846 3550C, SW-846 8082A/ SON002, ANA8082	1 x 8 oz amber glass wide-mouth jar with Teflon lined screw cap	30 g	≤ 6°C but not frozen	14 days / 40 days	
		SW-846 3550C, SW-846 8081B/ SON002, ANA8081		30 g			
	EXPLO	SW-846 8330B / HPL8330, MSE018		30 g ⁴			
		SW8330B, SW-846 8321A / MSE018, HPL8321		10 g ⁵	≤ 6°C but not frozen, headspace in jar	28 days	
		SW-846 6850 / HPL6850					
SS, SB, SD	METAL	SW-846 3050B, 6010C, 6020A / PRE3050B, ANA6010, ANA6020		1 x 8 oz amber glass wide-mouth jar with Teflon lined screw cap	1 g	≤ 6°C but not frozen	28 days
		SW-846 3060A, SW-846 7199/ ANA3060A, ANA218.6-7199			2.5 g		30 days / 7 days
	WCHEM (pH)	SW-846 9045D / ANA9045	20 g		ASAP		
	WCHEM (TOC)	Walkley Black / ANAWALKLEY	0.5 g		28 days		
	WCHEM (ORP)	ASTM D1498 / GEN-CR6	1 x 4 oz glass jar		10 g		30 days

SAP Worksheet #19—Field Sampling Requirements Table (continued)

Matrix	Analytical Group ^{1,2}	Analytical and Preparation Method / SOP Reference	Containers ²	Sample Volume ³	Preservation Requirements	Maximum Holding Time
SMI	EXPLO	SW-846 8330B / HPL8330, MSE018MIS	1 gallon bag(s)	10 g	≤ 6°C but not frozen	14 days / 40 days
		SW8330B, SW-846 8321A / MSE018, HPL8321		10 g		
		SW-846 6850 / HPL6850		10 g ⁵	Headspace in jar; ≤ 6°C but not frozen	28 days
	METAL	SW-846 3050B, 6010C, 6020A / PRE3050B, ANA6010, ANA6020		10 g ⁶	≤ 6°C but not frozen	180 days
		SW-846 3060A, SW-846 7199/ ANA3060A, ANA218.6-7199		2.5 g		30 days / 7 days
	WCHEM (pH)	SW-846 9045D / ANA9045		20 g		ASAP
	WCHEM (TOC)	Walkley Black / ANAWALKLEY		0.5 g		28 days
	WCHEM (ORP)	ASTM D1498 / GEN-CR6		10 g		30 days

Notes:

¹ Refer to Worksheet #18 for details regarding analytical groups to be tested for each media.

² All fractions are shipped to APPL.

³ Fill to capacity. These are minimum required for preparation and/or analysis.

⁴ 8330B Explosives and Picric Acid are analyzed from the same extract.

⁵ APPL will extract 10g of soil for perchlorate rather than the typical 1g. This is intended to provide a more-representative extraction.

⁶ APPL will digest 10g of SMI for metals rather than the typical 1g. This is intended to provide a more-representative digestion

SAP Worksheet #20—Field Quality Control Sample Summary Table

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Triplicates	No. of Field Duplicates	No. of MS/ MSD*	No. of Trip Blanks ¹	No. of Equipment Blanks ¹	Total No. of Samples to Lab
Berm Area²								
SB	VOC	3	-	1	1	1	1	8
	SVOC	3	-	1	1	-	1	7
	PEST/PCB	3	-	1	1	-	1	7
	EXPLO	3	-	1	1	-	1	7
	METAL	3	-	1	1	-	1	7
	WCHEM (pH)	3	-	-	-	-	-	3
	WCHEM (TOC)	3	-	-	-	-	-	3
	WCHEM (ORP)	3	-	-	-	-	-	3
Drum Area								
SS, SB	VOC	16	-	2	1	2	2	24
	SVOC	16	-	2	1	-	2	22
	PEST/PCB	16	-	2	1	-	2	22
	EXPLO	16	-	2	1	-	2	22
	METAL	16	-	2	1	-	2	22
	WCHEM (pH)	16	-	-	-	-	-	16
	WCHEM (TOC)	16	-	-	-	-	-	16
	WCHEM (ORP)	16	-	-	-	-	-	16
Detonation Area								
SMI	EXPLO	2	1	-	1	-	1	7
	METAL	2	1	-	1	-	1	7
	WCHEM (pH)	2	-	-	-	-	-	2
	WCHEM (TOC)	2	-	-	-	-	-	2
	WCHEM (ORP)	2	-	-	-	-	-	2
SB	EXPLO	2	-	1	1	-	1	6
	METAL	2	-	1	1	-	1	6
	WCHEM (pH)	2	-	-	-	-	-	2
	WCHEM (TOC)	2	-	-	-	-	-	2
	WCHEM (ORP)	2	-	-	-	-	-	2
Debris Pile A and F								
SD	Select METAL	10	-	1	1	-	1	14
	WCHEM (pH)	10	-	-	-	-	-	10
	WCHEM (TOC)	10	-	-	-	-	-	10
	WCHEM (ORP)	10	-	-	-	-	-	10
Debris Piles C and D								
SS	Select METAL	10	-	1	1	-	1	14
	WCHEM (pH)	10	-	-	-	-	-	10
	WCHEM (TOC)	10	-	-	-	-	-	10
	WCHEM (ORP)	10	-	-	-	-	-	10

Notes:

¹The number of equipment and trip blanks is based on a fundamental assumptions. For surface and subsurface soil samples, it was assumed that 10 samples can be collected per day.

²Exact number of berm samples will be determined based on DGM results.

* MS = matrix spike MSD = matrix spike duplicate

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SAP Worksheet #23—Analytical SOP References Table

Lab SOP Number	Title, Revision Date ¹ , and/or Number	Date Last Revisited if not Revised ¹	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis ^{1,2}	Variance to QSM	Modified for Project Work? (Y/N)
ANA6010	Inductively Coupled Plasma Atomic Emission Spectroscopy by EPA Method 6010; 03/2014; Rev. 7		Definitive	SS/SB/SD/SMI / METAL	ICP-AES	APPL	None	N
ANA8260	Analysis of Water/Soil/Sludge by EPA Method 8260; 10/2013; Rev. 5		Definitive	SS/SB / VOC	GC-MS	APPL	None	N
SON002	OCL, PCB, OP and Carbamate sonication extraction of soil, sludge, solids and wipes (EPA method 3550C); 11/2013; Rev. 3		Definitive	SS/SB / PEST/PCB	GC-MS	APPL	None	N
ANA8081	Organochlorine Pesticides by gas chromatography by EPA Method 8081; 12/2013; Rev. 3		Definitive	SS/SB / PEST	GC-MS	APPL	None	N
ANA8082	PCBs and Congeners by EPA Method 8082; 02/2014; Rev. 2		Definitive	SS/SB / PCB	GC-MS	APPL	None	N
ANA6020	Inductively Coupled Plasma-Mass Spectrometry by EPA Method 6020; 10/2013; Rev. 3		Definitive	SS/SB/SD/SMI / METAL	ICP-MS	APPL	None	N
ANA218.6-7199	Hexavalent Chromium Analysis EPA Method 7199/218.6; 06/2014; Rev. 5		Definitive	SS/SB/SD/SMI / METAL	IC	APPL	None	N
ANA8270SIM	PAH by SIM by EPA Method 8270; 03/2014; Rev. 1		Definitive	SS/SB / SVOC	GC-MS	APPL	None	N
ANA8270	Semivolatile Organic Compounds by EPA Method 8270; 03/2014; Rev. 3		Definitive	SS/SB / SVOC	GC-MS	APPL	None	N
ANAWALKLEY	Total Organic Carbon (TOC) in Soil (Walkley-Black, Modified); 06/2014; Rev. 1		Screening	SS/SB/SD/SMI / WCHEM	N/A (titration)	APPL	None	N
HPL6850	Analysis of Perchlorate in Environmental Samples by EPA 6850; 01/2014; Rev. 2		Definitive	SS/SB/SMI / EXPLO	HPLC	APPL	None	Y ³
HPL8321	Method 8321 LC-Mass Spectrometer Analysis of Carbamate / Urea and Nitroaromatic / Nitrosamine Compounds; 01/2014; Rev. 1		Definitive	SS/SB/SMI / EXPLO (Picric Acid only)	HPLC	APPL	None	N
HPL8330	Explosive Compounds: Diode Array Detector by High Pressure Liquid Chromatography; 06/2014; Rev. 3		Definitive	SS/SB/SMI / EXPLO	HPLC	APPL	None	N
PRE3050B	Acid Digestion of Sediments, Sludges, and Soils by EPA Method 3050B; 05/2014; Rev. 3		N/A	SS/SB/SD/SMI / METAL	N/A (digestion)	APPL	None	Y ⁴
SON009	8270, BNA, SIM, and PAH Sonication Extraction of Soil, Sludge and Solids (EPA Method 3550C); 11/2013; Rev. 9		N/A	SS/SB / SVOC	N/A (extraction)	APPL	None	N
ANA3060A	Alkaline Digestion for Hexavalent Chromium (Method 3060A); 06/2014; Rev. 1		Definitive	SS/SB/SD/SMI / METAL	N/A (digestion)	APPL	None	N
ANA9045D	pH in Soil and Waste (EPA SW846 Method 9045C&D); 06/2014; Rev. 2		Screening	SB/SS/SD/SMI / WCHEM	pH Probe	APPL	None	N
ASTM D1498	ALS-Kelso employs ASTM D1498 for analysis of ORP in soil. Due to copyright restrictions, this method is not available for distribution.		Screening	SB/SS/SD/SMI / WCHEM	ORP Probe	ALS - Kelso	None	N
SHR001	Receiving Samples; 06/03/2014; Rev. 0		N/A	SB/SS/SD/SMI / VOC, SVOC, PEST/PCB, EXPLO, METAL, WCHEM	N/A (receiving)	APPL	None	N
SHR003	Subcontracting Samples to Other Laboratories; 06/24/2014; Rev. 15		N/A	SB/SS/SD/SMI / VOC, SVOC, PEST/PCB, EXPLO, METAL, WCHEM	N/A (receiving)	APPL	None	N
SHR012	Sample Disposal and Waste Collection, Storage and Disposal; 06/17/2014; Rev. 16		N/A	SB/SS/SD/SMI / VOC, SVOC, PEST/PCB, EXPLO, METAL, WCHEM	N/A (disposal)	APPL	None	N
SMO-SCOC	Sample Tracking and Internal Chain-of-Custody; 12/01/12; Rev. 13		N/A	SB/SS/SD/SMI / WCHEM	N/A (receiving)	ALS - Kelso	None	N
SMO-DISP	Sample Disposal; 6/01/14; Rev. 11		N/A	SB/SS/SD/SMI / WCHEM	N/A (disposal)	ALS - Kelso	None	N
SMO-GEN	Sample Receiving; 7/31/13; Rev. 30		N/A	SB/SS/SD/SMI / WCHEM	N/A (receiving)	ALS - Kelso	None	N
MSE018	EPA Method 8330 Mechanical Orbital Shaker Extraction for Solid Explosive Samples; 01/2014; Rev. 0		N/A	SB/SS / EXPLO	N/A (extraction)	APPL	None	N

SAP Worksheet #23—Analytical SOP References Table (continued)

Lab SOP Number	Title, Revision Date ¹ , and/or Number	Date Last Revisited if not Revised ¹	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis ^{1,2}	Variance to QSM	Modified for Project Work? (Y/N)
MSE018MIS	Mechanical Shaker Extraction for Solid Explosive Samples using Incremental sampling (IS) techniques EPA METHOD 8330B; 06/2014; Rev. 3		Definitive	SMI / EXPLO	N/A (extraction)	APPL	None	N
PREMETALSIS	Incremental Sampling (IS) techniques for Digestion of Soil Samples; 06/2014; Rev. 2		Definitive	SMI / METAL	N/A (digestion)	APPL	None	N

Notes:

1. This worksheet was prepared in August 2014 and updated in March 2015. It is intended to be a snapshot as it pertains to dates for SOP revision/revisitation and DoD ELAP accreditation.
2. The laboratories are DoD ELAP accredited for analysis methods they are to perform which will generate definitive data. Refer to Appendix A:
 APPL's DoD ELAP accreditation through PJLA is granted through November 27, 2015.
 ALS-Kelso's DoD ELAP accreditation through PJLA is granted through March 13, 2016.
3. Due to regulator request, APPL will extract 10g of soil for perchlorate rather than the typical 1g. This is intended to provide a more-representative extraction.
4. Due to regulator request, APPL will digest 10g of SMI for metals rather than the typical 1g. This is intended to provide a more-representative digestion.

SAP Worksheet #24—Analytical Instrument Calibration Table

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC-MS (for VOC, SVOC)	Tune check	Prior to initial calibration (ICAL) and prior to each 12-hour period of sample analysis	Specific ion abundance criteria of BFB or DFTPP from method	Retune instrument and verify	Analyst	ANA8260, ANA8270, ANA8270SIM
	Performance check (Method 8270 only)	At the beginning of each 12-hour period, prior to analysis of samples	Degradation ≤ 20% for DDT. Benzidine and pentachlorophenol shall be present at their normal responses, and shall not exceed a tailing factor of 2.	Correct problem, then repeat performance checks		
	ICAL for all analytes (including surrogates)	At instrument set-up, prior to sample analysis	Each analyte must meet one of the three options below: Option 1: relative standard deviation (RSD) for each analyte ≤ 15% Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$ Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$	Correct problem then repeat ICAL		
	Retention time window position establishment	Once per ICAL and at the beginning of the analytical sequence	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial continuing calibration verification (CCV) is used.	NA		
	Evaluation of relative retention times (RRT)	With each sample	RRT of each reported analyte within ± 0.06 RRT units	Correct problem, then rerun ICAL		
	Initial calibration verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis	All reported analytes within ± 20% of true value	Correct problem. Rerun ICV. If that fails, repeat ICAL.		
	Continuing calibration verification (CCV)	Daily before sample analysis; after every 12 hours of analysis time; and at the end of the analytical batch run	All reported analytes and surrogates within ± 20% of true value. All reported analytes and surrogates within ± 50% for end of analytical batch CCV.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
GC-ECD (for PEST/PCB)	Breakdown check (Endrin/DDT Method 8081 only)	Before sample analysis and at the beginning of each 12-hour shift	Degradation of DDT and Endrin must each be $\leq 15\%$	Correct problem, then repeat breakdown checks	Analyst	ANA8081
	ICAL	At instrument set-up and after ICV or CCV failure, prior to sample analysis	ICAL must meet one of the three options below: Option 1: RSD for each analyte $\leq 20\%$ Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$ Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$	Correct problem then repeat ICAL		ANA8081, ANA8082
	RT window position establishment	Once per ICAL and at the beginning of the analytical sequence	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA		
	RT window width	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from the 72 hour study	NA		
	ICV	Once after each ICAL, analysis of a second source standard prior to sample analysis	All reported analytes within established RT windows All reported analytes within $\pm 20\%$ of true value	Correct problem, rerun ICV. If that fails, repeat ICAL.		
GC-ECD (for PEST/PCB)	CCV	Before sample analysis, after every 10 field samples, and at the end of the analysis sequence with the exception of CCVs for Pesticides multi-component analytes (i.e. Toxaphene, Chlordane), which are only required before sample analysis.	All reported analytes and surrogates within established RT windows All reported analytes and surrogates within $\pm 20\%$ of true value	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	Analyst	ANA8081, ANA8082
HPLC (for 8330B EXPLO)	5-point ICAL for linear calibration (6-points for quadratic)	At instrument setup and after ICV or CCV failure, prior to sample analysis	ICAL must meet one of the three options below: Option 1: RSD for each analyte $\leq 15\%$ Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$ Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$	Correct problem then repeat ICAL	Analyst	HPL8330
	ICV	Once after each initial calibration	Analytes within $\pm 20\%$ of expected value (initial source)	Correct problem. Rerun ICV. If that fails, repeat ICAL.		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
HPLC (for 8330B EXPLO)	RT window width	At method set-up and after major maintenance	RT width is ± 3 times standard deviation for each analyte RT from 72-hour study	NA	Analyst	HPL8330
	Establishment and verification of the RT window for each analyte and surrogate	Once per ICAL and at the beginning of the analytical shift for establishment of RT; and with each CCV for verification of RT	Using the midpoint standard or the CCV at the beginning of the analytical shift for RT establishment; analyte must fall within established window during RT verification	NA		
	CCV	Before sample analysis, after every 10 field samples, and at the end of the analysis sequence	All reported analytes and surrogates within $\pm 20\%$ of the true value	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		
LCMS (for Picric Acid)	ICAL	At instrument set-up and after ICV or CCV failure, prior to sample analysis	Minimum 5 levels for linear and 6 levels for quadratic ICAL must meet one of the three options below: Option 1: RSD for each analyte $\leq 20\%$ Option 2: linear least squares regression for each analyte: $r^2 \geq 0.99$ Option 3: non-linear least squares regression (quadratic) for each analyte: $r^2 \geq 0.99$	Correct problem then repeat ICAL	Analyst	HPL8321
	RT window position establishment	Once per ICAL and at the beginning of the analytical sequence	Position shall be set using the midpoint standard of the ICAL curve when ICAL is performed. On days when ICAL is not performed, the initial CCV is used.	NA.		
	RT window width	At method set-up and after major maintenance (e.g., column change)	RT width is ± 3 times standard deviation for each analyte RT from the 72-hour study	NA.		
	ICV	Once after each ICAL, analysis of a second source standard prior to sample analysis	All reported analytes within established RT windows. All reported analytes within $\pm 15\%$ of true value.	Correct problem, rerun ICV. If that fails, repeat ICAL.		
	CCV	Before sample analysis, after every 10 field samples, and at the end of the analysis sequence	All reported analytes and surrogates within established RT windows. All reported analytes and surrogates within $\pm 15\%$ of true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
HPLC-MS (for Perchlorate)	Interference Threshold Study	At initial setup and when major changes occur in the method's operating procedures (e.g., addition of cleanup procedures, column changes, mobile phase changes)	Measure the threshold of common suppressors (chloride, sulfate, carbonate, bicarbonate) that can be present in the system without affecting the quantitation of perchlorate. The threshold is the concentration of the common suppressors where perchlorate recovery falls outside an 80-120% window.	NA	Analyst	HPL6850
	Mass Calibration	Instrument must have a valid mass calibration prior to any sample analysis The mass calibration is updated on an as-needed basis (e.g., QC failures, ion masses show large deviations from known masses, major instrument maintenance is performed, or the instrument is moved)	Mass calibration range must bracket the ion masses of interest. The most recent mass calibration must be used for an analytical run, and the same mass calibration must be used for all data files in an analytical run. Mass calibration must be verified by acquiring a full scan continuum mass spectrum of a perchlorate stock standard.	If the mass calibration fails, recalibrate. If it still fails, consult manufacturer instructions on corrective maintenance.		
	Tune Check	Prior to ICAL and after any mass calibration or maintenance is performed	Tuning standards must span the mass range of the analytes of interest and meet acceptance criteria outlined in the laboratory SOP	Retune instrument and verify. If the tune check will not meet acceptance criteria, an instrument mass calibration must be performed and the tuning redone.		
	ICAL	At instrument setup or after ICV or CCV failure, prior to sample analysis	Minimum of 6 calibration levels must be used ICAL must meet one of the two options below: Option 1: RSD for each analyte $\leq 15\%$ Option 2: linear least squares regression for each analyte: $r^2 \geq 0.995$	Correct problem, then repeat ICAL		
	ICV	Once after each ICAL	Perchlorate concentration must be within $\pm 15\%$ of its true value	Correct problem. Rerun ICV. If that fails, repeat ICAL.		
	CCV	On days an ICAL is performed, after every 10 field samples and at the end of the analytical sequence. On days an ICAL is not performed, at the beginning of the sequence, after every 10 field samples and at the end of the analytical sequence.	Perchlorate concentration must be within $\pm 15\%$ of its true value	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		
	Laboratory Reagent Blank (LRB)	Prior to calibration and at the end of the analytical sequence	No perchlorate detected $> \frac{1}{2}$ LOQ	Reanalyze reagent blank (until no carryover is observed) and all samples processed since the contaminated blank		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
ICP-AES (for METAL)	Linear Dynamic Range (LDR) or high-level check standard	At initial set up and checked every 6 months with a high standard at the upper limit of the range	Within $\pm 10\%$ of true value	Dilute samples within the calibration range, or re-establish/ verify the LDR	Analyst	ANA6010
	ICAL	Daily ICAL prior to sample analysis	Minimum one high standard and a calibration blank. If more than one calibration standard is used, $r^2 \geq 0.99$	Correct problem, then repeat ICAL		
	ICV	Once after each ICAL, analysis of a second source standard prior to sample analysis	All reported analytes within $\pm 10\%$ of true value	Correct problem. Rerun ICV. If that fails, repeat ICAL.		
	CCV	After every 10 field samples, and at the end of the analysis sequence	All reported analytes within $\pm 10\%$ of the true value	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		
	Low-level Calibration Check Standard (Low-level ICV)	Daily	All reported analytes within $\pm 20\%$ of true value	Correct problem and repeat ICAL		
	Initial and Continuing Calibration Blank (ICB/CCB)	Before beginning a sample run, after every 10 field samples, and at end of the analysis sequence	No analytes detected > LOD	Correct problem and repeat ICAL. All samples following the last acceptable calibration blank must be reanalyzed.		
	ICS (also called Spectral Interference Checks)	After ICAL and prior to sample analysis	ICS-A: Absolute value of concentration for all non- spiked project analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes) ICS-AB: Within $\pm 20\%$ of true value All analytes must be within the LDR. ICS-AB is not needed if instrument can read negative responses.	Terminate analysis; locate and correct problem; reanalyze ICS, reanalyze all samples		
ICP-MS (for METAL)	Linear Dynamic Range (LDR) or High-level Check Standard	At initial set-up and checked every 6 months with a high standard at the upper limit of the range	Within $\pm 10\%$ of true value	Dilute samples within the calibration range, or re-establish/verify the LDR	Analyst	ANA6020
	Tuning	Prior to ICAL	Mass calibration ≤ 0.1 amu from the true value; Resolution <0.9 amu full width at 10% peak height	Retune instrument and verify		
	ICAL	Daily ICAL prior to sample analysis	Minimum one high standard and a calibration blank. If more than one calibration standard is used, $r^2 \geq 0.99$.	Correct problem, then repeat ICAL		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
ICP-MS (for METAL)	ICV	Once after each ICAL, analysis of a second source standard prior to sample analysis	All reported analytes, within ± 10% of true value	Correct problem. Rerun ICV. If that fails, repeat ICAL.	Analyst	ANA6020
	CCV	After every 10 field samples and at the end of the analysis sequence	All reported analytes within ± 10% of the true value	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.		
	Low Level ICV	Daily	All reported analytes within ± 20% of the true value	Correct problem and repeat ICAL		
	ICB/CCB	Before beginning a sample run, after every 10 field samples, and at end of the analysis sequence	No analytes detected > LOD	Correct problem and repeat ICAL. All samples following the last acceptable calibration blank must be reanalyzed.		
	ICS (also called Spectral Interference Checks)	After ICAL and prior to sample analysis	<u>ICS-A</u> : Absolute value of concentration for all non- spiked project analytes < LOD (unless they are a verified trace impurity from one of the spiked analytes) <u>ICS-AB</u> : Within ± 20% of true value	Terminate analysis, locate and correct problem, reanalyze ICS, reanalyze all samples		
IC (for Hexavalent Chromium)	ICAL (minimum three standards and a calibration blank)	Daily ICAL prior to sample analysis	$r^2 \geq 0.99$	Correct problem, then repeat ICAL	Analyst	ANA218.6-7199
	ICV	Immediately following ICAL	Value of second source within ± 10% of true value	Correct problem and verify second source standard. Rerun ICV. If that fails, correct problem and repeat calibration.		
	CCV	Before and after every 10 field samples and at the end of the run	Value of CCV within ± 10% of true value	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV		
	CCB	Before and after every 10 field samples and at the end of the run	No analytes detected > LOD	Correct problem. Re-prep and reanalyze calibration blank. All samples following the last acceptable calibration blank must be reanalyzed.		

SAP Worksheet #24—Analytical Instrument Calibration Table (continued)

(UFP-QAPP Manual Section 3.2.2)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action	Person Responsible for Corrective Action	SOP Reference
pH meter	Minimum 3-point calibration	Daily or prior to analyzing samples	±0.05 unit	Terminate analysis, recalibrate, and verify before sample analysis	Analyst	ANA9045
	CCV	One CCV every 10 samples	±0.05 unit	Terminate analysis, recalibrate, and verify before sample analysis		
ORP Probe	Electrode zero	Daily	±0.5mV	Correct the problem and repeat the electrode zero	Analyst	ASTM D1498
	Check to Standard Redox Solution	Daily	Within ±30mV of expected value. A second reading (from fresh solution) within ±10mv of first reading.	Correct the problem and repeat the check		

Notes:
 DoD QSM v5.0 or laboratory SOPs and analytical methods are the basis for this table.

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SAP Worksheet #25—Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
GC-MS	Routine Maintenance under Service contract	N/A	N/A	Twice a year and additionally as needed	N/A	N/A	Analyst/ Supervisor	ANA8260, ANA8270, ANA8270SIM
	Replace hydrocarbon traps and oxygen traps on helium gas lines; replace chemical traps	VOCs, SVOCs	Check GC system for high detector noise and reduced detector response.	As needed	Passing ICAL and CCV	Replace traps		ANA8260
	Clean and/or replace GC inlet	Check system pressure for vacuum range and for steadiness with an HP Ion Gauge Pressure Measuring Device; run a manual tune	Check and tighten interface column nut inside GC oven	As needed	Passing ICAL and CCV	Thermally clean by “baking-out” the instrument		ANA8270, ANA8270SIM
	Inspect, clean and/or replace ALS syringe. Replace column.	VOCs, SVOCs	Monitor for subtle changes in chromatography and/or calibration inconsistencies	As needed	Passing ICAL and CCV	Replace syringe if dirt is noticeable in the syringe. Replace column if tailing occurs or decreased resolution.		
	Add oil to vacuum rough pump	Check oil in vacuum rough pump	Visually inspect for dark oil	Every 4 to 6 weeks	Passing ICAL and CCV	Perform complete oil change.		
	Replace/refill oxygen and moisture traps	VOCs, SVOCs	Perform oxygen and water check in tune parameters	Yearly, or as needed	Passing ICAL and CCV	Replace traps.		
GC-FID	Replace capillary inlet inserts and check septa	Analyze CCV	Watch chromatograms for peak tailing, low peak response of standards or breakdown products	At least once a week or for every 100 injections	Passing ICAL and CCV	Do not analyze samples until passing CCV	Analyst / Supervisor	ANA8015
	Replace split seal (frit) for capillary inlet systems, clean injector ports or replace detector jets	Check for dirty injector port	Degradation of standards indicates a dirty split seal; Dirty detector jets may cause reduced peak height	As needed	Passing ICAL and CCV	Do not analyze samples until passing CCV		
	Replace hydrocarbon traps and oxygen traps on helium and hydrogen gas lines; Replace chemical traps; Replace converter tube in gas purifier system	Check oxygen/moisture indicator (OM 1) tube for a color change	high detector noise and reduced detector response	As needed	Passing ICAL and CCV	Do not analyze samples until passing CCV		
	Replace trap on purge and trap unit; Clean and/or replace lamp; Clean the transfer line	Leak check fittings with leak detector while unit is in purge mode	Symptoms of a dirty lamp are low PID response and increased background	whenever required to generate system response within acceptable limits	Passing ICAL and CCV	Do not analyze samples until passing CCV		ANA8015G
	Replace hydrocarbon traps and oxygen traps on helium and hydrogen gas lines; Clean and replace the FID Jet; Replace columns	Extra peaks on both detectors, excessive background, low response and loss of compounds, especially on the PID, are signs that a column needs to be replaced	Low response and excessive background indicate the FID jet needs cleaning or replacing	whenever required to generate system response within acceptable limits	Passing ICAL and CCV	Do not analyze samples until passing CCV		

SAP Worksheet #25—Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (continued)

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
GC-ECD	Change gas purifier	PEST/PCBs	Visually inspect if traps changing color	Every 6 to 12 months	No moisture	Replace indicating traps	Analyst/ Supervisor	ANA8081, ANA8082
	Change syringes / syringe needles		Visually inspect for wear or damage	Every 3 months	Part was replaced	Replace syringe if dirt is noticeable in the syringe		
	Change Inlet liner, Liner O-rings, and Inlet Septum		Visually inspect for dirt or deterioration	Weekly for liner	Part was replaced	Replace them and check often		
				Monthly for O-rings				
	Daily for septum							
Change front-end column	Check peak tailing, decreased sensitivity, retention time changes	Weekly, monthly, or when needed	Part was replaced	Remove 1/2 to 1 meter from the front of the column when experiencing problems				
Perform 'Wipe Test' and clean up the baseline	Baseline is noisy	Every 6 month or as needed	In accordance with manufacturer's recommendation or lab SOP	Thermally clean by "baking-out" the instrument over-night	ANA8081			
HPLC	Change guard cartridge, inlet filter and PTFE frit	EXPLO	Review pressure profile	As needed, based on pressure profile	Part was replaced	Replace them and check often	Analyst / Supervisor	HPL8330
	Change analytical column		Check peak tailing, decreased sensitivity, retention time changes, etc.	When chromatography indicates	Analyte separation and calibration curve meets 20% RSD	Replace column, if needed		
	Replace mobile phase daily		Visually inspect for sufficient level of solvent	Daily	Solvent was replaced	Prepare fresh mobile phase solution		
HPLC	Change guard cartridge, inlet filter and PTFE frit	Picric Acid	Review pressure profile	As needed, based on pressure profile	Passing ICAL and CCV	Replace them and check often	Analyst / Supervisor	HPL8321
	Change analytical column		Check peak tailing, decreased sensitivity, retention time changes, etc.	When chromatography indicates	Passing ICAL and CCV	Replace with another analytical column		
	Replace mobile phase daily		Check the stability of the base line	Daily	minimum noise in the base line	Prepare fresh mobile phase solution		
LC-MS	Monitor for subtle changes in chromatography and detector quality		Warning flags indicating a decrease in data quality include: a decreased detector response, elevated baseline or calibration inconsistencies	Daily	Calibrations meet method acceptance criteria	tune MS		
	tune MS		Manufacturer comes on-site to re-tune annually	Annual	Calibrations meet method acceptance criteria	A service call should be placed with the manufacturer		
HPLC	Change guard cartridge, inlet filter and Ftpf frit	Perchlorate	Review pressure profile	As needed based on pressure profile	Part was replaced	Replace them and check often	Analyst / Supervisor	HPL6850
	Change analytical column		Check peak tailing, decreased sensitivity, retention time changes, etc.	When chromatography indicates	Analyte separation and calibration curve meets 20% RSD	Replace column, if needed		
	Replace mobile phase daily		N/A	Daily	minimum noise in the base line	Prepare fresh mobile phase solution		

SAP Worksheet #25—Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (continued)

Instrument / Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
ICP-AES	Check instrument connections, gas flow, pressure	Conduct leak test	Visually inspect for wear or damage and indicator from computer controls	Daily and annual maintenance from manufacturer	Intensity of spectrum is within manufacture's recommendation	Call for maintenance service	Analyst / Supervisor	ANA6010
	Clean the torch in Aqua Regia solution and align the torch	Conduct leak test and adjust alignment	Inspect for leaks and align the torch and ensure that it is in the center	Each week (minimum every 2 weeks)	Torch is centered and no leaks	Replace or call for maintenance service		
	Clean the chamber and nebulizer.	METAL	Visually inspect for foreign objects	Each week	Make sure chamber and nebulizer are clean	Replace or call for maintenance service		
	Clean the lens and optimize the detector sensitivity		Clean up the dust from the lens	Every 6 months	In accordance with manufacturer's recommendation or lab SOP	Install new lens		
ICP-MS	Check windings	METAL	Visually inspect for wear or damage	8 hrs of operation	Part was replaced	Replace windings	Analyst / Supervisor	ANA6020
	Clean nebulizer		Visually inspect for wear or damage	Daily prior to operation	Part was replaced	Flush with DI water		
	Clean spray chamber		Visually inspect for dirt or deterioration	As necessary	Part was replaced	Rinse with DI water		
	Clean Torch		Visually inspect for dirt or deterioration	Monthly	Part was replaced	Clean with a 10% HNO3 solution and soak any parts with buildup overnight in a 5% HNO3 solution. Rinse with DI water and air dry		
Dionex IC	Inject DI rinse at the end of every run; rinse the piston seals	Hexavalent Chromium, Anions	Check for and isolate leaks	Daily	none	Clean up and repair any leaks	Analyst / Supervisor	ANA218.6-7199
	Locate and replace any pinched or damaged airlines		When chromatography indicates a flow problem	As necessary	none	Repair any airlines		
	Replace primary and rinse seals in pump heads		When chromatography indicates a flow problem	As necessary	none	Repair any seals or rinse pump heads		
pH meter	Check LCD display and pH probe	3 point calibration using known standards	Visually inspect for wear or damage and indicator from computer controls	Daily and annual maintenance from manufacturer	± 0.05 units	Return to manufacturer for recalibration or call for maintenance service	Analyst / Supervisor	ANA9045

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SAP Worksheet #26—Sample Handling System

(UFP-QAPP Manual Appendix A)

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
<p>Sample Collection (Personnel/Organization): Field Team Leader (Ronny Fields or TBD)/CH2M HILL</p> <p>Sample Packaging (Personnel/Organization): Sample Processor or Field Team Member (TBD)/CH2M HILL</p> <p>Coordination of Shipment (Personnel/Organization): Sample Processor or Field Team Member (TBD)/CH2M HILL</p> <p>Type of Shipment/Carrier: Overnight/FedEx</p>
SAMPLE RECEIPT AND ANALYSIS
<p>Sample Receipt (Personnel/Organization): Sample Receipt Personnel/APPL. Sample Receipt Personnel/ALS-Kelso. Note that all samples will be shipped to APPL who will forward ORP fraction to ALS.</p> <p>Sample Custody and Storage (Personnel/Organization): Sample Receipt Personnel/APPL. Sample Receipt Personnel/ALS-Kelso.</p> <p>Sample Preparation (Personnel/Organization): Digestion Personnel/APPL. Extraction Personnel/ALS-Kelso.</p> <p>Sample Determinative Analysis (Personnel/Organization): Analyst/APPL. Analyst/ALS-Kelso.</p>
SAMPLE ARCHIVING
<p>Field Sample Storage (No. of days from sample collection): 90</p> <p>Sample Extract/Digestate Storage (No. of days from extraction/digestion): Extracts may be disposed of 90 days after extraction. Digestates may be disposed of 90 days after digestion.</p> <p>Biological Sample Storage (No. of days from sample collection): 90 days</p>
SAMPLE DISPOSAL
<p>Personnel/Organization: Environmental Health and Safety Officer/APPL. Environmental Health and Safety Officer/ALS-Kelso.</p> <p>Number of Days from Analysis: Samples may be disposed of 90 days after report mail date.</p>

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SAP Worksheet #28-0—Laboratory QC Samples Table

Matrix: SMI
Analytical Group: EXPLO, METAL, WCHEM
Analytical Method/SOP Reference: SW-846 8330B (preparation) / MSE018IS, PREMETALSIS

Laboratory Preparation of a Multi-Incremental Sample:

1. The sample material is dried.
2. The sample material is #10 sieved. If necessary, a mortar and pestle is used to break up soil clumps.
3. Calculate how much soil does not require mechanical grinding (depending on the requested analyses other than 8330B EXPLO and Perchlorate):
 - a. 10g for 6010/6020 metals
 - b. 2.5g for HexCr
 - c. 5g for TOC
 - d. 50g for pH
 - e. 10g for ORP
 - f. 10g for Picric Acid
4. Multiply by 2 (remove twice that needed for analytical preparation) for potential re-extraction/reanalysis.
5. Subsample (30 or more increments) that soil, per #3 above, which does not require mechanical grinding.
6. The remainder of the soil is mechanically-ground with the puck mill grinder.
 - a. Selected option: one 90s cycle (per MSE018MIS).
 - b. Not selected: Five 60s cycles separated by two minute cool-down periods (because samples are not expected to contain NC-based residues).
7. Subsample (30 or more increments) the soil which has been mechanically-ground via puck mill as described in 8330B.
 - a. 10g for Explosives
 - b. 10g for Perchlorate
8. Hand-grind (using equipment suitable for metals) the soil from #4, above.
9. Subsample (30 or more increments) from the soil which has been hand-ground.

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SAP Worksheet #28-1—Laboratory QC Samples Table

Matrix: SB, SS
Analytical Group: VOC
Analytical Method/SOP Reference: SW-846 8260C / ANA8260

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Qualify as per Worksheet #36	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Trip Blank	One per cooler of VOCs shipped to the laboratory	Same as method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).					
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See below.				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits
Laboratory QA/QC Samples						
Internal standards (IS)	Every field sample, standard and QC sample	Retention time within ± 10 seconds from retention time of the midpoint standard in the ICAL; extracted ion current profile (EICP) area within - 50% to +100% of ICAL midpoint standard	Inspect mass spectrometer and GC for malfunctions and correct problem. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst / Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Method Blank (MB)	One per preparatory batch	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater. Common contaminants must not be detected > LOQ.	Correct problem. If required, re-prep and reanalyze MB and all samples processed with the contaminated blank. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Contamination	
Laboratory Control Sample (LCS)	One per preparatory batch	See Worksheet #15	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Must contain all surrogates and all analytes to be reported. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Accuracy	

SAP Worksheet #28-1—Laboratory QC Samples Table (continued)

Matrix: SB, SS
Analytical Group: VOC
Analytical Method/SOP Reference: SW-846 8260C / ANA8260

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike (MS)	One per preparatory batch	See Worksheet #15	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.	Analyst / Supervisor	Accuracy, Precision	Same as Method/SOP QC Acceptance Limits
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch	See Worksheet #15			Accuracy, Precision	
Surrogate Spike	All field and QC samples	1,2-Dichloroethane-d4: 71-136% 4-Bromofluorobenzene: 79-119% Dibromofluoromethane: 78-119% Toluene-d8: 85-116%	Correct problem, then re-prep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy	

Notes:
 The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-2—Laboratory QC Samples Table

Matrix: SB, SS

Analytical Group: SVOC

Analytical Method/SOP Reference: SW-846 8270D, 8270D-SIM/ ANA8270, ANA8270SIM

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable)	Same as method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See below				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits
Laboratory QA/QC Samples						
Internal standards (IS)	Every field sample, standard, and QC sample	Retention time within ± 10 seconds from retention time of the midpoint standard in the ICAL; EICP area within - 50% to +100% of ICAL midpoint standard.	Inspect mass spectrometer and GC for malfunctions and correct problem. Reanalysis of samples analyzed while system was malfunctioning is mandatory.	Analyst / Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Method Blank (MB)	One per preparatory batch	No analytes detected > ½ LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater. Common contaminants must not be detected > LOQ.	Correct problem. If required, re-prep and reanalyze MB and all samples processed with the contaminated blank. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Contamination	
Laboratory Control Sample (LCS)	One per preparatory batch	See Worksheet #15	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Must contain all surrogates and all analytes to be reported. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Accuracy	

SAP Worksheet #28-2—Laboratory QC Samples Table (continued)

Matrix: SB, SS

Analytical Group: SVOC

Analytical Method/SOP Reference: SW-846 8270D, 8270D-SIM/ ANA8270, ANA8270SIM

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike (MS)	One per preparatory batch	See Worksheet #15	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.	Analyst / Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch	See Worksheet #15	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	
Surrogate Spike	All field and QC samples	2,4,6-TRIBROMOPHENOL: 39-132% 2-FLUORBIPHENYL: 44-115% 2-FLUOROPHENOL: 35-115% NITROBENZENE-D5: 37-122% PHENOL: 33-122% TERPHENYL-D14: 54-127%	Correct problem, then re-prep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy	

Notes:

The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-3—Laboratory QC Samples Table

Matrix: SB, SS

Analytical Group: PEST/PCB

Analytical Method/SOP Reference: SW-846 8081B, 8082A / ANA8081, ANA8082

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See below				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits
Laboratory QA/QC Samples						
Method Blank (MB)	One per preparatory batch	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Correct problem. If required, re-prep and reanalyze MB and all samples processed with the contaminated blank. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst / Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
Laboratory Control Sample (LCS)	One per preparatory batch	See Worksheet #15	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst / Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Matrix Spike (MS)	One per preparatory batch	See Worksheet #15	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Accuracy	
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch	See Worksheet #15			Accuracy, Precision	
Surrogate Spike	All field and QC samples	SW-846 8081B: TCMX: 70-125% Decachlorobiphenyl: 55-130% SW-846 8082A: Decachlorobiphenyl: 60-125	Correct problem, then re-prep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy	

SAP Worksheet #28-3—Laboratory QC Samples Table (continued)

Matrix: SB, SS

Analytical Group: PEST/PCB

Analytical Method/SOP Reference: SW-846 8081B, 8082A / ANA8081, ANA8082

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One per preparatory batch	See Worksheet #15	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst / Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Matrix Spike (MS)	One per preparatory batch	See Worksheet #15	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Accuracy	
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch	See Worksheet #15			Accuracy, Precision	
Surrogate Spike	All field and QC samples	SW-846 8081B: TCMX: 70-125% Decachlorobiphenyl: 55-130% SW-846 8082A: Decachlorobiphenyl: 60-125	Correct problem, then re-prep and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.		Accuracy	
Confirmation of positive results (second column)	All positive results must be confirmed	Calibration and QC criteria for second column are the same as for initial or primary column analysis. Results between primary and secondary column RPD ≤ 40%.	NA	Analyst / Supervisor	Accuracy, Precision	Same as Method/SOP QC Acceptance Limits

Notes:

The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-4—Laboratory QC Samples Table

Matrix: SB, SS, SMI

Analytical Group: EXPLO

Analytical Method/SOP Reference: SW-846 8330B / HPL8330

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate (for SB, SS only)	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Field Triplicate (for SMI only)	One per 10 normal field samples per matrix	% Relative Standard Deviation (RSD) < 30% (advisory only)	None.	N/A	Precision	
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See below				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits
Laboratory QA/QC Samples						
Soil drying procedure	Each sample, LCS, and Method Blank	Laboratory must have a procedure to determine when the sample is dry to constant mass. Record date, time, and ambient temperature on a daily basis while drying samples.	NA	Analyst / Supervisor	NA	Same as Method/SOP QC Acceptance Limits
Soil sieving procedure (for SMI only)	Each sample, LCS, and Method Blank	Weigh entire sample. Sieve entire sample with a 10 mesh sieve. Breakup pieces of soil (especially clay) with gloved hands. Do not intentionally include vegetation in the portion of the sample that passes through the sieve unless this is a project specific requirement. Collect and weigh any portion unable to pass through the sieve.	NA		NA	
Soil grinding Procedure (for SMI only)	Initial demonstration	The laboratory must initially demonstrate that the grinding procedure is capable of reducing the particle size to < 75 µm by passing representative portions of ground sample through a 200 mesh sieve (ASTM E11).	NA		NA	

SAP Worksheet #28-4—Laboratory QC Samples Table (continued)

Matrix: SB, SS, SMI

Analytical Group: EXPLO

Analytical Method/SOP Reference: SW-846 8330B / HPL8330

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Soil grinding blank (for SMI only)	Prior to grinding samples; after every 10 samples; and at the end of the batch	A grinding blank using clean solid matrix (such as Ottawa sand) must be prepared (e.g., ground and subsampled) and analyzed in the same manner as a field sample. No reported analytes must be detected > 1/2 LOQ.	Blank results must be reported and the affected samples must be flagged accordingly if blank criteria are not met. If any individual grinding blank is found to exceed the acceptance criteria, apply B-flag to the samples following that blank. Grinding blanks may be composited for analysis. At least one grinding blank per batch must be analyzed.	Analyst / Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
Soil subsampling process (for SMI only)	Each sample, duplicate, LCS, and Method Blank	Entire ground sample is mixed, spread out on a large flat surface (e.g., baking tray), and 30 or more randomly located increments are removed from the entire depth to sum a ~10 g subsample	NA		NA	
Soil sample triplicate (for SMI only)	At the subsampling step, one sample per batch. Cannot be performed on any type of blank sample. Client must designate sample.	Three 10 g subsamples are taken from the designated sample. The RSD for results above the LOQ must not exceed 20%.	Corrective action must be taken if this criterion is not met (e.g., the grinding process should be investigated to ensure that the samples are being reduced to a sufficiently small particle size). If reported per the client, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Precision	
Method Blank	One per preparatory batch	No analytes detected >1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Correct problem. If required, re-prepare and reanalyze method blank and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst / Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
Laboratory Control Sample (LCS)	One per preparatory batch	See Worksheet #15	Correct problem. If required, re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for the failed analytes, if sufficient sample material is available. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Accuracy	
Matrix spike (MS) / Matrix Spike Duplicate (MSD)	One per preparatory batch	See Worksheet #15	Examine the project-specific DQOs. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	

SAP Worksheet #28-4—Laboratory QC Samples Table (continued)

Matrix: SB, SS, SMI

Analytical Group: EXPLO

Analytical Method/SOP Reference: SW-846 8330B / HPL8330

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Surrogate Spike	All field and QC samples	1,2-Dinitrobenzene: 78-119%	Correct problem, then re-prepare and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst / Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Confirmation of positive results (second column)	All positive results must be confirmed	Calibration and QC criteria are the same for the confirmation analysis as for initial or primary column analysis. Results between primary and second column RPD ≤ 40%.	Report from both columns. Apply J-flag if RPD >40%. Discuss in the case narrative.		Accuracy, Precision	

Notes:

The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-5—Laboratory QC Samples Table

Matrix: SB, SS, SMI

Analytical Group: EXPLO

Analytical Method/SOP Reference: SW-846 8321A / HPL8321

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate (for SB, SS only)	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Field Triplicate (for SMI only)	One per 10 normal field samples per matrix	% Relative Standard Deviation (RSD) < 30% (advisory only)	None.	N/A	Precision	
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See below				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-5—Laboratory QC Samples Table (continued)

Matrix: SB, SS, SMI

Analytical Group: EXPLO

Analytical Method/SOP Reference: SW-846 8321A / HPL8321

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Method Blank (MB)	One per preparatory batch	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Correct problem. If required, re-prepare and reanalyze MB and all samples processed with the contaminated blank. If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst / Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
Laboratory Control Sample (LCS)	One per preparatory batch	See Worksheet #15	Correct problem, then re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Accuracy	
Matrix Spike (MS)	One per preparatory batch	See Worksheet #15	Examine the project-specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Accuracy	
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch	See Worksheet #15			Accuracy, Precision	
Surrogate Spike	All field and QC samples	1,2-Dinitrobenzene: 50-150%	Correct problem, then re-prepare and reanalyze all failed samples for all surrogates in the associated preparatory batch, if sufficient sample material is available. If obvious chromatographic interference with surrogate is present, reanalysis may not be necessary.	Analyst / Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Confirmation of positive results (second column)	All positive results must be confirmed	Calibration and QC criteria for second column are the same as for initial or primary column analysis. Results between primary and secondary column RPD ≤ 40%.	Apply J-flag if RPD > 40%. Discuss in the case narrative.		Accuracy, Precision	

Notes:

The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-6—Laboratory QC Samples Table

Matrix: SB, SS, SMI

Analytical Group: EXPLO

Analytical Method/SOP Reference: SW-846 6850 / HPL6850

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate (for SB, SS only)	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	
Field Triplicate (for SMI only)	One per 10 normal field samples per matrix	% Relative Standard Deviation (RSD) < 30% (advisory only)	None.	N/A	Precision	
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See below.				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits
Laboratory QA/QC Samples						
Laboratory Reagent Blank (LRB)	Prior to calibration and at the end of the analytical sequence.	No perchlorate detected > ½ LOQ.	Reanalyze reagent blank (until no carryover is observed) and all samples processed since the contaminated blank. Problem must be corrected. Results may not be reported without a valid reagent blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst / Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
Method Blank (MB)	One per preparatory batch.	No analytes detected >1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. Re-prepare and reanalyze method blank and all samples processed with the contaminated blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Contamination	

SAP Worksheet #28-6—Laboratory QC Samples Table (continued)

Matrix: SB, SS, SMI

Analytical Group: EXPLO

Analytical Method/SOP Reference: SW-846 6850 / HPL6850

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample (LCS)	One per preparatory batch.	See Worksheet #15	Correct problem. Re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Problems must be corrected. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst / Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Matrix Spike (MS)	One per preparatory batch per matrix.	See Worksheet #15	Examine the project specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.		Accuracy	
Matrix Spike Duplicate (MSD) or Laboratory Duplicate (LD)	One per preparatory batch per matrix.	See Worksheet #15			Accuracy, Precision	
Internal Standard (IS)	Addition of ¹⁸ O-labeled perchlorate to every sample, batch QC sample, standard, instrument blank, and method blank.	Measured ¹⁸ O IS area within ± 50% of the value from the average of the IS area counts of the ICAL. RRT of the perchlorate ion must be 1.0 ± 2% (0.98 – 1.02).	Rerun the sample at increasing dilutions until the ± 50% acceptance criteria are met. If criteria cannot be met with dilution, the interference is suspected and the sample must be re-prepped using additional pretreatment steps.		Accuracy	
Interference Check Sample (ICS)	One ICS is prepared with every batch of 20 samples and must undergo the same preparation and pretreatment steps as the samples in the batch. It verifies the method performance at the matrix conductivity threshold (MCT). At least one ICS must be analyzed daily. The ICS shall be prepared at the LOQ.	Perchlorate concentration must be within ± 20% of its true value.	Correct problem. Reanalyze all samples and QC samples in the batch. If poor recovery from the cleanup filters is suspected, a different lot of filters must be used to re-extract all samples in the batch. If column degradation is suspected, a new column must be calibrated before the samples can be reanalyzed.	Analyst / Supervisor	Accuracy, Bias	Same as Method/SOP QC Acceptance Limits
Isotope Ratio ³⁵ Cl/ ³⁷ Cl	Every sample, batch QC sample, and standard.	Monitor for either the parent ion at masses 99/101 or the daughter ion at masses 83/85 depending on which ions are quantitated. Must fall within 2.3 to 3.8.	If criteria are not met, the sample must be rerun. If the sample was not pretreated, the sample must be re-extracted using cleanup procedures. If, after cleanup, the ratio still fails, use alternative techniques to confirm presence of perchlorate, e.g., a post spike sample or dilution to reduce any interference.		Accuracy	

Notes:

The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-7—Laboratory QC Samples Table

Matrix: SB, SS, SMI

Analytical Group: METAL

Analytical Method/SOP Reference: SW-846 6010C / ANA6010

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate (for SB, SS only)	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	
Field Triplicate (for SMI only)	One per 10 normal field samples per matrix	% Relative Standard Deviation (RSD) < 30% (advisory only)	None.	N/A	Precision	
Field Duplicate	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	Same as Method/SOP QC Acceptance Limits
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See below.				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-7—Laboratory QC Samples Table

Matrix: SB, SS, SMI

Analytical Group: METAL

Analytical Method/SOP Reference: SW-846 6010C / ANA6010

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Method Blank	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, re-prepare and reanalyze method blank and all samples processed with the contaminated blank. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.	Analyst / Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
Laboratory Control Sample (LCS)	One per preparatory batch.	See Worksheet #15	Correct problem, then re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Must contain all reported analytes. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Accuracy	
Matrix spike (MS) / Matrix Spike Duplicate (MSD)	One per preparatory batch.	See Worksheet #15	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply Jflag if acceptance criteria are not met and explain in the case narrative. Run dilution test or PDS.	Analyst / Supervisor	Accuracy, Precision	Same as Method/SOP QC Acceptance Limits
Dilution test	One per preparatory batch if MS or MSD fails. Only applicable for samples with concentrations > 50 x LOQ (prior to dilution).	Five-fold dilution must agree within ± 10% of the original measurement.	No specific CA, unless required by the project. For the specific analyte(s) in the parent sample, apply Jflag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	
Post-digestion spike (PDS) addition	Perform if MS/MSD fails. One per preparatory batch (using the same sample as used for the MS/MSD if possible). Criteria applies for samples with concentrations <50 X LOQ prior to dilution.	Recovery within 80-120%.	No specific CA, unless required by the project. For the specific analyte(s) in the parent sample, apply Jflag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	

Notes:

The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-8—Laboratory QC Samples Table

Matrix: SB, SS, SMI

Analytical Group: METAL

Analytical Method/SOP Reference: SW-846 6020A / ANA6020

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate (for SB, SS only)	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	
Field Triplicate (for SMI only)	One per 10 normal field samples per matrix	% Relative Standard Deviation (RSD) < 30% (advisory only)	None.	N/A	Precision	
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See below				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits
Laboratory QA/QC Samples						
Internal Standards (IS)	Every field sample, standard, and QC sample.	IS intensity in the samples within 30-120% of intensity of the IS in the ICAL blank.	If recoveries are acceptable for QC samples, but not field samples, the field samples may be considered to suffer from a matrix effect. Reanalyze sample at 5- fold dilutions until criteria is met. For failed QC samples, correct problem, and rerun all associated failed field samples.	Analyst / Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Method Blank	One per preparatory batch	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater	Correct problem. If required, re-prep and reanalyze method blank and all samples processed with the contaminated blank. Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Contamination	
Laboratory Control Sample (LCS)	One per preparatory batch	See Worksheet #15	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available. Must contain all reported analytes. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Accuracy	

SAP Worksheet #28-8—Laboratory QC Samples Table (continued)

Matrix: SB, SS, SMI

Analytical Group: METAL

Analytical Method/SOP Reference: SW-846 6020A / ANA6020

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Matrix Spike (MS)	One per preparatory batch.	See Worksheet #15	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply Jflag if acceptance criteria are not met and explain in the case narrative. Run dilution test or PDS.	Analyst / Supervisor	Accuracy	Same as Method/SOP QC Acceptance Limits
Matrix spike (MS) / Matrix Spike Duplicate (MSD)	One per preparatory batch.	See Worksheet #15			Accuracy, Precision	
Dilution test	One per preparatory batch if MS or MSD fails.	Five-fold dilution must agree within $\pm 10\%$ of the original measurement.	No specific CA, unless required by the project. For the specific analyte(s) in the parent sample, apply Jflag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	
Post-Digestion spike (PDS) addition	One per preparatory batch if MS or MSD fails (using the same sample as used for the MS/MSD if possible).	Recovery within 80-120%.	No specific CA, unless required by the project. For the specific analyte(s) in the parent sample, apply Jflag if acceptance criteria are not met and explain in the case narrative.		Accuracy, Precision	

Notes:

The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-9—Laboratory QC Samples Table

Matrix: SB, SS, SMI

Analytical Group: METAL

Analytical Method/SOP Reference: SW-846 7199 / ANA218.6-7199

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Field Duplicate (for SB, SS only)	One per 10 normal field samples per matrix	% Relative Percent Difference (RPD) < 30%	Assess laboratory homogenization procedures and precision. Examine laboratory replicate. Assess field homogenization procedures. Qualify as per Worksheet #36.	PM/FTL, Data Validator	Precision	
Field Triplicate (for SMI only)	One per 10 normal field samples per matrix	% Relative Standard Deviation (RSD) < 30% (advisory only)	None.	N/A	Precision	
Equipment Blank	One per day per equipment type (when decontaminated). One per event per equipment type (when disposable).	Same as method blank (see below)	Assess decontamination procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Contamination	
Matrix Spike/Matrix Spike Duplicate	One per 20 normal field samples per matrix	See below				
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-9—Laboratory QC Samples Table (continued)

Matrix: SB, SS, SMI

Analytical Group: METAL

Analytical Method/SOP Reference: SW-846 7199 / ANA218.6-7199

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory QA/QC Samples						
Method blank	One per preparatory batch of up to 20 samples.	No analytes detected >1/2 LOQ and >1/10 the amount measured in any sample or 1/10 the regulatory limit (whichever is greater). Blank result must not otherwise effect sample results for common laboratory contaminants no analytes >LOQ.	Correct problem, then re-prep and reanalyze the MB and all samples in the associated batch for failed analytes, except when sample results are below the LOD if sufficient material is available.	Analyst / Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
Laboratory Control Sample (LCS)	One per preparatory batch of up to 20 samples.	See Worksheet #15	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated batch for failed analytes, if sufficient material is available. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.		Accuracy	
Matrix Spike (MS)	One per preparatory batch of up to 20 samples.	See Worksheet #15	Dilute and reanalyze sample; persistent interference indicates the need to use the method of standard addition, alternative analytical conditions, or an alternative method.		Accuracy	
Matrix Spike Duplicate (MSD) or Matrix Duplicate	One per preparatory batch	See Worksheet #15			Accuracy, Precision	
Pre-digestion matrix spikes (solid matrix samples only, Method 3060)	One soluble and insoluble pre-digestion MS analyzed per preparatory batch prior to analysis	Spike recovery within 75–125%	Correct problem and rehomogenize, redigest, and reanalyze samples. If that fails, evaluate against LCS results.		Accuracy, Precision	
Post-digestion matrix spike (solid matrix samples only)	One per preparatory batch.	Spike recovery between 85–115%.	Examine project-specific DQOs. Contact the client as to additional measures to be taken. If requested, correct problem and rehomogenize, redigest, and reanalyze samples.		Accuracy, Precision	

Notes:

The specifications in this table meet the requirements of DoD QSM v5.0.

SAP Worksheet #28-10—Laboratory QC Samples Table						
Matrix: SB, SS, SMI						
Analytical Group: WCHEM (pH)						
Analytical Method/SOP Reference: SW-846 9045D / ANA9045						
QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits
Laboratory QA/QC Samples						
Laboratory Replicate	One per every 10 samples.	%D ≤ 3% (between sample and laboratory replicate)	Correct problem and reanalyze sample and duplicate.	Analyst / Supervisor	Precision	Same as Method/SOP QC Acceptance Limits

SAP Worksheet #28-11—Laboratory QC Samples Table

Matrix: SB, SS, SMI

Analytical Group: WCHEM (TOC)

Analytical Method/SOP Reference: Walkley Black / ANAWALKLEY

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits
Laboratory QA/QC Samples						
Method Blank	One per preparation batch	No target analytes ≥ ½ LOQ in accordance with DoD QSM requirements.	Correct problem, then re-extract and reanalyze method blank and all samples processed with the contaminated blank in accordance with DoD QSM requirements.	Analyst / Supervisor	Contamination	Same as Method/SOP QC Acceptance Limits
LCS	One LCS per analytical/preparation batch	See Worksheet #15	Correct problem, reanalyze or re-extract the LCS and all associated batch samples in accordance with DoD QSM requirements.		Accuracy	
MS/MSD	One MS/MSD pair per analytical/preparation batch of 20 samples or less	See Worksheet #15	Examine the project- specific requirements. Contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply Jflag if acceptance criteria are not met and explain in the case narrative. Run dilution test or PDS.		Accuracy, Precision	

SAP Worksheet #28-12—Laboratory QC Samples Table

Matrix: SB, SS, SMI

Analytical Group: WCHEM (ORP)

Analytical Method/SOP Reference: ASTM D1498

QC Sample	Frequency & Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field QA/QC Samples						
Temperature Blank	One per cooler	≤ 6°C but not frozen	Notify project chemist. Assess sample packaging and shipment procedures. Consider recollection if the exceedance may cause data rejection. Qualify as per Worksheet #36.	Laboratory PM, PM/FTL, Data Validator	Representativeness	Same as Method/SOP QC Acceptance Limits
Laboratory QA/QC Samples						
Laboratory Replicate	One per batch of 20 or fewer samples	≤ 30% RPD	Repeat until QC acceptance limits are met. Narrate as "difficult sample matrix" if the system is slow to stabilize and thus will not yield a meaningful result.	Analyst / Supervisor	Precision	Same as Method/SOP QC Acceptance Limits

SAP Worksheet # 30—Analytical Services Table

Matrix	Analytical Group	Sample Locations/ID Number	Analytical SOP	Data Package Turnaround Time	Laboratory / Organization ¹	Backup Laboratory / Organization
SS, SB	VOC	See Worksheet #18	SW-846 8260C / ANA8260	28 Calendar-day TAT	APPL, Inc. 908 North Temperance Avenue Clovis, CA (559) 275-2175 POC: Cynthia Clark	TBD
	SVOC		SW-846 8270D, 8270D_SIM / SON009, ANA8270, ANA8270SIM			
	PEST/PCB		SW-846 8081B, 8082A / SON002, ANA8081, ANA8082			
	EXPLO		SW-846 8330B / MSE018 , HPL8330			
	EXPLO (Picric Acid)		SW-846 8321A / MSE018, HPL8321			
	EXPLO (Perchlorate)		SW-846 6850 / HPL6850			
	METAL		SW-846 6010C, 6020A / PRE3050B, ANA6010, ANA6020			
	METAL (Hexavalent Chromium)		SW-846 7199 / NA3060A, ANA218.6-7199			
	WCHEM (pH)		SW-846 9045D / ANA9045D			
	WCHEM (TOC)		Walkley Black / ANAWALKLEY			
	WCHEM (ORP)		ASTM D1498		ALS - Kelso 1317 South 13th Avenue Kelso, WA 98626 (360) 577-7222 POC: Howard Holmes	

SAP Worksheet #30—Analytical Services Table (continued)

Matrix	Analytical Group	Sample Locations/ID Number	Analytical SOP	Data Package Turnaround Time	Laboratory / Organization ¹	Backup Laboratory / Organization
SMI	EXPLO	See Worksheet #18	SW-846 8330B / MSE018 , HPL8330	28 Calendar-day TAT	APPL	TBD
	EXPLO (Picric Acid)		SW-846 8321A / MSE018, HPL8321			
	EXPLO (Perchlorate)		SW-846 6850 / HPL6850			
	METAL		SW-846 6010C, 6020A / PRE3050B, ANA6010, ANA6020			
	METAL (Hexavalent Chromium)		SW-846 7199 / NA3060A, ANA218.6-7199			
	WCHEM (pH)		SW-846 9045D / ANA9045D			
	WCHEM (TOC)		Walkley Black / ANAWALKLEY			
	WCHEM (ORP)		ASTM D1498		ALS - Kelso	

Notes:

¹ All samples will be shipped from the field to APPL. APPL will ship ORP fractions to ALS-Kelso.

SAP Worksheet #34-36—Data Verification and Validation (Steps I and IIa/IIb) Process Table

Data Review Input	Description ¹	Responsible for Verification	Step I / IIa / IIb ²	Internal / External
Field Notebooks	Field notebooks will be reviewed internally and placed into the project file for archival at project closeout.	FTL/CH2M HILL (Ronny Fields or TBD)	Step I	Internal
Chains of Custody and Shipping Forms	Chain-of-custody forms and shipping documentation will be reviewed internally upon their completion and verified against the packed sample coolers they represent. The shipper's signature on the chain-of-custody will be initialed by the reviewer, a copy of the chain-of-custody retained in the site file, and the original and remaining copies taped inside the cooler for shipment.	FTL/CH2M HILL (Ronny Fields or TBD) Michael Zamboni/CH2M HILL (PC)	Step I	Internal / External
Sample Condition Upon Receipt	Any discrepancies, missing, or broken containers will be communicated to the project data manager in the form of laboratory logins.	Michael Zamboni/CH2M HILL (PC)	Step I	External
Documentation of Laboratory Method Deviations	Laboratory Method Deviations will be discussed and approved by the project chemist. Documentation will be incorporated into the case narrative which becomes part of the final hardcopy data package.	Michael Zamboni/CH2M HILL (PC)	Step I	External
Electronic Data Deliverables	Electronic Data Deliverables will be compared against hardcopy laboratory results (10% check).	Michael Zamboni/CH2M HILL (PC)	Step I	External
Case Narrative	Case narratives will be reviewed by the data validator during the data validation process. This is verification that they were generated and applicable to the data packages.	Data Validator/TBD	Step I	External
Laboratory Data	All laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal.	APPL QAO ALS - Kelso QAO	Step I	Internal
Laboratory Data	The data will be verified for completeness by the Project Chemist. In order to ensure completeness, EDDs will be compared to the SAP and Sampler's Table. This is verification that all samples are included in the laboratory data and correct analyte lists are included.	Michael Zamboni/CH2M HILL (PC)	Step I	External

SAP Worksheet #34-36—Data Verification and Validation (Steps I and IIa/IIb) Process Table (continued)

Data Review Input	Description ¹	Responsible for Verification	Step I / IIa / IIb ²	Internal / External
Audit Reports	Upon report completion, a copy of all audit reports will be placed in the site file. If CAs are required, a copy of the documented CA taken will be attached to the appropriate audit report in the QA site file. Periodically, and at the completion of site work, site file audit reports and CA forms will be reviewed internally to ensure that all appropriate CAs have been taken and that CA reports are attached. If CAs have not been taken, the site manager will be notified to ensure action is taken.	John Swenfurth/CH2M HILL (PM) Michael Zamboni/CH2M HILL (PC)	Step I	Internal
Corrective Action Reports	CA reports will be reviewed by the project chemist or PM and placed into the project file for archival at project closeout.	John Swenfurth/CH2M HILL (PM) Michael Zamboni/CH2M HILL (PC)	Step I	External
Laboratory Methods	Ensure the laboratory analyzed samples using the correct methods by comparing the EDDs to the SAP.	Michael Zamboni/CH2M HILL (PC)	Step IIa	External
Target Compounds List Target Analyte List	Ensure the laboratory reported all analytes from each analysis group as per Worksheet 15.	Michael Zamboni/CH2M HILL (PC)	Step IIa	External
Reporting Limits	Ensure the laboratory met the project-designated quantitation limits as per Worksheet 15. If quantitation limits were not met, the reason will be determined and documented.	Michael Zamboni/CH2M HILL (PC)	Step IIb	External
Laboratory SOPs	Ensure that approved analytical laboratory SOPs were followed.	Data Validator/TBD	Step IIa	External
Sample Chronology	Holding times from collection to extraction or analysis and from extraction to analysis will be considered by the data validator during the data validation process.	Data Validator/TBD	Step IIa / IIb	External
Raw Data	10 percent review of raw data to confirm laboratory calculations.	Data Validator/TBD	Step IIa	External
Onsite Screening	All non-analytical field data will be reviewed against QAPP requirements for completeness and accuracy based on the field calibration records.	FTL/ CH2M HILL (Ronny Fields or TBD)	Step IIb	Internal

SAP Worksheet #34-36—Data Verification and Validation (Steps I and IIa/IIb) Process Table (continued)

Data Review Input	Description ¹	Responsible for Verification	Step I / IIa / IIb ²	Internal / External
Documentation of Method QC Results	Establish that all required QC samples were run and met limits.	Data Validator/TBD	Step IIa	External
Documentation of Field QC Sample Results	Establish that all required QAPP QC samples were run and met limits.	Project Chemist/CH2M HILL Data Validator/TBD	Step IIb	External
Third-Party Data Validation (VOC) ³	"Validating Volatile Organic Compounds by SW-846 Method 8260B" (SOP HW-24 Rev. 2; August, 2009).	Data Validator/TBD	Step IIa and IIb	External
Third-Party Data Validation (SVOC) ³	"Validating Semivolatile Organic Compounds by SW-846 Method 8270" (SOP HW-22; Rev. 4; August, 2008)	Data Validator/TBD	Step IIa and IIb	External
Third-Party Data Validation (PEST/PCB) ³	For SW-846 8081B: "Data Validation SOP of Organochlorine Pesticides by Gas Chromatography SW-846 Method 8081B" (SOP HW-44 Rev. 1; August, 2009). For SW-846 8082A: "Data Validation SOP of PCBs by Gas Chromatography SW-846 Method 8082A (SOP HW-45, Rev. 1, October, 2006)	Data Validator/TBD	Step IIa and IIb	External
Third-Party Data Validation (METAL) ³	Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. QA/QC criteria for field QC samples are presented in Worksheet 28, QA/QC criteria for calibrations are presented in Worksheet 24, and QA/QC criteria for laboratory QC samples are presented in Worksheet 28. Reference limits, laboratory-specific limits, and accuracy/precision limits are presented in Worksheet 15. Data may be qualified if QA/QC exceedances have occurred. Data qualifiers will be those presented in "ICP-MS Data Validation" (SOP HW-2b; Rev. 15; December 2012) for SW-846 6020A and "ICP-AES Data Validation" (SOP HW-2a; Rev. 15; December 2012) for SW-846 6010C. Note that, because there are no EPA Region II SOPs for data validation of 6010, 6020, and 7199 data, the data validator may prepare in-house worksheets similar to those familiar to Region II. Guidance and qualifiers from "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review" (OSWER 9240.1-51; EPA 540-R-10-011; January, 2010) may also be applicable.	Data Validator/TBD	Step IIa and IIb	External

SAP Worksheet #34-36—Data Verification and Validation (Steps I and IIa/IIb) Process Table (continued)

Data Review Input	Description ¹	Responsible for Verification	Step I / IIa / IIb ²	Internal / External
Third-Party Data Validation (EXPLO) ³	<p>For SW-846 8330B and 8321A: "Nitroaromatics and Nitroamines by HPLC" (SOP HW-16 Rev. 2.1; December 2010). Note that this validation SOP is specific to 8330A; therefore A/P limits from this UFP-SAP will take precedence over validation SOP limits.</p> <p>For SW-846 6850: Analytical methods and laboratory SOPs, as presented in this UFP-SAP, will be used to evaluate compliance against QA/QC criteria. QA/QC criteria for field QC samples are presented in Worksheet 28, QA/QC criteria for calibrations are presented in Worksheet 24, and QA/QC criteria for laboratory QC samples are presented in Worksheet 28. Reference limits, laboratory-specific limits, and accuracy/precision limits are presented in Worksheet 15. Data may be qualified if QA/QC exceedances have occurred. Data qualifiers will be those presented in "ICP-MS Data Validation" (SOP HW-2b; Rev. 15; December 2012). Note that, because there are no EPA Region II SOPs for data validation of 6850 data, the data validator may prepare in-house worksheets similar to those familiar to Region II. Guidance and qualifiers from "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review" (OSWER 9240.1-51; EPA 540-R-10-011; January, 2010) may also be applicable.</p>	Data Validator/TBD	Step IIa and IIb	External
Data Validation (WCHEM)	Level IV analytical data validation is not required for screening data. However, they are still subject to the verification and validation procedures described above.	Michael Zamboni/ CH2M HILL (PC)	Step I, IIa and IIb	External

Notes:

1. Should the CH2M HILL project chemist find discrepancies during the verification or validation procedures above, an email documenting the issue will be circulated to the internal project team, and a Corrections to File Memo will be prepared identifying the issues and the corrective action needed. This Memo will be sent to the laboratory, or applicable party, and maintained in the project file.
2. IIa = compliance with methods, procedures, and contracts [see Table 10, page 117, UFP-QAPP manual, V.1, March 2005.]
 IIb = comparison with measurement performance criteria in the SAP [see Table 11, page 118, UFP-QAPP manual, V.1, March 2005]
3. Level IV third-party data validation will be performed on 100% of definitive analyses. Of the 100% validated, 10% of results will be recalculated from the raw data in order to verify calculations.

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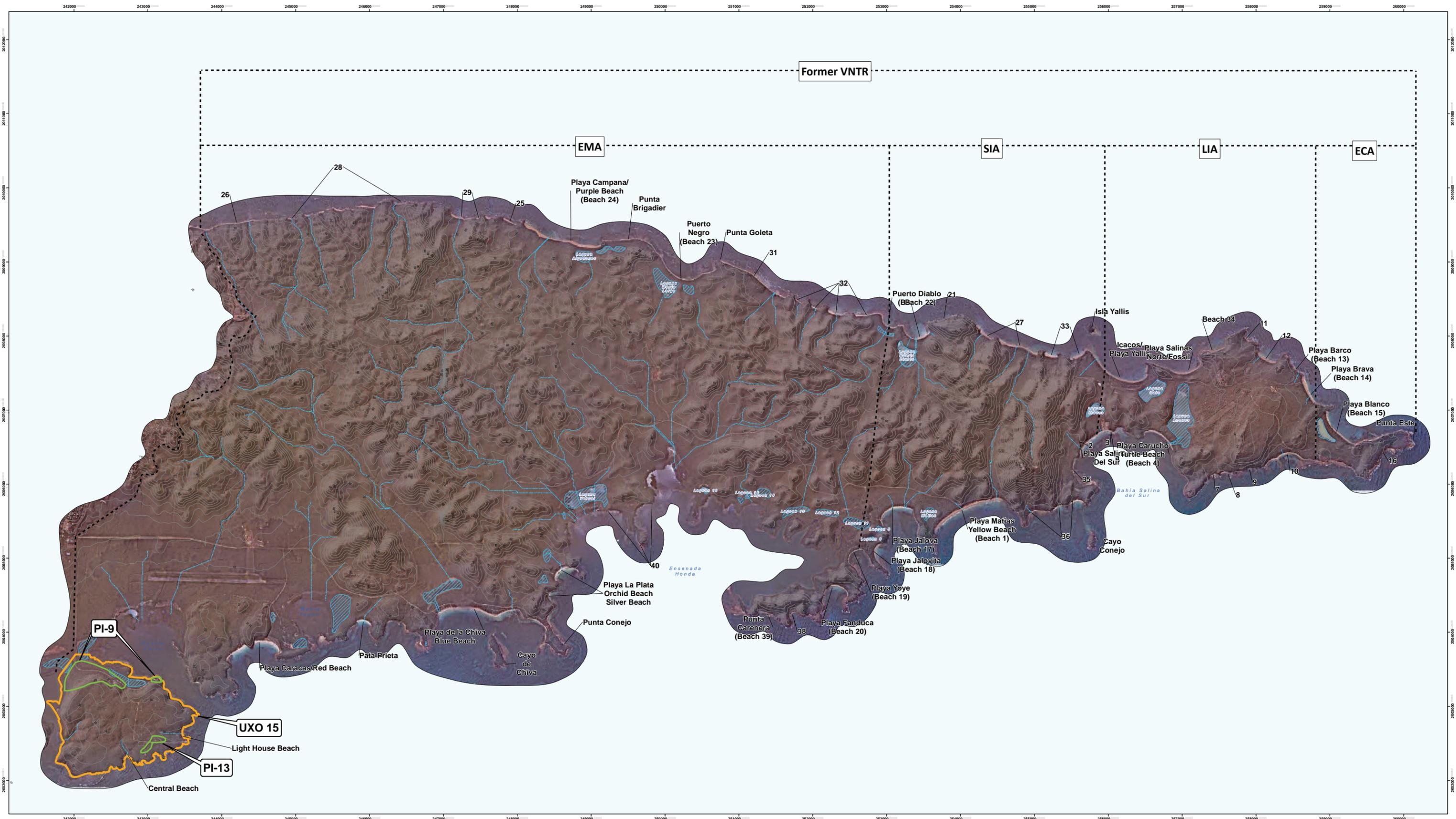
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Figures



Legend

- Photo Identified Site
- UXO 15 Site Boundary
- Topographic Contours (10 Meter)
- Stream
- Lagoon

2005 Aerial Imagery
2005 Hillshade

Notes:

- SIA - Surface Impact Area
- LIA - Live Impact Area
- ECA - Eastern Conservation Area
- EMA - Eastern Maneuver Area
- VNTR - Vieques Naval Training Range

Topographic Contours derived from United States Geological Survey 30 Meter Digital Elevation Model.

Coordinate System - NAD 1983 UTM Zone 20 (Meters)

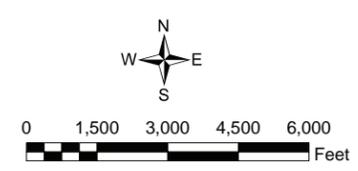
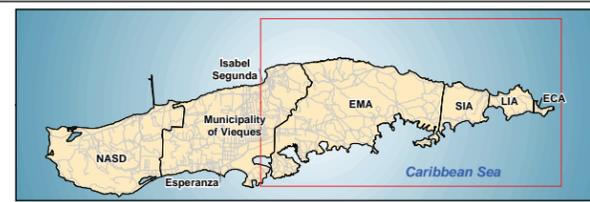


Figure 1
Former VNTR Site Location Map
UXO 15 Addendum 2 Sampling and Analysis Plan
Former Vieques Naval Training Range
Vieques, Puerto Rico

CH2MHILL



- Legend**
- Deteriorated Drum
 - ⊕ Possible Detonation Area
 - Former Debris Pile
 - Approximate Berm Location
 - PI Site
 - UXO15

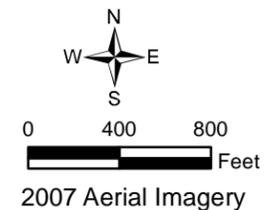
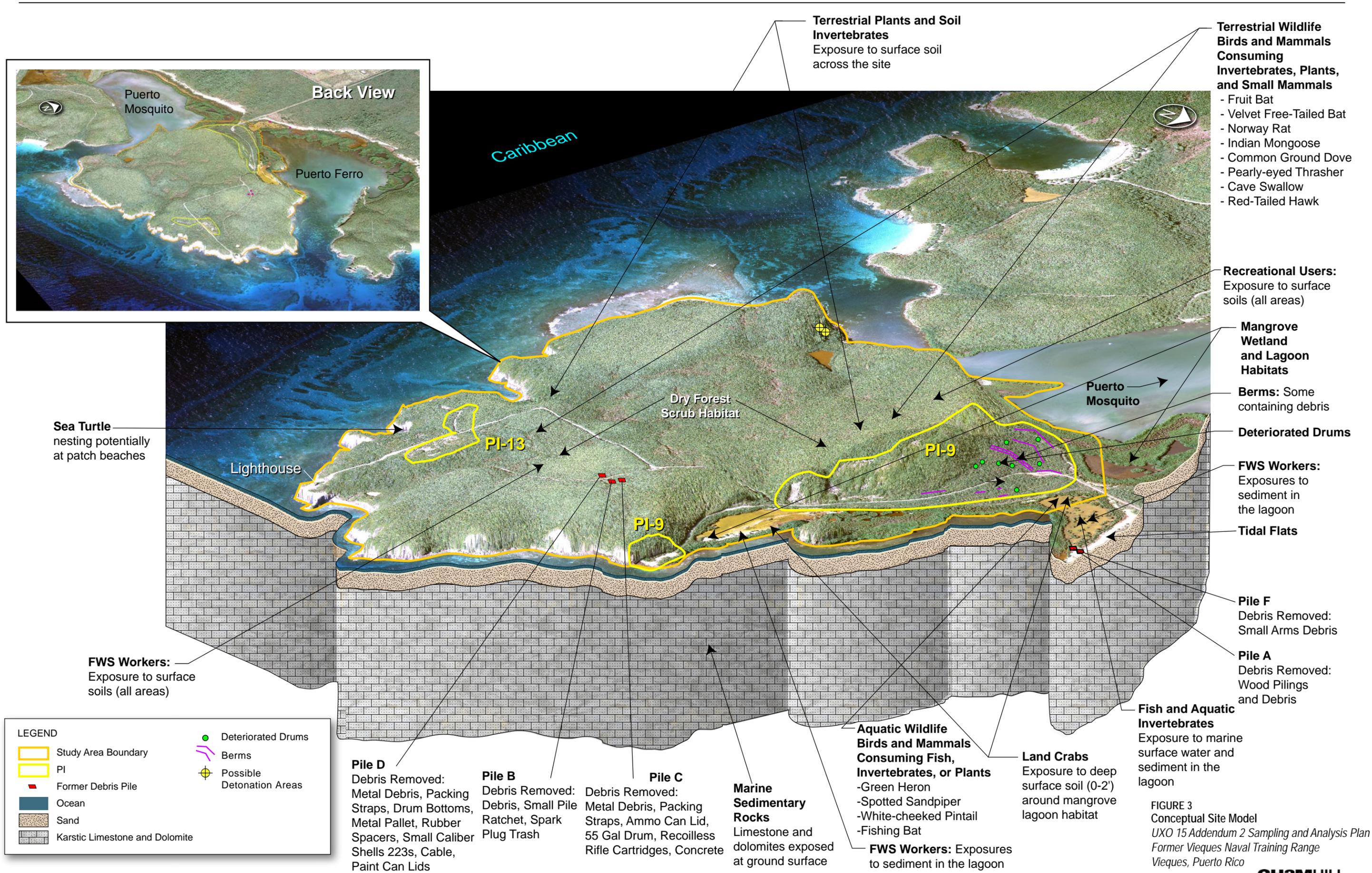


Figure 2
Site Features, UXO 15
UXO 15 Addendum 2 Sampling and Analysis Plan
Former Vieques Naval Training Range
Vieques, Puerto Rico



Terrestrial Plants and Soil Invertebrates
Exposure to surface soil across the site

Terrestrial Wildlife Birds and Mammals Consuming Invertebrates, Plants, and Small Mammals
 - Fruit Bat
 - Velvet Free-Tailed Bat
 - Norway Rat
 - Indian Mongoose
 - Common Ground Dove
 - Pearly-eyed Thrasher
 - Cave Swallow
 - Red-Tailed Hawk

Recreational Users:
Exposure to surface soils (all areas)

Mangrove Wetland and Lagoon Habitats

Berms: Some containing debris

Deteriorated Drums

FWS Workers:
Exposures to sediment in the lagoon

Tidal Flats

Pile F
Debris Removed: Small Arms Debris

Pile A
Debris Removed: Wood Piling and Debris

Fish and Aquatic Invertebrates
Exposure to marine surface water and sediment in the lagoon

Land Crabs
Exposure to deep surface soil (0-2') around mangrove lagoon habitat

Aquatic Wildlife Birds and Mammals Consuming Fish, Invertebrates, or Plants
 -Green Heron
 -Spotted Sandpiper
 -White-cheeked Pintail
 -Fishing Bat

FWS Workers: Exposures to sediment in the lagoon

Marine Sedimentary Rocks
Limestone and dolomites exposed at ground surface

Pile C
Debris Removed: Metal Debris, Packing Straps, Ammo Can Lid, 55 Gal Drum, Recoilless Rifle Cartridges, Concrete

Pile B
Debris Removed: Debris, Small Pile Ratchet, Spark Plug Trash

Pile D
Debris Removed: Metal Debris, Packing Straps, Drum Bottoms, Metal Pallet, Rubber Spacers, Small Caliber Shells 223s, Cable, Paint Can Lids

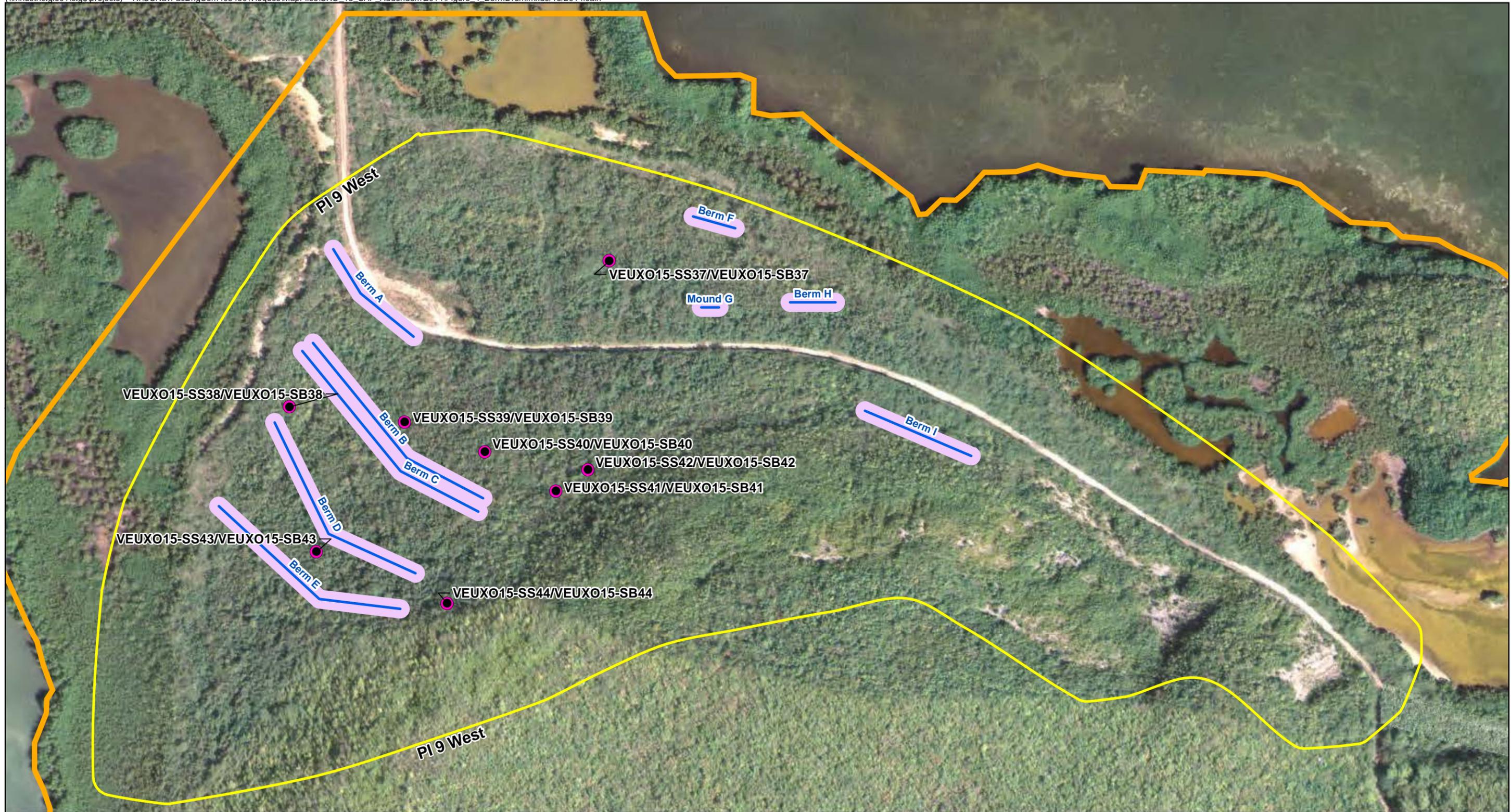
Sea Turtle
nesting potentially at patch beaches

FWS Workers:
Exposure to surface soils (all areas)

LEGEND

- Study Area Boundary
- PI
- Former Debris Pile
- Ocean
- Sand
- Karstic Limestone and Dolomite
- Deteriorated Drums
- ~ Berms
- ⊕ Possible Detonation Areas

FIGURE 3
Conceptual Site Model
UXO 15 Addendum 2 Sampling and Analysis Plan
Former Vieques Naval Training Range
Vieques, Puerto Rico



- Legend**
- Proposed Sample Location
 - Deteriorated Drums
 - Berm Location
 - Proposed Selective Vegetation Clearance
 - PI Site
 - UXO15

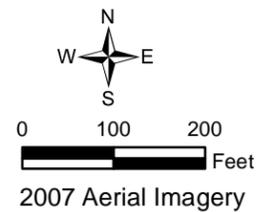
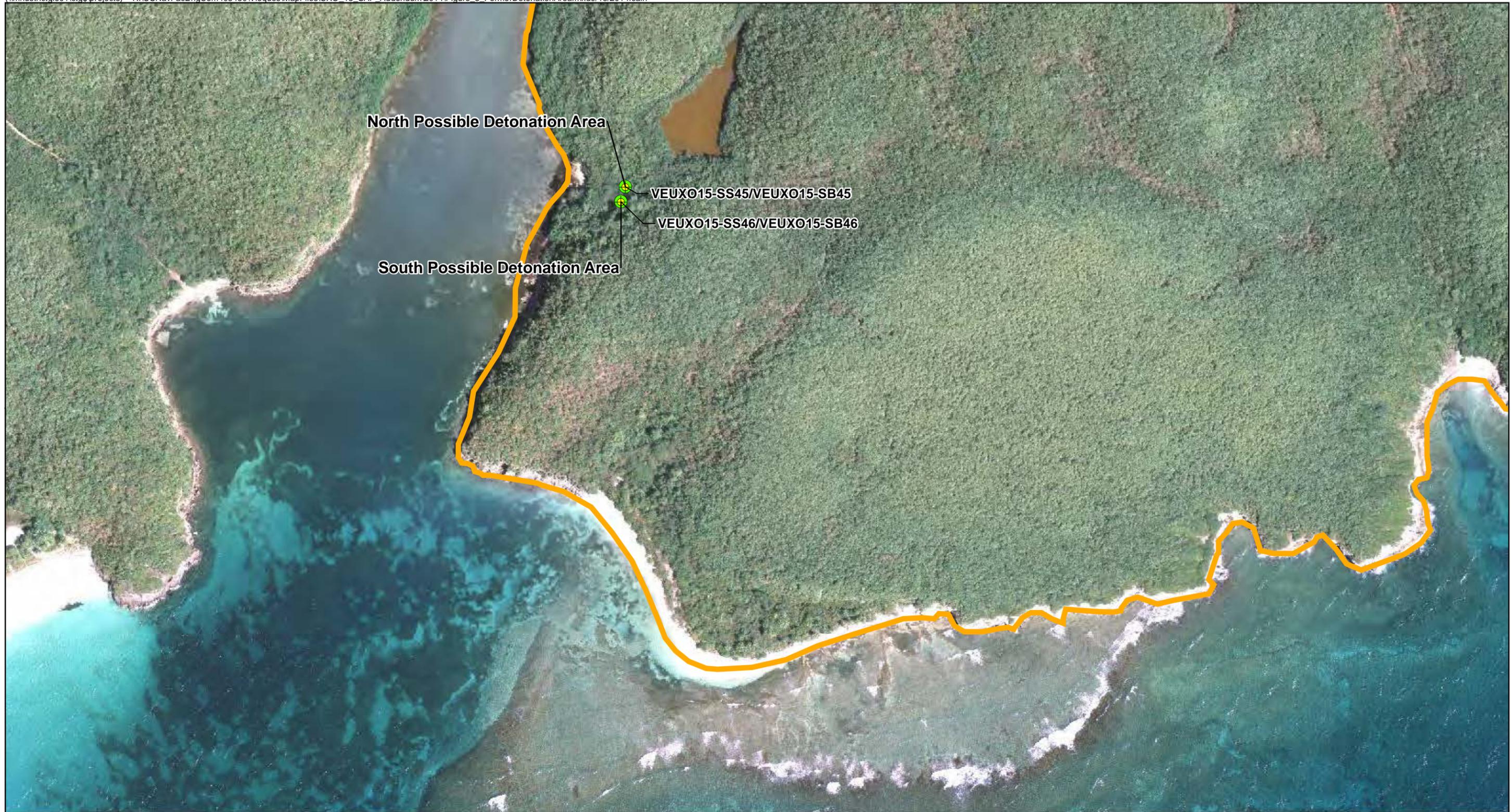


Figure 4
Sample Locations at PI 9 West
 UXO 15 Addendum 2 Sampling and Analysis Plan
 Former Vieques Naval Training Range
 Vieques, Puerto Rico



- Legend**
- Sample Location
 - ⊕ Possible Detonation Area
 - ▭ UXO15

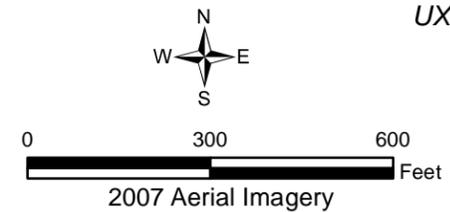
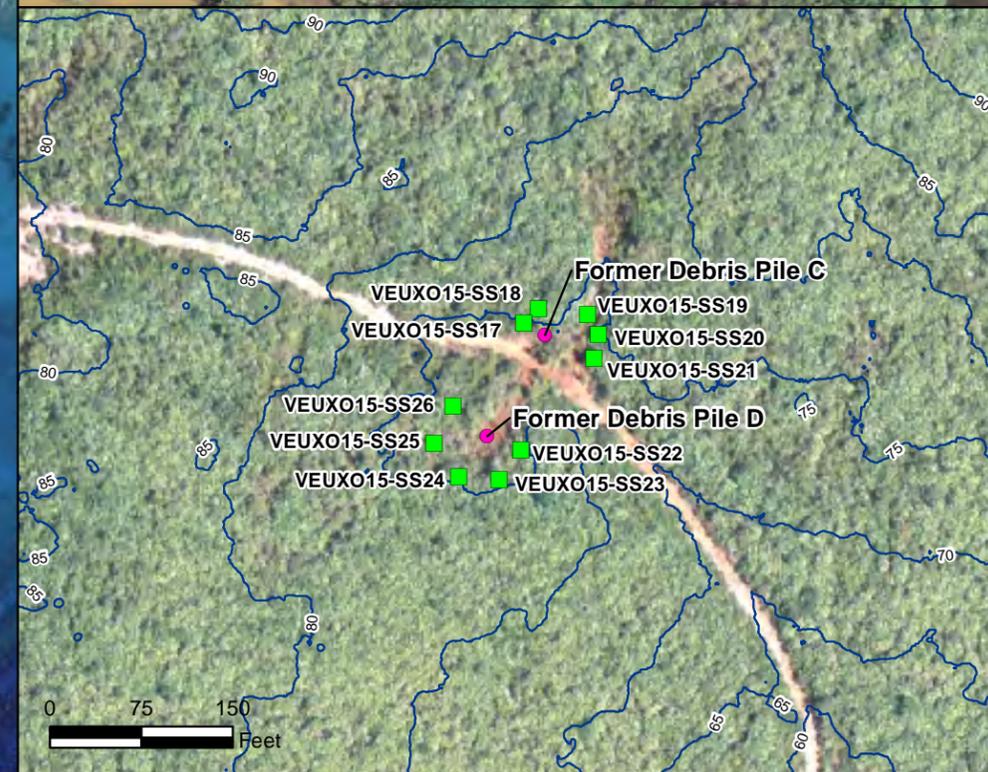
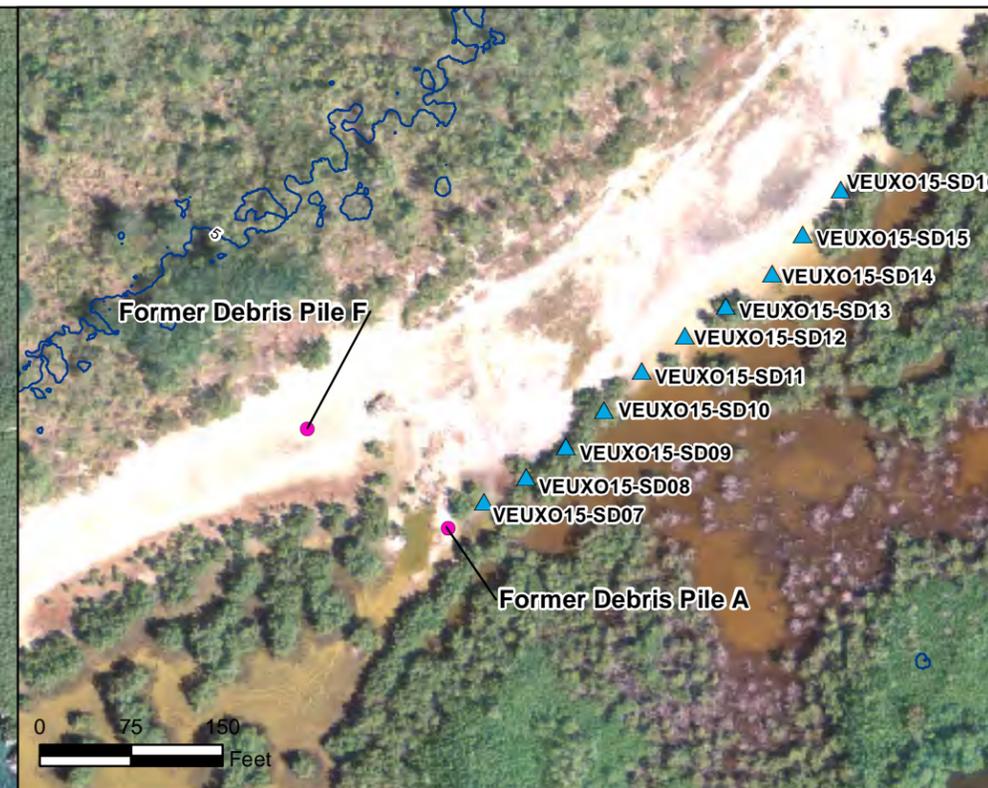


Figure 5
Potential Former Detonation Areas
UXO 15 Addendum 2 Sampling and Analysis Plan
Former Vieques Naval Training Range
Vieques, Puerto Rico



- Legend**
- Proposed Inorganics Confirmation Sample, Piles C & D
 - ▲ Proposed Inorganics Confirmation Sample, Piles A & F
 - Former Debris Pile
 - Lidar Derived Ground Surface Elevation, 5-ft Contour Interval
 - ▭ UXO15

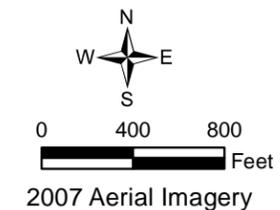
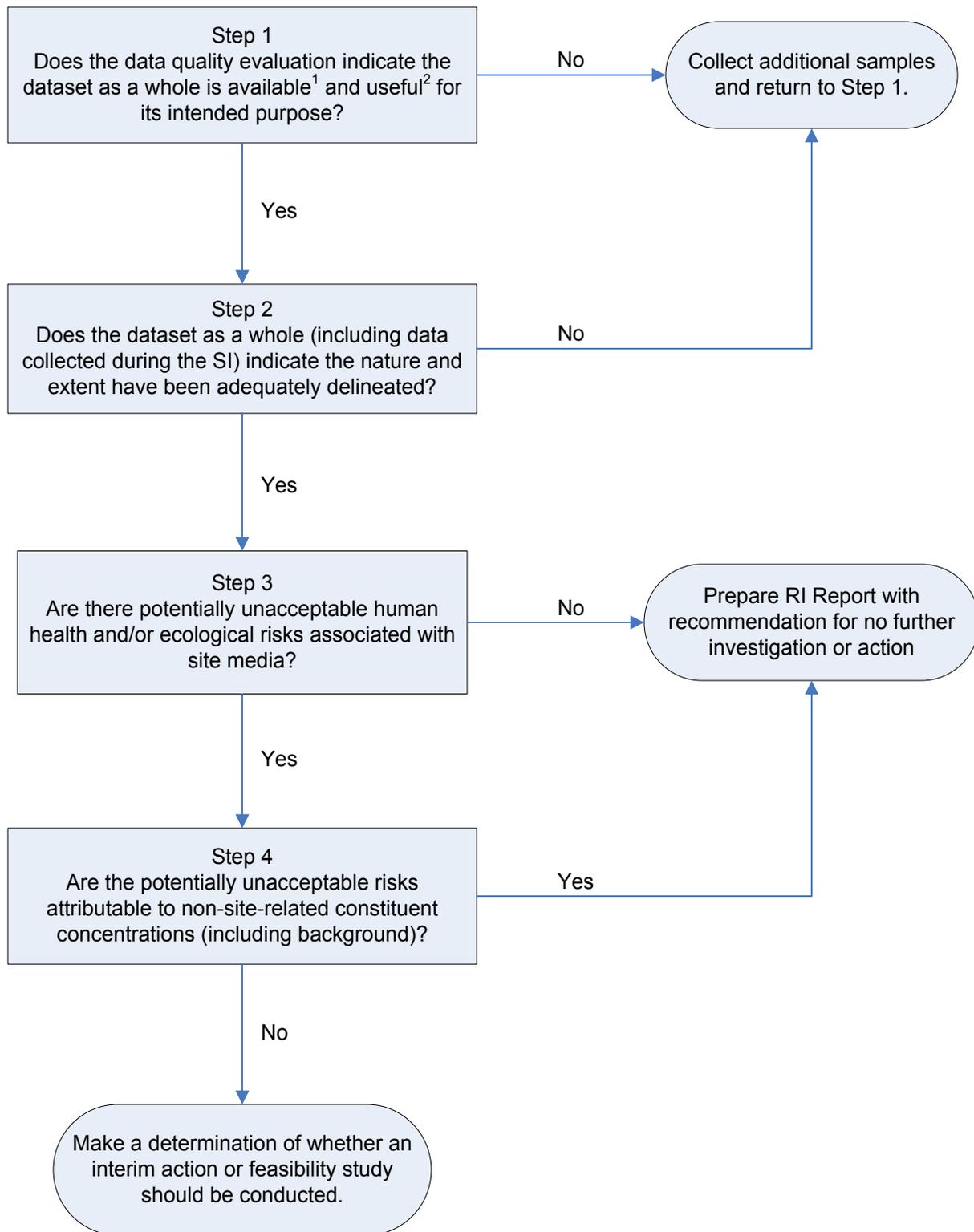


Figure 6
Sample Locations at Former Debris Piles
 UXO 15 Addendum 2 Sampling and Analysis Plan
 Former Vieques Naval Training Range
 Vieques, Puerto Rico



Notes:

The decision makers associated with this decision tree are the Navy, USEPA, PREQB, PRDNER, and USFWS.

¹ “Available” data are described in Worksheet #37

² “Useful” data are described in Worksheet #37

Figure 7
 Remedial Investigation Evaluation Decision Tree
 UXO 15 Addendum 2 Sampling and Analysis Plan
 Former Vieques Naval Training Range
 Vieques, Puerto Rico

Attachment A
Former Debris Pile Photos

PHOTO 6A
Pre-debris Removal Conditions at Debris Pile A



PHOTO 6B
Post-debris Removal Conditions at Debris Pile A



PHOTO 7A
Pre-debris Removal Conditions at Debris Pile B



PHOTO 7B
Post-debris Removal Conditions at Debris Pile B



PHOTO 8A
Pre-debris Removal Conditions at Debris Pile C



PHOTO 8B
Post-debris Removal Conditions at Debris Pile C



PHOTO 9A
Pre-debris Removal Conditions at Debris Pile D



PHOTO 9B
Post-debris Removal Conditions at Debris Pile D



PHOTO 10A
Debris Found at Debris Pile F



PHOTO 10B
Debris Removal at Debris Pile F



PHOTO 10C
Debris Removal at Debris Pile F



Attachment B
Relevant Standard Operating Procedures

Modified Soil Sample Depth Selection Protocol

This protocol defines the soil sample selection criteria that are used to select soil sampling depths for environmental investigations on Vieques, unless otherwise deemed appropriate and specified in site-specific project plans.

Soil sampling is conducted to provide information for various purposes. In addition to general site characterization use (e.g., nature and extent of contamination), surface soil data are used in human health and ecological risk assessments. Subsurface soil data from samples collected to a depth of 6 feet are used in human health risk assessments. The presence or potential presence of basements often is associated with subsurface soil depths of 10 feet for human health risk assessment. The subsurface soil depth for human health risk assessments conducted for Vieques is limited to 6 feet because there are no basements in Puerto Rico. Soil data are also used to assess the presence of contaminants that may be continuing sources of groundwater contamination.

Surface Soil

In order to provide analytical data from a single depth that can be used for both human health and ecological screening/risk assessments (as well as site characterization), the following are the criteria used to select the surface soil sampling depth at a given site under investigation:

- Surface soil samples will be collected from the top 24 inches of soil when the sample location is near a surface water body and land crabs or burrowing reptiles (e.g., nesting sea turtles) are potential receptors of concern at the sample location.
- Surface soil samples will be collected from the top 12 inches of soil when the sample location is not near a surface water body and land crabs or burrowing reptiles (e.g., nesting sea turtles) are not potential receptors of concern at the sample location.
- Surface soil samples will be collected from the top 6 inches of soil when collected from under debris or contaminated soil that has been removed to determine whether a release to underlying soil has occurred.

Subsurface Soil

The following are the general criteria that are used to select subsurface soil sampling depths at environmental sites. It should be noted that subsurface soil sample selection criteria may be modified on a site-specific basis, based on factors such as the depth to groundwater, depth to bedrock, depth of contaminant source, and extent of contamination.

For the purposes of collecting data for site characterization and human health risk assessment, at each subsurface soil sampling location, continuous split-spoon (or direct-push) samples will be collected from the bottom of the surface soil interval (i.e., 1 foot or 2 feet) to 6 feet (or bedrock or water table if encountered above 6 feet). One subsurface soil sample will be collected for analysis in the 2-ft interval directly beneath a subsurface munitions item (MEC and MD) or highest anomaly reading identified using a geophysical instrument-aided technique, if encountered and deemed safe to remove. If subsurface munitions items are not identified, the normal Vieques protocol will be as follows: collected within the 1- or 2-to-6 ft interval (depending on the surface soil depth), based on where visual and/or instrument (e.g., OVA) screening suggests the presence of contamination, to be used for human health risk evaluation (and site characterization). In the absence of potential contamination based on visual and/or instrument screening, the subsurface soil sample will be collected for analysis at the 4-to-6 ft interval (or just above the water table or bedrock, if encountered before this depth).

For the purposes of site characterization (not for risk assessment purposes), continuous soil sampling will continue from 6 feet to bedrock or the water table, whichever is shallower. Additional soil sample(s) will be collected for analysis below the 6-foot depth (i.e., between 6 feet and the water table or bedrock, whichever is shallower) if visual or instrument screening suggests the presence of contamination, to assist in delineating the vertical extent of contamination.

Systematic Random Increment Sampling

1.1 Purpose

The Systematic random increment sampling of surface soil samples is performed to minimize any bias of sample representativeness introduced by compositional and distribution heterogeneity of constituents within the sample. This procedure should only be used when sampling surface soils for explosive residuals and metals.

1.2 Scope

Standard techniques for surface soil random incremental sampling for the analysis of explosives residuals, SVOCs, and metals, and required equipment are provided in this SOP.

1.3 Equipment and Materials

Random incremental sampling will be performed with clean hardened plastic or metal scoops, spoons, or coring tools (such as a MIST sampling tool) depending on the cohesiveness of the soil. Sample containers are lab and analyte specific, but generally will consist of two clean 16 ounce wide mouth glass jars for 1 kg samples and two clean 32 ounce wide mouth glass jars for 2 kg samples. Soil will be homogenized in the laboratory rather than the field.

1.4 Procedures and Guidelines

Surface soil composite samples will be collected from Decision or Sampling Units for analysis for explosives residues and/or total metals. Each Decision Unit will be defined based on past range activities and ecological and human health risks associated with that area. Where applicable, larger Decision Units may be sampled multiple times in one acre area Sampling Units. Each Decision/Sampling Unit location sampled and a summary of sampling activities will be recorded in a field book.

Increment composite surface soil samples will be collected within the Decision or Sampling Unit using a systematic sampling pattern with a random starting point. Number of increments should be between 30 and 100 depending on the size of the Decision or Sampling Unit (increments should be discussed with stakeholders prior to sampling). Samples will be collected by walking from one corner of the grid systematically back and forth across the entire grid area, collecting an increment of soil every so many paces, depending on the grid size and number of increments to be collected. The sample increments will be approximately equal in the amount of soil, which will be collected from depths of approximately 0-2 inches (up to about 2.5-inches) below ground surface. While walking the sampling unit grid, subsamples will be stored in a gallon ziplock or equivalent plastic bag, labeled with the sampling unit number. After the Decision/Sampling Unit has been sampled, the individual increment samples will be transferred to the appropriate laboratory-supplied sample containers. Triplicate (two replicate) samples should be collected from each site on a one per 10 basis. Each replicate sample will be collected using the same method as the original sample. The replicate samples should be started from a different corner of the decision unit to avoid sampling the same location as the original sample.

Samples will be stored on ice in clean plastic bags or clean large mouth glass bottles and submitted for laboratory analysis by one or more of the following analytical methods: EPA SW-846 Method 8330, Method 8330B, Method 6850, and the appropriate project specific analytical methods for metals. Method 8330B uses an air drying and mechanical grinding process. Mechanical grinding will not be conducted for samples submitted for metals analysis. A minimum of 1 kg of soil will be collected per RI sample.

The sampling tools will not need to be cleaned between increments since each individual increment will be a part of the same sample, but tools will be cleaned between each RI sample. The decontamination process follows SOP E1, Decontamination of Personnel, and Equipment.

Follow manufacturer's instructions for use of the sampling tool. For pogo-stick type MIS samplers, insert the appropriate core tip, place the tip on the surface to be sampled, and drive the sampler tip into the ground with the pogo-stick foot pedals. If using both foot pedals at the same time, be careful about balance, and if this method cannot be done safely, discontinue use of both foot pedals simultaneously. To extrude the sample, press on the sample extruder, holding the sample tip over the plastic bag in which the sample is to be collected. Decontaminate sampling equipment that has come in contact with the ground before switching to sample a separate sampling unit.

1.5 Attachments

None.

1.6 Key Checks and Items

- Triplicate samples collected from each Decision Unit at 1 per 10 samples.
- Replicate samples should be started from a different corner of the decision unit to avoid sampling the same location as the original sample.
- Sampling method is only applicable to explosives residues and metals.
- Number of increments should be between 30 and 100 depending on the size of the Decision Unit.
- Check that decontamination of equipment is thorough.

Attachment C
Laboratory DoD ELAP Accreditation Letters



PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

ALS Environmental-Kelso
1317 South 13th Avenue, Kelso, WA 98626

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 “General Requirements for the competence of Testing and Calibration Laboratories” and the DoD Quality Systems Manual for Environmental Laboratories Version 4.2 10/26/2010 and is accredited in accordance with the:

United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP)

This accreditation demonstrates technical competence for the defined scope:
Environmental Testing
(As detailed in the supplement)

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body’s duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen
President/Operations Manager

Initial Accreditation Date:

July 19, 2011

Issue Date:

March 13, 2014

Expiration Date:

March 13, 2016

Accreditation No.:

65188

Certificate No.:

L14-51

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjllabs.com



Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous	EPA 1631E	CVAFS	Mercury (Low level)
Aqueous	EPA 1664A	Gravimetry	Hexane Extractable Material (HEM)
Aqueous	EPA 1664A	Gravimetry	Total Petroleum Hydrocarbons (TPH)
Aqueous	EPA 180.1	Nephelometer	Turbidity
Aqueous	EPA 2340B	Calculation by 6010	Hardness as CaCO ₃)
Aqueous	EPA 245.1	CVAA	Mercury
Aqueous	EPA 300.0	IC	Bromide
Aqueous	EPA 300.0	IC	Chloride
Aqueous	EPA 300.0	IC	Fluoride
Aqueous	EPA 300.0	IC	Nitrate + Nitrite as N
Aqueous	EPA 300.0	IC	Nitrate as N
Aqueous	EPA 300.0	IC	Nitrite as N
Aqueous	EPA 300.0	IC	Sulfate
Aqueous	EPA 353.2	Automated Colorimetry	Nitrate + Nitrite as N
Aqueous	EPA 7196A	Colorimetry	Chromium VI
Aqueous	EPA 7470A	CVAA	Mercury
Aqueous	EPA 8260C SIM	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,1,2-Trichloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,1-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	1,2-Dibromoethane (EDB)
Aqueous	EPA 8260C SIM	GC-MS	1,2-Dichloroethane
Aqueous	EPA 8260C SIM	GC-MS	1,3 Butadine
Aqueous	EPA 8260C SIM	GC-MS	1,4-Dichlorobenzene
Aqueous	EPA 8260C SIM	GC-MS	Bromodichloromethane
Aqueous	EPA 8260C SIM	GC-MS	Carbon Tetrachloride
Aqueous	EPA 8260C SIM	GC-MS	Chlorodibromomethane
Aqueous	EPA 8260C SIM	GC-MS	Chloroform
Aqueous	EPA 8260C SIM	GC-MS	Chloromethane
Aqueous	EPA 8260C SIM	GC-MS	cis-1,2-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Dichloromethane (Methylene Chloride)
Aqueous	EPA 8260C SIM	GC-MS	Tetrachloroethene
Aqueous	EPA 8260C SIM	GC-MS	trans-1,2-Dichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Trichloroethene
Aqueous	EPA 8260C SIM	GC-MS	Vinyl chloride
Aqueous	EPA 9020B	Microcoulometric-titration detector	Total Organic Halides (TOX)



Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous	EPA 9040C	pH Meter	pH
Aqueous	EPA 9060A	TOC Meter	Total Organic Carbons (TOC)
Aqueous	SM 2130B	Nephelometer	Turbidity
Aqueous	SM 4500 CN- G	Colorimetry	Cyanide, Amenable
Aqueous	SM 4500 P-E	Colorimetry	ortho-phosphorous
Aqueous	SM 4500 S2 D	Distillation Unit	Sulfide
Aqueous	SM2320B	Titrimetry	Total Alkalinity (as CaCO ₃)
Aqueous	SM2510B	Conductivity Meter	Specific Conductance
Aqueous	SM2540B	Balance	Solids, Total
Aqueous	SM2540C	Balance	Solids, Total Dissolved
Aqueous	SM2540D	Balance	Solids, Total Suspended
Aqueous	SM4500CN E	Colorimetry	Total Cyanide
Aqueous	SM4500CN-G	Colorimetry	Cyanide, Amenable
Aqueous	SM4500NH3 G	Colorimetry	Ammonia
Aqueous	SM5220C	Titrimetry	Chemical Oxygen Demand (COD)
Aqueous	SM5310C	TOC Meter	Total Organic Carbons (TOC)
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluor-n butanoic acid (PFBA)
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluor-n octanesulfonate (PFOS)
Aqueous	SOP-LCP-PFC	HPLC/MS/MS	Perfluor-n octanoic acid (PFOA)
Aqueous/Drinking Water	EPA 200.9	GFAA	Antimony
Aqueous/Drinking Water	EPA 200.9	GFAA	Selenium
Aqueous/Drinking Water	EPA 200.9	GFAA	Thallium
Aqueous/Drinking Water	EPA 200.9	GFAA	Arsenic
Aqueous/Drinking Water	EPA 200.9	GFAA	Lead
Aqueous/Solid	ASTM D 1426-93B	ISE	Nitrogen, Total Kjeldahl (TKN)
Aqueous/Solid	EPA 1630	CVAFS	Methyl Mercury
Aqueous/Solid	EPA 1020A	Closed Cup Flashpoint	Ignitability
Aqueous/Solid	EPA 314.0	IC	Perchlorate
Aqueous/Solid	EPA 350.1	Colorimetry	Ammonia
Aqueous/Solid	EPA 365.3	Colorimetry	Total Phosphorus
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Aluminum



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ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Antimony
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Arsenic
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Barium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Beryllium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Boron
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Cadmium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Calcium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Chromium, total
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Cobalt
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Copper
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Iron
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Lead
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Magnesium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Manganese
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Molybdenum
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Nickel
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Potassium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Selenium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Silver
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Sodium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Strontium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Thallium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Tin
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Titanium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Vanadium
Aqueous/Solid	EPA 6010B, C/200.7	ICP	Zinc
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Aluminum
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Antimony
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Arsenic
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Barium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Beryllium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Boron
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Cadmium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Chromium, total



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Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Cobalt
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Copper
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Iron
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Lead
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Manganese
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Molybdenum
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Nickel
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Selenium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Silver
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Strontium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Thallium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Tin
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Titanium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Vanadium
Aqueous/Solid	EPA 6020, A/200.8	ICP-MS	Zinc
Aqueous/Solid	EPA 7010	GFAA	Antimony
Aqueous/Solid	EPA 7010	GFAA	Arsenic
Aqueous/Solid	EPA 7010	GFAA	Chromium, total
Aqueous/Solid	EPA 7010	GFAA	Lead
Aqueous/Solid	EPA 7010	GFAA	Selenium
Aqueous/Solid	EPA 7010	GFAA	Thallium
Aqueous/Solid	EPA 7742	AA, Borohydride Reduction; GFAA	Selenium
Aqueous/Solid	EPA 8015C/AK103-RRO	GC-FID	Residual Range Organics (RRO)
Aqueous/Solid	EPA 8015C; AK101-GRO; NWTPH-Gx	GC-FID	Gasoline Range Organics (GRO)
Aqueous/Solid	EPA 8015C; AK102-DRO; NWTPH-Dx	GC-FID	Diesel Range Organics (DRO)
Aqueous/Solid	EPA 8021B	GC-FID	Benzene
Aqueous/Solid	EPA 8021B	GC-FID	Ethyl Benzene
Aqueous/Solid	EPA 8021B	GC-FID	Toluene
Aqueous/Solid	EPA 8021B	GC-FID	Xylene, total
Aqueous/Solid	EPA 8081A, B	GC-ECD	Aldrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Alpha-BHC



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Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDD (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDE (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	DDT (4,4)
Aqueous/Solid	EPA 8081A, B	GC-ECD	delta-BHC
Aqueous/Solid	EPA 8081A, B	GC-ECD	Dieldrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan I
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan II
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endosulfan sulfate
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin aldehyde
Aqueous/Solid	EPA 8081A, B	GC-ECD	Endrin ketone
Aqueous/Solid	EPA 8081A, B	GC-ECD	gamma-BHC
Aqueous/Solid	EPA 8081A, B	GC-ECD	gamma-Chlordane
Aqueous/Solid	EPA 8081A, B	GC-ECD	Heptachlor
Aqueous/Solid	EPA 8081A, B	GC-ECD	Heptachlor Epoxide (beta)
Aqueous/Solid	EPA 8081A, B	GC-ECD	Methoxychlor
Aqueous/Solid	EPA 8081A, B	GC-ECD	Toxaphene (total)
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDD
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDE
Aqueous/Solid	EPA 8081B	GC-ECD	2,4-DDT
Aqueous/Solid	EPA 8081B	GC-ECD	Chlorpyrifos
Aqueous/Solid	EPA 8081B	GC-ECD	cis-Nonachlor
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachlorobenzene
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachlorobutadiene
Aqueous/Solid	EPA 8081B	GC-ECD	Hexachloroethane
Aqueous/Solid	EPA 8081B	GC-ECD	Isodrin
Aqueous/Solid	EPA 8081B	GC-ECD	Mirex
Aqueous/Solid	EPA 8081B	GC-ECD	Oxychlordane
Aqueous/Solid	EPA 8081B	GC-ECD	trans-Nonachlor
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,3,4,4,5,5,6-Nonachlorobiphenyl (PCB 206)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,3,4,4,5,6-Octachlorobiphenyl (PCB 195)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,3,4,4,5-Heptachlorobiphenyl (PCB 170)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,3,4,4-Hexachlorobiphenyl (PCB 128)



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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,4,5,5-Heptachlorobiphenyl (PCB180)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,4,5,6-Heptachlorobiphenyl (PCB 183)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,4,5-Hexachlorobiphenyl (PCB 138)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,4,6,6-Heptachlorobiphenyl (PCB 184)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,5,5,6-Heptachlorobiphenyl (PCB 187)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,5-Pentachlorobiphenyl (PCB87)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,4,5-Pentachlorobiphenyl (PCB90)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,3,5-Tetrachlorobiphenyl (PCB44)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,4,4,5,5-Hexachlorobiphenyl (PCB153)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,4,5,5-Pentachlorobiphenyl (PCB 101)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,5,5-Tetrachlorobiphenyl (PCB 53)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,2,5-Trichlorobiphenyl (PCB18)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,3,4,4,5,5-Heptachlorobiphenyl (PCB 189)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,3,4,4,5-Hexachlorobiphenyl (PCB 156)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,3,4,4,5-Hexachlorobiphenyl (PCB 157)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,3,4,4,6-Hexachlorobiphenyl (PCB 158)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,3,4,4-Pentachlorobiphenyl (PCB 105)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4,5,5 Hexachlorobiphenyl (PCB 167)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4,5,6-Hexachlorobiphenyl (PCB 168)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4,5-Pentachlorobiphenyl (PCB 114)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4,5-Pentachlorobiphenyl (PCB 118)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4,5-Pentachlorobiphenyl (PCB 123)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4-Tetrachlorobiphenyl (PCB60)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,3,4,4-Tetrachlorobiphenyl (PCB66)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,4,4-Trichlorobiphenyl (PCB 28)
Aqueous/Solid	EPA 8082, A	GC-ECD	2,4-Dichlorobiphenyl (PCB8)
Aqueous/Solid	EPA 8082, A	GC-ECD	3,3,4,4,5,5-Hexachlorobiphenyl (PCB 169)
Aqueous/Solid	EPA 8082, A	GC-ECD	3,3,4,4,5-Pentachlorobiphenyl (PCB 126)
Aqueous/Solid	EPA 8082, A	GC-ECD	3,3,4,4-Tetrachlorobiphenyl (PCB 77)
Aqueous/Solid	EPA 8082, A	GC-ECD	3,4,4,5-Tetrachlorobiphenyl (PCB 81)
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1016
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1221
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1232



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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1242
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1248
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1254
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1260
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1262
Aqueous/Solid	EPA 8082, A	GC-ECD	Aroclor 1268
Aqueous/Solid	EPA 8082, A	GC-ECD	Decachlorobiphenyl (PC B209)
Aqueous/Solid	EPA 8151A	GC-ECD	2,4,5-T
Aqueous/Solid	EPA 8151A	GC-ECD	2,4,5-TP (Silvex)
Aqueous/Solid	EPA 8151A	GC-ECD	2,4-D
Aqueous/Solid	EPA 8151A	GC-ECD	2,4-DB
Aqueous/Solid	EPA 8151A	GC-ECD	Dalapon
Aqueous/Solid	EPA 8151A	GC-ECD	Dicamba
Aqueous/Solid	EPA 8151A	GC-ECD	Dichloroprop
Aqueous/Solid	EPA 8151A	GC-ECD	Dinoseb
Aqueous/Solid	EPA 8151A	GC-ECD	MCPA
Aqueous/Solid	EPA 8151A	GC-ECD	MCPP
Aqueous/Solid	EPA 8260B, C	GC-MS	1-phenylpropane
Aqueous/Solid	EPA 8260B, C	GC-MS	Benzene
Aqueous/Solid	EPA 8260B, C	GC-MS	DIPE
Aqueous/Solid	EPA 8260B, C	GC-MS	ETBE
Aqueous/Solid	EPA 8260B, C	GC-MS	Ethyl Benzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Freon 11
Aqueous/Solid	EPA 8260B, C	GC-MS	Freon 113
Aqueous/Solid	EPA 8260B, C	GC-MS	MTBE
Aqueous/Solid	EPA 8260B, C	GC-MS	TAME
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-Butyl alcohol
Aqueous/Solid	EPA 8260B, C	GC-MS	Toluene
Aqueous/Solid	EPA 8260B, C	GC-MS	Xylene, total
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,1,2-Tetrachloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,1-Trichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,2,2-Tetrachloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1,2-Trichloroethane



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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8260B, C	GC-MS	1,1-Dichloroethane
Aqueous/Solid	EPA 8260B,C	GC-MS	1,1-Dichloroethene
Aqueous/Solid	EPA 8260B,C	GC-MS	1,1-Dichloropropene
Aqueous/Solid	EPA 8260B,C	GC-MS	1,2,3-Trichlorobenzene
Aqueous/Solid	EPA 8260B,C	GC-MS	1,2,3-Trichloropropane
Aqueous/Solid	EPA 8260B,C	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solid	EPA 8260B,C	GC-MS	1,2,4-Trimethylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dibromoethane (EDB)
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,2-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3,5-Trimethylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	1,3-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	1,4-Dichlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	2,2-Dichloropropane
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Butanone (MEK)
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Chloroethylvinylether
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Chlorotoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	2-Hexanone
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Chlorotoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Isopropyltoluene
Aqueous/Solid	EPA 8260B, C	GC-MS	4-Methyl-2-pentanone (MIBK)
Aqueous/Solid	EPA 8260B, C	GC-MS	Acetone
Aqueous/Solid	EPA 8260B, C	GC-MS	Acetonitrile
Aqueous/Solid	EPA 8260B, C	GC-MS	Acrolein
Aqueous/Solid	EPA 8260B, C	GC-MS	Acrylonitrile
Aqueous/Solid	EPA 8260B, C	GC-MS	Benzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromochloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromodichloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromoform
Aqueous/Solid	EPA 8260B, C	GC-MS	Bromomethane



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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8260B, C	GC-MS	Carbon disulfide
Aqueous/Solid	EPA 8260B, C	GC-MS	Carbon Tetrachloride
Aqueous/Solid	EPA 8260B, C	GC-MS	Chlorobenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Chlorodibromomethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloroethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloroform
Aqueous/Solid	EPA 8260B, C	GC-MS	Chloromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	cis-1,2-Dichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	cis-1,3-Dichloropropene
Aqueous/Solid	EPA 8260B, C	GC-MS	Dibromomethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Dichlorodifluoromethane
Aqueous/Solid	EPA 8260B, C	GC-MS	Dichloromethane (Methylene Chloride)
Aqueous/Solid	EPA 8260B, C	GC-MS	Di-isopropylether (DIPE)
Aqueous/Solid	EPA 8260B, C	GC-MS	Ethylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Hexachlorobutadiene
Aqueous/Solid	EPA 8260B, C	GC-MS	Isopropylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Methyl-tert-butylether (MTBE)
Aqueous/Solid	EPA 8260B, C	GC-MS	Naphthalene
Aqueous/Solid	EPA 8260B, C	GC-MS	n-Butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	n-Propylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	sec-Butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Styrene
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-amylmethylether (TAME)
Aqueous/Solid	EPA 8260B, C	GC-MS	tert-butylbenzene
Aqueous/Solid	EPA 8260B, C	GC-MS	Tetrachloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	Toluene
Aqueous/Solid	EPA 8260B, C	GC-MS	trans-1,2-Dichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	trans-1,3-Dichloropropene
Aqueous/Solid	EPA 8260B, C	GC-MS	Trichloroethene
Aqueous/Solid	EPA 8260B, C	GC-MS	Trichlorofluoromethane (Freon 11)
Aqueous/Solid	EPA 8260B, C	GC-MS	Vinyl acetate
Aqueous/Solid	EPA 8260B, C	GC-MS	Vinyl chloride
Aqueous/solid	EPA 8260B, C	GC-MS	Xylenes, total



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Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8270C, D	GC-MS	1,2,4-Trichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,2-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,3-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	1,4-Dichlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4,5-Trichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4,6-Trichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dimethylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dinitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,4-Dinitrotoluene
Aqueous/Solid	EPA 8270C, D	GC-MS	2,6-Dichlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2,6-Dinitrotoluene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Chloronaphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Chlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methyl-4,6-Dinitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methylnaphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Methylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	2-Nitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	3,3-Dichlorobenzidine
Aqueous/Solid	EPA 8270C, D	GC-MS	3-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Bromophenyl-phenylether
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chloro-3-methylphenol
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chloroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Chlorophenyl-phenylether
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Methylphenol (and/or 3-Methylphenol)
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Nitroaniline
Aqueous/Solid	EPA 8270C, D	GC-MS	4-Nitrophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Acenaphthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Acenaphthylene
Aqueous/Solid	EPA 8270C, D	GC-MS	Aniline
Aqueous/Solid	EPA 8270C, D	GC-MS	Anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Azinphos-methyl (Guthion)



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Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzidine
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(a)anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(a)pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(b)fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzo(k)fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzoic acid
Aqueous/Solid	EPA 8270C, D	GC-MS	Benzyl alcohol
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroethoxy)methane
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroethyl)ether
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-Chloroisopropyl)ether
Aqueous/Solid	EPA 8270C, D	GC-MS	bis(2-ethylhexy)phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Butyl benzyl phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Carbazole
Aqueous/Solid	EPA 8270C, D	GC-MS	Chlorpyrifos
Aqueous/Solid	EPA 8270C, D	GC-MS	Chrysene
Aqueous/Solid	EPA 8270C, D	GC-MS	Demeton O & S
Aqueous/Solid	EPA 8270C, D	GC-MS	Diazinon
Aqueous/Solid	EPA 8270C, D	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solid	EPA 8270C, D	GC-MS	Dibenzofuran
Aqueous/Solid	EPA 8270C, D	GC-MS	Dichlorvos
Aqueous/Solid	EPA 8270C, D	GC-MS	Diethyl phthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	dimethoate
Aqueous/Solid	EPA 8270C, D	GC-MS	Dimethylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	di-n-butylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Di-n-octylphthalate
Aqueous/Solid	EPA 8270C, D	GC-MS	Disulfoton
Aqueous/Solid	EPA 8270C, D	GC-MS	Ethoprop
Aqueous/Solid	EPA 8270C, D	GC-MS	Fluoranthene
Aqueous/Solid	EPA 8270C, D	GC-MS	Fluorene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorobutadiene
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachlorocyclopentadiene



Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8270C, D	GC-MS	Hexachloroethane
Aqueous/Solid	EPA 8270C, D	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Isophorone
Aqueous/Solid	EPA 8270C, D	GC-MS	Naphthalene
Aqueous/Solid	EPA 8270C, D	GC-MS	Nitrobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitrosodiethylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitrosodimethylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitroso-di-n-propylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	N-Nitrosodiphenylamine
Aqueous/Solid	EPA 8270C, D	GC-MS	o-Toluidine
Aqueous/Solid	EPA 8270C, D	GC-MS	Parathion, ethyl
Aqueous/Solid	EPA 8270C, D	GC-MS	Parathion, methyl
Aqueous/Solid	EPA 8270C, D	GC-MS	Pentachlorobenzene
Aqueous/Solid	EPA 8270C, D	GC-MS	Pentachlorophenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Phenanthrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Phenol
Aqueous/Solid	EPA 8270C, D	GC-MS	Phorate
Aqueous/Solid	EPA 8270C, D	GC-MS	Pyrene
Aqueous/Solid	EPA 8270C, D	GC-MS	Pyridine
Aqueous/Solid	EPA 8270C, D	GC-MS	Ronnel
Aqueous/Solid	EPA 8270C, D	GC-MS	Stirophos
Aqueous/Solid	EPA 8270C, D	GC-MS	Sulfotepp
Aqueous/Solid	EPA 8270C, D	GC-MS	2,3,4,6-Tetrachlorophenol
Aqueous/Solid	EPA 8270C,D	GC-MS	1,2,4,5-Tetrachlorobenzene
Aqueous/Solid	EPA 8270SIM	GC-MS	2-Methylnaphthalene
Aqueous/Solid	EPA 8270SIM	GC-MS	Acenaphthene
Aqueous/Solid	EPA 8270SIM	GC-MS	Acenaphthylene
Aqueous/Solid	EPA 8270SIM	GC-MS	Anthracene
Aqueous/Solid	EPA 8270SIM	GC-MS	Benzo(a)anthracene
Aqueous/Solid	EPA 8270SIM	GC-MS	Benzo(a)pyrene
Aqueous/Solid	EPA 8270SIM	GC-MS	Benzo(b)fluoranthene
Aqueous/Solid	EPA 8270SIM	GC-MS	Benzo(g,h,i)perylene
Aqueous/Solid	EPA 8270SIM	GC-MS	Benzo(k)fluoranthene



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ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 8270SIM	GC-MS	Chrysene
Aqueous/Solid	EPA 8270SIM	GC-MS	Dibenzo(a,h)anthracene
Aqueous/Solid	EPA 8270SIM	GC-MS	Fluoranthene
Aqueous/Solid	EPA 8270SIM	GC-MS	Fluorene
Aqueous/Solid	EPA 8270SIM	GC-MS	Indeno(1,2,3, cd)pyrene
Aqueous/Solid	EPA 8270SIM	GC-MS	Naphthalene
Aqueous/Solid	EPA 8270SIM	GC-MS	p-Dioxane
Aqueous/Solid	EPA 8270SIM	GC-MS	Phenanthrene
Aqueous/Solid	EPA 8270SIM	GC-MS	Pyrene
Aqueous/Solid	EPA 8330B	HPLC	1,3,5-Trinitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	1,3-Dinitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	2,4,6-Trinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2,4-Dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2,6-Dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2-Amino-4,6-dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	2-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	3,5-Dinitroaniline
Aqueous/Solid	EPA 8330B	HPLC	3-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	4-Amino-2,6-dinitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	4-Nitrotoluene
Aqueous/Solid	EPA 8330B	HPLC	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Aqueous/Solid	EPA 8330B	HPLC	Nitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	Nitroglycerin
Aqueous/Solid	EPA 8330B	HPLC	Pentachloronitrobenzene
Aqueous/Solid	EPA 8330B	HPLC	Pentaerythritoltetranitrate
Aqueous/Solid	EPA 8330B	HPLC	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Aqueous/Solid	EPA 8330B	HPLC	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Aqueous/Solid	EPA 9012B,	Colorimetry	Total Cyanide
Aqueous/Solid	EPA 9030B	Distillation Unit	Sulfide
Aqueous/Solid	EPA 9056A	IC	Bromide
Aqueous/Solid	EPA 9056A	IC	Chloride
Aqueous/Solid	EPA 9056A	IC	Fluoride



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Matrix	Standard / Method	Technology	Analyte
Aqueous/Solid	EPA 9056A	IC	Sulfate
Aqueous/Solid	EPA 9065	Spectrophotometer	Total Phenolics
Aqueous/Solid	LCP-NITG	HPLC/UV	Nitroguanidine
Aqueous/Solid	SM4500 NH3 G	Colorimetry	Ammonia
Aqueous/Solid	SOC-OTTO	GC-ECD	Otto Fuel
Aqueous/Solid	SOC-Butyl	GC-FPD	Di-n-butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	n-Butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	Tetra-n-butyltin
Aqueous/Solid	SOC-Butyl	GC-FPD	Tri-n-butyltin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Aldrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Alpha-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	beta-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDD (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDE (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	DDT (4,4)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	delta-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Dieldrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan I
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan II
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endosulfan sulfate
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin aldehyde
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Endrin ketone
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	gamma-BHC
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Heptachlor
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Heptachlor Epoxide (beta)
Aqueous/Solid	SOC-PESTMS2	GC/MS/MS/MS	Methoxychlor
Drinking Water	EPA 504.1	GC-ECD	1,2-Dibromo-3-chloropropane (DBCP)
Drinking Water	EPA 504.1	GC-ECD	1,2-Dibromoethane (EDB)
Drinking Water	EPA 524.2	GC-MS	1,1,1,2-Tetrachloroethane
Drinking Water	EPA 524.2	GC-MS	1,1,1-Trichloroethane
Drinking Water	EPA 524.2	GC-MS	1,1,2,2-Tetrachloroethane
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloroethane
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloroethene



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ALS Environmental-Kelso

1317 South 13th Avenue, Kelso, WA 98626
Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Drinking Water	EPA 524.2	GC-MS	1,1-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	1,2,3-Trichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2,3-Trichloropropane
Drinking Water	EPA 524.2	GC-MS	1,2,4-Trichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2,4-Trimethylbenzene
Drinking Water	EPA 524.2	GC-MS	1,2-Dibromoethane (EDB)
Drinking Water	EPA 524.2	GC-MS	1,2-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,2-Dichloroethane
Drinking Water	EPA 524.2	GC-MS	1,2-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	1,3,5-Trimethylbenzene
Drinking Water	EPA 524.2	GC-MS	1,3-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	1,3-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	1,4-Dichlorobenzene
Drinking Water	EPA 524.2	GC-MS	2,2-Dichloropropane
Drinking Water	EPA 524.2	GC-MS	2-Chlorotoluene
Drinking Water	EPA 524.2	GC-MS	4-Chlorotoluene
Drinking Water	EPA 524.2	GC-MS	4-Isopropyltoluene
Drinking Water	EPA 524.2	GC-MS	Benzene
Drinking Water	EPA 524.2	GC-MS	Bromobenzene
Drinking Water	EPA 524.2	GC-MS	Bromochloromethane
Drinking Water	EPA 524.2	GC-MS	Bromodichloromethane
Drinking Water	EPA 524.2	GC-MS	Bromoform
Drinking Water	EPA 524.2	GC-MS	Bromomethane
Drinking Water	EPA 524.2	GC-MS	Carbon Tetrachloride
Drinking Water	EPA 524.2	GC-MS	Chlorobenzene
Drinking Water	EPA 524.2	GC-MS	Chlorodibromomethane
Drinking Water	EPA 524.2	GC-MS	Chloroethane
Drinking Water	EPA 524.2	GC-MS	Chloroform
Drinking Water	EPA 524.2	GC-MS	Chloromethane
Drinking Water	EPA 524.2	GC-MS	cis-1,2-Dichloroethene
Drinking Water	EPA 524.2	GC-MS	cis-1,3-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	Dibromomethane
Drinking Water	EPA 524.2	GC-MS	Dichlorodifluoromethane
Drinking Water	EPA 524.2	GC-MS	Dichloromethane (Methylene Chloride)



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1317 South 13th Avenue, Kelso, WA 98626
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Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Drinking Water	EPA 524.2	GC-MS	Ethylbenzene
Drinking Water	EPA 524.2	GC-MS	Hexachlorobutadiene
Drinking Water	EPA 524.2	GC-MS	Isopropylbenzene
Drinking Water	EPA 524.2	GC-MS	m+p-Xylene
Drinking Water	EPA 524.2	GC-MS	Naphthalene
Drinking Water	EPA 524.2	GC-MS	n-Butylbenzene
Drinking Water	EPA 524.2	GC-MS	n-Propylbenzene
Drinking Water	EPA 524.2	GC-MS	o-Xylene
Drinking Water	EPA 524.2	GC-MS	sec-Butylbenzene
Drinking Water	EPA 524.2	GC-MS	Styrene
Drinking Water	EPA 524.2	GC-MS	tert-butylbenzene
Drinking Water	EPA 524.2	GC-MS	Tetrachloroethene
Drinking Water	EPA 524.2	GC-MS	Toluene
Drinking Water	EPA 524.2	GC-MS	trans-1,2-Dichloroethene
Drinking Water	EPA 524.2	GC-MS	trans-1,3-Dichloropropene
Drinking Water	EPA 524.2	GC-MS	Trichloroethene
Drinking Water	EPA 524.2	GC-MS	Trichlorofluoromethane (Freon 11)
Drinking Water	EPA 524.2	GC-MS	Vinyl chloride
Drinking Water	EPA 524.2	GC-MS	Xylenes, total
Solid	ASTMD4129-92M, Lloyd Kahn	TOC Meter	Total Organic Carbons (TOC)
Solid	EPA 160.3M	Gravimetry	Solids, Total
Solid	EPA 7471A, B	CVAA	Mercury
Solid	EPA 9045D	pH Meter	pH
Solid	EPA 9056A	IC	Nitrate as N
Solid	EPA 9056A	IC	Nitrite as N
Solid	EPA 9071B	Gravimetry	Hexane Extractable Material (HEM)
Solid	GEN-AVS	Colorimetry	Acid Volatile Sulfides
Solid	GEN-NCEL	Colorimetry	Nitrocellulose
Solid	LCP-LCMS4	HPLC/MS/MS	1,3,5-Trinitrobenzene
Solid	LCP-LCMS4	HPLC/MS/MS	1,3-Dinitrobenzene
Solid	LCP-LCMS4	HPLC/MS/MS	2,4,6-Trinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2,4-Dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2,6-Dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	2-Amino-4,6-dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	3,5-Dinitroaniline



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 1317 South 13th Avenue, Kelso, WA 98626
 Lee Wolf Phone: 360-577-7222

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard / Method	Technology	Analyte
Solid	LCP-LCMS4	HPLC/MS/MS	4-Amino-2,6-dinitrotoluene
Solid	LCP-LCMS4	HPLC/MS/MS	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
Solid	LCP-LCMS4	HPLC/MS/MS	Pentaerythritoltetranitrate
Solid	LCP-LCMS4	HPLC/MS/MS	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Solid	LCP-LCMS4	HPLC/MS/MS	Tetryl (methyl-2,4,6-trinitrophenylnitramine)
Solid	LCP-Nitro	HPLC/MS/MS	2,4-Dinitrophenol
Solid	LCP-Nitro	HPLC/MS/MS	Picramic Acid
Solid	LCP-Nitro	HPLC/MS/MS	Picric Acid
Solid	PSEP	Gravimetry	Particle Size

Matrix	Standard / Method	Technology	Analyte
Aqueous	EPA 1640	Reductive Metals Precipitation	Prep Method
Aqueous	EPA 3010A	Acid Digestion	Metals Digestion
Aqueous	EPA 3020A	Acid Digestion	Metals Digestion
Aqueous	EPA 3520C	Continuous Liquid-Liquid Extraction	Extractable Prep
Aqueous	EPA 3535A	Solid Phase Extraction	Prep Method
Aqueous	EPA 5030B	Purge and Trap for Volatiles	Volatile Prep
Aqueous	SOP-MET-DIG	Acid Digestion	Metals Digestion
Aqueous/Solids	EPA 1311	TCLP Extraction	Physical Extraction
Aqueous/Solids	EPA 3620C	Florisil clean up	Extractable Cleanup
Aqueous/Solids	EPA 3630C	Silica gel clean up	Extractable Prep
Aqueous/Solids	EPA 3640A	Gel-Permeation Clean-up	Extractable Cleanup
Aqueous/Solids	EPA 3660	Sulfur Clean-up	Extractable Prep
Aqueous/Solids	EPA 3665A	Acid clean up	Extractable Cleanup
Aqueous/Solids	ASTM D3590-89	Digestion	TKN
Solid	EPA 3050B	Acid Digestion	Metals Digestion
Solid	EPA 3060	Alkaline Digestion for Cr(VI)	Alkaline Digestion for Cr(VI) only
Solid	EPA 3541	Automated Soxhlet Extraction	Extractable Prep
Solid	EPA 3550B	Ultrasonic Extraction	Extractable Prep
Solid	EPA 5035A	Purge and Trap for Volatiles	Voc Organics
Solid	EPA 5050	Bomb Digestion	Prep Method
Solids	EPA 9013	Midi-Distillation	Cyanides



PERRY JOHNSON LABORATORY ACCREDITATION, INC.

Certificate of Accreditation

Perry Johnson Laboratory Accreditation, Inc. has assessed the Laboratory of:

APPL, Inc.

908 N. Temperance Avenue, Clovis, CA 93611

(Hereinafter called the Organization) and hereby declares that Organization has met the requirements of ISO/IEC 17025:2005 “General Requirements for the competence of Testing and Calibration Laboratories” and the DoD Quality Systems Manual for Environmental Laboratories Version 4.2 10/26/2010 and is accredited in accordance with the:

United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP)

***This accreditation demonstrates technical competence for the defined scope:
Environmental Testing
(As detailed in the supplement)***

Accreditation claims for such testing and/or calibration services shall only be made from addresses referenced within this certificate. This Accreditation is granted subject to the system rules governing the Accreditation referred to above, and the Organization hereby covenants with the Accreditation body’s duty to observe and comply with the said rules.

For PJLA:

Tracy Szerszen
President/Operations Manager

Initial Accreditation Date:

May 13, 2013

Issue Date:

November 28, 2013

Expiration Date:

November 27, 2015

Accreditation No.:

74807

Certificate No.:

L13-238

Perry Johnson Laboratory
Accreditation, Inc. (PJLA)
755 W. Big Beaver, Suite 1325
Troy, Michigan 48084

The validity of this certificate is maintained through ongoing assessments based on a continuous accreditation cycle. The validity of this certificate should be confirmed through the PJLA website: www.pjilabs.com



Certificate of Accreditation: Supplement
ISO/IEC 17025:2005 and DoD-ELAP

APPL, Inc.

908 N. Temperance Avenue, Clovis, CA 93611
Diane Anderson Phone: 559-275-2175

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous	EPA 218.6	Ion Chromatography (IC)	Chromium VI
Aqueous	EPA 245.1	AAS	Mercury
Aqueous	EPA 7470A	AAS	Mercury
Aqueous	EPA 8011	GC/ECD	1,2,3-Trichloropropane
Aqueous	EPA 8011	GC/ECD	1,2-Dibromo-3-chloropropane (DBCP)
Aqueous	EPA 8011	GC/ECD	1,2-Dibromomethane (EDB, Ethylene dibromide)
Aqueous	EPA 9060A	Nondispersive Infrared Detector (NDIR)	Dissolved Organic Carbon
Aqueous	EPA 9060A	Nondispersive Infrared Detector (NDIR)	Total Organic Carbon
Aqueous	RSK-175	GC/FIC	Ethane
Aqueous	RSK-175	GC/FIC	Ethene
Aqueous	RSK-175	GC/FIC	Methane
Aqueous	SM 2320B	Titrimetric	Bicarbonate
Aqueous	SM 2320B	Titrimetric	Carbonate
Aqueous	SM 2320B	Titrimetric	Hydroxide
Aqueous	SM 2320B	Titrimetric	Total Alkalinity (CaCO ₃)
Aqueous	SM 2510B	EC Meter	Specific conductance, Conductivity (25C)
Aqueous	SM 2540C	Gravimetric	Total Dissolved Solids (TDS)
Aqueous	SM 2540D	Gravimetric	Non-Filterable Residue (TSS)
Aqueous	SM 4500S2F	Titrimetric	Sulfide
Aqueous	SM 5310B	Nondispersive Infrared Detector (NDIR)	Dissolved Organic Carbon
Aqueous	SM 5310B	Nondispersive Infrared Detector (NDIR)	Total Organic Carbon
Aqueous	SM 5520B	Gravimetric	Oil & Grease
Aqueous	SM 5520BF	Gravimetric	TRPH (Gravimetric)
Aqueous	SM 5540C	UV/Vis	MBAS
Aqueous	EPA 160.1	Gravimetric	Total Dissolved Solids (TDS)
Aqueous	EPA 1664A	Gravimetric	n-Hexane Extractable Material (O&G)
Aqueous	EPA 1664A	Gravimetric	TPH (SGT-HEM)
Solids	AK103	GC/FID	Residual Range Organics, C25-C36
Solids	EPA 1030	Manual	Ignitability



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Matrix	Standard/Method	Technology	Analyte
Solids	EPA 7471A/B	AAS	Mercury
Solids	EPA 8015B/C/D	GC/FID	RRO (Residual Range Organics)
Solids	EPA 9045C/D	Ion Selective Electrode	pH/Corrosivity
Solids	WALKLEY-BLACK	Titration	Total Organic Carbon (TOC)
Aqueous/Solids	AK101	GC-FID	Gasoline Range Organics, C6-C10
Aqueous/Solids	AK102	GC-FID	Diesel Range Organics, C10-C25
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,2',5,5'-Tetrachlorobiphenyl (PCB 52)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,3,4,4',5-Pentachlorobiphenyl (PCB 114)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,3',4,4',5-Pentachlorobiphenyl (PCB 118)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,3',4,4',5'-Pentachlorobiphenyl (PCB 123)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	2,4,4'-Trichlorobiphenyl (PCB 28)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	3,3',4,4',5-Pentachlorobiphenyl (PCB 126)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	3,3',4,4'-Tetrachlorobiphenyl (PCB 77)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	3,4,4',5-Tetrachlorobiphenyl (PCB 81)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	PCB (129)+(138)+(163)



Certificate of Accreditation: Supplement

ISO/IEC 17025:2005 and DoD-ELAP

APPL, Inc.

908 N. Temperance Avenue, Clovis, CA 93611
Diane Anderson Phone: 559-275-2175

Accreditation is granted to the facility to perform the following testing:

Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 1668A	High Res. GC/MS	PCB (153)+(168)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	PCB (156)+(157)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	PCB (180)+(193)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	PCB (20)+(28)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	PCB (90)+(101)+(113)
Aqueous/Solids	EPA 1668A	High Res. GC/MS	PCBs, total
Aqueous/Solids	EPA 300.0	Ion Chromatography (IC)	Orthophosphate as P
Aqueous/Solids	EPA 300.0	Ion Chromatography (IC)	Bromide
Aqueous/Solids	EPA 300.0	Ion Chromatography (IC)	Chloride
Aqueous/Solids	EPA 300.0	Ion Chromatography (IC)	Fluoride
Aqueous/Solids	EPA 300.0	Ion Chromatography (IC)	Nitrate as N (NO ₃ ⁻ as N)
Aqueous/Solids	EPA 300.0	Ion Chromatography (IC)	Nitrite + Nitrate as N
Aqueous/Solids	EPA 300.0	Ion Chromatography (IC)	Nitrite as N
Aqueous/Solids	EPA 300.0	Ion Chromatography (IC)	Sulfate (SO ₄)
Aqueous/Solids	EPA 350.1	Flow Injection Analysis (FIA)	Ammonia as N
Aqueous/Solids	EPA 351.2	Flow Injection Analysis (FIA)	Total Kheldahl Nitrogen
Aqueous/Solids	EPA 353.2	Flow Injection Analysis (FIA)	Nitrate as N (NO ₃ as N)
Aqueous/Solids	EPA 353.2	Flow Injection Analysis (FIA)	Nitrate + Nitrate as N
Aqueous/Solids	EPA 353.2	Flow Injection Analysis (FIA)	Nitrite as N
Aqueous/Solids	EPA 6010B/C	ICP-OES	Aluminum
Aqueous/Solids	EPA 6010B/C	ICP-OES	Antimony
Aqueous/Solids	EPA 6010B/C	ICP-OES	Antimony
Aqueous/Solids	EPA 6010B/C	ICP-OES	Arsenic
Aqueous/Solids	EPA 6010B/C	ICP-OES	Arsenic
Aqueous/Solids	EPA 6010B/C	ICP-OES	Barium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Beryllium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Boron
Aqueous/Solids	EPA 6010B/C	ICP-OES	Cadmium



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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 6010B/C	ICP-OES	Calcium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Chromium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Cobalt
Aqueous/Solids	EPA 6010B/C	ICP-OES	Copper
Aqueous/Solids	EPA 6010B/C	ICP-OES	Iron
Aqueous/Solids	EPA 6010B/C	ICP-OES	Lead
Aqueous/Solids	EPA 6010B/C	ICP-OES	Magnesium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Manganese
Aqueous/Solids	EPA 6010B/C	ICP-OES	Molybdenum
Aqueous/Solids	EPA 6010B/C	ICP-OES	Nickel
Aqueous/Solids	EPA 6010B/C	ICP-OES	Potassium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Selenium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Silver
Aqueous/Solids	EPA 6010B/C	ICP-OES	Sodium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Strontium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Thallium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Tin
Aqueous/Solids	EPA 6010B/C	ICP-OES	Titanium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Total Phosphorus
Aqueous/Solids	EPA 6010B/C	ICP-OES	Vanadium
Aqueous/Solids	EPA 6010B/C	ICP-OES	Zinc
Aqueous/Solids	EPA 6020A	ICP-MS	Aluminum
Aqueous/Solids	EPA 6020A	ICP-MS	Antimony
Aqueous/Solids	EPA 6020A	ICP-MS	Arsenic
Aqueous/Solids	EPA 6020A	ICP-MS	Barium
Aqueous/Solids	EPA 6020A	ICP-MS	Beryllium
Aqueous/Solids	EPA 6020A	ICP-MS	Boron
Aqueous/Solids	EPA 6020A	ICP-MS	Cadmium
Aqueous/Solids	EPA 6020A	ICP-MS	Calcium
Aqueous/Solids	EPA 6020A	ICP-MS	Chromium
Aqueous/Solids	EPA 6020A	ICP-MS	Cobalt
Aqueous/Solids	EPA 6020A	ICP-MS	Copper
Aqueous/Solids	EPA 6020A	ICP-MS	Iron
Aqueous/Solids	EPA 6020A	ICP-MS	Lead
Aqueous/Solids	EPA 6020A	ICP-MS	Magnesium



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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 6020A	ICP-MS	Manganese
Aqueous/Solids	EPA 6020A	ICP-MS	Molybdenum
Aqueous/Solids	EPA 6020A	ICP-MS	Nickel
Aqueous/Solids	EPA 6020A	ICP-MS	Potassium
Aqueous/Solids	EPA 6020A	ICP-MS	Selenium
Aqueous/Solids	EPA 6020A	ICP-MS	Silver
Aqueous/Solids	EPA 6020A	ICP-MS	Sodium
Aqueous/Solids	EPA 6020A	ICP-MS	Strontium
Aqueous/Solids	EPA 6020A	ICP-MS	Thallium
Aqueous/Solids	EPA 6020A	ICP-MS	Tin
Aqueous/Solids	EPA 6020A	ICP-MS	Titanium
Aqueous/Solids	EPA 6020A	ICP-MS	Vanadium
Aqueous/Solids	EPA 6020A	ICP-MS	Zinc
Aqueous/Solids	EPA 6850	HPLC/Electrospray Ionization/MS	Perchlorate
Aqueous/Solids	EPA 7196A	UV/Vis	Chromium VI
Aqueous/Solids	EPA 7199	Ion Chromatography (IC)	Chromium VI
Aqueous/Solids	EPA 8015B/C/D	GC/FID	Total Purgeable Hydrocarbons
Aqueous/Solids	EPA 8015B/C/D	GC/FID	Diesel Range Organics
Aqueous/Solids	EPA 8015B/C/D	GC/FID	Gasoline Range Organics
Aqueous/Solids	EPA 8081A/B	GC/ECD	4,4'-DDD
Aqueous/Solids	EPA 8081A/B	GC/ECD	4,4'-DDE
Aqueous/Solids	EPA 8081A/B	GC/ECD	4,4'-DDT
Aqueous/Solids	EPA 8081A/B	GC/ECD	4,4'-Methoxychlor
Aqueous/Solids	EPA 8081A/B	GC/ECD	a-BHC
Aqueous/Solids	EPA 8081A/B	GC/ECD	a-Chlordane
Aqueous/Solids	EPA 8081A/B	GC/ECD	Aldrin
Aqueous/Solids	EPA 8081A/B	GC/ECD	b-BHC
Aqueous/Solids	EPA 8081A/B	GC/ECD	Chlordane
Aqueous/Solids	EPA 8081A/B	GC/ECD	d-BHC
Aqueous/Solids	EPA 8081A/B	GC/ECD	Dieldrin
Aqueous/Solids	EPA 8081A/B	GC/ECD	Endosulfan I
Aqueous/Solids	EPA 8081A/B	GC/ECD	Endosulfan II
Aqueous/Solids	EPA 8081A/B	GC/ECD	Endosulfan sulfate
Aqueous/Solids	EPA 8081A/B	GC/ECD	Endrin



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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8081A/B	GC/ECD	Endrin aldehyde
Aqueous/Solids	EPA 8081A/B	GC/ECD	Endrin ketone
Aqueous/Solids	EPA 8081A/B	GC/ECD	g-BHC (Lindane)
Aqueous/Solids	EPA 8081A/B	GC/ECD	g-Chlordane
Aqueous/Solids	EPA 8081A/B	GC/ECD	Heptachlor
Aqueous/Solids	EPA 8081A/B	GC/ECD	Heptachlor epoxide
Aqueous/Solids	EPA 8081A/B	GC/ECD	Hexachlorobenzene
Aqueous/Solids	EPA 8081A/B	GC/ECD	Methoxychlor
Aqueous/Solids	EPA 8081A/B	GC/ECD	Toxaphene
Aqueous/Solids	EPA 8082A	GC/ECD	2,2',3,4,4',5,5'-Heptachlorobiphenyl (PCB 180)
Aqueous/Solids	EPA 8082A	GC/ECD	2,2',3,4,4',5'-Hexachlorobiphenyl (PCB 138)
Aqueous/Solids	EPA 8082A	GC/ECD	2,2',4,4',5,5'-Hexachlorobiphenyl (PCB 153)
Aqueous/Solids	EPA 8082A	GC/ECD	2,2',4,5,5'-Pentachlorobiphenyl (PCB 101)
Aqueous/Solids	EPA 8082A	GC/ECD	2,2',5,5'-Tetrachlorobiphenyl (PCB 52)
Aqueous/Solids	EPA 8082A	GC/ECD	2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)
Aqueous/Solids	EPA 8082A	GC/ECD	2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)
Aqueous/Solids	EPA 8082A	GC/ECD	2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)
Aqueous/Solids	EPA 8082A	GC/ECD	2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)
Aqueous/Solids	EPA 8082A	GC/ECD	2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)
Aqueous/Solids	EPA 8082A	GC/ECD	2,3,4,4',5-Pentachlorobiphenyl (PCB 114)
Aqueous/Solids	EPA 8082A	GC/ECD	2,3',4,4',5-Pentachlorobiphenyl (PCB 118)
Aqueous/Solids	EPA 8082A	GC/ECD	2,3',4,4',5'-Pentachlorobiphenyl (PCB 123)
Aqueous/Solids	EPA 8082A	GC/ECD	2,4,4'-Trichlorobiphenyl (PCB 28)
Aqueous/Solids	EPA 8082A	GC/ECD	3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)
Aqueous/Solids	EPA 8082A	GC/ECD	3,3',4,4',5-Pentachlorobiphenyl (PCB 126)
Aqueous/Solids	EPA 8082A	GC/ECD	3,3',4,4'-Tetrachlorobiphenyl (PCB 77)



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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8082A	GC/ECD	3,4,4',5-Tetrachlorobiphenyl (PCB 81)
Aqueous/Solids	EPA 8082A	GC/ECD	Aroclor 1016/1242
Aqueous/Solids	EPA 8082A	GC/ECD	Aroclor-1016 (PCB-1016)
Aqueous/Solids	EPA 8082A	GC/ECD	Aroclor-1221 (PCB-1221)
Aqueous/Solids	EPA 8082A	GC/ECD	Aroclor-1232 (PCB-1232)
Aqueous/Solids	EPA 8082A	GC/ECD	Aroclor-1242 (PCB-1242)
Aqueous/Solids	EPA 8082A	GC/ECD	Aroclor-1248 (PCB-1248)
Aqueous/Solids	EPA 8082A	GC/ECD	Aroclor-1254 (PCB-1254)
Aqueous/Solids	EPA 8082A	GC/ECD	Aroclor-1260 (PCB-1260)
Aqueous/Solids	EPA 8082A	GC/ECD	Aroclor-1262 (PCB-1262)
Aqueous/Solids	EPA 8082A	GC/ECD	Aroclor-1268 (PCB-1268)
Aqueous/Solids	EPA 8082A	GC/ECD	PCB (129)+(138)+(163)
Aqueous/Solids	EPA 8082A	GC/ECD	PCB (153)+(168)
Aqueous/Solids	EPA 8082A	GC/ECD	PCB (156)+(157)
Aqueous/Solids	EPA 8082A	GC/ECD	PCB (180)+(193)
Aqueous/Solids	EPA 8082A	GC/ECD	PCB (20)+(28)
Aqueous/Solids	EPA 8082A	GC/ECD	PCB (90)+(101)+(113)
Aqueous/Solids	EPA 8082A	GC/ECD	PCBs, total
Aqueous/Solids	EPA 8141A/B	GC/ECD	Ametryn
Aqueous/Solids	EPA 8141A/B	GC/ECD	Atraton
Aqueous/Solids	EPA 8141A/B	GC/ECD	Atrazine
Aqueous/Solids	EPA 8141A/B	GC/ECD	Azinphosmethyl
Aqueous/Solids	EPA 8141A/B	GC/ECD	Bolstar
Aqueous/Solids	EPA 8141A/B	GC/ECD	Chlorpyrifos
Aqueous/Solids	EPA 8141A/B	GC/ECD	Coumaphos
Aqueous/Solids	EPA 8141A/B	GC/ECD	Cyanizine
Aqueous/Solids	EPA 8141A/B	GC/ECD	DEF
Aqueous/Solids	EPA 8141A/B	GC/ECD	Demeton, (Mix of Isomers O:S)
Aqueous/Solids	EPA 8141A/B	GC/ECD	Diazinon
Aqueous/Solids	EPA 8141A/B	GC/ECD	Dichlorvos
Aqueous/Solids	EPA 8141A/B	GC/ECD	Dimethoate
Aqueous/Solids	EPA 8141A/B	GC/ECD	Disulfoton
Aqueous/Solids	EPA 8141A/B	GC/ECD	EPN
Aqueous/Solids	EPA 8141A/B	GC/ECD	Ethion
Aqueous/Solids	EPA 8141A/B	GC/ECD	Ethoprop



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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8141A/B	GC/ECD	Fenchlorphos (Ronnel)
Aqueous/Solids	EPA 8141A/B	GC/ECD	Fensulfothion
Aqueous/Solids	EPA 8141A/B	GC/ECD	Fenthion
Aqueous/Solids	EPA 8141A/B	GC/ECD	Malathion
Aqueous/Solids	EPA 8141A/B	GC/ECD	Merphos
Aqueous/Solids	EPA 8141A/B	GC/ECD	Mevinphos
Aqueous/Solids	EPA 8141A/B	GC/ECD	Naled
Aqueous/Solids	EPA 8141A/B	GC/ECD	Parathion ethyl
Aqueous/Solids	EPA 8141A/B	GC/ECD	Parathion methyl
Aqueous/Solids	EPA 8141A/B	GC/ECD	Phorate
Aqueous/Solids	EPA 8141A/B	GC/ECD	Prometon
Aqueous/Solids	EPA 8141A/B	GC/ECD	Prometryn
Aqueous/Solids	EPA 8141A/B	GC/ECD	Propazine
Aqueous/Solids	EPA 8141A/B	GC/ECD	Prowl
Aqueous/Solids	EPA 8141A/B	GC/ECD	Simazine
Aqueous/Solids	EPA 8141A/B	GC/ECD	Simetryn
Aqueous/Solids	EPA 8141A/B	GC/ECD	Sulfotep
Aqueous/Solids	EPA 8141A/B	GC/ECD	Terbutryn
Aqueous/Solids	EPA 8141A/B	GC/ECD	Terbutylazine
Aqueous/Solids	EPA 8141A/B	GC/ECD	Tetrachlorvinphos (Stirophos)
Aqueous/Solids	EPA 8141A/B	GC/ECD	Tokuthion
Aqueous/Solids	EPA 8141A/B	GC/ECD	Trichlorinate
Aqueous/Solids	EPA 8141A/B	GC/ECD	Trifluralin
Aqueous/Solids	EPA 8151A	GC/ECD	2,4,5-T
Aqueous/Solids	EPA 8151A	GC/ECD	2,4-D (2,4-Dichlorophenoxyacetic acid)
Aqueous/Solids	EPA 8151A	GC/ECD	2,4-DB
Aqueous/Solids	EPA 8151A	GC/ECD	3,5-Dichlorobenzoic acid
Aqueous/Solids	EPA 8151A	GC/ECD	4-Nitrophenol
Aqueous/Solids	EPA 8151A	GC/ECD	Acifluorfen
Aqueous/Solids	EPA 8151A	GC/ECD	Bentazon
Aqueous/Solids	EPA 8151A	GC/ECD	Dacthal
Aqueous/Solids	EPA 8151A	GC/ECD	Dalapon
Aqueous/Solids	EPA 8151A	GC/ECD	Dicamba
Aqueous/Solids	EPA 8151A	GC/ECD	Dichlorprop



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Aqueous/Solids	EPA 8151A	GC/ECD	Dinoseb (2-sec-Butyl-4,6-dinitrophenol)
Aqueous/Solids	EPA 8151A	GC/ECD	Pentachlorophenol
Aqueous/Solids	EPA 8151A	GC/ECD	Picloram
Aqueous/Solids	EPA 8151A	GC/ECD	Silvex (2,4,5-TP)
Aqueous/Solids	EPA 8260B/C	GC/MS	1,1,1,2-Tetrachloroethane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,1,1-Trichloroethane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,1,2,2-Tetrachloroethane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,1,2-Trichloroethane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,1,2-Trichlorotrifluoroethane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,1-Dichloroethane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,1-Dichloroethene
Aqueous/Solids	EPA 8260B/C	GC/MS	1,1-Dichloropropene
Aqueous/Solids	EPA 8260B/C	GC/MS	1,2,3-Trichlorobenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	1,2,3-Trichloropropane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,2,4-Trichlorobenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	1,2,4-Trimethylbenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	1,2-Dibromo-3-chloropropane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,2-Dibromoethane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,2-Dichlorobenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	1,2-Dichloroethane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,2-Dichloropropane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,3,5-Trimethylbenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	1,3-Dichlorobenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	1,3-Dichloropropane
Aqueous/Solids	EPA 8260B/C	GC/MS	1,4-Dichlorobenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	2,2-Dichloropropane
Aqueous/Solids	EPA 8260B/C	GC/MS	2-Butanone (Methyl ethyl ketone)
Aqueous/Solids	EPA 8260B/C	GC/MS	2-Chloroethyl vinyl ether
Aqueous/Solids	EPA 8260B/C	GC/MS	2-Chlorotoluene
Aqueous/Solids	EPA 8260B/C	GC/MS	2-Hexanone
Aqueous/Solids	EPA 8260B/C	GC/MS	4-Chlorotoluene
Aqueous/Solids	EPA 8260B/C	GC/MS	4-methyl-2-pentanone
Aqueous/Solids	EPA 8260B/C	GC/MS	Acetone
Aqueous/Solids	EPA 8260B/C	GC/MS	Acetonitrile
Aqueous/Solids	EPA 8260B/C	GC/MS	Acrolein



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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8260B/C	GC/MS	Acrylonitrile
Aqueous/Solids	EPA 8260B/C	GC/MS	Benzene
Aqueous/Solids	EPA 8260B/C	GC/MS	Bromobenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	Bromochloromethane
Aqueous/Solids	EPA 8260B/C	GC/MS	Bromodichloromethane
Aqueous/Solids	EPA 8260B/C	GC/MS	Bromoform
Aqueous/Solids	EPA 8260B/C	GC/MS	Bromomethane
Aqueous/Solids	EPA 8260B/C	GC/MS	Carbon disulphide
Aqueous/Solids	EPA 8260B/C	GC/MS	Carbon tetrachloride
Aqueous/Solids	EPA 8260B/C	GC/MS	Chlorobenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	Chloroethane
Aqueous/Solids	EPA 8260B/C	GC/MS	Chloroform
Aqueous/Solids	EPA 8260B/C	GC/MS	Chloromethane
Aqueous/Solids	EPA 8260B/C	GC/MS	cis-1,2-Dichloroethene
Aqueous/Solids	EPA 8260B/C	GC/MS	cis-1,3-Dichloropropene
Aqueous/Solids	EPA 8260B/C	GC/MS	Dibromochloromethane
Aqueous/Solids	EPA 8260B/C	GC/MS	Dibromomethane
Aqueous/Solids	EPA 8260B/C	GC/MS	Dichlorodifluoromethane
Aqueous/Solids	EPA 8260B/C	GC/MS	Ethyl tert-butyl ether (ETBE)
Aqueous/Solids	EPA 8260B/C	GC/MS	Ethylbenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	Hexachlorobutadiene
Aqueous/Solids	EPA 8260B/C	GC/MS	Hexachloroethane
Aqueous/Solids	EPA 8260B/C	GC/MS	Iodomethane
Aqueous/Solids	EPA 8260B/C	GC/MS	Isopropyl ether (DIPE)
Aqueous/Solids	EPA 8260B/C	GC/MS	Isopropylbenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	m+p-Xylene
Aqueous/Solids	EPA 8260B/C	GC/MS	Methyl tert-butyl ether (MTBE)
Aqueous/Solids	EPA 8260B/C	GC/MS	Methylene chloride (Dichloromethane)
Aqueous/Solids	EPA 8260B/C	GC/MS	Naphthalene
Aqueous/Solids	EPA 8260B/C	GC/MS	n-Butyl benzene
Aqueous/Solids	EPA 8260B/C	GC/MS	Nitrobenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	n-Propylbenzene
Aqueous/Solids	EPA 8260B/C	GC/MS	o-Xylene
Aqueous/Solids	EPA 8260B/C	GC/MS	p-isopropyl toluene
Aqueous/Solids	EPA 8260B/C	GC/MS	sec-Butyl benzene



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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8260B/C	GC/MS	Styrene
Aqueous/Solids	EPA 8260B/C	GC/MS	tert-Amyl methyl ether (TAME)
Aqueous/Solids	EPA 8260B/C	GC/MS	tert-Butyl alcohol (t-Butanol)
Aqueous/Solids	EPA 8260B/C	GC/MS	tert-Butyl benzene
Aqueous/Solids	EPA 8260B/C	GC/MS	tert-Butyl ethyl ether (ETBE)
Aqueous/Solids	EPA 8260B/C	GC/MS	Tetrachloroethene
Aqueous/Solids	EPA 8260B/C	GC/MS	Toluene
Aqueous/Solids	EPA 8260B/C	GC/MS	Total Xylenes
Aqueous/Solids	EPA 8260B/C	GC/MS	trans-1,2-Dichloroethene
Aqueous/Solids	EPA 8260B/C	GC/MS	trans-1,3-Dichloropropene
Aqueous/Solids	EPA 8260B/C	GC/MS	Trichloroethene
Aqueous/Solids	EPA 8260B/C	GC/MS	Trichlorofluoromethane
Aqueous/Solids	EPA 8260B/C	GC/MS	Vinyl Acetate
Aqueous/Solids	EPA 8260B/C	GC/MS	Vinyl chloride
Aqueous/Solids	EPA 8270C/D	GC/MS	1,1-Biphenyl
Aqueous/Solids	EPA 8270C/D	GC/MS	1,2,4,5-Tetrachlorobenzene
Aqueous/Solids	EPA 8270C/D	GC/MS	1,2,4-Trichlorobenzene
Aqueous/Solids	EPA 8270C/D	GC/MS	1,2-Dichlorobenzene
Aqueous/Solids	EPA 8270C/D	GC/MS	1,3-Dichlorobenzene
Aqueous/Solids	EPA 8270C/D	GC/MS	1,4-Dichlorobenzene
Aqueous/Solids	EPA 8270C/D	GC/MS	1,4-Dioxane
Aqueous/Solids	EPA 8270C/D	GC/MS	2,3,4,6-Tetrachlorophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	2,4,5-Trichlorophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	2,4,6-Trichlorophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	2,4-Dichlorophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	2,4-Dimethylphenol
Aqueous/Solids	EPA 8270C/D	GC/MS	2,4-Dinitrophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	2,4-Dinitrotoluene (2,4-DNT)
Aqueous/Solids	EPA 8270C/D	GC/MS	2,6-Dichlorophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	2,6-Dinitrotoluene (2,6-DNT)
Aqueous/Solids	EPA 8270C/D	GC/MS	2-Chloronaphthalene
Aqueous/Solids	EPA 8270C/D	GC/MS	2-Chlorophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	2-Methyl-4,6-Dinitrophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	2-Methylnaphthalene
Aqueous/Solids	EPA 8270C/D	GC/MS	2-Methylphenol (o-Cresol)



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Aqueous/Solids	EPA 8270C/D	GC/MS	2-Nitroaniline
Aqueous/Solids	EPA 8270C/D	GC/MS	2-Nitrophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	3,3'-Dichlorobenzidine
Aqueous/Solids	EPA 8270C/D	GC/MS	3+4-Methylphenol (m+p-Cresol)
Aqueous/Solids	EPA 8270C/D	GC/MS	3-Nitroaniline
Aqueous/Solids	EPA 8270C/D	GC/MS	4-Bromophenyl phenyl ether
Aqueous/Solids	EPA 8270C/D	GC/MS	4-Chloro-3-methylphenol
Aqueous/Solids	EPA 8270C/D	GC/MS	4-Chloroaniline
Aqueous/Solids	EPA 8270C/D	GC/MS	4-Chlorophenyl phenylether
Aqueous/Solids	EPA 8270C/D	GC/MS	4-Methylphenol (p-Cresol)
Aqueous/Solids	EPA 8270C/D	GC/MS	4-Nitroaniline
Aqueous/Solids	EPA 8270C/D	GC/MS	4-Nitrophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	Acenaphthene
Aqueous/Solids	EPA 8270C/D	GC/MS	Acenaphthylene
Aqueous/Solids	EPA 8270C/D	GC/MS	Acetophenone
Aqueous/Solids	EPA 8270C/D	GC/MS	Aniline
Aqueous/Solids	EPA 8270C/D	GC/MS	Anthracene
Aqueous/Solids	EPA 8270C/D	GC/MS	Atrazine
Aqueous/Solids	EPA 8270C/D	GC/MS	Benzaldehyde
Aqueous/Solids	EPA 8270C/D	GC/MS	Benzidine
Aqueous/Solids	EPA 8270C/D	GC/MS	Benzo(a)anthracene
Aqueous/Solids	EPA 8270C/D	GC/MS	Benzo(a)pyrene
Aqueous/Solids	EPA 8270C/D	GC/MS	Benzo(b)fluoranthene
Aqueous/Solids	EPA 8270C/D	GC/MS	Benzo(g,h,i)perylene
Aqueous/Solids	EPA 8270C/D	GC/MS	Benzo(k)fluoranthene
Aqueous/Solids	EPA 8270C/D	GC/MS	Benzoic acid
Aqueous/Solids	EPA 8270C/D	GC/MS	Benzyl alcohol
Aqueous/Solids	EPA 8270C/D	GC/MS	Benzyl butyl phthalate
Aqueous/Solids	EPA 8270C/D	GC/MS	Biphenyl
Aqueous/Solids	EPA 8270C/D	GC/MS	bis(2-Chloroethoxy) methane
Aqueous/Solids	EPA 8270C/D	GC/MS	bis(2-Chloroethyl) ether
Aqueous/Solids	EPA 8270C/D	GC/MS	bis(2-Chloroisopropyl) ether
Aqueous/Solids	EPA 8270C/D	GC/MS	bis(2-Ethylhexyl) phthalate (DEHP)
Aqueous/Solids	EPA 8270C/D	GC/MS	Butyl benzyl phthalate
Aqueous/Solids	EPA 8270C/D	GC/MS	Caprolactam



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Aqueous/Solids	EPA 8270C/D	GC/MS	Carbazole
Aqueous/Solids	EPA 8270C/D	GC/MS	Chrysene
Aqueous/Solids	EPA 8270C/D	GC/MS	Dibenz(a,h) anthracene
Aqueous/Solids	EPA 8270C/D	GC/MS	Dibenzofuran
Aqueous/Solids	EPA 8270C/D	GC/MS	Diethyl phthalate
Aqueous/Solids	EPA 8270C/D	GC/MS	Dimethyl phthalate
Aqueous/Solids	EPA 8270C/D	GC/MS	Di-n-butyl phthalate
Aqueous/Solids	EPA 8270C/D	GC/MS	Di-n-octyl phthalate
Aqueous/Solids	EPA 8270C/D	GC/MS	Fluoranthene
Aqueous/Solids	EPA 8270C/D	GC/MS	Fluorene
Aqueous/Solids	EPA 8270C/D	GC/MS	Hexachlorobenzene
Aqueous/Solids	EPA 8270C/D	GC/MS	Hexachlorobutadiene
Aqueous/Solids	EPA 8270C/D	GC/MS	Hexachlorocyclopentadiene
Aqueous/Solids	EPA 8270C/D	GC/MS	Hexachloroethane
Aqueous/Solids	EPA 8270C/D	GC/MS	Indeno(1,2,3-cd) pyrene
Aqueous/Solids	EPA 8270C/D	GC/MS	Isophorone
Aqueous/Solids	EPA 8270C/D	GC/MS	Naphthalene
Aqueous/Solids	EPA 8270C/D	GC/MS	Nitrobenzene
Aqueous/Solids	EPA 8270C/D	GC/MS	N-nitrosodimethylamine
Aqueous/Solids	EPA 8270C/D	GC/MS	N-nitrosodi-n-propylamine
Aqueous/Solids	EPA 8270C/D	GC/MS	n-Nitrosodiphenylamine
Aqueous/Solids	EPA 8270C/D	GC/MS	Pentachlorophenol
Aqueous/Solids	EPA 8270C/D	GC/MS	Phenanthrene
Aqueous/Solids	EPA 8270C/D	GC/MS	Phenol
Aqueous/Solids	EPA 8270C/D	GC/MS	Pyrene
Aqueous/Solids	EPA 8270C/D	GC/MS	Pyridine
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	1-Methylnaphthalene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	2-Methylnaphthalene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Acenaphthene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Acenaphthylene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Anthracene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Benzo(a)anthracene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Benzo(a)pyrene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Benzo(b)fluoranthene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Benzo(b+k)fluoranthene



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Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Benzo(e)pyrene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Benzo(g,h,i)perylene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Benzo(k)fluoranthene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Chrysene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Dibenzo(a,h)anthracene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Fluoranthene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Fluorene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Indeno(1,2,3-cd) pyrene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Naphthalene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Phenanthrene
Aqueous/Solids	EPA 8270C/D SIM	GC/MS	Pyrene
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,4,7,8,9-Hpcdf
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,4,6,7,8,9-OCDD
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,4,6,7,8,9-OCDF
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,4,6,7,8-Hpcdd
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,4,6,7,8-Hpcdf
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,4,7,8-Hxcdd
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,4,7,8-Hxcdf
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,6,7,8-Hxcdd
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,6,7,8-Hxcdf
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,7,8,9-Hxcdd
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,7,8,9-Hxcdf
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,7,8-Pecdd
Aqueous/Solids	EPA 8290A	HRGC/HRMS	1,2,3,7,8-Pecdf
Aqueous/Solids	EPA 8290A	HRGC/HRMS	2,3,4,6,7,8-Hxcdf
Aqueous/Solids	EPA 8290A	HRGC/HRMS	2,3,4,7,8-Pecdf
Aqueous/Solids	EPA 8290A	HRGC/HRMS	2,3,7,8-TCDD
Aqueous/Solids	EPA 8290A	HRGC/HRMS	2,3,7,8-TCDF
Aqueous/Solids	EPA 8290A	HRGC/HRMS	Hpcdd, total
Aqueous/Solids	EPA 8290A	HRGC/HRMS	Hpcdf, total
Aqueous/Solids	EPA 8290A	HRGC/HRMS	Hxcdd, total
Aqueous/Solids	EPA 8290A	HRGC/HRMS	Hxcdf, total
Aqueous/Solids	EPA 8290A	HRGC/HRMS	PCDD + PCDF, total
Aqueous/Solids	EPA 8290A	HRGC/HRMS	PCDD, total
Aqueous/Solids	EPA 8290A	HRGC/HRMS	PCDF, total



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Matrix	Standard/Method	Technology	Analyte
Aqueous/Solids	EPA 8290A	HRGC/HRMS	Pecdd, total
Aqueous/Solids	EPA 8290A	HRGC/HRMS	Pecdf, total
Aqueous/Solids	EPA 8290A	HRGC/HRMS	TCDD, total
Aqueous/Solids	EPA 8290A	HRGC/HRMS	TCDF, total
Aqueous/Solids	EPA 8321A	HPLC	3-Hydroxycarbofuran
Aqueous/Solids	EPA 8321A	HPLC	Aldicarb
Aqueous/Solids	EPA 8321A	HPLC	Aldicarb sulfone
Aqueous/Solids	EPA 8321A	HPLC	Aldicarb sulfoxide
Aqueous/Solids	EPA 8321A	HPLC	Ammonium picrate
Aqueous/Solids	EPA 8321A	HPLC	Barban
Aqueous/Solids	EPA 8321A	HPLC	Baygon (Propoxur)
Aqueous/Solids	EPA 8321A	HPLC	Bromacil
Aqueous/Solids	EPA 8321A	HPLC	Carbaryl
Aqueous/Solids	EPA 8321A	HPLC	Carbofuran
Aqueous/Solids	EPA 8321A	HPLC	Chloroxuron
Aqueous/Solids	EPA 8321A	HPLC	Dioxacarb
Aqueous/Solids	EPA 8321A	HPLC	Diuron
Aqueous/Solids	EPA 8321A	HPLC	Linuron
Aqueous/Solids	EPA 8321A	HPLC	Methiocarb
Aqueous/Solids	EPA 8321A	HPLC	Methomyl
Aqueous/Solids	EPA 8321A	HPLC	Oxamyl
Aqueous/Solids	EPA 8321A	HPLC	Picric Acid
Aqueous/Solids	EPA 8321A	HPLC	Promecarb
Aqueous/Solids	EPA 8321A	HPLC	Propham
Aqueous/Solids	EPA 8330A/B	HPLC	1,3,5-Trinitrobenzene
Aqueous/Solids	EPA 8330A/B	HPLC	1,3-Dinitrobenzene
Aqueous/Solids	EPA 8330A/B	HPLC	2,4,6-Trinitrotoluene
Aqueous/Solids	EPA 8330A/B	HPLC	2,4-Dinitrotoluene
Aqueous/Solids	EPA 8330A/B	HPLC	2,6-Dinitrotoluene
Aqueous/Solids	EPA 8330A/B	HPLC	2-Amino-4,6-dinitrotoluene
Aqueous/Solids	EPA 8330A/B	HPLC	2-Nitrotoluene
Aqueous/Solids	EPA 8330A/B	HPLC	3-Nitrotoluene
Aqueous/Solids	EPA 8330A/B	HPLC	4-Amino-2,6-dinitrotoluene
Aqueous/Solids	EPA 8330A/B	HPLC	4-Nitrotoluene
Aqueous/Solids	EPA 8330A/B	HPLC	HMX (Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)



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Aqueous/Solids	EPA 8330A/B	HPLC	Nitrobenzene
Aqueous/Solids	EPA 8330A/B	HPLC	Nitroglycerin
Aqueous/Solids	EPA 8330A/B	HPLC	Pentaerythritoltetranitrate (PETN)
Aqueous/Solids	EPA 8330A/B	HPLC	RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine)
Aqueous/Solids	EPA 8330A/B	HPLC	Tetryl (Methyl-2,4,6-trinitrophenylnitramine)
Aqueous/Solids	EPA 9010C & 9014	Distillation/UV/Vis	Amenable Cyanide
Aqueous/Solids	EPA 9010C & 9014	Distillation/UV/Vis	Total Cyanide
Aqueous/Solids	EPA 9010C & 9014	UV/Vis	Total Cyanide
Aqueous/Solids	EPA 9010C & 9014	Distillation/UV/Vis	Amenable Cyanide
Aqueous/Solids	EPA 9040C	Ion Selective Electrode	pH/Corrosivity
Aqueous/Solids	EPA 9056A	Ion Chromatography (IC)	Bromide
Aqueous/Solids	EPA 9056A	Ion Chromatography (IC)	Chloride
Aqueous/Solids	EPA 9056A	Ion Chromatography (IC)	Fluoride
Aqueous/Solids	EPA 9056A	Ion Chromatography (IC)	Nitrate as N
Aqueous/Solids	EPA 9056A	Ion Chromatography (IC)	Nitrite + Nitrate as N
Aqueous/Solids	EPA 9056A	Ion Chromatography (IC)	Nitrite as N
Aqueous/Solids	EPA 9056A	Ion Chromatography (IC)	Orthophosphate as P
Aqueous/Solids	EPA 9056A	Ion Chromatography (IC)	Sulfate



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Aqueous	EPA 3010A	Hot Block	Acid digestion for metals analysis
Aqueous	EPA 3015A	Microwave	Microwave assisted acid digestion for metals analysis
Aqueous	EPA 3510C	Separatory funnel	Separatory funnel extraction
Aqueous	EPA 3520C	Liquid-liquid extractor	Liquid-Liquid extraction
Aqueous	EPA 3535A	SPE	SPE extraction for explosives
Aqueous	EPA 5030B/C	Purge and trap	Purge and trap
Aqueous	EPA 7470A	Hotplate digestion	Mercury digestion
Solids	CCR Chapter 11, Article 5, Appendix II	Rotary tumbler	Waste Extraction test (WET) (STLC)
Solids	EPA 1311	Rotary tumbler	TCLP Extraction
Solids	EPA 1312	Rotary tumbler	SPLP Extraction
Solids	EPA 3050B	Hotplate digestion	Acid digestion for metals analysis
Solids	EPA 3051A	Microwave	Microwave assisted acid digestion for metals analysis
Solids	EPA 3060A	Hotplate digestion	Alkaline digestion for hexavalent chromium
Solids	EPA 3550B	Ultrasonic waterbath	Ultrasonic extraction
Solids	EPA 5035/A	Closed-system purge and trap	Closed-system purge and trap extraction
Solids	EPA 7471B	Hotplate digestion	Mercury digestion
Solids	EPA 8330B, Appendix A	Puck mill grinder	Incremental sampling
Aqueous/Solids	EPA 3540C	Soxhlet	Soxhlet extraction
Aqueous/Solids	EPA 3630C	Cleanup	Silica gel cleanup
Aqueous/Solids	EPA 3660B	Cleanup	Sulfuric acid cleanup
Aqueous/Solids	EPA 3665A	Cleanup	Sulfuric acid - Permanganate cleanup
Aqueous/Solids	EPA 8151A	Separatory funnel	Herbicide extraction

Attachment D
Responses to Regulatory Agency Comments

**Responses to EPA Comments on the
Draft Sampling and Analysis Plan Addendum 2 for the Remedial Investigation at UXO 15,
Former Vieques Naval Training Range, Vieques, Puerto Rico;
Dated October 2014 (hereinafter referred to as SAP Addendum 2)**

GENERAL COMMENTS

1. Worksheet #9: Please note that Mindy Pensak participated in the June 18, 2014 scoping session by phone.

Navy Response: The text “(by phone)” was added with Mindy’s name on Worksheet #9.

2. Worksheet # 10 **Conceptual Site Model**, page 8 & Figure 3 Conceptual Site Model: Please include aquatic wildlife in addition to terrestrial wildlife in the conceptual site models as wetland and lagoon habitats are present in this UXO, and as noted under Ecological Receptors on page 10 of this worksheet.

Navy Response: Aquatic ecological exposure pathways have been added to Figure 3, including those for aquatic organisms (fish and invertebrates) living in the lagoon and aquatic wildlife (birds and mammals) foraging in the lagoon. Fish have been added to the list of aquatic ecological receptors listed under “Ecological” on page 10.

3. Worksheet # 10 **Environmental Questions to be Answered by the RI Sampling**, Question # 3, page 11: It is noted that the extent of the two detonation areas will be defined visually once vegetation removal has occurred. Therefore, as the size of the area has not been appropriately determined, it may be premature to limit the sampling to one surface and one subsurface sample. If the proposed geophysical surveys demonstrate that these pits were indeed former OD/OB areas, implementation of a more rigorous protocol, similar to the one used at SWMU-4, is recommended. Sample depth should consider both munitions and inorganics and their different mobility in the soil. EPA is concerned with depositional material that may have deepened the contamination, and also with dissolution of energetics to the saturated zone. A groundwater sample on each of the pits would also be indicated.

Navy Response: The fourth and fifth sentences of the answer to Question #3 have been revised as follows: “The boundaries of each potential detonation area will constitute a sampling unit because, as has been observed at SWMU 4 on the former NASD, OB/OD pits represent the most conservative sampling areas based on density of munitions-related items found. Within each sampling unit, one surface soil and a minimum of one subsurface soil sample will be collected. The surface soil samples will be incremental samples (0 – approx. 2 inches bgs, 30 increments per sampling unit).

If no subsurface anomalies are identified, one subsurface soil sample will be collected from the center of each sampling unit following the Modified Soil Sample Depth Selection Protocol for subsurface soil samples (Attachment B). If subsurface MEC or MD is identified, the subsurface soil sample(s) will be collected from directly beneath, if safe to do so. Additional subsurface soil samples may be added to ensure sufficient characterization of the subsurface soil based on identification of the subsurface anomalies. The number of samples collected to sufficiently characterize the subsurface soil within the detonation area is subjective, and will be based on professional judgment. The rationale for the subsurface sample collection will be provided for regulatory consideration in the RI Report.”

In addition, the following has been added to Worksheet #17: “The determination of whether groundwater evaluation is warranted will be deferred until after the soil samples have been collected and their data evaluated in the context of the conceptual site model. Evaluation of the data will include multiple lines of

evidence including comparison to background concentrations, proximity to groundwater and/or surface water bodies, potential source materials identified, etc.”

4. Further, the depth of the sample locations appears to be the top 1’ and then a subsurface sample would follow the sampling protocol identified in Worksheet # 17. However, sampling at the drum areas and the debris piles occurred or will occur in the top 6” underneath the drum/debris. Therefore it is recommended that in the event that debris items are found in the detonation areas, that sampling in the 0-6” horizon immediately beneath the debris material be conducted.

Navy Response: Please see response to general comment #3 above.

5. Worksheet # 10 **Environmental Questions to be Answered by the RI Sampling**, Question # 4, pages 11-12: It appears as if two different questions are being posed: 1) Have there been releases of inorganic constituents to the surrounding soil from the debris piles, which would appear to indicate that perhaps additional delineation of inorganics previous identified in downgradient areas should be conducted (e.g. samples should be collected downgradient from the Debris Piles, for example there should be sample locations between Debris Piles C & D and to the North and West of Pile A) and 2) Are inorganics associated with debris piles attributable to background, which would require better delineation of background soils. It appears that the latter form of sampling is being conducted here because proposed sample locations are those upgradient from the debris piles and Worksheet # 17 (Former Debris Piles, page 41) notes that sample locations are “. . .in areas likely outside the potential for contamination from these piles.” Therefore it is recommended that Question # 4 be revised (as discussed) to better support the rationale for additional sampling around the debris piles.

Navy Response: Question #4 has been revised as follows: “Are the inorganic constituents observed in soil associated with the former debris piles attributable to background?”

6. Further, It is noted that surface soils will be collected from the 0-6” horizon, however the last sentence in the first full paragraph on page 12 indicates that samples will be collected in accordance with the Modified Soil Sample Depth Selection Protocol. The 0-6” additional soil samples proposed are not consistent with the protocol sampling depths and referring to this protocol adds confusion. The protocol discusses collecting surface soil samples from the top 0-2’ where samples are collected near lagoon areas (Debris Piles F & A), however, the samples to be collected will be in the 0-6” horizon to be consistent with the previously collected soil sample depth. It is recommended that reference to the protocol be removed.

Navy Response: The last sentence has been removed.

7. Please note that the proposed sampling around Debris Piles C & D should include cadmium, which was identified at Pile D.

Navy Response: Cadmium has been added to Worksheet 10, answer to Environmental Question to be Answered No. 4.

8. Worksheet # 11, **How much data should be collected (number of samples for each analytical group, matrix, and concentration)?** Fourth bullet, page 14: Please add cadmium to the list of analytes to be analyzed for Debris Piles C & D.

Navy Response: Cadmium has been added to the list of inorganics listed in the referenced sentence.

9. SAP Worksheet #10, Page 9: Please include the areas/dimensions of the potential detonation areas.

Navy Response: Worksheet #10 first sentence under the Potential Detonation Area Section has been edited as follows: “Two potential detonation areas, approximately 12 ft by 12 ft each, are located in the southwestern portion of UXO 15 (Figure 2).”

10. SAP Worksheet #10, Page 11 (and elsewhere, such as in Worksheet #11, Page 14.): “Environmental Questions to be answered by the RI Sampling”: Question 4 states that samples will be collected topographically up- or side-gradient of the former debris piles. However, Figure 6 shows that debris piles A and F are adjacent to each other. It is recommended that additional consideration be given to co-locating these up- or side-gradient samples for these two piles.

Navy Response: Former Debris Pile F background soil samples SD27 through SD36 have been removed and their planned analysis (i.e., arsenic) has been added to background samples SD07 through SD16, which are up- or side-gradient from both Debris Piles A and F. The associated text will be revised accordingly.

11. The SAP Addendum 2 does not provide detailed decision statements for all of the project-specific work and instead, Worksheet #11 references Figure 7, Remedial Investigation Evaluation Decision Tree, for the overall Remedial Investigation (RI) decision process. For example, the SAP Addendum 2 does not specify how the results for the proposed samples collected around the debris piles will be used to determine if the previously measured debris piles results are related to site-specific background levels. As another example, Worksheets #11 and #15 identify multiple screening levels and it is unclear what decisions will be made using each of the project action limits (PALs). Further, Figure 7 indicates additional samples may be collected to delineate the nature and extent of contamination, but it is unclear how it will be determined where additional samples will be collected (e.g., a decision process for step-out sampling is not defined or referenced) or if another SAP Addendum will be submitted to support this work. Revise the SAP Addendum 2 to provide project-specific decisions for the proposed sampling including how decisions will be made based on the screening criteria in Worksheet #15 and determining whether the debris pile sample results are “naturally occurring localized variations in geochemistry.” Also, revise SAP Addendum 2 to discuss the potential additional sampling indicated in Figure 7.

Navy Response: Worksheet #10, response to Environmental Question 4 discusses the use of background sampling. The following statement has been added to Worksheet #11 statement 5, at the end of fourth bullet: “The background soil samples are being collected to confirm if inorganics associated with the debris piles are attributable to background. A background set will be created listing the 95% UTL value and additionally the minimum and maximum value of the data set will be used for screening purposes.”

Text has been added in applicable locations within the document that the background soil samples collected adjacent to the former debris piles will not be compared to PALs; a 95% UTL will be calculated, and the previous former debris pile soil samples will be compared to the 95% UTL and the minimum and maximum concentrations range observed.

With regards to decision processes associated with data evaluation, Figure 7 is the standard RI process, which has inherent data evaluation and decision processes that are subjective, based on professional judgment, and common to RIs conducted throughout the industry. The regulatory agencies will have the opportunity to review the findings, evaluations, and conclusions drawn by the Navy. With respect to the potential for additional sampling, it will be conducted under this SAP (and any SAP upon which this SAP is based), unless the type of sampling has not been covered by the SAP. In this case, a SAP addendum would be submitted. This information has been added to Worksheets #10, #11, and #17, as applicable.

Additional EPA Evaluation Comment: The soil samples that are to be collected in the vicinity of the debris piles (as shown in Figure 6) should not be considered background samples. While it is understood that these soil data will be compared to background samples, the data collected should not be included in the previously established background data set.

Navy Response to Evaluation Comment: The following has been added as the last sentence to above: “This background set will not be included as part of the East Vieques background soil inorganics UTLs, but will be used as site-specific background because the data are representative of site-specific conditions not affected by potential releases from the small debris piles.”

12. There appears to be some misidentification of the chemical nomenclature of the military explosives referred to as “Explosive D” in the SAP Addendum 2. The chemical nomenclature of the military grade Explosive D loaded into projectiles is ammonium picrate or ammonium 2,4,6-trinitrophenolate. However, it is misidentified in the Potential Detonation Areas section of Worksheet #17-Sampling Design and Rationale as “Explosive D (picric acid)”. Although military grade Explosive D may contain up to 0.025 percent picric acid, this is considered to be a synthesis impurity. It should be noted that picric acid was not normally loaded in Naval projectiles due to its shock sensitivity and its tendency to react with the metals present in the projectiles, which often resulted in the formation of extremely shock-sensitive compounds. In addition, with the exception of the cited Worksheet #17, the term “Explosive D” is not used in the body of the SAP Addendum 2. However, it is used in Attachment C, Laboratory Department of Defense (DoD) Environmental Laboratory Accreditation Program (ELAP) Accreditation Letter (page 16 of 18) where the chemicals that the laboratory is certified to perform are listed.

Review the SAP Addendum 2 and determine if Explosive D was actually sampled, or if picric acid was erroneously sampled instead. If the sampling and analysis for picric acid was done instead, provide an explanation for this and note if this would be considered as sufficient to determine the presence or absence of Explosive D in the media sampled.

Navy Response: Please note that the picric acid result is a combination of picric acid and ammonium picrate. In other words, picric acid and/or ammonium picrate can be detected, but results are expressed as “picric acid.” Worksheet #15-6 has been updated to add Footnote 6 (attached to the picric acid analyte), which states: “Results are expressed as picric acid.” Results can be converted to “ammonium picrate” using the following formula based on the ratio of molecular weights: (ammonium picrate [$\mu\text{g}/\text{kg}$]) = (picric acid [$\mu\text{g}/\text{kg}$]) * (246.13/229.10). Please also note that there are no widely accepted human health or ecological screening values for ammonium picrate and picric acid, and the laboratory will report the picric acid results at its reporting limit.

13. Worksheet #10, page 10, indicates that cadmium was detected above screening criteria and background levels in the soil samples collected beneath Debris Pile D, but the proposed sampling for Debris Piles C/D does not include cadmium (see Worksheet #10, page 12 and Worksheet #15-7). Revise the analytes for the soil samples to be collected at Debris Piles C/D to include cadmium.

Navy Response: Cadmium has been added to the list of analytes in Worksheet #10.

14. The SAP Addendum 2 indicates it provides information relating to the procurement of a new analytical laboratory, but the SAP Addendum 2 does not provide all of the laboratory information. For example, the laboratory standard operating procedures (SOPs) and laboratory statistically derived quality control (QC) limits are not provided for all of the proposed analytical methods. Without this information, the adequacy of the laboratory methods cannot be evaluated and the information in the SAP Addendum 2 cannot be

verified. For example, it is unclear if the laboratory SOP contains the soil sieving procedure, soil grinding procedure, and the soil subsampling process required for Method 8330B. Revise the SAP Addendum 2 to include all relevant laboratory-specific information.

Navy Response: Please note this is an addendum and as such provides only new or changed information from the SAP to which it is an addendum. Information that is identical to the original SAP is not included. Soil sieving procedure, soil grinding procedure, soil subsampling process required for SW-846 8330B, which was not part of the Draft SAP Addendum has been added as a result of the comment responses, so the applicable worksheets have been revised to include this information.

15. Worksheet #2 indicates that only those worksheets that are applicable to the new proposed RI work and the procurement of the new analytical laboratory have been included in the SAP Addendum 2. However, the SAP Addendum 2 does not include Worksheets #3 with the new laboratory contact information to indicate that the laboratory will receive a copy of this SAP Addendum 2. In addition, Worksheet #4 should be provided with the project-specific personnel for this RI work to sign that they have received this SAP Addendum 2. Revise the SAP Addendum 2 to include these worksheets.

Navy Response: Worksheets #3 and #4 have been added to the SAP.

16. The SAP Addendum 2 does not identify all of the personnel and subcontractors for the proposed work. For example, the field team leader in Worksheet #26 is TBD (to be determined). In addition, Worksheet #14 lists vegetation removal, data validation, and investigation derived waste (IDW) disposal contractors that are not identified (e.g., the third party data validation subcontractor is listed as TBD in Worksheet #34-#36). Revise the SAP Addendum 2 to identify the personnel and subcontractors that will perform the proposed RI work or indicate that this information will be included in the Final version of the SAP Addendum 2.

Navy Response: Information available at the time the SAP is finalized will be added. If not available, it will remain as “TBD.” Some staff positions, such as field staff, may not be known until the SAP is implemented. However, all staff are qualified for the roles they fulfill. Subcontractors procured after finalizing the SAP will be included in the RI Report.

SPECIFIC COMMENTS

1. **Worksheet #11, Project Quality Objectives/Systematic Planning Process Statements, Page 13:** The text states that certain analyte limits of detection (LODs) exceed PALs, but detection limits (DLs) are closer to the PALs and detections less than the LOD will be reported and qualified. However, the SAP Addendum 2 does not discuss why the uncertainty associated with using these qualified results (and the non-detections) to make decisions was deemed acceptable for this project. In addition, the Soil Screening Levels (SSLs) that are less than DLs are discussed as overly conservative, but the analyte with a toxicity reference value (TRV) less than the DL (i.e., atrazine in Worksheet #15-2) is not discussed. Revise the SAP Addendum 2 to discuss why the uncertainty associated with using results with LODs greater than the PALs and atrazine results is acceptable for project decisions.

Navy Response: The following has been added in the 7th tick mark under Question #2: “Detections less than the LOD that are qualified as estimated will be used as reported, as this is industry-standard practice for these types of results.”

In addition, 8th tick mark under Question #2 has been modified to read: "As noted above, with exception of one SVOC (atrazine), all occurrences of the DL being greater than the PAL are for SSLs. The Vieques screening values on which the PALs are based . . . in the Site Inspection/Expanded Site Inspection Report (CH2M HILL, 2010b). While atrazine's TRV is less than the DL, that the remaining SVOCs (and pesticides) have PALs above the DL is sufficient to address any potential uncertainty associated with non-detect results for atrazine (i.e., it is unlikely atrazine would be present in the absence of other SVOCs and pesticides."

2. **Worksheet #17, Sampling Design and Rationale, Page 41:** The text states that ten samples surrounding the debris piles was determined to be able to create a statistically significant data set for each location, but it is unclear how this number of samples was determined. Further, it is unclear if statistics will be used to assess the data. Revise this worksheet to clarify the rationale for selecting ten samples at each site and discuss any statistical analyses that will be performed.

Navy Response: The last bullet within Worksheet #17 has been modified as follows:

"Ten soil samples are selected to create a statistically significant data set for each location; eight samples or above is a statistically representative number when determining background upper tolerance limits (UTLs) for individual inorganics. However, in addition to determining UTLs, the minimum and maximum values will also be used for comparison."

Additional EPA Evaluation Comment: As noted for the response to General Comment # 11, while ten may be considered a statistically valid data set as per ProUCL, these sample locations should not be considered "background" samples (http://www.epa.gov/osp/hstl/tsc/ProUCL_v5.0_tech.pdf).

Navy Response to Evaluation Comment: Please see the Navy Response to Evaluation General Comment 11 above.

3. **Worksheet #18, Sampling Locations and Methods/SOP Requirements Table, Pages 43 to 45:** This table does not include the soil samples proposed for collection in the berms when debris considered a potential release of contamination is found. Revise this table to include these berm soil samples.

Navy Response: The samples in the berms were not included in the SAP because the number of samples will not be identified until after the DGM work has been accomplished. However, it is likely some samples will be collected so a section has been added to Worksheet #18 called "Berm Area (Contingency Samples)" and 3 subsurface samples have been listed with a footnote indicating more samples may be collected based on the DGM results.

4. **Worksheet #18, Sampling Locations and Methods/SOP Requirements Table, Page 43:** A field duplicate is not identified for collection at the Detonation Area. Revise this table to indicate a field duplicate will be collected at the Detonation Area as indicated in Worksheet #20.

Navy Response: A field duplicate sample (VEUXO15-SB45P-TDBD-MMY) has been added to Worksheet #18 in the Detonation Area.

5. **Worksheet #19, Field Sampling Requirements Table, Page 47:** Some of the maximum holding times are inconsistent with the proposed methods. The maximum holding times indicated for samples to be analyzed for volatile organic compounds (VOCs) and for perchlorate are 14 days/40 days, but soil samples for VOCs analyses by Method 8260C should be preserved immediately based on the proposed collection method then prepared and analyzed within 14 days. Soil samples for perchlorate analysis by Method 6850 should be prepared within 28 days and analyzed within 28 days. Revise the maximum holding times for

samples to be analyzed for VOCs and perchlorate to be consistent with Methods 8260C and 6850.

Navy Response: Worksheet #19 has been updated to reflect the correct holding time of 28 days for perchlorate and 48 hours to freezing for VOCs.

6. **Worksheet #19, Field Sampling Requirements Table, Page 47:** Footnote (3) states that sample containers should be filled to capacity, but the Method 6850 preservation requirements for perchlorate analyses indicate all sample containers should contain headspace to prevent potential anaerobic biodegradation (see Section 8.6). Revise Worksheet #19 to indicate that samples for perchlorate analyses will contain headspace.

Navy Response: Worksheet #19 has been revised to indicate that the proper preservation for perchlorate analysis in soil is “≤ 6°C but not frozen, headspace in jar.”

7. **Worksheet #20, Field Quality Control Sample Summary Table, Page 49:** The trip blank to be collected at the Drum Area is indicated to be analyzed for SVOCs, but should be analyzed for VOCs. Revise this table to indicate that the trip blank will be analyzed for VOCs.

Navy Response: Worksheet #20 has been revised to indicate that 2 trip blanks will be collected for VOCs rather than SVOCs.

8. **Worksheet #28, Laboratory QC Samples Table, Pages 65 to 92:** The corrective action (CA) information in these tables is incomplete. For example, the corrective action for exceedances of the matrix spike/matrix spike duplicate (MS/MSD) acceptance limits for all analyses is to examine the project-specific requirements and contact the client for the additional measures to be taken. In addition, the corrective action for the dilution test and post-digestion spike (PDS) for metals analyses states, “No specific CA, unless required by the project.” However, the SAP Addendum 2 should define these project-specific CA requirements (i.e., when and what CAs will be taken). For example, a CA for the metals MS/MSD exceedances is to analyze a dilution test and PDS as noted in the Frequency & Number column. In addition, at a minimum, CA for the dilution test and PDS should be to qualify the associated sample results, and sample analysis by the method of standard additions or using an internal standard technique should be considered. Revise Worksheet #28 to include the project-specific CAs for the MS/MSDs, dilution test, and PDS.

Navy Response: Worksheet #28 has been revised to include “For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative” as the corrective action for all MS/MSD, dilution test, and PDS samples. Worksheet #28 has been revised to include “Run dilution test or PDS” for MS/MSD metals samples.

9. **Worksheet #28-4, Laboratory QC Samples Table, Pages 73 to 74:** This table does not include all of the QC samples for Method 8330B (e.g., the soil grinding blank). Revise Worksheet #28-4 to include all relevant QC samples for Method 8330B.

Navy Response: The requested information has been added to the applicable worksheets.

10. **Worksheets #28-7 and #28-8, Laboratory QC Samples Table, Pages 83 and 87:** The dilution test is indicated to be analyzed when the MS or MSD fails, but a dilution test should be analyzed with each batch. Revise the Frequency & Number column to indicate that a dilution test will be analyzed with each batch.

Navy Response: The specifications in Worksheets 28-7 and 28-8 meet the requirements of DoD QSM v5.0. DoD QSM v5.0 specifies that the frequency of the dilution test is “one per preparatory batch if MS or MSD fails” for Methods 6010 and 6020. SW-846 6010C and 6020A also specify that dilution test should be run if the spike fails.

**Responses to PREQB Comments on the
Draft Sampling and Analysis Plan Addendum 2 for the Remedial Investigation at UXO 15, Atlantic
Fleet Weapons Training Area-Vieques, Former Vieques Naval Training Range, Vieques, Puerto Rico
Dated October 2014**

GENERAL COMMENTS

1. Please provide additional detail for the MEC investigation. For example, the amount of anomaly excavation in the berms and suspected detonation areas that is required to provide the quantity and quality of data needed to support decision-making needs to be specifically defined in either Worksheet 14 (Page 22) or 17 (Page 41), rather than indicating that “select” anomalies will be excavated from the berms and that “MEC removal” will be performed at the two suspected detonation areas (Worksheet 14, Page 22). Information is needed on how much anomaly excavation is needed to achieve the project goals of characterizing the berms and performing MEC removal from the suspected detonation areas. Please either develop a DQO describing the amount of anomaly excavation required to provide the needed data on MEC or, alternatively, include a plan for the regulators to be briefed via teleconference on the results of the DGM in the berms and suspected detonation areas for the purpose of understanding the results to the DGM data acquisition and concurring with the selection of anomalies for excavation.

Navy Response: Until the data are collected, it is not possible to know the amount of data necessary to achieve the project goals. Within the berms, the anomalies selected for intrusive investigation will be presented to the Technical Subcommittee for consideration. Professional interpretation will be used to select specific anomalies to intrusively investigate, such as by the geophysical signature, shape, and size. This information has been added in the appropriate Worksheets.

As stated in Worksheet #10, 100% of the anomalies identified within the potential detonation areas are planned for investigation. The fourth and fifth sentences of the answer to Question #3 have been revised as follows: “The boundaries of each potential detonation area will constitute a sampling unit because, as has been observed at SWMU 4 on the former NASD, OB/OD pits represent the most conservative sampling areas based on density of munitions-related items found. Within each sampling unit, one surface soil and a minimum of one subsurface soil sample will be collected. The surface soil samples will be incremental samples (0 – approx. 2 inches bgs, 30 increments per sampling unit).

If no subsurface anomalies are identified, one subsurface soil sample will be collected from the center of each sampling unit following the Modified Soil Sample Depth Selection Protocol for subsurface soil samples (Attachment B). If subsurface MEC or MD is identified, the subsurface soil sample(s) will be collected from directly beneath, if safe to do so. Additional subsurface soil samples may be added to ensure sufficient characterization of the subsurface soil based on identification of the subsurface anomalies. The number of samples collected to sufficiently characterize the subsurface soil within the detonation area is subjective, and will be based on professional judgment. The rationale for the subsurface sample collection will be provided for regulatory consideration in the RI Report.”

WORKSHEET-SPECIFIC COMMENTS

1. Worksheet #9-1 – Project Scoping Session Participants Sheet:
 - a. Page 5, Please change the phone number for Katarina Rutkowski to (860)-305-4339.

Navy Response: The phone number has been edited as shown.

b. Page 6, Key Discussion Points, Second Paragraph:

- i. The approach for characterizing the nature and potential contamination associated with the berms includes "... intrusive investigations at select locations." Please provide the decision protocol and criteria for selecting specific locations for intrusive investigation.

Navy Response: Please see the response to General Comment #1.

- ii. At each drum location, surface and subsurface soils are to be analyzed for VOCs, SVOCs, pesticides, PCBs, inorganic constituents, and explosives. Given that drums could potentially have contained other types of organic contaminants (i.e., petroleum or herbicides) used or likely used by the Navy at Vieques, please analyze surface and subsurface soil samples at each drum location for total petroleum hydrocarbons and herbicides. This comment affects other worksheets within the document which will require updating (e.g., Worksheet #10).

Navy Response: The proposed analyses are representative of materials that may have been used by the Navy and are consistent with sampling procedures used at other Vieques sites where debris piles, including drums, have been located. In addition, TPH is not regulated under CERCLA and the proposed analyte list includes constituents found in petroleum (e.g., BTEX, PAHs).

2. Worksheet #10—Conceptual Site Model:

- a. Page 11, Environmental Questions to be Answered by the RI Sampling, Item 3: The proposed sample design for the OB/OD pits appears insufficient to document potential impacts from kick-outs. The proposed approach is to collect one discrete sample in the center of each pit. This section states, "The horizontal extent of each individual potential detonation pit will be defined visually, with the aid of the DGM findings and intrusive investigation of the associated subsurface anomalies. One hundred percent of anomalies will be intrusively investigated. One surface soil sample and one subsurface soil sample will be collected at each potential detonation area. The subsurface soil samples will be collected from directly underneath MEC or MD found during the anomaly investigation..." Please clarify the following:

- i. Please clarify what is known about how OB/OD operations were conducted, including whether donor charges were used and what type of MEC was demolished in these pits.

Navy Response: The extent of information known is stated in the Site Background Section of Worksheet #10: "Interviews conducted during the Environmental Baseline Survey (EBS) ERM, 2003 suggest PI 9 was used for munitions storage and disposal and small open burn/open detonation (OB/OD). Two possible OB/OD locations were identified during the RI south of PI 9 west (Figure 2)."

- ii. Please describe the current estimated size of the pits (include this information on page 9).

Navy Response: Worksheet #10 first sentence under the Potential Detonation Area Section has been edited as follows: "Two potential detonation areas, approximately 12 ft by 12 ft each, are located in the southwestern portion of UXO 15 (Figure 2)."

- iii. Please clarify the decision process for selecting the surface soil sample location in each pit and how this will adequately characterize soil within the pits and any kick-out area extending outward from each pit.

Navy Response: Please see the response to General Comment #1.

- iv. The text indicates that one subsurface soil sample will be collected; however, the text also states that the subsurface soil sample will be collected from beneath each MEC/MD item found in the subsurface. Please clarify whether additional contingency samples are planned should more than one MEC/MD item be found in the subsurface.

Navy Response: Please see the response to General Comment #1.

- v. Please note that EPA guidance recommends incremental sampling across an area where OB/OD pits are located (EPA Federal Facilities Forum Issue Paper: Site Characterization for Munitions Constituents, EPA-505-S-11-001, January 2012). If the results of the field visual and geophysical survey confirm the presence of the OB/OD pits, it appears that the sample design needs to be revised for consistency with the EPA-recommended method for investigation OB/OD pit areas, i.e., revise the sample design for surface soil to collect one incremental sample that is comprised of 30 increments collected from 0-6 inches from a grid that encompasses both pits. Please also ensure that there are contingent subsurface soil samples should multiple potential MC sources be found during the field surveys. Please note that should the sampling design be revised, please revise other worksheets as appropriate.

Navy Response: Please see the response to General Comment #1.

3. Page 11, Environmental Questions to be Answered by the RI Sampling,

- a. Item 1: Please add herbicides and total petroleum hydrocarbons to the list of contaminants to be assessed to evaluate potential releases from subsurface debris present in the bermed areas as these materials were used or were likely used by the Navy at Vieques and could potentially be associated with debris at the Site. This comment affects other worksheets within the document.

Navy Response: Please see the response to Specific Comment #1.b.ii.

b. Item 4:

- i. To ensure consistency with the approach used in collecting the East Vieques Background dataset, please confirm that the localized background samples will be analyzed for the following: Target Analyte List (TAL) inorganics by Method ILM05.3, explosives by Method SW846 8330, pH by method SW9045, Total Organic Carbon (TOC) by method SW9060MOD, redox potential by SM2580 B, and cation exchange capacity by method 9081.

Navy Response: Because the data from these samples are intended for comparison to target inorganics detected in soil samples within the former debris piles, they will be analyzed only for the necessary inorganics by the analytical method defined in the SAP, consistent with the analytical methodology used for the former debris pile samples.

- ii. Ten additional surface soil samples are proposed upgradient or cross gradient of each of the following former debris piles to evaluate background metals concentrations: A, C/D, and F. Two of these former debris piles (A and F) are in areas that are subject to flooding, which could have distributed metals associated with the piles to areas that are topographically upgradient and cross gradient. On this basis, it is preferable that samples in the areas of former Piles A and F be collected from areas that are not periodically flooded. Alternatively, please provide a protocol for assuring

that soil samples collected to evaluate background metals concentrations are representative of background conditions rather than redistribution of metals from the piles by periodic flooding. This comment also affects Worksheet #17.

Navy Response: Based on the extremely small areas of debris piles A and F and that they were composed of timbers (A) and small arms (F), from which a release would likely be insignificant, the background locations proposed are appropriate as they would not have been influenced by releases from either debris pile. In addition, because there are 10 background sample locations for these former debris piles, the distribution of inorganics detected in the samples will help ensure they are representative of localized background.

- iii. To assist in the evaluation of background metals in soils, it is suggested that a subset of shallow subsurface samples be collected in the vicinity of former debris piles A and F and analyzed for the same metals as surface samples. If representative of background, concentrations of metals in the surface and subsurface soils should be similar.

Navy Response: Comment noted; however, note that depth to water in this area may be shallow. It is anticipated that surface soil samples collected will be sufficient to help determine if the previous soil samples from the debris piles are attributable to background.

- iv. Page 12, Question 4: According to page 10, cadmium exceeded background and screening criteria for Pile D. Therefore, add cadmium to the list of metals to be analyzed at Debris Piles C and D in this section.

Navy Response: Cadmium has been added to Worksheet 10, response to Question No. 4 and Worksheet 11, response to Question 5.

4. Worksheet #11—Project Quality Objectives/Systematic Planning Process Statements:

- a. Worksheet 10 indicates that area-specific background concentrations will be determined; however, this worksheet indicates that the Vieques discrete surface soil inorganics screening values are the East Vieques background soil inorganics upper tolerance limits. Please clarify.

Navy Response: Soil samples from the drum locations and potential detonation area will be compared to the East Vieques background values. Soil samples collected adjacent to the former debris piles will be used for comparison to the previous soil sample collected from the former debris pile.

Further clarification has been added to the SAP.

b. Item 5:

- i. Bullet 1: Please clarify how many samples will be collected from beneath each berm, consistent with discussions of the other areas of concern in this bulleted list.

Navy Response: Please see the response to General Comment #1.

- ii. Bullet 4: Please denote the debris pile samples as background samples in the text of the report for clarity.

Navy Response: Worksheet #11, fourth bullet first sentence has been edited to read: “Ten background soil samples will be collected up- or side-.....” The second sentence has been edited to read: “Ten background soil samples will be collected at” The third sentence has been edited to read: “Ten background soil samples will be collected up gradient...”

- c. Page 13, Question 2, last bullet: The last bullet indicates that SSLs are not reliable indicators of impact to groundwater. Please indicate how potential impacts to groundwater will be evaluated if an SSL is exceeded.

Navy Response: The following has been added to Worksheet #17: “The determination of whether groundwater evaluation is warranted will be deferred until after the soil samples have been collected and their data evaluated in the context of the conceptual site model. Evaluation of the data will include multiple lines of evidence including comparison to background concentrations, proximity to groundwater and/or surface water bodies, potential source materials identified, etc.”

- d. Page 14, Question 5, last bullet: According to page 10, cadmium exceeded background and screening criteria for Pile D. Therefore, add cadmium to the list of metals to be analyzed at Debris Piles C and D in this section.

Navy Response: Please see the response to Specific Comment #3.b.iv.

5. Worksheet #15-7—Reference Limits and Evaluation Table: According to page 10, cadmium exceeded background and screening criteria for Pile D. Therefore, please add cadmium to the list of metals to be analyzed.

Navy Response: Cadmium has been added to Worksheet #15-7.

6. Worksheet #18—Sampling Locations and Methods/SOP Requirements:

- a. The text states that the soil sample depth intervals will be in accordance with the Modified Soil Sample Depth Selection Protocol in Worksheets #10, 11, 14, and 17. However, according to the footer of this worksheet, it appears that the subsurface sample depths are pre-defined (4-6 ft bgs or 2 feet above the water table). Please clarify and revise the footer as appropriate.

Navy Response: Footnote 2 has been edited to read: “For the drum and detonation area, subsurface soil samples will be collected in accordance with the Modified Soil Sample Depth Selection Protocol (Appendix B). The 4-6’ bgs interval listed in the table is included as the place holder and not necessarily the depth the sample will be collected. For the detonation area, surface soil.....”

- b. Debris Pile A: Please revise the sample IDs and the matrix from “SS” to “SD” as per Figure 6.

Navy Response: Sample IDs and the matrix are correct as shown.

- c. Debris Pile F: Please revise the sample IDs and the matrix from “SS” to “SD” as per Figure 6.

Navy Response: Sample IDs and the matrix are correct as shown.

7. Worksheet #19—Field Sampling Requirements Table: Please add the holding time for VOCs (14 days to analysis).

Navy Response: Worksheet #19 has been updated to reflect the correct holding time of 28 days for perchlorate and 48 hours to freezing for VOCs.

8. Worksheet #20—Field Quality Control Sample Summary Table, Drum Area: Please move the two trip blanks to the VOC row instead of the SVOC row.

Navy Response: Worksheet #20 has been revised to indicate that 2 trip blanks will be collected for VOCs rather than SVOCs.

9. Worksheet #28-1—Laboratory QC Samples Table: Please remove the references to laboratory and field homogenization in the corrective action associated with field duplicates, as this is not appropriate for VOCs.

Navy Response: Worksheet #28-1 has been revised so that the corrective action for field duplicates is “Qualify as per Worksheet #36.”

10. Worksheet #28-2—Laboratory QC Samples Table: Please add the acid surrogate compounds to the Surrogate Spike row since acid SVOCs are included in the target compound list.

Navy Response: Worksheet #28-2 has been updated to include all surrogate spikes, as shown below.

2,4,6-TRIBROMOPHENOL: 39-132%

2-FLUORBIPHENYL: 44-115%

2-FLUOROPHENOL: 35-115%

NITROBENZENE-D5: 37-122%

PHENOL: 33-122%

TERPHENYL-D14: 54-127%

11. Worksheet #34-36—Data Verification and Validation (Steps I and IIa/IIb) Process Table: Please update the data validation reference citations, as most of these have been revised in 2013 or 2014.

Navy Response: Worksheet #34-36 contains the data validation references to be used for this project. References updated in 2013 and 2014 do not apply to the proposed methods.

12. Attachment B: This soil sampling approach does not appear to consider munitions-related releases and the fate and transport of explosives particulates if released from munitions items. Research indicates that it resides mainly in the top 6 inches and more likely, the top 2 inches of soil. Therefore, please revise this attachment to address appropriate soil sample depths and methods for munitions constituent releases.

Navy Response: As noted in the response to General Comment #1, the sampling approach at the possible detonation areas has been changed to incremental sampling. The SOP for incremental sampling has been added to Attachment B after the Modified Soil Sample Depth Selection Protocol.

Preliminary Responses to Department of Natural and Environmental Resources Comments

DNER Comments on <i>Draft Sampling and Analysis Plan Addendum 2 for the Remedial Investigation at UXO 15 (dated: October 2015)</i> Comments Made by DNER - December 2014					
PDF Page #	Doc. Page #	SAP Wksht #	Highlighted Document Text/Summary of Content	DNER Comments	Navy Response
5	V	Acronyms and Abbrev	N/A	Add PRDNER (Department of Natural and Environmental Resources to Acronyms and Abbreviations list Add PQO (Project Quality Objectives) to Acronyms and Abbreviations list	Abbreviations added to acronym list.
12	4	2 Part 6	Puerto Rico Department of Natural and Environmental Resources (PRDNER) – The agency responsible for protecting natural resources, Commonwealth-owned conservation areas, submerged lands, and the coastal zone in the Commonwealth of Puerto Rico.	Amend to (edits in underline red): Puerto Rico Department of Natural and Environmental Resources (PRDNER) – The agency responsible for protecting natural resources, Commonwealth-owned conservation areas, submerged lands, and the coastal zone in the Commonwealth of Puerto Rico. the Puerto Rico Territorial Sea out to 9 nautical miles (10.35 statute miles) from the shore, submerged lands within the Puerto Rico Territorial Sea, associated islands, cayos and otherwise islets within the Puerto Rico Territorial Sea, and the Maritime Terrestrial Zone (one kilometer inland from the shoreline or additional distances needed to protect key coastal natural systems).	Text added as indicated in the comment.
13	5	9	Tim Reilly Contact Information	Phone Number: 978-290-1242 Email: treilly@lighthousetechnical.com	Edit made as indicated in comment.
14	6	9-1	The objective of this RI Addendum activities will be to confirm inorganics associated with the debris piles are attributable to background.	The stated objective has an inherent bias regarding inorganic source. To remove this bias, reword this sentence to: The objective of this RI Addendum activities will be to determine and confirm the source of high inorganics levels co-located with the former debris piles.	Sentence will remain as written. The initial evaluation of the inorganics data purported they were attributable to background. The objective, therefore, is to confirm this supposition.

DNER Comments on Draft Sampling and Analysis Plan Addendum 2 for the Remedial Investigation at UXO 15 (dated: October 2015) Comments Made by DNER - December 2014					
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29	21	14	Vegetation removal at UXO 15 is required to support related DGM activities at each of the berms and around the potential detonation areas. A BA of sensitive species and habitats was conducted in April 2011. A copy of the Final BA report is included with the RI SAP Addendum (CH2MHILL, 2012b) as Attachment A. The results of the BA indicated that no threatened or endangered plant or bird species were observed during the survey; however, 63.5 acres of important habitats were identified within PI 9 and PI 13.	<p>It is unclear whether vegetation clearing will occur in the mangrove, wetland and/or lagoon habitats. Will this occur as part of the proposed UXO 15 work (e.g., near former debris piles A and F)? If so, what quantity (acreage) of these habitats will be cleared? What method of clearing would be employed for these habitats?</p> <p>DNER Technical Evaluation of Navy's Preliminary Response (March 30, 2015): Mangroves are very sensitive to clearing and using the proper mangrove species-specific procedures are critical to ensure continued health of the mangrove trees. As stated in the Navy response, simply leaving the root mass in place may be insufficient to guarantee the health of the cleared mangrove trees and habitat. The response to FWS comment #15 only addresses a threatened plant species, not mangrove habitats. Mangrove trimming strategies vary by mangrove species as well. Attached to this technical evaluation is a guidance from the State of Florida for trimming Mangroves so that they will retain vitality after trimming – see especially pp 4, 7-10 of the attached mangrove trimming guidance. Pursuant to the attached – and other applicable - guidance, DNER requests clarification from the Navy regarding how mangroves will be trimmed – by species – to ensure that the 1) mangroves are preserved and 2) UXO/MEC/etc. investigations can successfully proceed.</p>	<p>Vegetation clearing will occur where necessary to ensure the objectives of the project are met. In most areas, mangroves are not present. However, if they are present in areas where surface clearance, DGM, or sampling is to occur, they will be cut to allow access, but the root mass will be left in place. See also the response to FWS comment #15.</p> <p>Navy Response to Evaluation: According to the SAP, vegetation removal will occur only along the berms (which do not occur in mangrove habitat) and at the two potential detonation areas. To help specifically address DNER's concern, a CH2M HILL biologist (with UXO avoidance support) conducted a site visit to the potential detonation areas during the week of April 27. These areas are characterized as two large nearly circular depressions, one immediately north and one immediately south of a possible historic roadway. They are</p>

<p style="text-align: center;">DNER Comments on Draft Sampling and Analysis Plan Addendum 2 for the Remedial Investigation at UXO 15 (dated: October 2015) Comments Made by DNER - December 2014</p>					
PDF Page #	Doc. Page #	SAP Wksht #	Highlighted Document Text/Summary of Content	DNER Comments	Navy Response
					<p>approximately 30-ft by 40-ft across and 4 to 5-ft deep. Other than their shape, instrument-aided visual observations do not suggest they were used as detonation areas, primarily because no metallic anomalies were identified within the depression areas using a metal detector.</p> <p>There is a single black mangrove in the south lagoon, about 3 inches in diameter. There are three black mangroves in the north depression (5, 7, and 8 inches diameter), and a couple small saplings. All of these trees have been marked with orange flagging. There are no mangroves adjacent to the depressions, or within about 50 feet. It is reasonable to assume that any DGM survey within or around the perimeter of the depressions can be conducted without cutting down any of these mangroves, and pruning my not even be necessary</p>

<p style="text-align: center;">DNER Comments on <i>Draft Sampling and Analysis Plan Addendum 2 for the Remedial Investigation at UXO 15 (dated: October 2015)</i> Comments Made by DNER - December 2014</p>					
PDF Page #	Doc. Page #	SAP Wksht #	Highlighted Document Text/Summary of Content	DNER Comments	Navy Response
					based on their spacing. If any trimming is required to facilitate use of DGM equipment, only low canopy branches (within about 5 feet of ground surface) will be trimmed.

**Responses to USFWS Comments on the
Draft Sampling and Analysis Plan Addendum 2 for the Remedial Investigation at UXO 15,
Former Vieques Naval Training Range, Vieques, Puerto Rico;
Dated October 2014**

1. SAP Worksheet 9-1, page 5: Richard Henry was present at the June 18, 2014 Project Scoping Meeting in San Juan and should be added to this worksheet.

Navy Response: Richard Henry has been added to the list on Worksheet 9-1.

2. SAP Worksheet 9-1, page 6, Key Discussion Points: Here and in several other places in this SAP Addendum, it is stated that intrusive investigations and/or sampling will be conducted at select locations in the berms. The criteria used to select locations that will be used to characterize the berms should be discussed here and in Worksheets 10, 14 and 17.

Navy Response: The anomalies selected for intrusive investigation will be presented to the Technical Subcommittee for consideration. Professional interpretation will be used to select specific anomalies to intrusively investigate, such as by the geophysical signature, shape, and size. This information has been added in the appropriate Worksheets.

3. Drums were observed at eight locations in PI-9 West and soil will be sampled and analyzed for VOCs, SVOCs, pesticides, PCBs, inorganics, and explosives. While this is a broad representation of potential contaminants that may be associated with the drums, it is suggested that this list of analytes be compared to the use of drummed materials used by the Navy during training activities and modified if appropriate.

Navy Response: The proposed analyses are representative of materials that may have been used by the Navy and are consistent with sampling procedures used at other Vieques sites where debris piles, including drums, have been located.

4. Very little information is available concerning the potential OB/OD areas south of the lagoon in the western portion of UXO-15. While the proposed approach to characterizing this area is suitable for an exploratory investigation and it may result in data sufficient to make decisions, it is suggested that language be inserted in the document which will set the stage for additional characterization should the results indicate that this area was used more intensively than anticipated and/or the data is insufficient to make decisions.

Navy Response: The fourth and fifth sentences of the answer to Question #3 have been revised as follows: "The boundaries of each potential detonation area will constitute a sampling unit because, as has been observed at SWMU 4 on the former NASD, OB/OD pits represent the most conservative sampling areas based on density of munitions-related items found. Within each sampling unit, one surface soil and a minimum of one subsurface soil sample will be collected. The surface soil samples will be incremental samples (0 – approx. 2 inches bgs, 30 increments per sampling unit).

If no subsurface anomalies are identified, one subsurface soil sample will be collected from the center of each sampling unit following the Modified Soil Sample Depth Selection Protocol for subsurface soil samples (Attachment B). If subsurface MEC or MD is identified, the subsurface soil sample(s) will be collected from directly beneath, if safe to do so. Additional subsurface soil samples may be added to

ensure sufficient characterization of the subsurface soil based on identification of the subsurface anomalies. The number of samples collected to sufficiently characterize the subsurface soil within the detonation area is subjective, and will be based on professional judgment. The rationale for the subsurface sample collection will be provided for regulatory consideration in the RI Report.” In addition, the following has been added to Worksheet #17: “The determination of whether groundwater evaluation is warranted will be deferred until after the soil samples have been collected and their data evaluated in the context of the conceptual site model. Evaluation of the data will include multiple lines of evidence including comparison to background concentrations, proximity to groundwater and/or surface water bodies, potential source materials identified, etc.”

5. Worksheet 10, page 8, Conceptual Site Model, Figure 3: This section should include a somewhat more detailed description of the ecological resources present in the terrestrial and aquatic portions of UXO-15. While it is understood that the offshore areas are part of UXO-1 6, Figure 3 should be amended to include aquatic receptors associated with the lagoons and wetlands.

Navy Response: The following paragraphs have been added under “Physical Characteristics” to provide a more detailed description of ecological resources at UXO 15:

“A variety of habitat types occur at UXO 15 including dry scrub forest, mangrove forest, secondary growth forest, evergreen scrub, areas of mixed native/naturalized and invasive vegetation, and areas of entirely invasive species.

The dry scrub forest is located on hilltops and ridges and is dominated by small diameter *trees and shrubs*. Dominant plant species include *calambreña (Coccoloba venosa)*, *corcho bobo (Pisonia subcordata)*, *gumbo limbo (Bursera simaruba)*, *muñeco (Cordia collococca)*, *torchwood (Amyris elemifera)*, *silver palm Coccothrinax sp.*, and *tamarind (Tamarindus indica)*. Dominant species associated with the mangrove forests, which occur along the northern and western shorelines, include *black mangrove (Avicennia germinans)*, *red mangrove (Rhizophora mangle)*, *white mangrove (Laguncularia racemosa)*, *buttonwood (Conocarpus erectus)*, and *portia tree (Thespesia populnea)*. Secondary growth forests contain *pink trumpet tree (Tabebuia heterophylla)*, *cassia (Senna bicapsularis)*, *torchwood (Amyris elemifera)*, and *gumbo limbo (Bursera simaruba)*. Evergreen scrub habitat generally consists of very dense low-growing, or dwarf, drought-resistant shrubs and palms found on rocky coasts and limestone formations. Common species at UXO 15 include *Thrinax morrisii*, *Erithalis fruticosa*, *beach creeper (Ernodea littoralis)*, *Coccoloba krugi*, *Coccothrinax sp.*, *button sage (Lantana involucrata)*, *seagrape (Coccoloba uvifera)*, *sea-oxeye (Borrhichia arborescens)*, *slender seapurslane (Sesuvium portulacastrum)*, and *blacktorch (Erithalis fruticosa)*. Mixed native and naturalized species included *pink trumpet tree (Tabebuia heterophylla)*, *cassia (Senna bicapsularis)*, *torchwood (Amyris elemifera)*, *gumbo limbo (Bursera simaruba)*, *sapwood (Comocladia dodonaea)*, *silver palm (Coccothrinax sp.)*, and multiple *monk orchids (Oeceoclades maculata)* on the forest floor. Invasive or introduced species including *acacia (Acacia tortuosa)*, *tan tan (Leucaena leucocephala)*, and *mesquite (Prosopis juliflora)*. Additional details are provided in the Biological Assessment in Attachment A in the RI SAP Addendum.

Terrestrial wildlife include *land crab (Cardisoma guanhumii)* colonies, *greater Antillean grackle (Quiscalus niger)*, *white-winged dove (Zenaida asiatica)*, *yellow warbler (Dendroica petechia)*, *mangrove cuckoo (Coccyzus minor)*, *clapper rail (Rallus longirostris)*, *bananaquit (Coereba flaveola)*, *pearly-eyed thrasher (Margarops fuscatus)*, *grey kingbird (Tyrannus dominicensis)*, *black-necked stilt (Himantopus mexicanus)*, *black-bellied plover (Pluvialis squatarola)*, *Wilson’s plover (Charadrius wilsonia)*, *fulvous whistling duck (Dendrocygna bicolor)*, and *Antillean nighthawks (Chordeiles gundlachii)* nesting on exposed limestone. A wide variety of organisms can occur in the coastal marine habitat, and though not specifically surveyed in relation to UXO 15, would likely include a diverse community of marine fish

(damsels, gobies, blennies, snapper, mullet, snook, tarpon), invertebrates (polychaetes, bivalves, gastropods, crustaceans, sponges, gorgonians, corals), and plants (seagrasses, marine algae)."

Figure 3 has been updated to include aquatic wildlife (birds and mammals) that may forage on aquatic organisms including fish, invertebrates, or plants, and fish and invertebrates potentially exposed to surface water and sediment in the lagoon.

6. The term "patchy beaches" used on Figure 3 to indicate sea turtle nesting areas should be revised to read "patch beaches."

Navy Response: Figure 3 has been updated as requested.

7. Worksheet 10, page 11, Environmental Questions to be Answered by the RI Sampling, Question 1: As indicated in comments on Worksheet 9-1, the criteria used to select the anomalies to be intrusively investigated should be discussed.

Navy Response: Please see the response to the comment #2 above.

8. Worksheet 10, page 11, Environmental Questions to be Answered by the RI Sampling, Question 2: As indicated in comments on Worksheet 9-1, additional thought should be given to the list of analytes.

Navy Response: Please see the response to comment #3 above.

9. Worksheet 10, page 11, Environmental Questions to be Answered by the RI Sampling, Question 3: As indicated in comments on Worksheet 9-1, should the investigation indicate that the detonation areas were insufficiently characterized, the sampling protocol will need to be expanded in the pits as well as into the associated kick-out area.

Navy Response: Please see the response to comment #4 above. The need for additional sampling will be based on the findings of the planned investigation.

10. Worksheet 10, page 11, Environmental Questions to be Answered by the RI Sampling, Question 4: Worksheet 9-1 indicates that four samples will be collected topographically up and side gradient to the debris soils to determine if the concentrations of inorganics can be attributable to local variation in background. In contrast, Worksheet 10 indicates that 10 samples will be collected to address this issue. While the collection of 10 samples is preferable, the document should clarify this discrepancy.

Navy Response: Worksheet 9 consists of the Technical Subcommittee Meeting notes. At that time four background samples were proposed. During the development of the SAP the number of background samples was increased to 10 samples to better assist with statistical comparisons of the samples.

11. Cadmium should be added to the list of analytes for Debris Piles C and D.

Navy Response: Cadmium has been added to Worksheet 10, response to Question No. 4 and Worksheet 11, response to Question 5.

12. Debris piles A and F are located adjacent to a lagoon and may be influenced by tides or seasonal and storm influenced inundation, the placement of sampling locations should avoid potential contaminant migration pathways associated with the local hydrology.

Navy Response: Based on the extremely small areas of debris piles A and F and that they were composed of timbers (A) and small arms (F), from which a release would likely be insignificant, the background locations proposed are appropriate as they would not have been influenced by releases from either debris pile. In addition, because there are 10 background sample locations for these former debris piles, the distribution of inorganics detected in the samples will help ensure they are representative of localized background.

13. Worksheet 10, page 11, Environmental Questions to be Answered by the RI Sampling, Question 5: Figure 7 does not include a step that specifically answers Question 5. This step should be between Steps 2 and 3 or included as a distinct phase of Step 3.

Navy Response: Question 5 is addressed via the “no” pathway after Step 4.

14. It is assumed that an Ecological and Human Health Risk Assessment will be conducted as part of Step 3 of the decision tree depicted in Figure 3. If this is the case, it should be stated here and in other worksheets as appropriate.

Navy Response: Question 5 refers to decision tree (which is Figure 7), which indicates human health and ecological risk assessments will be performed.

15. Worksheet 14, page 21, Vegetation Removal: While a BA was conducted in April of 2011, it is now known that the endangered plant *Varronia rupicola* occurs in the area of U X0-15 and must be considered in any vegetation removal process.

Navy Response: The VNWR refuge manager will be notified prior to site vegetation removal activities at the berms and detonation areas to allow for a site visit by refuge staff to determine if *Varronia rupicola* is present. An experienced biologist will accompany refuge staff during this survey, and in coordination with refuge staff identify what protective measures may be required during vegetation removal should this species be found.

16. Worksheet 14, page 22, Excavation of Subsurface Anomalies: Prior to initiating the removal of vegetation at the berms and the potential detonation areas, the Navy should contact the Vieques National Wildlife Refuge Manager to ensure that local populations of the endangered plant species *Varronia rupicola* are not present.

Navy Response: Please see the response to comment #15 above.

17. Worksheet 14, page 21, Excavation of Subsurface Anomalies: As indicated in comments on Worksheet 9-1, the criteria used to select the anomalies to be intrusively investigated should be discussed.

Navy Response: Please see the response to comment #2 above.

18. Worksheet 17, page 41, Former Debris Piles: If debris piles A and F are situated in the intertidal area or are influenced by seasonal and storm influenced inundation, the sampling protocol should be modified to reflect potential contaminant migration patterns associated with local hydrology and aimed at collecting sediment that is outside of the influence of the debris piles.

Navy Response: Please see the response to comment #12 above.

19. Attachment B, page 80, Surface Soil: For clarity, it should be mentioned that the surface soil sample (0 to 24 inches; 0 to 12 inches; 0 to 6 inches) will represent a composite of all soil collected from the specified interval.

Navy Response: The soil sampling interval will be determined by the criteria listed in Attachment B. Each sample collected in this manner is a discrete sample not classified as a composite sample.

20. Question 4 posed in the Environmental Questions to be Answered by the RI Sampling section of Worksheet 10 and the Former Debris Pile section of Worksheet 17 indicate that soil and/or sediment will be collected from the 0 to 6 inch interval to determine if inorganics are attributable to background. These sections further indicate that debris piles A and F are periodically undated and the samples will be designated as sediment. The document should specifically indicate that the sampling proposed is a modification of the Surface Soil sampling protocol which indicates that the sample interval will be from 0 to 24 inches where the sample location is near a surface water body and land crabs or burrowing reptiles are potential receptors of concern.

Navy Response: The samples proposed for background consideration are being collected to compare results to previously collected soil sample collected below a debris pile from the 0 to 6 inch interval. The previous soil samples were collected in accordance with the Vieques Modified Soil Sample Depth Selection; however, for ecological characterization previously, the soil samples were considered sediment.

21. Attachment B, page 80, Subsurface Soil: For clarity, it should be mentioned that the subsurface soil sample will be a composite of all soil collected from the bottom of the surface soil interval to the depth determined using the Subsurface Soil protocol.

Navy Response: Note that Attachment B, the Modified Soil Sample Depth Selection Protocol defines the soil sample depth selection protocol. The soil sample methodology collection is in accordance with the Master Standard Operating Procedures, Protocols, and Plans. The subsurface soil samples are not composite soil samples.

22. A subsurface soil sample is collected from the 2 foot interval directly beneath a subsurface munitions item (MEC and MD) or the highest anomaly reading identified using a geophysical instrument-aided technique. It should be noted that the maximum depth of this interval may or may not be at 6 feet; the maximum of this subsurface sample will be a function of the upper depth of the interval as well as site specific conditions.

Navy Response: The statement is accurate as written. There are many scenarios that will require a field call at the time of sampling. The protocol is listed for the most common scenarios and the project team will be able to make sampling decisions at the time of sampling.