DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 49TH FIGHTER WING (ACC)
HOLLOMAN AIR FORCE BASE, NEW MEXICO

09 FEB 2000

MEMORANDUM FOR NEW MEXICO ENVIRONMENT DEPARTMENT
Attn: Ms. Julie Jacobs
Ground Water Quality Bureau
1190 St. Francis Drive
P.O. Box 26110
Santa Fe NM 87502

FROM: 49 CES/CC
550 Tabosa Avenue
Holloman AFB NM 88330-8458

SUBJECT: Final Closure Report Submittal for the F-4 Crash Site

1. The attached closure report is submitted for your review. The report discusses cleanup activities that were accomplished at the site.

2. If you have any questions or require additional information, please contact Jose Gallegos or Court Fesmire at (505) 572-5395.

HOWARD E. MOFFITT
Deputy Base Civil Engineer

Atttachment:
Final Closure Report for the F4-E Crash Compliance Site (1 copy)

cc (w/ attachment):
Attn: Mr. Cornelius Amindyas
Hazardous & Radioactive Materials Bureau
P.O. Box 26110
Santa Fe NM 87502

Attn: Mr. Kelly Roderick
WSES-C, Bldg 163
White Sands Missle Range NM 88002

cc (w/o attachment):
Mr. Derek Johnson
Foster Wheeler Environmental Corp.
6605 Uptown Blvd., Ste. 220
Albuquerque NM 87110

Mr. Tom Zink
USACE, Omaha District
Attn: CENWO-PM-H (Zink)
215 North 17th St.
Omaha NE 68102-4978

FINAL
CLOSURE REPORT
FOR THE
F4-E CRASH COMPLIANCE SITE
HOLLOMAN AIR FORCE BASE, NEW MEXICO

Prepared for:
49 CES/CEV
Holloman Air Force Base, NM
and
HQ ACC CES/ESV
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 22, Work Authorization Directive 19
U.S. Army Corps of Engineers
Omaha District
Omaha, Nebraska

January 2000

USAF Project Number: No Project Number Assigned

TABLE OF CONTENTS

APPENDICES

LIST OF ACRONYMS

AFB	Air Force Base
bgs	below ground surface
BTEX	benzene, toluene, ethyl benzene, and xylenes
CE	Civil Engineering
COC	contaminant of concern
CY	cubic yard
DQCR	daily quality control report
EOD	Explosive Ordnance Disposal
FCR	field change request
Foster Wheeler	Foster Wheeler Environmental Corporation
ft	feet/foot
F4 Crash Site	F4-E Crash Compliance Site
HASP	Health and Safety Plan
HSPA	Health and Safety Plan Addendum
mg/kg	milligrams per kilogram
Mg-Th	magnesium thorium
OEW	ordnance explosive waste
RCP	Regulatory Compliance Plan
SAP	Sampling and Analysis Plan Addendum
TRPH	total recoverable petroleum hydrocarbons
USACE	United States Army Corps of Engineers
UXO	unexploded ordnance
WSMR	White Sands Missile Range

1.0 INTRODUCTION

The United States Army Corps of Engineers (USACE)-Omaha District retained Foster Wheeler Environmental Corporation (Foster Wheeler) to complete the final cleanup of the former F4-E Crash Compliance Site (F4 Crash Site) for Holloman Air Force Base (AFB), New Mexico. On October 14, 1998, at approximately 1506 hours, an F4-E German aircraft impacted the White Sands Missile Range (WSMR). The aircraft held approximately 6,500 pounds of JP-8 jet fuel on board at the time of impact; the majority was consumed in the ensuing fire. However, soil contamination, low-level radioactive material, and ordnance explosive waste/unexploded ordnance (OEW/UXO) remained in the area surrounding the crash crater.

The F4 Crash Site remediation was performed in two phases. First, a site assessment was performed to delineate the vertical and horizontal extent of the soil contamination at the site. This effort was completed in February 1999 and the Soil Sampling and Site Assessment Report was completed on March 16, 1999. Once this effort was completed, a Construction Work Plan was developed to perform the final soil remediation and cleanup of the F4 Crash Site. The Work Plan was submitted on June 8, 1999. Work on the remediation of the F4 Crash Site began on June 14, 1999 and final revegetation of the site was completed on August 18, 1999.

This Closure Report provides the project objectives for the site, site description, summary of the construction activities (including any changes from the Construction Work Plan dated June 1999), and construction documentation for the cleanup activities at the former F4 Crash Site. This Closure Report meets the requirements stipulated within the Total Environmental Restoration Contract No. DACW45-94-D-0003, Delivery Order 22, Work Authorization Directive 19. All field activities were performed in accordance with the Basewide Health and Safety Plan (Foster Wheeler, 1995) and the Health and Safety Plan Addendum (HSPA) (Appendix B of the Construction Work Plan) (Foster Wheeler, 1999a).

1.1 PROJECT OBJECTIVES

The overall goal of the project was to completely remediate and close the F4 Crash Site. To meet this goal, the following project objectives were undertaken:

- JP-8-contaminated soil was excavated to the point of "clean closure" (verified through confirmation samples), the site backfilled with clean soil, and the F4 Crash Site declared a no further action site.
- Any threat to human health and the environment was minimized.
- The escape of any hazardous waste, hazardous constituents, leachate, contaminated runoff, or decomposition products was controlled or eliminated.

1.2 CLOSURE REPORT OVERVIEW

This Closure Report is divided into eight sections and seven appendices. Section 1 contains the introduction and project objectives for closure of the site, Section 2 presents the site description, and Section 3 details the closure requirements for the F4 Crash Site. Section 4 discusses the construction activities performed during the cleanup activities (from mobilization through demobilization), Section 5 describes the sampling activities and results from the cleanup construction, Section 6 presents the construction and closure documentation, Section 7 describes the post-closure requirements for the site, and Section 8 contains the references used for this Closure Report.

Supporting information is contained in the appendices. Appendix A includes the site and sample location plan and Appendix B presents the stockpile and closure confirmation sampling results. Appendix C contains the inspection reports for the F4 Crash Site project, Appendix D contains the Field Change Requests (FCRs) for the closure construction, and Appendix E contains the manufacturer's certificates for the seeding and hay required for revegetation of the site. Appendix F contains the nonhazardous waste manifests for the exported soil (total recoverable petroleum hydrocarbon [TRPH]-contaminated soil) and Appendix G contains the F4 Crash Site Construction Photographs (from start through completion).

2.0 SITE DESCRIPTION

The former F4 Crash Site is located 13 miles south of the Stallion Gate on Range Road 7, WSMR, New Mexico. The exact location of the site is N 33 44 24.5 and W 106 35 39.3, WSMR, which is in an isolated and semidesert region of WSMR. The aircraft held approximately 6,500 pounds of JP-8 jet fuel at the time of impact and the majority was consumed in the fire. Components that remained in the crash crater area included JP-8-contaminated soil, low-level radioactive material, and residual OEW/UXO materials. The original dimensions of the crater was approximately 30 feet (ft) in diameter and 10 ft below ground surface (bgs), with a bottom diameter of 5 ft. The actual cleanup area for the crash site was approximately 28 ft by 28 ft by 10 ft in depth with a maximum excavation of 3 ft in the crater bottom (13 ft bgs). The excavation volume for the cleanup was 68 cubic yards (CY) and the estimated amount of soil used to backfill and grade the site for proper drainage was approximately 150 CY.

The results of the December 22, 1998, investigation and cleanup performed by representatives from WSMR and Holloman AFB identified the presence of low-level radioactive material (small amounts of magnesium-thorium [Mg-Th] debris from the gear boxes in the aircraft). According to a letter from the Base Radiation Safety Officer, it was believed that upon completion of the recovery effort, the vast majority of the Mg-Th debris was located and containerized, but it was possible that a small quantity of additional material might be discovered as the recovery operation progressed. This material represented a minimal risk and appropriate on-site monitoring, use of personal protective equipment, and proper disposal of the contaminated material was practiced at the site. Only three small pieces of debris were recovered during the closure activities and properly disposed of in accordance with the Construction Work Plan (Foster Wheeler, 1999a).

In addition, it was assumed that OEW/UXO materials would be encountered at the site during the soil cleanup. Based on the United States Air Force Explosive Ordnance Disposal (EOD) investigation and cleanup operation, completed on October 24, 1998, Holloman AFB EOD personnel concluded that further searches were not necessary and that the EOD recovery operation for materials associated with the aircraft was complete. However, due to the potential for contact with OEW/UXO debris as a result of the prior and continuing use of the WSMR site,

Foster Wheeler employed a full-time, properly trained and experienced Senior OEW/UXO supervisor to monitor the cleanup activities. No OEW/UXO material was encountered during the F4 Crash Site cleanup and closure activities.

3.0 CLOSURE REQUIREMENTS

The original contaminants of concern (COCs) for the remediation of the F4 Crash Site were TRPH at concentrations exceeding 1,000 milligrams per kilogram (mg/kg) and benzene at concentrations exceeding 25 mg/kg. The cleanup level applicable to petroleum-contaminated soil at the site as established by the Groundwater Bureau of the New Mexico Environment Department is TRPH less than 1,000 mg/kg. The samples obtained during the preliminary site assessment were analyzed for TRPH, benzene, toluene, ethyl benzene, and xylenes (BTEX). The sample results of the preliminary site assessment (Foster Wheeler, 1999b) showed that: (1) benzene was not detected at concentrations above 25 mg/kg (clean closure requirement for Holloman AFB) and (2) toluene, ethyl benzene, and xylenes were detected at concentrations well below the EPA Region 6 human health media-specific screening levels (EPA, 1999). Therefore, the only COC for the soil cleanup activities was TRPH.

In order to obtain a clean closure for the F4 Crash Site, it was established that all OEW/UXO and low-level radioactive debris would have to be removed and the TRPH-contaminated soil be remediated to concentrations below 1,000 mg/kg. As explained in Section 2.0, all OEW/UXO debris and a majority of the low-level radioactive material was removed from the site prior to the preliminary site assessment. Section 4.0 details the construction activities performed to completely remove the remaining radioactive material, excavate the TRPH-contaminated soil, backfill, and revegetate the site.

4.0 PROJECT ACTIVITIES

4.1 GENERAL

This section discusses the construction activities that were performed from June 14, 1999, through August 18, 1999, to remediate the F4 Crash Site and obtain clean closure. The closure of the F4 Crash Site was performed in accordance with the scope of work, health and safety plan (HASP), regulatory compliance plan (RCP), sampling and analysis plan (SAP), technical

specifications, and applicable requirements and procedures as stipulated in the approved Construction Work Plan (Foster Wheeler, 1999a). Overall, the former F4 Crash Site encompassed an area of approximately 0.02 acres (28 ft by 28 ft) and had a depth of 10 ft. The site location and aerial extent of the crash site is shown on Figure A-1, found in Appendix A of this report. The depth of excavation required for clean closure of the site was 1 ft at the outer edges of the crater and approximately 2 to 3 ft at the center (13 ft bgs). A total of 68 CY of TRPH-contaminated soil was excavated from the site during construction, approximately three 55-gallon drums (0.82 CY) of scrap metal debris were screened out and removed, three small pieces of low-level Mg-Th debris were screened and removed from the site, and 150 CY of native, or clean, soil was excavated from the adjacent borrow pit and placed in the crater excavation during the construction activities.

4.2 CONSTRUCTION ACTIVITIES

Mobilization for the closure of the F4 Crash Site began on June 14, 1999, in coordination with WSMR points of contact to ensure minimal disturbance of ongoing operations. Mobilization activities included site-specific orientation and health and safety training of workers, establishment of both staging and material stock pile areas, delineation of work zones, inspection of equipment, and the preparatory inspection. Revegetation of the site was completed on August 18, 1999, and the site was demobilized by conducting the final inspection and removing all equipment and materials from the site. The construction activities for the cleanup were performed in accordance with the HASP, RCP, SAP, technical specifications, and applicable requirements and procedures as stipulated in the approved Construction Work Plan (Foster Wheeler, 1999a) and are described below.

1. Prior to the mobilization and construction activities, WSMR EOD personnel performed an initial screening of the work zone and stockpile/storage area for OEW/UXO and low-level radioactive debris (Mg-Th). Also, as a precautionary measure, Foster Wheeler UXO personnel performed an additional followup OEW/UXO low-level radioactive screening of the work zone and stockpile/storage area. The Foster Wheeler UXO personnel approached the area with an all-metals geophysical instrument and calibrated radiation meter to locate, identify, and delineate any OEW/UXO materials or low-level radioactive debris. No

OEW/UXO materials or low-level radioactive debris were found during this initial site screening.

2. Prior to excavation of specific areas of the crater, the Foster Wheeler UXO personnel (George Bridgeman—UXO Supervisor and Patrick Saveall—UXO Specialist) screened the in situ TRPH-contaminated soil in the crater for OEW/UXO and low-level radioactive debris using an all-metals geophysical instrument (Vallon VMX-1) and calibrated radiation meter (Victoreene 190 with 489-110 geiger Mueller pancake probe). This was performed whenever the local excavation within the crater was changed.

3. The contaminated soil was excavated using a backhoe, and placed into a front-end loader bucket. Approximately 68 CY of TRPH-contaminated soil was excavated and staged on a 40-mil high-density polyethylene liner in accordance with the Construction Work Plan (Foster Wheeler, 1999a). The contaminated soil was then removed by Rhino Construction and properly disposed of at the Rhino Waste Deposition Facility. The nonhazardous waste manifests for the removal of the contaminated soil are shown in Appendix F.

4. Foster Wheeler UXO personnel raked the excavated soil into a thin layer in the bucket of the front-end loader and performed a secondary visual screening of the soil for OEW/UXO debris. No OEW/UXO debris was found during the remedial and closure activities.

5. Scrap metal debris (non-UXO or radioactive material) was also removed from the excavated soil by the UXO personnel during the soil screening process. Approximately three 55-gallon drums (0.82 CY) of the material was containerized by Foster Wheeler personnel during the cleanup activities. The scrap metal debris was turned over to the Base Civil Engineering (CE) by Foster Wheeler. This debris is the responsibility of the Base CE and is temporarily stored at the crash recovery staging area on Holloman AFB. The Base CE will arrange for the proper removal and disposal of the debris.

6. Foster Wheeler UXO personnel also performed a secondary screening of the excavated soil in the front-end loader bucket for low-level radioactive material using calibrated radiation meters. Approximately three small pieces of radioactive debris were recovered during the cleanup activities. The Base Radiation Officer at Holloman AFB was notified of the debris

and the material was bagged, labeled, and properly stored on site in accordance with the Construction Work Plan after which it was removed by Base EOD personnel for proper disposal.

7. Decontamination and radiation frisking of personnel and equipment was performed in accordance with the HSPA, Appendix B of the Construction Work Plan (Foster Wheeler, 1999a).

8. Field screening, confirmation, and verification samples were collected for in situ soil and the soil stockpile. A sample of the decontamination water was to be sampled as explained in the Construction Work Plan (Foster Wheeler, 1999a). However, due the incohesive nature of the soil, the decontamination was performed through "dry" decontamination procedures, which involved brush and broom scouring of project equipment and materials and placement of the resultant soil in the contaminated soil stockpiles. The contaminated soil was then removed by Rhino Construction and properly disposed of at the Rhino Waste Deposition Facility. Therefore, no decontamination water was generated from the cleanup and closure activities. Field ENSYS® test kits were used to screen soil during excavation to verify that the TRPH in the soil was less than 1,000 mg/kg and to satisfy the clean closure criteria for the site. In addition, all visibly contaminated soil was removed from the crater area. A detailed discussion of the sampling process and analytical results is found in Section 5.0 of this report.

9. Once the confirmation sample results indicated that the sampled area had concentrations of TRPH less than 1,000 mg/kg, the area was backfilled with native or clean soil obtained from a small WSMR-approved borrow pit located 500 ft north of the crash site (Figure A-1, Appendix A). It is estimated that approximately 150 CY of native or clean soil was excavated from the borrow pit and deposited as backfill at the F4 Crash Site crater.

10. The backfilled crater was then graded to allow for proper drainage of the site and revegetated with native vegetation to protect the site from soil erosion. The revegetation of the site was completed on August 18, 1999.

5.0 SAMPLING ACTIVITIES

Field screening, closure confirmation, and verification samples were collected for the in situ soil and soil stockpiles during the remediation phase of the project. Field ENSYS® test kits were used to screen soil during excavation to verify that the TRPH in the soil was less than 1,000 mg/kg to satisfy the clean closure criteria for the site. Therefore, no post-cleanup monitoring or maintenance is required at the F4 Crash Site. Fourteen confirmation soil samples with JP-8 test kit concentrations greater than 500 mg/kg were sent to an off-site analytical laboratory for verification analysis of the TRPH (United States Environmental Protection Agency Method 9071A/418.1) in accordance with the SAP (Foster Wheeler, 1999a). Confirmation samples F4-01 through F4-10 were collected from the crater floor and walls. Surface soil (0–6 inches) confirmation samples F4-11 through F4-14 were collected outside the crater area. In addition, three soil stockpile samples (F4SPA, F4SPB, and F4SPC) were sent for off-site laboratory analyses. The soil stockpile samples were analyzed only for TRPH (FCR #1) in order to characterize the soil for either redeposition in the crater or waste disposal purposes (if TRPH > 1,000 mg/kg). The samples were analyzed only for TRPH because the sampling performed at the site during the preliminary site assessment showed that TRPH was the only COC for the site (BTEX was not detected in amounts exceeding clean closure standards). Due to the incohesive nature of the soil, the decontamination was performed through "dry" decontamination procedures. The contaminated soil was removed by Rhino Construction and properly disposed of at the Rhino Waste Deposition Facility. There was no decontamination water generated during the cleanup activities.

The analytical results for the 14 closure confirmation samples and 3 soil stockpile samples are summarized on Table B-1 in Appendix B. No confirmation samples showed a concentration of TRPH exceeding 1,000 mg/kg. Therefore, the site remediation goal of clean closure was achieved (see Appendix A for the confirmation sampling locations). One of the soil stockpile samples (F4SPC) showed a TRPH concentration of 1,100 mg/kg, exceeding the clean closure standard for the site. Since soil stockpiles A and B were relatively small in comparison to stockpile C, it would not have been cost effective to perform the labor-intensive effort of sorting out the small amount of clean soil from the large volume of contaminated soil. Therefore, all

three of the soil stockpiles were disposed of by Rhino Construction as TRPH-contaminated soil at the Rhino Waste Disposal Facility.

6.0 CONSTRUCTION DOCUMENTATION

Daily Quality Control Reports (DQCRs) were prepared to document remedial activities at the F4 Crash Site. These reports were previously submitted to the USACE project engineer and are therefore not included with this report. The DQCRs document site activities; resources used (including labor, material and equipment); inspection and testing performed; problems encountered; and actions taken. Vendor submittals and construction activities were documented according to the procedures outlined in the Construction Work Plan (Foster Wheeler, 1999a).

The specific submittals and remedial construction activities are described in the following sections. This information forms the complete construction documentation record for the closure of the F4 Crash Site. The Base's Environmental Flight (49 CES/CEV) will be the custodian of the complete construction documentation record. All work was completed in conformance with applicable state and federal requirements and in accordance with the approved Construction Work Plan (Foster Wheeler, 1999a).

6.1 RECORD DRAWINGS

Foster Wheeler performed a global positioning system survey of F4 Crash Site features and confirmation sampling locations throughout the cleanup and closure phase of the project. The site and sample location plan is provided in Appendix A.

6.2 INSPECTION REPORTS

Preparatory and final inspection/completion reports were performed on each definable section of work (i.e., work zones, staging/storage areas, liners, final grading, revegetation, and demobilization). These reports are provided in Appendix C.

6.3 FIELD CHANGE REQUESTS

FCR forms were used to document approved changes to the Construction Work Plan (Foster Wheeler, 1999a). There was one FCR completed for the project provided in Appendix D. The

FCR proposed a minor change relating to obtaining a TRPH-contaminated soil sample from the crater for waste characterization and disposal requirements.

6.4 MANUFACTURER'S CERTIFICATES

Revegetation (hay and seed) certificates are included in Appendix E.

6.5 NONHAZARDOUS WASTE MANIFESTS FOR THE EXPORTED SOIL

The nonhazardous waste manifests (for the export of the TRPH-contaminated soil) have been included in Appendix F.

7.0 POST-CLOSURE MAINTENANCE

The F4 Crash Site cleanup and closure activities have been completed. All OEW/UXO and low-level radioactive debris have been removed and the closure confirmation sampling results have shown that the TRPH-contaminated soil has been remediated to concentrations below the clean closure requirement of 1,000 mg/kg. The cleanup activities have successfully achieved clean closure for the F4 Crash Site. Therefore, no post-closure maintenance or monitoring needs to be performed. No further action is required at the F4 Crash Site.

8.0 REFERENCES

EPA (United States Environmental Protection Agency)
1999 EPA Region 6 Human Health Medium-Specific Screening Levels.

Foster Wheeler (Foster Wheeler Environmental Corporation)

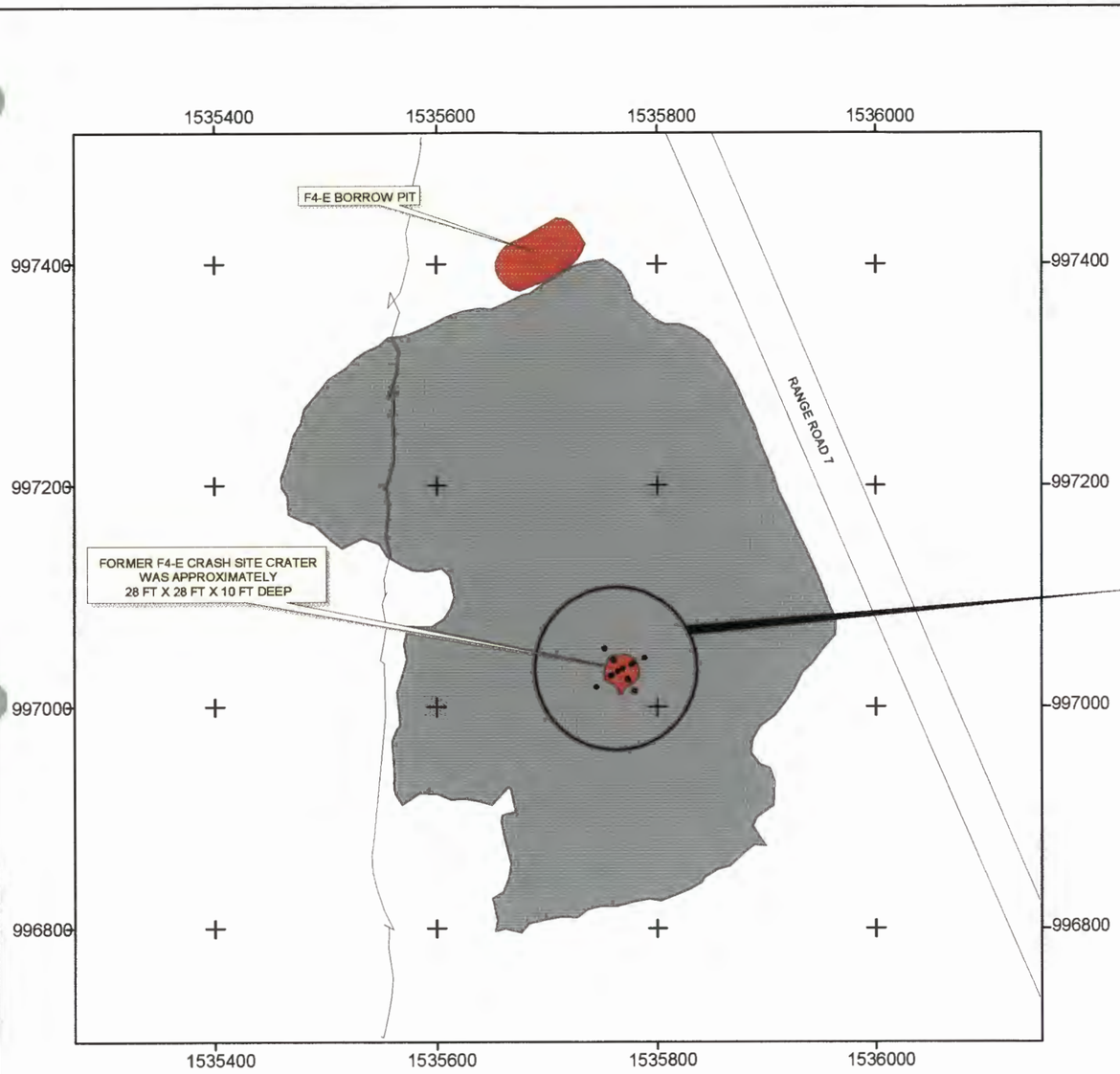
1995 Holloman Air Force Base Basewide Health and Safety Plan. December.

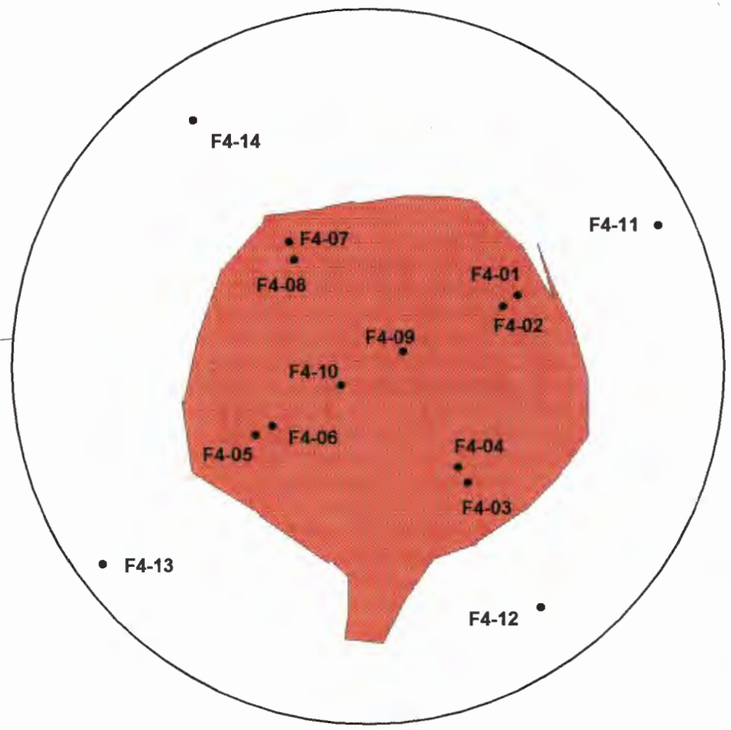
1999a Construction Work Plan. Holloman Air Force Base, New Mexico.

1999b Soil Sample and Site Assessment Report for the F4-E Crash Compliance Site, Holloman Air Force Base, New Mexico.

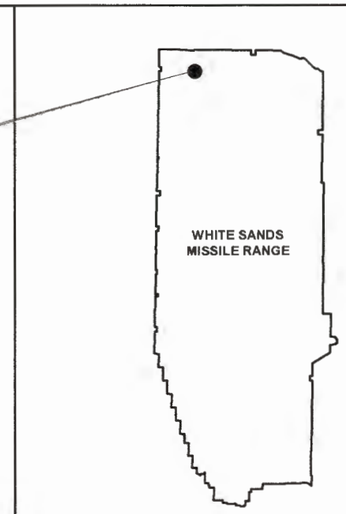
Appendix A

Site and Sample Location Plan





NOT TO SCALE



LEGEND:

- CONFIRMATION SAMPLE POINTS
- UNCONSTRUCTED FENCE LINE
- CRATER
- BURN AREA

SCALE

100 0 100 200 Feet

N
W E
S

NOTE: MAP UNITS ARE IN STATE PLANE 1983 COORDINATES

HOLLOMAN AIR FORCE BASE
F4-E CRASH COMPLIANCE SITE
AT WHITE SANDS MISSILE RANGE

SITE AND SAMPLE LOCATION PLAN

FIGURE A-1

FOSTER WHEELER ENVIRONMENTAL CORPORATION

JANUARY 2000