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JAN 2007
NMED
Waste Bureau

Mr. James Bearzi
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Dear Mr. Bearzi

Cannon AFB respectfully submits under separate cover two copies of the Final Accelerated Corrective Measures Work Plan for SWMU 109 Fire Training Area No. 4 (FTA-4). These copies were sent to Mr. David Cobrain in your Santa Fe office.

The purpose of this document is provided in response to your 2 Nov 06 letter containing NMED review comments on the Final No Further Action Report for FTA-4 Report dated Jun 06. If you have any questions, please contact Ms. Kristi Doll at (505) 784-1098.

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

Sincerely

Stephen D. Wood
STEPHEN D. WOOD, Lt Col, USAF

Attachment:
Final Accelerated Corrective Measures Work Plan for SWMU 109 FTA-4 dated Oct 06

cc:
NMED (David Cobrain) w/2 copy
EPA Region 6 (Bob Sturdivant) w/1 copy

Accelerated Corrective Measures Work Plan for the Removal of Contaminated Soil at SWMU 109 (Fire Training Area No. 4) Cannon Air Force Base, New Mexico

Final
October 2006

27 CE/CEV
Cannon Air Force Base
New Mexico

Accelerated Corrective Measures Work Plan for the Removal of Contaminated Soil at SWMU 109 (Fire Training Area No. 4) Cannon Air Force Base, New Mexico

Final
October 2006

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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AHA	activity hazard analysis
bgs	below ground surface
CAO	corrective action objective
CMS	corrective measures study
CQC	Contractor Quality Control
DQCR	Daily Quality Control Report
DRO	diesel-range organic
EPA	U.S. Environmental Protection Agency
Foster Wheeler Environmental	Foster Wheeler Environmental Corporation
ft	foot or ft
FTA4	Fire Training Area No. 4
HASP	Health and Safety Plan
mg/kg	milligrams per kilogram
NFA	No Further Action
NELAC	National Environmental Laboratory Accreditation Conference
NMED	New Mexico Environment Department
OSHA	Occupational Safety and Health Administration
PCS	petroleum-contaminated soil
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
QA	quality assurance
QC	quality control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	Remedial Investigation

LIST OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

SHSO	Site Health and Safety Officer
SOP	standard operating procedure
SSHP	Site Safety and Health Plan
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TCLP	toxicity characteristic leaching procedure
TN&A	T N & Associates, Inc.
TPH	total petroleum hydrocarbons
TtEC	Tetra Tech EC, Inc.
TtFW	Tetra Tech FW, Inc.
USACE	U.S. Army Corps of Engineer
VCA	Voluntary Corrective Action
VOC	volatile organic compound

1. INTRODUCTION

This document is an addendum to the May 2000 *Draft Work Plan for the Removal of Contaminated Soil at Solid Waste Management Unit (SWMU) 109 (Fire Training Area No. 4)* (Foster Wheeler Environmental 2000a). The Work Plan Addendum describes the updated scope of work and field program for the excavation and disposal of petroleum-contaminated soil (PCS) at Fire Training Area 4 (FTA4), Cannon Air Force Base (AFB) (Figure 1-1). As shown on Figure 1-2, four separate SWMUs comprise FTA4:

- SWMU 109—Fire Training Pit
- SWMU 110—Underground Waste Oil Tank
- SWMU 111—Unlined Pit
- SWMU 112—Oil/Water Separator

The scope of work developed in 2000 as part of the corrective measures study (CMS) (Foster Wheeler Environmental 2001) described the work process and requirements for excavating soil from an area measuring 20 feet (ft) by 20 ft to a depth of 2 ft, and the subsequent disposal of the PCS to support corrective action of the site. The scope of the original field program was never conducted and a revised approach for corrective action of the site using in situ passive bioventing was selected as the final remedy during the CMS. However, a passive bioventing system was never implemented either, and a subsequent action took place in 2005 at SWMU 109 to remove high molecular weight petroleum contamination in the vicinity of the former fire training pit as described in Section 2. Currently, petroleum contamination still exists in soil at the site even though the risk assessment shows that exposure to individual chemicals indicated acceptable risk to human health and the environment following current New Mexico Environment Department (NMED) guidance (NMED 2005).

The objective of this field program is to remove the remaining contaminated soil from SWMU 109 based on the results of confirmation sampling conducted as part of the 2005 soil removal activities. Excavation will take place in the area where total petroleum hydrocarbon (TPH) diesel-range organics (DRO) were detected at levels exceeding NMED guidelines during soil removal action in March and April 2005. Field work will consist of the following tasks:

- Site mobilization
- Excavation and stockpiling of PCS
- Confirmation sampling of the excavation sidewalls and floor, and sampling of the soil to be disposed offsite for the purpose of waste characterization
- Offsite transportation and disposal of PCS
- Excavation backfilling, compacting, and grading
- Site demobilization

The approach for this soil removal project is based on the results of PCS excavation and confirmation soil sampling at FTA4 in March and April 2005 (TtEC, 2005). This document is an addendum to the May 2000 *Draft Work Plan for the Removal of Contaminated Soil at SWMU 109 (Fire Training Area No. 4)* (Foster Wheeler Environmental 2000a). The 2000 Work Plan is presented in its entirety as Appendix A of this 2000 Work Plan addendum for reference.

All field activities will be performed in accordance with the Basewide Health and Safety Plan (HASP) (Foster Wheeler Environmental, 2000b), the project Site Safety and Health Plan (SSHP), and the U.S. Army Corps of Engineers (USACE) health and safety requirements (USACE, 2003). The 2000 Work Plan is presented in its entirety as Appendix A of this document. The project-specific SSHP is contained in Appendix A (Appendix E of the 2000 Work Plan), and includes an updated site-specific Activity Hazard Analysis (AHA).

All activities will be governed by the applicable technical specifications, standard operating procedures (SOPs), and requirements as originally presented in Appendices A through E of the 2000 Work Plan. Supplemental information for the management of waste and project-specific quality assurance (QA) and quality control (QC) requirements are provided in Section 5.0 of this Work Plan Addendum.

2. 2005 VOLUNTARY CORRECTIVE ACTION

The Final CMS report for FTA4 was prepared in 2001 (Foster Wheeler Environmental 2001) and the corrective action objective (CAO) developed for SWMUs 109, 110, and 111 was to meet the then-current TPH action level of 5,000 milligrams per kilogram (mg/kg) in soil. Based on the results of the CMS, No Action was the only corrective measures alternative evaluated for SWMUs 110 and 111 because all detected concentrations of TPH were below the action level. No CAO was developed for SWMU 112 because the oil/water separator and associated leach field at this site had been removed previously and all related soil contamination was addressed under the corrective action for SWMU 111. SWMU 109 was the only SWMU that warranted corrective action because there was known TPH contamination at this site based on previous sampling programs.

The recommended corrective measure for SWMU 109 in the CMS was passive bioventing. Passive bioventing was selected as the remedy for SWMU 109 based on data from investigations in 1991 and 1997. To determine the current site conditions so that design parameters for the remedy could be established, a Phase I Soil Investigation was conducted at SWMU 109 in November 2004. The results of this investigation (TN&A 2005) supported a decision to implement a presumptive remedy to remove the source of contamination by excavating and disposing the contaminated soil rather than implementing passive bioventing.

Section 2.1 summarizes the information originally presented in the 2004 Technical Memorandum (TtFW 2004), which outlined the work completed through the CMS for FTA4 and the recommended sampling to determine site conditions prior to corrective action. Section 2.2 presents the sampling program conducted in November 2004 (TN&A 2005) in response to the Technical Memorandum. Section 2.3 provides the results of the voluntary corrective action (VCA) conducted, which consisted of contaminated soil removal, offsite disposal, and excavation backfilling.

2.1 Evaluation of Site Conditions

A technical memorandum was developed in 2004 to present the background information and rationale for proposed sampling to confirm the concentration of petroleum hydrocarbons in soil at FTA4 prior to implementing any corrective action. The Technical Memorandum (TtFW 2004) presented supporting information from current site conditions; previous investigations; the CMS for SWMUs 109, 110, 111, and 112 (Foster Wheeler Environmental 2001); and the regulatory framework for addressing residual petroleum contamination in soil at the site. SWMU 109 was the primary area of interest at FTA4 addressed in this memorandum because it is the area impacted the most by previous activities at FTA4.

Based on the investigations conducted to date, the primary chemicals of concern at FTA4 are petroleum hydrocarbons associated with the storage and use of JP-4 during training exercises. A risk assessment was conducted as part of the Phase II Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) to evaluate risk to human and ecological receptors from exposure to site contaminants (Harza 1997). The risk assessment concluded that human health and ecological risks associated with exposure to contamination at FTA4 were negligible under the conditions of the site at that time.

As part of the CMS, human health risks were re-evaluated because the previous investigations did not characterize potential risks associated with a residential use scenario. Using the NMED guidance available at the time (NMED 2001), along with data from the Remedial Investigation (RI) conducted in 1992 by Woodward-Clyde, and the Phase II RFI conducted in 1997 by Harza, concentrations of chemicals in soil were compared to the NMED soil screening levels (SSLs). This comparison confirmed that there is no significant human health risk requiring further action at FTA4. The detailed results of this evaluation are presented in Appendix B of the Final CMS Report (Foster Wheeler Environmental 2001).

Although No Further Action (NFA) was recommended to address health risks at this site, the presence of petroleum in soil required attention. Since the CMS was submitted in 2001, the NMED Hazardous Waste Bureau issued TPH screening guidelines in 2003 and 2005 to support the evaluation and determination of cleanup levels for sites impacted by releases of petroleum hydrocarbons (NMED 2003, 2005). NMED provided a TPH screening guideline for each type of petroleum product based on the assumed composition of petroleum products released at a site. Based on the fact that JP-4 was the fuel used at FTA4, screening guidelines for jet fuel were used to determine the extent of contaminated soil requiring remediation at the site. The residential direct exposure soil screening guideline for TPH in soil is 940 mg/kg, and the industrial direct exposure guideline is 2,350 mg/kg.

Based on the corrective measures alternative evaluation presented in the Final CMS report (Foster Wheeler Environmental 2001), the preferred corrective measures alternative for remediation of PCS at SWMU 109 was passive bioventing. Passive bioventing is relatively easy to implement and can be conducted onsite with periodic maintenance and sampling over a period spanning several years.

The selection of the remedial alternative (passive bioventing) was based on analytical data collected in 1991 and 1997. In order to define the extent of contamination requiring corrective action, additional sampling at FTA4 was proposed in the Technical Memorandum to confirm the concentrations of petroleum hydrocarbons in soil at locations where the 1991 and 1997 investigations indicated elevated levels of contamination, and at new locations in areas not previously sampled to help define the lateral and vertical extent of contamination. These new sample locations were selected using the passive soil gas data collected for DRO during the Phase II RFI (Harza 1997). The area of the highest DRO concentrations in soil gas was centered around the former concrete pad at SWMU 109, and the new locations were proposed within this area. Confirmation samples and additional data were collected to more accurately delineate the current extent of contamination because it is likely that petroleum in soil has degraded over the past several years since the most recent investigation of the site.

The proposed sampling program was implemented as the pre-VCA site characterization to delineate the current extent of PCS at FTA4 and to re-evaluate the corrective action required for the site. Because Cannon AFB wanted to accelerate cleanup of FTA4 to facilitate site closure in 2006, the primary focus of the corrective measures evaluation for this site included contaminated soil removal and offsite disposal as presented in Section 2.3.

2.2 Pre-Voluntary Corrective Action Characterization

Based on the recommendation for additional sampling at FTA4 presented in the Technical Memorandum, the *Phase I Investigation at Fire Training Area 04* (Phase I Investigation) (TN&A 2005) took place at FTA4 in November 2004. The objective of this project was to confirm subsurface petroleum soil contamination in the vicinity of SWMU 109, SWMU 111, and SWMU 112. The investigation was focused primarily on the SWMU 109 area, but included two borings in the vicinity of SWMUs 111 and 112. The field investigation was implemented to confirm the vertical and horizontal extent of contamination.

Sampling locations were based on the locations recommended in the Technical Memorandum. Ten boreholes were sampled in the vicinity of the former concrete pad and 34 soil samples were collected for TPH-DRO analysis. The locations of the boreholes drilled and sampled during the Phase I investigation at FTA4 are presented in Figure 2-1. Staining and strong odors were generally observed only in the upper 2 to 4 ft of soil in some borings. Of the 14 samples with analytical results exceeding the screening criteria, 8 samples had observed staining and/or odors. Photoionization detector (PID) field screening results appeared to be a better indicator of soil contamination such that 10 of the 14 samples with analytical results exceeding the NMED screening criteria had PID readings exceeding 100 parts per million (ppm) (TN&A 2005).

The Phase I investigation results confirmed that soil in the SWMU 109 area was impacted with residual TPH-DRO at concentrations greater than NMED guidelines for jet fuel for both residential direct exposure (940 mg/kg) and industrial direct exposure (2,350 mg/kg) scenarios. The highest concentrations of TPH-DRO (up to 15,000 mg/kg at 0 to 1 ft) were identified in a boring located at soil boring location SB01 on the southern edge of the former concrete pad at SWMU 109. Cross-sections presented in the Phase I Investigation report show that, at most locations, the soil contamination decreases to less than the residential direct exposure guideline of 940 mg/kg at a depth of 5 ft below ground surface (bgs). However, PCS was found at depths of 10 ft bgs and greater in only two borings (soil borings 200401 and SB01) located in the vicinity of the former concrete pad (TN&A 2005).

Based on the results from the Phase I Investigation and previous investigations, PCS is present in the vicinity of SWMU 109. The depth of contamination across the site ranges from less than 3 ft to greater than 20 ft in a localized area. The deepest soil contamination was detected in soil boring SB01 located south-southeast of the former concrete pit at SWMU 109. Areas immediately beneath the former SWMU 109 concrete slab appear to have relatively low concentrations; however, prior investigative data suggest that higher concentrations may be present (TN&A 2005).

2.3 Voluntary Corrective Action Activities

Although risk posed by direct exposure to petroleum hydrocarbons is minimal in the vicinity of SWMU 109, the primary purpose of the VCA was to remove PCS from SWMU 109 to eliminate the source of contamination and any associated risk. The VCA included excavating an area covering approximately 7,000 square ft as defined by the data collected during the Phase I Investigation (TN&A 2005). The VCA involved removing the top 2 ft of soil from this defined area as shown in Figure 2-1.

VCA field activities were performed in two phases between March 28 and April 22, 2005 (TtEC 2005).

2.3.1 Waste Characterization

Prior to excavating, one sample was collected from 0 to 2 ft using a hand auger within the excavation footprint where the highest concentrations of contamination were expected to exist. The purpose of this sample was to provide data for waste characterization of the PCS. The waste characterization sample was analyzed for the following parameters:

- TPH-DRO—U.S. Environmental Protection Agency (EPA) SW-846 method modified 8015M
- Toxicity characteristic leaching procedure (TCLP) volatile organic compounds (VOCs)—EPA SW-846 method 1311/8260B
- TCLP semivolatile organic compounds (SVOCs)—EPA SW-846 method 1311/8270
- TCLP pesticides—EPA SW-846 method 1311/8081
- TCLP herbicides—EPA SW-846 method 1311/8151
- TCLP metals—EPA SW-846 method 1311/6010B and 7470A
- Ignitability—EPA SW-846 method 1311/1010
- Reactivity (cyanide and sulfide)—EPA SW-846 method Chapter 7

Based on the analytical results of the waste sample (sample 01), the PCS was characterized as nonhazardous waste and eligible for disposal at the permitted Rhino Environmental, Inc. landfarm facility in Hobbs, New Mexico.

2.3.2 Excavation Activities

PCS was excavated from within the delineated footprint and stockpiled onsite in a temporary storage area. The stockpile area was bermed and lined and covered with plastic to prevent cross contamination and runoff from the PCS during the 2-week period between the excavation and disposal and backfilling activities.

A total of approximately 740 tons of PCS soil were excavated and transported from FTA4 for offsite disposal at the Rhino Environmental, Inc. landfarm facility. All soil was exported under nonhazardous waste manifests.

2.3.3 Confirmation Sampling

Confirmation samples were collected from the sidewalls and floor of the excavation to verify the concentrations of petroleum contamination remaining in place prior to backfilling (Figure 2-1). Five discrete samples (02 through 06) were collected at intervals along the sidewalls and three samples (07 through 09) were collected from the floor of the excavation. Confirmation samples were analyzed for TPH-DRO using EPA SW-846 method modified 8015M. Table 2-1 presents a summary of the

TPH-DRO results for confirmation samples. There were two exceedances of the TPH-DRO regulatory guideline of 940 mg/kg (NMED 2003). The highest detection of 7,200 mg/kg occurred in the sample collected from the southeastern wall of the excavation. The other exceedance was on the western side of the excavation floor (2,200 mg/kg). The exceedance of the duplicate sample result from the western excavation sidewall (990 mg/kg) was not considered significant (TtEC 2005). Although TPH concentrations in confirmation soil samples exceed screening levels, environmental risk is negligible because the chemical-specific risk screening evaluation completed during the CMS indicated there are no unacceptable noncarcinogenic or carcinogenic risks associated with FTA4. Additionally, the potential for future degradation to groundwater caused by leaching is unlikely to occur due to limited infiltration predicted by fate and transport modeling conducted during the CMS.

Table 2-1. TPH-DRO Analytical Results for 2005 Confirmation Samples

Sample ID	Location	TPH-DRO (mg/kg)	Exceedance of Residential Guideline (940 mg/kg)	Comments
C109WEW02 (sample 01)	West Excavation Sidewall	810	No	
C109WEWED10 (sample 10)	West Excavation Sidewall (Duplicate)	990	Yes	Duplicate of sample C109WEW02; concentration exceeds Residential Guideline of 940 mg/kg
C109SEW03 (sample 03)	South Excavation Sidewall	7,200	Yes	Concentration exceeds Residential Guideline of 940 mg/kg
C109EEW04 (sample 04)	East Excavation Sidewall	9.9	No	
C109NEW05 (sample 05)	North excavation Sidewall	20	No	
C109NEEW06 (sample 06)	Northeast Excavation Sidewall	7.5	No	
C109EEF07 (sample 07)	East Excavation Floor	630	No	
C109WEF08 (sample 08)	West Excavation Floor	2,200	Yes	Concentration below Industrial Guideline of 2,350 mg/kg
C109MEF09 (sample 09)	Middle of Excavation Floor	210	No	

2.3.4 Backfilling, Compaction, and Grading Activities

The SWMU 109 excavation was completely backfilled using certified clean soil. The surface was graded to a slight mound to allow for settlement and to provide positive drainage. The first loads of clean fill material were imported from the Rhino Environmental, Inc. landfarm in Hobbs, New Mexico. Additional fill material was brought in from a second source on the property of Clovis Concrete in Clovis, New Mexico, on April 22, 2005. A total of approximately 800 tons of clean soil was imported to backfill the excavation.

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3. SCOPE OF ACTIVITIES

The following subsections present information related to the activities associated with the proposed removal action at FTA4. For specific information refer to Section 4.0 of the 2000 Work Plan.

3.1 Site Mobilization

Mobilization activities will include:

- Attending preconstruction meeting
- Determining site layout and traffic/access roads
- Delivering equipment, materials, and supplies to the site
- Establishing construction zones at the site
- Confirming approval of the base digging permit and inspecting utility mark-outs at the site
- Securing necessary clearances/approvals to work at the site
- Conducting site-specific orientation and health and safety training of workers, including medical surveillance information, and issuing base passes

A preconstruction meeting will be held at Cannon AFB on the morning of the first day of mobilization. Meeting invitees will include the Restoration Project Manager from Cannon AFB and representatives from the USACE and its contractor. Other individuals from the base, USACE, and the contractor's team members may attend the meeting as necessary. For specific information related to mobilization, refer to Section 4.2.2 of the 2000 Work Plan (Foster Wheeler Environmental 2000a).

3.2 Excavation and Stockpiling

PCS from the area of the former fire training pit within SWMU 109 will be excavated and stockpiled during this task. Construction activities that will be performed immediately following mobilization include:

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

Since the specific extent of PCS requiring removal is not known, excavation will take place in a stepped approach utilizing exploratory test pits and trenches to delineate contamination. Figure 3-1 presents a map of the site showing proposed exploratory test pit locations and previous excavation and confirmation soil sample locations indicated. Figure 3-2 presents a proposed layout of the site including designated stockpile areas.

Soil will be excavated to a maximum depth of 10 ft based on the low potential for direct exposure to contaminants by human and the environmental receptors once PCS excavation and backfilling is complete. Following the steps presented below, the excavation of PCS will be conducted to define the extent of soil to be removed.

- *Step 1*: As shown in Figure 3-1, exploratory test pit locations are located on a 30-ft grid spacing within a 90-ft by 90-ft area in the southwestern portion of the former fire training pit. Step 1 of the removal action will consist of excavating test pits at each location to a depth of 10 ft to determine whether there is an indication of visible contamination (e.g., stained soil) and elevated volatile organic headspace screening results within the soil. If there is no evidence of contamination within any of the test pits, further exploration will not be required. If there is evidence of contamination in any of the test pits, the field operations lead will determine where additional test pits should be excavated to determine the lateral extent of contamination.

- *Step 2:* If additional exploratory test pits are required to determine the lateral extent of contamination, test pits or trenches will be excavated to a depth of 10 ft. At this point, exploratory trenches may provide the best means to determine the lateral extent of contamination because they can cover a greater distance and provide a basis for accurate observations. Visual observations will be made and headspace screening will be conducted for each test pit/trench. Exploratory test pits/trenches will be excavated until the lateral and vertical extent of contamination has been delineated.

- *Step 3:* Based on the results of the exploratory test pits/trenches, excavation of PCS will occur across the site to remove contaminated soil as required under this Work Plan Addendum. Based on previous sampling and soil removal activities, staining is indicative of levels of TPH that exceed the NMED guidelines. Therefore visual observation of the soil will be used to help define the limits of the excavation, such that soil exhibiting staining will be removed to a maximum depth of 10 ft. For specific information related to excavation and stockpiling, refer to Section 4.2.3 of the 2000 Work Plan.

In order to efficiently manage the soil that will require offsite disposal, stockpiles will be segregated based on whether the soil appears clean or shows evidence of contamination. 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 presented in Section 3.3.

3.3 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 ft along the perimeter of the excavation. Floor samples will be discretely collected at a frequency of one per 10,000 sq ft, equivalent to an area of 100 ft by 100 ft. 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 SOP C3, Soil Sampling,

which is included in Appendix A of this Work Plan Addendum (Appendix C of the 2000 Work Plan). The analytical results for confirmation samples will be evaluated in accordance with current NMED guidance (NMED 2005).

During excavation activities, one five-point composite sample per 1,000 cubic yards will be collected from within the stockpiles of PCS in order to characterize the soil for offsite disposal. The stockpile soil sample will be analyzed for the following parameters:

- TPH-DRO—EPA SW-846 method modified 8015M
- TCLP VOCs—EPA SW-846 method 1311/8260B
- TCLP SVOCs—EPA SW-846 method 1311/8270
- TCLP pesticides—EPA SW-846 method 1311/8081
- TCLP herbicides—EPA SW-846 method 1311/8151
- TCLP metals—EPA SW-846 method 1311/6010B and 7470A
- Ignitability—EPA SW-846 method 1311/1010
- Reactivity (cyanide and sulfide)—EPA SW-846 method Chapter 7

Upon receipt of the analytical data, the project chemist will review the results and submit a recommendation to Cannon AFB and USACE 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, this soil will be used for excavation backfill material. If analytical results indicated that the soil is contaminated, then offsite disposal of this soil will be required.

3.3.1 Sample Designation

The following sample nomenclature will be used for designating analytical samples per the 2000 Work Plan:

Installation	###	AA	##
Cannon	SWMU Identification	Sample Type	Sequential Sample Number

Sample nomenclature for this project is limited to the following:

Installation:	Cannon AFB (C)
###:	109
AA:	Excavation floor (EF) or sidewall (EW); or stockpile (SP)
##:	11, 12, 13, 14, 15, etc.

For example, according to the sample numbering system, the first soil sample collected from an excavation sidewall will be identified as C109EW11.

3.3.2 Sampling Equipment and Procedures

All sampling will be conducted in accordance with the SOPs contained in Appendix C of the 2000 Work Plan. Specifically, these SOPs and the equipment required to implement the SOPs are as follows:

- SOP C1—Wet Decontamination Methods
- SOP C2—Photoionization Detectors
- SOP C3—Soil Sampling
- SOP C4—Soil Stockpile Sampling
- SOP C5—Sample Handling and Documentation

In addition, SOP C6, Headspace Screening of Soil, has been added to this Work Plan Addendum to provide the procedure for headspace screening of volatile compounds in soil. This new SOP is included in Appendix C of the 2000 Work Plan (Appendix A of this Work Plan Addendum).

3.4 Offsite Transportation and Disposal

Based on the results of confirmation samples collected during the 2005 soil removal activities, offsite disposal of PCS will be required if TPH-DRO exceeds the NMED guideline of 940 mg/kg and the results of the TCLP analyses indicate the soil is not a hazardous waste. 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 RCRA hazardous waste disposal facility.

The contractor will provide oversight for waste loading and transportation off the Base. Manifests for all waste disposed offsite will be signed by the Cannon AFB Project Manager. The contractor will provide copies of the waste manifests to Cannon AFB and USACE for project documentation.

For specific information related to waste management, refer to Section 5.3 of the 2000 Work Plan (Appendix A of the Work Plan Addendum).

3.5 Excavation Backfilling

The excavation will be backfilled with clean material imported from an 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 may be used to place backfill in maximum 1-ft lifts.

<u>Variation to the Technical Specification on Earthwork in Appendix A of the 2000 Work Plan:</u>
The weight of the truck and/or the backhoe or wheel loader will be sufficient to compact the soil backfill material. Mechanical compaction to 90 percent of standard Proctor will not be required. Consistent with the technical specification in Appendix A of the 2000 Work Plan, geotechnical testing will not be required.

Grading and compaction 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.

For specific information related to backfilling, refer to Appendix A of this Work Plan Addendum (Section 4.2.3.3 and Appendix A of the 2000 Work Plan).

3.6 Site Demobilization

Demobilization will consist of removing all equipment, cleaning the project site, inspecting the work, and certifying completion. Site cleaning will include repairing any erosion- or runoff-related damage; grading all areas affected by the construction; removing all materials such as excess construction material, wood, debris, and other foreign material; and removing all construction equipment and temporary facilities.

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4. HEALTH AND SAFETY

The Basewide HASP and project-specific SSHP (in Appendix A) will be used during the soil sampling and all other field activities. Based onsite-specific information and the concentrations of constituents in the soil, the subsequent sections summarize the health and safety protocol that will be followed during the soil removal activities.

4.1 Personal Protective Equipment

Level D personal protective equipment (PPE) will be used to conduct soil excavation and associated activities at FTA4. The following items comprise Level D PPE that will be used during sampling activities:

- Sturdy pants and short- or long-sleeved shirt
- Leather or chemical-resistant work boots with a steel toe and shank
- Disposable nitrile outer gloves and nitrile inner gloves (required for sampling)
- Safety glasses
- Occupational Safety and Health Administration (OSHA)-approved hard hat

4.2 Hazards

An updated AHA is provided in the 2000 Work Plan, Appendix E, Attachment 1 (Foster Wheeler Environmental 2000a), which is contained as Appendix A of the Work Plan Addendum. The AHA presents the potential physical, chemical, and biological hazards of the field program and the measures that will be taken to mitigate those hazards. During the excavation and truck loading, the Site Health and Safety Officer (SHSO) will monitor the breathing zone of workers using a PID or flame ionization detector whenever odors indicate the presence of petroleum-type materials in the excavated soil. In the event that a sustained concentration of 5 ppm is detected during air monitoring in the work area, an upgrade in PPE to Level C respiratory protection will be required. Based on recent field activities at FTA4 and associated air monitoring data, chemical exposure is expected to be minimal or non-detectable.

4.3 Project Personnel and Emergency Response

Key project personnel for this project, their responsibilities, and telephone numbers will be provided to Cannon AFB and USACE prior to mobilization to the site. Emergency contacts for this project (to date) are provided in the health and safety contact summary sheet (see page 4-2).

HEALTH AND SAFETY CONTACT SUMMARY SHEET

Cannon Air Force Base
27 CES/CEV
506 D.L. Ingram Blvd.
Cannon AFB, NM 88103

Ms. Kristi Doll, RCRA Corrective Action Remediation Program Manager
Phone: 505-784-1098
Fax: 505-784-1089

CONTACT NAME/TELEPHONE NUMBERS

Name and Title	Telephone Number
Contractor Project Manager	*TBD*
Contractor Site Superintendent	*TBD*
Contractor SHSO	*TBD*
Contractor Project Environmental Safety Manager	*TBD*
USACE Project Engineer (onsite)	*TBD*
USACE Technical Project Manager	*TBD*
EMERGENCY TELEPHONE NUMBERS	
Agency	**Telephone Number**
Ambulance (Base)	(505) 784-4033
Fire Department (Base)	(505) 784-2578
Base Clinic	(505) 432-6866
Poison Control	(800) 432-6866
EPA (information line)	(800) 424-9346
National Response Center	(800) 424-8802
Chemtrec	(800) 424-9300
Civilian Hospital – Clovis High Plains Hospital	(505) 769-2141

5. QUALITY ASSURANCE PROJECT PLAN

The Quality Assurance Project Plan (QAPP), Section 7 of the 2000 Work Plan (Foster Wheeler Environmental 2000a), will be followed during the soil removal action. The 2000 Work Plan is presented as Appendix A of the Work Plan Addendum. This QAPP follows the format provided in the General Chemistry Supplement to the Scope of Services for Studies (USACE, 2002). Sampling and analysis will be conducted in accordance with the QAPP and specific information presented in this Work Plan Addendum.

Appendix B to this Work Plan Addendum presents the analytical methods, reporting limits, and QC criteria specific to this soil removal action. The information presented in Appendix B of this Work Plan Addendum supersedes the information presented in Section 7 of the 2000 Work Plan. Soil samples collected in support of the FTA4 soil removal action will be sent to a USACE-approved National Environmental Laboratory Accreditation Conference (NELAC)-certified analytical laboratory.

Confirmation soil samples will be analyzed for TPH-DRO only. The composite samples collected for characterization of the soil stockpiles will be analyzed for RCRA waste characterization parameters including TCLP, ignitability, and reactivity. The method reporting limits for TPH-DRO and the RCRA waste characterization analyses will achieve the 940 mg/kg NMED screening level for petroleum hydrocarbons and the regulatory levels for toxicity characteristics.

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6. REGULATORY COMPLIANCE

6.1 Permits

Title 40 of the Code of Federal Regulations 122.26 requires a National Pollution Discharge Elimination System permit for construction activity, including clearing, grading, and excavation activities, except for operations that result in the disturbance of less than 1 acre of total land area and are not part of a larger common plan of development or sale. The actual construction area for this project is less than 1 acre, so a construction permit or a Notice of Intent to discharge and a project-specific Stormwater Pollution Prevention Plan are not required. To minimize any discharges resulting from construction activities, best management practices will be followed. Appendix A of the Work Plan Addendum (Appendix A of the 2000 Work Plan [Foster Wheeler Environmental 2000a]) presents the technical specifications for this project as they relate to dust control, erosion and sediment control, and earthwork.

6.2 Waste Management

Waste will be generated as a result of excavation activities. Waste minimization techniques will be employed whenever possible. Waste generated during this field program will be characterized using the analytical results available from stockpile soil samples. Wastes that may be generated in the field are listed below:

- Contaminated soil
- Clean soil
- Decontamination fluids
- PPE

The management of these wastes will follow Section 5.6 of the Regulatory Compliance Plan, included in Appendix A (Section 5 of the 2000 Work Plan [Foster Wheeler Environmental 2000a]).

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7. PROJECT MANAGEMENT

7.1 Project Schedule

A proposed project schedule will be provided by the contractor prior to mobilization to the site.

7.2 Project Staffing Plan

The key parties involved in the project are the USACE Omaha District, Cannon AFB, and the contractor. A proposed project staffing plan will be provided by the contractor prior to mobilization to the site.

7.3 Documentation and Reporting

Reports and submittals are addressed in detail in Appendix A (Section 4 of the Contractor Quality control (CQC) Plan in Appendix D of the 2000 Work Plan [Foster Wheeler Environmental 2000a]).

7.3.1 Inspections

Due to the timeframe associated with the field program, two inspections will be conducted by the contractor and USACE related to their specific work tasks as follows:

- *Preparatory/Initial Phase Inspection*—This single inspection will be completed prior to performing any work onsite and will meet the requirements of both types of inspections. Specific details of these inspections are provided in Appendix A (Sections 3.1 and 3.2 of the CQC Plan in Appendix D of the 2000 Work Plan).

- *Completion Inspection*—This single inspection will take place at the conclusion of the field tasks after all work has been completed by the contractor. This inspection will fulfill the requirements of the three types of completion inspections as outlined in Appendix A (Sections 3.4.1, 3.4.2, and 3.4.3 of the CQC Plan in Appendix D of the 2000 Work Plan).

7.3.2 Reporting

The reporting required for this project includes the following:

- *Daily Quality Control Summary Reports*—In accordance with Section 4.1 of the Construction QA/QC Plan in Appendix A (Appendix D of the 2000 Work Plan), the Site Superintendent will prepare and submit Daily Quality Control Summary Reports (DQCRs) to the USACE Project Manager. A DQCR will be completed to document construction activities covered by the CQC Plan (Appendix D of the 2000 Work Plan). Contractors will be responsible for the DQCRs related to their field tasks.

- *Report*—At the conclusion of the project, Draft and Final versions of a completion report will be submitted to document project activities. Additional items to be presented in the report include variances to the work plan, if any; analytical data and associated evaluations; and waste manifests.

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8. REFERENCES

Foster Wheeler Environmental (Foster Wheeler Environmental Corporation)

2001 *Final Corrective Measures Study Report for SWMUs 109, 110, 111, and 112—Fire Training Area Four, Cannon Air Force Base, New Mexico.* December.

2000a *Draft Work Plan for the Removal of Contaminated Soil at SWMU 109 (Fire Training Area No. 4), Cannon Air Force Base, Clovis, New Mexico.* May.

2000b *Final Basewide Health and Safety Plan for Cannon Air Force Base.* February.

Harza (Harza Environmental Services)

1997 *Phase II RCRA Facility Investigation Report (Draft), Cannon Air Force, New Mexico.* August.

NMED (New Mexico Environment Department)

2005 *Total Petroleum Hydrocarbon (TPH) Screening Guidelines.* November 2004 update.

2003 *New Mexico Environment Department TPH Screening Guidelines.* June.

2001 *Technical Background Document for Development of Soil Screening Levels, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program.*

TN&A (T N & Associates, Inc.)

2005 *Phase 1 Investigation at Fire Training Area 4, Cannon Air Force Base, New Mexico.* January.

TtEC (Tetra Tech EC, Inc.)

2005 *Final Voluntary Corrective Measures Report for Fire Training Area No. 4, Cannon Air Force Base, New Mexico.* May.

TtFW (Tetra Tech FW, Inc.)

2004 *Technical Memorandum, Evaluation of Total Petroleum Hydrocarbons in Soil at Fire-Training Area 4.* May.

USACE (U.S. Army Corps of Engineers)

2003 *Safety and Health Requirements, EM 385-1-1.* November.

2002 *General Chemistry Supplement to the Scope of Services, Revision 2.* November.

Woodward-Clyde (Woodward-Clyde Consultants)

2005 *Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, New Mexico.* October.

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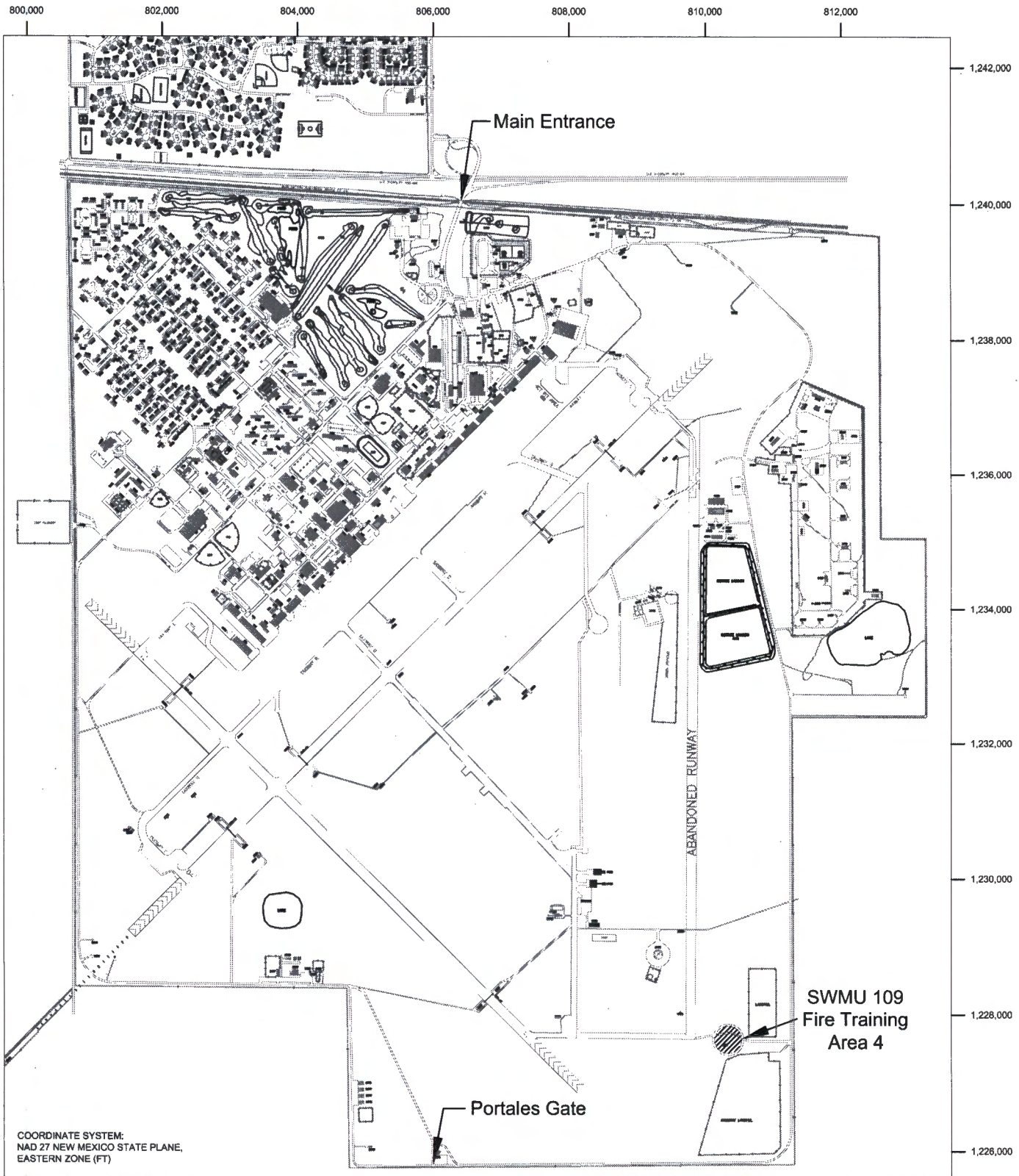
Figures



1000 500 0 1000 2000 3000

SCALE IN FEET

N

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

FTA4 Location Map

Date: 09-14-06

File Name:
Figure 1-1.dwg

Figure 1-1

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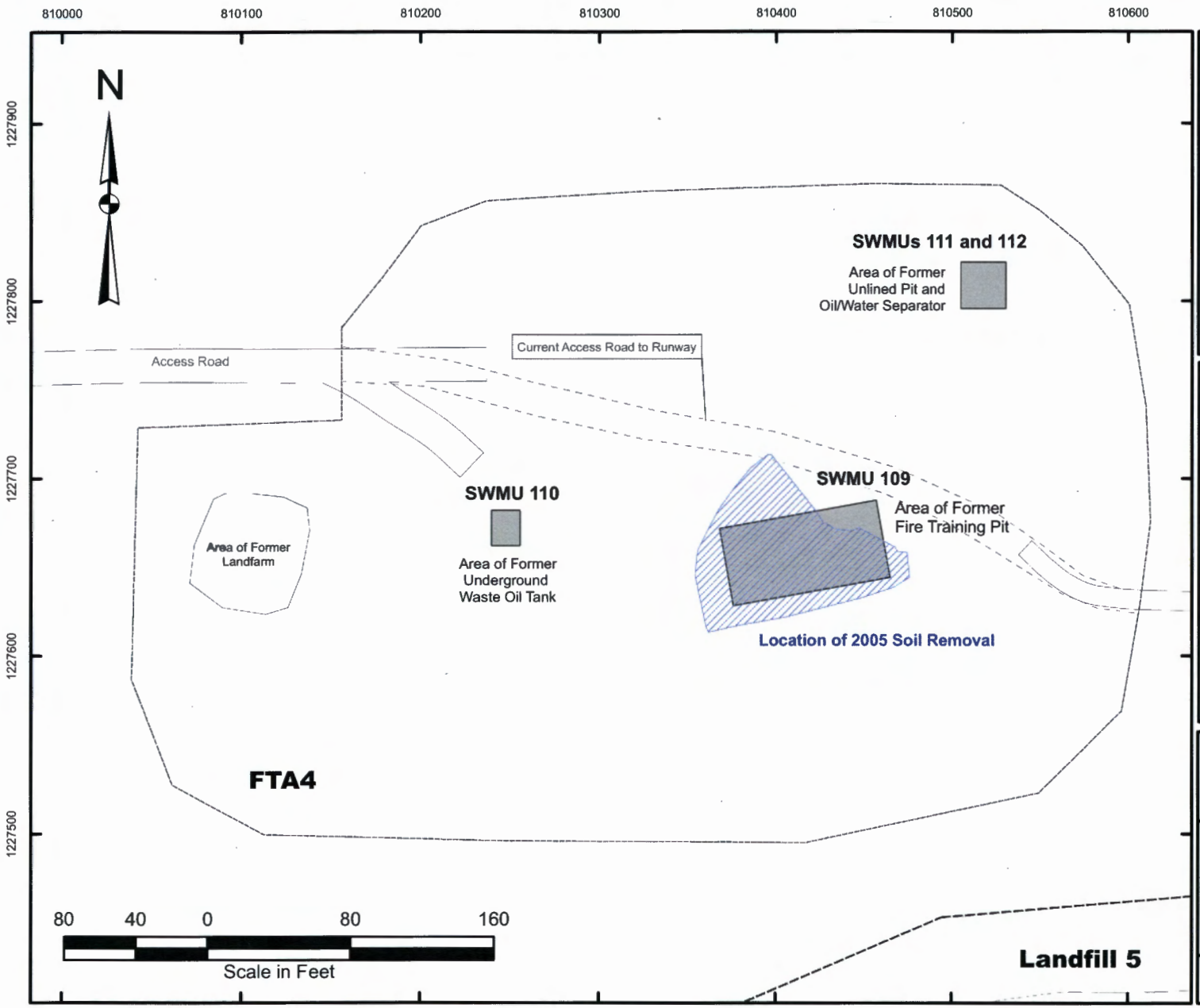
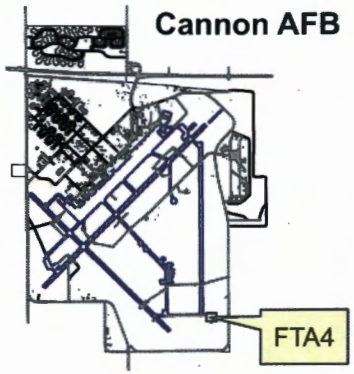




LEGEND

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

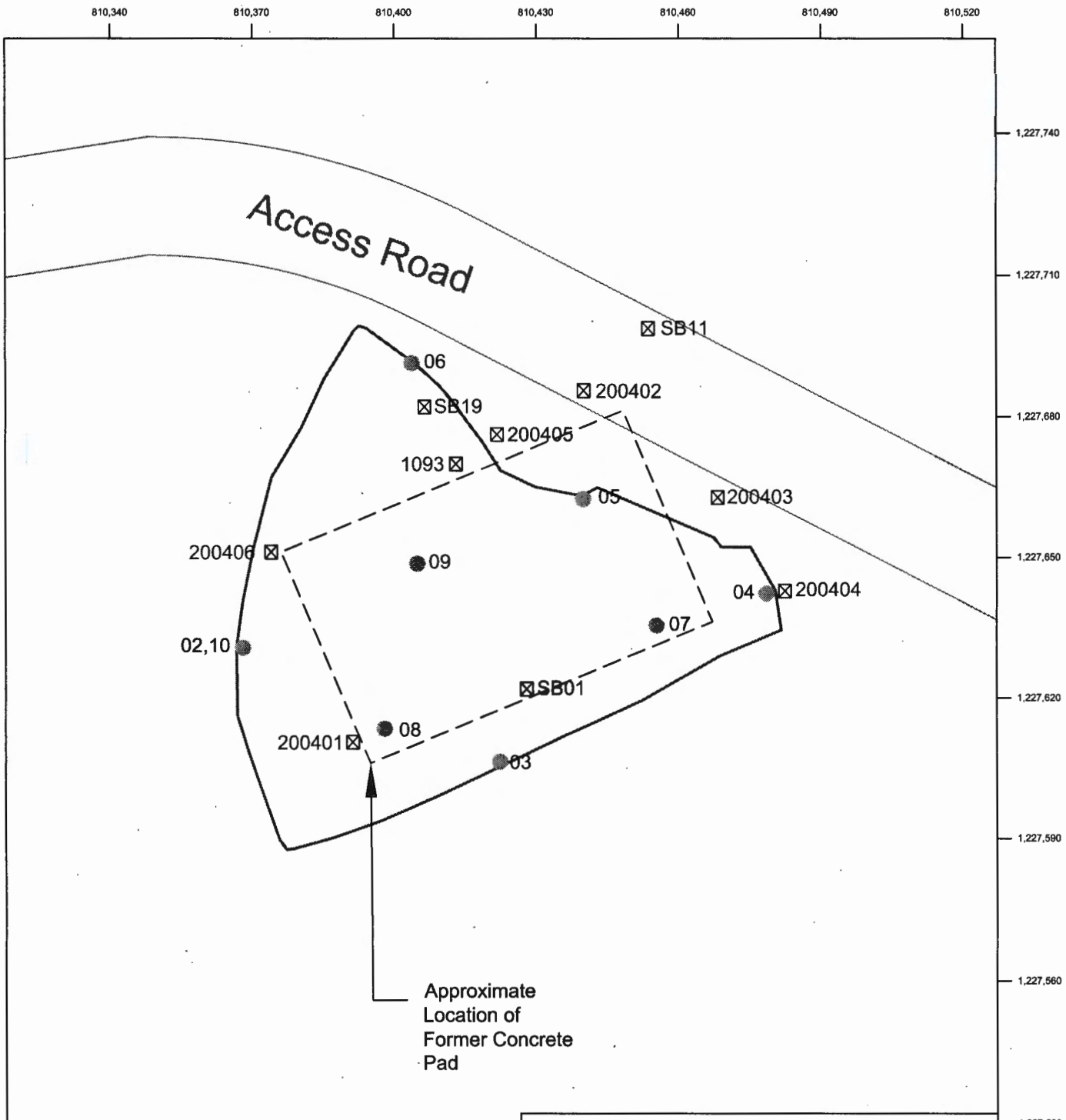
Coordinate System:
NAD 27 New Mexico State Plane,
Eastern Zone (ft)

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

Figure 1-2

SWMU Locations at FTA4

File Name: FTA4 WP Map 1-2.mxd
Rev.: 10-16-06



Legend

—	Extent of Excavation
● 07	Confirmation Sampling Points
⊠ 200401	Phase 1 Investigation Sampling Location (location approximate)

COORDINATE SYSTEM:
NAD 27 NEW MEXICO STATE PLANE,
EASTERN ZONE (FT)

15 7.5 0 15 30 45
SCALE IN FEET

N

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

Extent of 2005 Soil Excavation at
SWMU 109

Date: 09-14-06
File Name:
Figure 2-1.dwg

Figure 2-1

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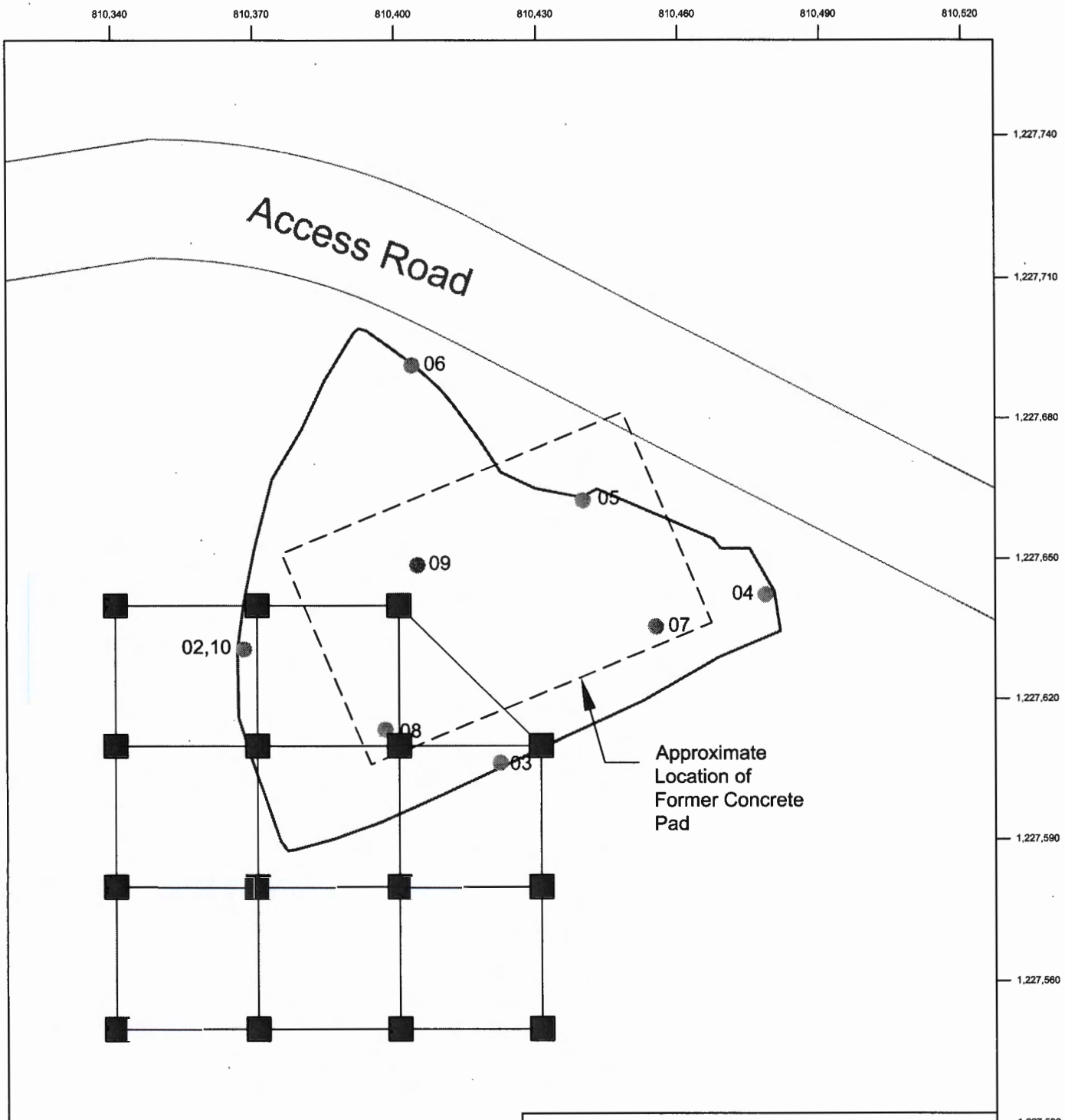

COORDINATE SYSTEM:
NAD 27 NEW MEXICO STATE PLANE,
EASTERN ZONE (FT)

Legend

—	Extent of Excavation
07	Confirmation Sampling Points
■	Proposed Exploratory Test Pit

15 7.5 0 15 30 45
SCALE IN FEET

N

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

Proposed Area of Excavation

Date: 09-14-06
File Name:
Figure 3-1.dwg

Figure 3-1

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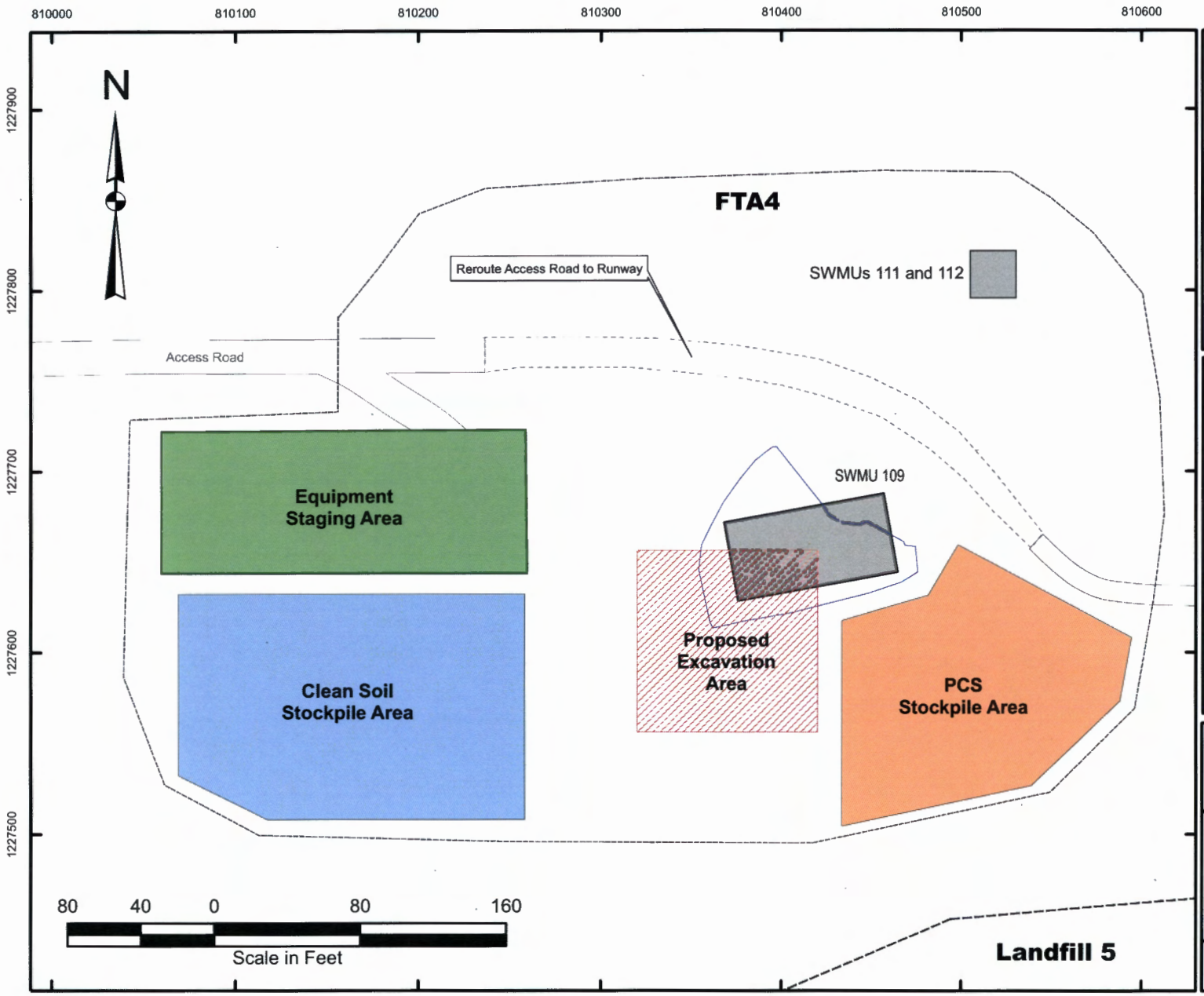
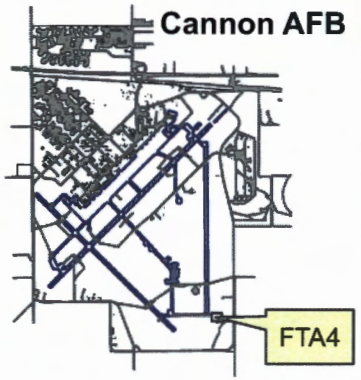




LEGEND

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

Coordinate System:
NAD 27 New Mexico State Plane,
Eastern Zone (ft)

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

Figure 3-2

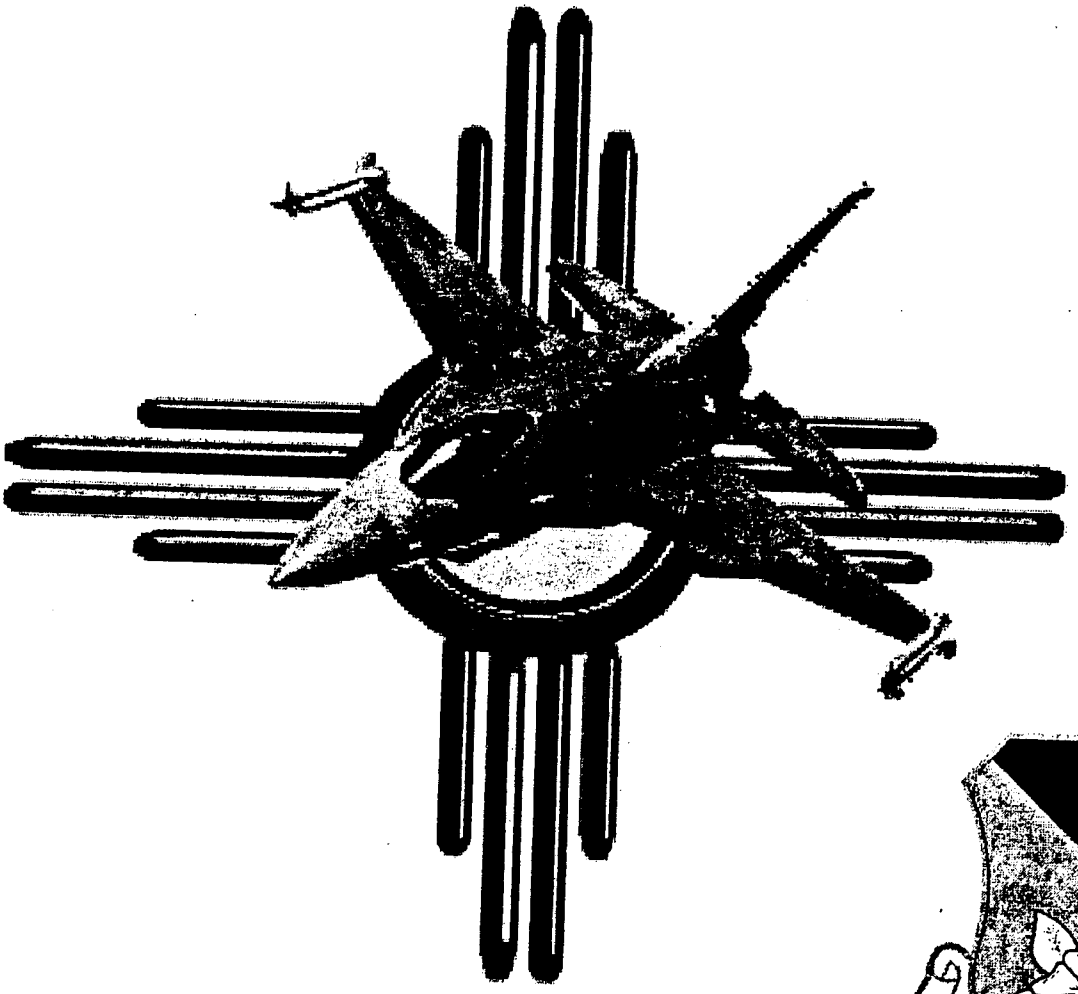
Site Layout

File Name: FTA4 WPMap 3-2.mxd
Rev.: 10-16-06

Appendix A
Draft Work Plan for the Removal of Soil at SWMU 109 (Fire Training Area No. 4) Cannon Air Force Base, New Mexico (May 2000)

Draft Work Plan for the Removal of Contaminated Soil at SWMU 109 (Fire Training Area No. 4) Cannon Air Force Base Clovis, New Mexico

May 2000



Project Number: CZQZ979361Z1

DRAFT WORK PLAN
FOR THE REMOVAL OF CONTAMINATED SOIL
AT SWMU 109 (Fire Training Area No. 4)
Cannon Air Force Base, New Mexico

Prepared for:

27 CE/CEV
Cannon Air Force Base, NM

and

HQ ACC/CEV
Langley Air Force Base, VA

Prepared by:

Foster Wheeler Environmental Corporation
143 Union Boulevard, Suite 1010
Lakewood, Colorado 80228-1824

Under Contract No. DACW45-94-D-0003

Delivery Order 28, Work Authorization Directive 1

U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

May 2000

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LIST OF ACRONYMS

AFB	Air Force Base
°C	degrees Celsius
CFR	Code of Federal Regulations
CMI	Corrective Measure Implementation
CMS	corrective measure study
C-O-C	chain-of-custody
CQAB	Chemistry Quality Assurance Branch
CQC	Contractor Quality Control
DOM	Delivery Order Manager
DOT	Department of Transportation
DQCR	daily quality control report
DQO	data quality objective
EPA	United States Environmental Protection Agency
ESQ	Environmental Safety and Quality
FCR	field change request
Foster Wheeler	Foster Wheeler Environmental Corporation
FSP	Field Sampling Plan
ft	feet/foot
FTA4	Fire Training Area No. 4
GC	gas chromatography
HARZA	Harza Environmental Services, Inc.
LDR	land disposal restriction
LIMS	laboratory information management system
MDL	method detection limit
MRL	method reporting limit
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department

LIST OF ACRONYMS (Continued)

PCB	polychlorinated biphenyl
PCS	petroleum-contaminated soil
PESM	Project Environmental Safety Manager
PPE	personal protective equipment
ppm	parts per million
PSGS	passive soil gas survey
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCP	Regulatory Compliance Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SAP	Sampling and Analysis Plan
SHSO	Site Health and Safety Officer
SHSP	Site-Specific Health and Safety Plan
SOP	Standard Operating Procedure
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TCLP	Toxicity Characteristic Leaching Procedure
TERC	Total Environmental Restoration Contract
TPH	total petroleum hydrocarbon
TRPH	total recoverable petroleum hydrocarbon
TSDF	treatment, storage, and disposal facility
USACE	United States Army Corps of Engineers
VOC	volatile organic compound

1.0 INTRODUCTION

This work plan presents the procedures that will be used for the voluntary removal of contaminated soil to support the Corrective Measures Study (CMS) of Fire Training Area No. 4 (FTA4) (Solid Waste Management Unit [SWMU] 109, the Fire Training Pit) at Cannon Air Force Base (AFB), New Mexico. This voluntary action is being performed under the Base's Resource Conservation and Recovery Act (RCRA) permit, issued by the New Mexico Environment Department (NMED) on behalf of the United States Environmental Protection Agency (EPA). Foster Wheeler Environmental Corporation (Foster Wheeler), at the direction of the United States Army Corps of Engineers (USACE) and Cannon AFB, will excavate and dispose of the contaminated soil and restore the site.

This work plan meets the requirements stipulated within the Total Environmental Restoration Contract (TERC) No. DACW45-94-D-0003, Delivery Order 28, Work Authorization Directive 1; RCRA Corrective Action Plan guidance (EPA, 1994a); and USACE and Base requirements. The work plan provides project objectives, site descriptions, technical specifications, field procedures, and related plans that address all aspects of the proposed construction activities at SWMU 109. All field activities will be performed in accordance with the Site-Specific Health and Safety Plan (SHSP) in Appendix E and USACE health and safety requirements (Section 4.2.6).

1.1 PROJECT OBJECTIVES AND DESCRIPTIONS

This work plan is designed to minimize the threat to human health and the environment at SWMU 109 by accomplishing the following:

- Excavate contaminated surface soil at SWMU 109
- Assess levels of contamination that remain following soil removal
- Characterize excavated soils for disposal
- Perform site restoration (backfilling with clean soil)

Contaminated soil will be excavated within the limits described in the project scope of work (an area of 20 feet (ft) by 20 ft by 2 ft deep surrounding Soil Boring [SB]-01). As requested by USACE, an action level of 1,000 parts per million (ppm) of total recoverable petroleum

hydrocarbons (TRPH) will determine the necessity for further excavation. This action level has been used for similar projects at Holloman AFB near Alamogordo, New Mexico. If the extent of contamination is above the proposed action level, as determined by immunoassay field test kits for total petroleum hydrocarbons (TPH) (described in Section 6.0), excavation will continue as requested by USACE and Cannon AFB. Soil excavation that exceeds the dimensions given above will require the submission of a field change request (FCR) to USACE. When excavation is complete, sampling will be conducted at the excavated area to assess the levels of contamination following the removal of the surface soil.

The excavated soil will be characterized to determine disposal options, and the site will be backfilled with clean soil. A letter report describing all work performed under this contract, including descriptions of tasks performed, supporting analytical data, daily quality control reports (DQCRs), and site maps showing the excavated areas, will be submitted to the USACE and Cannon AFB as an appendix to the SWMU Corrective Measures Study Report.

1.2 SITE BACKGROUND

Previous investigations conducted at SWMUs 109, 110, 111, and 112, which comprise FTA4, identified potential contamination in the area. A Phase II RCRA Facility Investigation (RFI) was conducted by Harza Environmental Services, Inc. (Harza) between October 16, 1996, and February 26, 1997. The investigations included:

- Passive soil gas survey (PSGS) to better determine the lateral extent of contamination by volatile and semivolatile organic compounds (SVOCs) and provide information used to select boring locations
- Drilling of 19 soil borings for the collection of surface and subsurface soil samples
- Collection and analysis of 77 soil samples and associated quality assurance/quality control (QA/QC) samples for laboratory chemical analysis, headspace analysis, and immunoassay screening
- Collection and testing of 12 soil samples for particle size analysis and moisture content
- Collection of continuous soil samples from each boring for lithologic description

Soil was the primary media investigated as part of the RFI. Soil sampling completed during the RFI determined the vertical and horizontal extent of contamination within the four SWMUs at FTA4. The PSGS indicated that the highest relative concentrations of volatile organic compounds (VOCs) and diesel range organics in soil gas were located within and immediately adjacent to the fire training pit (SWMU 109) and that VOC concentrations generally decreased with lateral distance from the fire training pit. Soil borings were located according to PSGS results in order to evaluate the other SWMUs and several anomalous areas identified by the survey. Subsequent fixed-laboratory data identified soil boring SB01, located at the fire pit, as the only significant area of soil contamination, in agreement with the PSGS. The soil gas data indicated high concentrations of ethylbenzene; xylenes; 1,2,4-trimethylbenzene; 1,3,5-trimethylbenzene; naphthalene; and 2-methylnaphthalene. High concentrations of these chemicals were also detected in the surface soil sample (3 to 4 ft) collected from SB01. The soil gas data also indicated relatively high concentrations of benzene, toluene, and cis-1,2-dichloroethane, which were not detected in samples analyzed by the laboratory. Conversely, some of the organic chemicals that were detected by the laboratory analysis were not identified by the soil gas technique. Most of the remaining sampling locations were shown to contain either nondetectable or low concentrations of VOCs and SVOCs by both soil gas and laboratory methods, with few exceptions.

Soil boring samples collected during the RFI indicated that VOCs above method reporting limits (MRLs) were only present in SB01, with total VOC concentrations ranging from 27.2 to 145,440 micrograms per kilogram (µg/kg), to a depth of 65 ft. SVOCs were detected above the MRLs in borings SB01 and SB16. SVOCs were mainly present in SB01, having concentrations varying from 18.5 to 17,089 µg/kg to a depth of about 80 ft. However, most of the SVOCs were detected between the soil surface and 40 ft in boring SB01 and shallower than 10 ft in boring SB16. Similarly, benzene, toluene, ethybenzene, and xylenes were detected only in SB01, with concentrations ranging from 299.1 to 63,640 µg/kg. Total recoverable petroleum hydrocarbon (TRPH) was detected in all soil borings; however, high levels of TRPH were limited to SB01. Unlike the organics compounds, metals were present in all soil borings.

1.3 WORK PLAN OVERVIEW

This work plan describes the methods that will be used to excavate the contaminated soil from SWMU 109, collect sidewall and bottom samples, and characterize excavated soils for disposal. Foster Wheeler personnel, including subcontractors, will follow the procedures outlined within this work plan at all times.

This work plan is divided into nine sections and five appendices. The site description and history are presented in Section 2, and project personnel are discussed in Section 3. Section 4 includes the Project Implementation Plan and Scope of Work, which describes all site activities from mobilization through demobilization. The Regulatory Compliance Plan (RCP), including environmental procedures, permitting and approval requirements, and regulatory procedural and training requirements, is presented in Section 5. Section 6 presents the Sampling and Analysis Plan (SAP), including the FSP, and Section 7 is the Quality Assurance Project Plan (QAPP) for project activities. Section 8 includes the project schedule and planned meetings; references are provided in Section 9. The technical specifications for the project are contained in Appendix A. The analytical methods, reporting limits, and QC criteria are provided in Appendix B; the standard operating procedures are presented in Appendix C. The Contractor Quality Control (CQC) Plan is presented in Appendix D, and the health and safety requirements are provided in Appendix E.

2.0 SITE DESCRIPTION AND HISTORY

Site activities for this project consist of removing contaminated soil at SWMU 109, performing sidewall and bottom sampling and analysis, characterizing and disposing of excavated soil, and completing site restoration. A description of Cannon AFB and of the SWMU are provided below. The site history and detailed descriptions of previous site activities have been presented in the previous investigation report (Harza, 1997).

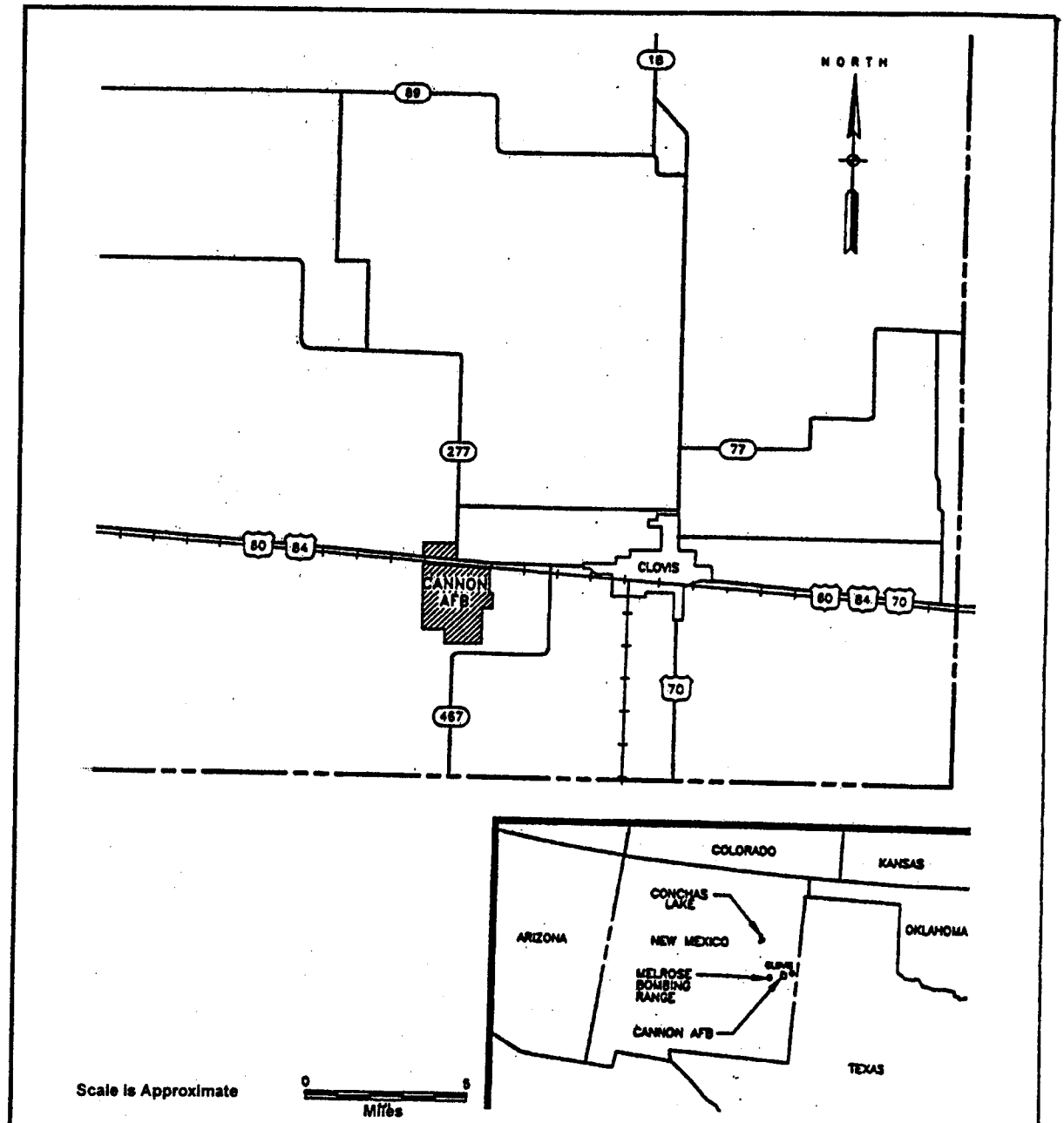
2.1 CANNON AFB LOCATION AND HISTORY

Cannon AFB occupies approximately 4,000 acres south of U.S. Highway 60/84 in Curry County, New Mexico. The Base is situated 6 miles west of the city of Clovis, near the New Mexico–Texas border (Figure 2-1). The area surrounding Cannon AFB is used mainly for farming and ranching. Cannon AFB also maintains several satellite facilities.

In 1942, the Department of Defense established the Clovis Army Air Base, a training facility for B-17, B-24, and B-29 air crews. The Base was renamed Clovis Army Airfield in 1945 and eventually closed in 1947. Reactivated in 1951, the Base was reassigned to the Tactical Air Command and was renamed Cannon AFB in 1957. In 1975, the 27th Tactical Fighter Wing became the principal United States Air Force unit at Cannon AFB. The Base was reassigned to the Air Combat Command in 1992 and currently maintains a combat-ready force and provides replacement training of combat air crews for tactical organizations worldwide.

2.2 SWMU 109 SITE DESCRIPTION AND HISTORY

SWMU 109, the Fire Training Pit, is located near the southeast corner of Cannon AFB, approximately 2,000 ft southeast of the end of Runway 31. Figure 2-2 shows the location of the FTA4 within Cannon AFB. SWMU 109 consists of a concrete-lined pit and berm. A mock airplane was formerly located in the center of the pit and used for fire-training exercises. The pit contains 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. Activities at FTA4 were related to fire-training exercises using JP-4 and other appropriate materials generated by routine maintenance tasks elsewhere at Cannon AFB, such as cleaning engines, painting, and



CORRECTIVE MEASURES WORK PLAN
SWMU 109--FIRE TRAINING AREA 4

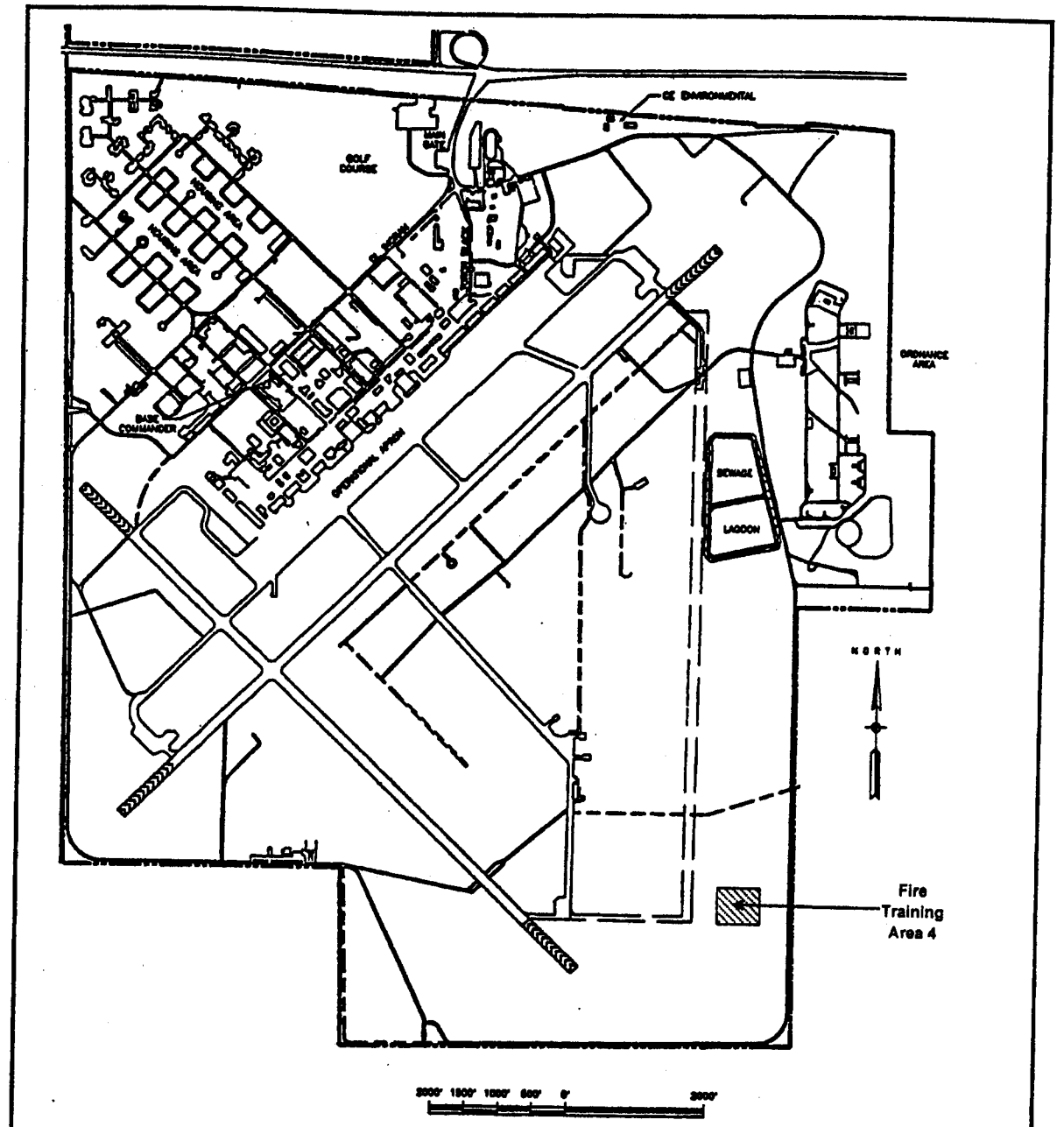
Cannon Air Force Base, New Mexico

U.S. Army Corps of Engineers, Omaha District

Figure 2-1

Base Location Map
Cannon Air Force Base, New Mexico

Foster Wheeler Environmental Corporation



Scale in Feet is Approximate

SOIL REMOVAL WORK PLAN

Cannon Air Force Base, New Mexico

U.S. Army Corps of Engineers, Omaha District

Figure 2-2

Site Location Map

Foster Wheeler Environmental Corporation

maintaining aircraft. Reportedly, fuel was introduced to the ground surface between 1961 and 1974 during fire-training exercises. From 1974 to 1975, co-mingled waste oils, solvents, and recovered JP-4 were used at the SWMU. Between 1975 and 1995, only recovered JP-4 had reportedly been used.

2.3 SITE GEOLOGY AND HYDROGEOLOGY

Soils underlying SWMU 109 consist of sandy loam and loamy sand of the Amarillo Soil group. The soils consist primarily of a fine-grained, well-sorted silty/clayey, unconsolidated brown/reddish brown sand. Such soils are generally classified as silty sand to clayey sand under the United Soil Classification System. The near-surface (upper 90 ft) stratigraphy at SWMU 109 consists of Miocene to Pliocene fluvial deposits of the Ogallala Formation. The site is underlain by Ogallala fluvial deposits consisting primarily of well-sorted sand classified as silty sand to clayey sand. The total thickness of these Ogallala deposits beneath the site is not known, as bedrock was not encountered during field investigation activities. Based on available regional information, they may be as thick as 390 ft.

Geologic materials underlying SWMU 109 are relatively homogeneous, consisting of dense; generally brown, tan, or gray, mixture of fine sand, silt, and clay. The granular soils generally are uncemented but contain sporadic caliche layers and more extensive zones containing caliche-cemented nodules.

The lower deposit is field classified as predominantly silty sand with lesser percentages of silt and clay. The material extends from depths between about 6 and 44 ft to the maximum drilled depth (90 ft). Geotechnical testing (grain size and moisture content) was performed on nine samples from this SWMU at depths ranging from 19 to 56 ft. Results indicate that the lower deposit is generally comprised of approximately 55 to 72 percent sand, 14 to 29 percent silt, and 5 to 29 percent clay, with a moisture content ranging from 6 to 14.9 percent.

The upper deposit overlies the silty sands in most locations, extending from the ground surface to depths between approximately 6 and 44 ft, generally averaging about 20 ft. These deposits consist predominantly of silt/clay mixtures with lesser percentages of sand and are more variable in thickness and consistency. Three samples were collected for geotechnical testing from this unit

at depths ranging from 3 to 9 ft. Results indicate that these samples were generally comprised of approximately 30 to 35 percent sand, 17 to 21 percent silt, and 48 to 49 percent clay, with a moisture content ranging from 11.4 to 21.3 percent.

No groundwater was encountered at SWMU 109 to the maximum drilled depth of 90 ft. Groundwater reportedly occurs at a depth between 240 ft and 295 ft beneath Cannon AFB.

3.0 PROJECT PERSONNEL

A team consisting of Foster Wheeler, USACE, and Cannon AFB will manage the soil removal for this project. This section identifies the key personnel and their roles in the construction phase of the project. The project organization chart is presented in Figure 3-1.

3.1 PROGRAM MANAGER

Mr. Sina Seyedian, P.E., is the Program Manager for the TERC and provides overall management of program activities.

3.2 DELIVERY ORDER MANAGER

Ms. Carol Bieniulis is the Delivery Order Manager (DOM) for this project and reports to the Program Manager. A detailed description of the responsibilities and authority of this position is provided in the CQC Plan, Appendix D.

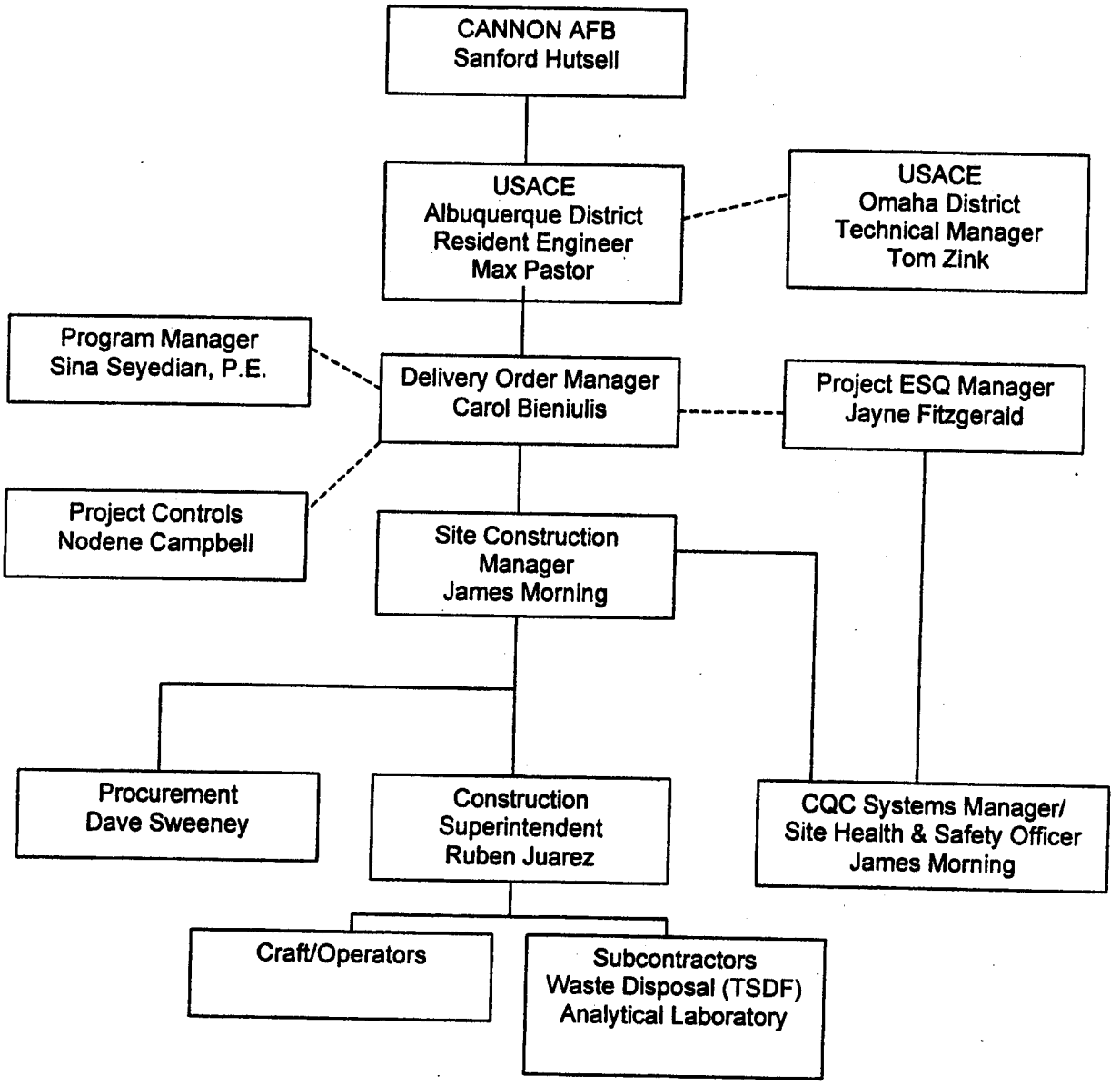
3.3 CONTRACTOR QUALITY CONTROL SYSTEMS MANAGER/SITE HEALTH AND SAFETY OFFICER/SITE CONSTRUCTION MANAGER

Mr. James Morning will be the Site Construction Manager in charge of field operations. He will also act as the project CQC Systems Manager and Site Health and Safety Officer (SHSO). A detailed description of these positions, including responsibilities and authorities, is provided in the CQC Plan, Appendix D.

3.4 PROJECT CHEMIST

Ms. Pam Moss will be the Project Chemist for the chemical analysis effort. Ms. Moss will be responsible for the coordination of project sampling and analysis activities along with the Site Construction Manager. She will also lend technical assistance to field personnel and subcontractors to ensure work is performed in accordance with regulations, professional standards, and client expectations.

Figure 3-1 Project Organization Chart



4.0 PROJECT IMPLEMENTATION PLAN/SCOPE OF WORK

This section provides the details of Base access and site security; on-site activities, including mobilization, excavation activities, and demobilization; and off-site activities.

4.1 BASE ACCESS AND SITE SECURITY

Contractor and subcontractor vehicles will access sites at the Base via the main gate. All vehicles will travel along improved roads and will not enter areas marked as secure without receiving prior clearance. The Foster Wheeler Site Construction Manager, required Foster Wheeler personnel and subcontractors will receive vehicle passes valid for the duration of the project. A valid driver's license, proof of vehicle insurance, and valid vehicle registration will be required to obtain a pass. The site security consists of procedures, structures, and personnel provided by Cannon AFB at the Base perimeter.

4.2 ON-SITE ACTIVITIES

On-site activities will include the following:

- Project kick-off meeting
- Mobilization
- Construction activities
  - Sidewall and bottom sampling and analysis
  - Characterization and disposal of excavated soil
  - Site restoration
- Demobilization
- Field engineering and QC
- Health and safety monitoring

4.2.1 Project Kick-Off Meeting

Foster Wheeler will conduct a project kick-off meeting at the Base or by conference call prior to initiation of construction, with participation from Foster Wheeler, USACE, and Cannon AFB. The agenda for this meeting will include the following topics:

- Introductions, roles, and responsibilities
- Review Scope of Work

- Construction schedule
- Mobilization logistics
- Coordination of schedules
- Review of quality/health and safety programs
- Pending FCRs
- Effects on construction, completion date, and other aspects of the project
- Other business

The agenda will be formalized prior to the project kick-off meeting.

4.2.2 Mobilization

Mobilization will consist of logistical planning and a personnel orientation meeting prior to start-up of field activities. This meeting will include site-specific health and safety training covering site hazards, procedures, and contents of the SHSP; a review of intended operations; and training on pollution prevention and waste minimization procedures. USACE and/or Cannon AFB personnel will assist Foster Wheeler personnel in staking the areas to be excavated prior to initiation of excavation activities.

4.2.2.1 *Utility Clearance*

Cannon AFB will provide utility clearance for the construction sites. Foster Wheeler will notify Mr. Sanford Hutsell at Cannon AFB a minimum of 7 days prior to mobilization. Mr. Hutsell will obtain the utility clearance for these sites.

4.2.2.2 *Staging and Storage Areas*

Staging and storage areas will be determined at the project kick-off meeting. A staging area identified for excavated soil and a separate storage area will be designated for equipment and supplies.

4.2.2.3 *Miscellaneous Site Preparation*

Construction and health and safety personnel will establish work zones for the project in accordance with the SHSP. The decontamination area for the project will be determined at the kick-off meeting.

4.2.3 Construction Activities

The following subsections describe the major construction activities that will be performed at the excavation areas. Discussions of specific equipment, methods, and procedures are included in the technical specifications, Appendix A.

4.2.3.1 *Excavation/Removal Activities*

A backhoe will be used to remove contaminated soil from the excavation area in SWMU 109. The excavation at SWMU 109 will be a 20-ft-by-20-ft-by-2-ft-deep area around soil boring SB-01. The excavation limits for the area will be measured and recorded on site maps. The excavated soil from the SWMU will then be deposited into a bermed and lined area for storage pending characterization sampling results. Once excavation is complete, sidewall and bottom soil samples will be collected as described in the SAP, Section 6, for laboratory analysis. Prior to backfilling, the excavated areas will be taped and barricaded.

Upon receipt of the characterization sampling results, Foster Wheeler will determine disposal options for the excavated soils. Uncontaminated, clean soil will be used as backfill for the excavated area in SWMU 109; backfill will be mechanically compacted to meet the specified 90 percent (Standard Proctor) compaction criteria prior to revegetation.

4.2.3.2 *Segregation of Materials*

It is anticipated that excavated soil will be placed directly into a bermed and lined area and stored until disposition is determined by characterization sampling and analysis. Once the excavation is complete, the volume of material on the bermed and lined area will be estimated by hand survey and recorded.

4.2.3.3 *Backfill*

Following approval from USACE and Cannon AFB, the excavation shall be backfilled with acceptable soil compacted to 90 percent (Standard Proctor) or clean, gravel-base course material. Clean, gravel-base course material will be placed at SWMU 109. Clean earth and gravel-base course material may be imported from an off-site source. The backfill materials will be brought above grade and sloped away from the excavation center.

4.2.3.4 *Site Restoration Activities*

Site restoration activities at the excavated areas consist of backfilling and grading activities as described in Section 4.2.3.3. All debris related to construction activities will be removed and properly disposed of.

4.2.4 Demobilization

Demobilization activities will include equipment decontamination, site cleanup, disposal, personnel and equipment demobilization, and organization of field records. The Site Construction Manager will ensure that the excavation area has been returned to preconstruction conditions and will then fill out the certification of completion.

4.2.5 Field Engineering and Quality Control

Field engineering and QC include engineering and QC inspection. Field engineering will be performed under the direction of the Site Construction Manager. In accordance with the CQC Plan (Appendix D), required QC inspections will be conducted and FCRs, Design Change Notices, and nonconformance reports will be generated when discrepancies concerning constructed elements and associated drawings and specifications occur. In addition, a DQCR documenting each day's construction activities will be completed and maintained and the approximate locations of the excavation limits will be incorporated into the as-constructed drawings.

4.2.6 Health and Safety

Health and safety activities will be conducted in accordance with the SHSP (Appendix E); Foster Wheeler Environmental Corporate Health and Safety Program; USACE Safety and Health Requirements Manual (EM 385-1-1) (1992); and USACE Appendix B, Safety and Occupational Health Requirements Manual (ER 385-1-1). The Site Construction Manager will ensure implementation of these programs and procedures, and all employees will be responsible for complying with these documents.

4.3 OFF-SITE ACTIVITIES

The Task Manager will oversee the coordination of the project from the Foster Wheeler office in Denver, Colorado. The Foster Wheeler home-office staff in Denver, Colorado, will provide all

off-site engineering services. The Site Construction Manager will serve as the point of contact for all field inquiries regarding engineering and will coordinate engineering efforts in compliance with Foster Wheeler corporate procedures and applicable professional standards.

Home-office staff will procure subcontractors and major work items and will furnish the following support functions:

- Regulatory Compliance—Compliance with permits and regulatory requirements will be overseen by the Regulatory Compliance Specialist as described in the RCP, Section 5 of this work plan.
- Safety Compliance—The Project Environmental Safety Manager (PESM) will receive regular reports from the Site Construction Manager/SHSO during field activities.

Technical specifications (Appendix A) have been prepared to describe the general requirements for submittals, temporary facilities and utilities, dust control, erosion and sediment control, project record documents, project record drawings, and earthwork.

5.0 REGULATORY COMPLIANCE PLAN

The RCP was specifically developed to identify regulatory requirements applicable to the removal and disposal of contaminated soil generated during the excavation activities at SWMU 109. The RCP details the corrective action requirements, waste management practices, documentation, and training requirements that are necessary for these activities. In addition, the RCP provides guidance regarding waste minimization practices to be followed during the project to reduce the volume of waste generated, stored, and removed from the site for disposal.

5.1 REGULATORY FRAMEWORK

Pursuant to the requirements of their RCRA permit, Cannon AFB is actively conducting corrective action activities for SWMUs identified at the Base. EPA has authorized NMED to implement the RCRA program and NMED oversees corrective-action program activities conducted in accordance with the Base's RCRA permit.

5.2 REGULATED SITE ACTIVITIES

The corrective action for SWMU 109 involves the excavation of contaminated soil from FTA4. Previous investigations of the SWMU have indicated the presence of various contaminants, including certain VOCs, SVOCs, and TRPH. Following excavation, the areas will require sidewall and bottom sampling and analysis and site restoration. A more detailed discussion of the SWMU characteristics and the specific corrective action activities to be implemented during the project is presented in Section 4 of this work plan, and the contaminant distribution at SWMU 109 is summarized in Sections 2.2 and 2.3.

The anticipated regulated activities are as follows:

- Excavating and storing contaminated and potential RCRA hazardous waste and petroleum-contaminated soil (PCS) material
- Sampling and analysis of excavated soil for subsequent characterization, management, and disposal purposes
- Identifying appropriate transportation companies and disposal facilities for hazardous waste and/or New Mexico-regulated special wastes (i.e., PCS)
- Completing documentation and labeling and placarding waste containers for transporting the waste to an appropriate disposal facility

5.3 REGULATORY REQUIREMENTS

Project activities can be expected to generate nonhazardous waste, NMED-regulated special waste, and possibly RCRA hazardous wastes. The following federal and state regulations are therefore applicable and must be complied with during implementation of planned project activities:

- EPA Regulations for Identification and Management of Hazardous Waste, Title 40 of the Code of Federal Regulations (CFR) Parts 2601–299
- Department of Transportation (DOT) Rules For Hazardous Materials Transport, 49 CFR Parts 100–178
- New Mexico Hazardous Waste Management Regulations
- New Mexico Air Quality Control Regulations
- Applicable Cannon AFB permits, policies, and procedures

Appropriate best management practices will be followed to control runon/runoff and to minimize fugitive dust emissions during closure activities.

5.4 WASTE MINIMIZATION

To minimize the volume of waste, contaminated materials will not be unnecessarily commingled with uncontaminated materials. When practicable, material and equipment will be decontaminated and reused. Volume reduction techniques will also be used.

5.5 PROJECT WASTE DESCRIPTIONS

The potential waste streams associated with soil removal at SWMU 109 can be categorized as follows:

- Contaminated soil
- Uncontaminated soil
- Decontamination fluids
- Personal protective equipment (PPE)

Table 5-1 presents a summary of the applicable waste management, transportation, and disposal requirements for each of the above waste streams.

Table 5-1 Waste Management Summary

Waste Type	Characterization Requirements	Applicable Regulations	Allowable Containment	Storage Requirements	Transportation Requirements	Disposal Requirements
Excavated Soil	Excavated soil will be characterized to determine if it is a RCRA hazardous waste or a NMED special waste. A representative sample will be taken from each rolloff bin or stockpile containing excavated soil. Analysis may include ignitability, TCLP metals, VOCs, PCBs and pesticides, and TRPH. Existing soil analytical data for the SWMUs will be reviewed and may be substituted for one or more of these analyses.	20 NMAC 4.1 "Identification & Listing of Hazardous Waste" and "Standards Applicable to Generators of Hazardous Waste" 40 CFR 268.48—LDR-UTS 40 CFR 262—Generator Requirements 20 NMAC 9.1 Special Waste Requirements	Hazardous waste: Rolloffs or lined berms must be kept sealed when not being loaded or unloaded. Special Waste: Store in rolloff or lined-bermed unit meeting NMED requirements.	Hazardous Waste: 90-day storage limit if determined to be a hazardous waste and must be labeled with a completed hazardous waste label. Special Waste: PCS: Maximum on-site storage for PCS special waste is 45 days. NOTE: Storage clock starts from the date that waste is first put into the container.	Hazardous Waste: Hazardous waste manifest, DOT placarding. Must use an EPA-permitted transporter. Must also have LDR certifications as necessary. Special Waste: PCS shipped offsite must be accompanied by a NMED special waste manifest. Containers must be labeled indicating contents and the potential health, safety, and environmental hazards associated with the waste. NOTE: Individuals involved in overseeing or shipping hazardous materials must meet HM-181 & HM-126F training requirements.	Hazardous Waste: Must be disposed of at an approved RCRA TSDF. PCS special waste can be disposed of only in an approved off-site solid waste facility authorized for special wastes. PCS special waste containing free liquid cannot be sent to a landfill and must pass the paint filter test before it can be landfilled. NOTE: Foster Wheeler ESQ and Cannon AFB must approve TSDF and transporter prior to shipment of waste.
Decontamination Water	Decon water will be characterized using the analytical data from associated soil samples. If necessary, a representative sample will be taken from accumulation container or portable tanks. Analysis may include metals, VOCs, PCBs and pesticides, and SVOCs.	20 NMAC 4.1 "Identification & Listing of Hazardous Waste" and "Standards Applicable to Generators of Hazardous Waste" 40 CFR 268.48—LDR-UTS 40 CFR 262—Generator Requirements WQCC 82-1, Part 3-103	DOT-approved 55-gallon (bunghole-type) metal drums (1A1) or DOT-approved portable tanks (DOT 51, 52, 53, 56, 57, and 60) that must be sealed when not being filled.	Hazardous Waste: 90-day storage limit if determined to be a hazardous waste and must be labeled with a completed hazardous waste label. NOTE: Storage clock starts from the date that waste is first put into the container.	Hazardous Waste: Hazardous waste manifest, DOT placarding. Must use an EPA-permitted transporter. Must have LDR certifications as necessary. NOTE: Individuals involved in overseeing or shipping hazardous materials must meet HM-181 & HM-126F training.	Hazardous Waste: Must be disposed of at an approved off-site RCRA TSDF. If not a hazardous waste and meets groundwater discharge standards, can discharge to the ground with approval of NMED. If aboveground discharge levels, water may be disposed of, with authorization, to one of the Base's WWTFs.

Table 5-1 Waste Management Summary (Continued)

Waste Type	Characterization Requirements	Applicable Regulations	Allowable Containment	Storage Requirements	Transportation Requirements	Disposal Requirements
Disposable PPE	Decontaminated PPE will be handled as solid wastes and no analysis is required.	20 NMAC 9.1 Solid Waste Management Regulations 20 NMAC 4.1 "Identification & Listing of Hazardous Waste" and "Standards Applicable to Generators of Hazardous Waste" 40 CFR 268.48—LDR-UTS 40 CFR 262—Generator Requirements	Double bagged in plastic bags.	N/A	N/A	Nonhazardous solid waste to be disposed of at an approved solid waste landfill. NOTE: Foster Wheeler ESQ and Cannon AFB must approve TSDF and transporter prior to shipment of waste.

NOTES:

AFB	Air Force Base
CFR	Code of Federal Regulations
DOT	Department of Transportation
EPA	United States Environmental Protection Agency
ESQ	Environmental Safety and Quality
HM	Hazardous material
LDR	Land disposal restriction
N/A	Not applicable
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
PCBs	Polychlorinated biphenyls
PCS	Petroleum-contaminated soil
PPE	Personal protective equipment
RCRA	Resource Conservation and Recovery Act
SVOCs	Semivolatile organic compounds
SWMU	Solid waste management unit
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total petroleum hydrocarbons
TRPH	Total recoverable petroleum hydrocarbons
TSDF	Treatment, storage, and disposal facility
UTS	Universal treatment standards
VOC	Volatile organic compound
WQCC	Water Quality Control Commission
WWTF	Wastewater treatment facility

5.6 WASTE MANAGEMENT ACTIVITIES

This section describes in detail how waste generated during soil removal activities will be characterized and classified.

5.6.1 Waste Characterization/Classification

To determine proper waste management requirements for waste generated during soil excavation, waste characterization is necessary. All waste streams will be sampled and/or characterized in accordance with 40 CFR 262.11 and New Mexico Solid Waste Management Regulations (20 New Mexico Administrative Code [NMAC] 9.1) relating to PCS. These regulations require the generator to determine whether a solid waste is a listed or characteristic hazardous waste or a New Mexico special waste. To meet these testing requirements, representative samples will be collected and analyzed in accordance with federal and New Mexico Hazardous Waste Management Regulations and Solid Waste Management Regulations.

Wastes are determined to be characteristically hazardous on the basis of their chemical constituents or physical properties. Listed wastes are specifically identified in 40 CFR Part 261, Subpart D. Characteristic hazardous wastes are those wastes that exhibit toxicity in excess of the values indicated in 40 CFR Part 261, Subpart C. An exceedance of a toxicity characteristic is generally determined by comparing the constituent concentration of the waste to listed Toxicity Characteristic Leaching Procedure (TCLP) regulatory levels.

Documentation of all proposed waste classifications will be provided to Cannon AFB for final waste stream characterizations. The Base is responsible for making all final waste characterizations and for signing waste manifests.

5.6.2 Hazardous Waste Management

RCRA Subtitle C and the New Mexico Hazardous Waste Management Regulations (20 NMAC 4.1) govern hazardous waste management from the point of generation through storage and treatment (if necessary) to ultimate disposal. The NMED Hazardous Waste Bureau oversees management of the hazardous waste program in New Mexico.

Hazardous waste management must comply with the following requirements:

- Hazardous waste must be managed in accordance with 40 CFR Part 262, Standards Applicable to Generators of Hazardous Waste.
- Hazardous waste transported off site must be manifested in accordance with 40 CFR Part 262, Subpart B, Manifests, and accompanied by land disposal restriction (LDR) certification notices as per 40 CFR 268.7, Waste Analysis and Recordkeeping.
- Hazardous waste must be stored in accordance with 40 CFR Part 265, Subpart I, Use and Management of Containers.
- All containers of hazardous waste to be stored or disposed will be clearly marked with a completed hazardous waste label indicating the starting date of accumulation, EPA identification number, EPA waste code, etc., and DOT markings.
- Hazardous waste may be stored on site for a maximum of 90 days. The 90 days begin on the date that the waste is first generated and containerized (i.e., that day the first drop of waste is placed in a container).
- Hazardous waste must be disposed only at a hazardous waste disposal facility permitted for the disposal of the particular type of hazardous waste generated.

5.6.3 New Mexico Special Waste Management

New Mexico Special Waste Regulations are found in 20 NMAC 9.1. Management of special wastes is under the control of the NMED Solid Waste Bureau.

With regard to this project, New Mexico special wastes are defined as solid wastes, including PCS, that have unique handling, transportation, or disposal requirements necessary to ensure protection of the environment and the public's health and safety.

New Mexico has generally defined PCS as special waste if the TRPH concentration is greater than 1,000 ppm and/or benzene is greater than 10 ppm. Special wastes must comply with the following requirements:

- Special wastes must be treated prior to disposal and/or isolated in their disposal to ensure a minimum of exposure to the public.
- All special wastes must be disposed only at solid waste facilities permitted for disposal of special wastes.
- All special wastes must be manifested in accordance with Section 712 of the New Mexico Special Waste Requirements Regulations.
- Storage of special wastes will occur only at an approved special waste storage area in a rolloff or bermed area containing an impermeable membrane liner. Special wastes will not be stored longer than 45 days, unless approved in advance by NMED.

- All containers of special wastes to be stored or disposed will be clearly labeled, indicating the contents and potential health, safety, and environmental hazards associated with the waste.
- The physical and chemical characteristics of all special wastes will be documented prior to storage, transportation, or disposal, by the following:
  - Records of the results of analysis performed in accordance with Section 704 as applicable
  - Detailed descriptions of the generator's knowledge of specific wastes.

Transporters of any type of regulated special waste must be registered with the NMED Solid Waste Bureau.

5.6.4 Waste Containerization and Storage

DOT-trained personnel will select containers based on type and quantity of waste to be generated. Containers may include either DOT-specification drums or rolloffs for regulated hazardous material. DOT-specification containers are not required for material that does not meet a DOT hazard class (e.g., PCS, which may be transported in a dump truck).

Prior to starting closure activities, the Foster Wheeler Site Construction Manager will, in conjunction with Cannon AFB personnel, select areas for the temporary staging and storage of excavated materials, decontamination fluids, and PPE.

Waste material must be classified according to EPA and DOT criteria before the labels are applied. Upon classification, each container will be marked and labeled as required by EPA and DOT, if applicable. Trained personnel will conduct all DOT functions as required by 49 CFR Part 172, Subpart H.

At the time of generation, all waste containers will be labeled, using indelible ink, with the following information:

- Source and location
- Contents and quantity of material in the container
- Potential health, safety, and environmental hazards
- Accumulation start date (the date the first drop of material was put in the container)
- Date container sampled

- Parameters analyzed

Containers determined to contain hazardous waste will immediately be labeled with a completed commercial EPA "HAZARDOUS WASTE" label, which will include the accumulation start date and other requested information.

Excavated soil stockpiles containing confirmed PCS will be labeled using the following format:

"Petroleum-Contaminated Soil"
Origin: Soil Excavation—Petroleum Hydrocarbons
Contaminated Soil—Gasoline, Diesel, Jet Fuel (whichever applies)
Concentration: _____ parts per million TRPH

All hazardous waste stored in drums will also be stored on wooden pallets and subsequently transported off site or to the Cannon AFB Defense Reutilization and Marketing Office. An inventory of waste containers will be maintained for later submittal to and inspection by both USACE and Cannon AFB personnel.

Containers of hazardous waste will be inspected and logged weekly while the field work is in progress. Inspections will encompass evaluation for proper labeling, secure closure, condition of each container, number of containers, and condition of the storage area. Any signs of deterioration, leaking, or dents will be noted, and containers will be immediately overpacked, if necessary. Inspection results will be provided to the USACE and Cannon AFB.

5.7 REPORTING SPILLS AND RELEASES

Precautions will be taken to prevent oil and hazardous material spills, including daily inspection by the site personnel of equipment, structure(s), and containers. Personnel using hazardous materials will inspect containers before and after use. In the event of a spill/release, the Site Construction Manager will notify the Cannon AFB Fire Department and the USACE. Spill response will be conducted in accordance with federal, state, local, and Cannon AFB regulations. Emergency response procedures are specified in the SHSP (Appendix E).

The following chain of communications will be used in case of a spill:

- Mr. James Morning has been designated as the Foster Wheeler Spill and Release Reporting Site Representative. In the event of a spill or release, Mr. Morning will

immediately notify Mr. Sanford Hutsell, Cannon AFB (505-784-6378); Mr. Max Pastor, USACE (505-784-4350); and the Base Fire Department (505-784-2578).

- Site personnel must contact the Foster Wheeler Task Manager. In addition, the Task Manager must immediately contact the Regional Environmental, Safety, and Quality (ESQ) Manager and DOM:
  - Foster Wheeler Task Manager: Charley Haddox
    Telephone: (303) 980-3533
    Facsimile: (303) 980-3539
  - Foster Wheeler Regional ESQ Manager: Jayne Fitzgerald
    Telephone: (714) 444-5500
    Facsimile: (714) 444-5560
  - Foster Wheeler DOM: Carol Bieniulis
    Telephone: (505) 878-8924
    Facsimile: (505) 878-8933

5.8 TRAINING/CERTIFICATION REQUIREMENTS

This section presents the DOT training and certification requirements for personnel involved in the remediation project. In addition to the DOT training, employees will be trained in Foster Wheeler's waste management and environmental compliance policies and procedures to ensure that they are familiar with the program. These policies and procedures meet Department of Justice requirements for a sound environmental management program. The Occupational Safety and Health Administration training and certification requirements are contained in the SHSP (Appendix E).

All personnel who perform or oversee DOT-related activities will be DOT trained. DOT training records will be maintained in project files on site. Foster Wheeler's Corporate ESQ Department will also maintain a copy of the DOT training records.

5.9 INSPECTION PROCEDURES

The following section describes inspection procedures to be followed by field personnel in the event of a regulatory-agency or third-party on-site inspection.

5.9.1 Inspections by Regulatory Agencies and Third Parties

Foster Wheeler personnel will respond to inspections by regulatory agencies and third parties in accordance with the company's environmental compliance procedure No. EHS 1-10 External Inspections. The Site Construction Manager, Mr. James Morning, is designated as the Foster Wheeler on-site representative during inspections by regulatory agencies. Mr. Morning has received training on this procedure and is familiar with its implementation. In the event that Cannon AFB is notified of an impending regulatory inspection, the Base personnel will notify Mr. Morning as soon as possible. During any inspection, both a Base and USACE representative should be present. The Foster Wheeler procedures for external inspections also require that the Site Construction Manager notify the PESM.

5.10 DOCUMENTATION AND RECORDS RETENTION

This section presents project requirements relating to documentation and records and their retention.

5.10.1 Documentation

The information contained in this section applies to all waste managed during project activities. Field records will be kept in a bound, numbered field logbook. Information to be recorded includes, but is not limited to, the following:

- Description of waste-generating activities
- Location of waste generation (including depth, if applicable)
- Type of waste
- Date and time of generation
- Name of person recording information
- Name of field manager at time of generation and at time of disposal
- Test results

In addition, the following information will be placed in the project files:

- Inspection logs
- Waste documentation, including:
  - Waste profile sheets
  - LDR certification

- Hazardous waste manifest
- Trip tickets or bills of lading
- Copies of any state or local permits or approvals

5.10.1.1 *Transportation*

Transportation documentation will comply with DOT regulations 49 CFR Parts 100–178 and will be prepared by appropriately trained Foster Wheeler personnel. Containers will be marked, labeled, and/or placarded prior to off-site transport. Foster Wheeler personnel will prepare the treatment, storage, and disposal facility (TSDF) waste profile sheets, LDR notifications, waste manifests, and shipping documents for Cannon AFB officials to review and sign. All waste transporters will be registered with NMED and approved by the Base and be in accordance with Foster Wheeler procedures for TSDF and transporter approvals.

5.10.1.2 *Hazardous and Special Waste Manifests and LDR Certification*

All hazardous waste transported from the site will be accompanied by a Hazardous Waste Manifest. New Mexico does not provide a standard state manifest, so the receiving state manifest must be used. If the receiving state does not have a state manifest, a Uniform Hazardous Waste Manifest may be used. Cannon AFB personnel will be responsible for reviewing and signing all waste documentation, including waste profiles, manifests, and LDR notifications (manifest packages). Prior to signing the manifest, the designated Cannon AFB official will ensure that pretransport requirements of packaging, labeling, marking, and placarding are met according to 40 CFR 262.30–262.33 and 49 CFR Parts 100–177.

For special waste, a manifest containing the following information will accompany each load of special waste originating from or to be disposed in New Mexico, as specified in Section 702.C:

- Name, address, and telephone number of the generator
- Name, address, and telephone number of any and all transporters in the order each will be transporting the waste
- Name, site address, telephone number, and identification number of the solid waste facility to which the waste is to be delivered
- Type and proper name of waste being shipped
- Total weight or volume of waste prior to shipment from generator

- Total weight or volume of waste received at the solid waste facility
- Type and number of containers in shipment
- Any special handling instructions
- Date and location the waste was delivered

If more than one transporter is used, each transporter will provide the date of receipt and total weight or volume of waste received from the previous transporter.

The manifest will be signed by the Cannon AFB personnel, each transporter of the special waste, and the solid waste facility operator. All signatories will be duly authorized agents of their organizations. Significant discrepancies will be reported to the NMED Solid Waste Bureau within 24 hours of discovery. Cannon AFB will receive one copy of the manifest; the remaining copies will be given to the transporter. The manifest will be returned to the Cannon AFB signatory official to be placed on file. Copies of all manifests for waste generated at the site will also be kept in a central project file. A copy of the manifest will be sent to the state by Cannon AFB.

An LDR form will accompany the shipment of hazardous waste to the TSDF. The TSDF must be notified prior to sending the waste. The following items must accompany the notification and are included in one of the following facility specific forms:

- EPA and New Mexico Hazardous Waste Generator identification number (provided by Cannon AFB)
- Manifest number, including state disposal application number
- Waste analysis data
- If the waste is also restricted, corresponding concentration-based or technology-based treatment standards or prohibition

5.10.2 RCRA Records Retention

The designated Cannon AFB manifest signatory official will be responsible for ensuring that all RCRA record-keeping requirements are met according to 40 CFR 262.20–262.44, including retention of signed copies of manifests from the designated facility that received the waste. The copy must be maintained for a period of at least 3 years from the date the waste was accepted by the initial transporter. Additionally, biennial and exception reporting must be submitted, as

necessary, according to 40 CFR 262.41 and 262.42, respectively. Additional reporting may be required, according to 40 CFR 262.43.

5.11 UPDATING THE REGULATORY COMPLIANCE PLAN

The RCP will be updated if changes in site activities or changes in applicable regulations occur.

6.0 SAMPLING AND ANALYSIS PLAN

The SAP has been developed according to USACE and EPA Region 6 requirements and provides an overview of the sampling program, methodologies, objectives, equipment, and procedures. This SAP specifically outlines the constituent sampling and analytical procedures/methodologies that will be used to verify that hazardous constituents have been removed and to characterize the excavated soil for disposal. The SAP prepared for these sites is intended to be used in tandem with the QAPP (Section 7) to provide specific rationales, protocols, and methodologies to be employed when performing field sampling or data collection activities during the project.

The SAP is divided into five sections. Sections 6.1 and 6.2 describe field sampling objectives and summarize the sampling and analysis program, respectively. Section 6.3 discusses data collection information. Sections 6.4 and 6.5 outline project sampling procedures and field measurements.

6.1 SAMPLING OBJECTIVES

Field sampling will be performed to (1) identify residual concentrations of VOCs and TRPH in the soil after excavation activities have been completed and (2) characterize soil generated during excavation activities to determine appropriate management and disposition. The FSP is designed to meet project objectives associated with the removal of contaminated soil to obtain site restoration at SWMU 109.

Specifically, the FSP will be used to generate analytical data for soil samples collected during remedial activities to ensure the following:

- Analytical quantitation limits are sufficient to enable detection of potential contaminants of concern at concentrations sensitive to human health and ecological concerns
- Site restoration can be achieved and performed in a safe manner
- Soil collection, containment, storage, transport, and discharge activities are in compliance with all federal, state, and local regulatory agency requirements

6.2 SUMMARY OF SAMPLING AND ANALYSIS PROGRAM

The analytical parameters for the field screening, confirmation, and waste characterization soil samples were selected based on the results of the Phase II RFI (1996) for SWMUs 109, 110, 111,

and 112 (Harza, 1997), which identified TRPH and VOCs as contaminants at SWMU 109. ENSYS PETRO RISc® Soil Test System, EPA Method 4030, will be used to conduct field screening for total petroleum hydrocarbons (TPH) during the soil excavation activities. Soil samples will be collected from the excavated area and analyzed by the off-site laboratory to confirm TRPH below the 1,000-mg/kg action level. One waste characterization sample will be analyzed to support waste disposal activity.

Table 6-1 summarizes the number of samples to be collected for the CMS and the associated analytical parameters for this project. A discussion of the sampling program is provided in Section 6.3.

Table 6-1. Cannon AFB Corrective Measures Study Sampling and Analysis Program

Matrix	Sample No.	TRPH	VOCs	TCLP VOCs	Ignitability
SWMU 109					
Soil	5	5	5	NA	NA
Soil-Field Dup	1	1	1	NA	NA
Soil-Waste Characterization	1	1	NA	1	1

Notes:

TRPH Total recoverable petroleum hydrocarbon
VOCs Volatile organic compounds
TCLP Toxicity Characteristic Leaching Procedure— volatile organics, semivolatile organics, pesticides, herbicides, metals
NA Not applicable

6.3 DESIGN OF DATA COLLECTION OPERATIONS

This section addresses project-specific requirements related to the location and frequency of sampling. Sample nomenclature to designate the various samples that will be acquired in the field is also detailed.

6.3.1 Sample Locations and Frequency

Five soil samples will be collected from the excavated trench (at least 2 ft below ground surface) to verify the concentration of TRPH is below the 1,000-ppm action level and to identify any VOCs remaining in the excavated area. One random grab sample will be collected from each of

the trench sidewalls and the bottom at 0 to 2 ft below the excavated area using a stainless steel trowel. Encore samplers will be used for VOC sample collection, if possible. If Encore samplers cannot be used, VOCs will be collected using the methanol field preservation technique. One field duplicate sample will be collected. The construction drawings to be provided in the final letter report will show the sample locations. The SOPs presented in this work plan (Appendix C) will be used in collecting the necessary data.

6.3.2 Sample Designation

The following sample nomenclature will be used for designating environmental samples:

Installation	XXX	AA	NN
Cannon	SWMU Identification	Sample Matrix	Sequential Sample Number

Allowable nomenclature for this project is limited to the following:

Installation:	Cannon AFB (C)
XXX:	109
AA:	Sidewall soil (SS)
NN:	01, 02, 03, etc.

The following is an example of the sample numbering system:

A soil sample collected from the excavation at SWMU 109 sidewall would be identified as C109SS01.

Duplicate samples will be given a unique sequential sample number and will be submitted to the laboratory as blind QC samples. The field logbook will note the sample designated for duplicate analysis.

6.4 DISPOSAL CHARACTERIZATION SAMPLING AND ANALYSIS

The following sections discuss characterization sampling and analysis needs for the potential waste streams resulting from excavation activities. Excavated soil will be sampled as indicated, and samples will be analyzed for the parameters specified in Table 6-1. The soil will be classified as either a hazardous or nonhazardous waste. Sampling and analysis will be performed

in accordance with the latest revision of EPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition (EPA, 1986) and updates.

6.4.1 Characterization of Decontamination Water

Decontamination water generated during the excavation activities will be characterized using the analytical data from the confirmation soil samples. If analytical results from the soil samples indicate that there is a potential for the decontamination water to be characterized as hazardous, the water will be sampled and analyzed for TCLP VOCs, ignitability, and TRPH.

6.4.2 Characterization of Contaminated Soils

Excavated soil from the SWMU will be placed and stored on a bermed and lined area until disposal options are determined based on the characterization analysis. One composite sample will be generated from the bermed and lined area by randomly collecting a backhoe bucket sample. Soil will be collected randomly from the material contained in the center of the backhoe bucket using a stainless steel trowel, composited in a stainless steel bowl, placed in appropriate sample containers, labeled, and documented on chain-of-custody (C-O-C) records. The composite soil samples will be packaged, stored, and analyzed in accordance with appropriate requirements specified in this SAP, EPA SW-846, and the USACE-Omaha District General Chemistry Supplement to the Scope of Services for Studies (January 1996).

The SWMU 109 characterization soil sample will be analyzed for TCLP VOCs, ignitability, and TRPH.

Waste characterization analysis will be appropriate to determine disposal at an approved TSDF.

6.5 SAMPLING EQUIPMENT AND PROCEDURES

The following SOPs contained in Appendix C will be followed to collect samples:

SOP C1	Wet Decontamination Methods
SOP C2	Photoionization Detectors
SOP C3	Soil Sampling
SOP C4	Soil Stockpile Sampling
SOP C5	Sample Handling and Documentation

7.0 QUALITY ASSURANCE PROJECT PLAN

This QAPP has been prepared to follow the format provided in the General Chemistry Supplement to the Scope of Services for Studies (USACE, 1996). The "A" designations following the section heading number correspond to the designation found in the above-referenced document.

7.1 (A2) TABLE OF CONTENTS

The Table of Contents for the QAPP is contained within the Table of Contents for this work plan.

7.2 (A3) DISTRIBUTION LIST

The distribution list is indicated on the transmittal letter for the submittal of this work plan.

7.3 (A4) PROJECT ORGANIZATION AND RESPONSIBILITIES

Ms. Pam Moss (Foster Wheeler) will be the Project Chemist. In this capacity, she will be responsible for oversight of laboratory performance and for validation of the analytical data prior to disposition of the waste. EMAX Laboratories, Inc. will provide analytical services. Ms. Kam Pang (EMAX) will be responsible for the overall performance of the laboratory and the implementation of the analytical requirements for the project. Ms. Pang is also responsible for reporting any problems associated with sample cooler receipt and/or problems with analysis of the samples. Any corrective action implemented in the laboratory that may potentially affect the quality of the analytical data must be approved by Ms. Moss prior to implementation.

The CQC Systems Manager/SHSO/Site Construction Manager will be responsible for ensuring that sampling is conducted in accordance with prescribed procedures. All corrective actions will be provided to the Foster Wheeler Project QA Manager and the DOM for concurrence. Additional information regarding the project organization, including an organization chart, is provided in Section 3 of this work plan.

7.4 (A5) PROBLEM BACKGROUND/DEFINITION

Sample matrices generated during the excavation operation at SWMU 109 consist of soil samples collected from the sidewalls and bottom of the excavation. Potential site contaminants

include VOCs and TRPH. A site description, including the site history and site contamination information, is contained in Section 2. The known contaminants were identified during the Phase II RFI for SWMUs 109, 110, 111, 112 (Harza, 1997). Additional details regarding contaminants are contained in Sections 2.2 and 2.3.

7.5 (A6) PROJECT DESCRIPTION

This QAPP has been prepared to address the specific chemical QA requirements for sampling and analysis conducted during the excavation activities at SWMU 109. A description of the scope of work is contained within Section 4.

The activities covered by this QAPP include on-site soil screening for TPH, soil confirmation sampling and analysis to identify residual concentrations of VOCs and TRPH subsequent to excavation, and characterization of the excavated soil for disposal. Section 6, the SAP, contains detailed information on the number and types of samples to be collected and the sampling procedures to be used. QC activities for the closure operation are discussed in the CQC Plan, Appendix D.

7.6 (A7) QUALITY OBJECTIVES

7.6.1 Data Quality Objectives

Data quality objectives (DQOs) for this project are described in the USACE Scope of Services, January 27, 2000, and include the following objectives to support the final corrective measure:

- Excavation of potentially contaminated soil at SWMU 109
- Sampling and analysis to confirm TRPH concentrations do not exceed the action level
- Sampling and analysis of excavated soil to determine the appropriate disposal option

7.6.2 Analytical Support Levels

The analytical support levels for the corrective action at SWMU 109 will include screening and definitive data levels as determined by the project DQOs. Screening level data will be generated during the on-site field screening using the TPH test kits. Definitive data will be generated by the off-site analytical laboratory for the analysis of the confirmation samples (VOCs and TRPH) and the characterization analysis of the excavated soil (TCLP VOCs, TRPH, and ignitability).

7.6.3 Data Quality Indicators

Laboratory precision and accuracy data and reporting limits are provided in Appendix B. Method descriptions for each of the analyses required for the project are provided in Section 7.13.

7.6.4 Level of Field Quality Control Effort

One field duplicate soil sample will be collected at SWMU 109 and sent to EMAX for TRPH and VOC analysis to assess sampling and analytical precision.

7.7 (A8) PROJECT NARRATIVE

Information required for the project narrative is contained throughout the work plan.

7.8 (A9) SPECIAL VALIDATION

EMAX is validated by the USACE Chemistry Quality Assurance Branch (CQAB) of the Waterways Experimentation Station Laboratory to perform the analytical methods required for this project. All contact with EMAX will be made to:

EMAX Laboratories, Inc.
630 Maple Ave.
Torrance, CA 90503
Phone: 310-618-8889
Attn: Ms. Kam Pang

7.9 (A10) DOCUMENTATION AND RECORDS

Documentation and records generated during this project and the associated submittal schedule will consist of the following:

1. Field Investigation Logs—Maintained in the Foster Wheeler project files.
2. DQCRs—Submitted to USACE in the CMS Final Letter Report.
3. Definitive Level Analytical Data Packages—Submitted by EMAX to the Foster Wheeler Project Chemist within 21 days of sample receipt; submitted to USACE with the CMS Final Letter Report.

Additional documentation consisting of the field sampling logbooks will be maintained in the project files.

7.10 (B1) SAMPLING DESIGN PROCESS

The design of data collection operations is presented in Section 6.3. This section discusses the project-specific requirements related to the type and frequency of sampling, including QC samples, as well as establishment of nomenclature to designate the various samples that will be acquired in the field. Field procedures to be used during the project are provided in Appendix C.

7.11 (B2) SAMPLING METHOD REQUIREMENTS

Sampling procedures for TPH field screening and collection of soil samples and waste characterization samples are discussed in Section 6 of the work plan. These procedures are provided in Appendix C of this plan.

7.12 (B3) SAMPLE HANDLING AND CUSTODY REQUIREMENTS

Sample handling and custody requirements are contained in SOP C4. This SOP provides detailed information on the processes used for sample labeling, sample preservation, sample handling and shipping, sample documentation and tracking, and sample C-O-C. Examples of the sample tag, C-O-C, and the custody seal forms are presented as Figures 7-1, 7-2, and 7-3, respectively. Sample containers, preservation requirements, and holding times are presented in Table 7-1.

Soil samples received at EMAX will be documented and logged into their Laboratory Information Management System (LIMS) for tracking purposes. Each sample will be assigned a unique work order sample number, and a label exhibiting the unique work order number will be attached to each sample container. Date and time of sample receipt, as well as identifying marks, are recorded on the sample receipt forms. Samples are tracked under C-O-C from the point of entry into the laboratory system until time of disposal and are checked into and out of secure storage areas by authorized personnel.

7.13 (B4) ANALYTICAL METHODS REQUIREMENTS

The methods and procedures that will be used to prepare and analyze samples are discussed in this section and summarized in Table 7-2. Chemical analyses will be performed according to

Figure 7-1. Sample Tag Form

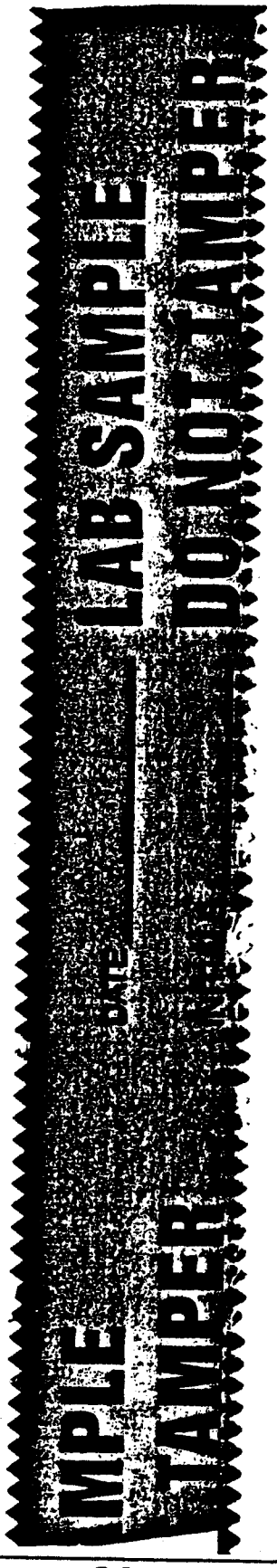


Figure 7-2. C-O-C Record Form

FOSTER WHEELER ENVIRONMENTAL CORPORATION

Chain-of-Custody Record

AFIID:	Project: USACE Cannon AFB	Sample Date:
Method Type:	Samplers:	

Location Type	Location Identification	Time (Military Standard)	Sample Depth (Feet)	Preservative: HNO3	H2SO4	NaOH	HCL	Sampling Method	No. of Containers	VOCs	TCLP VOCs	TRPH	Ignitability																	Sample Tag No.

Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Date/Time
Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Date/Time
Relinquished by: *(Signature)*	Date/Time	Received by: *(Signature)*	Date/Time

Remarks:

FEDERAL EXPRESS #:

MATRIX:
LABCODE:
LOGCODE:

LABORATORY USE ONLY	Y	N
Package Received/Custody Seals Intact		
Sample Labels/C-O-Cs Agree		
Temperature Within Specification °C		
Corrected Copy Attached		
Problems or Discrepancies		

Figure 7-3. Custody Seal

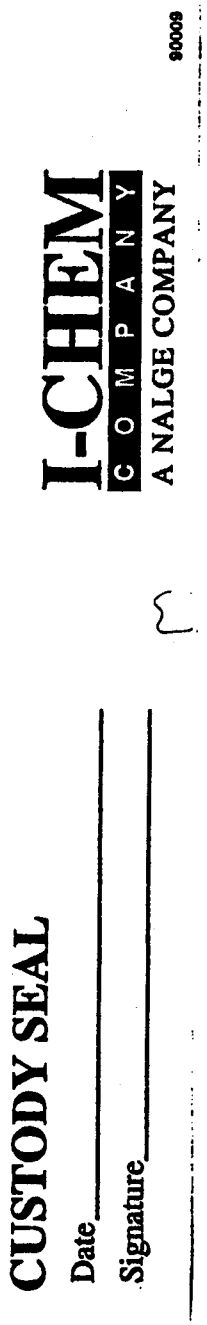


Table 7-1. Sample Container, Preservation, and Holding Time Requirements

Matrix	Parameter	Container[1]	Preservation[2]	Maximum Holding Times[3] Extraction	Analysis
Soil	TRPH	1 × 8-oz G	Ice to 4°C	--	28 d
Soil	VOCs	1 × 4-oz G	Ice to 4°C	--	14 d
Soil	TCLP VOCs	1 × 8-oz G	Ice to 4°C	14 d	14 d
Soil	Ignitability	--	--	--	7 d

Notes:

1 All containers must have Teflon-lined lids.
2 Sample preservation will be done in the field immediately upon sample collection.
3 When only one holding time is given, it implies total holding time from sampling until analysis.
°C Degrees Celsius
d Day
G Amber glass
oz Ounce
TCLP Toxicity Characteristic Leaching Procedure
TRPH Total recoverable petroleum hydrocarbons
VOCs Volatile organic compounds

EPA SW-846, Test Methods for Evaluating Solid Waste (EPA, 1986). The specific compounds to be analyzed with each method are listed in Appendix B.

The laboratory will perform instrument-specific demonstration of capability and method detection limit (MDL) studies to verify that project-specific reporting limits can be met. Analyses will only be performed on instruments with valid and current MDL studies. The MDL documentation is provided in Appendix B.

7.13.1 Total Recoverable Petroleum Hydrocarbons

Soil samples will be analyzed for TRPH to determine the presence of TRPH fuels, oils, and lubricants. TRPH analysis will be performed in accordance with SW-846 Method 9071 for extraction and 418.1 for analysis. The soil sample is extracted with trichlorotrifluoroethane solvent using a Soxhlet apparatus and analyzed using infrared spectrophotometry.

7.13.2 Ignitability

The waste soil sample will be analyzed for ignitability in accordance with a modified SW-846 Method 1020. This method uses the Setaflash closed tester to determine whether a material will flash at a specified temperature. Material that flashes at or below a temperature of 60° Celsius will be determined as ignitable.

7.13.3 Toxicity Characteristic Leaching Procedure

Waste soil will be analyzed for TCLP VOCs. The waste soil is leached in accordance with SW-846 Method 1311, using an acetic acid solution. The extract obtained from the acidified leaching process is then analyzed for the RCRA toxicity list of VOCs using SW-846 Method 8260B. The resulting concentrations are compared to the RCRA toxicity values.

7.13.4 Soil Moisture

Soil moisture will be measured in each soil sample using SW-846 Section 7.2, Determination of Percent Moisture. Percent moisture will be used to report analytical results on a dry-weight basis.

Table 7-2. Analytical Procedures for the Corrective Measure Study at SWMU 109

Parameter	Technique	Extraction/Analysis Method[1]
VOCs	GC/MS	5035/8260B
TRPH	IR	9071/418.1
TCLP VOCs	GC/MS	1311/8260B
Ignitability	Setaflash Tester	1020

Notes:
[1]Method EPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition, 1986 and updates

VOCs Volatile organic compounds
GC/MS Gas chromatography/mass spectrometry
TRPH Total recoverable petroleum hydrocarbon
IR Infrared spectrophotometry
TCLP Toxicity Characteristic Leaching Procedure

7.14 (B5) QUALITY CONTROL REQUIREMENTS

One confirmation soil duplicate sample will be collected and analyzed for the same parameters as the associated field sample (VOCs and TRPH). No field duplicate sample will be collected for waste soil characterization samples.

Corrective actions will be conducted in accordance with the process identified in the CQC Plan (Appendix D). The CQC Systems Manager/SHSO will be responsible for identifying nonconforming conditions during sampling and shipping. The Laboratory QA Manager will be responsible for identifying nonconforming conditions in the laboratory. All nonconforming conditions and recommended corrective action will immediately be reported to the Project Chemist and the Project QA Manager.

EMAX will perform sample analysis in accordance with their internal QA program, which includes periodic review and inspection of laboratory procedures, followed by reports to management. The Laboratory QA Manager performs these reviews. The audits are used to ensure proper use of measurement systems, evaluate accuracy of analytical procedures, and to ensure the laboratory is adhering to internal policies and procedures as set forth in their QA Plan and SOPs.

7.15 (B6) INSTRUMENT/EQUIPMENT TESTING AND MAINTENANCE REQUIREMENTS

All field and laboratory instruments will be tested to ensure proper functioning prior to sampling and analysis. The laboratory performs maintenance on all instruments as per an established schedule or based on the manufacturer's recommendation.

7.16 (B7) INSTRUMENT CALIBRATION

Instrument calibration for health and safety monitoring is discussed in the SHSP (Appendix E).

7.17 (B8) INSPECTION/ACCEPTANCE REQUIREMENTS FOR SUPPLIES

Level I certified sample containers will be used for collection of field samples. The off-site laboratory will maintain certification.

Standard solutions used by EMAX for analytical testing are obtained from reliable sources and prepared with calibrated glassware. Where possible, standards that are traceable to the National Institute of Standards and Technology through the stock standard supplier and EMAX's internal system of standards tracking are used.

7.18 (B9) DATA ACQUISITION REQUIREMENTS

Data used to determine the field sampling and analysis requirements were obtained from the Phase II RFIs for SWMUs 109, 110, 111, and 112. The data collected for the Phase II RFI has been determined as meeting the DQOs for the investigation.

7.19 (B10) DATA MANAGEMENT

Definitive data deliverables are required for this project for the off-site laboratory analysis. Hard copies of the data deliverables will be provided to Foster Wheeler within 21 days of receipt of samples at the laboratory. An electronic data submittal to USACE is not required for this project. The following information is to be included in the hardcopy data deliverables:

- Case narrative
- Sample results summary forms
- C-O-C documentation/sample receipt forms
- Holding time information
- Initial and continuing calibration information
- Method blank summary
- Laboratory control sample summary
- Matrix spike/matrix spike duplicate summary
- Laboratory duplicate sample summary
- Surrogate percent recovery data
- Raw instrument data

7.20 (C) ASSESSMENT/OVERSIGHT

The on-site CQC Systems Manager/SHSO will conduct soil sampling inspections during the closure operations. All inspections will be documented in the DQCR. In addition, one completion inspection will be conducted as indicated in the CQC Plan, Appendix E. The

Laboratory QA Manager will conduct laboratory oversight as described in the QA Plan. Any deficiencies noted during inspection activity requiring corrective action will be documented in a nonconformance report generated by the laboratory and provided to the Foster Wheeler Project Chemist. The DOM and the Project QA Manager must approve all corrective actions.

7.21 (D) DATA VALIDATION AND USABILITY

The Foster Wheeler Project Chemist or designee will validate analytical data generated by Emax. This validation will be in accordance with the EPA guidance (1994b, 1994c) and will include a review of the C-O-Cs, holding times, instrument calibration, method blanks, verification of quantitation limits, laboratory corrective actions, analyte quantitation and identification, surrogate system monitoring compounds, MS/MSD recovery data, laboratory control sample data, duplicate sample analysis data, and data completeness. A brief summary of data usability will be included with the CMS Final Letter Report.

Section 7.0 (A)—Quality Assurance Project Plan

Title and Approval Sheet

For

Corrective Measures Study at SWMU 109
Quality Assurance Project Plan
Cannon AFB
Clovis, NM

Prepared by:

Foster Wheeler Environmental Corporation
143 Union Boulevard, Suite 1010
Lakewood, CO 80228

Foster Wheeler Environmental Corporation Approval

Carol Bieniulis Delivery Order Manager	Date
Deborah Wilson Project Quality Assurance Manager	Date
Pam Moss Project Chemist	Date

8.0 PROJECT SCHEDULE AND MEETINGS

This section presents the schedule for the major project phases.

8.1 PROJECT SCHEDULE

The following table outlines the anticipated schedule for the CMS at SWMU 109.

Procurement	May 29, 2000–June 9, 2000
Project Kick-Off Meeting	June 7, 2000
Mobilization and Field Activities	June 12, 2000–June 23, 2000
Sample Analysis	June 26, 2000–June 30, 2000
Backfill/Site Restoration and Waste Disposal	July 3, 2000–July 7, 2000
Completion Report	July 10, 2000–July 14, 2000

8.2 PROJECT MEETINGS

Project meetings will be held at the site and the Denver home office (by telephone) and will be supplemented by weekly (or more frequent) teleconferences. The agenda for these meetings may include the following:

- Review of work progress
- Field observations, problems, and conflicts
- Problems that affect the construction schedule and proposed corrective actions
- Review of off-site delivery schedules
- Revisions to construction schedule
- Forecast of progress for following week
- Review of submittal schedule
- Review of quality/health and safety programs
- Pending changes and substitutions
- Review of proposed changes for effects on construction, construction completion date, and other construction activities
- Any other business

9.0 REFERENCES

EPA (United States Environmental Protection Agency)

1986 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, Third Edition. Office of Solid Waste and Emergency Response. November.

1994a RCRA Corrective Action Plan, OSWER Directive #9902.3.

1994b Contract Laboratory Program National Functional Guidelines for Inorganic Data Review. EPA 540/R-94/013.

1994c Contract Laboratory Program National Functional Guidelines for Organic Data Review. EPA 540/R-94/012.

Foster Wheeler (Foster Wheeler Environmental Corporation)

1994 Foster Wheeler Environmental Corporate Health and Safety Manual.

Harza Environmental Services, Inc.

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

USACE (United States Army Corps of Engineers)

1996 General Chemistry Supplement to the Scope of Services for Studies.

Woodward Clyde

1994 RCRA Facility Investigation, Appendix III SWMUs—Phase I, Cannon Air Force Base, New Mexico, February.

Appendix A

Technical Specifications

DEFINITIONS, ABBREVIATIONS, AND REFERENCE STANDARDS

1.0 GENERAL

1.1 Definitions Used in the Technical Specifications

Contract Documents

Contract documents include the following:

- Construction Drawings
- Technical Specifications
- Construction Work Plan
- Subcontract Agreements

Base—Cannon Air Force Base

USACE—United States Army Corps of Engineers

Contractor—Foster Wheeler Environmental Corporation (Foster Wheeler)

Subcontractor or Vendor—A person, firm, or corporation with whom the Contractor has contracted with to perform the Work.

Work—Any and all obligations, duties, and responsibilities necessary to the successful completion of the Project assigned to or undertaken by the Contractor or any Subcontractor or Vendor under the Contract Documents, including all labor, materials, equipment, permits, inspections, and other incidentals, and the furnishing thereof.

1.2 Abbreviations

%	percent
AFB	Air Force Base
SWMU	Solid Waste Management Unit

1.3 Reference Standards

Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to any Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code, or Laws or Regulations in effect at the time of execution of the Work, except as otherwise specifically stated. However, no provision of any referenced standard, specification, manual, or code (whether or not specifically incorporated by reference in the Contract Documents) shall be

effective to change the duties and responsibilities of Owner, Contractor, Subcontractor, Vendor, or any of their Consultants, agents, or employees from those set forth in the Contract Documents.

1.4 Clarifications

In the event of a discrepancy between the Work Plan, Construction Drawings, and Technical Specifications, the Construction Superintendent shall bring the discrepancy to the attention of the Construction Site Manager for resolution.

Reference: Standard Specifications for Highway and Bridge Construction, New Mexico State Highway and Transportation Department, 1994. Section 101.

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.

EROSION AND SEDIMENT CONTROL

1.0 GENERAL

The Contractor shall 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 shall provide additional berms at the perimeter of the trench or stockpile (if used).

2.0 MATERIALS

Materials shall 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 shall make every effort to minimize erosion from excavating, stockpiling (if used), and backfilling operations and be responsible for diverting all runoff from rainfall, directing it to natural drainage pathways.

The Contractor shall construct and maintain all temporary stockpile enclosures and covers. All required material shall 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 shall 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.

EARTHWORK

1.0 GENERAL

This section covers the excavation, stockpiling, and backfilling of soil. Excavation will be undertaken to remove contaminated soil from each site and to allow verification soil samples to be collected. After soil is excavated, it will be put into rolloffs until disposal options are determined, based on the waste characterization analysis. Following receipt of confirmation soil sample analysis, each excavation will be backfilled.

The Contractor shall supply all materials, equipment, and services required for excavating, loading, storing material, placing, and compaction operations.

2.0 MATERIALS

SWMU 109 will be backfilled with clean gravel base course.

3.0 EXECUTION

3.1 On-Site Excavation

On-site excavation shall consist of the excavation of all materials required to complete the Work. Excavation operations shall be conducted so material outside the Work zone will not be disturbed.

The Contractor shall contact Base personnel to field-locate all existing utilities within the Work zones and take all precautions to protect them during excavation activities. If active utility lines are encountered, necessary steps shall be taken to assure that any service interruptions, if required, are kept to a minimum.

All excavated materials shall be handled in accordance with the Construction Work Plan.

3.2 Rolloff/Stockpiling

Soil from each excavation shall be placed into a rolloff. Samples shall be taken from the rolloff for chemical analysis, as specified in the Sampling and Analysis Plan.

3.3 Backfilling

The excavated areas will be backfilled with backfill and stockpiled material. Soil and/or gravel base course will be placed in the excavations and mechanically compacted 90 percent standard proctor. No geotechnical testing will be required.

Reference: Standard Specifications for Highway and Bridge Construction, New Mexico State Highway and Transportation Department, 1994. Section 203.

Appendix B

Analytical Methods, Reporting Limits, And Quality Control Criteria

SUMMARY OF MDL RL QC LIMITS

WET CHEMISTRY		Water				Soil			
METHOD	PARAMETER	MDL	RL	UNIT	QCL (%R)	MDL	RL	UNIT	QCL (%R)
310.1	Alkalinity	0.469	5	mg/L	80 - 120				
350.2	Ammonia	0.0299	1	mg/L	80 - 120	0.0202	1	mg/kg	80 - 120
405.1	Biochemical Oxygen Demand (BOD)	0.341	1	mg/L	80 - 120				
410.4	Chemical Oxygen Demand (COD)	4.045	10	mg/L	80 - 120				
9010B 9014A	Cyanide	0.0028	0.01	mg/L	80 - 120	0.119	0.5	mg/kg	80 - 120
9030 9014A	Cyanide,Reactive	0.0841	0.1	mg/L	80 - 120	8.71	20	mg/kg	80 - 120
130.2	Hardness	5.13	10	mg/L	80 - 120				
2340B	Hardness	0.563	10	mg/L	80 - 120				
7196A	Hexavalent Chromium	0.0024	0.01	mg/L	80 - 120	0.024	0.44	mg/kg	80 - 120
425.1	MBAS	0.027	0.1	mg/L	80 - 120				
354.1	Nitite/Nitrate ✓	0.0005	0.01	mg/L	80 - 120				
351.3	Nitrogen (TKN)	0.0255	1	mg/L	80 - 120	0.0623	1	mg/kg	80 - 120
413.2	Oil & Grease	0.555	1	mg/L	80 - 120	1.62	10	mg/kg	80 - 120
420.1	Phenols, Total (Phenolics)	0.0151	5	mg/L	80 - 120				
365.2	Phosphorus, PO4	0.0062	0.05	mg/L	80 - 120				
365.2	Phosphorus, Total	0.0077	0.05	mg/L	80 - 120				
370.1	Silica	0.0293	0.1	mg/L	80 - 120				
160.1	Solids, Total Dissolved (TDS)	4.33	10	mg/L	80 - 120				
160.2	Solids, Total Suspended (TSS)	1.81	10	mg/L	80 - 120				
120.1	Specific Conductance	0.197	1	umhos/cm	80 - 120				
375.4	Sulfate	0.253	0.5	mg/L	80 - 120				
376.1	Sulfide	0.362	1	mg/L	80 - 120				
9034	Sulfide, Reactive	0.219	1	mg/L	80 - 120	17.6	20	mg/kg	80 - 120
415.1 W Black	Total Organic Carbon (TOC) ✓	0.551	5	mg/L	80 - 120	0.0486	0.06	%by Wt	80 - 120
9060 W Black	Total Organic Carbon (TOC) ✓	0.551	5	mg/L	80 - 120	0.0486	0.06	%by Wt	80 - 120
418.1	TRPH	0.558	1	mg/L	80 - 120	4.15	10	mg/kg	80 - 120
180.1	Turbidity	0.0168	1	mg/L	80 - 120				

%RPD 20 for both soil and water

Comment: The RL QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits. Effective Date: November 15, 1999.

TCLP Analyte List with Regulatory Limits and Reporting Limits

Method	Parameters	Regulatory Level (mg/L)	TCLP RL (mg/L)	Solid RL (mg/kg)
VOA by 8260B	Benzene	0.50	0.05	0.50
	2-Butanone	200	0.50	5.00
	Carbon Tetrachloride	0.50	0.05	0.50
	Chlorobenzene	100	0.05	0.50
	Chloroform	6	0.05	0.50
	1,4-Dichlorobenzene	7.5	0.05	0.50
	1,2-Dichloroethane	0.50	0.05	0.50
	1,1-Dichloroethene	0.70	0.05	0.50
	Tetrachloroethene	0.70	0.05	0.50
	Trichloroethene	0.50	0.05	0.50
	Vinyl Chloride	0.20	0.05	0.50

Method	Parameters	Regulatory Level (mg/L)	TCLP RL (mg/L)	Solid RL (mg/kg)
Metals by 6010B/ 7470A	Arsenic	5.0	1.0	20
	Barium	100	1.0	20
	Cadmium	10	1.0	20
	Chromium	5.0	1.0	20
	Lead	5.0	1.0	20
	Mercury	0.2	0.02	0.2
	Selenium	1.0	1.0	20
	Silver	5.0	1.0	20

Method	Parameters	Regulatory Level (mg/L)	TCLP RL (mg/L)	Solid RL (mg/kg)
Herbicides by 8151A	2,4-D	10	0.005	0.084
	2,4,5-TP (Silvex)	1.0	0.002	0.033

Method	Parameters	Regulatory Level (mg/L)	TCLP RL (mg/L)	Solid RL (mg/kg)
Pesticides by SW8081A	Endrin	0.02	0.001	0.033
	Lindane	0.4	0.0005	0.017
	Methoxychlor	10	0.005	0.17
	Heptachlor	0.008	0.0005	0.017
	Heptachlor Epoxide	0.008	0.0005	0.017
	Toxaphene	0.5	0.010	0.33
	Chlordane (β or γ)	0.03	0.0005	0.017

Method	Parameters	Regulatory Level (mg/L)	TCLP RL (mg/L)	Solid RL (mg/kg)
SVOA by SW8270C	2,4-Dinitrotoluene	0.13	0.10	1.65
	Hexachlorobenzene	0.13	0.10	1.65
	Hexachlorobutadiene	0.50	0.10	1.65
	Hexachloroethane	3.0	0.10	1.65
	Nitrobenzene	2.0	0.10	1.65
	Pentachlorophenol	0.7	0.50	3.3
	Pyridine	5.0	0.50	3.3
	2-Methylphenol	200	0.10	1.65
	4-Methylphenol	200	0.10	1.65
	2,4,5-Trichlorophenol	400	0.50	3.3
	2,4,6-Trichlorophenol	2.0	0.10	1.65

SUMMARY OF MDL RL QC LIMITS

5035 8260B	MDL	RL	UNIT	QC LIMITS
TARGET ANALYTE				
1 1,1,1,2-Tetrachloroethane	0.196	5	ug/kg	50 - 150
2 1,1,1-Trichloroethane	0.209	5	ug/kg	65 - 133
3 1,1,2,2-Tetrachloroethane	0.210	5	ug/kg	44 - 144
4 1,1,2-Trichloroethane	0.160	5	ug/kg	71 - 129
5 1,1-Dichloroethane	0.134	5	ug/kg	56 - 136
6 1,1-Dichloroethene	0.326	5	ug/kg	50 - 149
7 1,1-Dichloropropene	0.518	5	ug/kg	62 - 127
8 1,2,3-Trichlorobenzene	0.902	5	ug/kg	64 - 143
9 1,2,3-Trichloropropane	0.454	5	ug/kg	41 - 145
10 1,2,4-Trichlorobenzene	0.861	5	ug/kg	69 - 139
11 1,2,4-Trimethylbenzene	0.517	5	ug/kg	74 - 126
12 1,2-Dibromo-3-chloropropane	0.772	10	ug/kg	45 - 147
13 1,2-Dibromoethane	0.299	5	ug/kg	50 - 150
14 1,2-Dichlorobenzene	0.252	5	ug/kg	79 - 122
15 1,2-Dichloroethane	0.195	5	ug/kg	69 - 132
16 1,2-Dichloropropane	0.257	5	ug/kg	72 - 124
17 1,3,5-Trimethylbenzene	0.279	5	ug/kg	75 - 125
18 1,3-Dichlorobenzene	0.242	5	ug/kg	66 - 131
19 1,3-Dichloropropane	0.225	5	ug/kg	70 - 128
20 1,4-Dichloro-2-butene	2.590	10	ug/kg	50 - 150
21 1,4-Dichlorobenzene	0.297	5	ug/kg	74 - 126
22 1-Chlorohexane	0.307	5	ug/kg	72 - 129
23 2,2-Dichloropropane	0.270	5	ug/kg	52 - 146
24 2-Butanone(MEK)	1.640	20	ug/kg	50 - 150
25 2-Chloroethyl Vinyl Ether	0.683	5	ug/kg	50 - 150
26 2-Chlorotoluene	0.341	5	ug/kg	73 - 128
27 2-Hexanone	1.090	20	ug/kg	20 - 165
28 4-Chlorotoluene	0.223	5	ug/kg	71 - 125
29 4-Methyl-2-Pentanone(MIBK)	0.991	10	ug/kg	50 - 150
30 Acetone	2.330	10	ug/kg	20 - 165
31 Acrolein	20.000	50	ug/kg	50 - 150
32 Acrylonitrile	2.410	50	ug/kg	50 - 150

Comment: The RL QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits. Effective Date: November 15, 1999.

SUMMARY OF MDL RL QC LIMITS

5035 8260B	MDL	RL	UNIT	QCL (%)
TARGET ANALYTE				
33 Benzene	0.181	5	ug/kg	66 - 125
34 Bromobenzene	0.529	5	ug/kg	62 - 134
35 Bromochloromethane	0.421	5	ug/kg	22 - 164
36 Bromodichloromethane	0.208	5	ug/kg	71 - 130
37 Bromoform	0.184	5	ug/kg	54 - 141
38 Bromomethane	0.403	5	ug/kg	42 - 158
39 Carbon Disulfide	0.113	5	ug/kg	64 - 113
40 Carbon Tetrachloride	0.288	5	ug/kg	60 - 141
41 Chlorobenzene	0.178	5	ug/kg	72 - 126
42 Chloroethane	0.602	5	ug/kg	28 - 165
43 Chloroform	0.386	5	ug/kg	61 - 132
44 Chloromethane	0.628	5	ug/kg	38 - 144
45 cis-1,2-Dichloroethene	0.183	5	ug/kg	58 - 135
46 cis-1,3-Dichloropropene	0.240	5	ug/kg	47 - 142
47 Dibromochloromethane	0.145	5	ug/kg	70 - 128
48 Dibromomethane	0.248	5	ug/kg	70 - 126
49 Dichlorodifluoromethane	0.194	5	ug/kg	20 - 165
50 Ethyl Methacrylate	0.401	5	ug/kg	50 - 150
51 Ethylbenzene	0.162	5	ug/kg	78 - 121
52 Hexachlorobutadiene	0.279	5	ug/kg	53 - 163
53 Iodomethane	0.236	5	ug/kg	50 - 150
54 Isopropyl Benzene	0.212	5	ug/kg	76 - 121
55 m,p-Xylene	0.350	5	ug/kg	79 - 124
56 Methyl Tert-Butyl Ether	0.250	5	ug/kg	44 - 165
57 Methylene Chloride	0.986	10	ug/kg	37 - 149
58 n-Butylbenzene	0.929	5	ug/kg	60 - 136
59 n-Propylbenzene	0.298	5	ug/kg	70 - 129
60 Naphthalene	1.310	5	ug/kg	36 - 165
61 o-Xylene	0.172	5	ug/kg	80 - 125
62 p-Isopropyltoluene	0.603	5	ug/kg	74 - 130
63 sec-Butylbenzene	0.356	5	ug/kg	77 - 122
64 Styrene	0.162	5	ug/kg	75 - 129

Comment: The RL QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits. Effective Date: November 15, 1999.

SUMMARY OF MDL RL QC LIMITS

5035 8260B		MDL	RL	UNIT	QCL (%R)
TARGET ANALYTE					
65	tert-Butylbenzene	0.208	5	ug/kg	80 - 120
66	Tetrachloroethene	0.222	5	ug/kg	68 - 138
67	Toluene	0.191	5	ug/kg	68 - 126
68	trans-1,2-Dichloroethene	0.301	5	ug/kg	56 - 137
69	trans-1,3-Dichloropropene	0.262	5	ug/kg	58 - 135
70	Trichloroethene	0.198	5	ug/kg	68 - 127
71	Trichlorofluoromethane	0.160	5	ug/kg	29 - 165
72	Vinyl Acetate	0.569	5	ug/kg	50 -150
73	Vinyl Chloride	0.317	5	ug/kg	42 - 149
SURROGATE					
1	1,2-Dichloroethane-d4				54 - 139
2	Bromofluorobenzene				71 - 125
3	Toluene-d8				73 - 124

Comment: The RL QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits. Effective Date: November 15, 1999.

EMAX IN-HOUSE QUALITY CONTROL PROCEDURES

SW8260B **Project Code:**

QC PROCEDURE	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION	FLAGGING CRITERIA	1st Rvw	2nd Rvw
Five-point initial calibration for all analytes	Initially; as needed	SPCCs: (1)ARF =/> 0.1 (2)ARF=/> 0.3 CCC : RSD for RF < 30% Quantitation Options: 1). linear- mean RSD for all analytes =/<15% with no analyte have RSD >30% 2). linear – least squares regression r =/> 0.995 3). non-linear – COD > 0.990 (6 points shall be used for second order, 7 points shall be used for third order)	Correct the problem then repeat initial calibration			
Second-source calibration verification	After initial calibration	All analytes within ± 25% of expected value *[±35% of expected value]	Correct the problem then repeat initial calibration			
Retention time window calculated for each analyte	Each sample	Relative retention time (RRT) of the analyte within ± 0.06 RRT units of the RRT	Correct the problem then reanalyze all samples analyzed since the last retention time check			
Calibration verification	Daily, before sample analysis and every 12 hours of analysis time	SPCCs: (1)ARF=/>0.1 (2) ARF=/>0.3 CCCs =/< 20% Diff(when using RFs)or drift (when using least squares regression or non-linear calibration)	Correct the problem then repeat initial calibration			
ISs	Immediately after or during data acquisition for each sample	Retention time ±30 seconds from retention time of the mid-point std. in the ICAL.EICP area within -50% to +100% of ICAL mid-point std.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning			
Method blank	One per preparation batch	No analytes detected =/> RL	Reprep and reanalyze method blank and all samples processed with the contaminated blank	Apply B to specific analyte(s) on all associated samples		
LCS	One LCS per preparation batch	Within EMAX QC Limits	Reprep and reanalyze the LCS and all associated samples			
MS/MSD	One MS/MSD per every 20 project samples per matrix	Within EMAX QC Limits	none			
Check of mass spectral ion intensities using BFB	Prior to initial calibration and calibration verification	Refer to criteria listed in the method description (EMAX-8260 Table 7)	Retune instrument and verify			
Surrogate spike	Every sample, spiked sample, standard, and method blank	Within EMAX In-house QC Limits	Correct the problem then reextract and analyze sample			
Results reported between MDL and RL	none	none	none	Apply J to all values between MDL and RL		

Comments: Comments: RL= lowest calibration point
SPCC: (1). Bromoform, Chloromethane and 1,1-Dichloroethane (2). Chlorobenzene and 1,1,2,2-Tetrachloroethane
CCC: Chloroform,1,1-DCE, 1,2-DCP, Chloroform, Ethylbenzene, Toluene and Vinyl Chloride.
*Except for the following compounds due to erratic chromatographic behavior Bromomethane, Chloroethane, Chloromethane, Dichlorodifluoromethane

Reviewed by:		
Date:		

EMAX Laboratories Fax:310-618-0818 Mar 30 00 10:39 P.10
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Appendix C

Standard Operating Procedures

SOP C1 WET DECONTAMINATION METHODS

Wet decontamination methods will consist of high-pressure steam cleaning or of a Liquinox wash followed by a potable water rinse. The stainless-steel sampling equipment will be decontaminated with a Liquinox wash and potable water rinse between sample locations. All visible dirt, grease, oil, and foreign particles will be removed during decontamination.

Foster Wheeler personnel will construct a temporary decontamination pad at a site location approved by Cannon AFB and the USACE Resident Engineer. The decontamination pad will be bermed and sloped to a sump for water and sludge collection. The decontamination pad will be lined with 40-mil plastic sheetng. Any holes in the plastic sheeting will be repaired to watertight conditions before use. The plastic sheeting will be secured to prevent fluttering or blowing away by high winds.

All equipment and tools will be decontaminated both upon arrival and prior to departure from each site. All decontaminated equipment will be stored in a clean condition.

Residuals from decontamination activities will be managed in accordance with this Work Plan.

SOP C2 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 C3 SOIL SAMPLING

The following procedure will be used for excavation and sampling:

1. Wear appropriate health and safety equipment as required in the Site-Specific Environmental Health and Safety Plan (Appendix E).
2. 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. Personnel should not enter the excavation.
4. Empty trowel contents into a stainless-steel pan.
5. 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, corners, 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 corners 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.
6. Place analytical samples in cooler and chill to 4°C. Samples should be shipped within 24 hours.
7. Fill out field logbook, sample tag forms, custody seals, and C-O-C forms. Example copies of these forms are included in the QAPP, Section 7 of this Work Plan.
8. A hand-sketched map of the excavation showing the soil layers should be included in the field logbook..

SOP C4 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 (Appendix E). 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.
6. Empty the contents of the scoop/trowel into the decontaminated stainless-steel bowl for homogenization.
7. 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, corners, and bottom of the pan and rolling it to the middle of the pan. Fill the sample jars with the homogenized soil using a stainless-steel spatula or spoon.
8. Place analytical samples in a cooler containing ice and chill to 4°C. Samples should be shipped within 24 hours to an appropriate laboratory.
9. Decontaminate scoop/trowel and bowl as specified in SOP D1.
10. Fill out field logbook, sample log sheet, custody seals, labels, and chain-of-custody forms.
11. Write out sample ID for each composite bermed and lined area or stockpile sample.

SOP C5 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 (C-O-C) 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 on the 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. Allowable holding times are listed in Table 7-1 of the QAPP. Samples should be sent daily by overnight courier service to the laboratory after collection.

Chemical constituents that will be analyzed have been identified in the Sampling and Analysis Plan, Section 6.

Sample Documentation and Tracking

This section describes documentation required in the field logbook, Daily Quality Control Reports (DQCRs), and sample C-O-C 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 included 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 Foster Wheeler QA Manager for review on a weekly basis.

Sample C-O-C—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 C-O-C form. C-O-Cs will include site identification, field sample number, sample type, and analysis requested.

The sample handler will be responsible for completing the C-O-C form. The C-O-C will be signed by the sampler when the sampler relinquishes the samples to anyone else. It is not necessary for the

courier service to sign C-O-Cs; however, the airbill will be retained by the sample handler for tracking purposes. A C-O-C 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 carrier will sign the C-O-C form, retain the last copy of the three-part C-O-C form, document the method of shipment, and send the original and the second copy of the C-O-C 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 C-O-C form and return the second copy to the Delivery Order Manager. Copies of the C-O-C forms and all custody documentation will be received and kept in the central files. The original C-O-C 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 C-O-C will be sent to the Delivery Order Manager by the analytical laboratory to be incorporated into the central files.

SOP C6 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). DQCRs are discussed in the Quality Assurance Project Plan (Appendix A of the 2000 Draft Work Plan).

Appendix D

Contractor Quality Control Plan

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1.0 CONTRACTOR QUALITY CONTROL PLAN

This CQC Plan establishes the procedures and methods to be implemented during remediation of contaminated soil at SWMU 109 on Cannon AFB, New Mexico. This CQC Plan combines the QA/QC requirements from the USACE-Omaha District with the Foster Wheeler QC system requirements to form a set of common requirements commensurate with the scope and nature of services planned under the Southwest Total Environmental Restoration Contract (TERC) Program.

1.1 PURPOSE

The purpose of this CQC Plan is to establish the procedures and methods to be implemented during construction operations to complete a voluntary corrective action at the two sites under TERC No. DACW45-94-D-0003, with the USACE-Omaha District. This CQC Plan provides an effective QC system to ensure the quality of all work performed by describing the specific organization, personnel, procedures, controls, instructions, tests, records, submittals, and forms to be used to ensure that all work products comply with the contract requirements.

1.2 SCOPE

The CQC Plan is applicable to all on-site construction operations, including inspections and testing activities performed for this project. All work activities will be conducted in accordance with this work plan and its respective attachments. This CQC Plan will be implemented for the following activities:

- Required project meetings/teleconferences
- Mobilization
- Excavation/removal of contaminated soil
- Verification/closure sampling and analysis
- Characterization sampling and analysis of excavated soil
- Backfilling
- Site restoration
- Inspection and testing
- Demobilization
- Waste disposal

2.0 ORGANIZATION AND RESPONSIBILITIES

2.1 QUALITY CONTROL ORGANIZATION

This section describes the responsibilities for project personnel performing QC of the on-site construction operations. Project organization chart is provided in Section 3 of the Work Plan.

2.2 DELIVERY ORDER MANAGER

The DOM, Ms. Carol Bieniulis, oversees the coordination of the entire project and is responsible for the direction, execution, and successful completion of project tasks. Ms. Bieniulis is responsible for performing the following activities related to the specific task order:

- Prepare and approve all proposed task-specific work orders.
- Coordinate work activities of subcontractors and Foster Wheeler personnel and ensure that all personnel adhere to the administrative and technical requirements of the project.
- Monitor and report the progress of work and ensure that project deliverables are completed on time and within budget.
- Ensure performance of project management activities including procurement/purchase order preparation, monthly exposure reporting, invoicing, scheduling, and other TERC requirements.
- Ensure adherence to the quality requirements of the contract, specifications of the delivery order, and the CQC Plan.
- Direct the Construction Site Manager to undertake and accomplish the required construction.
- Ensure that all task activities are conducted in a safe manner in accordance with the SSHP in Section 6 of this work plan.
- Communicate as the primary contact between USACE-Construction Representative (CR) and Foster Wheeler for actions and information related to the delivery order.
- Communicate and interface with the CQC Systems Manager Site Health and Safety Officer (SHSO).

2.3 CONTRACTOR QUALITY CONTROL SYSTEMS MANAGER/SITE HEALTH AND SAFETY OFFICER

The CQC Systems Manager/SHSO (James Morning) is responsible for overall management of contractor quality control and health and safety and reports to the Site Construction Manager. The CQC Systems Manager/SHSO will be on site at all times during construction. In the event of this individual's absence, a qualified individual will be appointed to serve as his/her replacement for periods of time not to exceed 2 weeks at any one time and not to exceed more

than 30 work days during a calendar year. The requirements for the alternate will be the same for the designated CQC Systems Manager/SHSO.

The duties of the CQC Systems Manager/SHSO, as they apply to this project, include the following:

- Provide and maintain an effective QC system for all construction activities.
- Monitor QC activities to ensure conformance with authorized policies, procedures, contract specifications, and sound practices.
- Maintain sufficient staff to perform all QC activities appropriate to all work phases, work shifts, and work crews.
- Inspect the work performed each day for compliance with the plans and specifications and prepare the DQCR.
- Ensure that required phases of inspection (preparatory, initial, and followup) are implemented for all definable phases of construction.
- Schedule and manage all submittals, as identified in the Submittal Register, including those of subcontractors providing monthly updates.
- Ensure that all required tests and inspections are performed and the results reported.
- Attend required meetings, including submittal review meetings and field review meetings.
- Review all submittals in detail and verify that they are correct and in strict compliance with contract drawings and specifications.
- Stop work that is not in compliance with the contract.
- Perform the duties of the SHSO as stated in the Basewide Health and Safety Plan.

2.4 SITE CONSTRUCTION MANAGER

Mr. James Morning will also serve as the Site Construction Manager. The primary responsibility of the Site Construction Manager is the timely completion of all field activities as directed by the DOM. The duties of the Site Construction Manager, as they apply to the project, include the following:

- Establish a field base for operations and mobilize subcontractors and Foster Wheeler personnel.
- Procure equipment for work crews and health and safety personnel.
- Coordinate all personnel involved in task activities, including obtaining support services.
- Direct field leaders, support personnel, and subcontractors.

- Administer site access.
- Maintain work site, vehicles, and equipment.
- Coordinate and maintain logistics of all components of on-site tasks, including all personnel and equipment.
- Prepare weekly status reports and estimate future scheduling needs.
- Coordinate, prepare, and complete all required field reports.
- Evaluate relevant documents and permits for validity and current status.
- Acquire necessary permits, licenses, and rights-of-way.

2.5 SUBCONTRACTORS AND VENDORS

Subcontractors and vendors will be required to conform to the Foster Wheeler CQC Plan and any other approved procedures, technical specifications, or contract provisions.

The subcontractor's QC inspectors are responsible for field inspection of their construction and operating activities. Foster Wheeler will monitor, oversee, and make on-site observations and inspections of work in progress to determine whether the subcontractor's work is in accordance with the CQC Plan.

Subcontractor personnel are responsible for maintaining a daily log of the project activities they perform and for providing information needed to complete the DQCR. All inspection records, including inspection and deficiency reports and re-inspections of corrective actions, will be documented.

3.0 CONSTRUCTION INSPECTION PLAN

Contractor QC is the means by which Foster Wheeler ensures that all construction complies with the requirements of the contract. The Construction Inspection Plan establishes the measures required to verify both the quality of work performed and compliance with specified requirements, including the inspection of materials and workmanship before, during, and after each definable feature of work. Contractor QC includes implementation of the following control phases for all aspects of the work specified:

- Preparatory phase
- Initial phase
- Followup phase

Inspection requirements specific to this project are discussed throughout this section.

3.1 PREPARATORY PHASE INSPECTIONS

Preparatory phase inspections will be conducted by the CQC Systems Manager/SHSO prior to starting the definable features of work listed in the technical specifications. At a minimum, these inspections will include the following:

- A review of each paragraph of applicable specifications
- A review of the contract plans
- A check to ensure that all materials and/or equipment have been tested, submitted, and approved
- A check to ensure that provisions have been made for required control inspection and testing
- An examination of the work area to ensure that all required preliminary work has been completed and is in compliance with the contract
- A physical examination of required materials, equipment, and sample work to ensure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored
- A review of the appropriate AHA to ensure that safety requirements are met
- A discussion of procedures for constructing the work, including repetitive deficiencies
- Documentation of construction tolerances and workmanship standards for that phase of work
- A check to ensure that the portion of the CQC Plan for the work to be performed has been accepted by the USACE or designee

The Base Project Manager and USACE Resident Engineer/CR will be notified at least 48 hours in advance of any preparatory phase activity. This phase will include a meeting conducted by the CQC Systems Manager/SHSO that will be attended by other responsible construction personnel as applicable (e.g., the project superintendent, the construction foreman).

The preparatory phase meetings will be documented by item on the Inspection Checklist, as shown on Figure 3-1. Preparatory inspections will be reported on the DQCR, with the checklist included as an attachment. An example of the DQCR is included as Figure 3-2. Personnel performing work activities will be directed by the CQC Systems Manager/SHSO as to the acceptable level of workmanship involved for the particular feature of work covered by the inspection.

3.2 INITIAL PHASE INSPECTION

An initial inspection will be performed at the beginning of a definable feature of work and will include the following:

- A check of preliminary work to ensure that it is in compliance with contract requirements
- A review of the Inspection Checklist documenting results of the preparatory meeting
- Verification of full contract compliance, including required control inspection and testing
- Establishment of the required level of workmanship and verification that it meets minimum acceptable standard
- Resolution of all differences
- A check of safety requirements to include compliance with and upgrading of the safety plan and activity hazard analysis
- A review of the activity analysis with project personnel

The Base Project Manager and the USACE Resident Engineer/CR will be notified at least 48 hours in advance of any initial phase activity. The CQC Systems Manager/SHSO will document each item on the Inspection Checklist (Figure 3-1) during the initial inspection. This documentation will be attached to the DQCR. The exact location of the initial phase inspection will be indicated for future reference and to allow for comparison with followup inspections.

An initial phase inspection will be conducted each time a new crew arrives on site or any time acceptable specified quality standards are not being met.

3.3 ADDITIONAL PREPARATORY AND INITIAL PHASES

Additional preparatory and initial inspections may be conducted by the CQC Systems Manager/SHSO on the same definable features of work under several circumstances. These include when the quality of ongoing work is unacceptable as determined by the Base Project Manager or the USACE Resident Engineer/CR; when staff, on-site supervision, or work crew changes; when work on a definable feature is resumed after a substantial period of inactivity; or if other problems develop.

3.4 COMPLETION INSPECTION

Completion inspections will be performed as summarized in this section.

3.4.1 Contractor's Quality Control Completion Inspection

The CQC Systems Manager/SHSO or designated Foster Wheeler Environmental QC Inspection personnel will conduct a detailed inspection when all of the work or an increment of work is substantially complete. This inspection will be conducted prior to the prefinal inspection. The Base Project Manager and the USACE Resident Engineer/CR may also participate and will be notified in advance of the inspection date. The work will be inspected for conformance to plans, specifications, quality, workmanship, and completeness. The CQC Systems Manager/SHSO will prepare an itemized list of work not properly completed, inferior workmanship, or work that does not conform to plans and specifications. The list will also include outstanding administrative items such as record (as-built) drawings, O&M manuals, and spare parts. The list will be included in the QC documentation and submitted to the Base Project Manager or designee and the USACE Resident Engineer/CR with an estimated date for correction of each deficiency scheduled within 5 working days after the conduct of the inspection. The completion inspection will be documented on the Inspection Checklist, shown in Figure 3-1, and attached to the DQCR.

3.4.2 Prefinal Inspection

The prefinal inspection will be conducted by the Base Project Manager; the USACE Resident Engineer/CR, Foster Wheeler QC inspection personnel, CQC Systems Manager/SHSO, or other primary management representative, as applicable, will attend. The Base Project Manager or designee in response to notification from the CQC Systems Manager/SHSO prior to the planned inspection date will schedule the prefinal inspection. The CQC Systems Manager/SHSO is required to verify at this time that all specific items previously identified to Foster Wheeler as being unacceptable, along with all remaining project work, will be complete and acceptable by the date scheduled for the prefinal inspection. At this inspection, the Base Project Manager or designee will develop a specific list of incomplete and/or unacceptable work performed under the contract and will provide this list to Foster Wheeler.

3.4.3 Final Acceptance Inspection

The final acceptance inspection will be formally scheduled by the Base Project Manager based on notification from the CQC Systems Manager/SHSO of readiness and will include the QC

FIGURE 3-1 INSPECTION CHECKLIST

ITEM:				DATE:
Contract Specifications:				
MATERIAL:	QTY:	CONDITION:	TESTING:	COMMENTS:
STORAGE CONDITIONS:				
SUBMITTALS:				

FIGURE 3-1 INSPECTION CHECKLIST

MATERIAL/EQUIPMENT CERTIFICATIONS:	
PREPARATORY SITE CONDITIONS:	
CONTRACT VARIANCE:	
COMMENTS:	
ATTENDEES:	
	QC REPRESENTATIVE DATE
	QCSM DATE

FIGURE 3-2 DAILY QUALITY CONTROL REPORT

Daily Report No.: _____ Date: _____

Contract No.: _____

Project Title & Location: _____

Weather: _____ Precipitation: _____ In.: ___ Temp.: _____ Min.: _____ Max.: _____

1. Contract/Subcontractors and Area of Responsibility:

NUMBER	TRADE	HOURS	EMPLOYER	LOCATION/DESCRIPTION OF WORK

2. Operating Plant or Equipment (not hand tools):

Plant/Equipment	Date of Arrival/Departure	Date of Safety Check	Hours Used	Hours Idle	Hours Repair

FIGURE 3-2 DAILY QUALITY CONTROL REPORT

3. Work Performed Today: (Indicate location and description of work performed by prime and/or subcontractors. When network analysis is used, identify work by NAS activity number.)

4. Control Activities Performed:

- Preparatory Inspections: Identify features of work and attach minutes.
- Initial Inspections: Identify features of work and attach minutes.
- Follow-up Inspections: List inspections performed, results of inspections compared to specification requirements, and corrective actions taken when deficiencies are noted.

5. Tests Performed and Test Results: Identify test requirement by paragraph number in specifications and/or sheet number in plans.

6. Material Received: Note inspection results and storage provided.

FIGURE 3-2 DAILY QUALITY CONTROL REPORT

7. Submittals Reviewed:

(a) Submittal No.	(b) Spec/Plan Reference	(c) By Whom	(d) Action

8. Off-Site Surveillance Activities, Including Action Taken:

9. Job Safety: List items checked, results, instructions, and corrective actions taken.

10. Remarks: Instructions received or given. Conflict(s) in plans and/or specifications. Delays encountered.

<u>Contractor's Verification</u>: On behalf of the Contractor, I certify this report is complete and correct, and all materials and equipment used and work performed during this reporting period are in compliance with the contract plans and specifications, to the best of my knowledge, except as may be noted above.

CQC SYSTEMS MANAGER

DATE

inspection personnel, CQC Systems Manager/SHSO and other primary management personnel as needed, the Base Project Manager, and the USACE Resident Engineer/CR. This notification will be provided prior to the planned final acceptance inspection date and must include verification that all specific items previously identified as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection.

3.4.4 Management Inspections

In addition to the required QC field inspections, one internal management inspection will be performed to ensure adherence for the following:

- Possession and use of approved procedures, standards, and technical specifications
- Conformance with appropriate procedures, standards, and instructions
- Thoroughness of performance
- Identification and completeness of documentation generated during performance

3.4.5 Inspection Documentation

The CQC Systems Manager/SHSO is responsible for the maintenance of the inspection records. Inspection records will be legible and will provide all necessary information clearly to verify that the items or activities inspected conform to the specified requirements or, in the case of nonconforming conditions, provide evidence that the conditions were brought into conformance or otherwise accepted by Foster Wheeler.

All inspection records will be made available to Cannon AFB and USACE through the Foster Wheeler DOM.

4.0 PROJECT DOCUMENTS

Preparation, review, approval, and issuance of documents affecting quality will be controlled to the extent necessary to determine that the documents meet specified requirements. Project documents to be controlled include the following:

- Submittal register
- Inspection documentation
- DQCR
- Test results

- Nonconformance reports
- Project plans

Discussions of the required DQCR and records to be provided to document conferences are included in this section. The DQCR and required inspection documents are described in this CQC Plan in Section 3-1, Construction Inspection Plan. The Nonconformance Report is included in Section 5, Nonconformances.

4.1 DAILY QUALITY CONTROL REPORT

The CQC Systems Manager/SHSO is responsible for maintenance of current records of QC operation, activities, and tests performed, including the work of subcontractors and suppliers. The records will include factual evidence that required QC activities and tests were performed. A DQCR will be completed to document construction activities covered by the CQC Plan and will include the following information:

- Contractor/subcontractor(s) and their area of responsibility
- Operating equipment, with hours worked, idle, or down for repair
- Work performed that day, giving location, description, and by whom
- Test and/or control activities performed with results and references to specifications/plan requirements, including the control phase (preparatory, initial, follow-up) and deficiencies (along with corrective action)
- Material received with statement as to its acceptability and storage
- Submittals reviewed, with contract reference, by whom, and action taken
- Off-site surveillance activities, including actions taken
- Job safety evaluations stating what was checked, results, and instructions or corrective actions
- A list of instructions given/received and conflicts in plans and/or specifications
- Contractor's verification statement
- Site visitors/purpose, deviations from plans, difficulties/resolution

The records will indicate a description of trades working on the project, the number of personnel working, weather conditions encountered, and any delays encountered. Both conforming and nonconforming features will be discussed with a statement that equipment and materials used during the work and workmanship comply with the contract. The original of this report shall be

furnished to the USACE Resident Engineer/CR on the first work day following the date covered by the report, although reports need not be submitted for days on which no work is performed. At a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no-work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work will summarize work for that day only. Reports will be signed and dated by the CQC Systems Manager/SHSO and other appropriate personnel, including subcontractors responsible for completion of activities. The report from the CQC Systems Manager/SHSO will include copies of test reports and copies of reports prepared by all subordinate QC personnel.

4.2 MEETING NOTES AND CONFIRMATION NOTICES

In addition to other required documentation, the DOM is responsible for taking notes and preparing reports for all meetings and teleconferences. Notes will be typed and the original report furnished to the USACE within 7 working days after the date of the meeting/biweekly teleconference for concurrence and subsequent distribution to all attendees. At a minimum, this report will include the following items:

- Air Force Project Number, date and time the meeting/teleconference was held, and agenda
- List of attendees, including name, organization, email address, and telephone number (for meetings)
- Written comments presented by attendees attached to each report with the conference action noted: "A" for an approved comment, "D" for a disapproved comment, "W" for a comment that has been withdrawn, and "E" for a comment that has an exception noted
- Comments made during the meeting/teleconference and decisions affecting criteria changes
- Conference notes that augment the written comments
- Documentation of any augmentation of written comments

Project meetings include the scope development meeting held at Cannon AFB, biweekly teleconferences to discuss work progress and project status, one site visit, and project kick-off meeting. The DOM or his designee is also responsible for providing a weekly record of all discussions, verbal directions, telephone conversations, etc., in which Foster Wheeler personnel or their representatives participated on matters relating to this contract and work. These records, which are entitled confirmation notices, will be numbered sequentially and will fully identify

participating personnel, subject discussed, and any conclusions reached. The DOM or designee will forward to the Base Project Manager or designee and the USACE Resident Engineer/CR a reproducible copy of the confirmation notices within 7 working days.

4.3 RECORD DRAWINGS

In addition to the basic requirements for record drawings, all drawings will be developed or modified using Auto-CADD for required submittals. All Auto-CADD drawings will be compatible with the Auto-CADD system used at Cannon AFB. After construction, Foster Wheeler will provide the Base Project Manager with a copy of the Auto-CADD drawing files (on disk) and prints (drawings), which will include the as-constructed site conditions.

4.4 FINAL SUBMITTALS

Specific requirements pertaining to final submittals are provided in this section. Final submittals will be reproduced and distributed by mail to all reviewers via a carrier service that will provide overnight service. All reports shall be printed on recyclable paper to the maximum extent possible.

Partial submittals will not be accepted unless prior approval is given in writing. A cover letter addressed to the Resident Engineer will accompany each final document and will indicate the following information: project, project number, project phase, date comments are due, to whom comments are to be submitted, and the date and location of the review conference, as appropriate. Depending on the recipient, all letters shall be coordinated with the USACE Resident Engineer/CR prior to the submittal date. The cover letter will not be bound into the document.

One unbound copy of each submittal will be provided to USACE and to Cannon AFB when the project is completed. This copy will be in addition to the quantities listed in the submittal register. All final submittals should be error free.

4.5 SUPPORTING DATA AND CALCULATIONS

The tabulation of criteria, data, calculations, cost estimates, etc., that are performed but not included in detail in the report will be assembled as appendices. Criteria provided by the USACE-Omaha District shall be referenced as appropriate. Persons performing and checking

calculations shall place their full names on the first page of all supporting calculations, estimates, etc., and initial the following sheets. The originator of the calculations may not also be the checker. Each sheet shall be dated and numbered in sequence.

4.6 CORRECTIVE MEASURE REPORT

All work performed under this delivery order shall be documented in a final letter report. This report shall include a description of tasks performed, supporting analytical data, DQCRs, and site maps showing the location of any excavated areas and sampling schematic. A draft letter report will first be provided to USACE and Cannon AFB for review; the final report shall incorporate all comments received on the draft report.

5.0 NONCONFORMANCES

5.1 NONCONFORMANCE REPORT

Any work or materials not conforming to the technical specifications or contract requirements will be identified and documented on a Nonconformance Report as indicated in Figure 5-1. The Nonconformance Report will detail the nonconforming condition, recommended corrective action(s), and disposition of the corrective action(s). The Nonconformance Report will remain open until the nonconforming condition has been satisfactorily resolved and verified by QC inspection staff. Upon receipt of notification of detected nonconformances from the USACE Base Project Manager, Nonconformance Reports for each item will be completed.

5.2 IDENTIFICATION OF NONCONFORMING ITEMS

Items identified as nonconforming will be documented on a Nonconformance Report, which will include the following information:

- Description of nonconforming item or activity
- Detailed description of nonconformance
- Referenced criteria
- Recommended disposition and corrective action to prevent recurrence (as applicable)
- Affected organization

5.3 CONTROL AND SEGREGATION

The nonconforming items will be controlled to prevent inadvertent use. All items identified as nonconforming will be clearly identified and segregated from acceptable items when practical.

5.4 DISPOSITION

The disposition of Nonconformance Reports will include the necessary actions required to transform the nonconforming condition into an acceptable condition and may include reworking, replacing, retesting, or reinspecting. Implementation of the disposition may be done in accordance with the original procedural requirements, a specific instruction, or an FCR (Figure 5-2).

5.5 CORRECTIVE ACTIONS

Upon detection of a nonconforming condition, the CQC Systems Manager/SHSO will immediately take corrective action. In addition to resolving identified nonconforming conditions, corrective action records will also address the initial cause of adverse conditions and establish methods and controls to prevent recurrence of the same or similar types of nonconformances. The CQC Systems Manager/SHSO will monitor the corrective actions to verify that they were properly implemented and accepted and that the Nonconformance Report was closed out.

FIGURE 5-1 NONCONFORMANCE REPORT

FOSTER WHEELER ENVIRONMENTAL CORPORATION QUALITY ASSURANCE
REPORT NO(1) _____ NONCONFORMANCE REPORT

CLIENT OR PROJECT (2)		DRAWING NO./SPEC NO. (3)
SUPPLIER, CONSTRUCTION QC, OR CONTRACTOR (4)	P. O. NO. (5)	
DESCRIPTION OF COMPONENT, PART, OR SYSTEM (6)		

I. DESCRIPTION OF NONCONFORMANCE (7) *(Items involved, Specifications, Code, or Standard to Which Items Do Not Comply, Submit Sketch if Applicable)*			
NAME AND SIGNATURE OF PERSON REPORTING NONCONFORMANCE (8)		TITLE/COMPANY	DATE (9)
II. RECOMMENDED DISPOSITION (10) *(Submit Sketch If Applicable)*			
NAME AND SIGNATURE OF PERSON RECOMMENDING DISPOSITION (11)		TITLE/COMPANY	DATE (12)
III. EVALUATION OF DISPOSITION BY FOSTER WHEELER ENVIRONMENTAL. REASON FOR DISPOSITION (13)			
IV. CORRECTIVE ACTION (14) o Required o Not Required			

FIGURE 5-1 NONCONFORMANCE REPORT

FOSTER WHEELER ENVIRONMENTAL CORPORATION QUALITY ASSURANCE
REPORT NO(1) _____NONCONFORMANCE REPORT

V. ° ENGINEERING	° QUALITY ASSURANCE	° CONSTRUCTION	° OTHER
NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)	NAME (SIGNATURE)
DATE	DATE	DATE	DATE
° ACCEPTED ° REJECTED ° ACCEPTED WITH COMMENTS	° ACCEPTED ° REJECTED ° ACCEPTED WITH COMMENTS	° ACCEPTED ° REJECTED ° ACCEPTED WITH COMMENTS	° ACCEPTED ° REJECTED ° ACCEPTED WITH COMMENTS

VI. VERIFICATION OF DISPOSITION ° REQUIRED ° NOT REQUIRED (16)

(17) BY _____ SIGNATURE _____
TITLE _____ DATE _____

FIGURE 5-2. FIELD CHANGE REQUEST

FOSTER WHEELER ENVIRONMENTAL CORPORATION
ENGINEERING PROCEDURES
DEVELOPING AND ISSUING ENGINEERING DOCUMENTS

Project	Proj. No.	Field Change No.

TO _____ DEPT _____ LOCATION _____
DATE _____

RE: ? Drawing No. _____
Title _____
? Spec No. _____
Title _____
?
Other _____

1. Description (Items involved, submit sketch if applicable)

_____

2. Reasons for Change (If from disposition of nonconformance report, list report number) _____

_____

3. Recommended Disposition Change ? Minor Change ? Major

_____

4. Resident Engineer (Signature)	Date	Project Supt. Concurrence (Signature)	Date

FIGURE 5-2. FIELD CHANGE REQUEST

5. Disposition

? NOT APPROVED (Give Reason)

? CONSIDERED MINOR CHANGE – Approved per Recommended Disposition-Design documents will not be normally revised; field to maintain as-built records

? CONSIDERED MAJOR CHANGE - Action will be taken as prescribed on DCN -

Lead Discipline Engineer or Designee (Signature)	Date	Project Engineer or Designee	Date

Project Engineer signs and returns to LDE for transmittal to Resident Engineer with copies to:

Project Manager_____

Others as Required

Project Supt.

Project Files

Appendix E

Site Specific Health and Safety Plan

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LIST OF ACRONYMS

AFB	Air Force Base
BTEX	benzene, toluene, ethylbenzene, and xylene
CFR	Code of Federal Regulations
ESS	Environmental Safety Specialist
FID	flame ionization detector
Foster Wheeler	Foster Wheeler Environmental Corporation
HASP	Health and Safety Plan
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PESM	Project Environmental Safety Manager
PID	photoionization detector
PPE	personal protective equipment
ppm	parts per million
SVOC	semivolatile organic compound
SWMU	solid waste management unit
VOC	volatile organic compound

1.0 INTRODUCTION

This addendum to the Basewide Health and Safety Plan (HASP) provides the site-specific health and safety requirements for soil removal at Solid Waste Management Unit (SWMU) 109, Cannon Air Force Base (AFB), New Mexico. This plan serves as an addendum to the existing Final Basewide HASP for Cannon AFB prepared by Foster Wheeler Environmental Corporation (Foster Wheeler) (Foster Wheeler, 2000). The Basewide HASP contains requirements for personnel and training, site history, a description of the basic scope of work, personnel monitoring and protection, site control, decontamination, hazard evaluation, first-aid practices, and emergency-response activities.

The purpose of the Corrective Measures Implementation is to minimize the threat to human health and the environment at SWMU 109. Site activities for this project consist of removing an area of contaminated soil at SWMU 109, performing verification and confirmation sampling and analysis, disposing of excavated soil, and completing site restoration.

2.0 AIR MONITORING

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 Basewide HASP. All site workers will be properly fitted with PPE (i.e., respirators) and trained in their use (i.e., donning and doffing). 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. A photoionization detector (PID), equipped with a 10.2-electron volt lamp, calibrated with isobutylene, and referenced to benzene-in-air (or a flame ionization detector [FID] calibrated with and referenced to methane-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 or FID as described above.

PID/FID 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 Environmental Safety Specialist (ESS), 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. 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 a PID or FID do not exceed 50 ppm at any time. This is a very conservative approach to employee protection because it presumes that

20 percent of the measured organic vapors are benzene, which is extremely unlikely. If cartridges other than MSA are used, the Project Environmental Safety Manager (PESM) should be contacted for a cartridge change schedule from the cartridge manufacturer. Cartridges will be discarded at the end of each shift.

3.0 HAZARD IDENTIFICATION

Attachment 1 presents the potential hazards associated with the activities planned for the soil removal at SWMU 109 and the measures to be taken to mitigate potential hazards in the field. Sections 3.1 and 3.2 present detailed information pertaining to the chemical and physical hazards that may be encountered at the site. Section 3.3 provides project-specific requirements for the levels of personnel protection required during field activities.

3.1 CHEMICAL HAZARDS

Previous soil analytical results from the site were reviewed during the work plan preparation. Contaminants known to be present at the site can be grouped into three categories: semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs) and petroleum hydrocarbons. The planned soil removal sampling offer minimal exposure; therefore, risk is minimal. However, significant exposure to VOCs could occur if soil samples are saturated with "free product" or vapors persist in the breathing zone.

Exposure to the vapors of BTEX greater than the permissible exposure limit (PEL) for each compound, as defined by the Occupational Safety and Health Administration (OSHA), may produce irritation of the mucous membranes of the upper respiratory tract, nose, and mouth. Overexposure may also result in the depression of the central nervous system. Symptoms of such exposure include drowsiness, headache, fatigue, and drunken-like behavior. Benzene has been determined to be carcinogenic, targeting blood-forming organs and bone marrow.

Exposure to the vapors of many chlorinated organic compounds, such as tetrachloroethylene and trichloroethylene, above their PELs will result in similar symptoms. The actual PELs, as set by the OSHA, vary depending on the specific compound.

Overexposure to the vapor from these compounds can cause irritation of the eyes, nose, and throat. The liquid, if splashed in the eyes, may cause burning, irrigation, and damage. Repeated or prolonged skin contact with the liquid may cause dermatitis. Acute overexposure to chlorinated hydrocarbons depresses the central nervous system and causes such symptoms as drowsiness, dizziness, headache, blurred vision, incoordination, mental confusion, flushed skin, tremors, nausea, vomiting, fatigue, and cardiac arrhythmia. Alcohol may worsen symptoms of

overexposure. If alcohol has been consumed, the overexposed worker may become flushed. Some of these compounds are considered to be potential human carcinogens.

The vapor pressures of these compounds are high enough to generate significant quantities of airborne vapor. On sites where high concentrations of these compounds are present, this situation can result in a potential inhalation hazard to the field team during subsurface investigations. However, if the site is open and the anticipated quantities of VOC and SVOC contamination are small (i.e., ppm concentrations in the soil), overexposure potential will also be low.

3.2 PHYSICAL HAZARDS

The use of trucks, backhoes, and other mechanical equipment presents potentially serious construction hazards. Whenever such equipment is used, personnel in the vicinity shall be limited to those who must be present to complete their assigned duties. All personnel must avoid standing within the turning radius of the equipment or below any suspended load. Job sites must be kept as clean, orderly, and sanitary as possible. When water is used, care must be taken to avoid creating muddy or slippery conditions. If slippery conditions are unavoidable, barriers and warning signs must be used to warn of these dangers.

A "Competent Person" must perform frequent and regular inspection of the site, materials, and equipment, in accordance with Title 29 of the Code of Federal Regulations (CFR) 1926.20, to identify site hazards. All personnel on site shall be provided with the information and training necessary to avoid accidental injury and to assure that the site is maintained in such a way that slip, trip, and fall hazards are recognized and eliminated or controlled. Basic PPE (steel-toe boots, hard hats, and safety eyewear) must be available and their use enforced. Hearing protection will be worn by personnel in contact with drilling equipment.

3.2.1 Fire and Explosion

The possibility of flammable materials being encountered during field activities must be recognized, and the appropriate steps necessary to minimize fire and explosion must be observed. This procedure applies to situations where excessive organic vapors or free products are

encountered. At least one 10-pound ABC fire extinguisher must be located within 100 feet of each work area.

3.2.2 Heat and Cold Stress

Overexposure to temperature extremes can represent significant risks to personnel if simple precautions are not observed. Typical control measures designed to prevent heat stress, including dressing properly, drinking plenty of the right fluids, and establishing an appropriate work/break regimen must be taken. Typical control measures designed to prevent cold stress also include dressing properly and establishing an appropriate work/break regimen. The project manager must assure that the appropriate measures are observed.

3.2.3 Moving Vehicles and Traffic Safety

All vehicular traffic routes that could impact worker safety must be identified and communicated. Whenever necessary, barriers or other methods must be established to prevent injury from moving vehicles. This is particularly important when field activities are conducted in parking lots, driveways, ramps, or roadways. Title 29 CFR 1926.201 specifies that when signs, signals, or barricades do not provide adequate protection from highway or street traffic, flagmen must be used. Flagmen must wear red or orange garments, and garments worn at night must be reflective.

3.2.4 Pedestrian Traffic

The uncontrolled presence of pedestrians during drilling activities can be hazardous to both pedestrians and site workers. Prior to the initiation of site activities, the site shall be surveyed to determine if, when, and where pedestrians may gain access. These access areas include walkways, parking lots, gates, and doorways. Exclusion zones constructed of barriers or caution tape shall be used to exclude all pedestrian traffic. Exclusion of pedestrian traffic is intended to prevent injury to the pedestrians and eliminate distractions, which could cause injury to site workers.

3.2.5 Manual Lifting and Material Handling

The following procedures shall be adhered to for manual lifting and material handling:

- Always bend at the knees when lifting heavy objects such as sample coolers and equipment cases.
- Keep the weight close to your body. Do not twist or turn the body while lifting.
- Get help or use a mechanical device when lifting awkward-shaped objects or objects too heavy to comfortably lift alone.

3.3 PERSONNEL PROTECTION

The ESS shall determine the level of protection required during field activities and whether the level of protection needs to be upgraded or downgraded. Appropriate documentation shall be forwarded to the PESM. It is anticipated that Level D or modified Level D will be required for all field activities. Requirements for Level D and modified Level D are discussed below.

3.3.1 Level D Protection

The following PPE shall be considered typical Level D protection:

- Coveralls
- Leather or chemical-resistant work boots with a steel toe and shank
- Work gloves
- Safety glasses, chemical splash goggles, or a face shield (as determined by the ESS)
- Hard hat (as determined by the ESS)
- Hearing protection (as determined by the ESS)
- Outer latex disposable boots (as determined by the ESS)
- Disposable nitrile outer gloves and latex inner gloves (required for sampling)

3.3.2 Modified Level D Protection

Level C protection is not anticipated; however, modified Level D protection shall be used when an increased need for dermal protection is recognized or if air-monitoring results are above action levels (1 ppm for benzene).

3.3.3 Level C Protection

Level C protection is not anticipated.

4.0 PROJECT PERSONNEL AND EMERGENCY PROCEDURES

Key project personnel on Delivery Order 28, Work Authorization Directive 1, their responsibilities, and telephone numbers are provided in Table 1. Emergency contacts for this project are provided in the health and safety contact summary sheet (Attachment 2). Mr. James Morning of Foster Wheeler will serve as the ESS, providing health and safety support throughout the field program.

Table 1. Key Personnel and Responsibilities

Name	Responsibility	Telephone Numbers
Carol Bieniulis	Delivery Order Manager	(505) 878-8924 Office (505) 934-0879 Cell
Charley Haddox	Task Order Manager	(303) 980-3533 Office
James Morning, OHST	Foster Wheeler Cannon AFB Site Manager/ESS	(505) 479-2668 Office (505) 430-2307 Cell
Roger Margotto, CIH	PESM	(619) 234-8696 (ext. 203) Office (714) 810-3742 Pager

4.1 HOSPITAL ROUTE

Attachment 3 contains a route map with directions to the civilian hospital in Clovis, New Mexico.

4.2 AGREEMENT AND ACKNOWLEDGMENT

All project personnel on site, subcontractor personnel, and visitors are required to read the Basewide HASP and the site-specific addendum and sign the agreement and acknowledgment sheet (Attachment 4) prior to conducting field activities. Foster Wheeler personnel have the authority to stop field activities at this site if an activity is not performed in accordance with the requirements of the HASP or site-specific addendum.

5.0 INCIDENT REPORTING

In the event of an accident or incident, an incident report and investigation form, as provided in the Basewide HASP, must be completed within 24 hours. This is an internal reporting document. In addition to current Foster Wheeler incident reporting procedures, accident investigation procedures pursuant to United States Army Corps of Engineers EM 385-1-1, Section 1d should be implemented.

Depending upon the nature of the incident, additional agencies or individuals that may need to be notified include the United States Environmental Protection Agency, New Mexico Environment Department, OSHA, and the base point of contact. Unless otherwise mandated by law, no outside agency may be contacted without explicit approval by the United States Air Force.

SITE-SPECIFIC HEALTH AND SAFETY PLAN ADDENDUM

IDENTIFICATION AND APPROVALS

PROJECT NAME:	Soil Removal at SWMU 109
LOCATION:	Cannon Air Force Base
CONTRACT NUMBER:	DACW45-94-D-0003 Delivery Order No. 28 Work Authorization Directive 7
CLIENT:	U.S. Army Corps of Engineers–Omaha District Omaha, Nebraska
DATE PREPARED:	May 17, 2000
REVISION:	0
PREPARED BY:	James Morning, OHST

REVIEWER'S APPROVALS

Carol Bieniulis
Delivery Order Manager

Tom Zink, PG
USACE Project Manager

Roger Margotto, C.I.H.
Project Environmental Safety Manager

Carrie Ables
USACE Industrial Hygienist

James Morning, OHST
Environmental Safety Specialist/Site Mgr.

Attachment 1

Activity Hazard Analysis

ACTIVITY HAZARD ANALYSIS

Removal of Contaminated Soil at SWMU 109, FTA4
Cannon Air Force Base, New Mexico

SITE MOBILIZATION

Principal Steps	Potential Hazards	Recommended Controls
Set up work areas	Potential exposure to chemical hazards	• Delineate exclusion zones and use PPE specified in SSHP. • Visual observation shall be used to verify selection of PPE. • Identify all chemical hazards and receive training (MSDS) regarding safe handling of chemicals. The SHSO will file copies of all MSDSs at the site.
	Noise exposure	• Hearing protection (as needed if noise inhibits verbal communication at normal speaking levels) will be worn by operators and site personnel with a noise reduction rating capable of maintaining personal exposure below 85 dBA (earmuffs or earplugs).
	Biological hazards such as snakes, insects, or spiders could cause injury or bites	• Wear PPE. • Look carefully for snakes, insects and spiders before stepping into any area or before placing hands near the ground. • Use insect repellant as necessary.
	Slip, trip, and fall hazards	• Work areas shall be visually inspected and slip, trip, and fall hazards shall be marked, barricaded, or eliminated, if feasible. Use care in work area; look for depressions and obstructions. • Employees shall only be allowed to work on walking/working surfaces that have the strength and integrity to support employees safely. Walking/working surfaces for this requirement include the edges of trenches. • Employees performing work on a walking/working surface with an unprotected side or edge which is 6 feet or more above a lower level shall be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems. • Openings of 18 inches or more in diameter must be covered and marked. All openings less than 18 inches in diameter and all holes must be marked or barricaded.

ACTIVITY HAZARD ANALYSIS

Removal of Contaminated Soil at SWMU 109, FTA4
Cannon Air Force Base, New Mexico

SITE MOBILIZATION

Principal Steps	Potential Hazards	Recommended Controls
Set up work areas (Continued)	Sharp objects/punctures	• Wear cut-resistant work gloves when sharp edges or other objects may cause the possibility of lacerations or other injury. When possible, sharp edges will be blunted. • Workers should not stand or walk on equipment or supplies.
	Strains from manually moving materials and equipment	• Personnel will be trained to use proper lifting techniques such as keeping the back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. Use of hand truck shall be encouraged. • Employees will not lift more than 50 pounds. • Pre-employment back evaluations are recommended for craft workers who may be at greater risk of developing low back pain or low back injury. • Surveys shall be performed by qualified persons to identify and evaluate tasks that might result in injuries due to ergonomic hazards. The focus of the surveys will be operations that involve the manual lifting and moving of objects of excessive weight or asymmetric size. • Hand tools shall be selected to minimize the following stressors: chronic muscle contraction or steady force, extreme or awkward finger/hand/arm positions, repetitive forceful motions, excessive gripping, pinching, and pressing with hand and fingers.
	Exposure to extreme temperatures	• Monitor for heat stress. Provide fluids and rest breaks during warm weather and while wearing impermeable protective clothing.
	Eye hazards	• Safety glasses are the minimum required eye protection for all work areas.
	Lack of communication in widely dispersed areas	• Ensure each work team has a telephone or a two-way radio or access to a telephone for communication. • If more than one team at a time is working, ensure there is communication between the work teams and project management. Workers must work in teams of two or more. Each team must use the "buddy" system.

ACTIVITY HAZARD ANALYSIS

Removal of Contaminated Soil at SWMU 109, FTA4
Cannon Air Force Base, New Mexico

SITE MOBILIZATION

Principal Steps	Potential Hazards	Recommended Controls
Set up work areas (Continued)	Struck by or against vehicles	• Wear high-visibility reflective vests at all times in work area. • Make eye contact with operators of vehicles. • Understand and review posted hand signals. Traffic barricades, signs, flags, and backup spotters will be used during field activities, as necessary.
	Power and hand tools	• Inspect all tools before each use. Discard or tag out any tool that is not safe, has broken handles, patched handles, missing guards, and so forth. • Personnel will be trained in the proper use of hand and power tools. • If power tools are connected to power sources other than batteries, the tools will be grounded or double insulated and connected to a GFCI outlet.
	Material handling	• Identify and avoid pinch points. • Maintain communication with others involved in material handling. • Use appropriate PPE.

Equipment to be Used	Inspection Requirements	Training Requirements
Vehicles, equipment, hand tools	Daily and before use	• Only DOT-licensed personnel will operate vehicles. • Specific training for power tools and hand tools will be provided.

dBA decibels, A-weighted scale
DOT Department of Transportation
GFCI ground fault circuit interrupter
MSDS Material Safety Data Sheet
PPE personal protective equipment
SHSO Site Health and Safety Officer
SSHP Site Safety and Health Plan

ACTIVITY HAZARD ANALYSIS

Removal of Contaminated Soil at SWMU 109, FTA4
Cannon Air Force Base, New Mexico

EXCAVATION, BACKFILL, AND HAULING

Principal Steps	Potential Hazards	Recommended Controls
Excavation	Contact with underground utilities	• Physically verify the location and depth of existing utilities prior to starting excavation through geophysical and utility survey. • Complete Cannon AFB Dig Permit prior to any disturbance of ground. • Protect all existing utilities during excavation. • Perform excavation within 4 ft of existing utilities by hand and/or non-aggressive methods. • Protect all underground utilities as soil is removed around or under the utility line.
	Struck by or against heavy equipment	• Wear reflective warning vests when exposed to vehicular traffic. • Avoid equipment swing areas. • Make eye contact with operators before approaching equipment. • Understand and review posted hand signals. • Workers must always be in visual sight of the operators. • Use trained spotters.
	Exposure to chemical contaminants or potential gases, such as natural gas from a leaking gas line	• Conduct air monitoring for contaminants as excavation activities proceed according to the SSHP. • If odors are detected, immediately check for the presence of potentially explosive gas concentrations. • Wear PPE as required.

ACTIVITY HAZARD ANALYSIS

Removal of Contaminated Soil at SWMU 109, FTA4
Cannon Air Force Base, New Mexico

EXCAVATION, BACKFILL, AND HAULING

Principal Steps	Potential Hazards	Recommended Controls
Excavation (Continued)	Excavation hazards	• Ensure proper shoring or sloping. • Spoil banks and equipment must be at least 3 ft away from the excavation. • Use diversion ditches, dikes, or other means to prevent surface water from entering an excavation and to provide good drainage of the area adjacent to the excavation. • Daily inspections of excavation, the adjacent areas and protective systems shall be made by the project assigned competent person. The excavation/trenching permit must also be completed by the competent person each day. • Maintain eye contact with operators. Personnel must wear visible vests. • Avoid climbing on berms and stockpiles. Cover all stockpiles. • Workers will not work under any equipment or loads. • Barricade all open excavations as required by the work plan. • Handle soil carefully to avoid dust generation.
	Failure to protect excavations as required by EM 385-1-1, Section 25 could cause injury to workers and local population	• Install barricade protection as required by EM 385-1-1, Section 25. • At a minimum, all excavations left open overnight will be fenced unless they are located in a secured fenced area where no persons other than workers have access. • Cover all open excavations with trench plate, if possible. Place barricades and signs as appropriate. • If excavations are located on roads that will be partially closed or off to the side of open roads, or are located in any area where vehicles may drive, the excavation will be barricaded as required by EM 385-1-1, Section 25 and reflectors and/or flashing lights will be placed so that excavation activity is marked during hours of darkness. Verify that flashing lights are working at night.

ACTIVITY HAZARD ANALYSIS

Removal of Contaminated Soil at SWMU 109, FTA4
Cannon Air Force Base, New Mexico

EXCAVATION, BACKFILL, AND HAULING

Principal Steps	Potential Hazards	Recommended Controls
Excavation (Continued)	Falling into trench	• If walkover ramps are used they must meet the requirements for fall protection: Standard guard rails, designed for the weight of personnel and equipment, fixed (staked) to ground at both ends, inspected daily. • For excavations that are over 4 ft in depth, ladders will be placed in the excavation to provide access and egress within 25 ft lateral (for example, one ladder placed in center of 50 ft lateral provides egress within 25 ft on either side). • Ladder must extend 3 ft above edge of excavation and must be placed at an angle that is ¼ of the height.
	Strains from use of tools, such as shovels	• Maintain steady pace when using tools and take adequate rest periods. • If possible, rotate tasks among the workers. • Use appropriate tools for the task and maintain tools in good condition.
	Heavy equipment hazards	• Equip all heavy equipment on this project with rollover protection systems and backup alarms. • Stay clear of moving equipment unless necessary. (If working near equipment workers must be in visual contact with the operator.) • Inspect all equipment daily before use to ensure proper maintenance is being performed. • Make eye contact with operator, heavy equipment has right-of-way.
Shoring, if used to protect employees, if employees must enter the excavation	Improper construction or installation leading to collapse of excavation wall	• Insure support system is installed according to specifications and is capable of supporting sidewall of excavation. • All support systems are to be inspected by a qualified engineer.
Backfilling	Struck by or against heavy equipment or trucks	• Wear reflective warning vests. • Avoid equipment swing areas. • Make eye contact with operators before approaching equipment or trucks. • Always use spotters when backing up. • Understand and review posted hand signals.

ACTIVITY HAZARD ANALYSIS

Removal of Contaminated Soil at SWMU 109, FTA4
Cannon Air Force Base, New Mexico

EXCAVATION, BACKFILL, AND HAULING

Principal Steps	Potential Hazards	Recommended Controls
Backfilling (Continued)	Damage to utilities	• Ensure that utilities are protected from the fill material as it is being placed. • Be sure fill materials had no rocks or objects that could damage the utilities. • Follow work plan for proper placement and compaction of backfill.
Hauling, material must be hauled from the excavation and backfill must be hauled to the excavation	Struck by or against heavy equipment or trucks	• Establish and follow a traffic control plan. • Wear reflective warning vests. • Avoid equipment swing areas, and designated traffic routes. • Make eye contact with operators before approaching equipment or trucks. • Understand and review posted hand signals. • Use spotters and flaggers as necessary to direct trucks as well as any nearby traffic.
	Loading trucks	• Prohibit truck drivers from standing near trucks as they are being loaded. • Prohibit truck drivers from sitting in the cab of trucks as they are being loaded, unless the truck is equipped with a cab protector (FOPS).
	Dirt and dust can accumulate on roads used for transport of material	• Brush off trucks before they enter a paved road. • Tarp truck or load truck in such a manner to prevent dirt and dust from getting on to paved roads.

Equipment to be Used	Inspection Requirements	Training Requirements
Heavy equipment, dump trucks	Daily and before use	Only trained equipment operators may operate heavy equipment; only DOT-licensed personnel will operate trucks.

AFB Air Force Base
DOT Department of Transportation
EM Engineer Manual
FOPS Falling Object Protective System
ft foot/feet
PPE personal protective equipment
SSHP Site Safety and Health Plan

ACTIVITY HAZARD ANALYSIS

Removal of Contaminated Soil at SWMU 109, FTA4
Cannon Air Force Base, New Mexico

DEMOBILIZATION

Principal Steps	Potential Hazards	Recommended Controls
Decontaminate equipment	Atmospheric and contact hazards	• Wear required PPE. • Use ambient air monitoring and visual monitoring to verify PPE selection.
	Slip, trip, and fall hazards	• Visually inspect work areas and slip, trip, and fall hazards will be marked, barricaded, or eliminated as feasible. • Maintain proper illumination in all work areas.
	Exposure to high temperatures	• Monitor for heat stress. • Maintain fluid intake and take breaks, as needed.
	Strains from manually moving materials and equipment	• Use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. • Use of lifting devices whenever possible. • Pre-employment back evaluations are recommended for craft workers who may be at greater risk of developing low back pain or low back injury. • Surveys shall be performed by qualified persons to identify and evaluate tasks that might result in injuries due to ergonomic hazards. The focus of the surveys will be operations that involve the manual lifting and moving of objects of excessive weight or asymmetric size. • Hand tools shall be selected to minimize the following stressors: chronic muscle contraction or steady force, extreme or awkward finger/hand/arm positions, repetitive forceful motions, excessive gripping, pinching, and pressing with hand and fingers. • Do not lift more than 50 pounds without help.
Demobilization and site restoration	Struck by or against heavy equipment	• Wear high visibility reflective vests when exposed to vehicle traffic. Make eye contact with operators before approaching equipment. • Understand and review posted hand signals. • Use traffic barricades, signs, flags, and backup spotters during demobilization.

ACTIVITY HAZARD ANALYSIS

Removal of Contaminated Soil at SWMU 109, FTA4
Cannon Air Force Base, New Mexico

DEMOBILIZATION

Principal Steps	Potential Hazards	Recommended Controls
Demobilization and site restoration (Continued)	Electrocution	• Allow only qualified electricians to disconnect electrical circuits. Follow lockout, tag-out protocols. • Inspect all extension cords daily for structural integrity, ground continuity, and damaged areas.
		• Document extension cord inspection. • Use GFCIs on all outdoor 115- to 120-volt, 20 ampere or less, circuits. • Cover or elevate electric wire or flexible cord passing through work area to protect it from damage by foot traffic, vehicles, sharp corners, projections, or pinching. • Keep plugs and receptacles out of water unless they are approved- submersible types. • Ground all electrical circuits in accordance with the National Electrical Code (NEC) or other applicable regulations or standards. • Temporary wiring is not allowed to pass through walls, doors, or windows (extension cords are one type of temporary wiring). • If a generator is used, be sure it is a type that does not require grounding. If it requires grounding, follow manufacturer's directions. NEC 250-6 lists the exceptions for grounding portable and vehicle mounted generators. • If electricity is used from nearby buildings- verify that it is acceptable to the base to use those sources. In all cases ensure that all connections meet NEC requirements. Ensure that voltage, amperage and circuit breakers are rated for the equipment to be used.
	Struck by or against heavy equipment	• Wear high visibility reflective vests when exposed to vehicle traffic. • Make eye contact with operators before approaching equipment. • Understand and review posted hand signals. • Use traffic barricades, signs, flags, and backup spotters during demobilization.

ACTIVITY HAZARD ANALYSIS

Removal of Contaminated Soil at SWMU 109, FTA4
Cannon Air Force Base, New Mexico

DEMOBILIZATION

Principal Steps	Potential Hazards	Recommended Controls
Demobilization and site restoration (Continued)	Material handling	• Identify and avoid pinch points. • Maintain communication with others involved in material handling. • Use appropriate PPE.
	Strains from manually moving materials and equipment	• Use proper lifting techniques such as keeping back straight, lifting with legs, limiting twisting, and getting help when moving bulky/heavy materials and equipment. • Use lifting devices whenever possible. • Pre-employment back evaluations are recommended for craft workers who may be at greater risk of developing low back pain or low back injury. • Surveys shall be performed by qualified persons to identify and evaluate tasks that might result in injuries due to ergonomic hazards. The focus of the surveys will be operations that involve the manual lifting and moving of objects of excessive weight or asymmetric size. • Hand tools shall be selected to minimize the following stressors: chronic muscle contraction or steady force, extreme or awkward finger/hand/arm positions, repetitive forceful motions, excessive gripping, pinching, and pressing with hand and fingers. • Do not lift more than 50 pounds without assistance.

Equipment to be Used	Inspection Requirements	Training Requirements
Heavy equipment, hand tools, power tools	Daily and before use	• Only trained equipment operators may operate heavy equipment; only DOT-licensed personnel will operate trucks. • Specific training for power tools, hand tools, and electrical safety.

DOT Department of Transportation
GFCI ground fault circuit interrupter
NEC National Electrical Code
PPE personal protective equipment

Attachment 2

Health and Safety Contact Summary Sheet

HEALTH AND SAFETY CONTACT SUMMARY SHEET

Foster Wheeler Environmental Corporation–Albuquerque Office
Telephone No.: (505) 878-8900
Address: 6605 Uptown Blvd., Suite 220, Albuquerque, NM 87110

CONTACT NAME/TELEPHONE NUMBERS

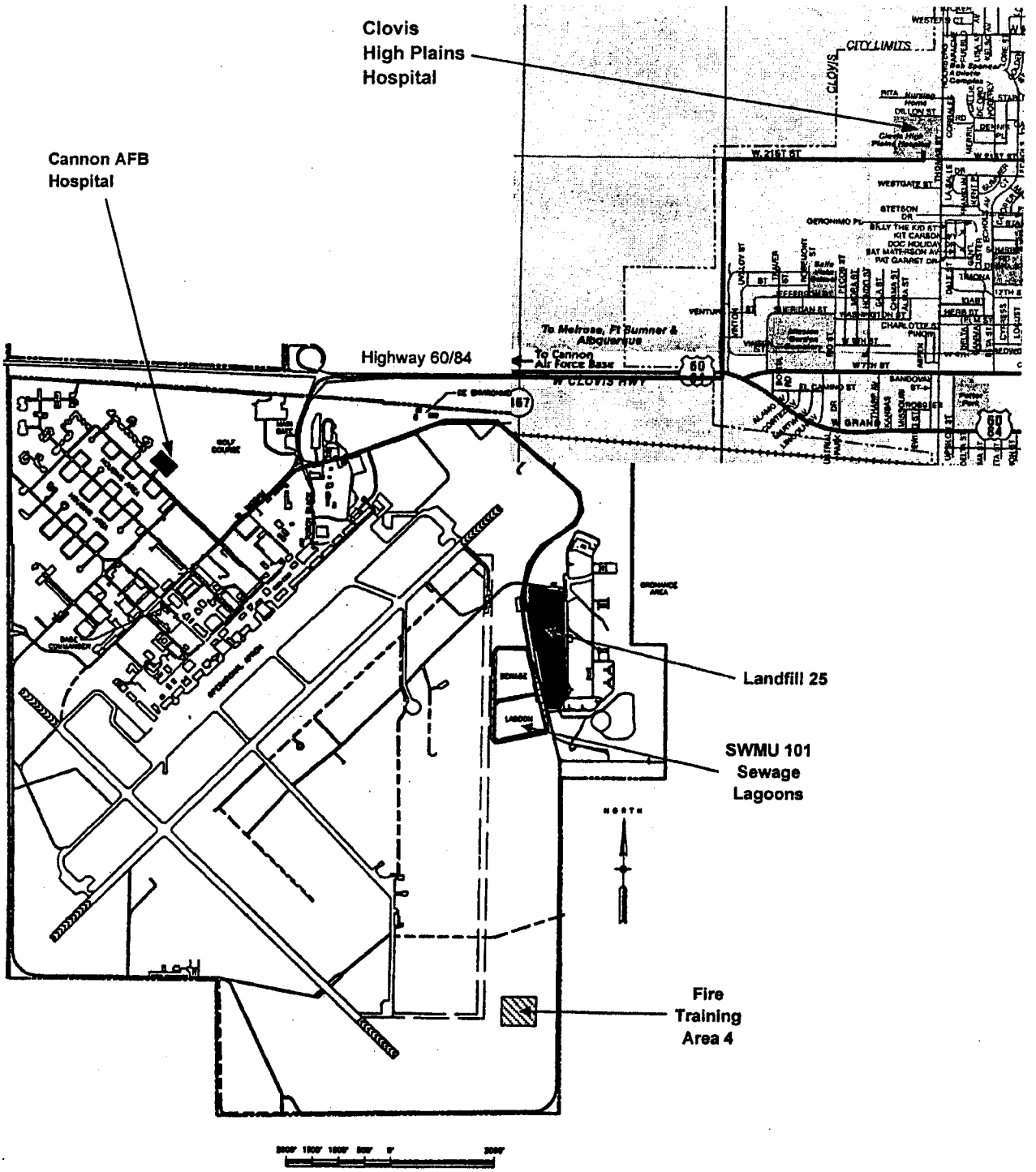
Name and Title	Telephone No.
Carol Bieniulis, Delivery Order Manager	(505) 878-8924 (505) 934-0879 Cell
Charley Haddox, Task Manager	(303) 980-3533
Sanford Hutsell, Base Point of Contact	(505) 784-6378
James Morning, Foster Wheeler Site Manager/EES	(505) 479-2668 (505) 430-2307 Cell

EMERGENCY TELEPHONE NUMBERS

Agency	Telephone No.
Ambulance (Base)	(505) 784-4033
Fire Department (Base)	(505) 784-2578
Base Hospital	(505) 432-6866
Poison Control	(800) 432-6866
EPA (information line)	(800) 424-9346
National Response Center	(800) 424-8802
Chemtrec	(800) 424-9300
Civilian Hospital (Clovis) Clovis High Plains Hospital	(505) 769-2141

Attachment 3

Route to Hospital



Scale in Feet is Approximate

SITE SPECIFIC HEALTH AND SAFETY PLAN ADDENDUM

Cannon Air Force Base, New Mexico

U.S. Army Corps of Engineers, Omaha District

Figure E-1

Hospital Route Map

Foster Wheeler Environmental Corporation

Attachment 4

Health and Safety Plan Acknowledgment

HEALTH AND SAFETY PLAN ACKNOWLEDGMENT

This form serves as documentation that field personnel have read, have been informed of, and understand the provisions of the Site-Specific Health and Safety Plan Addendum. In signing this form, each person will understand the following statement:

I have read, or have been informed of, the HASP. I understand the information presented and will comply with the provisions contained therein.

Name	Signature	Date

Attachment 5

Material Safety Data Sheets

Genium Publishing Corporation
One Genium Plaza
Schenectady, NY 12304-4690 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 467
Automotive Gasoline, Lead-free

Issued: 10/81 Revision: A, 9/91

Section 1. Material Identification

35

Automotive Gasoline, Lead-free, Description: A mixture of volatile hydrocarbons composed mainly of branched-chain paraffins, cycloparaffins, olefins, naphthenes, and aromatics. In general, gasoline is produced from petroleum, shale oil, Athabasca tar sands, and coal. Motor gasolines are made chiefly by cracking processes, which convert heavier petroleum fractions into more volatile fractions by thermal or catalytic decomposition. Widely used as fuel in internal combustion engines of the spark-ignited, reciprocating type. Automotive gasoline has an octane number of approximately 90. A high content of aromatic hydrocarbons and a consequent high toxicity are also associated with a high octane rating. Some gasolines sold in the US contain a minor proportion of tetraethyllead, which is added in concentrations not exceeding 3 ml per gallon to prevent engine "knock." However, methyl-tert-butyl ether (MTBE) has almost completely replaced tetraethyllead.

Other Designations: CAS No. 8006-61-9, benzin, gasoline, gasolene, motor spirits, natural gasoline, petrol.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(R) for a suppliers list.

R 1
I 2
S 2*
K 4
* Skin absorption

NFPA

HMIS
H 2
F 3
R 1
PPG†
† Sec. 8

Cautions: Inhalation of automotive gasoline vapors can cause intense burning in throat and lungs, central nervous system (CNS) depression, and possible fatal pulmonary edema. Gasoline is a dangerous fire and explosion hazard when exposed to heat and flames.

Section 2. Ingredients and Occupational Exposure Limits

Automotive gasoline, lead-free*

1990 OSHA PELs
8-hr TWA: 300 ppm, 900 mg/m³
15-min STEL: 500 ppm, 1500 mg/m³

1990-91 ACGIH TLVs
TWA: 300 ppm, 890 mg/m³
STEL: 500 ppm, 1480 mg/m³

1990 NIOSH REL
None established

1985-86 Toxicity Data*
Man, inhalation, TC_{Lo}: 900 ppm/1 hr; toxic effects include sense organs and special senses (conjunctiva irritation), behavioral (hallucinations, distorted perceptions), lungs, thorax, or respiration (cough)
Human, eye: 140 ppm/8 hr; toxic effects include mild irritation
Rat, inhalation, LC_{50}: 300 g/m³/5 min

* A typical modern gasoline composition is 80% paraffins, 14% aromatics, and 6% olefins. The mean benzene content is approximately 1%. Other additives include sulfur, phosphorus, and MTBE.
† See NIOSH, *RTECS* (LX3300000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: Initially, 102 °F (39 °C); after 10% distilled, 140 °F (60 °C); after 50% distilled, 230 °F (110 °C); after 90% distilled, 338 °F (170 °C); final boiling point, 399 °F (204 °C)
Vapor Density (air = 1): 3.0 to 4.0
Density/Specific Gravity: 0.72 to 0.76 at 60 °F (15.6 °C)
Water Solubility: Insoluble

Appearance and Odor: A clear (gasoline may be colored with dye), mobile liquid with a characteristic odor recognizable at about 10 ppm in air.

Section 4. Fire and Explosion Data

Flash Point: -45 °F (-43 °C)	Autoignition Temperature: 536 to 853 °F (280 to 456 °C)	LEL: 1.3% v/v	UEL: 6.0% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or alcohol foam as extinguishing media. Use of water may be ineffective to extinguish fire, but use water spray to knock down vapors and to cool fire-exposed drums and tanks to prevent pressure rupture. Do not use a solid stream of water since it may spread the fuel.

Unusual Fire or Explosion Hazards: Automobile gasoline is an OSHA Class IB flammable liquid and a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow to an ignition source and flash back. Automobile gasoline can also react violently with oxidizing agents.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode, and full protective clothing. When the fire is extinguished, use nonsparking tools for cleanup. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Automotive gasoline is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Automotive gasoline can react with oxidizing materials such as peroxides, nitric acid, and perchlorates.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of automotive gasoline can produce oxides of carbon and partially oxidized hydrocarbons.

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Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC list gasoline as a possible human carcinogen (Group 2B). Although the IARC has assigned an overall evaluation to gasoline, it has not assigned an overall evaluation to specific substances within this group (inadequate human evidence).
Summary of Risks: Gasoline vapors are considered moderately poisonous. Vapor inhalation can cause central nervous system (CNS) depression and mucous membrane and respiratory tract irritation. Brief inhalations of high concentrations can cause a fatal pulmonary edema. Reported responses to gasoline vapor concentrations are: 160 to 270 ppm causes eye and throat irritation in several hours; 500 to 900 ppm causes eye, nose, and throat irritation, and dizziness in 1 hr; and 2000 ppm produces mild anesthesia in 30 min. Higher concentrations are intoxicating in 4 to 10 minutes. If large areas of skin are exposed to gasoline, toxic amounts may be absorbed. Repeated or prolonged skin exposure causes dermatitis. Certain individuals may develop hypersensitivity. Ingestion can cause CNS depression. Pulmonary aspiration after ingestion can cause severe pneumonitis. In adults, ingestion of 20 to 50 g gasoline may produce severe symptoms of poisoning.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Skin, eye, respiratory and central nervous systems.
Primary Entry Routes: Inhalation, ingestion, skin contact.
Acute Effects: Acute inhalation produces intense nose, throat, and lung irritation; headaches; blurred vision; conjunctivitis; flushing of the face; mental confusion; staggering gait; slurred speech; and unconsciousness, sometimes with convulsions. Ingestion causes inebriation (drunkenness), vomiting, dizziness, fever, drowsiness, confusion, and cyanosis (a blue to dark purplish coloration of skin and mucous membrane caused by lack of oxygen). Aspiration causes choking, cough, shortness of breath, increased rate of respiration, excessively rapid heartbeat, fever, bronchitis, and pneumonitis. Other symptoms following acute exposure include acute hemorrhage of the pancreas, fatty degeneration of the liver and kidneys, and passive congestion of spleen.
Chronic Effects: Chronic inhalation results in appetite loss, nausea, weight loss, insomnia, and unusual sensitivity (hyperesthesia) of the distal extremities followed by motor weakness, muscular degeneration, and diminished tendon reflexes and coordination. Repeated skin exposure can cause blistering, drying, and lesions.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard. Give conscious victim a mixture of 2 tablespoons of activated charcoal mixed in 8 oz of water to drink. Consult a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Use nonsparking tools. Take up small spills with sand or other noncombustible adsorbent. Dike storage areas to control leaks and spills. Follow applicable OSHA regulations (29 CFR 1910.120).
Aquatic Toxicity: Bluegill, freshwater, LC_{50} 8 ppm/96 hr.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
RCRA Hazardous Waste (40 CFR 261.21): Characteristic of ignitability
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. There are no specific NIOSH recommendations. However, for vapor concentrations not immediately dangerous to life or health, use chemical cartridge respirator equipped with organic vapor cartridge(s), or a supplied-air respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Materials such as neoprene or polyvinyl alcohol provide excellent/good resistance for protective clothing. **Note:** Resistance of specific materials can vary from product to product.
Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in closed containers in a cool, dry, well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. Avoid direct sunlight. Storage must meet requirements of OSHA Class IB liquid. Outside or detached storage preferred.
Engineering Controls: Avoid vapor inhalation and skin or eye contact. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Indoor use of this material requires explosion-proof exhaust ventilation to remove vapors. Only use gasoline as a fuel source due to its volatility and flammable/explosive nature. Practice good personal hygiene and housekeeping procedures. Wear clean work clothing daily.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Gasoline (*including casing-head and natural*)
DOT Hazard Class: Flammable liquid
ID No.: UN1203
DOT Label: Flammable liquid
DOT Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Gasoline
IMO Hazard Class: 3.1
ID No.: UN1203
IMO Label: Flammable liquid
IMDG Packaging Group: II

MSDS Collection **References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 138, 140, 143, 146, 153, 159
Prepared by: M Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** JR Stuart, MS

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Material Safety Data Sheet

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No. 359
ETHYLENE DICHLORIDE
(Formerly 1,2-Dichloroethane)
(Revision C)
Issued: November 1978
Revised: August 1987

SECTION 1. MATERIAL IDENTIFICATION

CHEMICAL NAME: ETHYLENE DICHLORIDE (Changed to reflect common industrial practice)

DESCRIPTION (Origin/Uses): Made from acetylene and HCl. Used as a degreaser, a scavenger in leaded gasoline, as an intermediate in the manufacture of vinyl chloride, in paint removers, in wetting and penetration agents, in ore flotation processes, as a fumigant, and as a solvent for fats, oils, waxes, and gums.

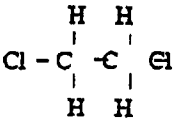
OTHER DESIGNATIONS: 1,2-Dichloroethane; *sym*-Dichloroethane; Dutch Liquid; Dutch Oil; EDC; Ethane Dichloride; Ethylene Chloride; 1,2-Ethylene Dichloride; Glycol Dichloride; $C_2H_4Cl_2$; NIOSH *RTECS* KI0525000; CAS #0107-06-2

MANUFACTURERS/SUPPLIERS: Available from several suppliers, including: Dow Chemical USA, 2020 Dow Center, Midland, MI 48640; Telephone: (517) 636-1000

COMMENTS: Ethylene dichloride is a flammable, toxic liquid.

HMIS			
H	1		
F	3	R	1
R	0	I	4
PPE*		S	2
* See Sect. 8		K	4

SECTION 2. INGREDIENTS AND HAZARDS

SECTION 2. INGREDIENTS AND HAZARDS	%	HAZARD DATA
	100	ACGIH Values 1987-88 TLV-TWA: 10 ppm, 40 mg/m³ OSHA PEL* 1986-87 8-Hr TWA: 50 ppm; Ceiling: 100 ppm (15 Min.) NIOSH REL 1986-87 10-Hr TWA: 1 ppm Ceiling: 2 ppm (15 Min.) Toxicity Data Man, Inhalation, TC_{Lo}: 4000 ppm/1 Hr Human, Oral, TD_{Lo}: 428 mg/kg Man, Oral, TD_{Lo}: 892 mg/kg Man, Oral, LD_{Lo}: 714 mg/kg Rat, Oral, LD_{50}: 670 mg/kg

*The maximum allowable peak concentration (above the ceiling level value) of ethylene dichloride is 200 ppm for 5 minutes in any 3-hour period.

COMMENTS: Additional data concerning toxic doses and tumorigenic, reproductive, and mutagenic effects is listed (with references) in the NIOSH *RTECS* 1983-84 supplement, pages 865-66.

SECTION 3. PHYSICAL DATA

Boiling Point ... 182.3°F (83.5°C)
Vapor Pressure ... 87 Torr at 77°F (25°C)
Water Solubility ... Soluble in about 120 Parts Water
Vapor Density (Air = 1) ... 3.4
Evaporation Rate (n-BuAc = 1) ... Not Listed
Specific Gravity ... 1.2569 at 69°F (20°C)
Freezing Point ... -31.9°F (-35.5°C)
Molecular Weight ... 98.96 Grams/Mole

Appearance and odor: Colorless, clear liquid. Sweet, chloroformlike odor is typical of chlorinated hydrocarbons. The recognition threshold (100% of test panel) for ethylene dichloride is 40 ppm. Odor detection probably indicates an excessive exposure to vapor. High volatility and flammability, coupled with its toxicity and carcinogenic potential, make this material a major health hazard.

COMMENTS: Ethylene dichloride is miscible with alcohol, chloroform, and ether.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
See Below	775°F (413°C)	% by Volume	6.2	15.9

EXTINGUISHING MEDIA: Use chemical, carbon dioxide, alcohol foam, water spray/fog, or dry sand to light fires involving ethylene dichloride. Direct water sprays may be ineffective extinguishing agents, but they may be successfully used to cool fire-exposed containers. Use a smothering effect to extinguish fires involving this material. UNUSUAL FIRE/EXPLOSION HAZARDS: Ethylene dichloride is a dangerous fire and explosion hazard when exposed to sources of ignition such as heat, open flames, sparks, etc. Its vapors are heavier than air and can flow along surfaces to distant, low-lying sources of ignition and flash back. If it is safe to do so, remove this material from the fire area. Ethylene dichloride burns with a smoky flame.

SPECIAL FIRE-FIGHTING PROCEDURES: Wear a self-contained breathing apparatus with a full facepiece operated in a pressure-demand or another positive-pressure mode.

COMMENTS: Flash Point and Method: 56°F (13°C) CC; 65°F (18°C) OC.

OSHA Flammability Class (29 CFR 1910.106): IB. DOT Flammability Class (49 CFR 173.115): Flammable Liquid

SECTION 5. REACTIVITY DATA

Ethylene dichloride is stable. Hazardous polymerization cannot occur.

CHEMICAL INCOMPATIBILITIES include strong oxidizing agents. Explosions have occurred with mixtures of this material and liquid ammonia or dimethylaminopropylamine. Finely divided aluminum or magnesium metal may be hazardous in contact with ethylene dichloride.

CONDITIONS TO AVOID: Eliminate sources of ignition such as excessive heat, open flames, or electrical sparks, particularly in low-lying areas, because the explosive, heavier-than-air vapors will concentrate there.

PRODUCTS OF HAZARDOUS DECOMPOSITION can include vinyl chloride, chloride fumes, and phosgene. Phosgene is an extremely poisonous gas. Products of thermal-oxidative degradation (i.e., fire conditions) must be treated with appropriate caution.

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SECTION 6. HEALTH HAZARD INFORMATION

Ethylene dichloride is listed as an anticipated human carcinogen by the NTP and as a probable human carcinogen (Group 2B), by the IARC. It was found to be an animal-positive carcinogen by the IARC. NCI reported positive results (mouse, rat) from its carcinogenesis bioassay. SUMMARY OF RISKS: Ethylene dichloride is considered to be one of the more toxic of the common chlorinated hydrocarbons. Deaths from accidental ingestion of this material have been reported. Inhalation of vapors reportedly caused three fatalities. Excessive inhalation of ethylene dichloride vapors can cause respiratory irritation, intoxication, narcotic and anesthetic effects, vomiting, dizziness, depression, and diarrhea. The hepatoxic (injurious to liver) effects of this material are significant. The systemic effects from overexposure can appear in the liver, kidneys, digestive tract, blood, lungs, adrenal glands, and the central nervous system. Tests on animals have revealed reproductive failure and fetal resorption. There may be increased risk to nursing infants of exposed mothers. TARGET ORGANS: Central nervous system, eyes, kidneys, liver, heart, adrenal glands, and skin. PRIMARY ENTRY: Inhalation, absorption through skin, oral, or eye contact. ACUTE EFFECTS: Skin contact causes irritation, defatting, and, if repeated or prolonged, burning. Eye contact causes irritation and serious injury (clouding of the cornea) if it is not removed promptly. CHRONIC EFFECTS: Injuries to the liver (hepatoxicity) and kidneys, weight loss, low blood pressure, jaundice, oliguria (reduced excretion of urine), or anemia. MEDICAL CONDITIONS AGGRAVATED BY LONG-TERM EXPOSURE: Persons taking anticoagulants could experience an increase in tendency to bleed. Persons taking insulin face an increased risk of lowered blood sugar. FIRST AID: Be prepared to restrain a hyperactive victim. EYE CONTACT: Flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. Get medical help.* SKIN CONTACT: Immediately flush the affected area with water. Wash thoroughly with soap and water. Remove and launder contaminated clothing before wearing it again; clean material from shoes and equipment. Get medical help.* INHALATION: Remove victim to fresh air; restore and/or support his breathing as needed. Get medical help.* INGESTION: Never give anything by mouth to someone who is unconscious or convulsing. Rinse victim's mouth with water. Oxygen and artificial respiration may be needed. Get medical help.*

* GET MEDICAL ASSISTANCE = IN PLANT, PARAMEDIC, COMMUNITY. Get prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: Before using ethylene dichloride, it is essential that proper emergency procedures be established and made known to all personnel involved in handling it. Notify safety personnel of ethylene dichloride spills or leaks and implement containment procedures. Remove and eliminate all possible sources of ignition such as heat, sparks, and open flames from the area. Cleanup personnel should use protection against inhalation of vapors and contact with liquid. Contain spills by using an absorbent material such as dry sand or vermiculite. Use nonsparking tools to mix waste material thoroughly with absorbent and place it in an appropriate container for disposal. Flush trace residues with large amounts of water. Do not flush waste to sewers or open waterways.
WASTE DISPOSAL: Consider reclamation, recycling, or destruction rather than disposal in a landfill. Waste may be burned in an approved incinerator equipped with an afterburner and a scrubber. Follow Federal, state, and local regulations.
Ethylene dichloride is designated as a hazardous substance by the EPA (40 CFR 116.4). Ethylene dichloride is reported in the 1983 EPA TSCA Inventory.
EPA Hazardous Waste Number (40 CFR 261.33): U077
EPA Reportable Quantity (40 CFR 117.3): 5000 lbs (2270 kgs)
Aquatic Toxicity Rating, TLm 96: 1000 - 100 ppm

SECTION 8. SPECIAL PROTECTION INFORMATION

GOGGLES: Always wear protective eyeglasses or chemical safety goggles. Ethylene dichloride is particularly harmful to the eyes, and direct contact results in corneal opacity (permanent clouding of the eye). GLOVES: Wear impervious rubber gloves to prevent skin contact. RESPIRATOR: Use a NIOSH-approved respirator per the NIOSH *Pocket Guide to Chemical Hazards* (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow the respirator guidelines in 29 CFR 1910.134. Any detectable concentration of ethylene dichloride requires an SCBA, full facepiece, and pressure-demand/positive-pressure modes. Warning: Air-purifying respirators will not protect workers from oxygen-deficient atmospheres. OTHER: Wear rubber boots, aprons, and other protective clothing suitable for use conditions to prevent skin contact. Remove contaminated clothing and launder it before wearing it again. Discard contaminated shoes. VENTILATION: Provide maximum explosion-proof local fume exhaust ventilation systems to maintain the airborne concentrations of ethylene dichloride vapors below the exposure limits cited in section 2. Install properly designed hoods that maintain a minimum face velocity of 100 lfm (linear feet per minute). SAFETY STATIONS: Make eyewash stations, washing facilities, and safety showers available in areas of use and handling.
SPECIAL CONSIDERATIONS: Vapors are heavier than air and will collect in low-lying areas. Eliminate sources of ignition in these areas and again provide good ventilation there.
COMMENTS: Practice good personal hygiene. Keep materials off of your clothes and equipment. Avoid transferring this material from hands to mouth while eating, drinking, or smoking. Immediately remove ethylene dichloride-saturated clothing to avoid flammability and health hazards. Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Store ethylene dichloride in tightly closed containers in a cool, dry, well-ventilated area away from sources of ignition. Protect containers from physical damage and from exposure to excessive heat. Avoid direct physical contact with strong acids, bases, oxidizing agents, and reducing agents. SPECIAL HANDLING/STORAGE: Use nonsparking tools. Outside or detached storage is preferred. Store and handle ethylene dichloride in accordance with the regulations concerning OSHA class IB flammable liquids.
ENGINEERING CONTROLS: During transfer operations involving ethylene dichloride, the liquid and its vapors must not be exposed to nearby sources of ignition from engineering systems that are not explosion proof. Preplan emergency response procedures.
TRANSPORTATION DATA (per 49 CFR 172.101-2):

DOT Hazard Class: Flammable Liquid
DOT Label: Flammable Liquid
IMO Class: 3.2

DOT Shipping Name: Ethylene Dichloride
DOT ID No. UN 1184
IMO Label: Flammable Liquid, Poison

References: 1-9, 12, 19, 21, 26, 43, 47, 73, 87-102. CK

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Appendix B
Analytical Quality Control Requirements

NEW MEXICO ENVIRONMENT DEPARTMENT TPH SCREENING GUIDELINES
November 2005

In some instances, it may be practical to assess areas of soil contamination that are the result of releases of petroleum products such as jet fuel and diesel, using total petroleum hydrocarbon (TPH) analyses. TPH results may be used to delineate the extent of petroleum-related contamination at these sites and ascertain if the residual level of petroleum products in soil represents an unacceptable risk to future users of the site. Petroleum hydrocarbons represent complex mixtures of compounds, some of which are regulated constituents and some compounds that are not regulated. In addition, the amount and types of the constituent compounds in a petroleum hydrocarbon release differ widely depending on what type of product was spilled and how the spill has weathered. This variability makes it difficult to determine the toxicity of weathered petroleum products in soil solely from TPH results; however, these results can be used to approximate risk in some cases, depending upon the nature of the petroleum product, the release scenario, how well the site has been characterized, and anticipated potential future land uses. In some cases, site clean up cannot be based solely on results of TPH sampling. The New Mexico Environment Department (NMED) will make these determinations on a case by case basis. If NMED determines that additional data are necessary, these TPH guidelines must be used in conjunction with the screening guidelines for individual petroleum-related contaminants in Table 3 and other contaminants, as applicable.

The screening levels for each petroleum carbon range from the Massachusetts Department of Environmental Protection (MADEP) Volatile Petroleum Hydrocarbons/Extractable Petroleum Hydrocarbons (VPH/EPH) approach and the percent composition table below were used to generate screening levels corresponding to total TPH. Except for waste oil, the information in the compositional assumptions table was obtained from the Massachusetts Department of Environmental Protection guidance document *Implementation of the MADEP VPH/EPH Approach* (October 31, 2002). TPH toxicity was based only on the weighted sum of the toxicity of the hydrocarbon fractions listed in Table 1.

Table 1. TPH Compositional Assumptions in Soil

Petroleum Product	C11-C22 Aromatics	C9-C18 Aliphatics	C19-C36 Aliphatics
Diesel #2/ new crankcase oil	60%	40%	0%
#3 and #6 Fuel Oil	70%	30%	0%
Kerosene and jet fuel	30%	70%	0%
Mineral oil dielectric fluid	20%	40%	40%
Unknown oil[a]	100%	0%	0%
Waste Oil[b]	0%	0%	100%

[a] Sites with oil from unknown sources must be tested for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and polychlorinated biphenyls (PCBs) to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

[b] Compositional assumption for waste oil developed by NMED is based on review of chromatographs of several types of waste oil. Sites with waste oil must be tested for VOCs, SVOCs, metals, and PCBs to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

A TPH screening guideline was calculated for each of the types of petroleum product based on the assumed composition from Table 1 for petroleum products and the direct soil standards incorporating ceiling concentrations given in the MADEP VPH/EPH Excel spreadsheet for each of the carbon fractions. Groundwater concentrations are based on the weighted sum of the noncarcinogenic toxicity of the petroleum fractions.

Method 1 from the MADEP VPH/EPH document was applied, which represents generic cleanup standards for soil and groundwater. Method 1 applies if contamination exists in only soil and groundwater. The MADEP VPH/EPH further divides groundwater into standards. Standard GW-1 applies when groundwater may be used for drinking water purposes. GW-1 standards are based upon ingestion and use of groundwater as a potable water supply. The TPH screening guidelines for sites with potable groundwater are presented in Table 2a.

Table 2a. TPH Screening Guidelines for Potable Groundwater (GW-1)

TPH			Concentration in Groundwater (mg/L)
Petroleum Product	**Residential Direct Exposure (mg/kg)**	**Industrial Direct Exposure (mg/kg)**	
Diesel #2/crankcase oil	520	1120	1.72
#3 and #6 Fuel Oil	440	890	1.34
Kerosene and jet fuel	760	1810	2.86
Mineral oil dielectric fluid	1440	3040	3.64
Unknown oil[a]	200	200	0.2
Waste Oil[b]	2500	5000	Petroleum-Related Contaminants
Gasoline	Not applicable	Not applicable	Petroleum-Related Contaminants

[a] Sites with oil from unknown sources must be tested for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and polychlorinated biphenyls (PCBs) to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

[b] Compositional assumption for waste oil developed by NMED is based on review of chromatographs of several types of waste oil. Sites with waste oil must be tested for VOCs, SVOCs, metals, and PCBs to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

The second standard is GW-2, which is applicable for sites where the depth to groundwater is less than 15 feet from the ground surface <u>and</u> within 30 feet of an occupied structure. The structure may be either residential or industrial. GW-2 standards are based upon "inhalation exposures that could occur to occupants of the building impacted by volatile compounds, which partition from the groundwater" (MADEP 2001). The GW-2 screening guidelines ONLY apply for the evaluation of inhalation exposures. If potential ingestion or contact with contaminated soil and/or

groundwater could occur, then the screening guidelines provided in Table 2.a should be applied. Table 2.b lists the TPH screening guidelines for the inhalation scenario.

Table 2b. TPH Screening Guidelines – Vapor Migration and Inhalation of Groundwater (GW-2)

TPH			Concentration in Groundwater (mg/L)
Petroleum Product	**Residential Direct Exposure (mg/kg)**	**Industrial Direct Exposure (mg/kg)**	
Diesel #2/crankcase oil	880	2200	30.4
#3 and #6 Fuel Oil	860	2150	35.3
Kerosene and jet fuel	940	2350	15.7
Mineral oil dielectric fluid	1560	3400	10.4
Unknown oil[a]	800	2000	50.0
Waste Oil[b]	2500	5000	Petroleum-Related Contaminants
Gasoline	Not applicable	Not applicable	Petroleum-Related Contaminants

[a] Sites with oil from unknown sources must be tested for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, and polychlorinated biphenyls (PCBs) to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

[b] Compositional assumption for waste oil developed by NMED is based on review of chromatographs of several types of waste oil. Sites with waste oil must be tested for VOCs, SVOCs, metals, and PCBs to determine if other potentially toxic constituents are present. The TPH guidelines in Table 2 are not designed to be protective of exposure to these constituents therefore they must be tested for, and compared to, their individual NMED soil screening guidelines.

Mineral oil based hydraulic fluids can be evaluated for petroleum fraction toxicity using the screening guidelines from Tables 2a and 2b specified for waste oil, because this type of hydraulic fluid is composed of approximately the same range of carbon fractions as waste oil. However, these hydraulic fluids often contain proprietary additives that may be significantly more toxic than the oil itself; these additives must be considered on a site- and product-specific basis (see ATSDR hydraulic fluids profile reference). **Use of alternate screening guideline values requires prior written approval from the New Mexico Environment Department.** TPH screening guidelines in Tables 2a and 2b must be used in conjunction with the screening levels for petroleum-related contaminants given in Table 3 because the TPH screening levels are NOT designed to be protective of exposure to these individual petroleum-related contaminants. Table 3 petroleum-related contaminants screening levels are based on the New Mexico Environment Department soil screening levels (SSLs) released in February 2004.

The list of petroleum-related contaminants does not include polyaromatic hydrocarbons (PAHs) with individual screening levels that would exceed the total TPH screening levels (acenaphthene, anthracene, flouranthene, flourene, and pyrene). In addition, these TPH screening guidelines are based solely on human health, not ecological risk considerations, protection of surface water, or

potential indoor air impacts from soil vapors. Potential soil vapor impacts to structures or utilities are not addressed by these guidelines. Site-specific investigations for potential soil vapor impacts to structures or utilities must be done to assure that screenings are consistently protective of human health, welfare or use of the property. NMED believes that use of these screening guidelines will allow more efficient screenings of petroleum release sites at sites while protecting human health and the environment. Copies of the references cited below are available on the MADEP website at http://www.state.ma.us/dep/bwsc/vph_eph.htm and the NMED website at http://www.nmenv.state.nm.us/HWB/guidance.html.

Table 3. Petroleum-Related Contaminants Screening Guidelines

Petroleum-Related Contaminants	Values for Direct Exposure to Soil		NMED DAF[a] 20 GW protection (mg/kg in soil)	NMED DAF[b] 1 GW protection (mg/kg in soil)
	NMED residential SSL (mg/kg)	NMED Industrial SSL (mg/kg)		
Benzene	2.70E+01	7.36E+01	2.83E-02	1.41E-03
Toluene	2.48E+02	2.48E+02	6.80E+00	3.40E-01
Ethyl benzene	1.06E+04	2.54E+04	1.05E+01	5.25E-01
Xylene[c]	1.32E+02	1.32E+02	1.01E+01	5.07E-01
Naphthalene	7.19E+01	9.83E+01	3.93E-01	1.97E-02
2-methyl naphthalene	1.00E+03[d]	2.50E+03[d]	---[d]	---[d]
Benzo(a)anthracene	6.21E+00	2.34E+01	1.10E+00	5.49E-02
Benzo(b)fluoranthene	6.21E+00	2.34E+01	3.40E+00	1.7E-01
Benzo(k)fluoranthene	6.21E+01	2.34E+02	3.40E+01	1.70E+00
Benzo(a)pyrene	6.21E-01	2.34E+00	6.12E+00	3.06E-01
Chrysene	6.21E+02	2.34E+03	1.10E+02	5.49E+00
Dibenz(a,h) anthracene	6.21E-01	2.34E+00	1.05E+00	5.24E-02
Indeno(1,2,3-c,d) pyrene	6.21E+00	2.34E+01	9.58E+00	4.79E-01

[a] DAF – Dilution Attenuation Factor
[b] For contaminated soil in contact with groundwater
[c] Based upon total xylenes
[d] No NMED value available, value taken from MADEP 2002

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1997. Toxicological Profile for Hydraulic fluids.

Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup and Office of Research and Standards. 1994. "Background Documentation for the Development of the MCP Numerical Standards."

Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup and Office of Research and Standards. 2002. "Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of the MADEP VPH/EPH Approach," Policy, October 31, 2002.

Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup and Office of Research and Standards. 2003. "Updated Petroleum Hydrocarbon Fraction Toxicity Values for the VPH/EPH/APH Methodology." November 2003.

New Mexico Environment Department, Hazardous Waste Bureau and Groundwater Quality Bureau Voluntary Remediation Program. 2004. "Technical Background Document for Development of Soil Screening Levels." February 2004. Revision 2.0.

EPA HW #	CONSTITUENT	REGULATORY mg/L
D004	Arsenic	5.0
D005	Barium	100.0
D018	Benzene	0.5
D005	Cadmium	1.0
D019	Carbon Tetrachloride	0.5
D020	Chlordane	0.03
D021	Chlorobenzene	100.0
D022	Chloroform	6.0
D007	Chromium	5.0
D026	Cresol	200.0 [2]
D023	o-Cresol	200.0 [2]
D024	m-Cresol	200.0 [2]
D025	p-Cresol	200.0 [2]
D016	2,4-D	10.0
D027	1,4-Dichlorobenzene	7.5
D028	1,2-Dichloroethane	0.5
D029	1,1-Dichloroethene	0.7
D030	2,4-Dinitrotoluene	0.1
D012	Endrin	0.02
D031	Heptachlor (and its epoxide)	0.008
D032	Hexachlorobenzene	0.1 [3]
D033	Hexachloro-1,3-butadiene	0.5
D034	Hexachlorothane	3.0
D008	Lead	5.0
D013	Lindane	0.4
D009	Mercury	0.2
D014	Methoxychlor	10.0
D035	Methyl Ethyl Ketone	200.0
D036	Nitrobenzene	2.0
D037	Pentachlorophenol	100.0
D038	Pyridine	5.0
D010	Selenium	1.0
D011	Silver	5.0
D039	Tetrachloroethene	0.7
D015	Toxaphene	0.5
D040	Trichloroethene	0.5
D041	2,3,5-Trichlorophenol	400.0
D042	2,4,6-Trichlorophenol	2.0
D017	2,4,5-TP	1.0
d043	Vinyl Chloride	0.2

[2] - If o, m, p-Cresol concentrations cannont be differentiated, the total Cresol concentration is used. Total Cresol regulatory level: 200 mg/L

[3] - If quanitation limit is greater than the calculated regulatory level, quanitation limit becomes regulatory limit.