

**PROPOSAL FOR CONFIRMATORY SAMPLING
NO FURTHER ACTION
Environmental Restoration Project**

**Site 56, Old Thunderwells (Thunder Range)
OU 1335**

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Prepared for the
United States Department of Energy

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1.0 Introduction

1.1 ER Site 56, Old Thunderwells

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a no further action (NFA) decision based on confirmatory sampling for Environmental Restoration (ER) Site 56, Old Thunderwells, Operable Unit (OU) 1335. ER Site 56 is listed in the Hazardous and Solid Waste Amendments (HSWA) Module IV (EPA August 1993) of the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Permit (NM5890110518-1) (EPA August 1992).

1.2 SNL/NM Administrative NFA Process

This proposal for a determination of an NFA decision based on confirmatory sampling was prepared using the process presented in Section 4.5.3 of the SNL/NM Program Implementation Plan (PIP) (SNL/NM February 1995). It follows guidance documented in 40 CFR 264.514[a] [2] that states NFAs "must contain information demonstrating that there are no releases of hazardous waste (including hazardous constituents) from solid waste management units (SWMUs) at the facility that may pose a threat to human health or the environment" (EPA July 1990). The HSWA Module IV contains the same requirements for an NFA demonstration:

"Based on the results of the RFI [RCRA Facility Investigation] and other relevant information, the Permittee may submit an application to the Administrative Authority for a Class III permit modification under 40 CFR 270.42(c) to terminate the RFI/CMS [corrective measures study] process for a specific unit. This permit modification application must contain information demonstrating that there are no releases of hazardous waste including hazardous constituents from a particular SWMU at the facility that pose threats to human health and/or the environment, as well as additional information required in 40 CFR 270.42(c) (EPA August 1993)."

If the available archival evidence is not considered convincing, SNL/NM performs confirmatory sampling to increase the weight of evidence and allow an informed decision on whether to proceed with the administrative-type NFA or to return to the site characterization program for additional data collection (SNL/NM February 1995).

The Environmental Protection Agency (EPA) acknowledged that the extent of sampling required may vary greatly, stating that:

"the agency does not intend this rule [the second codification of HSWA] to require extensive sampling and monitoring at every SWMU. . . . Sampling is generally required only in situations where there is insufficient evidence on which to make an initial release determination. . . . The actual extent of sampling will vary . . . depending on the amount and quality of existing information available (EPA December 1987)."

This request for an NFA decision for ER Site 56 is based primarily on analytical results of confirmatory soil samples collected at the site. Concentrations of site-specific constituents of concern (COCs) detected in the soil samples were first compared to background 95th percentile or upper tolerance limit (UTL) concentrations of COCs found in SNL/NM soils (IT March 1996). If no SNL/NM or other relevant background limit was available for a particular COC, or if the COC concentration exceeded the SNL/NM or other relevant background limit, then the constituent concentration was compared to the proposed 40 CFR Part 264 Subpart S or other relevant soil action level for the compound (EPA July 1990). If the COC concentration exceeded both the background limit and relevant action level for that compound, or if no background limit or action level has been determined or proposed for the constituent, then a risk assessment was performed. The highest concentration of the particular COC identified at the site was then compared to the derived risk assessment action level to determine if the COC concentration at the site poses a significant health risk.

A site is eligible for an NFA proposal if it meets one or more of the following criteria taken from the Environmental Restoration Document of Understanding (NMED November 1995):

- NFA Criterion 1: The site cannot be located or has been found not to exist, is a duplicate potential release site (PRS) or is located within and therefore, investigated as part of another PRS.
- NFA Criterion 2: The site has never been used for the management (that is, generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes and/or constituents or other CERCLA hazardous substances.
- NFA Criterion 3: No release to the environment has occurred, nor is likely to occur in the future.
- NFA Criterion 4: There was a release, but the site was characterized and/or remediated under another authority which adequately addresses corrective action, and documentation, such as a closure letter, is available.
- NFA Criterion 5: The PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use.

Review and analysis of the ER Site 56 soil sample analytical data indicate that concentrations of COCs at this site are less than (1) proposed Subpart S or other action levels, or (2) derived risk assessment action levels.

ER Site 56 is being proposed for an NFA decision based on confirmatory sampling data which demonstrates that hazardous waste or COCs that were released from this SWMU into the environment have been remediated and pose an acceptable level of risk under current and projected future land use (Criterion 5).

1.3 Local Setting

SNL/NM occupies 2,829 acres of land owned by the Department of Energy (DOE), with an additional 14,920 acres of land provided by land-use permits with Kirtland Air Force Base (KAFB), the United States Forest Service (USFS), the State of New Mexico, and the Isleta Indian Reservation (Figure 1). SNL/NM has been involved in nuclear weapons research, component development, assembly, testing, and other research and development activities since 1945 (DOE September 1987).

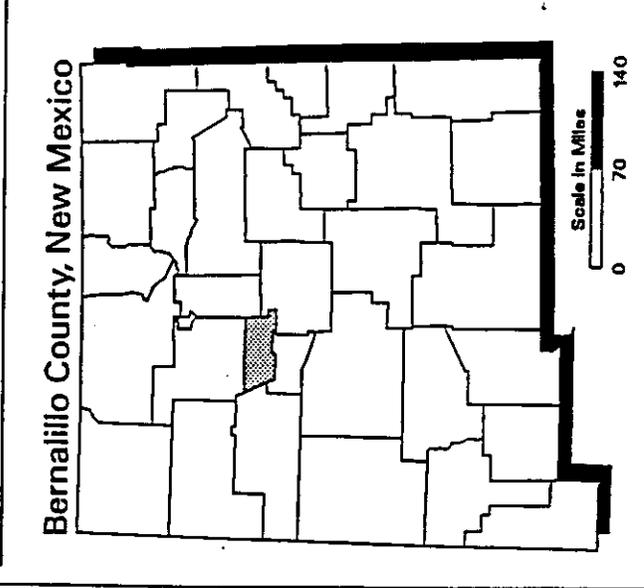
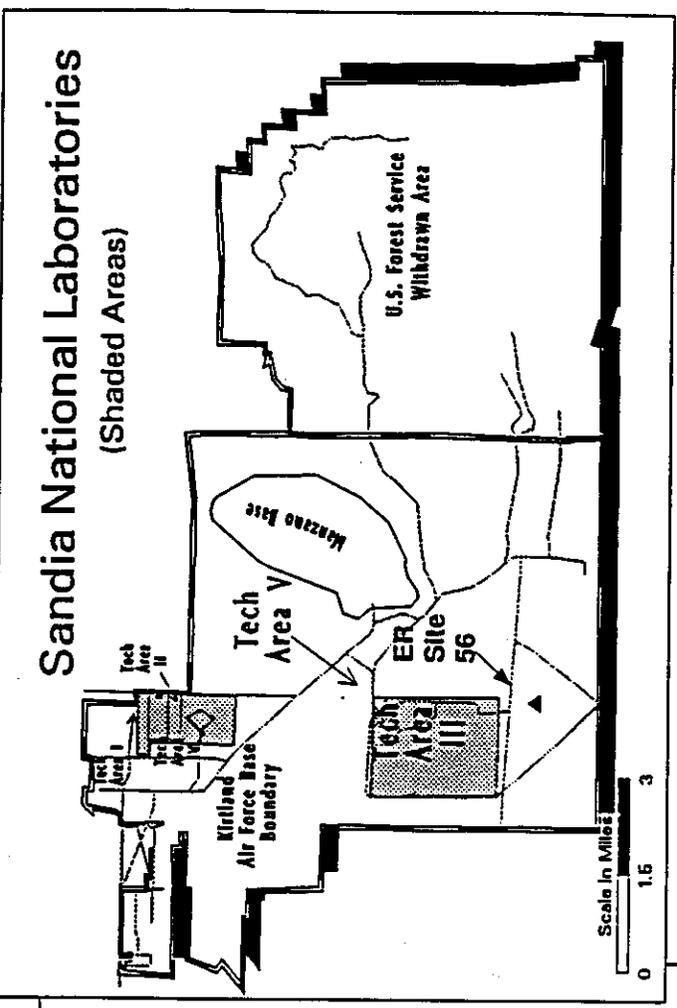
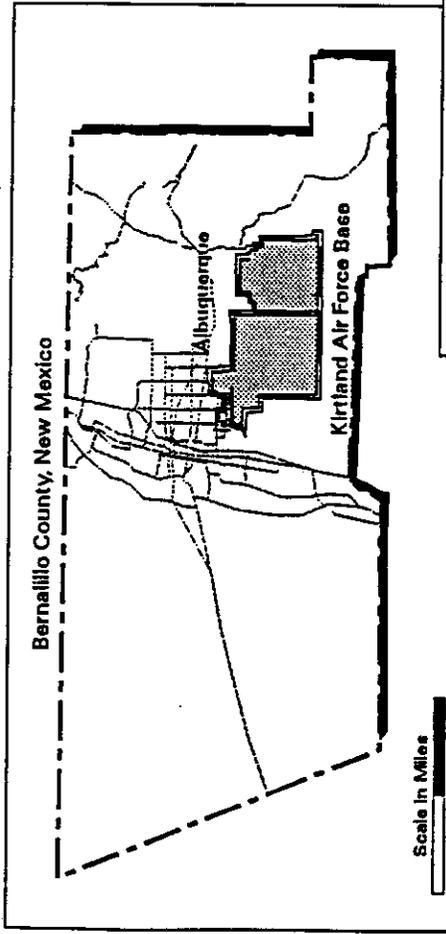
ER Site 56 is located near the southwest corner of Kirtland Air Force Base, east of Building 9966, south of Magazine Road near the large shock tube (ER Site 89) and west of the SNL Solar Power Tower (Figure 2). The site is actually two areas which were used for the same purposes at the same relative time. For all intents and purposes, though, ER Site 56 is considered one site. It is on land which is permitted to the Department of Energy from the Air Force. The site occupies approximately .86 acres and is essentially flat, with a slight slope to the west, at an average elevation of 5,415 feet above mean sea level (AMSL). The area is graded and clear of vegetation, however the surrounding area is covered by desert grasses and cacti. Access to the site is limited through a locked gate at the entrance to South Thunder Range.

The surficial geology at ER Site 56 is characterized by a veneer of aeolian sediments that are underlain by alluvial fan or alluvial deposits. Based on drilling records of similar deposits at KAFB, the alluvial materials are highly heterogeneous, composed primarily of medium to fine silty sands with frequent coarse sand, gravel, and cobble lenses. The alluvial deposits probably extend to the water-table. Vegetation consists predominantly of grasses including grama, muhly, dropseed, and galleta. Shrubs commonly associated with the grasslands include sand sage, winter fat, saltbrush, and rabbitbush. Cacti are common, and include cholla, pincushion, strawberry, and prickly pear.

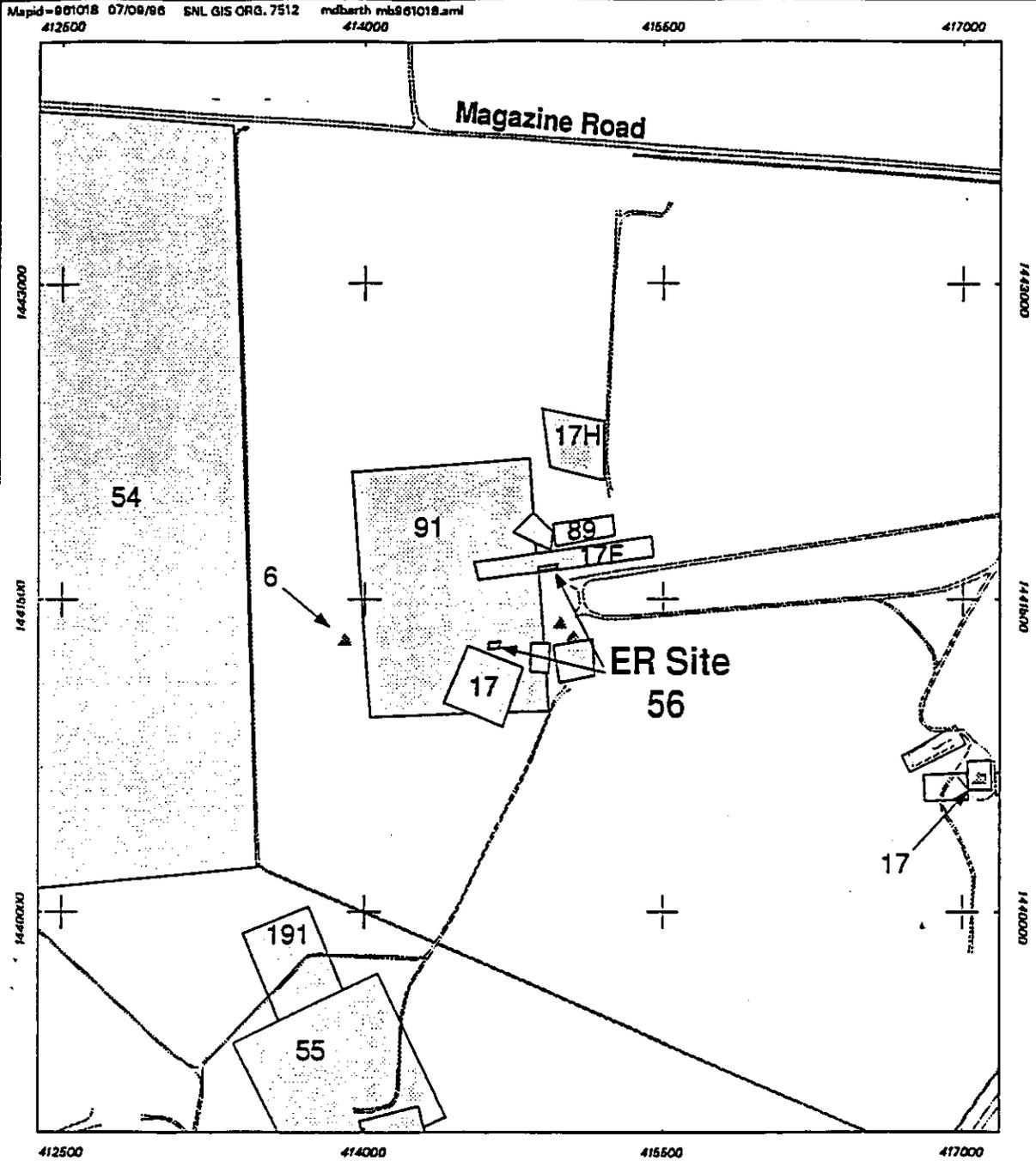
The water-table elevation is approximately 4935 feet AMSL at this location, with a depth to groundwater of approximately 480 feet. Local groundwater flow is believed to be in a generally west to northwest direction. The nearest production well, KAFB-9, is northeast of the site and is approximately 3 miles away. The nearest groundwater monitor wells to the site are the group of wells installed around the Chemical Waste Landfill in the southeast corner of TA III. These wells are located approximately 0.6 miles northeast of ER Site 56 (SNL/NM March 1995).

Figure 1

The Location of Kirtland Air Force Base and Sandia National Laboratories



MAPID 951017 071696 SNL GIS ORG. 7512 Mdbearth mb961017.amf



Legend

- ▲ ER Sites < .1 acre
- Roadways
- == KAFB Boundary
- - - - - Technical Area III Boundary
- ▨ ER Site 56
- Other ER Sites

Figure 2
Location of ER Site 56
Old Thunderwells



Sandia National Laboratories, New Mexico
 Environmental Restoration Geographic Information System

2.0 History of the SWMU

2.1 Sources of Supporting Information

In preparing the NFA proposal for ER Site 56, available background information was reviewed to quantify potential releases and to select analytes for the soil sampling. Background information was collected from SNL/NM Facilities Engineering drawings and interviews with employees familiar with site operational history. The following sources of information, hierarchically listed with respect to assigned validity, were used to evaluate ER Site 56:

- * Confirmatory subsurface soil sampling conducted in August 1995;
- * An unexploded ordnance/high explosive survey conducted in November 1993;
- * Interviews with current and retired personnel familiar with the activities at ER Site 56;
- * Miscellaneous information sources including SNL/NM personnel correspondence (memorandums, letters, and notes regarding ER Site 56);
- * Photographs and field notes collected at the site by SNL/NM ER staff;
- * Historical aerial photographs;
- * The Comprehensive Environmental Assessment and Response Program (CEARP) Phase I Report (DOE, Sept. 1987) and CEARP background records;
- * The RCRA Facility Assessment (RFA) report (EPA April 1987).

2.2 Previous Audits, Inspections, and Findings

Investigations conducted under the CEARP and RFA identified ER Site 56 as a potential release site. They listed the site because the site may have been contaminated with high explosives and well casing fragments and particulates.

2.3 Historical Operations

The site consisted of several (possibly six) wells measuring 20 ft deep, 8 ft in diameter and lined with 1/2 inch thick corrugated steel casing. Five wells were constructed at a location that is now on the south side of the 18-foot diameter Large Shock Tube (ER Site 89) about half way down the length of the tube, centered near the foot of the more easterly set of access steps to the top of the tube. Another well was constructed about 50 ft from the southeast corner of the fence around ER Site 91 (Lead Firing Site).

The tests associated with the Old Thunderwells were known as the "Bagpipe" tests. This testing program, jointly operated between SNL/NM and Lawrence Livermore National Laboratory (LLNL), was conducted between 1963 and 1971. Between 500 and 2,000 pounds of explosives for each test were placed in the bottom of the well and the test unit was placed near the top of the tube, where the blast pressures exerted several thousand pounds per square inch (psi). A bell shaped cavern was created in the bottom of each Thunderwell due to the force of the blasts. According to available information, there were 8 tests performed at the site, but there were only 5 documented Thunderwells on the site. It is believed that some of the tests may have been conducted in the above ground horizontal blast tubes at ER Site 89.

After each test was performed, the casing was removed from the well and the remaining hole was collapsed and filled with soil from the surrounding area.

3.0 Evaluation of Relevant Evidence

3.1 Unit Characteristics

The Old Thunderwells were constructed and used before the above-ground shock tubes (ER Site 89) existed and were used for studying the impact of shock waves on test units. Former locations of the wells and the description of the tests are based on information provided by the former Range Manager. The wells near the Large Shock Tube were open to the surface. A charge was detonated near the bottom of the hole, and the shock wave traveled up the well toward a test unit hanging overhead at the surface. The well casing within approximately 3 ft of the charge was deformed and/or fragmented by the detonation. The steel well casing was removed from the hole after each detonation and the well holes were backfilled with soil from the surrounding area, with the exception of the casing used in the last test which may still remain in the ground at that location. No depleted uranium was used in any of the tests. Only metal debris from the steel well casings and minor HE residues are suspected as being generated as the result of the blasts. The surface overlying and adjacent to the wells has been graded and used heavily for other shock tube tests since the Old Thunderwells testing operations were concluded.

The well located southeast of the adjacent ER Site 91 was used for 1 or 2 tests. These tests involved the use of water in creating the shockwave. A photograph taken in 1985 (CEARP) shows a metal cap on the top of the well. It is not known if the well was open to the surface during testing. This well was not damaged as the result of detonation, and no explosives contacted subsurface soils adjacent to the well. The casing was pulled from the well and the well was filled in following testing.

3.2 Operating Practices

Large pieces of shrapnel and explosives were generally picked up after a test. Any finely divided material was dispersed over the test area.

3.3 Presence or Absence of Visual Evidence

Since the tests were subsurface, and all test articles and the larger test article fragments were removed from the site, there is no visual evidence that releases of hazardous materials occurred. There are small metal fragments on the site. The sampling, discussed in Section 3.6, did not reveal any concentrations of RCRA regulated metals above background levels.

3.4 Results of Previous Sampling/Surveys

An Unexploded Ordnance (UXO)/High Explosives (HE) visual surface survey was conducted by KAFB Explosive Ordnance Disposal personnel in November of 1993. No UXO/HE or ordnance debris was found during the survey (SNL/NM, Sept. 1994). No geophysical surveys of the Thunderwells were performed since all metal casing was ostensibly removed from the wells. In

addition, the proximity of the Thunderwells to other large metallic objects such as the Large Shock Tube made electromagnetic geophysical methods impractical.

3.5 Assessment of Gaps in Information

Process knowledge and other available information help identify the most likely COCs which may be found in soils at ER Site 56, and help select the types of analyses to be performed on soil samples. While the history of past releases at the site is incomplete, analytical data from confirmatory soil samples collected in August 1995 (discussed below) are sufficient to determine whether releases of COCs occurred at the site.

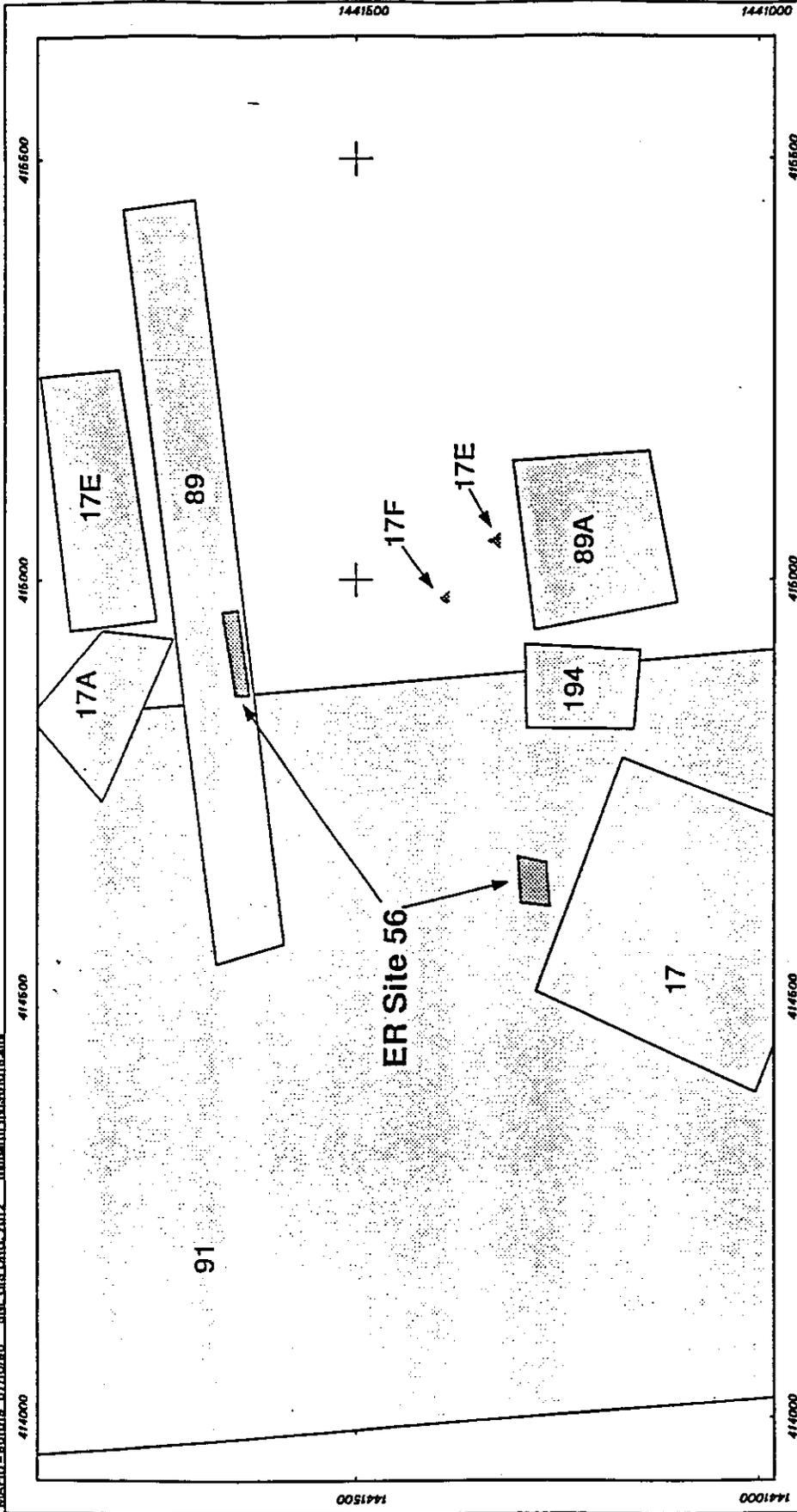
3.6 Confirmatory Sampling

Although the likelihood of hazardous waste releases at ER Site 56 was considered low, confirmatory soil sampling was conducted to determine whether COCs above background or detectable levels were released at this site. The confirmatory soil sampling program was performed in accordance with the rationale and procedures described in the Site 56 - Old Thunderwells Sampling and Analysis Plan developed in June 1995. A series of soil samples were collected to determine possible contamination at the site at judgementally selected locations (Figure 3). Since the tests were detonated in the subsurface, the majority of the explosive material would be contained at the center of the blast area. Therefore, the boreholes were advanced near the center of the thunderwells to target the "worst case" scenario for contamination at each of the well locations.

The Geoprobe™ sampling system was used to collect subsurface soil samples at this site. The Geoprobe™ sampling tool was fitted with a butyl acetate (BA) sampling sleeve and was then hydraulically driven to the top of the designated sampling depth. The sampling tool was opened, and driven an additional two feet in order to fill the two-foot long by approximately 1.25-inch diameter BA sleeve. The sampling tool and soil-filled sleeve were then retrieved from the borehole. Both ends of the seven-inch section of filled sleeve were immediately capped with a Teflon™ membrane and rubber end cap, sealed with tape, and placed in an ice-filled cooler at the site. The soil to be sent to the onsite laboratory was delivered to the lab in the sealed BA sleeve. The soil to be sent to the offsite laboratory was removed from the BA sleeve, emptied into and mixed in a decontaminated mixing bowl, then placed in 4 ounce glass sample containers using a decontaminated plastic spatula, sealed with tape and placed in an ice-filled cooler at the site.

A Geoprobe™ borehole was advanced near each known well location (Figure 4). Samples were taken at depths of 0-2, 5-7, 10-12, 15-17, 20-22, and 25-27 feet below ground surface (bgs). This sample interval is a standard interval used due to the 5-foot sleeve lengths of the Geoprobe™ sampling tool. Most samples were analyzed for HE residues and Target Analyte List (TAL) metals.

88 sample splits from five individual locations were collected and delivered to the appropriate laboratory. Of the 88 splits, 20 were analyzed by a commercial offsite laboratory, exceeding the 20 percent offsite analysis for verification purposes. A summary of the types of samples, number of sample locations, sample depths and analytical requirements for confirmatory soil samples collected at this site is presented in Table 1.

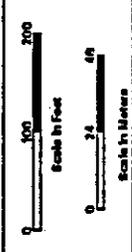


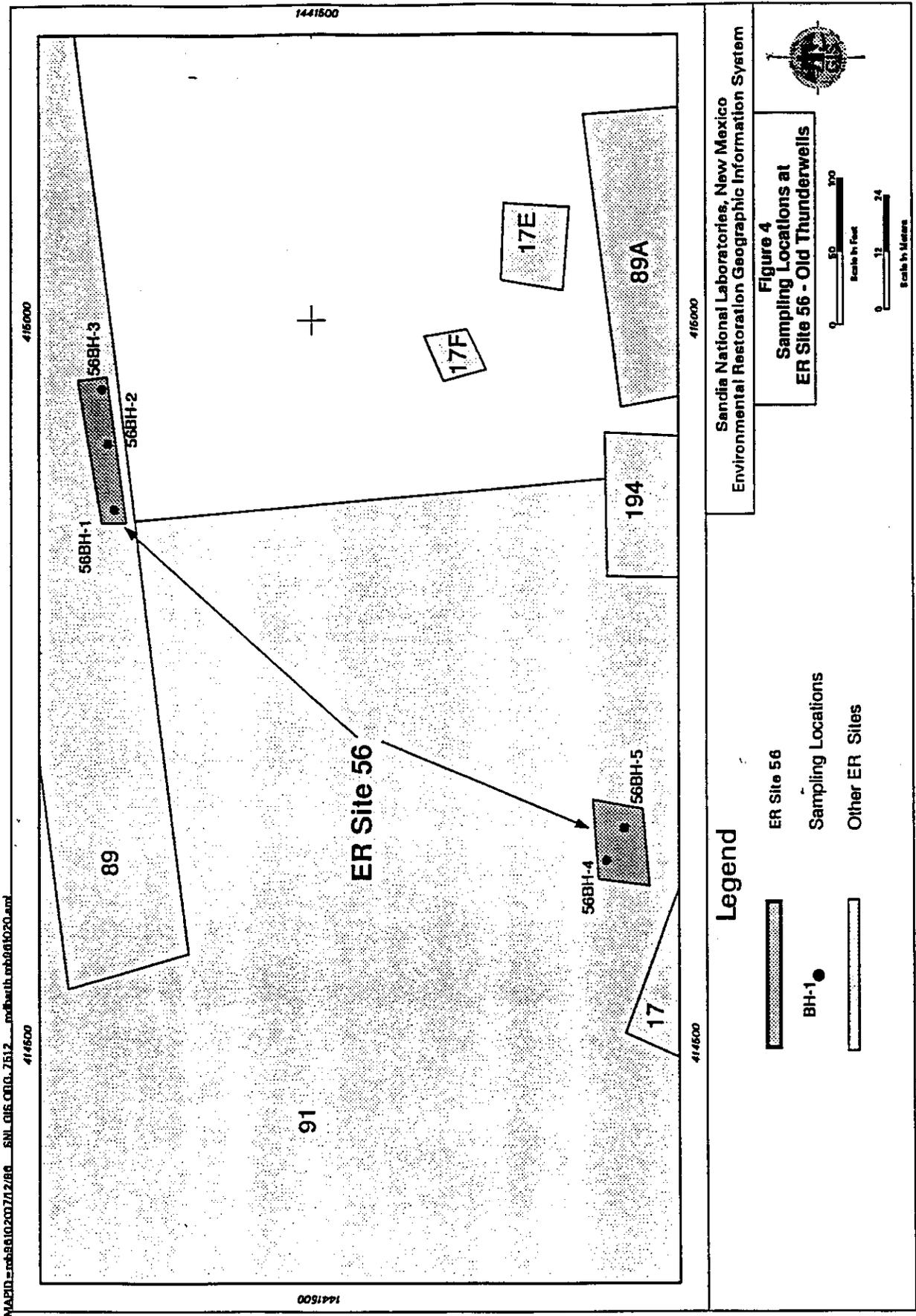
Legend

- ▲ ER Sites < .1 RCRO
- ▨ ER Site 56
- ▨ Other ER Sites

Sandia National Laboratories, New Mexico
 Environmental Restoration Geographic Information System

Figure 3
 Site Map for ER Site 56
 Old Thunderwells





ER Site 56 samples were analyzed by Inductively Coupled Plasma (ICP) for TAL Metals (EPA Method 6010, modified for the target metals) by the onsite Department 7584 Laboratory and for TAL Metals (EPA Method 6010/7000) by the offsite Lockheed Analytical Services of Las Vegas, Nevada. The HE samples were analyzed onsite by SNL Department 2552 High Explosives laboratory and by the offsite Lockheed laboratory. All samples were routed to the laboratories by the SNL/NM Sample Management Office. Routine SNL/NM chain-of-custody and sample documentation procedures were employed for all samples collected at this site.

Table 1
ER Site 54: Confirmatory Sampling Summary Table

Sampling Location	Analytical Parameters	Number of Borehole Locations	Top of Sampling Intervals at Each Borehole Location (ft)	Total Number of Investigative Samples	Total Number of QA/QC Samples	Samples Collection Date
<u>Boreholes 1, 2</u>	High Explosives	2	0,5,10,15,20,25	28	8	8/21/95
	TAL Metals					
<u>Boreholes 3, 4, 5</u>	High Explosives	3	0,5,10,15,20,25	44	8	8/22/95
	TAL Metals					

Quality assurance/quality control (QA/QC) samples collected during this effort consisted of two sets of aqueous equipment rinsate samples, one for the onsite lab and one for the offsite lab, that were analyzed for the same constituents as the other confirmatory soil samples. Two sets of aqueous samples, one for each laboratory, were collected as field blanks as well. No significant concentrations of COCs were detected in the QA/QC samples.

All samples were far below action level for all analytes in the analysis suite. A summary of all analytes for the TAL metals analysis is presented in Appendix A.2 and the corresponding summary for the High Explosives analysis is presented in Appendix A.3. Complete soil sample analytical data packages are archived in the SNL/NM Environmental Operations Records Center and are readily available for review.

3.7 Rationale for Pursuing a Confirmatory Sampling NFA Decision

The confirmatory sampling did not identify any residual COCs indicating past releases that could pose a threat to human health or the environment. Although there were some analytes that were above the laboratory detection limit, there were no analytes detected at the site that are classified as RCRA metals that were above the proposed RCRA Subpart S action levels.

4.0 Conclusion

Sample analytical results generated from this confirmatory sampling investigation have shown that there are no significant concentrations of COCs in soils at ER Site 56, and that additional investigations are unwarranted and unnecessary. Based on archival information and chemical and radiological analytical results of soil samples collected at the site, SNL/NM has demonstrated that this potential release site has been characterized in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use (Criterion 5 of Section 1.2). The site does not pose a threat to human health or the environment; therefore, ER Site 56 is recommended for an NFA determination.

5.0 References

5.1 ER Site 54 References

Sandia National Laboratories/New Mexico (SNL/NM), August 1995, Field Log #2RN, Pages 48 - 52, 08/21/95 - 8/22/95, Field notes of confirmatory sampling activities at ER Site 56 - Old Thunderwells.

5.2 Other References

Department of Energy (DOE), Albuquerque Operations Office, Environmental Safety and Health Division, Environmental Program Branch, September 1987, draft "Comprehensive Environmental Assessment and Response Program (CEARP) Phase 1: Installation Assessment, Sandia National Laboratories, Albuquerque", Department of Energy, Albuquerque Operations Office, Albuquerque, New Mexico.

IT Corporation (IT), March 1996, "Background Concentrations of Constituents of Concern to the Sandia National Laboratories/New Mexico Environmental Restoration Project and the Kirtland Air Force Base Installation Restoration Program", IT Corporation, Albuquerque, New Mexico.

New Mexico Environment Department (NMED), November 1995, "Environmental Restoration Document of Understanding", Santa Fe, New Mexico, November 16, 1995.

Sandia National Laboratories/New Mexico (SNL/NM), February 1995, "Program Implementation Plan for Albuquerque Potential Release Sites", Sandia National Laboratories Environmental Restoration Program, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 1995, "Site-Wide Hydrogeologic Characterization Project, Calendar Year 1994 Annual Report", Sandia National Laboratories Environmental Restoration Project, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 1996, "RCRA Facility Investigation Work Plan for Operable Unit 1335 Southwest Test Area", Sandia National Laboratories Environmental Restoration Project, Albuquerque, New Mexico.

U.S. Environmental Protection Agency (EPA), April 1987, "Final RCRA Facilities Assessment Report of Solid Waste Management Units at Sandia National Laboratories, Albuquerque, New Mexico." Prepared by A.T. Kearney, Inc., and Harding Lawson Associates under Contract No. 68-01-7038, April 1987.

U.S. Environmental Protection Agency (EPA), December 1987, "Hazardous Waste; Codification Rule for 1984 RCRA Amendments; Final Rule", *Federal Register*, Vol. 52, Title 40, Parts 144, 264, 265, 270, and 27, Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), July 1990, "Corrective Action for Solid Waste Management Units (SWMU) at Hazardous Waste Management Facilities, Proposed Rule," *Federal Register*, Vol. 55, Title 40, Parts 264, 265, 270, and 271.

U.S. Environmental Protection Agency (EPA), August 1992, "Hazardous Waste Management Facility Permit No. NM5890110518," EPA Region VI, issued to Sandia National Laboratories, Albuquerque, New Mexico.

U.S. Environmental Protection Agency (EPA), August 1993, "Module IV of RCRA Permit No. NM 5890110518," EPA Region VI, issued to Sandia National Laboratories, Albuquerque, New Mexico.

October 13, 2003

ADDITIONAL /SUPPORTING DATA

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