11/22/11 ENTERED

DEPARTMENT OF THE AIR FORCE
27TH SPECIAL OPERATIONS MISSION SUPPORT GROUP (AFSOC)
CANNON AIR FORCE BASE NEW MEXICO

Ronald A. Lancaster
Chief, Asset Management Flight
506 N DL Ingram Blvd
Cannon AFB NM 88103

Ms. Lane Andress
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East Bldg 1
Santa Fe NM 87505-6063

Dear Ms. Andress

Attached is the November 2011 Final Sampling and Analysis Plan for Remedial Action Construction at Solid Waste Management Unit (SWMU) 109 Cannon Air Force Base, New Mexico, for your review and approval.

If you have any questions regarding this submittal, please contact Mr. Matthew Higginbotham, Restoration Program Manager at (575) 784- 1092.

Sincerely

RONALD A. LANCASTER
Chief, Asset Management Flight

Attachment:
November 2011 Final Sampling and Analysis Plan for Remedial Action Construction at Solid Waste Management Unit (SWMU) 109

cc:
New Mexico Environment Department, Mr. David Cobrain w/o Attachment

Air Commandos

QAPP Worksheet #1
Title and Approval Page

FINAL

SAMPLING AND ANALYSIS PLAN

(Field Sampling Plan / Quality Assurance Project Plan)

NOVEMBER 2011

REMEDIAL ACTION CONSTRUCTION AT
SOLID WASTE MANAGEMENT UNIT (SWMU) 109
CANNON AIR FORCE BASE, NEW MEXICO

Prepared for:
Air Force Center for Engineering and the Environment
Lackland Air Force Base
San Antonio, Texas

Prepared by:
RMA-Insight EECI
4620 Northgate Boulevard, Suite 155
Sacramento, California 95834
(916) 923-3335

Prepared under:
Contract No. FA8903-09-D-8578-0002

Reviewed By: _____ _____

Nick Weinberger
RMA-Insight Project Chemist — Date

Approved By: _____ _____

Dave Marks, PG
RMA-Insight Project Manager — Date

EXECUTIVE SUMMARY

This Sampling and Analysis Plan (SAP) [Field Sampling Plan (FSP) / Quality Assurance Project Plan (QAPP)] has been prepared by RMA-Insight Environmental Engineering and Construction, Inc., Joint Venture (RMA-Insight) to identify and remediate the continued impact to soils by total petroleum hydrocarbon (TPH) as diesel range organics (DRO) at Solid Waste Management Unit (SWMU) 109 located in the former Fire Training Area Number 4 (FTA4) at Cannon Air Force Base (AFB) in New Mexico. This SAP is being prepared under the Air Force Center for Engineering and the Environment (AFCEE) Award Contract No. FA8903-09-D-8578-0002.

This SAP will be used as a reference document by all field and laboratory personnel engaged in the sampling and analysis for this project. This SAP is prepared in accordance with the requirements of the Uniform Federal Policy (UFP) for Quality Assurance Project Plans (Intergovernmental Data Quality Task Force [IDQTF], 2005).

Cannon AFB is an active installation located in southeastern Curry County, New Mexico. The installation is approximately 6 miles west of Clovis and south of U.S. Highway 60/84, near the New Mexico-Texas border. The base has been active for more than 60 years and started as a training base for B-17 crews during World War II. Cannon AFB occupies approximately 4,000 acres south of U.S. Highway 60/84. The area surrounding Cannon AFB is utilized for farming and ranching. Cannon AFB also maintains several satellite facilities.

Previous remedial actions (RAs) by others left impacted soils in place. The primary objectives of this RA are to (1) fully delineate the area of remaining TPH-DRO contamination in soil and (2) remove all remaining impacted soil. To delineate the remaining TPH-DRO in soil, soil samples will be collected from 8 borings advanced in the area south and west of the concrete lined pit. The samples will be analyzed to assess whether there is TPH-DRO, and to define the lateral and vertical extent of TPH-DRO in soil. Soils with TPH-DRO concentrations greater than 940 milligrams per kilogram (mg/kg) will be considered for removal. The New Mexico Environmental Department (NMED) has established this concentration as the clean-up criteria.

Selected samples from the borings will be analyzed for TPH-DRO by an offsite analytical laboratory using EPA Method 8015B. In addition, duplicate soil samples from the same interval will be field screened with a photo ionization detector (PID) to develop correlation criteria between PID readings and the more definitive-level laboratory data.

Once the areas of remaining TPH-DRO contamination have been delineated, soil excavation will be conducted to remove the contamination. Soils with TPH-DRO concentrations less than 940 mg/kg that overlie soils with TPH-DRO contamination greater than 940 mg/kg will be segregated and stockpiled separately. During excavation, a field portable PID will be used for screening-level assessment of the lateral and vertical extent of the TPH-DRO greater than 940 mg/kg.

After the TPH-DRO contamination has been excavated, confirmation soil samples will be collected from the bottom and sidewalls of the excavation to document the TPH-DRO concentrations remaining in the soil after excavation. A 20' by 20' sample grid will be established and superimposed over the bottom of the excavation. One discrete sample will be collected from each grid cell and analyzed for TPH-DRO by EPA Method 8015B at an offsite analytical laboratory. Sidewall confirmation samples will be collected at a frequency of one per 100 linear feet. Additional soil will be excavated, as practicable, if the confirmation sample analytical results indicate TPH-DRO concentrations greater than the 940 mg/kg clean-up criteria. Following any additional excavation, new confirmation samples will be collected from the failing grid cell.

After the grid cell has been excavated and confirmation sample analytical results indicate the remaining TPH-DRO concentrations are less than 940 mg/kg, the excavation will be considered complete at that cell.

Soil samples will be collected from the soil stockpile containing overburden and other soils which were field screened and determined to contain TPH-DRO concentrations less than 940 mg/kg. These samples will be analyzed by an offsite analytical laboratory. The results will be used to assess the appropriateness of using the soil for backfill. The soil will be used for backfill if concentrations are less than 940 mg/kg TPH-DRO.

Samples from the soil stockpile containing TPH-DRO greater than 940 mg/kg will be collected and submitted to an off-site laboratory for chemical analysis. Based on the results, the AFCEE contractor responsible for transport and disposal will characterize the waste and select an appropriate offsite landfill based on the waste profile.

Project History:

SWMU 109 (the Fire Training Area) was activated in 1974 and is located near the southeast corner of Cannon AFB, approximately 2,000 feet southeast of the end of Runway 31. Approximately 3,000 to 4,000 gallons of fuel were released to the ground surface as a result of fire training exercises from 1974 to 1975. During its operational phase, SWMU 109 consisted of a concrete-lined pit and berm. A mock airplane was formerly located in the center of the pit and used for the fire-training exercises. The pit contained internal drainage features such that excess fuel/water was drained to the oil/water separator (SWMU 112) located in the northeast part of the site. From 1974 to 1975, co-mingled waste oils, solvents, and recovered JP4 were used at the SWMU. Between 1975 and 1995, only recovered JP-4 had reportedly been used.

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LIST OF FIGURES

ATTACHMENTS

ABBREVIATIONS AND ACRONYMS

AFB	Air Force Base
AFCEE	Air Force Center for Engineering and the Environment
aka	also known as
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
COC	chain-of-custody
COR	Contracting Officer's Representative
DOD	Department of Defense
DOT	United States Department of Transportation
DPT	direct push technology
DQO	Data Quality Objective
ELAP	Environmental Laboratory Accreditation Program
EPA	Environmental Protection Agency
ERPIMS	Environmental Resources Program Information Management System
FTA4	Fire Training Area 4
GPS	global positioning satellite
HAZWOPER	hazardous waste operations and emergency response
JP4	jet propellant 4
LDC	Laboratory Data Consultants, Inc.
mg/kg	milligram per kilogram
µg/L	microgram per liter
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NCR	Non-conformance report
NMED	New Mexico Environmental Department
OSHA	Occupational Safety and Health Administration
PAL	Project Action Level
PCS	petroleum contaminated soil
PID	photo ionization detector
POC	point of contact
PPE	personal protective equipment
ppm	parts per million
PQO	project quality objective
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control

QCM	Quality Control Manager
QCR	Quality Control Report
QCSR	Quality Control Summary Report
QSM	Quality Systems Manual
RA	Removal Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RL	reporting limit
RMA-Insight	RMA/Insight Environmental Engineering and Construction, Inc. Joint Venture
RPD	relative percent difference
SOP	Standard Operating Procedure
SSHP	Site Safety and Health Plan
SWMU	Solid Waste Management Unit
TA	TestAmerica
TBD	to be determined
TCLP	toxicity characteristic leaching procedure
TPH-DRO	total petroleum hydrocarbons as diesel range organics
TPHg	total petroleum hydrocarbons as gasoline
UFP	Uniform Federal Policy
USACE	United States Army Corps of Engineers

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Number: SWMU 109 (aka FT-C109)
Operable Unit: N/A
Contractor Name: RMA-Insight Environmental Engineering and Construction, Inc. Joint Venture (RMA-Insight)
Contract Number: FA8903-09-D-8578-0002
Contract Title: Small Business Performance-Based Environmental Multiple Award Contract

1. This Sampling and Analysis Plan [Field Sampling Pan (FSP)/ Quality Assurance Project Plan (QAPP)] was prepared in accordance with the requirements of the *Uniform Federal Policy for Quality Assurance Project Plans (UFP-QAPP)* (IDQTF, 2005) and *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS* (U.S. EPA 2002).

2. Identify regulatory program: USEPA and NMED requirements

3. Identify Approval Entity: NMED

4. This QAPP is a project-specific QAPP.

5. List dates of scoping sessions that were held:

Scoping Session	Date

6. List dates and titles of any QAPP documents written for previous site work that are relevant to the current investigation.

Title	Date
Accelerated Corrective Measures Work Plan for the Removal of Contaminated Soil at SWMU 109.	November 2008

7. List organizational partners (stakeholders) and connection with lead organization:
EPA, Cannon AFB, and New Mexico Environmental Department

8. Lead organization:
AFCEE

9. If any required QAPP elements or required information are not applicable to the project or are provided elsewhere, then note the omitted QAPP elements and provide an explanation for their exclusion below:

UFP-QAPP Worksheet #	Required Information	Crosswalk to Related Information
A. Project Management		
Documentation		
1	Title and Approval Page	
2	Table of Contents SAP Identifying Information	
3	Distribution List	
4	Project Personnel Sign-Off Sheet	
Project Organization		
5	Project Organizational Chart	
6	Communication Pathways	
7	Personnel Responsibilities and Qualifications Table	
8	Special Personnel Training Requirements Table	
Project Planning/ Problem Definition		
9	Project Planning Session Documentation (including Data Needs tables) Project Scoping Session Participants Sheet	
10	Problem Definition, Site History, and Background. Site Maps (historical and present)	
11	Site-Specific Project Quality Objectives	
12	Measurement Performance Criteria Table	
13	Sources of Secondary Data and Information Secondary Data Criteria and Limitations Table	
14	Summary of Project Tasks	
15	Reference Limits and Evaluation Table	
16	Project Schedule/Timeline Table	
B. Measurement Data Acquisition		
Sampling Tasks		
17	Sampling Design and Rationale	

18	Sampling Locations and Methods/ SOP Requirements Table Sample Location Map(s)	
19	Analytical Methods/SOP Requirements Table	
20	Field Quality Control Sample Summary Table	
21	Project Sampling SOP References Table Sampling SOPs	Step-by-step sampling procedures are included within Worksheet #17.
22	Field Equipment Calibration, Maintenance, Testing, and Inspection Table	
Analytical Tasks		
23	Analytical SOPs Analytical SOP References Table	
24	Analytical Instrument Calibration Table	
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	
Sample Collection		
26	Sample Handling System, Documentation Collection, Tracking, Archiving and Disposal Sample Handling Flow Diagram	
27	Sample Custody Requirements, Procedures/SOPs Sample Container Identification Example Chain-of-Custody (COC) Form and Seal	
Quality Control Samples		
28	QC Samples Table Screening/Confirmatory Analysis Decision Tree	
Data Management Tasks		
29	Project Documents and Records Table	
30	Analytical Services Table Analytical and Data Management SOPs	
C. Assessment Oversight		
31	Planned Project Assessments Table	

	Audit Checklists	
32	Assessment Findings and Corrective Action Responses Table	
33	QA Management Reports Table	
D. Data Review		
34	Verification (Step I) Process Table	
35	Validation (Steps IIa and IIb) Process Table	
36	Validation (Steps IIa and IIb) Summary Table	
37	Usability Assessment	

QAPP Worksheet #3
Distribution List

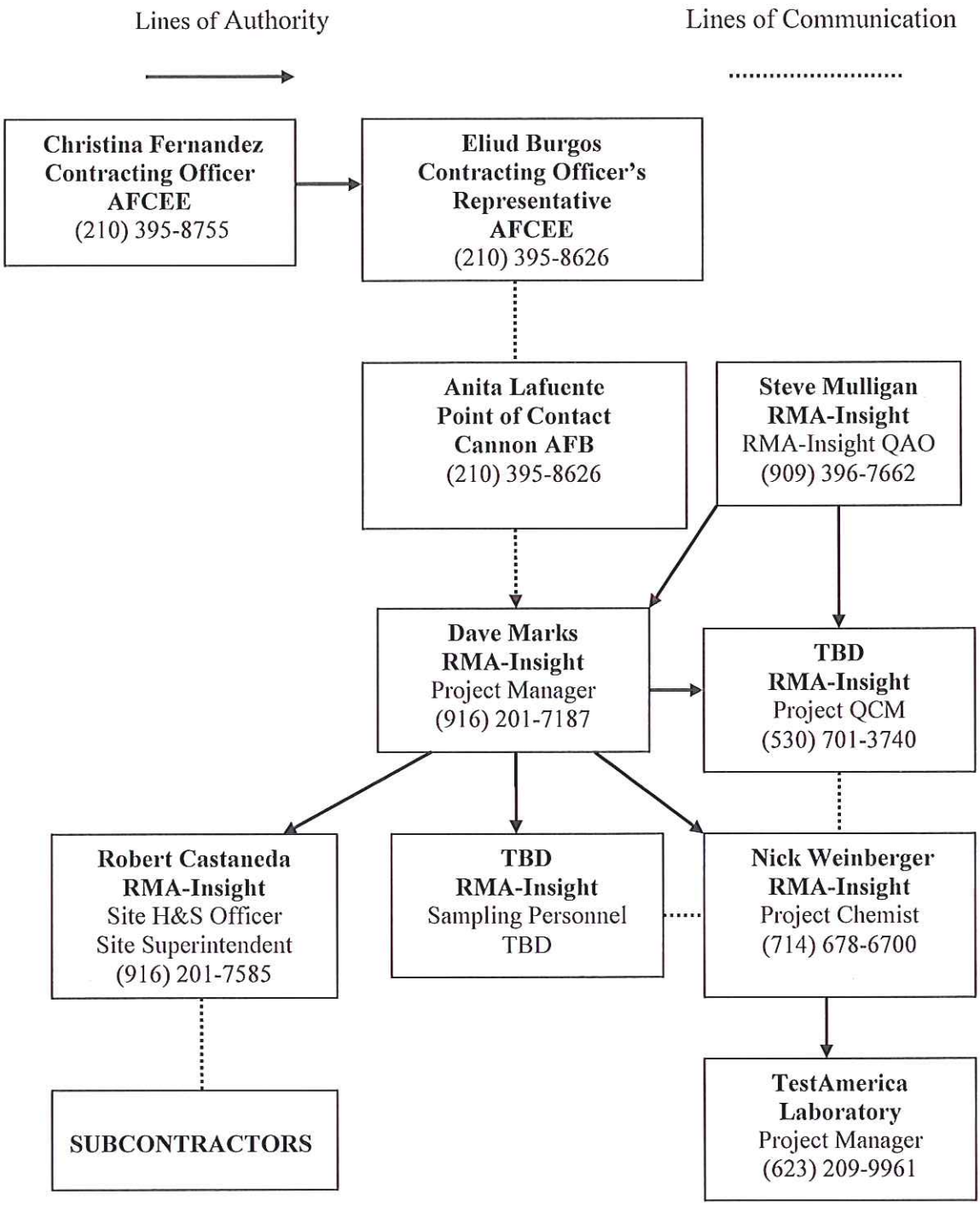
Name of QAPP Recipients	Title/Role	Organization	Telephone Number	E-mail Address or Mailing Address
Eliud Burgos	Contracting Officer Representative	AFCEE	210-395-8626	Eliud.burgos@cannon.af.mil
Anita Lafuente	Cannon AFB Point of Contact	Cannon AFB	575-784-1092	Anita.lafuente@cannon.af.mil
Christina Fernandez	Contracting Officer	AFCEE	210-395-8755	Christina.fernandez@us.af.mil
Karen Walker	Point of Contact Alternate	Cannon AFB	210-533-5100	karenw@ageiss.com
Steve Mulligan	Quality Assurance Officer	RMA/Insight	(909) 396-7662	smulligan@ieeci.com
Dave Marks	Project Manager	RMA/Insight	(916) 923-3335	dmarks@ieeci.com
Ken Bowen	Project SAP/QAPP Preparer	RMA/Insight	(916) 923-3335	kbowen@ieeci.com
Richard Burzinski	Project SAP/QAPP Preparer	RMA/Insight	(916) 923-3335	rburzinski@ieeci.com
Nick Weinberger	Project Chemist / Data Validator	RMA/Insight	(714) 678-6700	nweinberger@ieeci.com
Robert Castaneda	Site Health and Safety Officer / Superintendent	RMA/Insight	(916) 201-7585	rcastaneda@ieeci.com
Off-Site Analytical Lab	Laboratory Manager	Test America	(623) 209-9961	
Off-Site Analytical Lab	Laboratory QAO	Test America	(623) 209-9961	

QAPP Worksheet #4
Project Personnel Sign-Off Sheet

Prior to start of the project, the SAP will be provided to the following individuals for review. The undersigned acknowledge receipt and will implement the plan and requirements of this SAP. If only a portion of the SAP was reviewed, note the section(s) reviewed. This sign-off sheet (with appropriate signatures) will be scanned and filed in the project file.

Name	Organization/Title/Role	Signature/E-mail Receipt	SAP Section Reviewed	Date SAP Read
Nick Weinberger	RMA-Insight/Project Chemist			
Mr. Richard Burzinski	RMA-Insight/ Project Quality Control Manager			
Names to be determined two weeks prior to field activities	RMA-RMA-Insight Sampling Personnel			
TestAmerica	TestAmerica Project Manager/Analytical Laboratory			
Linda Rauto	Laboratory Data Consultants (LDC) /Project Manager/Third Party Data Validation			

QAPP Worksheet #5
Project Organizational Chart



QAPP Worksheet #6 – Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Point of contact (POC) for Cannon AFB quality issues	Cannon AFB POC	Anita LaFuenta	(575) 784-1092	The Cannon AFB POC will review and approve this SAP and all amendments prior to start of sampling. If changes in sampling procedures or strategy are required, the POC will be notified by phone or email.
Project Management	RMA-Insight Project Manager	Dave Marks	(916) 923-3335	Project Manager will manage all phases of the project.
Project management for AFCEE	AFCEE Contracting Officer's Representative (COR)	Eluid Burgos	(210) 395- 8626	The COR will ensure that the project scope of work requirements are fulfilled.
Field quality control oversight	RMA-Insight	Robert Castaneda	(916) 923-3335	Verify that all fieldwork is completed in accordance with contract and project requirements.
Field Health and Safety oversight	RMA-Insight	Robert Castaneda	(916) 923-3335	Verify that the Health and Safety Plan is adhered to.
SAP review	RMA-Insight QAO	Steve Mulligan	(909) 396-7662	The RMA-Insight QAO oversees project quality, ensuring that quality assurance activities are performed in accordance with the project and AFCEE requirements. The RMA-Insight QAO will communicate the status of quality activities to the AFCEE QAO by phone or by email.
Coordination and communication of fieldwork activities related to sampling	RMA-Insight Sampling Personnel	TBD[1]	(916) 923-3335	Sampling personnel will communicate relevant field information to the Project Manager and Project Chemist

QAPP Worksheet #6 – Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
Coordination and communication of field activities related to sampling, laboratory and data validation	RMA-Insight Project Chemist	Nick Weinberger	(714) 678-6700	The Project Chemist will be the primary point of contact with the analytical laboratory and validation subcontractor. However, others may contact the laboratory or data validation subcontractors as needed.
Submittal of samples to the laboratory	RMA-Insight Sampling Personnel	TBD[1]	(916) 923-3335	Sampling personnel will package and ship samples in accordance with this SAP.
Chain of Custodies (COCs) and shipping documentation	RMA-Insight Sampling Personnel	TBD[1]	(916) 923-3335	COCs and shipping documentation will be submitted via fax or e-mail to the Project Chemist at the end of each day that samples are collected.
Reporting laboratory data quality issues	TestAmerica Laboratory Project Manager	TBD[1]	(623) 209-9961	All Quality Assurance (QA)/Quality Control (QC) issues will be reported by the Laboratory Project Manager to the Project Chemist by telephone or e-mail within 2 business days.
Field and analytical corrective actions	Project Quality Control Manager (QCM)	TBD[1]	(530) 701-3740	The project QCM will immediately notify the Project Manager and Program Chemist in writing of any field or analytical procedures that were not performed in accordance with this SAP. The Project Chemist will complete documentation of the nonconformance and corrective actions to be

QAPP Worksheet #6 – Communication Pathways

Communication Drivers	Responsible Affiliation	Name	Phone Number	Procedure
				taken. The Project Chemist will verify that the corrective actions have been implemented.
Release of analytical data	RMA-Insight Project Chemist	Nick Weinberger	(714) 678-6700	The Project Chemist will review faxed/e-mailed data to verify that data quality is met as described in this SAP prior to releasing the data. Analytical data will be released to the Project Manager (or designee) after the Project Chemist has verified that the data are in accordance with the SAP requirements.
SAP procedure revision during field activities	RMA-Insight Project Chemist	Nick Weinberger	(714) 678-6700	If minor changes to the SAP are required in the field, the project QCM will get the Project Manager's and/or Project Chemist's approval before implementing the changes. The field change will be noted in the dailies. Any major changes to the SAP will require approval from the Project Manager, RMA-Insight Quality Assurance Officer (QAO), AFCEE COR, and the AFCEE Contracting Officer.
SAP amendments	RMA-Insight Project Chemist	Nick Weinberger	(714) 678-6700	Major changes to the SAP will require that the Project Chemist, in conjunction with the RMA-Insight QAO, prepare an addendum that will be approved by the AFCEE QAO prior to any field activities.

TBD[1] – To be determined. Sampling personnel and laboratory project manager have not been identified at this time. Names of sampling personnel and laboratory project manager will be identified and included in the Final version.

QAPP Worksheet #7
Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
Anita Lafuente	Point of Contact	Cannon AFB	Assist with coordination of support identified in the base support letter provided with the RFP.
Christina Fernandez	Contracting Officer	AFCEE	Performing project management for the AFCEE Ensuring that the project scope of work requirements are fulfilled Overseeing the project cost and schedule Providing formal technical direction to the RMA-Insight project team, as required Acting as lead interface with agencies
Eliud Burgos	COR	AFCEE	The COR has the primary responsibility for providing on-site QA and safety oversight of contractors. Providing AFCEE oversight of RMA-Insight's Quality Assurance Program Providing technical and administrative oversight of RMA-Insight's surveillance audit activities Reviewing and approving SAP Coordinating training on matters pertaining to generation and maintenance of quality of data Acting as Point of Contact for matters concerning quality assurance and the AFCEE's Laboratory Quality Assurance Program Authorizing the suspension of project execution if quality assurance requirements are not adequately followed
Stephen Mulligan	RMA-Insight QAO	RMA-Insight	The RMA-Insight QAO is responsible for ensuring and overseeing quality control activities performed during the project. The RMA-Insight QAO will ensure the activities described in this document are performed, verify the

QAPP Worksheet #7
Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
			qualifications and training of responsible individuals, identify and initiate corrective action for nonconformance, and communicate with the AFCEE QAO when issues arise which affect AFCEE or the performance of the contract's scope. The RMA-Insight QAO is independent of cost and schedule responsibility and has the authority to stop work if non-conformance is identified that would affect project quality.
Dave Marks	Project Manager	RMA-Insight	Coordinating work activities of subcontractors and RMA-Insight personnel and ensuring that all personnel adhere to the administrative and technical requirements of the project Monitoring and reporting the progress of work and ensuring that the project deliverables are completed on time and within project budget Monitoring the budget and schedule and notifying the POC and the COR of any changes that may require administration actions Ensuring adherence to the quality requirements of the contract, project scope of work, and the QC plans Ensuring that all work meets the requirements of the technical specifications and complies with applicable codes and regulations Ensuring that all work activities are conducted in a safe manner in accordance with the Site Safety and Health Plan, US Army Corps of Engineers (USACE) *Safety and Health Requirements* (EM-385-1-1)(USACE, 2003), and all applicable Occupational Safety and Health Administration (OSHA) regulations Serving as the primary contact between the POC, the COR, and RMA-Insight for actions and information related to the work and including appropriate RMA-Insight technical personnel in the decision-making

QAPP Worksheet #7
Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
			Coordinating satisfactory resolution and completion of evaluation and acceptance report for nonconformance reports Ensuring that all technical work meets the requirements of the technical specifications and complies with applicable codes and regulations Ensuring that all work is conducted in accordance with the QAPP
Robert Castaneda	Site Superintendent and Site Health & Safety Officer	RMA-Insight	Ensuring that all fieldwork is conducted in accordance with the SAP Providing direction to field staff and subcontractors Reporting field information to the Project Manager and Project Chemist
Richard Burzinski	Project QCM	RMA-Insight	The Project QCM has the authority to stop work on site-related issues affecting the quality of work performed and for directing the correction of all non-conformance work.
TBD[1]	Sampling Personnel	RMA-Insight	Ensuring that all fieldwork is conducted in accordance with the SAP Providing direction to field staff and subcontractors Reporting field information to the Project Manager and Project Chemist

QAPP Worksheet #7
Personnel Responsibilities and Qualifications Table

Name	Title/Role	Organizational Affiliation	Responsibilities
Nick Weinberger	Project Chemist	RMA-Insight	Implementing contract requirements for chemical data collection Supporting projects in chemical data collection and analysis Monitoring performance of the subcontract laboratory and the data validator Ensuring that sampling personnel have documented training on sampling procedures for specific project requirements Evaluating and selecting a qualified subcontract laboratory Reviewing laboratory data prior to use against requirements in this SAP Evaluating and selecting a qualified data validation subcontractor Reviewing data validation reports Preparing a data quality assessment report to ensure the quality of the data meets the intended use of the data Submitting Environmental Resources Program Information Management System (ERPIMS) formatted data to AFCEE

TBD[1] – To be determined. Sampling personnel have not been identified at this time. Names of sampling personnel will be identified and included in the Final version.

QAPP Worksheet #8
Special Personnel Training Requirements Table

Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates
Sampling	8-hour OSHA HAZWOPER Supervisor Refresher	Safety Unlimited, Inc.	03/31/2011	Robert Castaneda	Site Superintendent	Insight
Site Safety and Health	CPR/First Aid 30-hour OSHA Construction Safety and Health	ProTraining Dr. M. Sassoon, CIH	03/16/2011 06/11/2010	Robert Castaneda	Site Safety and Health Officer	Insight
Competent Person	OSHA Excavation Competent Person	National Environmental Trainers, Inc.	12/28/2007	Robert Castaneda	Site Superintendent	Insight
Heavy Equipment Operator	Certified Equipment Operator	IEECI	various	Robert Castaneda	Heavy Equipment Operator	Insight

QAPP Worksheet #9
Project Scoping Session Participants Sheet

Complete this worksheet for each project scooping session held.

Project Name: Remedial Action Construction **Projected Date(s) of Sampling:** January to March 2012 **Project Manager:** Dave Marks, PG	**Site Name:** SWMU 109 **Site Location:** Canon Air Force Base, New Mexico
Date of Session: TBD **Scoping Session Purpose:** Define removal action approach	

Name	Title	Affiliation	Phone No.	E-mail Address	Project Role
Eliud Burgos	COR	AFCEE	(210) 395-8626	EBurgos@us.af.mil	COR
Dave Marks	Project Manager	RMA-Insight	(916) 923-3335	dmarks@ieeci.com	Project Manager
Robert Castaneda	Site Superintendent	RMA-Insight	(916) 923-3335	rcastaneda@ieece.com	Site H&S Officer Site Superintendent

Comments/Decisions:

Action Items:

Consensus Decisions:

QAPP Worksheet #10
Problem Definition

The problem to be addressed by the project:
The objective of this field program is to remove remaining contaminated soil that exceeds 940 mg/kg from SWMU 109 based on the results of confirmation sampling conducted as part of a 2005 soil removal action by others.

The environmental questions being asked:
Is the soil free from petroleum hydrocarbon contamination?

Observations from any site reconnaissance reports:
Excavation will take place in the area where TPH-DRO was detected at levels exceeding NMED guidelines during soil removal action in March and April 2005.

A synopsis of secondary data or information from site reports:
All visually impacted petroleum contaminated soil will be removed before the initiation of sampling and analysis activities addressed in this SAP.

The possible classes of contaminants and the affected matrices:
Petroleum contaminated soil.

The rationale for inclusion of chemical and nonchemical analyses:
After removal of any visibly contaminated soil, confirmation soil samples will be collected and analyzed for petroleum constituents to verify that no petroleum contamination remains.

Information concerning various environmental indicators:
Site maps are included in this SAP.

Project decisions conditions:
If results for petroleum analyses show petroleum contamination, additional soil will be excavated and additional samples collected and analyzed until results indicate no petroleum contamination remains above 940 mg/kg using analyses method 8015 for TPH-DRO.

QAPP Worksheet #11
Project Quality Objectives/Systematic Planning Process Statements

Who will use the data?

The data will be used by AFCEE as the lead agency responsible for reducing TPH-DRO concentrations in soil to eliminate the risk posed to human health. The NMED will provide regulatory oversight.

What are the Project Action Limits?

For soil, the PAL is a TPH concentration of 940 mg/kg.

What will the data be used for?

Soil samples will be collected before, during and after excavation. The pre-excavation soil samples will be used to identify areas with TPH-DRO concentrations greater than the PAL, which will require excavation.

After the excavation, confirmation soil samples will be collected to document the remaining soil TPH-DRO concentrations. The goal is to have TPH-DRO concentrations less than the PAL after excavation. The post-excavation confirmation sample analytical results will be used to make decisions regarding the excavation of the TPH-DRO source. Additional excavation will be conducted in areas where confirmation samples have TPH-DRO concentrations greater than the PAL, however, the additional excavation will only be conducted if (1) deemed practical by the onsite Competent Person (e.g., the soil is not at a significant angle of repose) or (2) it is within the capabilities of the equipment at hand (e.g., within the reach of the long-arm excavator).

The soil stockpiles will be sampled to verify that the "clean" soil stockpile has TPH-DRO concentrations less than the PAL and is, therefore, suitable for use as backfill. Stockpiled soil with TPH-DRO concentrations greater than the PAL will be transported to an offsite disposal facility.

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

TPH-DRO concentrations in soil are needed to make the decisions required by this project. The soil samples collected before the excavation will be analyzed by a DOD ELAP-certified, and a State-certified and AFCEE-approved, analytical laboratory using EPA method 8015B.

The pre-excavation soil samples will be collected from the continuous core produced with a combination auger and dual-tube, direct push technology.

The soil samples collected during excavation will be screening-level samples and will be analyzed onsite by field personnel using a field portable PID. The samples collected during the excavation will be collected from the excavator bucket.

Confirmation soil samples collected from the excavator bucket will be analyzed by a State-certified and AFCEE-approved analytical laboratory using EPA method 8015B.

QAPP Worksheet #11
Project Quality Objectives/Systematic Planning Process Statements

Waste characterization samples will be analyzed by an off-site laboratory that is State-certified and AFCEE-approved. The soil samples will be collected by hand-digging into the soil stock pile. The waste characterization analyses will be that which the disposal facility requires.

Backfill material will be analyzed for total petroleum hydrocarbons as gasoline (TPHg), the constituents of benzene, toluene, ethyl benzene, and total xylenes (BTEX), and TPH-DRO.

How "good" do the data need to be in order to support the environmental decision?

The pre-excavation and post-excavation soil samples need to provide more reliable data, and therefore be of a higher quality, than the samples collected during excavation. This is because the pre-excavation sample data will be used to make decisions about where to excavate that will affect the success of the removal action. These samples will be analyzed by a State-certified and AFCEE-approved analytical laboratory using EPA method 8015B.

The TPH-DRO concentration data to be collected during excavation will determine the depth of the excavation. These data are screening-level using field instrumentation. These data do not need to be as high of quality because they will be verified by the more definitive post-excavation confirmation samples, which will be analyzed by a certified laboratory. A field portable PID will provide the screening-level data faster and less expensively than the higher quality data offered by a certified laboratory. This higher limit of detection is acceptable because there will be more definitive post-excavation confirmation samples to confirm soil has been sufficiently excavated.

The waste characterization samples need to be reliable because they are being used to decide the proper disposition of the waste.

How much data should be collected/generated?

Eight soil borings are proposed to identify the TPH-DRO contamination and characterize the lateral and vertical extent of TPH-DRO where previous sampling indicated that TPH-DRO concentrations greater than the PAL were present. As described in WS #18, the number of soil samples to be collected from each boring is contingent on the encountered depth to contaminated soil.

It is estimated that approximately 100 screening-level soil samples will be collected during excavation for analysis with the field portable PID.

The number of confirmation samples will be contingent upon the size of the excavation. The extent of anticipated excavation area is shown on Figure 3. The excavation bottom will be divided into a 20-foot grid. Within each grid cell, a discrete sample will be collected from a randomly selected location within the grid cell. Sidewall confirmation samples will be collected at a rate of one per 100 linear feet of expanded excavation.

QAPP Worksheet #11
Project Quality Objectives/Systematic Planning Process Statements

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

Samples will be collected by RMA-Insight personnel with over 20 years of experience in the collection of soil samples. At least one of the personnel conducting the sampling will be knowledgeable in the use of the PID. The analytical results associated with the pre-excavation samples will be submitted in a Technical Memorandum to AFCEE and regulatory agencies for review prior to excavation.

Off-site sample analysis will be performed by a DOD ELAP-certified analytical laboratory.

All results will be reported in a Removal Action Closeout Report. Analytical results will be provided weekly in the contractor quality control summary report (QCSR) to AFCEE. All data will be in ERPIMS format.

How will the data be archived?

Project documents including laboratory data will be maintained and archived as described in Worksheet #29.

List the Project Quality Objectives (PQOs) in the form of if/then qualitative and quantitative statements.

The main objective of this removal action is to eliminate the risk to human health caused by TPH-DRO in soil. The first step in accomplishing this objective is to identify the source of TPH-DRO in soil; the second step is to alleviate the source.

To identify the source, subsurface sampling will be conducted at 8 soil boring locations. The source will be considered soil with TPH-DRO concentrations greater than 940 mg/kg. Additional investigation may be required if soil samples collected from perimeter soil borings exceed TPH-DRO concentrations of 940 mg/kg.

Excavation will be conducted in the area(s) determined to be the areas of remaining contamination. During excavation, soil samples will periodically be collected and screened using a field-portable PID to determine the depth of the excavation. If concentrations are detected, then additional excavation will be conducted, if possible. If during excavation, TPH-DRO concentrations are not detectable by the PID, excavation will stop at that particular depth/direction, and a confirmation sample will be collected.

The post-excavation confirmation sample analytical results will be used to make decisions regarding success in excavation of the TPH-DRO contamination. If analysis of the confirmation samples indicates TPH-DRO concentrations greater than the PAL, additional excavation (a one-foot lift) will be conducted in the grid cell from which the failing confirmation sample was collected. However, the additional excavation will not be performed if deemed not practical or feasible by the onsite Competent Person.

QAPP Worksheet #12
Measurement Performance Criteria Table

QC Sample	Analytical Group	Frequency	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
Field Duplicate	TPH-DRO (soil)	10 percent	Precision	RPD ≤ 50 percent	S+A
Equipment Rinseate	TPH-DRO (water)	One per day	Accuracy	No analyte detected above the RL.	S
Source Blank	TPH-DRO (water)	Not applicable	Accuracy	No analyte detected above the RL	S
Temperature Blank	TPH-DRO (soil and water)	1 per cooler	Comparability	$4^{\circ} \pm 2^{\circ}$ C	S

Field Duplicate

Field quality control samples will be collected and analyzed during the project to assess consistency and performance of the sampling program. For this project, field duplicates will be collected per frequency listed above for each matrix. The samples from which field duplicates will be collected are listed in Worksheet #18. Soil field duplicates will be collocated soil samples.

Equipment Rinseate

One equipment rinseate will be collected per day of sampling. Equipment rinseate samples help determine the effectiveness of the decontamination process and potential for cross-contamination during sampling events. Equipment rinseate is a sample of analyte-free, water collected from a final rinse of sampling equipment after a decontamination procedure has been performed. Rinseate samples will be collected directly from the sampling equipment.

Source Blank

A source blank consists of analyte-free water provided by the laboratory to be used for the collection of equipment rinseate samples. In order to assure that the source blank is free of contamination, the laboratory will be asked to provide a certificate of analysis. The certificate of analysis certifies that the water provided for the equipment rinseate samples does not contain analytes above the reporting limit (RL). The equipment rinse samples will be collected using the certified source water and the source blank will not be collected for this project.

Temperature Blank

A temperature blank is a container of tap water that is shipped in each cooler containing field samples and ice. Laboratory personnel will use the temperature blank to measure the temperature of the cooler upon arrival at the laboratory.

QAPP Worksheet #13
Secondary Data Criteria and Limitations Table

Secondary Data	**Data Source** (originating organization, report title and date)	**Data Generator(s)** (originating organization, data types, data generation / collection dates)	**How Data Will Be Used**	**Limitations on Data Use**
Analytical data of the soil samples collected at SWMU 109 in 2004 as part of an exploratory action.	Phase I Investigation at Fire Training Area 4 (TN&A 2005).	Collected 34 soil samples from ten boreholes in vicinity of concrete pad and analyzed the samples for TPH-DRO.	The TPH-DRO concentration data was used to select investigative soil boring locations.	There are no limitations for the use of the secondary data.
Confirmation soil samples collected during excavation of soil in 2005.	Final Voluntary Corrective Measures Report for Fire Training Area No. 4, Cannon Air Force Base, New Mexico (May 2005)	Tetra Tech collected five sidewall and 3 floor samples and analyzed the samples for TPH-DRO during March 2005.	The TPH-DRO concentration data will be used to select investigative soil boring locations.	There are no limitations for the use of the secondary data.

QAPP Worksheet #14
Summary of Project Tasks

Major Tasks – Soil Excavation and Segregated Stockpiling

- Pre-excavation soil sampling
- Soil excavation
- Screening-level analysis of soil TPH-DRO concentrations
- Post-excavation confirmation soil sampling
- Decontamination
- Characterize soil stockpiles
- Survey site features and confirmation soil sample locations.
- Data management including third-party validation

Step-by-step procedures are presented in Worksheet #17.

Pre-Excavation Soil Sampling

A combination auger and direct push technology (DPT) rig will be used to advance exploratory borings at 8 locations throughout SWMU 109. Most of the borings will be located in and around the proposed excavation Soil samples will be collected from each boring. The data obtained from the investigation will be used to determine where to excavate.

Soil Excavation

Soil will be excavated at the TPH-DRO source. It is anticipated that most of the source material to be excavated will be between 0 and 40 feet. The TPH-DRO contaminated soil will be excavated and then transferred to a separate location where it will be stockpiled. Efforts will be made to separate the clean soil from the contaminated soil. Excavation activities will continue until soils can no longer be practically excavated or confirmation sample analytical results indicate TPH-DRO concentrations are less than 940 mg/kg.

Screening-Level Analysis

Soil samples will be field checked for TPH-DRO using an onsite, field portable PID.

Post-excavation Confirmation Soil Sampling

At the completion of excavation activities in an area, the excavator bucket will be used to retrieve select samples of the material at the bottom of the excavation and sidewalls of the excavation in accordance with Worksheet 11 – *How Much Data Should be Collected/Generated.* These samples are intended to document the TPH-DRO concentrations (if any) that remain in the subsurface after excavation. The goal is for all confirmation samples to have TPH-DRO concentrations less than the PAL. Additional excavation will be conducted, if practical and feasible, at grid cells from which a confirmation sample that exceeds the PAL was collected, if any. The procedures used to collect confirmation samples are described in Worksheet #17.

Decontamination

All reusable sampling equipment potentially contaminated with target analytes will be decontaminated. Equipment will be decontaminated by washing with low-residue, anionic detergent (e.g., Liquinox), followed by two separate fresh water rinses. Decontamination procedures are specifically discussed in Worksheet # 17.

Characterize Soil Stockpiles

Soil samples will be collected from the soil stockpiles and analyzed by a certified analytical laboratory. The data will be used to evaluate the soil's potential for use as backfill within the excavation or to characterize the soil for offsite disposal. Stockpile sampling procedures are discussed in Worksheet #17.

Survey Site Features and Confirmation Sample Locations

Site features will be surveyed using a handheld GPS. A 20' by 20' grid will be superimposed over the bottom of the excavation. This grid will be used to guide confirmation sample locations. Sidewall samples will be collected every 100 feet along the wall of the excavation.

Data Management including Third-Party Validation

The rest of this worksheet is dedicated to describing data management procedures. All laboratory-supplied data will be validated by a third party as described in Worksheet #34 and #35.

Procedures for Recording and Correcting Field Data

- Field documents shall include daily Contractor Quality Control Reports (CQCRs), field logbooks, photographic documentation, and daily progress reports. All field entries will be made in indelible ink. Field documents will allow a reviewer to reconstruct applicable events from entries made in chronological order and in sufficient detail. Corrections to documentation shall be made by placing a single line through the incorrect entry and noting the corrected information, recorder's initials, and the date the correction was performed. The logbook will serve as the primary record of fieldwork activity.
- A daily CQCR shall be prepared, dated, signed by the project contractor quality control representative, and sent to the COR for review. These reports shall include weather information at the time of sampling, identification of all field and control samples taken, departures from the approved QAPP, any problems encountered, and instructions from AFCEE personnel. Any deviations that may affect data quality objectives shall be conveyed to AFCEE personnel (remedial project manager, technical representative, COR, and the AFCEE QAO). A sample copy of a CQCR is in Attachment 1.
- Project field logbooks shall be permanently bound and have consecutively numbered pages. The site name and project name and number shall be recorded on the inside front cover of the logbook. All pertinent information regarding the site and sampling procedures shall be documented as near to real-time as possible. At the conclusion of each day, the person maintaining the logbook shall sign and date the day's documentation entries. Notations shall be made in logbook fashion, noting the time and date of all entries. Information recorded in other project documents shall not be repeated in the field logbook, except in

summary form to avoid transcription errors. Logbooks shall be kept in the field team member's possession or in a secure place during fieldwork. Following site activities or if the logbook is completely filled, the logbook shall become a part of the project file as noted previously.

- If it is necessary to transfer the logbook to another person during the course of field work, the person relinquishing the logbook will sign and date the logbook at the time it is transferred, and the person receiving the logbook will do likewise.
- Photographs are the most accurate and convenient record of field personnel observations. Keeping a record of photographs taken is crucial to their validity as a representation of an existing situation. For each photograph taken, the following items shall be noted in the field logbook: date, time, photographer, site name, general direction faced and description of the subject, file number, and site photo map. A sample copy of a field Photography Log sheet is in Attachment 1.
- A daily progress report (Contractor Production Report) will be prepared to summarize field activities. This report will describe sampling and field measurements, equipment used, RMA-Insight and subcontractor personnel on site, QA/QC and health and safety activities, problems encountered, corrective actions taken, deviations from the QAPP, and explanations for the deviations. The daily progress report is prepared by the field superintendent and submitted to the project manager and to the AFCEE COR, if requested. The content of the daily reports will be summarized and included in the final report submitted for the field activities. A sample copy of a Contractor Production Report is in Attachment 1.

Procedures for Recording and Correcting Laboratory Data

- The laboratory shall provide 90 percent Level III-equivalent data packages and 10 percent Level IV-equivalent data packages as required to perform validation in accordance with EPA (2004) guidance for data review. The packages will include a case summary, sample receipt, chain-of-custody, instrument calibration logs, sample preparation logs, sample analysis/run logs, sample results forms, QC sample analysis results, acceptance criteria, calculations, raw data printouts, and sample disposable records. All data will be verified as described in Worksheet #34.
- The laboratory shall provide data deliverables in format that is compatible with the project database. All laboratory deliverables will be submitted within 21 calendar days of receipt of samples.
- Electronic data will be reviewed to ensure that results for all samples and analyses are reported.
- Electronic data will be verified to ensure that the electronic data deliverable is consistent with the hardcopy report submitted by the laboratory. Finally, data validation will be conducted to check for irregularities in analyte identities, concentrations, and units.
- When revisions to data reports are required, the revised pages (an original and copy) shall be stamped with the notation "amended or revised report." If revisions affect the ERPIMS

submittal, a revised ERPIMS will then be sent along with the revised hardcopy pages. In addition, a hardcopy or electronic copy of items submitted to the validator by the laboratory will also be submitted to the Project Chemist.

Data Management Steps

The project files will be maintained in accordance with contract requirements and contractor SOPs. Location of the files is presented in Worksheet #29. Project documents and records will be submitted to AFCEE

- Copies of all chain-of-custody forms shall be maintained in the project file until receipt of the laboratory report. A copy of the chain-of-custody will be retained until the final acceptance of the laboratory report and data validation, when the chain-of-custody with the laboratory report will become the official record.
- The laboratories will maintain all relevant raw data and documentation, including but not limited to logbooks, data sheets, electronic files, and final reports for at least seven years.
- AFCEE will be notified 30 days before disposal of any relevant laboratory records.
- One copy of the laboratory report will be maintained in the project files. The second hardcopy of the laboratory report will be submitted for third-party validation.
- All electronic data will be transmitted in the ERPIMS format. Data will be submitted to AFCEE approximately 30 days after completion of validation.

Quality System Reporting

Reporting of quality assurance reviews to the project manager will be the responsibility of the RMA-Insight QAO. The RMA-Insight QAO will provide e-mail or memorandum to the Project Manager of quality assurance activities as they are performed, identifying deviations from planned quality assurance activities, uncorrected exceedances of quality control measurements and findings of data verification and validation which would warrant additional quality surveillance to ensure the data collected was sufficient for the use intended.

Data Review

This section describes the procedures used to review, verify and validate data collected during the sampling events. The purpose of data review, verification, and validation for this project is to ensure data collected meet the project quality objectives (PQOs) outlined in this QAPP and data quality is sufficient to support the project decisions.

Review of project data will include an initial completeness assessment to determine whether all required measurements are collected and data deliverables are present (e.g., case narratives, chain-of-custodies, etc.).

To ensure that field decisions are being made based on data of known quality, real-time measurements, including QC sample results, will be reviewed by the Project Manager and Project Chemist. Quality control data will be included with the daily field analytical data to facilitate the association of QC samples with the analytical batches run during the day. These data will be reviewed by the Project Chemist regularly to ensure that data quality objectives (DQOs) are attained. Final field analysis

reports and data submissions will include second level review by subcontractor supervisory personnel, in accordance with the subcontractor quality assurance requirements.

Fixed laboratory data generated during this remedial action will be subject to two levels of review within the laboratory. A peer and supervisory-level review will be completed to verify analyte identification, quantitation, and QC data. The review process will be performed in accordance with the laboratory quality assurance manual and will be in compliance with the DOD Quality Systems Manual (QSM) (DOD, 2010).

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: Diesel Range Organics 8015 DRO

Analyte	CAS Number	Project Action Limit (mg/Kg)	Project Action Limit Reference[1]	Project Quantitation Limit Goal (mg/Kg)	Laboratory-specific[2]	
					QLs (mg/Kg)	MDLs (mg/Kg)
Diesel Range Organics	STL00143	940	NMED	4	4	0.678

[1]List the type and source of the PAL used for each matrix specific analyte (e.g. Background, HH-MCL, HH-region III RBC, eco-WQC, eco-Region III BTAG, etc.)

[2]Laboratory-specific MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. MDLs may be subject to update.

QAPP Worksheet #16
Project Schedule/Timeline Table

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Collection of soil samples	RMA-Insight	01/01/12	03/01/12	Daily CQC reports	NLT 24 hours after workday
Lab analysis of soil samples	TestAmerica	01/20/12	03/20/12	Electronic data deliverable and comprehensive chemical data packages	EDD 10 days, packages 20 business days after receipt of samples
Data review and usability assessment	RMA-Insight	02/01/12	04/01/12	Quality Control Summary Report	30 days after completion of all analyses
Remedial Action Closure Report	RMA-Insight	05/01/12	05/01/12	RACR	Pre Project Close-Out

QAPP Worksheet #17
Sampling Design and Rationale

To implement removal action at SWMU 109, soil samples will be collected prior to excavation activities to help identify the extent of TPH-DRO. Then the impacted area will be excavated and disposed. During excavation, soil samples will be collected for screening-level analysis. After the excavation, soil samples will be collected to document remaining TPH-DRO concentrations. Sampling design and rationale for this removal action are discussed below. Additional Work Plan Elements are included in Attachment 2. Standard Operating Procedures (SOP) are included in Attachment 3.

Drilling and Sampling: Since the specific extent of PCS requiring removal at SWMU 109 is not known, excavation will take place after further investigation. Historical data indicate the highest TPH-DRO concentrations remain along the south area of the concrete lined pit and along the south boundary of the 2005 excavation (to 2-feet bgs). Eight (8) soil borings will be advanced and continuously sampled to 60 feet bgs (or as described below) to delineate the extent of contamination toward the south. Figure 4 shows an approximate lateral extent of PCS (in red) exceeding the NMED residential clean-up goal, and proposed boring locations.

RMA-Insight methodology to determine soil boring depths and locations most effectively and define the lateral and vertical extent of PCS exceeding the PAL TPH-DRO include: 1) terminating a boring shallower than 60 feet if two consecutive 10-foot intervals do not exhibit visual TPH-DRO contamination, and 2) advancing a step-out boring where an initial location exhibits visual TPH-DRO contamination to total depth of the boring.

The first four borings are numerically labeled in an order that will provide efficient evaluation of the extent of PCS. Final borehole locations may be adjusted to accommodate field conditions and/or screening results from previous boreholes.

A soil samples will be collected from each 10-foot core and analyzed for TPH-DRO by a qualified laboratory. The sample selected for analysis from each 10-foot core will be determined by both field screening and visual inspection. The 10-foot core will be continuously field screened. The soil within the 10-foot sample that exhibits the highest PID will be submitted for analysis. If a sample for laboratory analysis cannot be determined by field screening, the sample to be submitted will be the shallowest depth determined by visual inspection. Drilling will be performed by a qualified and licensed drilling firm (Vista Geoscience) using a combination auger and DPT type rig. This rig is equipped with four-inch solid stem augers which will penetrate the 5-foot caliche zone previously encountered at 33 feet bgs at SWMU 109.

An experienced RMA-Insight field geologist will supervise the drilling, log the boreholes, collect samples, and perform field screening, as necessary. Continuous soil sampling will be performed resulting in accurate lithologic logs of the boreholes. Visual observations will be made and headspace screening will be conducted at each sample interval using a PID until the lateral and vertical extent of contamination has been delineated. All sample collection, field data acquisition and drilling activities will be performed in accordance with this QAPP and Site Safety and Health Plan (SSHP). We anticipate that field work will be performed in Level D personal protective equipment (PPE). Personnel protective equipment will include chemical resistant gloves, splash goggles.

QAPP Worksheet #17
Sampling Design and Rationale

anticipate that field work will be performed in Level D personal protective equipment (PPE). Personnel protective equipment will include chemical resistant gloves, splash goggles.

Upon completion, each borehole will be properly backfilled from the bottom up with hydrated bentonite/grout. Down-hole tools and equipment will be properly decontaminated before each use. The location of each completed boring will be accurately mapped **to less than 1-foot accuracy** using a Trimble GeoExplorer™ GPS unit. All data will be evaluated and recommendations presented to AFCEE before excavation and disposal proceeds at the site.

Excavation and Stockpiling

PCS from the area of the former fire training pit within SWMU 109 will be excavated and stockpiled during this task.

- Temporary erosion and sediment control
- Excavation of PCS
- Stockpiling and management of soils prior to transportation and offsite disposal
- Confirmation and waste characterization stockpile soil sampling

Excavation will be performed with an excavator and will begin in the area(s) of highest contamination to optimize excavation efficiency and minimize removal of clean soils. The excavation will be benched or sloped for safety. RMA-Insight's excavation supervisor (Mr. Robert Castaneda), a certified competent person in excavation safety, will be onsite during all excavation activities.

Excavation activities will be directed based on real-time field screening of the soils. Based on previous sampling and soil removal activities, staining is indicative of levels of TPH that exceed the NMED guidelines. Therefore visual observation and headspace screening of the soil will be used to help define the limits of the excavation, such that soil exhibiting staining will be removed to the maximum depth required. In order to efficiently manage the PCS that will require offsite disposal, stockpiles will be segregated based on headspace screening and visual observation of the soil while the soil is being excavated. Clean soil stockpiles will be segregated from the stockpiles containing PCS that will require offsite disposal. Clean soil and PCS stockpiles will be sampled as discussed in the next section. RMA-Insight will use comparable excavation and stockpiling procedures to those discussed in Appendix A of the 2008 Work Plan Addendum (Tetra Tech 2008). Appropriate excerpts of this document will be found as Attachment 3 of this QAPP. Once field screening indicates all impacted soils have been removed above the clean-up goal, confirmation soil samples will be collected.

Based on existing site subsurface data, we anticipate groundwater will not be encountered during the removal action at SWMU 109. RMA-Insight will conduct excavation activities during the dry season to limit the potential for storm water collection in the excavation. If encountered, storm water that ponds in the excavation will be allowed to evaporate. If storm water ponds in an area that has not been cleared through confirmation samples and the water requires discharge, a sample of the water will be

QAPP Worksheet #17
Sampling Design and Rationale

collected and analyzed in accordance with state and federal requirements, prior to discharge. If encountered, saturated soils will be stockpiled separately and allowed to air dry prior to loading, transport and off-site disposal.

Confirmation and Stockpile Soil Sampling

Confirmation samples will be collected from the sidewalls and floor of the excavation to confirm the presence or absence of contamination. Sidewall samples will be discretely collected at a frequency of one per 100 feet along the perimeter of the excavation. Floor samples will be discretely collected at a frequency of one per 400 square feet, equivalent to an area of 20 feet by 20 feet. Field duplicate samples will be collected at a frequency of 5 percent compared to the confirmation samples and will be collected at random corresponding to any of the confirmation samples.

The confirmation soil samples will be analyzed for TPH-DRO using EPA SW-846 method modified 8015M. The excavation sidewalls and floor soil will be sampled according to is the protocol included in Appendix A of the 2008 Tetra Tech Work Plan Addendum (see Attachment 3). The analytical results for confirmation samples will be evaluated in accordance with current NMED guidance (NMED 2006).

During excavation activities, one composite sample per 500 cubic yards will be collected from within the PCS stockpiles in order to characterize the soil for offsite disposal. The stockpile soil samples will be analyzed in accordance with this QAPP and disposal facility requirements.

Upon receipt of the analytical data, RMA-Insight's project chemist will review the results and submit a recommendation to AFCEE for review. If stockpiled soil is certified as "clean" such that the concentration of TPH-DRO is less than NMED criteria based on the analytical results, the soil may be used for excavation backfill material. If analytical results indicated the soil is contaminated, then offsite disposal of this soil will be performed.

Offsite Transportation and Disposal

Offsite disposal of PCS is required when TPH-DRO exceeds the NMED guideline of 940 mg/kg. Although Toxicity Characteristic Leaching Procedure(TCLP) results from analyses performed during the 2005 soil removal activities indicated the soil was not a hazardous waste, similar TCLP analyses will be performed during this phase of work to confirm the PCS is non-hazardous. PCS is a New Mexico Special Waste and will require transportation and disposal as indicated under Title 20 of the New Mexico Administrative Code Chapter 9, Part 1, Section 708. If results of the waste characterization sampling indicate that the PCS is hazardous, the soil will require transportation to a permitted Resource Conservation and Recovery Act (RCRA) hazardous waste disposal facility.

RMA-Insight will provide oversight for waste loading and transportation off-base and ensure off-haul trucks are fitted with liners and taped secure. Manifests for each load of waste will be signed by the Cannon AFB Project Manager. RMA-Insight will provide copies of the waste manifests to Cannon AFB for project documentation.

QAPP Worksheet #17
Sampling Design and Rationale

In an effort to minimize truck traffic and greenhouse gas emissions, RMA-Insight will utilize the nearest permitted facility to accept the PCS. The Hobbs, NM Hydrocarbon Landfarm Facility (operated by Rhino Environmental Services, Inc.) is the preferred disposal site. The selection of disposal facilities is dependent upon RMA-Insight's review of their permits and the proximity of the disposal facility to Cannon AFB.

The off-haul will deliver its waste load of soil and its liner to the landfill, and then the ff-haul trucks will be loaded with clean fill on their return trip to the site (after dumping their loads and the liner at the disposal facility). After dumping its clean soil at the site, the off-haul truck will be fitted with another liner. This will significantly reduce the amount of truck traffic required as trucks will be hauling materials both to and from the site. Heavy equipment for excavation, stockpiling, loading, and backfilling operations will be rented locally from Associated Supply Company, Inc. in Clovis, NM.

Excavation Backfilling

The excavation will be backfilled with clean material imported from a local offsite source and any certified clean soil remaining onsite after excavation and disposal. Either direct dumping or the use of a backhoe or wheel loader will be used to place backfill in maximum 1-foot lifts. The weight of the equipment will be used to compact the soil backfill material. Mechanical compaction to 90 percent of standard Proctor and geotechnical testing are not required.

Backfill soil will be imported from a local source and will be assumed to be certified clean so that no testing will be required. . The excavation will be backfilled and mounded only after the following conditions are met: 1) sidewall and bottom confirmation soil sample results indicate clean-up goals have been met, 2) analytical results indicate the backfill material is clean, and 3) AFCEE provides approval. n will be conducted to allow for positive drainage and to prevent ponding of water within the excavation area. Revegetation of the area will not be required for this project. Specific information related to backfilling can be found in Section 4.2.3.3 and Appendix A of the Tetra Tech 2008 Work Plan Addendum (see Attachment 3 of this QAPP).

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
B1-10	Soil	10	TPH-DRO	1	SOP 3(1)
B1-20	Soil	20	TPH-DRO	1	SOP 3(1)
B1-30	Soil	30	TPH-DRO	1	SOP 3(1)
B1-40	Soil	40	TPH-DRO	1	SOP 3(1)
B1-50	Soil	50	TPH-DRO	1	SOP 3(1)
B1-60	Soil	60	TPH-DRO	1	SOP 3(1)
B2-10	Soil	10	TPH-DRO	1	SOP 3(1)
B2-20	Soil	20	TPH-DRO	1	SOP 3(1)
B2-30	Soil	30	TPH-DRO	1	SOP 3(1)
B2-40	Soil	40	TPH-DRO	1	SOP 3(1)
B2-50	Soil	50	TPH-DRO	1	SOP 3(1)
B2-60	Soil	60	TPH-DRO	1	SOP 3(1)
B3-10	Soil	10	TPH-DRO	1	SOP 3(1)
B3-20	Soil	20	TPH-DRO	1	SOP 3(1)
B3-30	Soil	30	TPH-DRO	1	SOP 3(1)
B3-40	Soil	40	TPH-DRO	1	SOP 3(1)

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
B3-50	Soil	50	TPH-DRO	1	SOP 3[1]
B3-60	Soil	60	TPH-DRO	1	SOP 3[1]
B4-10	Soil	10	TPH-DRO	1	SOP 3[1]
B4-20	Soil	20	TPH-DRO	1	SOP 3[1]
B4-30	Soil	30	TPH-DRO	1	SOP 3[1]
B4-40	Soil	40	TPH-DRO	1	SOP 3[1]
B4-50	Soil	50	TPH-DRO	1	SOP 3[1]
B4-60	Soil	60	TPH-DRO	1	SOP 3[1]
B5-10	Soil	10	TPH-DRO	1	SOP 3[1]
B5-20	Soil	20	TPH-DRO	1	SOP 3[1]
B5-30	Soil	30	TPH-DRO	1	SOP 3[1]
B5-40	Soil	40	TPH-DRO	1	SOP 3[1]
B5-50	Soil	50	TPH-DRO	1	SOP 3[1]
B5-60	Soil	60	TPH-DRO	1	SOP 3[1]
B6-10	Soil	10	TPH-DRO	1	SOP 3[1]
B6-20	Soil	20	TPH-DRO	1	SOP 3[1]

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
B6-30	Soil	30	TPH-DRO	1	SOP 3[1]
B6-40	Soil	40	TPH-DRO	1	SOP 3[1]
B6-50	Soil	50	TPH-DRO	1	SOP 3[1]
B6-60	Soil	60	TPH-DRO	1	SOP 3[1]
B7-10	Soil	10	TPH-DRO	1	SOP 3[1]
B7-20	Soil	20	TPH-DRO	1	SOP 3[1]
B7-30	Soil	30	TPH-DRO	1	SOP 3[1]
B7-40	Soil	40	TPH-DRO	1	SOP 3[1]
B7-50	Soil	50	TPH-DRO	1	SOP 3[1]
B7-60	Soil	60	TPH-DRO	1	SOP 3[1]
B8-10	Soil	10	TPH-DRO	1	SOP 3[1]
B8-20	Soil	20	TPH-DRO	1	SOP 3[1]
B8-30	Soil	30	TPH-DRO	1	SOP 3[1]
B8-40	Soil	40	TPH-DRO	1	SOP 3[1]
B8-50	Soil	50	TPH-DRO	1	SOP 3[1]
B8-60	Soil	60	TPH-DRO	1	SOP 3[1]

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
B1-110	Soil	10	TPH-DRO	1	SOP 3[1]
B2-110	Soil	10	TPH-DRO	1	SOP 3[1]
B3-110	Soil	10	TPH-DRO	1	SOP 3[1]
B4-110	Soil	10	TPH-DRO	1	SOP 3[1]
B5-110	Soil	10	TPH-DRO	1	SOP 3[1]
CF1-1-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-2-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-3-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-4-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-5-15	Soil	15	TPH-DRO	1	SOP 3[1]
CF1-6-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-7-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-8-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-9-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-10-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-11-15	soil	15	TPH-DRO	1	SOP 3[1]

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
CF1-12-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-13-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-14-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-15-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-16-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-17-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-18-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-19-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-20-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-21-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-22-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-23-15	soil	15	TPH-DRO	1	SOP 3[1]
CF1-7-115[2]	soil	15	TPH-DRO	1	SOP 3[1]
CF1-14-115[2]	Soil	15	TPH-DRO	1	SOP 3[1]
SP1-1A, SP-1B, and SP-1C[3,4]	soil	2	TPH-DRO	5 (to be composited into one at the laboratory)	SOP 3[1]

QAPP Worksheet #18
Sampling Locations and Methods/SOP Requirements Table

Sampling Location ID Number	Matrix	Depth (feet)	Analytical Group	Number of Samples	Sampling SOP Reference
SP1-2A[3,4]	soil	2	TPH-DRO, TCLP SVOCs, TCLP VOCs, TCLP metals, TCLP pesticides, TCLP herbicides, ignitability, reactivity	5 (to be composited into one at the laboratory)	SOP 3[1]
SP2-1A, SP2-1B, and SP2-1C[3,5]	soil	2	TPH-GRO, BTEX, PAHs, CAM 17 Metals, TPH-DRO	5 (to be composited into one at the laboratory)	SOP 3[1]

(1) Sampling Procedures are presented in SOP 3 in Attachment 3.

(2) Collocated Field Duplicate Sample.

(3) Five individual samples to be composited by the laboratory into one composite sample. See worksheet 17 for guidance on how to collect samples from a stockpile.

(4) The analytical from these samples will be used for waste profiling and for information purposes.

(5) The analytical from these samples will be used to determine the suitability of the material for use as backfill. The samples will be collected from the stockpile containing overburden and other soils thought to have TPH-DRO concentrations less than 940 mg/kg.

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Analytical / Preparation Method SOP Reference[1]	Containers (number, size, and type)	Sample volume[2] (units)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time[3] (preparation / analysis)
Soil	GC Semi VOA	DV-GC-0002 & DV-GC-0027 / DV-OP-0016 & DV-OP-0007	1, 4oz, glass jar	60 grams	Cool < 6°C	14 days to extract – 40 days from extract
Water	GC Semi VOA	DV-GC-0020 & DV-GC-0026 / DV-OP-0006 & DV-OP-0007	2, 1 liter, amber	2000mL	Cool < 6°C	7 Days to extract - 40 days from extract
Soil	GC Semi VOA	DV-GC-0020 & DV-GC-0026 / DV-OP-0016 & DV-OP-0007	1, 4oz, glass jar	60 grams	Cool < 6°C	14 days to extract – 40 days from extract

[1] Refer to the Analytical SOP References table (Worksheet #23).

[3]Maximum holding time is calculated from the time the sample is collected to the time the sample is prepared/extracted.

[2] The minimum sample size is based on analysis allowing for sufficient sample for reanalysis. Additional volume is needed for the laboratory Matrix Spike/Matrix Spike Duplicate sample analysis.

QAPP Worksheet #20
Field Quality Control Sample Summary Table

Matrix	Analytical Group	No. of Sampling Locations	No. of Field Duplicates[1]	No. of MS/MSDs[2]	No. of Field Blanks	No. of Equip. Blanks	No. of Volatile Organic Analysis Trip Blanks	No. of Proficiency Testing Samples	Total No. of Samples to Lab
Soil	TPH-DRO	71	7	4	0	(3)	0	0	82
Water	TPH-DRO	0	0	0	0	4	0	0	4

2 Although the matrix spike/matrix spike duplicate (MS/MSD) is not typically considered a field QC, it is included here because location determination is often established in the field.

1 One field duplicate sample will be collected for every 10 samples collected.

3 One equipment blank sample will be collected for each day of sampling.

Volatile organic analysis blanks are not need for TPH-DRO analyses.
MS/MSD = matrix spike/matrix spike duplicate

QAPP Worksheet #21
Project Sampling SOP References Table

Reference Number	Title, Revision Date and / or Number	Originating Organization of Sampling SOP	Equipment Type	Modified for Project Work? (Y/N)	Comments
C1	Photoionization Detectors	RMA-Insight	PID	N	
C2	Soil Sampling	RMA-Insight	trowel	N	
C3	Soil Stockpile Sampling	RMA-Insight	trowel	N	
C4	Sample Handling and Documentation	RMA-Insight		N	
C5	Headspace Screening of Soil	RMA-Insight	PID	N	
C6	Soil Sampling from Excavator Bucket	RMA-Insight	trowel	N	
C7	Decontamination of Equipment	RMA-Insight		N	

SOPs are included in Appendix C.

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Activity	Frequency	Acceptance Criteria	Corrective Action	Resp. Person	SOP Reference	Comments
Field Portable PID	Calibration check with manufacturer provided reference standard	Daily	±20 percent	Calibrate according to manufacturer's instructions	Sampling Personnel	SOPs 1 and 6	None

PID = Photo Ionization Detector

The field portable PID is calibrated at the factory and typically holds its calibration well. The PID, therefore, is not expected to require calibration by the operator. Instead, the calibration will be checked daily with a manufacturer-provided reference standard.

A number of samples to be analyzed by an analytical laboratory will also be analyzed with the field-portable PID. The screening level concentrations will be compared to the more definitive laboratory reported concentrations. The results will be plotted to assess bias. The least squares fit will be used to "correct" future PID results to account for this bias. There are a number of factors that can affect PID results, such as the presence of water or pebbles that can interfere with the transmissions to the instrument detectors.

QAPP Worksheet #23
Analytical SOP References Table

Lab SOP Number	Title, Revision Date, and / or Number	Definitive or Screening Data	Matrix and Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?[1] (Y/N)
DV-GC-0002	Revision 9.2, 09/24/2010 Diesel and Residual Range Organics (DRO and RRO) by GC/FID (SW846 Method 8015B, NWTPH-HCID, and NWTPH-Dx)	Definitive	DRO, RRO, AK102, and AK103	GC	TestAmerica Denver	N

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria[1]	Corrective Action (CA)	Person Responsible for CA	SOP Reference
GC – 8015 DRO	Six-point initial calibration for all target analytes	Initial calibration prior to sample analysis. Perform instrument re-calibration once per year minimum.	RSD of CF ≤ 20% Linear – least squares regression r2 ≥ 0.99, r ≥ 0.995	Correct problem then repeat initial calibration	Lab Manager/Analyst	DV-GC-0027
	Initial calibration verification	Immediately following five-	All analytes within ≤15% of	Correct problem then repeat initial	Lab Manager/Analy	DV-GC-0027

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria[1]	Corrective Action (CA)	Person Responsible for CA	SOP Reference
	(ICV), must be from a 2nd source.	point initial calibration	expected value	calibration	st	
	Continuing calibration verification (CCV)	Before sample analysis, after every 10 samples, and at the end of the analysis sequence	All analytes within ≤15% of expected value and within the RTW.	Correct problem then repeat initial CCV (re-calibrate if necessary) and re-analyze all samples since last successful CCV.	Lab Manager/Analyst	DV-GC-0027
	Retention time window calculated for each analyte (see section 10.4 for how to calculate RTWs).	System set-up, with each new column or major instrument maintenance. Update the mid-RTW as the start of the run or daily.	Each analyte of the LCS, MS/MSD and CCV must be within the calculated RTW.	Correct the problem and re-process or re-analyze samples. For questions, see the supervisor or technical director.	Lab Manager/Analyst	DV-GC-0027

1- This is a summary of the acceptance criteria; refer to the method SOP for specific or more information.

QAPP Worksheet #26
Sample Handling System

Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): RMA-Insight Sampling Personnel
Sample Packaging (Personnel/Organization): RMA-Insight Sampling Personnel
Coordination of Shipment (Personnel/Organization): RMA-Insight Project Chemist
Type of Shipment/Carrier: Laboratory Courier or Commercial Courier
SAMPLE RECEIPT AND ANALYSIS
Sample Receipt (Personnel/Organization): Laboratory Sample Custodian
Sample Custody and Storage (Personnel/Organization): Laboratory Sample Custodian
Sample Preparation (Personnel/Organization): Laboratory Sample Preparation Group
Sample Determinative Analysis (Personnel/Organization): Laboratory Bench Chemist
SAMPLE ARCHIVING
Field Sample Storage (No. of days from sample collection): 58 days.
Sample Extract/Digestate Storage (No. of days from extraction/digestion): Analyze within 28 days of sample collection.
Biological Sample Storage (No. of days from sample collection): N/A
SAMPLE DISPOSAL
Personnel/Organization: Laboratory Sample Custodian
Number of Days from Analysis: 30 days

QAPP Worksheet #27
Sample Custody Requirements

The following paragraphs describe sample handling procedures, including sample numbering and labeling, chain-of-custody, and sample packaging and shipment.

Sample Identification Numbering

All samples submitted to an analytical laboratory will be uniquely numbered as listed in Worksheet #18. The sample identification numbers for each sampling effort shall be used on sample labels, chain-of-custody forms, field logbooks, and other applicable documentation. A listing of sample identification numbers shall be recorded in the field logbook. Sample numbers will be assigned in the field according to the following sample numbering system.

Soil Boring Samples: A typical soil boring sample may be named "B1-10." The "B-" prefix identifies the soil boring. The soil borings will be numbered sequentially in the order that they are drilled/advanced. The number suffix refers to the depth at which the sample was collected starting at the top of the interval. For example, a sample collected between 10 and 10.5 feet bgs from the third boring would be called B3-10.

Soil Boring Field Duplicate Samples: Soil boring field duplicate samples will be numbered so that the laboratory does not know it is a duplicate sample, but those involved with the project will. This will be accomplished by adding 100 feet to the sample interval. For example, the collocated field duplicate collected from the fourth boring at 11 feet bgs would be called "B4-111".

Confirmation Samples: A typical confirmation sample may be named "CF1-12-15". The "CF-" prefix is used to identify the excavation. If there are more than one excavation areas (e.g., if the TPH-DRO source appears to be several "pockets" as opposed to one large area), each excavation will be numbered sequentially in the order that it is excavated. For example, CF1 would refer to the first excavated area, CF2 would refer to the second excavated area. The middle number refers to the sample identifier. This would correspond to a grid cell. The final number refers to the approximate depth from which the sample was collected.

Confirmation Field Duplicate Samples: Field duplicate confirmation samples will be named like a typical confirmation sample, except 100 will be added to the sample depth. For example a field duplicate sample collected from the first excavation area, grid cell 10 at 15 feet bgs would be called "CF1-10-115".

Stockpile Samples: A typical stockpile characterization sample may be named "SP1-1A." The "SP-" prefix refers to the stockpile number. The stockpiles will be numbered sequentially in the order in which they are sampled. The number suffix refers to the sample number. The letter following the number refers to the individual sample, which is to be included in a composite sample. For example, a 3-way composite sample may be made from the samples SP-1A, SP1B, and SP1C. The letters will start at "A" and proceed in alphabetical order.

Stockpile Field Duplicate Samples: Field duplicate stockpile characterization samples will be named like a typical stockpile sample, except that a 100 will be added to the stockpile number. For example, the field duplicate of the third sample pulled from the first stockpile would be called "SP101-3".

Sample Labeling

Sample containers will be labeled as follows:

- Labels will be written in indelible ink with the following information:
  - Project name or identifier
  - Sample identification number
  - Date and time of collection
  - Initials of the person collecting the sample
- A label with adhesive backing will be affixed to each sample container.
- The label will be covered with clear tape to further secure it to the container and to keep the ink from smearing.

Logbooks

A permanently bound field logbook with consecutively numbered pages, used for sampling activities only, will be assigned to this project. At a minimum, the logbook will contain the following information:

- Project name and site location;
- Date and time;
- Personnel in attendance;
- General weather information;
- Work performed;
- Field observations;
- Sampling performed, including locations, sample identification, and field duplicate sample identification;
- A drawing of confirmation sampling grids labeled with sample identifications;
- A drawing of stockpile sample locations with sample identifications;
- Descriptions of deviations from this QAPP; and
- Problems encountered and corrective action taken.

Chain-of-Custody

COC procedures provide documentation of the handling of each sample, from the time it is collected until it is destroyed. All samples will be recorded on COC forms. Chain-of-custody procedures are implemented so that a record of sample collection, transfer of samples between personnel, sample shipping, and receipt by the laboratory that will analyze the sample is maintained. A copy of the COC

form is provided at the end of this worksheet. The COC record serves as a legal record of possession of the sample. The chain-of custody record is initiated with acquisition of a sample. The COC record shall remain with the sample at all times and bears the name of the sampling personnel. A sample is considered to be under custody if one or more of the following criteria are met:

- The sample is in the sampler's possession.
- The sample is in the sampler's view after being in possession.
- The sample was in the sampler's possession and then was locked up to prevent tampering.
- The sample is in a designated secure area.

In addition to the COC record, a custody seal is placed in areas so that if a sealed container is opened, the seal would be broken. The custody seal ensures that no sample tampering occurred between the field and the laboratory analysis.

Sample Packaging and Shipment

Samples to be shipped by commercial carrier will be packed in a sample cooler lined with a plastic bag. Ice will be double-bagged and placed at the bottom of the cooler, one layer of sample containers will be placed on the ice, and more double-bagged ice will be placed on top of the containers. This will be repeated until the cooler is filled with ice to the top layer in the cooler. The COC record will include the airbill number, and the Received By box will be labeled with the commercial courier's name. The top two copies of the COC record will be sealed in a double-resealable bag and then taped to the inside of the sample cooler lid. The cooler will be taped shut with strapping tape. Two custody seals will be taped across the cooler lid: one seal in the front and one seal in the back. Clear tape will be applied to the custody seals to prevent accidental breakage during shipment. The pouch for the airbill will be placed on the cooler and secured with clear tape. The airbill will be completed for priority overnight delivery and placed in the pouch. If multiple coolers are being shipped, the original airbill will be placed on the cooler with the COC record, and copies of the airbill will be placed on the other coolers. The number of packages should be included on each airbill (1 of 2, 2 of 2). Saturday deliveries should be coordinated with the laboratory in advance, and field sampling personnel or their designee must ensure that Saturday delivery stickers are placed on each cooler by the commercial courier.

Samples will be shipped or delivered as soon as possible, but in no case more than 5 days from sample collection. A list of analyses to be performed and a space to record sample condition upon receipt are located on the COC record. The laboratory representative will sign the COC form and record the temperature of the samples or cooler on the chain-of-custody form and on the Sample Condition upon Receipt form. In case of breakage or discrepancies between the COC form, sample labels, or requested analyses, the sample custodian will notify the laboratory's project manager. A nonconformance report will be completed, and the project chemist will be notified within 24 hours. At the time of notification, a corrective action will be chosen. The sample custodian will enter the information into the laboratory system, and a log-in confirmation sheet will be sent to the project chemist within 48 hours. The laboratory will send the project chemist a written declaration of the samples in each sample delivery group.

Hazardous Materials Shipment

Hazardous materials, as defined by the U.S. Department of Transportation (DOT), are not expected in the course of this project. Shipment of soil and wastewater samples is not expected to exceed the minimal quantities for hazardous materials handling. The Site Superintendent is trained to recognize hazardous or dangerous goods and will notify the Project Manager of such issues prior to shipping.

QAPP Worksheet #28
Laboratory QC Samples Table

Matrix	Water/Soil
Analytical Group	Semi-Volatile Organics
Analytical Method / SOP Reference	EPA 8015B/8015C DRO, 8015B/8015C GRO DV-GC-0002, DV-GC-0010, DV-GC-0027, & DV-GC-0028

QC Sample	Frequency/ Number	Method/SOP QC Acceptance Limits[1]	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1/Batch (20 samples)	No Target Compounds>1/2RL; no common lab contaminants >RL.	If sufficient sample is available, reanalyze samples. Qualify data as needed. Report results if sample results >10x blank result or sample results ND.	Analyst / Section Supervisor	Accuracy/Bias-Contamination	No Target Compounds>1/2RL; no common lab contaminants >RL.

Matrix	Water/Soil					
Laboratory Control Sample (LCS for all analytes must be from a 2nd source.)	1/Batch (20 samples)	Refer to the Appropriate method Attachments for LCS control limits.	If sufficient sample is available, reanalyze samples. Qualify data as needed.	Analyst / Section Supervisor	Accuracy/Bias	Laboratory % Recovery Control Limits
Matrix Spike/Matrix Spike Duplicate	1/Batch (20 samples)	Refer to the Appropriate method Attachments for LCS control limits.	Determine root cause; flag MS/MSD data; discuss in narrative.	Analyst / Section Supervisor	Accuracy/Bias/ Precision	Laboratory % Recovery / RPD Control Limits
Surrogates	Every sample	Refer to the Appropriate method Attachments for Surrogate control limits.	Check calculations and instrument performance; recalculate, reanalyze.	Analyst / Section Supervisor	Accuracy/Bias	Laboratory % Recovery Control Limits
GC/MS confirmation	At the client request or analyst judgment	Same as for initial analysis	Same as for initial analysis.	Analyst / Section Supervisor	Accuracy/Bias	Same as for initial analysis

1- This is a summary of the acceptance criteria; refer to the method SOP for specific or more information.

QAPP Worksheet #29
Project Documents and Records Table

Document	Where Maintained
Field logbook	Project file
Daily Contractor Quality Control Report	Project file
Daily progress report	Project file
Chain of custody	Project file and laboratory
Laboratory data package including: • Sample receipt and login • Laboratory internal COC • Instrument calibration logs • Sample preparation logs • Sample analysis/run logs • Nonconformance reports including corrective actions	Laboratory and project file; project file copy will subsequently be sent to AFCEE Administrative Record.
Sample disposal records	Laboratory
Data validation report	Validator and project file; project file copy will subsequently be sent to AFCEE Administrative Record

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Sample Locations/ID Number	Analytical Method	Data Package Turnaround Time	Laboratory/Organization[1] (name and address, contact person and telephone number)	Backup Laboratory/Organization[1] (name and address, contact person and telephone number)
Soil	TPH-DRO	90	EPA 8015B	5 days	TestAmerica Laboratory Inc. Joy Chang 4955 Yarrow Street Arvada, CO 80002 (623) 209-9961	TestAmerica Laboratory Inc. Kevin Calcagno 880 Riverside Parkway West Sacramento, CA 95605 (916) 919-0319

[1] The primary laboratory, TestAmerica, is ELAP certified and have met the AFCEE qualifications.

All definitive-level TPH-DRO analyses will be analyzed by an offsite laboratory. The laboratory will prepare analytical data packages comprised of sample receipt and login, laboratory internal COC, instrument calibration logs, sample preparation logs, sample analysis/run logs, sample results, case narrative, sample disposal records, and non-conformance reports (NCR) including corrective actions. Laboratory deliverables will include two copies of the hardcopy data package, submitted as either EPA Level III-equivalent or IV-equivalent packages as specified on the COC.

The pages in the data package will be sequentially numbered. The package will contain a table of contents referencing individual sections, the original, (white copy) of COC records, a copy of all corrective action reports, and a narrative documenting the resolution of all corrective actions and non-conformances. All samples will be cross-referenced to the associated QC samples. The packages will be assembled in the following sequence:

- Cover page (with laboratory name, address, phone number, contact person, and sample delivery group number, as well as project name and project number)
- Table of contents
- Case narrative
- Sample management records including the original, white copy of COC records (including cooler temperature and sample condition), shipping documents, and laboratory sample receipt forms
- Cross-reference table
- Analytical results and QA/QC information by test

QAPP Worksheet #31
Planned Project Assessments Table

Assessment Type	**Frequency**	**Internal or External**	**Organization Performing Assessment**	**Person(s) Responsible for Performing Assessment** (title and organizational affiliation)	**Person(s) Responsible for Responding to Assessment Findings** (title and organizational affiliation)	**Person(s) Responsible for Identifying and Implementing Corrective Actions (CA)** (title and organizational affiliation)	**Person(s) Responsible for Monitoring Effectiveness of CA** (title and organizational affiliation)
Environmental Laboratory Accreditation Program (ELAP) Audit	Prior to sample analysis	External	NMED	ELAP	TA	Quality Assurance Manager, TA	Quality Assurance Manager, TA
Field Sampling Surveillance	Once at the beginning, of field sampling activities	Internal	RMA-Insight	Project QCM, RMA-Insight	Project Manager, RMA-Insight	Project Manager, RMA-Insight	Project Manager and PQCM, RMA-Insight

Field Audits

Prior to start of the project, a visit to the project sites will be performed to verify site conditions. Throughout the duration of the project, field documentation and sample receipt forms will be reviewed as needed.

The Project Manager and senior technical staff may schedule and/or perform field audits. All non-conformances must be corrected and objective evidence of the correction, either through additional on-site reviews or documentation provided to the quality manager and the project manager. The audit team may issue a corrective-action request form to identify and schedule specific corrective actions to be undertaken and completed by the project team. The RMA-Insight QAO is responsible to verify that any required corrective actions are completed. The RMA-Insight QAO has the authority to stop work if a non-conformance critical to data usability is identified.

Project quality assurance will be a function of the RMA-Insight QAO, who is assigned the authority to inspect all activities and may stop work if activities detrimental to the quality of the work product are detected. Project personnel will evaluate compliance of the laboratory QA program and procedures with AFCEE requirements. Oversight may include internal and external audits, documentation of findings, and reports of corrective action. The RMA-Insight QAO will coordinate a management review of any deficiencies that are noted.

Laboratory Performance Audits

Contracted laboratories must be ELAP certified for analysis of hazardous materials for each method specified. In addition, the laboratory will comply with the requirements for the current version of the DOD QSM. An ELAP audit will only be performed if certification or completion of evaluation is not current. TestAmerica Laboratories (TA) meets the requirements stated above.

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses

Assessment Type	**Nature of Deficiencies Documentation**	**Individual(s) Notified of Findings** (name, title, organization)	**Timeframe of Notification**	**Nature of Corrective Action Response Documentation**	**Individual(s) Receiving Corrective Action Response** (name, title, organization)	**Timeframe for Response**
Field Sampling Surveillance	Logbook or non-conformance report	Dave Marks, Project Manager, RMA-Insight	24 hours after completion of the inspection	Written	Richard Burzinski, Project QCM, RMA-Insight	5 days after notification
Field Documentation Review	Logbook	Project Manager / Project Chemist, RMA-Insight	24 hours after completion of the inspection	Written	Nick Weinberger, Project Chemist and Richard Burzinski, Project QCM, RMA-Insight	24 hours after notification
Laboratory Assessment (if significant quality issues are encountered)	Written audit report	Laboratory Project Manager, TA Dave Marks, Project Manager, RMA-Insight Nick Weinberger, Project Chemist, RMA-Insight	5 days after audit	Corrective Action Plan	Stephen Mulligan, RMA-Insight QAO	Two weeks after receiving notification

Field Sampling Audit

The RMA-Insight QCM may schedule surveillance of field activities at any time to evaluate the execution of sample collection, identification, and control in the field. The RMA-Insight QCM may conduct surveillance of field activities at a minimum of once for the duration of this project. Sampling operations may be reviewed and compared to this QAPP. Use of proper sample containers, proper handling of samples, and adequate documentation of the sampling operation will be verified. The surveillance may include observations of COC procedure, field documentations, instrument calibrations, and field measurements.

Field Documentation Review

Field documents and COC records will be reviewed to ensure that all entries are printed or written in indelible black or blue ink, dated and signed. The COC will be reviewed daily for completeness by the Project Chemist. The manila copy of the COC form will be retained by the Project Chemist and kept in the project file until the completion of the project.

Laboratory Assessment

The primary and secondary laboratories selected for this project are current on the ELAP certification and evaluation letters. RMA-Insight may conduct a laboratory assessment if warranted during the project. The scope of the laboratory assessment by RMA-Insight will be determined based on quality issues encountered.

Corrective Action Procedures

The RMA-Insight QAO or senior technical staff will document problems and the corrective actions to provide a complete record of QA activities and help identify necessary preventive actions. Non-conformances that affect the findings or recommendations of the project or that have impacts to Cannon AFB work outside of the project will be reported to the AFCEE QAO.

Corrective action procedures will depend on the severity of the nonconformance. In cases where field personnel implement immediate and complete corrective action, the corrective action will be recorded in the field logbook. Nonconformance issues that will impact data quality require completion of a field change request form. A copy of the field change request form is attached in Attachment 1. Copies of the field change request form will be distributed to the project team.

If the laboratories encounter issues during the project that may impact data quality, the laboratory project manager will notify RMA-Insight immediately to discuss corrective actions. A written corrective action plan shall be provided in a timely manner and implemented immediately by the laboratories. The corrective action plan must be approved by the laboratory QA officer.

QAPP Worksheet #33
QA Management Reports Table

The Daily Contractor Quality Control reports shall include weather information at the time of sampling, field instrument measurements, calibrations, identification of all field and control samples taken, departures from the approved QAPP, deviations from approved geotechnical procedures (such as well installation or drilling), any problems encountered, and instructions from AFCEE personnel.

A daily progress report (contractor production reports) will be prepared to summarize field activities.

Field Activity Report will document the activities associated with the TPH Investigation/Removal.

Type of Report	**Frequency** (daily, weekly monthly, quarterly, annually, etc.)	**Projected Delivery Date(s)**	**Person(s) Responsible for Report Preparation** (title and organizational affiliation)	**Report Recipient(s)** (title and organizational affiliation)
Daily QCR	Daily/after start of sampling	Weekly.	Richard Burzinski, Project QCM, RMA-Insight	Dave Marks, Project Manager, RMA-Insight
Data Usability Assessment Report	1/after all data are generated and validated	Six months after start of field work.	Nick Weinberger, Project Chemist, RMA-Insight	Dave Marks, Project Manager, RMA-Insight
Final Project Report	1/after field activities has been completed	Six months after start of field work.	Richard Burzinski, Project Geologist, RMA-Insight	Eliud Burgos, COR; Dave Marks, Project Manager, RMA-Insight; Steve Mulligan, RMA-Insight QAO

QAPP Worksheet #34
Verification (Step I) Process Table

Verification Input	Description	Internal / External	Responsible for Verification (name, organization)
Chain-of-custody forms	Chain-of-custody forms 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 should be initialed by the reviewer, a copy of the chain-of-custody retained in the project file, and the original and remaining copies taped inside the cooler for shipment.	I	Sampling Team Leader (RMA-Insight)
Audit reports	Upon report completion, a copy of all audit reports will be placed in the project file. If corrective actions are required, a copy of the documented corrective action taken will be attached to the appropriate audit report in the project file. At the beginning of each week, and at the completion of the site work, project file audit reports will be reviewed internally to ensure that all appropriate corrective actions have been taken and that corrective action reports are attached. If corrective actions have not been taken, the Project Manager will be notified to ensure action is taken.	I	Project/Task Manager (RMA-Insight)
Field notes/logbook	Field notes will be reviewed internally and placed in the project file. A copy of the field notes will be attached to the final report.	I	Sampling Team Leader (RMA-Insight)
Sample Receipt	For samples shipped via courier or by air, the Project Chemist will verify receipt of samples by the laboratory.	I	Nick Weinberger, RMA-Insight

Sample logins	Sample login information will be reviewed for completeness in accordance with the COC forms.	I,E	Nick Weinberger, RMA-Insight Project Manager, TA
Laboratory data prior to release	Laboratory data will be reviewed and verified for completeness against analyses requested on the COC forms.	E	Project Manager, TA
Verification Input	**Description**	**Internal / External**	**Responsible for Verification** (name, organization)
Laboratory data due at turnaround time listed on COC	Laboratory data will be verified that the analyses reported are consistent with the analyses requested on the COC forms.	I	Nick Weinberger, RMA-Insight
Laboratory data	Laboratory data packages will be verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal. All received data packages will be verified externally according to the data validation procedures specified in QAPP Worksheet #35.	I, E	Laboratory and Data Validator
Field and electronic data	One hundred percent of manual entries will be reviewed against the hardcopy information and 10 percent of electronic uploads will be checked against the hardcopy.	I	Nick Weinberger, RMA-Insight

QAPP Worksheet #35
Validation (Step IIa and IIb) Process Table

Step IIa / IIb[1]	Validation Input	Description	Responsible for Validation (name, organization)
IIa	Field logbook	Field logbooks will be reviewed weekly for accuracy associated with each sampling event. The inspection will be documented in daily QCR.	Richard Burzinski, RMA-Insight
IIa	Chain-of-custody forms	Chain-of-custody forms will be reviewed daily to ensure that project information, sample analyses requested, number of field QC samples collected, and percent level III or IV validation chosen is accurate and in accordance with the requirements in this SAP. Chain of custody forms will be reviewed by the validator for completeness and that preservations are in accordance with this SAP.	Nick Weinberger, RMA-Insight Third-party data validator, LDC
IIa	Sample receipt	The sample cooler will be checked for compliance with temperature and packaging requirements listed in QAPP Worksheet #27.	Sample Login, TestAmerica (TA)
IIa	Sample log-ins	Sample login will be reviewed for accuracy against the chain-of-custody form. Sample log-ins will be reviewed by the validator that preservation, temperature, and sample receipt conditions are in accordance with this SAP.	Nick Weinberger, RMA-Insight Third-party data validator, LDC
IIa	Laboratory data prior to release	Laboratory data will be reviewed to ensure that the data is accurate and meets the requirements in this SAP. Prior to release, data will be validated as follows:	Laboratory Project Manager, TA
		100 percent of the data comply with the method- and project-specific requirements and that any deviations or failure to meet criteria are documented for the project file.	Laboratory analyst, TA

Step IIa / IIb[1]	Validation Input	Description	Responsible for Validation (name, organization)
IIa	Laboratory data prior to release	100 percent of manual entries are free of transcription errors and manual calculations are accurate; computer calculations are spot-checked to verify program validity; data reported are compliant with method- and project-specific QC requirements; raw data and supporting materials are complete; spectral assignments are confirmed; descriptions of deviations from method or project requirements are documented; significant figures and rounding have been appropriately used; reported values include dilution factors; and results are reasonable.	Laboratory QC, TA
		Data reported are compliant with method- and project-specific QC requirements; the reported information is complete; the information in the report narrative is complete and accurate; and results are reasonable.	Laboratory Supervisor, TA
		Data reported are compliant with method- and project-specific QC; analytical methods are performed in compliance with approved SOPs. This review may be conducted after release of data since they are done only on 10 percent of the data.	Laboratory QC Manager, TA
IIa	Laboratory data turnaround time listed on COC	Laboratory data will be reviewed to ensure that the data reported met the analyte list and limits listed in Worksheet #15.	Nick Weinberger, RMA-Insight
IIa	Laboratory data packages	All laboratory data packages will be validated by the laboratory performing the work for technical accuracy prior to submittal.	Laboratory Project Manager, TA
		Data packages will then be reviewed for accuracy against the laboratory data that was faxed/emailed at the turnaround time listed on the chain-of-custody.	Nick Weinberger, RMA-Insight
		Data packages will be evaluated externally by undergoing data	Third-party data validator,

Step IIa / IIb[1]	Validation Input	Description	Responsible for Validation (name, organization)
		validation in accordance with *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Reviews.*(EPA, 2004)	LDC
IIb	Data validation reports	Data validation reports will be reviewed in conjunction with the project DQOs and data quality indicators (listed in Section 2.0).	Nick Weinberger, RMA-Insight
		Data validation reports will include cursory validation of holding time, sample handling, analytes, analytical methods, and laboratory performance criteria.	Third-party data validator, LDC
		Field duplicate results will be identified and any outlier will be discussed.	Third-party data validator, LDC
		Ten percent of the data will undergo full data validation, which includes evaluation of standards, project quantitation limits, and confirmatory analysis.	Third-party data validator, LDC
IIb	Data validation reports	The following data qualifiers will be used for all validations: J – Results are estimated U – Analyte is not detected at or above the stated PQL R – Data are rejected UJ – Analyte Is not detected, but there is an uncertainty about the QL.	Third-party data validator, LDC

[1] IIa=compliance with methods, procedures, and contracts
IIb=comparison with measurement performance criteria in the QAPP

QAPP Worksheet #36
Analytical Data Validation (Steps IIa and IIb) Summary Table

Step IIa / IIb	Matrix	Analytical Group	Validation Criteria[1]	Data Validator (title and organizational affiliation)
IIa	Soil	EPA Method 8015	In accordance with TA SOP DV-GC-0010, Rev. 7 dated 15 April 2011	TestAmerica
IIb	Soil	EPA Method 8015	Modified USEPA CLP National Functional Guidelines for Superfund Organic Methods Data Review (USEPA 2008)	Laboratory Data Consultants

(6) All data will be validated at 90 percent EPA Level III and 10 percent EPA Level IV.

QAPP Worksheet #37
Usability Assessment

The data usability assessment will be performed by the project chemist at RMA-Insight and will be reviewed with validated data. Data deemed appropriate for use will be compared against the project action limits. The results will be presented in the Closeout Report. The following items will be assessed and conclusion drawn based on their results.

Precision – For each field duplicate pairs and laboratory duplicate pairs, the relative percent difference (RPD) will be calculated for each analyte whose original and duplicate values are both greater than or equal to the quantitation limit. The RPDs will be checked against the measurement performance criteria presented on Worksheet #12. The RPDs exceeding criteria will be identified in the Closeout Report. Additionally, the RPD of each analyte will be averaged across all duplicate pairs whose original and duplicate values are both greater than or equal to the quantitation limit, and the combined overall average RPD for each analysis will be calculated for the laboratory duplicates. Any conclusions about the precision of the analyses will be drawn and any limitations on the use of the data will be described in the Closeout Report. Precision is most often expressed in terms of RPD:

RPD = 100 x 2 x (result - duplicate result)/(result + duplicate result)

Accuracy/Bias Contamination – Results for all laboratory method blanks and field equipment rinsate will be reviewed by the project chemist. The results for each analyte will be checked against the measurement performance criteria presented on Worksheet #12. Results for analytes that exceed criteria will be identified in the field report. A discussion will follow summarizing the results of the laboratory accuracy/bias. Any conclusions about the accuracy/bias of the analyses based on contamination will be drawn and any limitations on the use of the data will be described in the Closeout Report.

$$\%R = \left(\frac{|X_s - X_u|}{K} \right) \times 100\%$$

Bias values are commonly expressed as percent recovery. Percent recovery (%R) is calculated as follows:

Where

X_u = measured value of the unspiked sample

X_s = measured value of the spiked sample

K = known amount of the spike in the sample

QAPP Worksheet #37
Usability Assessment

When *%R* is calculated for the LCS or other reference materials, *Xu* could be set at zero. The relationship between percent bias (% *B)* and percent recovery (% *R*) is as follows:

$$\%B = \%R - 100$$

Sensitivity – Results for all laboratory control samples (LCS) will be reviewed by the project chemist for each analysis. The results will be checked against the measurement performance criteria presented on Worksheet #12 and cross-checked against the quantitation limits presented on Worksheet #15. Results for analytes that exceed criteria will be identified in the Closeout Report. A discussion will follow summarizing the results of the laboratory sensitivity. Any conclusions about the sensitivity of the analyses will be drawn and any limitations on the use of the data will be described in the Closeout Report.

Representativeness – The representativeness criterion is best satisfied in the laboratory by making certain that all sub-samples taken from a given sample are representative of the sample as a whole. This shall include sample premixing/homogenizing prior to and during aliquot procedures. Samples requiring volatile analysis shall not undergo any premixing or homogenization. Representativeness will be assessed by a review of the precision obtained from the field and laboratory duplicate samples. In this way, they provide both precision and representativeness information. Existing project data may be employed to assess the representativeness of a population by defining the continuity of data from point to point.

Comparability – Sample data shall be comparable for similar samples and sample conditions. This goal is achieved using standard techniques to collect representative samples, consistent application of analytical method protocols, and reporting analytical results with appropriate units.

Completeness – A completeness check will be done on all of the data generated by the laboratory. Completeness criteria are presented on Worksheet #12. Completeness will be calculated as follows. Completeness will be calculated as the number of data points for each analyte that meets the measurement performance criteria for precision, accuracy/bias, and sensitivity, divided by the total number of data points . A discussion will follow summarizing the calculation of data completeness. Any conclusions about the

QAPP Worksheet #37
Usability Assessment

completeness of the data will be drawn and any limitations on the use of the data will be described.

Review and verification of the data generated during field and laboratory activities are essential to obtaining data of defensible and acceptable quality. Review of project data will include an initial completeness assessment to determine whether all required measurements are collected and data deliverables are present (e.g., case narratives, chain-of-custodies, etc.).

The validated data will be evaluated to assess if it satisfies PQOs The Project Chemist will provide input on the suitability of the results for the purposes intended. Usable data and additional field monitoring data will be present in the Closeout Report

REFERENCES

AFCEE's Statement of Work for Remedial Action-Construction at SWMU 109 (FT-C109) for Cannon Air Force Base dated 22 February 2011

1997 Phase II RCRA Facilities Investigation Report Cannon Air Force Base, New Mexico

T N & Associates, Inc. report, Phase I Investigation, Soil Corrective Measures, Fire Training Area 04, Cannon Air Force Base, New Mexico, Final: January 10, 2005

Tetra Tech EC, Inc., Accelerated Corrective Measures Work Plan for the Removal of Contaminated Soil at SWMU 109 (Fire Training Area No. 4), Revised Final, 2008.

Intergovernmental Data Quality Task Force (EPA, DOD, DOE), 2003. *Uniform Federal Policy for Quality Assurance Project Plans. Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. Part 1: UFP-QAPP.* August, 2003.

US Army Corps of Engineers, 2003. *Safety and Health Requirements Manual* (EM-385-1-1). November 3, 2003.

U.S. Department of Defense, 2006. *Quality Systems Manual for Environmental Laboratories*. January, 2010.

United States Environmental Protection Agency (EPA) Standards: Title 40 CFR, Part 61, Subpart M; Title 40 CFR, Part 763, Subpart E; Title 40 CFR Part 763, Subpart G.

U.S Environmental Protection Agency, 2002. *EPA Guidance for Quality Assurance Project Plans, EPA QA/G-5, QAMS.*

U.S. EPA, 2004. *USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Reviews.* OSWER 9240.1-48. EPA 540-R-08-001. October, 2004.

FIGURES

From T&EC Nov 2008 Work Plan Addendm

INSIGHT
Environmental, Engineering and Construction, Inc.

15 0 15 30 45

N

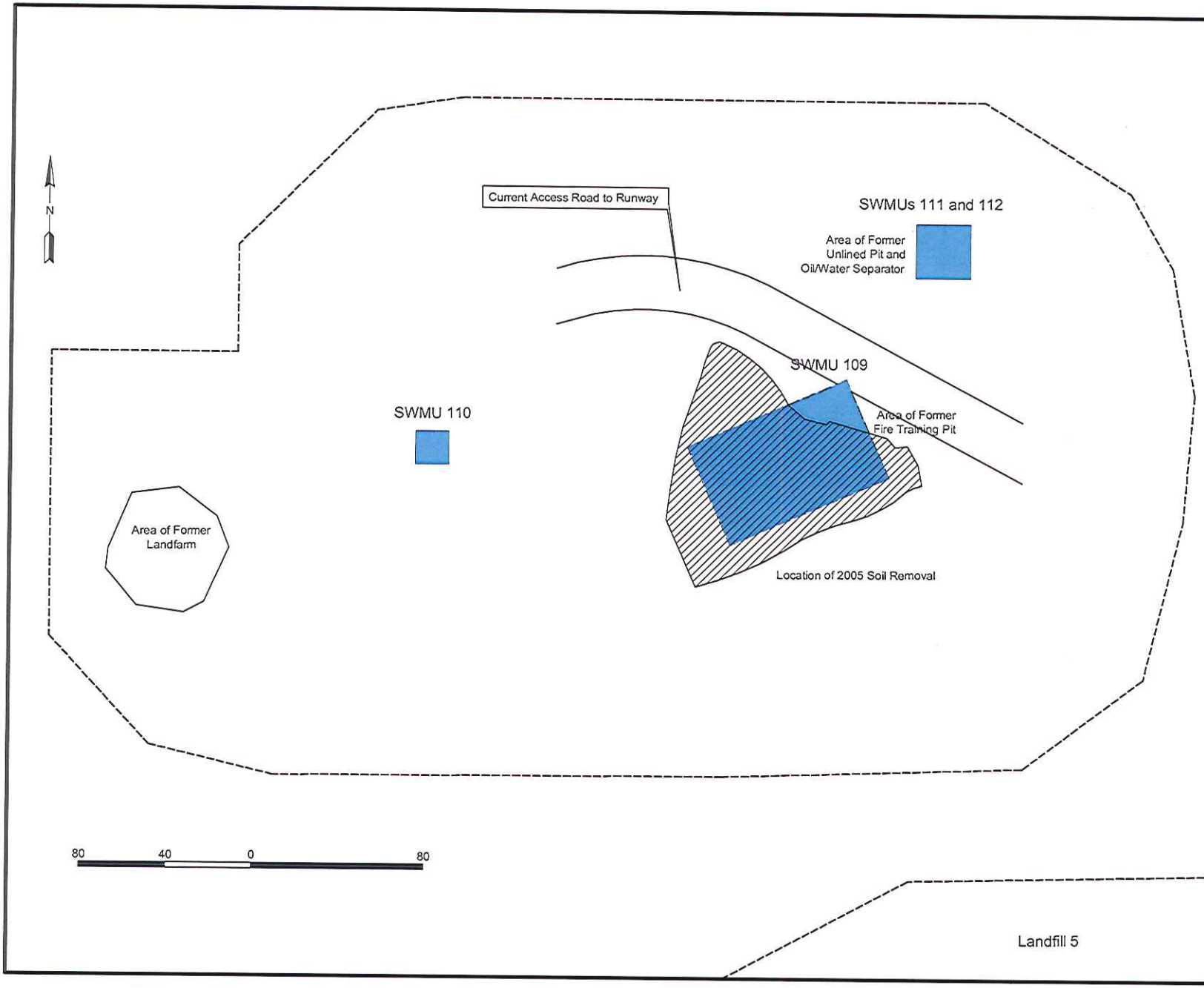
Soil Removal Work Plan Fire Training Area 4
Cannon AFB, New Mexico

FTA4 Location Map

Date: 05 - 06 - 11

File Name:
p:\miso spectrum\cad file\proposals\insight\cannon r070\extent\cad1f

Figure 1



LEGEND

- Location of SWMU
- 2005 Excavation Area
- Road
- Fence

INSIGHT

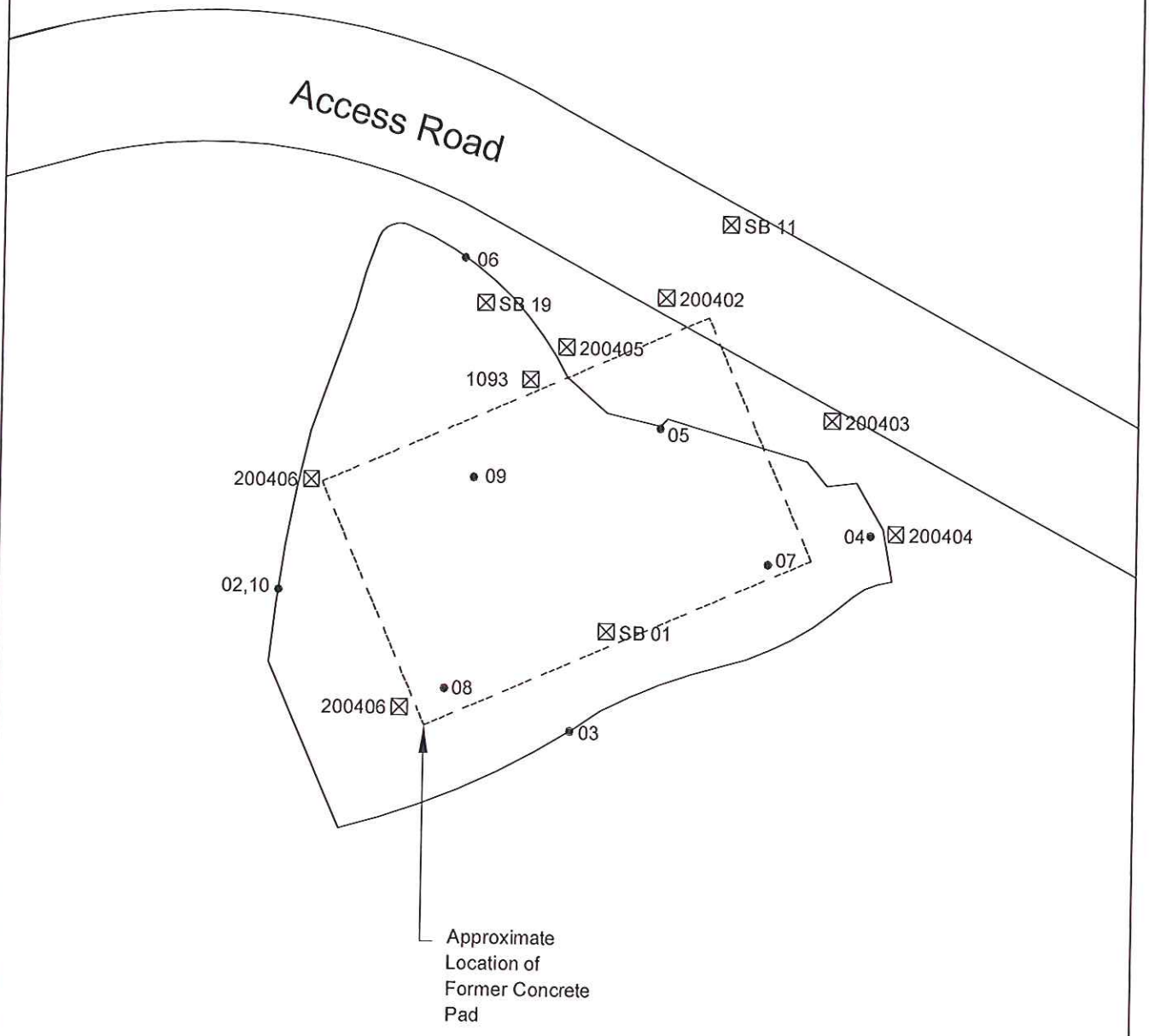
Soil Removal Work Plan
Fire Training Area 4
Connon Air Force Base, New Mexico

Figure 2

SWMU Locations at FTA4

Date: 05 - 06 - 11

File Name:



From T&EC Nov 2008 Work Plan Addendm

— Extent of Excavation
•07 Confirmation Sampling Points
⊠200404 Phase 1 Investingation Nov.2004 Sampling Location (location approximate)

INSIGHT
Environmental, Engineering and Construction, Inc.

15 0 15 30 45

N

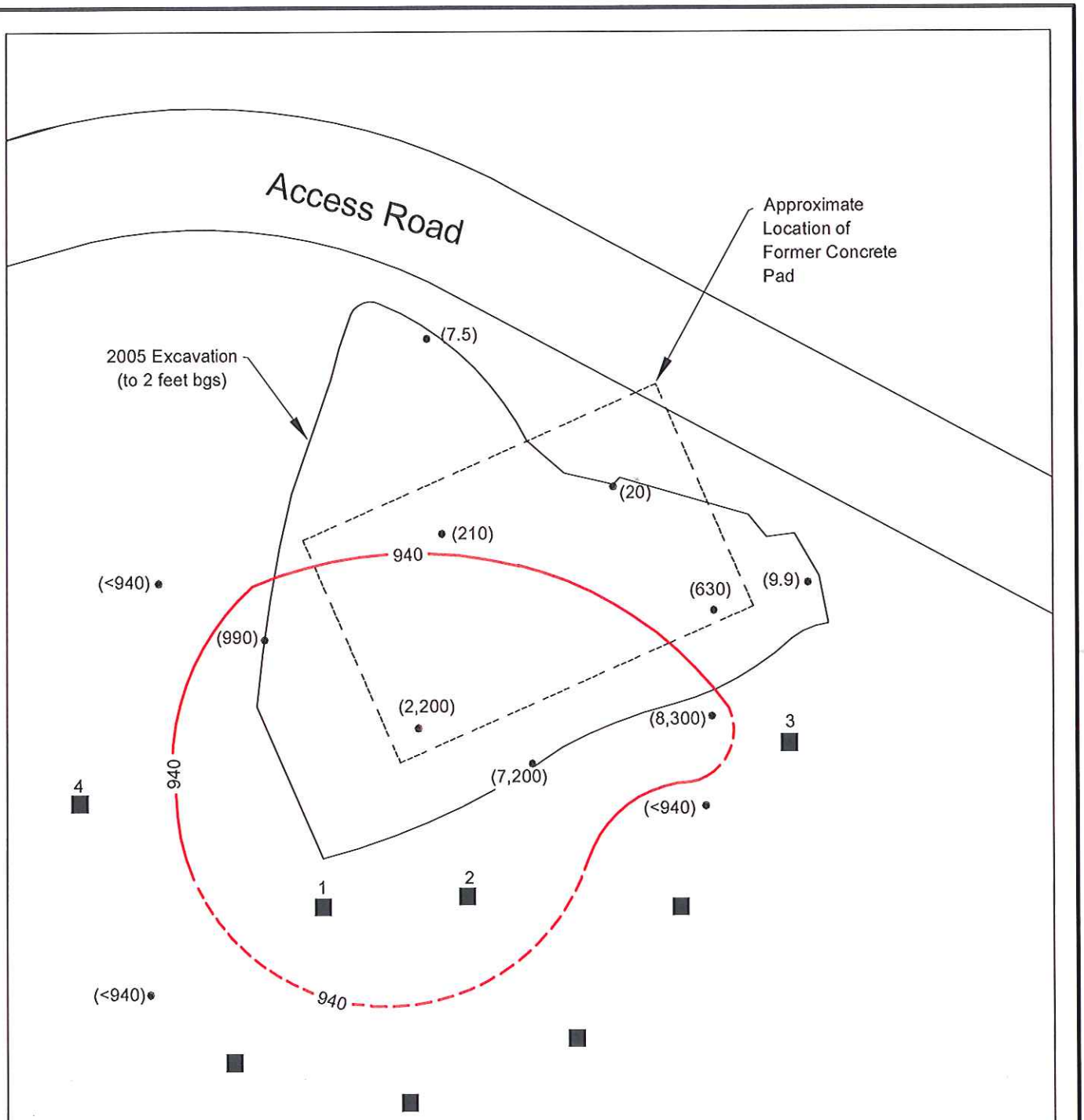
Soil Removal Work Plan Fire Training Area 4
Cannon AFB, New Mexico

Extent of 2005 Soil Excavation at SWMU 109

Date: 05 - 06 - 11

File Name:
p:\misc spectrum\cad file\proposals\insight\cannon r070\extent\cad.f

Figure 3



•(20) Historical Sample with TPH-DRO Result mg/kg

■ Proposed Boring Location

— — Estimated Extent of PCS > 940 mg/kg

From T&EC Nov 2008 Work Plan Addendm

INSIGHT
Environmental, Engineering and Construction, Inc.

15 0 15 30 45

N

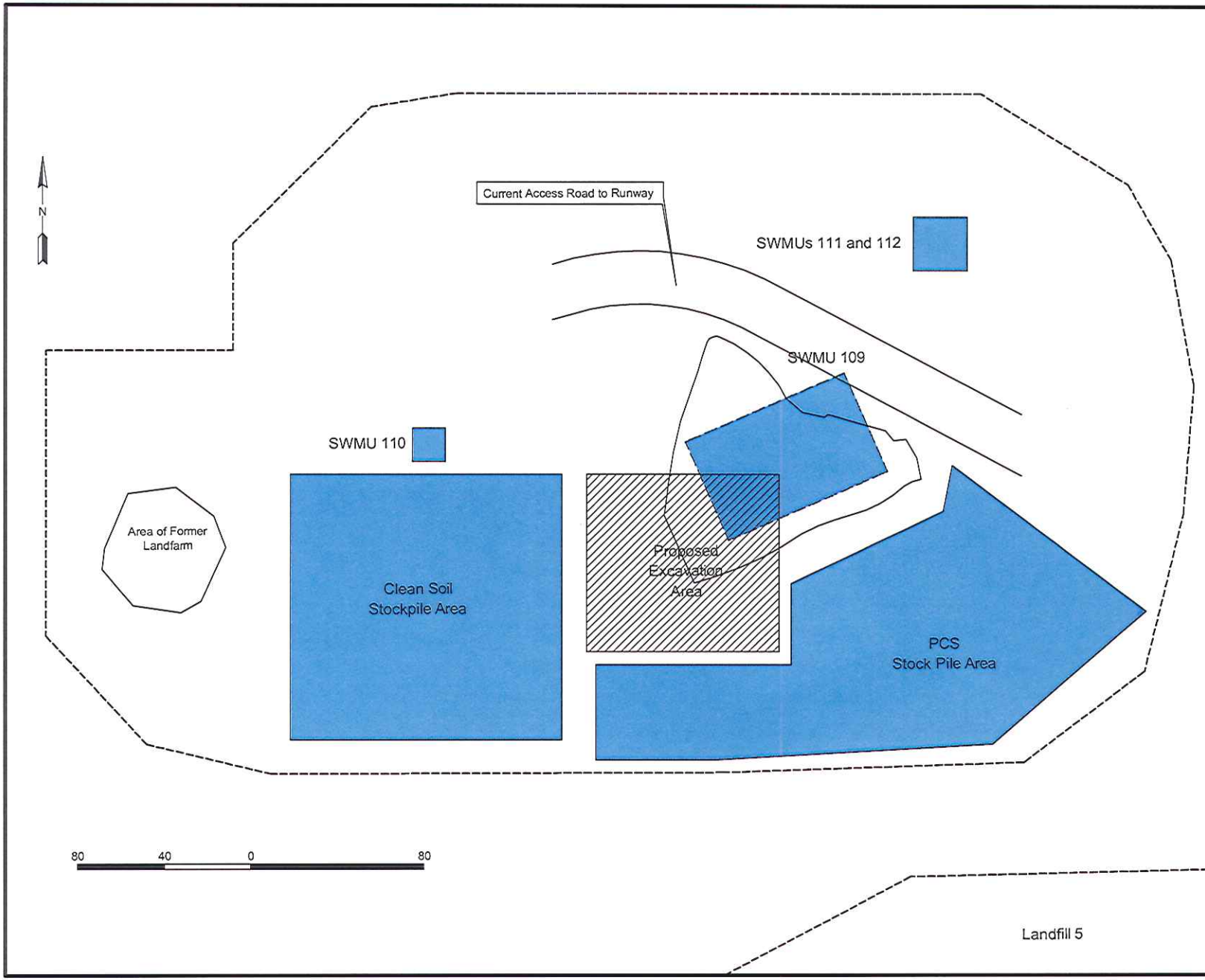
FT - C109 Conceptual Site Model

Canon Air Force Base, New Mexico

Date: 03 - 01 - 11

File Name: FT-C109 Figure 1.dwg

Figure 4



LEGEND

- Location of SWMU
- 2005 Excavation Area
- Road
- Fence

INSIGHT

Soil Removal Work Plan
Fire Training Area 4
Connon Air Force Base, New Mexico

Figure 5

Site Layout

Date: 05 - 06 - 11

File Name:

ATTACHMENTS

ATTACHMENT 1

FIELD QUALITY CONTROL FORMS

CONTRACTOR QUALITY CONTROL REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

REPORT NO

PHASE | CONTRACT NO | CONTRACT TITLE

PREPARATORY

WAS PREPARATORY PHASE WORK PREFORMED TODAY? YES ☐ NO ☐

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL PREPARATORY PHASE CHECKLIST.

Schedule Activity No.	Definable Feature of Work	Index #

INITIAL

WAS INITIAL PHASE WORK PREFORMED TODAY? YES ☐ NO ☐

IF YES, FILL OUT AND ATTACH SUPPLEMENTAL INITIAL PHASE CHECKLIST.

Schedule Activity No.	Definable Feature of Work	Index #

FOLLOW-UP

WORK COMPLIES WITH CONTRACT AS APPROVED DURING INITIAL PHASE? YES ☐ NO ☐

WORK COMPLIES WITH SAFETY REQUIREMENTS? YES ☐ NO ☐

Schedule Activity No.	Description of Work, Testing Performed & By Whom, Definable Feature of Work, Specification Section, Location and List of Personnel Present

REWORK ITEMS IDENTIFIED TODAY (NOT CORRECTED BY CLOSE OF BUSINESS)

Schedule Activity No.	Description

REWORK ITEMS CORRECTED TODAY (FROM REWORK ITEMS LIST)

Schedule Activity No.	Description

REMARKS (Also Explain Any Follow-Up Phase Checklist Item From Above That Was Answered "NO"), Manuf. Rep On-Site, etc.

Schedule Activity No.	Description

On behalf of the contractor, I certify that this report is complete and correct and equipment and material used and work performed during this reporting period is in compliance with the contract drawings and specifications to the best of my knowledge except as noted in this report.

AUTHORIZED QC MANAGER AT SITE DATE

GOVERNMENT QUALITY ASSURANCE REPORT

DATE

QUALITY ASSURANCE REPRESENTATIVE'S REMARKS AND/OR EXCEPTIONS TO THE REPORT

Schedule Activity No.	Description

GOVERNMENT QUALITY ASSURANCE MANAGER DATE

CONTRACTOR QUALITY CONTROL REPORT

(CONTINUATION SHEET)
(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE

REPORT NO.

PHASE	CONTRACT NO	CONTRACT TITLE

FOLLOW-UP

WORK COMPLIES WITH CONTRACT AS APPROVED DURING INITIAL PHASE? YES ☐ NO ☐

WORK COMPLIES WITH SAFETY REQUIREMENTS? YES ☐ NO ☐

Schedule Activity No.	Description of Work, Testing Performed & By Whom, Definable Feature of Work, Specification Section, Location and List of Personnel Present

REMARKS (Also Explain Any Checklist Item From Above That Was Answered "NO"), Manuf. Rep. On-Site, etc.

Schedule Activity No.	Description

CONTRACTOR PRODUCTION REPORT

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

DATE		
CONTRACT NO	TITLE AND LOCATION	REPORT NO
CONTRACTOR	SUPERINTENDENT	
AM WEATHER	PM WEATHER	MAX TEMP (F) / MIN TEMP (F)

WORK PERFORMED TODAY

Schedule Activity No.	WORK LOCATION AND DESCRIPTION	EMPLOYER	NUMBER	TRADE	HRS

JOB SAFETY

WAS A JOB SAFETY MEETING HELD THIS DATE? (If YES attach copy of the meeting minutes)	☐ YES	☐ NO	TOTAL WORK HOURS ON JOB SITE, THIS DATE, INCL CON'T SHEETS
WERE THERE ANY LOST TIME ACCIDENTS THIS DATE? (If YES attach copy of completed OSHA report)	☐ YES	☐ NO	CUMULATIVE TOTAL OF WORK HOURS FROM PREVIOUS REPORT
WAS CRANE/MANLIFT/TRENCHING/SCAFFOLD/HV ELEC/HIGH WORK/ HAZMAT WORK DONE? (If YES attach statement or checklist showing inspection performed.)	☐ YES	☐ NO	
WAS HAZARDOUS MATERIAL/WASTE RELEASED INTO THE ENVIRONMENT? (If YES attach description of incident and proposed action.)	☐ YES	☐ NO	TOTAL WORK HOURS FROM START OF CONSTRUCTION

Schedule Activity No.	LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED	☐ SAFETY REQUIREMENTS HAVE BEEN MET.

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB (INDICATE SCHEDULE ACTIVITY NUMBER)

Schedule Activity No.	Submittal #	Description of Equipment/Material Received

CONSTRUCTION AND PLANT EQUIPMENT ON JOB SITE TODAY. INDICATE HOURS USED AND SCHEDULE ACTIVITY NUMBER.

Schedule Activity No.	Owner	Description of Construction Equipment Used Today (incl Make and Model)	Hours Used

Schedule Activity No.	REMARKS

CONTRACTOR/SUPERINTENDENT _____ DATE _____

CONTRACTOR PRODUCTION REPORT
(CONTINUATION SHEET)

CONTRACT NO	TITLE AND LOCATION	DATE
		REPORT NO

WORK PERFORMED TODAY

Schedule Activity No.	WORK LOCATION AND DESCRIPTION	EMPLOYER	NUMBER	TRADE	HRS

Schedule Activity No.	LIST SAFETY ACTIONS TAKEN TODAY/SAFETY INSPECTIONS CONDUCTED

EQUIPMENT/MATERIAL RECEIVED TODAY TO BE INCORPORATED IN JOB (INDICATE SCHEDULE ACTIVITY NUMBER)

Schedule Activity No.	Submittal #	Description of Equipment/Material Received

CONSTRUCTION AND PLANT EQUIPMENT ON JOB SITE TODAY. INDICATE HOURS USED AND SCHEDULE ACTIVITY NUMBER.

Schedule Activity No.	Owner	Description of Construction Equipment Used Today (incl Make and Model)	Hours Used

Schedule Activity No.	REMARKS

INCLUDE ALL PERSONNEL WORK HOURS IN THE WORK PERFORMED SECTION ON THIS SHEET
INTO THE FRONT CONTRACTOR PRODUCTION REPORT

PHOTOGRAPHIC INVENTORY

INSIGHT
Environmental, Engineering and Construction, Inc.

Project Number: ____________ Date: __________ Photographed by: ________________

Photo No.	Roll No.	Site No.	Directional View	Site Description

PREPARED BY: INSIGHT Environmental, Engineering and Construction, Inc.	BORING LOG		BORING NO.
			FACILITY Hunters Point Shipyard
LOCATION ers Point, California	COORDINATES	SURFACE ELEVATION	MEASURING POINT ELEVATION
DRILLING CONTRACTOR	DRILLER	RIG TYPE	DRILLING METHOD
GEOLOGIST	DATE BORING STARTED	DATE BORING COMPLETED	TOTAL DEPTH

DEPTH IN FEET	GRAPHIC LOG	LITHOLOGIC DESCRIPTION	WELL CONSTRUCTION
0		GROUND SURFACE	
5			
10			
15			
20			
25			
30			

ATTACHMENT 2

ADDITIONAL WORK PLAN ELEMENTS

SITE SECURITY PLAN

1.0 GENERAL

The Contractor will conduct operations and maintain the project site security to eliminate non-essential personnel from entering the site without proper authorization. The entire site, to include the excavation, staging area, stockpile area, temporary field office, materials, and equipment area, will be enclosed with orange construction fencing.

2.0 MATERIALS AND EQUIPMENT

The Contractor will erect orange construction fencing around the entire project area. The fencing will be supported with "T" posts and have photo-electric WARNING lights attached to "A" frame barricades along the roadside. A gateway will be installed for general access and off-hauling of soils and equipment.

3.0 EXECUTION

The Contractor will implement strict enforcement and containment of the site. Signage will be erected along the perimeter fencing facing the frontage road directing personnel to stop at the access gate and await authorization to proceed into the site. Key onsite personnel contact information will be posted at the gate. A visitor sign-in sheet will be available for signing in and out of the site.

SITE PREPARATION PLAN

1.0 GENERAL

The Contractor will conduct site preparations immediately after mobilization and prior to any intrusive work at the site. The site staging area will be agreed upon by Cannon AFB and RMA-Insight, and will be located in the very near proximity of the excavation activities. It will house the on-site office trailer and all necessary PPE and erosion control material (see 3.0-Execution).

2.0 MATERIALS

The Contractor shall design, furnish, install, and maintain all erosion-control measures during the course of construction. Plastic sheeting and railroad ties shall be utilized by the Contractor, as necessary, to control erosion of stockpiled materials. Additional erosion control material will consist of hay bales and straw waddles as needed (see 3.0-Execution).

3.0 EXECUTION

The Contractor will obtain a dig permit from Cannon AFB, and notify New Mexico's One Call (811) utility locating system a minimum of two days prior to intrusive work. A temporary field office will be established to include: secured storage; portable toilet and wash station; generator and parking area. Temporary erosion and sediment control measures will be implemented. Site features such as boring locations, previous excavation and confirmation soil sample locations will be marked and logged into RMA-Insight's Trimble GeoExplorer Global Positioning System device.

SPILL AND DISCHARGE CONTROL PLAN

1.0 SPILL PREVENTION AND CONTROL PLAN

This Spill Prevention and Control Plan has been developed to guide in the prevention of contamination of soils, water, atmosphere, uncontaminated areas/surfaces, equipment or material by the uncontrolled release of hazardous waste and materials during the road improvement operations involved in this project. This plan provides for the protection of the surrounding soil, surface water, flora, fauna, personnel and ecosystems. Best Management Practices (BMP) will be followed.

The following spill control equipment will be available in the event of a spill of liquid or solid waste:

- Sand or other appropriate spill absorbent material
- Front-end loader
- 55-gallon Department of Transportation (DOT) drums (DOT 17 E or 17H)
- Shovels
- Decontamination supplies and protective clothing
- Hand operated pump

Regardless of the type of spill (liquid or solid), the following measures will be taken to address the spilled material(s):

- Isolate and contain the hazardous spill area
- Restrict access of unauthorized personnel
- Notify Mr. Eliud Burgos, (210) 395-8626
- Prevent contact with the spilled material
- Relocate personnel upwind and up-gradient of the spilled material
- Clean up the spilled material
- Take air, soil, or other appropriate samples to determine if clean-up is complete

For Emergency Response Contact: National Spill Response Center
(800) 424-8802

2.0 SOLID MATERIALS SPILLS

In the event of a spill or release of a solid, RMA-Insight will remove and place contaminated materials (except petroleum contaminated soils) into a dry container with a cover. The container will be appropriately labeled and disposed of as soon as possible. Petroleum contaminated soils will be stockpiled separately after notification to the AFB. Stockpiles may be bermed to prevent the run-off or run-on of any water. The berm will be a minimum of twelve inches in height. The stockpile area will have a 10 mil HDPE liner as a base and a minimum 10 mil covering placed over the soils and debris. The stockpile area will be sized to completely contain the material generated, and placed at a maximum height of four feet high.

3.0 LIQUID MATERIAL SPILLS

Liquid spills will be absorbed with sand or other appropriate absorbent material. The absorbent material will be stockpiled separately or incorporated into the contaminated stockpiled soil. The final disposition of the absorbent material will be determined in conjunction with the stockpiled soil. The spill will be the responsibility of the contractor.

In the event of a discharge of liquid into the soil, Insight will immediately identify the location of the discharge and take appropriate remedial actions to eliminate further spillage. The discharged liquid material will be controlled and disposed of as described above. If a reported discharge of any materials stored in drums, baker tanks, vacuum trucks, etc. occurs, the following steps will be followed:

- Notify AFCEE
- Contain and eliminate the discharge (if not prevented by safety considerations)
- Remove/retrieve any discharged liquids (if not prevented by safety considerations)
- Isolate the spill area and restrict access to unauthorized personnel
- Decontaminate the spill area, if necessary
- Prepare a spill report.

4.0 SPILL REPORT

The Spill Report will contain the following:

- A description of the material spilled; including identity, quantity, and a copy of the waste manifest.
- Identification of the cause of the spill.
- The exact time and location of the spill, and a description of the area involved.
- The containment procedures utilized.
- A description of the corrective actions implemented during the spill; including the method of disposal of the generated clean-up residues.
- A summary of the communications between Insight and any government officials other than AFCEE.

SURFACE WATER MANAGEMENT AND EROSION CONTROL PLAN

1.0 GENERAL

The Contractor will design, furnish, install, and maintain all temporary erosion-control measures as specified in this section. This section provides the technical requirements for the design of erosion and sediment-control systems to limit discharge of turbid or contaminated water into streams and waterways from construction operations in accordance with state and local ordinances. Existing earthen berms and trenches will be used for erosion and sediment control.

If additional requirements are necessary, the Contractor will provide additional berms at the perimeter of the trench or stockpile (if used).

2.0 MATERIALS

Materials will conform to the requirements of the State of New Mexico Standard Specifications for Highway and Bridge Construction, Section 603. The Contractor shall design, furnish, install, and maintain all erosion-control measures during the course of construction. Plastic sheeting and railroad ties shall be utilized by the Contractor, as necessary, to control erosion of stockpiled materials.

3.0 EXECUTION

The Contractor will make every effort to minimize erosion from excavating, stockpiling of soils, and backfilling operations, and be responsible for diverting all runoff from rainfall and directing it to natural drainage pathways.

The Contractor will construct and maintain all temporary stockpile enclosures and covers. All required material will be furnished and all necessary liners, berms, and covers installed so as to minimize obstruction of the work. After having served their purpose, all temporary stockpile enclosures will be removed to the satisfaction of the Base.

Reference." Standard Specifications for Highway and Bridge Construction, New Mexico State Highway and Transportation Department, 1994. Section 603.

EMISSIONS CONTROL PLAN

DUST CONTROL

1.0 GENERAL

The Contractor shall conduct operations and maintain the project site so as to minimize the creation and dispersion of dust. The Contractor shall use watering equipment for dust control as necessary. Dust control shall be implemented throughout the work.

2.0 MATERIALS AND EQUIPMENT

The Contractor shall have clean water available at the site, free from salt, oil, and other deleterious material, to be used for dust control at any area involved in the work. The Contractor shall supply water-spraying equipment capable of accessing all work areas.

3.0 EXECUTION

The Contractor shall implement strict dust-control measures during active excavation periods on site. These control measures will generally consist of water applications as necessary that shall be applied in the work zone to prevent dust emissions. The water will be applied at a rate that will control the dust without causing the water to pond.

Reference: Standard Specifications for Highway and Bridge Construction, New Mexico State Highway and Transportation Department, 1994. Section 603.

AIR MONITORING

1.0 GENERAL

The Contractor will monitor the breathing zone of workers. Air-monitoring action levels have been developed to indicate the chemical concentrations in the breathing zone that require an upgrade in the level of personal protective equipment (PPE). General air-monitoring guidelines are presented in the Site Safety and Health Plan.

2.0 MATERIALS AND EQUIPMENT

All site workers will be properly fitted with PPE (i.e., respirators) and trained in their use (i.e., donning and doffing). A photo ionization detector (PID), equipped with a 10.2-electron volt lamp, calibrated with isobutylene, and referenced to benzene-in-air will be used to monitor the breathing zone of workers to assess the potential presence of volatile organic vapors. Isobutylene has ionization potentials below 10 and will produce relative responses of approximately 1:1 using the PID as described above.

3.0 EXECUTION

Air-monitoring measurements for the worker most likely to have the highest exposure will be taken in the breathing zone. Transient peaks will not automatically trigger action. Action will be taken when levels are consistently exceeded in a 5-minute period. The action levels apply to all tasks performed on this site. Air monitoring falls into two categories: direct reading/environmental monitoring and personal exposure monitoring. PID readings will be obtained during direct push technology operations within the breathing zone. Monitoring will continue intermittently throughout sampling activities at a frequency of once every 15 minutes or another frequency as determined by the Site Safety Officer, or whenever odors are noticed. Benzene levels in benzene, toluene, ethylbenzene, and xylene (BTEX) are usually a very minor component of the overall constituents. Although benzene is a very minor contaminant, sustained levels of more than 5 parts per million (ppm) in the breathing zone will require an upgrade of respiratory protection to Level C. Personnel will wear full-face respirators with organic vapor cartridges when in Level C. If MSA cartridges are used, cartridges will be used for 8 hours per day assuming that the humidity is less than 50 percent, ambient temperature does not exceed 100 degrees Fahrenheit, and total organic vapors as measured by the PID do not exceed 50 ppm at any time. If cartridges other than MSA are used, the Corporate Health and Safety Officer will be contacted for a cartridge change schedule from the cartridge manufacturer. Cartridges will be discarded at the end of each shift.

DEMOBILIZATION AND CLOSURE PLAN

1.0 BACKFILL, COMPACTION and GRADING

The excavation will be backfilled with clean material imported from an offsite source and any certified clean soil remaining onsite after excavation and disposal. The backfill soil will be imported from a local source and sampled at a frequency of 1 sample per 1,000 cubic yards to ensure the backfill is clean. Each sample will be analyzed for TPH, Volatile Organic Compounds (VOCs), PAHs, and metals.

Either direct dumping or the use of an excavator, a backhoe, or wheel loader will be used to place backfill in maximum 1-foot lifts. The weight of the equipment will be used to compact the soil backfill material. Mechanical compaction to 90 percent of standard Proctor and geotechnical testing are not required.

After backfill is complete, the site will be graded to provide positive drainage. The excavation will be backfilled and mounded **only after the following conditions are met**: 1) analytical results indicate the backfill material is clean, 2) sidewall and bottom confirmation soil sample results indicate clean-up goals have been met, and 3) AFCEE provides approval. Revegetation of the area will not be required for this project.

2.0 SITE DEMOBILIZATION

Site demobilization will include: repairing erosion or water runoff related damage; grading areas affected by the construction; removing materials such as excess construction material, wood, debris, and other foreign material; and, removing equipment and temporary facilities. Final closure will include inspection of the work by the AFB, and certification of completion.

ATTACHMENT 3

STANDARD OPERATING PROCEDURES

SOP C1 - PHOTOIONIZATION DETECTORS

A photoionization detector (PID) is used to detect the concentration of organic gases in air. During field investigations, this particular instrument serves several functions. First, and most importantly, it is used to protect the health and safety of the field personnel by providing information concerning the presence and concentration of contaminants encountered. Second, the information gained from the instrument is used to screen for potentially contaminated materials. The use of this instrument for health and safety considerations is described in Appendix E.

The PID has some important limitations. The instruments can only monitor Certain vapors and gases in air. Many nonvolatile liquids, toxic solids, particulates, and other toxic gases and vapors cannot be detected. Because the types of compounds that' the PID can potentially detect are only a fraction of the chemicals possibly present at an incident, a zero reading does not necessarily signify the absence of air contaminants.

The instrument is also nonspecific, and its response to different compounds is relative to the calibration settings. In addition, the reading shown on the meter represents the total concentration of volatile organic compounds rather than the concentration of any one compound. The PID cannot detect methane, nor can it be used as an indicator for combustible gases or oxygen deficiency. In the presence of methane, the PID will register lower levels for organic contaminants that are present due to the interference caused by the methane.

If odor is detected by site workers, the PID will be used to monitor worker breathing zones for the presence of contaminants above action levels.

SOP C2 - SOIL SAMPLING

The following procedure will be used for boring sampling:

1. Wear appropriate health and safety equipment as required in the Site-Specific Environmental Health and Safety Plan. Use a stainless steel trowel to collect the soil as discussed in Sections 4.2.3 and 6.3 of this Work Plan. 3. Use a stainless-steel scoop to random grab soil sample and place in sample containers.

Fill jars with soil using stainless-steel spatulas or spoons. All soil samples for chemical analyses, except VOC, must be homogenized by vigorous mixing in stainless-steel pans with stainless-steel spoons prior to being put into containers. Collect VOC samples as discrete grab samples. These should be taken immediately from the hand auger and properly packaged. Homogenize the soil samples by first removing rocks, twigs, leaves, or other debris not considered part of the sample. Remove the soil/sediment from the sampling device and place it in a stainless-steel pan, thoroughly mixing it using a stainless-steel spoon. Scrape the sediment in the pan from the sides, comers, and bottom of the pan, roll it to the middle of the pan, and mix it. Once the initial mixing is complete, quarter the sample and move the quarters to the four comers of the pan. Mix each quarter of the sample individually, and then roll each to the center of the container and mix the entire sample again.

Place analytical samples in cooler and chill to 4°C. Samples should be shipped within 24 hours.

Fill out field logbook, sample tag forms, custody seals, and COC forms. Example copies of these forms are included in the QAPP, Section 7 of this Work Plan. A hand-sketched map of the excavation showing the soil layers should be included in the field logbook.

SOP C3 - SOIL STOCKPILE SAMPLING

Soil composite sampling from stockpiled soil will be performed using the following procedures:

1. Wear appropriate personal protection equipment as specified in the Site-Specific Health and Safety Plan. In addition, don new sampling gloves at each location.

2. Collect one random sample from each visually determined quadrant of the stockpiled soil using the backhoe bucket.

3. Use a decontaminated stainless-steel scoop/trowel to extract the soil sample from the interior of the backhoe bucket.

4. Record appropriate air monitoring results.

5. Obtain one sample from a random location within each backhoe bucket to create composite from each stockpile quadrant. Empty the contents of the scoop/trowel into the decontaminated stainless-steel bowl for homogenization.

Homogenize the soil samples by first removing rocks, twigs, leaves, .and other debris (if they are not considered part of the sample). Thoroughly mix the soil in the bowl by scraping it from the sides, comers, and bottom of the pan and roiling it to the middle of the pan. Fill the sample jars with the homogenized, soil using a stainless-steel spatula or spoon.

Place analytical samples in a cooler containing ice and chill to 4°C. Samples should be shipped within 24 hours to an appropriate laboratory. Decontaminate scoop/trowel and bowl as specified in SOP C7. Fill out field logbook, sample log sheet, custody seals, labels, and chain-of-custody forms. Write out sample ID for each composite bermed and lined area or stockpile sample.

SOP C4 - SAMPLE HANDLING AND DOCUMENTATION

Sample handling and documentation procedures will be used to ensure the integrity of the sample from sample collection to receipt at the laboratory. Documentation of sample handling will be implemented to ensure the traceability and integrity of the sample.

Labeling

All sample containers will be labeled. Labels may be partially completed prior to sample collection. The date, time, and sampler's name should NOT be completed until the time of sample collection. Preprinted, self-adhesive sample labels containing all appropriate sample information, including sample identification, field sample number, sample type, and analyses requested, will be used. Sample labels will be completed with waterproof ink. Sample labels should be completed and attached prior to sample collection for soil samples collected in jars and all decontamination samples collected in bottles. At a minimum, each numbered label will contain the following information:

* Project/facility

, Sample type (e.g., grab, composite)

¯ Sampler's company affiliation

, Date and time of sample collection

¯ Analyses required

¯ Preservation used

¯ Sampler's initials

¯ Chemical Materials Quality Assurance Laboratory of the Waterways Experiment Station (CQAB) identified if sample is collected for the USACE laboratory

¯ Sample identification (see below)

¯ CQAB LIMS number

Sampling Containers

Certified, commercially clean sample containers will be obtained from the contract analytical laboratory. If appropriate, the bottles will be labeled by the laboratory to indicate the type of sample to be collected. Surface soil samples will typically be collected in wide-mouth sample jars or in stainless-steel liners.

Sample Preservation

All samples will be stored on ice in an insulated cooler immediately following sample collection. Soil samples do not require additional preservation.

Sample Handling and Shipping

Sample containers will be placed in resealable plastic storage bags and wrapped in protective packing material (if appropriate). Ice (double-bagged using plastic trash bags) will be placed on top of the samples in a cooler for shipment to the laboratory. The drain on the cooler will be taped shut. Samples collected in glass containers will be packed in foam liners and bubble packing or styrofoam peanuts to ensure that no breakage occurs during shipment. Samples will

be shipped by overnight express carrier for delivery to the analytical laboratory and to the USACE laboratory (if used). The USACE laboratory will be notified prior to the arrival of the first shipment, after the final shipment, and prior to any Saturday delivery.

A completed chain-of-custody (COC) form for each cooler will be placed in a ziplock bag and taped to the inside of the cooler lid. Coolers will be wrapped with strapping tape at two locations to secure lids. Signed custody seals will be placed onthe outside of each cooler. In addition, "Fragile" labels and "This Side Up" labels will be placed on the outside of each cooler containing glass bottles. Put "This Side Up" labels on all four sides and "Fragile" labels on at least two sides. Note that each cooler cannot exceed the weight limit set by the shipper.

Holding Times and Analyses

The holding time is specified as the maximum allowable time between sample collection and analysis and/or extraction, based on the analyte of interest, stability factors, and preservation methods. Samples should be sent daily by overnight courier service to the laboratory after collection. Chemical constituents that will be analyzed have been idemified in the Sampling and Analysis Plan.

Sample Documentation and Tracking

This section describes documentation required in the field logbook, Daily Quality Control Reports (DQCRs), and sample COC requirements.

Field Logbook--Documentation of observations and data acquired in the field will provide information on the acquisition of samples and also provide a permanent record of field activities. The observations and data will be recorded with waterproof ink in a permanently bound weatherproof field book with consecutively numbered pages and, if applicable, on field sampling data sheets.

The information in the field logbook will include the following as a minimum. Additional information is incluided in the specific SOPs regarding the appropriate data sheets.

Project name

- Location of sample
- Sampler's signature
- Date and time of sample collection
- Sample identification numbers

Description of samples matrix, composite or grab sample

- Analysis to be performed
- Number and volume of samples
- Description of quality assurance/quality control (QA/QC) samples
- Sample methods or reference to the appropriate SOP
- Sample handling as appropriate for samples
- Field observations

- Personnel present

Changes or deletions in the field logbook should be lined out with a single strike mark, initialed, and dated by person making change, and remain legible. Sufficient information should be recorded to allow the sampling event to be reconstructed without relying on the collector's memory.

Each page of the field logbook will be signed by the person making the entry. Anyone making entries in another person's field book will sign and date those entries.

DQCR -- To supplement the information recorded in the field logbook, DQCRs will also be maintained to document daily field activities and will note any nonconformances and corrective actions taken at every sampling location. DQCRs will be maintained by each field sampling team and cross-checked for completeness at the end of each day by a sampling team member. They will be signed and dated by the individual making entries and initialed by the reviewer upon completion. Copies of the DQCR will be forwarded to the USACE Resident Engineer and to the Base environmental office by noon of the following day. Copies of the DQCR will be forwarded to the Insight/RMA QA Manager for review on a weekly basis.

Sample COC - During field sampling activities, traceability of the sample must be maintained from the time the samples are collected until laboratory data are issued. Information on the custody, transfer, handling, and shipping of samples will be recorded on a COC form. COCs will include site identification, field sample number, sample type, and analysis requested.

The sample handier will be responsible for completing the COC form. The COC will be signed by the sampler when the sampler relinquishes the samples to anyone else. The airbill will be retained by the sample handler for tracking purposes. A COC form will be completed for each set of samples collected daily and will contain the following information:

- Samplers signature and affiliation
- Project number

Date and.time of collection

- Sample identification number
- Sample type/matrix
- Grab or composite sample
- Preservative used
- Analyses requested
- Number of containers
- Signature of persons relinquishing custody, dates, and times
- Signature of persons accepting custody, dates, and times (laboratory)
- Method of shipment (e.g., Federal Express)

The person responsible for delivery of the samples to the air carder will sign the COC form, retain the last copy of the three-part COC form, document the method of shipment, and send the original and the second copy of the COC form with the sample (taped in a ziplock bag to inner

cooler lid). Upon receipt at the laboratory, the person receiving the samples will sign the COC form and return the second copy to the Delivery Order Manager. Copies of the COC forms and all custody documentation will be received and kept in the central files. The original COC forms will remain with the samples until final disposition of the samples by the laboratory. The analytical laboratory will dispose of the samples in an appropriate manner 60 to 90 days after data reporting. After sample disposal, a copy of the original COC will be sent to the Delivery Order Manager by the analytical laboratory to be incorporated into the central files.

SOP C5 - Headspace Screening of Soil

When headspace screening is specified, soil samples will be screened for volatile organic compounds (VOCs) in the field at the time of sample collection. Field screening will utilize an organic vapor analyzer (OVA) equipped with either photoionization detector (PID) or a flame ionization detector (FID). If a high humidity condition exists during the time period when field activity is to be performed, the FID is recommended since a PID is not a reliable screening instrument under these conditions. The ionization potential of the lamp for the PID will be optimum for the contaminants of concern. Field screening will be performed in accordance with the following procedures.

Immediately upon opening the split-spoon (or other sample retrieval device) and after collecting the volatile organic sample (if required), a representative portion of the sample will be collected and placed in a clean, contaminate-free jar. The sample may be placed in a new, clean, plastic sandwich bag inside a jar to minimize the number of new jars required. If the plastic bag method is utilized, readings will be taken inside empty bags to ensure no external contamination is being introduced. If the volume of sample recovered is insufficient for all analytical requirements, then the material used in the headspace readings could be utilized for any non-volatile sampling requirements (i.e., the headspace material could be used to fulfill geotechnical testing requirements). If due to insufficient sample volume an additional sample was retrieved immediately below the initial attempt, an additional headspace reading is not required.

– Seal each jar with at least one continuous sheet of aluminum foil, using the jar lid to secure the foil.

– Vigorously agitate the sample jar for at least 15 seconds and then allow a minimum of 10 minutes (or as the environmental conditions dictate) for the sample to adequately volatilize.

During cold weather the samples will be warmed to room temperature prior to taking the headspace measurement. Since a temporary shelter (i.e. van) is generally used to protect the field instruments, especially during inclement weather, warming the samples to room temperature should not be a problem.

Re-shake the jar and then remove the jar lid. Quickly insert the vapor sampling probe through the aluminum foil and record the maximum meter response (which should be within the first 2 to 5 seconds). Erratic responses should be evaluated in terms of high organic vapor concentrations or conditions of elevated headspace moisture.

– Record headspace screening data on the boring log and any other appropriate documentation (e.g., sample transmittals, field logbooks, etc.), as appropriate.

The screening instrument will be calibrated according to the appropriate standard span gas and will be calibrated a minimum of twice daily and before use after a long shut-down period (i.e., lunch breaks, equipment breakdowns, weather-related breaks, etc.).

If sample jars are to be re-used in the field, jars must be cleaned according to the field decontamination procedures for cleaning of sampling equipment. In addition, headspace readings must be taken to ensure no residual organic vapors exist in the cleaned sample jars.

Any deviation(s) from the approved procedures must be noted in field log book and the daily quality control report (DQCR) and a reason for the deviation(s).

SOP C6 - Soil Sampling from Excavator Bucket

Soil samples collected from the excavator bucket will be collected with a garden type trowel. This includes the samples collected during excavation and post-excavation confirmation samples. A stainless-steel trowel or scoop is recommended. The following procedures will be used:

1. Place labels on all sample containers. Covering sample labels with wide transparent waterproof tape can prevent label damage.
2. Note sample location and depth in the field notebook.
3. Insert a previously cleaned trowel into the soil and transfer the soil to the sample container(s). Avoid collecting large rocks or plant roots as much as possible. Fill the sample container to the top and leave no headspace.
4. Decontaminate the outside of the sample container. Wrap glass bottles in bubble-wrap packaging material. Place samples into re-sealable bags and store samples in an ice chest containing ice or blue icepacks. Samples should be kept at approximately 4°C.
5. If sample is to be shipped via a commercial carrier, line each cooler with a trash bag packed with bubble wrap, and seal trash bag with twist tie.
6. The sample number, date, time, and description of the sample will be recorded on the chain-of-custody COC record and in the field logbook. All entries will be written in indelible black or blue ink.
7. Decontaminate the sampling equipment for the next sample. If possible, have a sufficient quantity of clean decontaminated trowels available so that each of the soil samples can be collected with a different trowel and decontamination can be performed on all of the trowels at the end of the sampling effort rather than between each sample.

Stockpile Sampling

Soil from the stockpile will be sampled for chemical analyses using the following procedures:

1. The volume (in cubic yards) of the stockpiles will be calculated using the following formula:

   $V = A * H/27$

   Where:

   V = volume in cubic yards

   A = area of the base of the stockpile in square feet

   calculated using one of the following formulas:

   Rectangular = length * width

   Square = length * width

   Triangular = ½ base * height

   Circular = 3.14 * radius * radius

Oval = 3.14 * long radius * short radius

H = average height of the stockpile in feet

27 = conversion factor for cubic feet to cubic yards

2. The stockpile will be divided into the number of sections equivalent to the number of samples to be collected.
3. The sample locations within each section will be determined by using random numbers.
4. A hand auger or similar device will be used to access each x, y, and z coordinate. Due to limitations in accessing deep depths in a large stockpile, z-coordinates will be limited to 10 feet.
5. Sampling personnel will don a new pair of disposable nitrile gloves immediately before collecting soil samples at each location.
6. Grab samples will fill the sample containers completely. An additional sample may be collected to ensure sufficient sample quantity for analyses.
7. For waste characterization purpose, one jar at each sample location will be collected and the samples composited at the laboratory. After sampling, the sample jars will be placed in individual self-sealing plastic bags and immediately packed into a thermally–insulated, ice-chilled cooler maintained at $4^{\circ} \pm 2^{\circ}$ C prior to and during transportation to the laboratory.
8. Sample numbering, labeling, documenting, and packaging procedures will be followed as described in Worksheet #27.

Duplicate Soil Sample Collection

Duplicate samples will be collected during confirmation sampling at the frequency specified in Worksheet # 12. The following procedures will be used to collect duplicate samples from an excavator bucket:

1. Transfer an aliquot of soil from the excavator bucket to a clean stainless steel bowl with a clean trowel or spoon. Avoid collecting large rocks or plant roots as much as possible. Stir the soil in the bowl to homogenize.
2. Transfer the homogenized material into the two separate sample containers. Fill each sample container to the top and leave no headspace.
3. Place labels on all sample containers. The rationale for applying Identification numbers to duplicate samples is provided in Worksheet # 27.
4. Process the duplicate sample in accordance with the Procedures for Soil Sampling from an Excavator Bucket, steps 4-7

The following procedures will be used for collecting In-Situ field duplicate samples:

1. Follow the Procedures for In-Situ Soil Sampling Steps 1 and 2.
2. The sample technician, wearing a new pair of nitrile gloves, will cut out of the core, two adjacent intervals as a collocated sample.
3. Label the duplicate sample as specified in Worksheet #27.
4. Process the sample in accordance with the procedures specified for In-Situ soil sampling provided.

SOP C7 - Decontamination of Sampling Equipment

All reusable equipment potentially contaminated with target analytes will be decontaminated. Equipment will be decontaminated by washing with a low residue, anionic detergent (e.g., Liquinox), followed by two separate fresh water rinses.

1. Rinse with potable water. This step will decrease the gross contamination and reduce the frequency at which the detergent and water solution needs to be changed. Scrub the equipment in a 5-gallon bucket that is about 75 percent full of water with long-handled brush. Frequent changing of this water will increase its effectiveness.
2. Wash with detergent and water solution. This step will remove all visible contamination from the equipment. Scrub the item to be decontaminated with a long-handled brush in a 5-gallon bucket that contains a solution of water and detergent diluted according to the manufacturer's specifications.
3. Use a second bucket to rinse with potable water. This step will remove most of the detergent solution on the equipment. Periodic changing of this water is required.
4. Use a third bucket to rinse again with potable water. This step will further remove the detergent solution on the equipment. Visually inspect the equipment for any remaining detergent residues and rinse off with additional potable water as needed.

Decontamination of Equipment

A temporary decontamination pad will be constructed at a site location approved by Cannon AFB. The decontamination pad will be lined with 40-mil plastic sheeting. Years of experience have shown that 40-mil plastic sheeting is strong enough to hold up against equipment traffic. The plastic sheeting will be secured to prevent fluttering or blowing away by high winds. The pad will have a slight grade so that any decontamination water generated will collect at one end. This water will be pumped into 55-gallon drums with a contractor's pump. Trucks and excavation equipment will be visually inspected and dirt will be brushed and scraped from the equipment. All equipment and tools will be decontaminated both upon arrival and prior to departure.