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27TH CIVIL ENGINEER SQUADRON (ACC)
CANNON AIR FORCE BASE NEW MEXICO

MAY 05 2005

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Mr. David Cobrain
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Dear Mr. Cobrain

Enclosed for your review and records are two copies of the Work Plan Phase I Investigation Soil Corrective Measures Fire Training Area 04, Cannon Air Force Base, New Mexico, dated Nov 04 and two copies of the Final Work Plan Addendum for the removal of Contaminated Soil at SWMU 109 (Fire Training Area 04) Cannon Air Force Base, New Mexico, dated Mar 05. Fire Training Area 04 consists of Solid Waste Management Units 109, 110, 111, and 112.

The purpose of this work plan and addendum was to articulate the removal and disposal of contaminated soils at Fire Training Area 04.

If you have any questions regarding this information, please contact Mrs. Sheila Newman, Environmental Flight, at (505) 784-6391 or email sheila.newman@cannon.af.mil.

Sincerely

ALEXANDER P. KARIBIAN, Lt Col, USAF

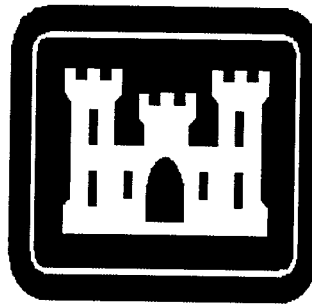
Attachments:

Work Plan Phase 1 Investigation Soil Corrective Measures Fire Training Area 04, Cannon AFB New Mexico (2 cys)

Final Work Plan Addendum for the removal of Contaminated Soil at SWMU 109 (Fire Training Area No. 04) Cannon AFB, New Mexico (2 cys)

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**WORK PLAN
PHASE I INVESTIGATION
SOIL CORRECTIVE MEASURES
FIRE TRAINING AREA 04
CANNON AIR FORCE BASE, NEW MEXICO**



November 3, 2004

Prepared for

**UNITED STATES ARMY CORPS OF ENGINEERS
OMAHA DISTRICT
106 South 15th Street
Omaha, Nebraska 68102-1618**

Contract No. DACA45-00-D-0006/0006

Project No. 2002189

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ABBREVIATIONS AND ACRONYMS

AFB	Air Force Base
BTEX	benzene, toluene, ethylbenzene, and xylenes
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CEV	Base Environmental Flight
CMS	Corrective Measures Study
DPT	direct-push technology
DQCR	Daily Quality Control Report
DRO	diesel-range organics
ft	foot
FTA4	Fire Training Area 04
GPS	Global Positioning System
IDW	investigative-derived waste
JP-4	Jet Propellant 4
LF-5	Landfill 5
mg/kg	milligram per kilogram
MS/MSD	matrix spike/matrix spike duplicate
NMED	New Mexico Environment Department
PID	photoionization detector
PM	Project Manager
PPE	personal protective equipment
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SSHO	Site Safety and Health Officer
SSHP	Site Safety and Health Plan
SOP	Standard Operating Procedures
SVE	soil-vapor extraction
SWMU	Solid Waste Management Unit
TCE	trichloroethene
TN&A	T N & Associates, Inc.
TPH	total petroleum hydrocarbons
TtFW	Tetra Tech Foster Wheeler, Inc.
USACE	United States Army Corps of Engineers
U.S. EPA	United States Environmental Protection Agency
WWTP	wastewater treatment plant

1.0 INTRODUCTION

T N & Associates, Inc. (TN&A) has prepared this Work Plan for the United States Army Corps of Engineers – Omaha District (USACE) under Contract Number DACA45-00-D-0006, Delivery Order 0006. The purpose of this Work Plan is to describe the work that will be performed to confirm petroleum hydrocarbon contaminated soils at the former Fire Training Area 04 (FTA4) at Cannon Air Force Base (AFB) in Clovis, New Mexico. FTA4 consists of Solid Waste Management Units (SWMUs) 109, 110, 111, and 112. SWMU 109 is the primary focus of this Work Plan, as it is the area which was impacted by the most by previous activities at FTA4.

The *Technical Memorandum, Evaluation of Total Petroleum Hydrocarbons in Soil at Fire Training Area 4, Cannon AFB, New Mexico*, dated May 21, 2004, prepared by Tetra Tech Foster Wheeler, Inc. (TiFW) presents the background information and rationale for the sampling to confirm the concentration of total petroleum hydrocarbons (TPH) in soil at FTA4. The *Technical Memorandum* is included as Appendix A of this Work Plan.

This Work Plan presents the project purpose and objectives, background information, and a description of the work to be performed under this delivery order. This Work Plan includes a Sampling and Analysis Plan (SAP) that integrates a Quality Assurance Project Plan (QAPP) for the acquisition of chemical and field data. The SAP is provided as Appendix B. Standard Operating Practices (SOPs) to be followed during the execution of the field effort are included in Appendix C. The Site Safety and Health Plan (SSHP) is provided as Appendix D.

This Work Plan is required reading for all staff participating in the work effort and will be in the possession of the field team executing the work described within. All TN&A staff and subcontractors will be required to comply with the procedures and standards document in the Work Plan to maintain comparability and representativeness of the collected and generated data.

2.0 SITE DESCRIPTION

2.1 Site Background

Cannon AFB is an active U. S. Department of Defense installation located in southeastern Curry County, New Mexico, approximately 5 miles west of Clovis and south of U.S. Highway 60/84 (Figure 1). The installation has been used by the Department of Defense for more than 50 years. The Base started as a training base for B-17 crews during World War II.

As stated above, FTA4 consists of SWMUs 109, 110, 111, and 112. SWMU 109 was used as a fuel truck cleaning area between 1961 and 1974. An estimated 3,000 to 4,000 gallons of fuel percolated into the ground as a result of these activities [Walk, Haydel, and Associates, Inc.

(Walk, Haydel, and Associates), 1990]. In 1974, the SWMU 109 site was activated as a fire training area. Commingled waste oils, solvents, and recovered Jet Propellant 4 (JP-4) were burned during fire training exercises conducted from 1974 to 1975. An underground storage tank (SWMU 110) was installed in 1975. Only recovered JP-4 was used as fuel for fire training exercises from 1975 to 1995. After that, SWMU 109 was no longer used as a fire training area [Harza Environmental Services (Harza), 1997].

SWMU 109 contained a 40 foot by 70 foot rebar-reinforced concrete-lined pit with a 4-foot tall berm that was removed in December 2000. The pit was filled with gravel and included internal drainage features that conveyed excess fuel and water to the oil/water separator (SWMU 112) located in the northeastern part of the site. These drainage features included an underground pipe running from pit to the oil/water separator. The separator was removed in 1997; however, the underground pipe is still in place. A mock airplane was formerly located in the center of the pit. Details of pit construction were confirmed using as-built drawings provided by Cannon AFB. The concrete pit was reportedly saturated with water during some fire training exercises. An above-ground fuel tank supplied fuel to the burn pit via an underground pipeline. The above-ground tank is presently empty and remains on site.

As part of the fire training system SWMU 111 (an unlined pit) was used to collect runoff from SWMU 109 after the fires were extinguished. The pit was backfilled in 1985 when the oil/water separator was installed at SWMU 112. One soil sample collected in the vicinity of SWMU 111 (SB14 on Figure 2) identified TPH at 1,040 mg/kg at a depth of 1 foot.

2.2 Physical Conditions

2.2.1 Soils and Geology

Soils underlying FTA4 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 Unified Soil Classification System (Harza, 1977).

FTA4 is underlain by Ogallala Formation fluvial deposits consisting primarily of unconsolidated silty sand to clayey sand. These deposits include sporadic caliche layers and more extensive zones containing caliche-cemented nodules (Harza, 1997). The total thickness of the Ogallala Formation beneath the site is not known, as bedrock was not encountered during previous field investigation activities, which were conducted to depths of 90 ft. Based on available regional information, the Ogallala Formation may be as thick as 390 ft at Cannon AFB.

2.2.2 Groundwater

No groundwater was encountered during previous investigations of FTA4 at the maximum drilled depth of 90 ft. Groundwater occurs at depths ranging from 290 to 300 ft at nearby Landfill 5 (LF-04). Occupants of the area surrounding the Base rely primarily on groundwater for irrigation. The nearest downgradient water well is ¼ mile from FTA4.

Groundwater monitoring is conducted annually at several sites on the Base, including LF-05, which is downgradient of FTA4. During sampling conducted in March 2000, wells were monitored for volatile organic compounds, polychlorinated biphenyls, pesticides, and metals. Analytes detected in the downgradient wells included trichloroethene (TCE), chloroform, and metals. Metals were detected at concentrations that were consistent with background levels in the area (U.S. Geological Survey, 2000). Because JP-4 was the fuel used at FTA4 during all but a brief part of its history, TCE and chloroform were not believed to be chemicals of concern at this site. Groundwater analytical data from monitoring wells downgradient of FTA4 indicate that chlorinated solvents have not impacted groundwater due to previous operations at the site (U.S. Geological Survey, 2000).

2.2.3 Surface Water

Stream valleys in Curry County tend to be fairly broad and widely spaced. Streams are ephemeral and drainages are poorly developed. No permanent streams exist on or near Cannon AFB (Harza, 1997).

Historically, runoff at Cannon AFB has drained into four natural ephemeral playas. The two northern playas were converted into plastic-lined golf course ponds. The southern playa is still intact; however, the surrounding drainage patterns have been altered. The eastern playa, known as North Playa Lake, was bermed on the north, west, and south sides with topsoil and concrete debris. Drainage ditches at Cannon AFB are concentrated around the developed/landscaped areas of the Base and carry runoff to the playa lakes and golf course ponds. The playa lakes have no surface outlet, and any water they collect is eventually lost to evaporation or infiltration or is used by plants and animals.

2.3 Site Investigative History

Four investigations have been conducted at FTA4. Radian Corporation installed two soil borings in 1985 and collected five soil samples for analysis for oil and grease, lead and volatile organic compounds. The samples were not analyzed for total petroleum hydrocarbons (TPH).

In 1988, Walk, Haydel and Associates performed a remedial investigation where they installed nine soil borings and collected 26 soil samples. The soil was analyzed for metals

with 13 samples analyzed for benzene, toluene, ethylbenzene, and xylenes. Again, the soils were not analyzed for TPH.

In 1991, Woodward-Clyde installed two soil borings in the vicinity of FTA4 where the concentrations of TPH exceeded the action limits of 5,000 milligrams per kilograms (mg/kg).

A Phase II Remedial Investigation was conducted by Harza in 1996-1997 in which 19 soil borings were installed and 77 soil samples were collected for analysis. A passive soil gas survey was also conducted at that time. Two soil samples collected from borings in the FTA4 area exceed the action limit of 5,000 mg/kg for TPH.

2.4 Corrective Action Implementation at FTA4

The recommended corrective action alternative identified in the *Final Corrective Measures Study Report for SWMUs 109, 110, 111, and 112 – Fire Training Area Four* [Final Corrective Measures Study (CMS) Report][Foster Wheeler Environmental Corporation (Foster Wheeler Environmental), 2001] for SWMU 109 was passive bioventing. Further information on the CMS and the evaluations performed to evaluate corrective measure alternatives is summarized in the *Technical Memorandum* (Appendix A). The analytical data, upon which the selection of the remedial alternative was based, were collected in 1991 and 1997. In order to define the current extent of contamination, additional sampling at FTA4 was proposed to confirm the levels and extent of TPH in soil. Furthermore, Cannon AFB desires to facilitate cleanup and closure of the FTA4 site within the next year. Therefore, corrective measure alternatives will be re-evaluated following implementation of this Work Plan.

2.5 Regulatory Framework

Cannon AFB operates its corrective measures program in accordance with the provisions of the original Hazardous Waste Facility Permit (see Appendix A, "Regulatory Framework" for more information). 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. Risk assessments performed to date (Appendix A) support that no further action is needed to address health risks at this site. However, the New Mexico Environment Department (NMED) is requiring Cannon AFB to meet the TPH standard for soils in the FTA4 area. The residential direct exposure screening guideline for TPH is 940 mg/kg (NMED, June 2003), which has been selected as the "action level" for the re-evaluation of corrective measure alternatives for this site.

3.0 PROJECT OBJECTIVES

The objective of this project is to confirm subsurface TPH soil contamination in the vicinity of SWMU 109 and 111/112 in the FTA4 area (Figure 2). This work will be considered the

Phase I effort at the site. Once the vertical and horizontal extent has been confirmed, the corrective measure alternatives will be re-evaluated by USACE and TtFW, Inc.

(Note: Confirmation of later soil removal, if selected as the final corrective measure, will include sampling for benzene, toluene, ethylbenzene, and total xylenes as required by the NMED. Future soil cleanup activities and confirmation sampling will be performed in accordance with a corrective measures implementation plan to be developed by the USACE and TtFW at a later date.)

The Phase I sampling program will be performed in accordance with United States Environmental Protection Agency (U.S. EPA) Resource Conservation and Recovery Act (RCRA) and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) guidance, the USACE Geology supplemental scope of services, and in compliance with the Cannon AFB RCRA Permit. Sample results will be compared to NMED standard for TPH in residential soils (940 mg/kg).

3.1 Sampling Activities

TN&A will perform the field work in accordance with the approved SAP (Appendix B). Pre-field planning and implementation of the SAP will include the activities described in the following sections.

3.1.1 Site Access, Utility Clearance, and Permits

TN&A will coordinate the field schedule and site access with the Base Environmental Flight (CEV). TN&A will obtain vehicle and personnel passes for entry onto the Base. Utility clearance will be coordinated by TN&A with USACE, TtFW and the Base CEV.

3.1.2 Drilling and Sampling

An experienced TN&A field geologist will oversee the drilling, log the boreholes, collect samples, and perform other fieldwork to complete the scope of work. A qualified subcontract driller, ESN Southwest (Tijeras, NM), will perform the direct-push technology (DPT) drilling. All sample collection and field data acquisition will be performed in accordance with the approved SAP (Appendix B). Field activities will conform to TN&A SOPs (Appendix C).

All field work will be performed in Level D personal protective equipment (PPE) in accordance with the approved SSHP (Appendix D). If field conditions encountered are such that a higher level of PPE is required, TN&A will immediately contact USACE to discuss the situation.

Sampling locations were selected by TtFW based on prior investigative information and are shown on Figure 2. Sampling locations will be marked in the field by TtFW prior to the

beginning of drilling. Alternatively, TtFW will provide boring location coordinates to TN&A prior to the field work and TN&A will use a hand-held Global Positioning System (GPS) unit, landmarks, and a scaled map to locate the planned sampling locations. A total of 12 boreholes will be advanced using DPT drilling techniques to an approximate maximum depth of 50 feet (167 linear drilling feet). The drilling depths and sampling intervals are based on Table 3 in the Technical Memorandum (Appendix A). A total of 32 soil samples will be collected for TPH analysis (plus additional samples for QA/QC purposes; see SAP in Appendix B). The field geologist will use professional judgment, field observations, and PID headspace screening results to adjust sampling intervals within each borehole so that the best possible data are generated to support the project objectives.

The drilling site may have some caliche zones that could make penetration using DPT difficult. If this condition is encountered, the driller will switch to use of a solid-stem auger (drill rig will be equipped for both methods of drilling) for the purpose of penetrating the caliche layer. No samples will be collected through the caliche interval. Once the caliche is penetrated, the driller will switch back to the use of DPT and continuous sampling. This approach will prevent the need to off-set or move planned boring locations.

The field geologist will use a properly calibrated photoionization detector (PID) to perform air monitoring in the breathing zone and headspace screening of soil samples. Samples for head-space screening will be collected from every 2-foot interval during drilling.

The field geologist will collect samples into laboratory-provided containers and maintain them on ice in clean coolers. TN&A will follow chain-of-custody procedures in the approved SAP (Appendix B) to manage the samples until shipment by common carrier for overnight delivery to the subcontract laboratory.

The TN&A geologist will log borehole geology following the USACE General Geology Scope of Services and using HTW soil boring logs. Additionally, the TN&A geologist will carefully examine soil cores for visual indications of soil contamination (staining, etc.) and note these observations in the log. The completed HTW boring logs will be submitted to the USACE within three business days of completing drilling at the site.

3.1.3 Decontamination Procedures

TN&A will construct a decontamination pad in the designated decontamination area within the adjacent landfill site (LF-5). The drilling rig and downhole equipment will be decontaminated before and after work at FTA4. If necessary, the heavily contaminated drill-stem will also be steam-cleaned at the decontamination pad between sampling locations. Sampling equipment used to collect soil samples will be disposable and will be used only once per sample.

3.1.4 Sample Location Surveying

TN&A will stake and flag the borehole locations and will survey horizontal coordinates and approximate elevations using a hand-held GPS surveying instrument. The GPS instrument (Geo Explorer XT or equivalent) will have sub-meter accuracy after differential correction.

3.1.5 Borehole Abandonment

Following sampling, the boreholes will be abandoned in accordance with the USACE General Geology Scope of Services, New Mexico Underground Storage Tank Bureau "Guidelines for Corrective Action" (March 2000) and Base requirements. As the drilling locations are not on a flight line, and the area is not paved, no special surface repairs will be performed. Borehole abandonment materials and quantities and method for abandonment will be documented in the field logbook and on the HTW boring log.

3.1.6 Site Restoration

Following completion of all sampling activities, TN&A will manage investigative-derived wastes (IDW) as described below (Section 3.2). TN&A will remove other investigation-related materials and restore the site to pre-drilling condition.

3.2 IDW Management and Disposal

Used PPE and investigation incidental wastes will be managed as trash, being placed in garbage bags and disposed of in a Base dumpster. The drill cuttings will be retained in steel 55-gallon drums labeled with the appropriate collection and contact information. Soils that appear to be contaminated (visually or based on PID readings) will be segregated from apparently clean soils. The drums will be stored on pallets in the LF-5 area.

Decontamination fluids will be placed in a 55-gallon drum and allowed to evaporate. Residual solids in the IDW fluid drum will be combined with the IDW solids. IDW solids will be combined with other IDW or soil removed and disposed of as part of the final corrective measure at the site by TtFW. Any residual IDW fluids that have not evaporated by the time of the implementation of the final corrective measure will be taken by TtFW to the headwaters of the Cannon AFB water treatment plant for final disposal.

3.3 Sample Analysis

The soil samples will be analyzed for TPH-diesel range organics (DRO) by Modified Method 8015 in general accordance with the New Mexico Underground Storage Tank Bureau "Guidelines for Corrective Action" (March 2000) and the USACE Chemistry Scope of Services. The subcontractor laboratory, STL Laboratories – Chicago, is a National Environmental Laboratory Accreditation Program certified laboratory. A draft Sampling and Analysis Summary table is provided below in the SAP (Appendix B).

A total of 32 field samples will be collected as well as the following quality control samples at a rate of one per 10 samples for field duplicates (three samples) (minimum of 5 percent duplicate samples) and matrix spike/matrix spike duplicates (MS/MSD) (one per 20 samples or two MS and two MSD). All QC samples will be analyzed for TPH (DRO) by Modified 8015.

3.4 Data Quality Control and Validation

TN&A will perform a Level III data validation on 90 percent of the data and a Level IV on the remaining 10 percent of laboratory data, following the U.S. EPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (USEPA-540/R-94/012) Methods that do not exist within the Functional Guidelines will be evaluated by similar criteria and against similar standards to existing methods. The QAPP is incorporated into the SAP (Appendix B).

3.5 Site Safety and Health

All field work performed by TN&A or under direct supervision of TN&A will be in strict accordance with the approved SSHP (Appendix C). A copy of the SSHP will be available on site and followed during field operations.

3.6 Reports and Documentation

3.6.1 Field Records

Verbal Conversation Records will be completed to document significant changes in scope of work, costs, or deliverables. Other supporting documentation, logs, or records will be provided as necessary to maintain a record of communications and decision-making during the course of the project.

TN&A will prepare and fax (or email) Daily Quality Control Reports (DQCRs) to the USACE Project Manager (PM) during each field event on a daily basis.

With permission of the Cannon AFB CEV, TN&A will photodocument key field activities (soil sampling, drilling) and drilling locations showing relevant landmarks (if practicable). The Field Investigation Report will include photodocumentation

3.6.2 Field Investigation Report

TN&A will prepare a concise Field Investigation Report summarizing the work performed, samples collected, and summarizing the sample analytical results. The report will be submitted in Draft, Final, and Revised Final forms. Annotated "Response to Comments" will be provided for each version.

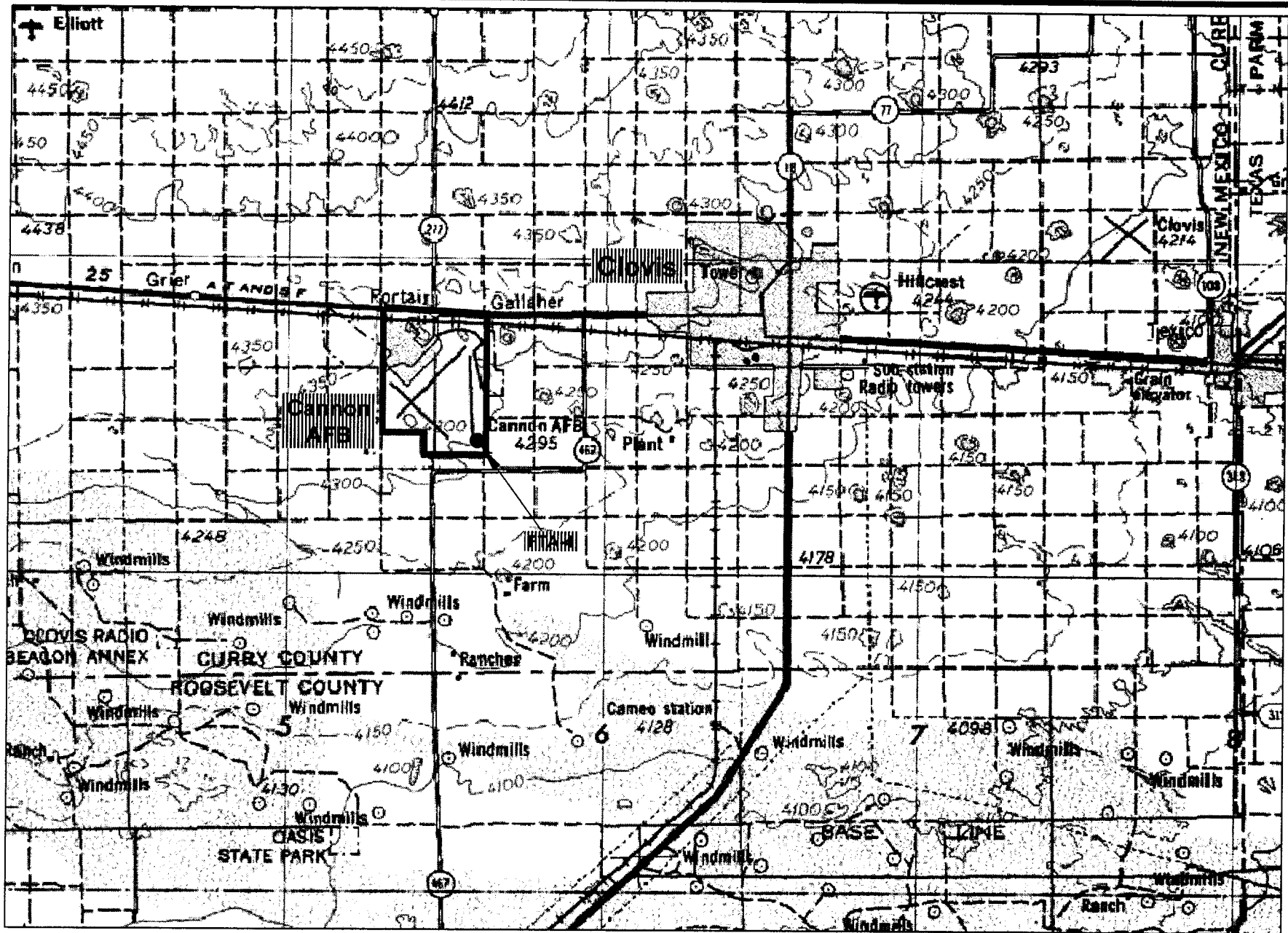
Figures will include Base and site location maps, a site plan showing prior drilling, and a plan showing new borings (approximate locations) and sample results. Additionally, one or

two cross-sections will be prepared, if warranted by the data, showing geologic layers and sample analytical results.

Appendices will include the chemical analytical data summaries, Data Quality Control Summary, chain-of-custody forms, boring logs, and photodocumentation.

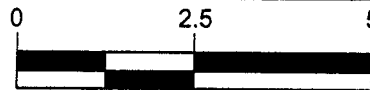
4.0 REFERENCES

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- Harza (Harza Environmental Services). August 1997. Phase II RCRA Facility Investigation Report (Draft), Cannon Air Force Base, New Mexico.
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- Radian. August 1988. Site-Specific Quality Management Plan Installation Restoration Program Fire Protection Training Area, Site 9 Tank Removal, Cannon Air Force Base, New Mexico.
- Walk, Haydel, and Associates (Walk, Haydel, and Associates, Inc.). January 1990. Final Installation Restoration Program Remedial Investigation, Cannon Air Force Base, New Mexico.
- Woodward-Clyde (Woodward-Clyde Consultants). October 1992. Remedial Investigation Report for 18 Solid Waste Management Units, Cannon Air Force Base, New Mexico.



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Figure was adapted from USGS Quads:
Midway, NM (1985)
Clovis, NM (1978)
Clovis, NM, TX (1972)



1 Inch = 2.5 Miles (approximately)



Figure 1
Cannon Air Force Base Site
Location Map