

5th + resubmittal of 2nd 10/3/96 Len Dawson
Confirmatory Summary No Data see pg 4-1

**PROPOSAL FOR
NO FURTHER ACTION
ENVIRONMENTAL RESTORATION SITES 93A, B, & C
MADERA CANYON ROCKET LAUNCHER PADS A, B, & C
OPERABLE UNIT 1333
SEPTEMBER 1996**

Prepared by
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Environmental Restoration Project
Albuquerque, New Mexico

Prepared for the
U.S. Department of Energy

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1.0 INTRODUCTION

1.1 Environmental Restoration Site Identification Number and Name

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a no further action (NFA) decision for Environmental Restoration (ER) Site 93, Madera Canyon Rocket Launcher Pads, Operable Unit 1333. ER Site 93 is listed in the Hazardous and Solid Waste Amendment (HSWA) Module IV (EPA August 1993) of the SNL/NM Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Facility Permit (NM5890110518) (EPA August 1992).

1.2 SNL/NM NFA Process

This proposal for a determination of an NFA decision has been prepared using the criteria presented in Section 4.5.3 of the SNL/NM Program Implementation Plan (SNL/NM February 1994). Specifically, this proposal will "contain information demonstrating that there are no releases of hazardous waste (including hazardous constituents) from solid waste management units (SWMU) at the facility that may pose a threat to human health or the environment" (as proposed in the Code of Federal Regulations [CFR], Section 40 Part 264.51[a] [2]) (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).

This request for an NFA decision for ER Site 93 is based on historical information and analytical results of confirmatory soil samples collected at the site. Concentrations of site-specific constituents of concern (COC) detected in the soil samples were first compared to background 95th percentile or upper tolerance limit concentrations of COCs found in SNL/NM soils (IT March 1996). The constituent concentration was also compared to the proposed 40 CFR Part 264 Subpart S (Subpart S) soil action level for the compound (EPA July 1990).

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

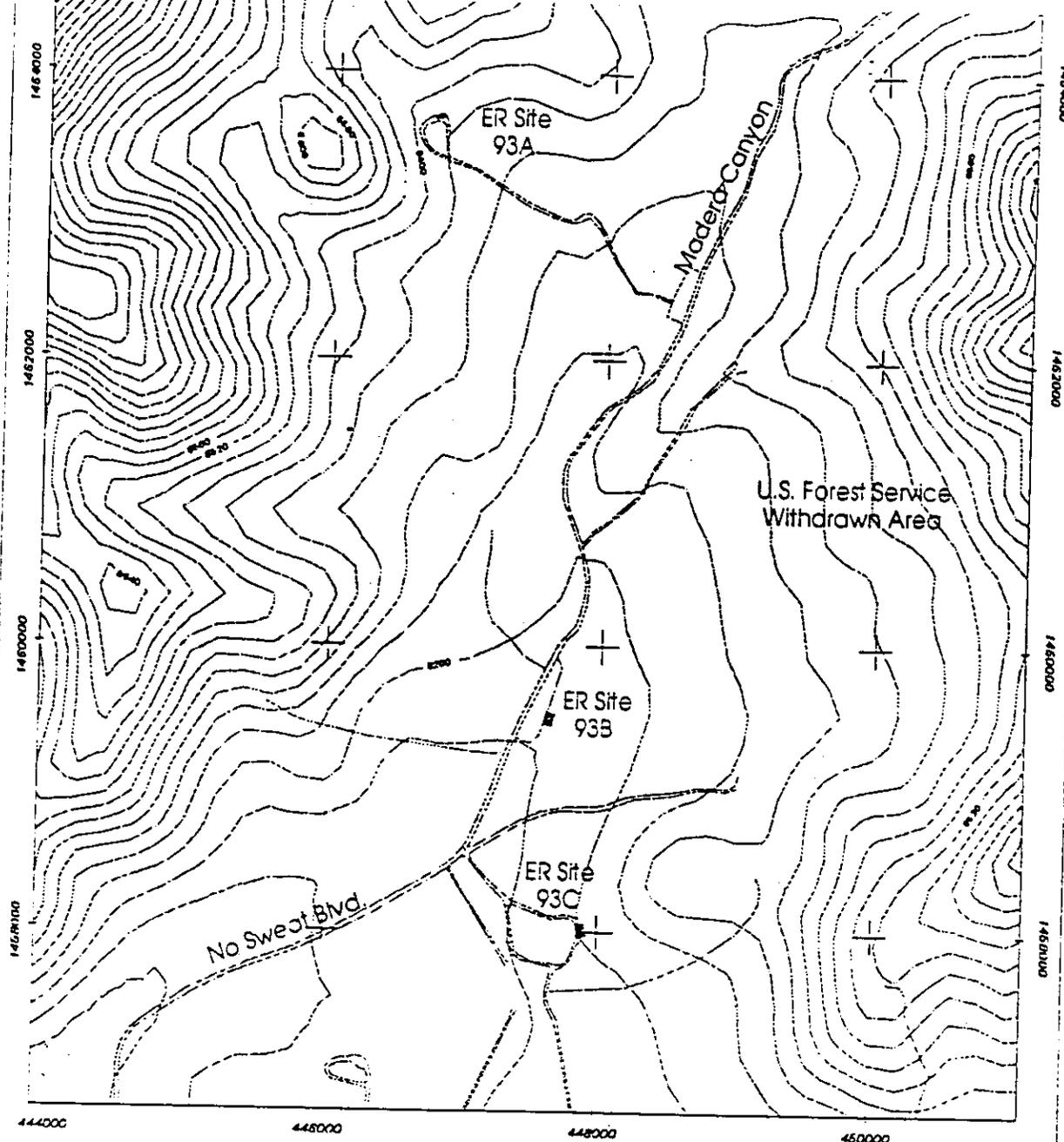
- NFA Criterion 1: The site cannot be located or has been found not to exist, is a duplicate potential release site (PRS) or is located within and, therefore, investigated as part of another PRS.
- NFA Criterion 2: The site has never been used for the management (that is, generation, treatment, storage, 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 one likely to occur in the future.
- NFA Criterion 4: There was a release, but the site was characterized and/or remediated under another authority that 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 93 soil sample analytical data indicate that concentrations of COCs at this site are less than SNL/NM background levels and proposed Subpart S soil action levels. ER Site 93 is proposed for an NFA decision based on historical information and confirmatory sampling data demonstrating that hazardous waste or COCs that may have been released from this SWMU into the environment 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 (ac) of land owned by the U.S. Department of Energy (DOE), with an additional 14,920 ac of land provided by land-use permits with Kirtland Air Force Base (KAFB), the U.S. Forest Service (USFS), the State of New Mexico, and the Isleta Pueblo. SNL/NM has been involved in nuclear weapons research, components development, assembly, testing, and other nuclear activities since 1945.

ER Site 93 (Figure 1-1) consists of three separate rocket launcher pads (designated subunits 93A, 93B, and 93C). ER Site 93 is located on land withdrawn by the DOE from the USFS (SNL/NM July 1994). The three subunits are comprised of concrete pads aligned in a northwest to southeast direction located in the Madera Canyon. Access to the Madera Canyon and the sites is provided by No Sweat Boulevard. The subunits lie on approximately 0.071 ac (93A), 0.164 ac (93B), and 0.171 ac (93C) at a mean elevation of 6,378 feet (ft), 6,170 ft, and 6,205 ft above sea level, respectively (SNL/NM September 1994).



Legend		Sandia National Laboratories, New Mexico Environmental Restoration Geographic Information System	
	KAFB Roads	OU 1333 Central Coyote Test Area	
	40 Foot Contours		
	OU 1333 ER Site 93	 Scale in Feet	Unclassified DRAFT
		 Scale in Meters	1:14400 1 in=1200'
		<small>Interim Mapping Protocol, San Mateo Base Area Covered Areas, Control Line 1927 North American Horizontal Datum, 1929 North American Vertical Datum</small>	
		<small>shebarl SNL GIS ORG. 7512 01/18/86 MAPID - 850329a</small>	

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Figure 1-1
Location of ER Site 93, Madera Rocket Launcher Pads

The subunits are located in the Madera Canyon on canyon floor alluvium and bedrock slopes. ER Sites 93A and 93B lie on Tesajo-Millett stony sandy loams, with soils of the Salas complex also present at ER Site 93A (USDA June 1977). Rock outcrop with soils of the Orthids complex are present at ER Site 93C (USDA June 1977). Immediate topographic relief around the site is greater than 1,000 ft. The nearest monitoring well is TSA-1, located approximately 1.6 miles west in the lower reaches of the Lurance Canyon, just west of the confluence with the Madera Canyon. Based on depth to groundwater in TSA-1 and the elevation of the three sites, depth to groundwater is estimated as greater than 300 ft for ER Site 93A and approximately 200 ft for ER Sites 93B and 93C.

Recent geophysical surveys in the Lurance Canyon (Bay Geophysical Associates October 1994) and drilling logs from the installation of the TSA-1 and Burn Site wells indicate that the alluvium in the Lurance Canyon is approximately 70 to 100 ft thick and unsaturated. Drilling logs from these wells suggest that the first saturated groundwater conditions are encountered in fractured Precambrian bedrock under confined to semiconfined hydraulic conditions. Local groundwater flow may be complicated by abundant fractures and faults in the area.

2.0 HISTORY OF THE SWMU

2.1 Previous Audits, Inspections, and Findings

ER Site 93 was identified during investigations conducted under the Comprehensive Environmental Assessment and Response Program (CEARP) (DOE September 1987) and the RCRA facility assessment (RFA) (EPA April 1987). The site is divided into three subunits (ER Sites 93A, 93B, and 93C) based on the physical separation of the three launch pads. Although ER Site 93 does not meet the regulatory definition of a SWMU, the CEARP speculated that the nature of activities at ER Site 93 may pose a reasonable threat of environmental contamination (DOE September 1987).

Concrete pads at ER Site 93 were used for launching various experimental rockets and missiles at targets suspended from cables at ER Site 81 (DOE September 1987). The CEARP and RFA investigations noted that some residual rocket propellant (explosive) and/or liner material could be associated with the launch pads. However, the status of the site remained uncertain with respect to RCRA-regulated hazardous waste. Insufficient information also prevented calculating a Hazard Ranking System score for the site.

2.2 Historical Operations

ER Site 93 consists of three separate rocket launcher pads designated ER Site 93A (Figure 2-1), 93B (Figure 2-2), and ER Site 93C (Figure 2-3). Based on current archival information, all of the rocket launcher pads were used as platforms for shoulder-fired missiles (93-12, 93-14) and portable rocket launching vehicles (93-18). However, it is not possible to distinguish the particular historical operations associated with each subunit based on available records. Therefore, the tests conducted at the ER Site 93 subunits are discussed comprehensively after construction activities are summarized.

Based on available historical aerial photographs, (Koogle and Pouls Engineering, Inc., April 10, 1992) the three subunits were constructed between June 1975 and September 1982 (SNL/NM August 1994). Initially, each subunit consisted of a small concrete pad, and these were used as platforms for shoulder-fired missiles and to stage the rocket launcher for firing. The area surrounding each pad was graded, possibly to stage heavy equipment during construction of the pad or to park monitoring equipment during the rocket launches. There are no other structures or visible activities in the historical aerial photographs (SNL/NM August 1994; Koogle and Pouls Engineering, Inc., April 10, 1992). The physical characteristics of each pad are identified below.

¹ All numbered citations within parentheses (93-) throughout this proposal refer to documents listed in the bibliography under Section 5.1 of this proposal.

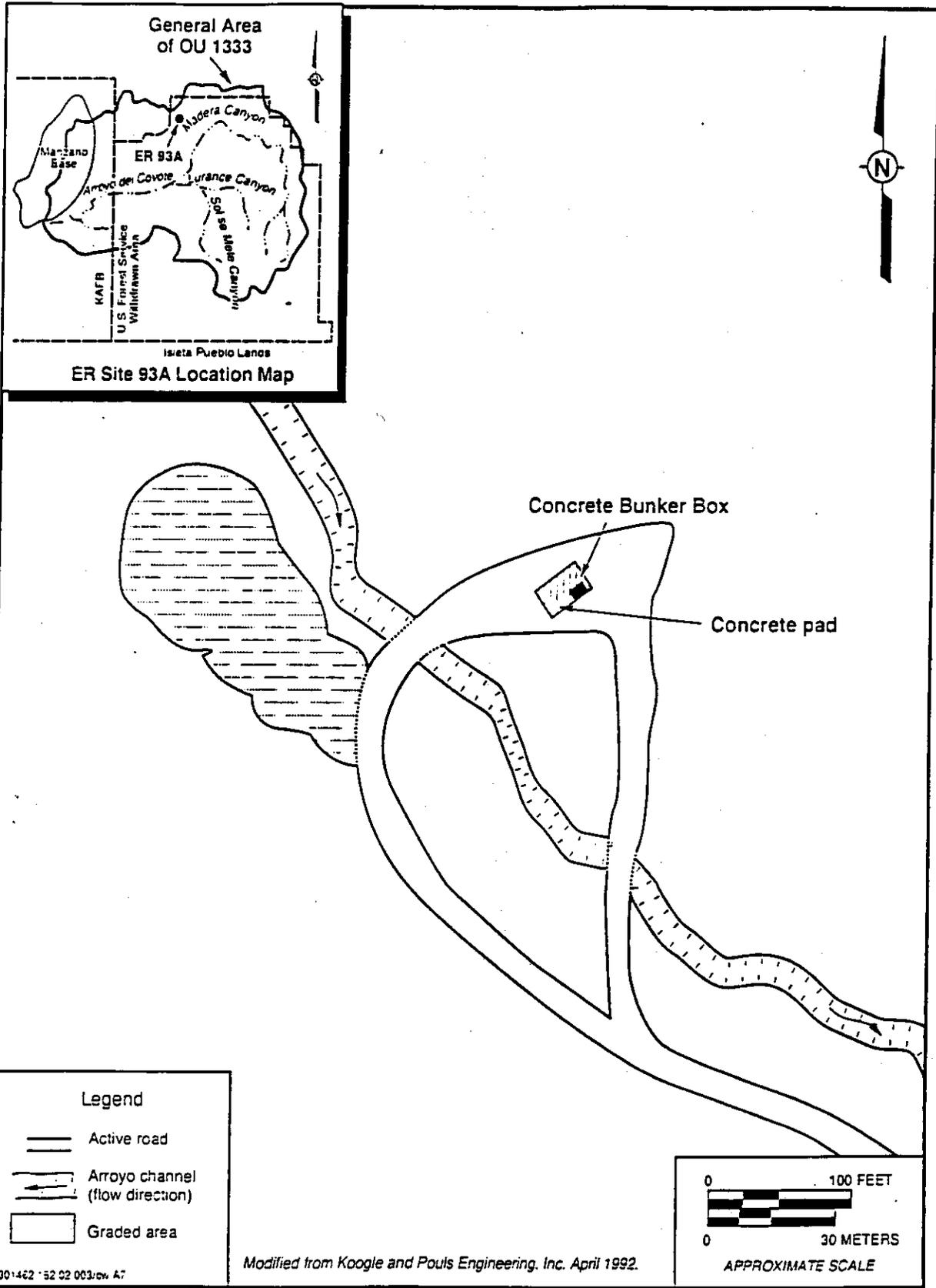


Figure 2-1
 Location of ER Site 93A, Madera Canyon Rocket Launcher Pad A

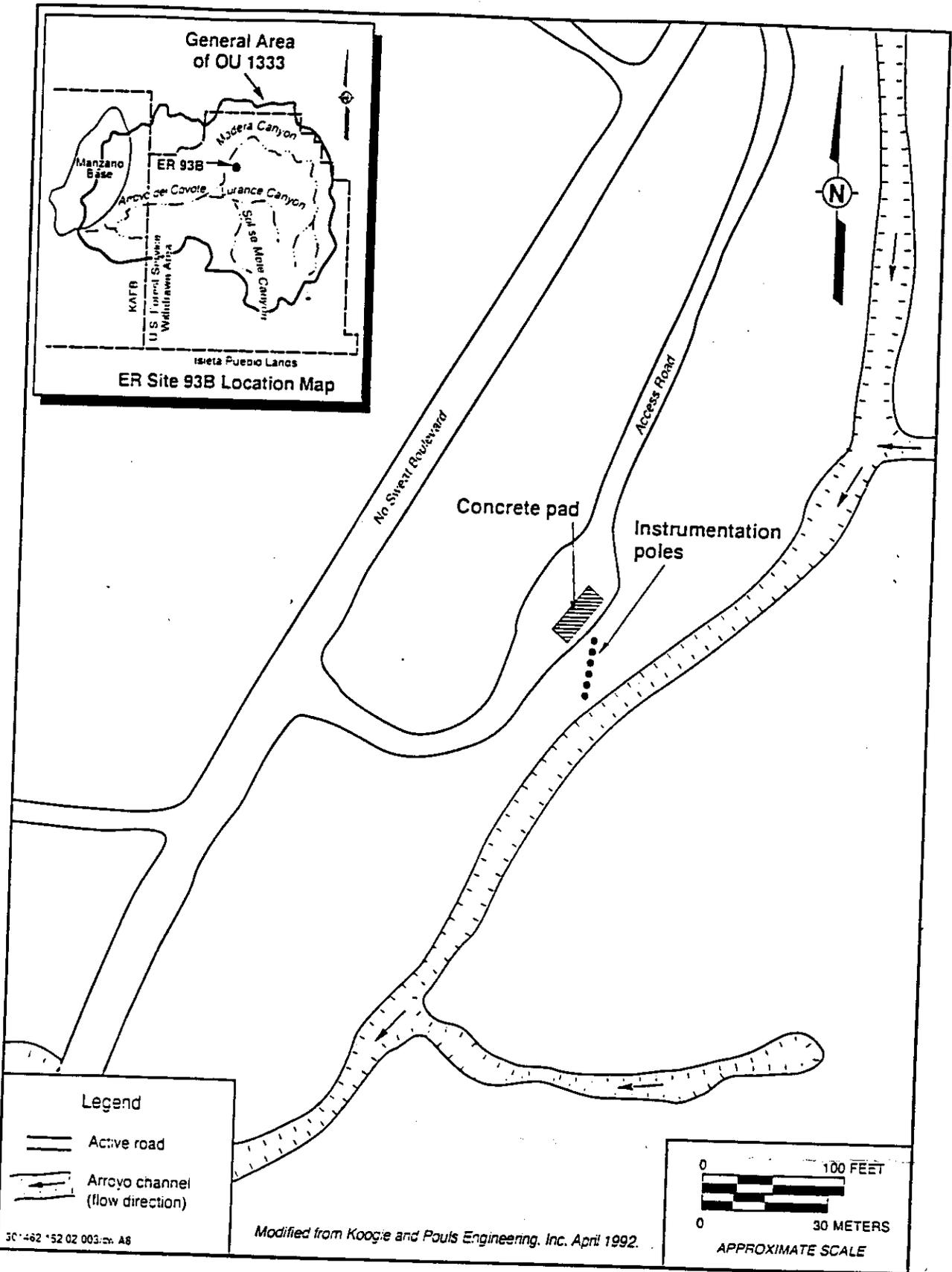


Figure 2-2
Location of ER Site 93B, Madera Canyon Rocket Launcher Pad B

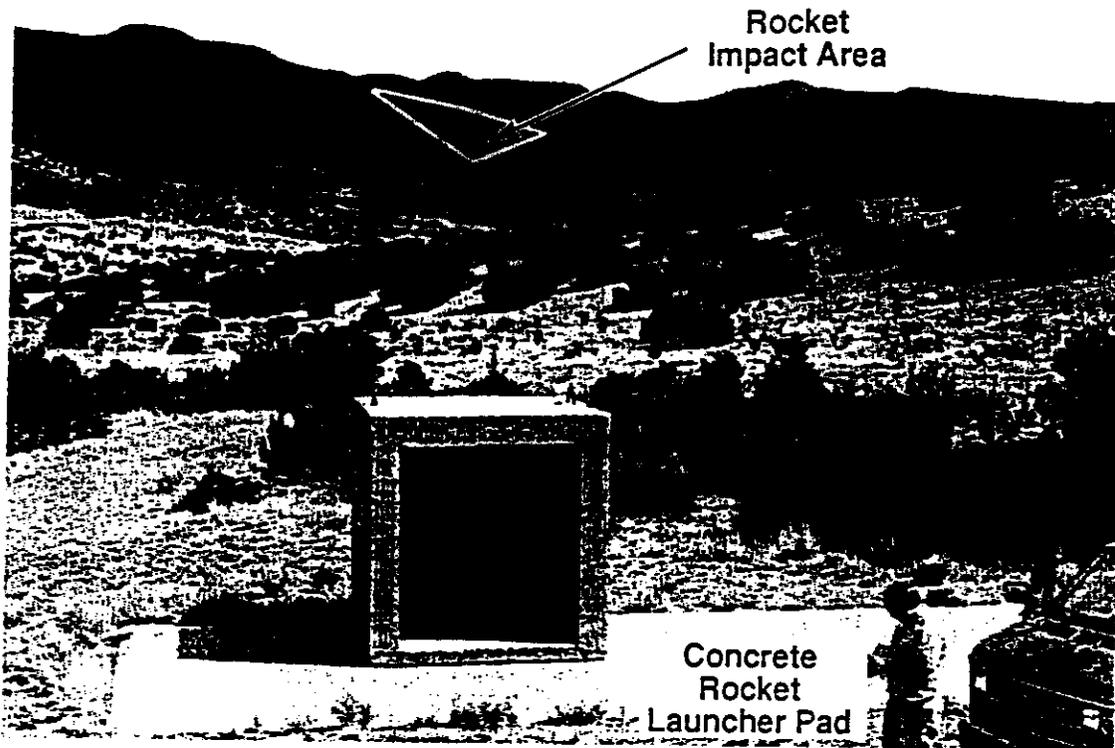


Figure 2-4a. Photograph of ER Site 93A, Madera Rocket Launcher Pad A and expected impact area. View to the southeast.

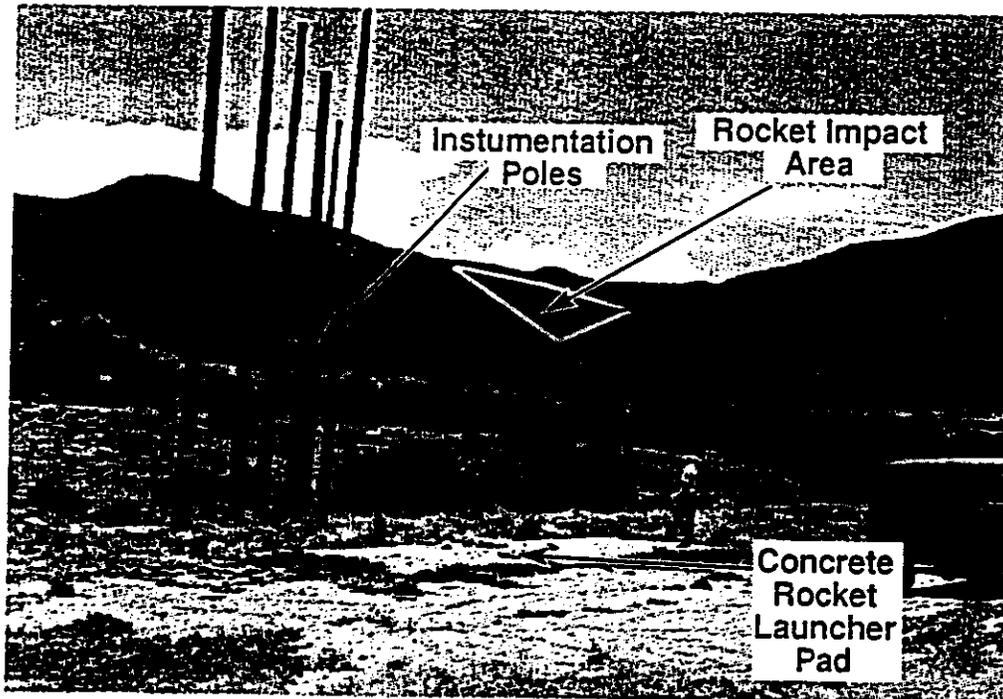


Figure 2-4b. Photograph of ER Site 93B, Madera Rocket Launcher Pad B and expected impact area. View to the southeast.

Figure 2-4
ER Site 93 Photographs



Figure 2-4c. Photograph of ER Site 93C, Madera Rocket Launcher Pad C and expected impact area. View to the southeast.

Figure 2-4 (Concluded)
ER Site 93 Photographs

ER Site 93A consists of a 14- by 36-ft concrete pad, a concrete bunker box approximately 7 by 7 by 8 ft that is open to the northwest, and a graded area (Figures 2-1 and 2-4a). The concrete bunker box was placed on the eastern portion of the concrete pad between 1985 and 1991 (SNL/NM August 1994). The bunker box may have been used to house personnel and/or equipment when rockets were fired.

ER Site 93B consists of a 12- by 35-ft concrete pad and six 35- to 40 ft-high wooden poles (SNL/NM August 1994) (Figures 2-2 and 2-4b). The wooden poles were placed southeast of the concrete pad sometime after 1983 (SNL/NM August 1994). These poles may have held telemetry equipment used to monitor and track the flight path of the rockets.

ER Site 93C consists of a 15- by 35-ft concrete pad (SNL/NM August 1994) (Figures 2-3 and 2-4c). A shallow exploratory pit and a mine shaft with associated tailings are located near the pad, but these features are not associated with ER Site 93 activities. The U.S. Air Force (USAF) (93-24) currently owns the mine shaft.

From 1979 through 1989, the U.S. Department of Defense (DoD) used the ER Site 93 pads to launch approximately 400 guided missiles or rockets at targets suspended from the southern aerial cable at ER Site 81 (93-16). Guided missiles fired from ER Site 93 were conventional weapons consisting of shoulder-fired Red-eyes, Stingers, and SA-7s (93-1, 93-4, and 93-14). The missiles contained a booster and main rocket motor. The booster contained less than one-half pound of rocket propellant to launch the rocket several hundred feet away from the individual firing the missile, at which point the main rocket motor engaged to propel the missile to its target (93-12). HVAR and ZUNI rockets were also fired for telemetry studies (93-9, 93-29). The first 20 missiles launched reportedly had explosive warheads, all of which detonated on impact (93-1, 93-4). Approximately 24 missiles have been fired since 1990 (93-13). The number of missiles or rockets fired from each of the individual pads is unknown, but each pad was used as a launch site for shoulder-fired missiles (93-12, 93-14) and portable rocket launchers (93-18). There is no launch debris associated with any of the ER Site 93 launch pads (93-8).

The missile flight path is along a slightly northwest to southeast line extending from the rocket launcher pads toward the impact area in Sol se Mete Canyon (Figures 2-4 and 2-5) (93-1, 93-4, 93-27). The impact area lies southeast of ER Site 81 (Figure 2-5). Flight path lengths from the three subunits to the impact area are approximately 2.6 miles (mi) (93A), 1.8 mi (93B), and 1.5 mi (93C). Recovery of missile and rocket motor components from the impact area was never attempted because the rocket propellant was burned in flight and the missiles containing warheads detonated on impact (93-1). Debris found in the impact area in the southeast corner of ER Site 81 (Figure 2-5) includes metal shrapnel, electrical components, rubber rings, and plastic insulation (93-1, 93-4, 93-19). No rocket propellant or unexploded ordnance (UXO)/high explosives (HE) was found during a recent UXO/HE survey of the site and impact area (93-8). Based on the DoD origin of debris in the impact area in the Sol se Mete Canyon, it is assumed that the USAF maintains responsibility for the impact area.

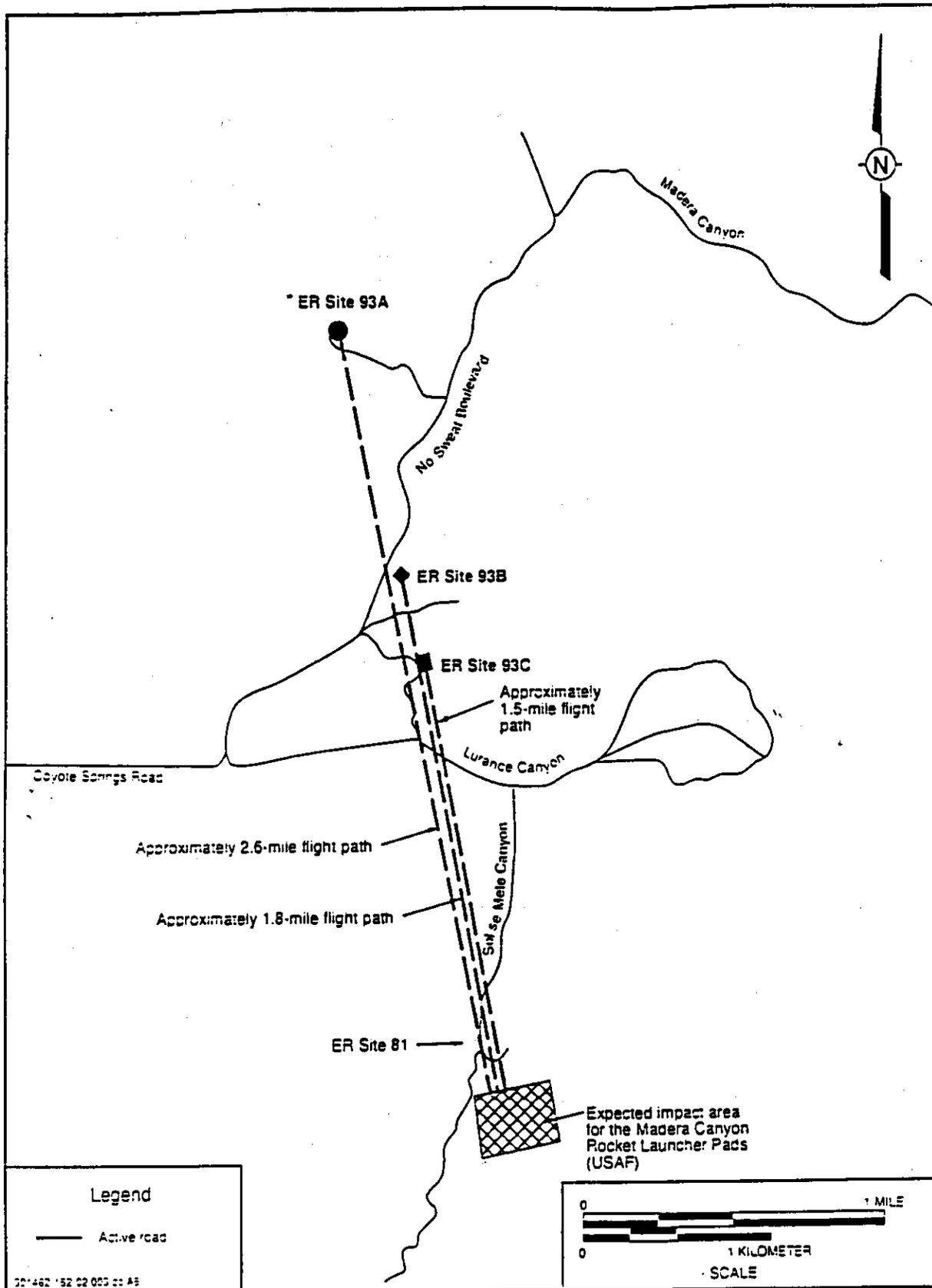


Figure 2-5
 Madera Canyon Rocket Launcher Pads (93A, 93B, and 93C)
 and Impact Area

3.0 EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics

ER Site 93 is comprised of three concrete pads surrounded by graded areas, a concrete bunker box at ER Site 93A, and six poles at ER Site 93B. The concrete pads were used to launch shoulder-fired missiles and to stage rocket launchers, and the graded areas may have been used to stage support equipment. At ER Site 93A, the concrete box may have provided protection for personnel or equipment. The six poles at ER Site 93B are believed to have held telemetry equipment that monitored the flight of the missiles.

3.2 Operating Practices

The three subunits of ER Site 93 (A, B, and C) were used for DoD tests that involved launching more than 400 conventional missiles and rockets (93-1, 93-4, 93-9, 93-14). The only hazardous constituent used in the testing was a solid nitrocellulose/nitroglycerin-based rocket propellant (93-28) that completely burned in flight (DOE September 1987, 93-5, 93-6). The missile rocket motors were modified with aluminum/ammonium perchlorate (93-12, 93-25). Small motors using less than one-half pound of propellant thrust the shoulder-fired missiles a distance of several hundred feet from the launch pads and personnel firing the missile, at which point the main rocket motors engaged and propelled the missile to its final target in the Sol sé Mete Canyon (93-12). Because no rocket propellant was found at the subunits (93-8), the only potential contaminants at the site would be derived from the rocket propellant exhaust (93-12).

The components of the rocket exhaust (Table 3-1) were primarily carbon dioxide (CO₂), carbon monoxide (CO), water (H₂O), hydrogen (H₂), nitrogen (N₂), hydrochloric acid (HCl), and aluminum oxide (Al₂O₃) (93-12, 93-26), with a small component of lead (0.07 weight percent) in the HVAR rocket exhaust. Most of the combustion products would have dispersed as gases and aerosols (93-12), with some particulate possibly remaining in the launch pad areas.

3.3 Presence or Absence of Visual Evidence

ER Site 93 is comprised of three concrete pads surrounded by graded areas, a concrete bunker box at ER Site 93A, and six poles at ER Site 93B. These are the only physical structures associated with past activities, as evidenced by historical aerial photographs (Koogle and Pouls Engineering, Inc., April 10, 1992) that indicate no other activities or structures were present at the subunits comprising ER Site 93 (SNL/NM August 1994). Additionally, there is no visible evidence of debris around the subunit sites (93-8).

Because the missiles used in testing at each subunit were expensive (approximately \$100,000 each), any malfunction that prevented a launch was corrected on site or the missile was returned for repair (93-12). The missiles were under strict control at all times and were never left or stored at any subunit in any form (93-12). Additional items used in the test launches (e.g., instrumentation) were presumably transported to the subunits as they were needed and were not permanent structures.

Table 3-1
Exhaust Components from Typical Rocket Motors^a

Rocket Motor	Components Expressed as Weight Percent							
	CO ₂	CO	H ₂ O	H ₂	N ₂	HCl	Al ₂ O ₃	Other
ZUNI	11.6	42.0	21.2	13.2	11.9	NR	NR	0.1 unspec.
HVAR	7.3	44.7	14.1	23.5	9.0	NR	NR	0.7 K ₂ O 0.68 SO ₂ 0.07 Pb
Sprint ^b	26.4	16.4	19.8	0.4	11.0	11.0	13.6	NR
Javelin ^b	5.0	28.3	13.0	1.3	11.0	13.4	28.8	NR

^a Modified from Table 2 in 93-26 and Table 12 in U.S. Department of Energy (DOE), Albuquerque Operations Office, September 1992, draft. "Special Technical Reports, Coyote Canyon Test Complex Environmental Assessment, Sandia National Laboratories, Albuquerque," Albuquerque Operations Office, U.S. Department of Energy, Albuquerque, New Mexico.

^b Exhaust components similar to exhaust emitted from Redeye and Stinger missiles (93-25, Sandia National Laboratories, January 1995, Environmental Operations Record Center Record Number ER/1333 093/INT/95-013, Sandia National Laboratories, Albuquerque, New Mexico).

KI₂O = Potassium oxide.

NR = No reported information for indicated component.

Pb = Lead.

SO₂ = Sulphur dioxide.

unspec. = unspecified.

3.4 Results of Previous Sampling/Surveys

In October 1993, KAFB Explosive Ordnance Division conducted a visual survey for the presence of UXO/HE on the ground surface of each of the subunits of ER Site 93. The three subunits of ER Site 93 were reported as one site. The survey did not identify any rocket propellant or live ordnance. Expended slap flares and smoke grenades were found (93-8), but these items are associated with DoD war games that occur in the area.

3.5 Assessment of Gaps in Information

There is an absence of records documenting the launches specific to each subunit of ER Site 93. The three subunits are simply different locations used to conduct similar tests. Therefore, it is difficult to distinguish the particular historical operations associated with each. Additionally, there are no analytical data to verify that a release did not occur. However, solid rocket propellant was the only hazardous constituent used at the site (DOE September 1987, 93-5, 93-6), and the only potential constituents of concern at the rocket pads would have been produced by the rocket propellant exhaust (93-12).

Rocket propellant exhaust is composed primarily of carbon dioxide, carbon monoxide, water, hydrogen, nitrogen, hydrochloric acid, and aluminum oxide (Table 3-1). Most of these combustion products would disperse as gases and aerosols (93-12), with some particulate possibly remaining in the launch pad areas. Because one of the trace exhaust components in the HVAR rocket is lead (0.07 weight percent), small releases of lead may have occurred when HVAR rockets were fired. However, the amount of lead in the launch pad areas is believed to be insignificant, based on analytical results from soil samples collected around the Technical Area III rocket sled track (DOE September 1992).

HVAR rockets are used frequently at the Technical Area III rocket sled track, and soil samples adjacent to the track contain lead concentrations of 11 to 18 milligrams per kilogram (mg/kg) (DOE September 1992), which is within the reported range of 6.5 to 100 mg/kg for surface soil background lead concentrations in the Lower Canyons/Upper Canyons Area Group (IT March 1996). The soil surrounding the Technical Area III sled track is a worst-case scenario for potential lead accumulation from rocket propellant exhaust, because the rockets remain in a horizontal trajectory near the ground surface over the entire sled track path. At ER Site 93, the rockets did not remain near the ground when fired, and the exhaust would have dispersed over a very large area relative to exhaust dispersion at the sled track. Therefore, lead is expected not to be present at concentrations above background at the ER Site 93 rocket launcher pads. There are no other constituents of concern in the particulate derived from the rocket propellant exhaust.

While the history of past releases at the site is convincing, analytical data from confirmatory soil samples collected in May 1996 (discussed below) provide additional information regarding actual COC concentrations. This information is 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 93 was considered low, confirmatory soil sampling was conducted based on regulatory input to determine whether COCs above background or detectable levels were released at this site. Soil samples were collected from each subunit in accordance with ER FOP 94-52 (SNL/NM January 1995). Four locations were sampled at each subunit at 0- to 6-in. and 6- to 12-in. intervals (Figures 3-1, 3-2, and 3-3). A single duplicate sample was collected from soil in front (i.e., southwest) of the concrete pad at each subunit at the 0- to 6-in. interval. All soil samples were submitted for off-site analysis for lead by EPA Method 6010. Table 3-2 presents the results of off-site analysis, along with a comparison to local background levels and the applicable proposed RCRA Subpart S Soil Action Level.

3.7 Rationale for Pursuing an NFA Decision

The subunit sites at ER Site 93 were used for launching various missiles and rockets, and rocket propellant was the only hazardous constituent used at the subunits. An investigation conducted under the CEARP indicated that some residual rocket propellant and/or liner material could be associated with the launch site (DOE September 1987), but this postulate is unsubstantiated by ER Project interviews (93-1, 93-2, 93-4, 93-13, 93-14). Subsequent to the CEARP inspection, the U.S. Environmental Protection Agency conducted a RFA. The RFA report identified ER Site 93 in Section VII, Other Areas of Concern, which addresses areas that do not meet the regulatory definition of a SWMU (EPA April 1987).

In October 1993, a UXO/HE survey conducted by KAFB found no live ordnance at any of the subunits (93-8). Review and analysis of the ER Site 93 soil sample analytical data indicate that concentrations of COCs at this site are comparable with SNL/NM background levels, and much less than proposed Subpart S soil action levels. ER Site 93 is proposed for an NFA decision based on historical information and confirmatory sampling data demonstrating that hazardous waste or COCs that may have been released from this SWMU into the environment pose an acceptable level of risk under current and projected future land use (Criterion 5).

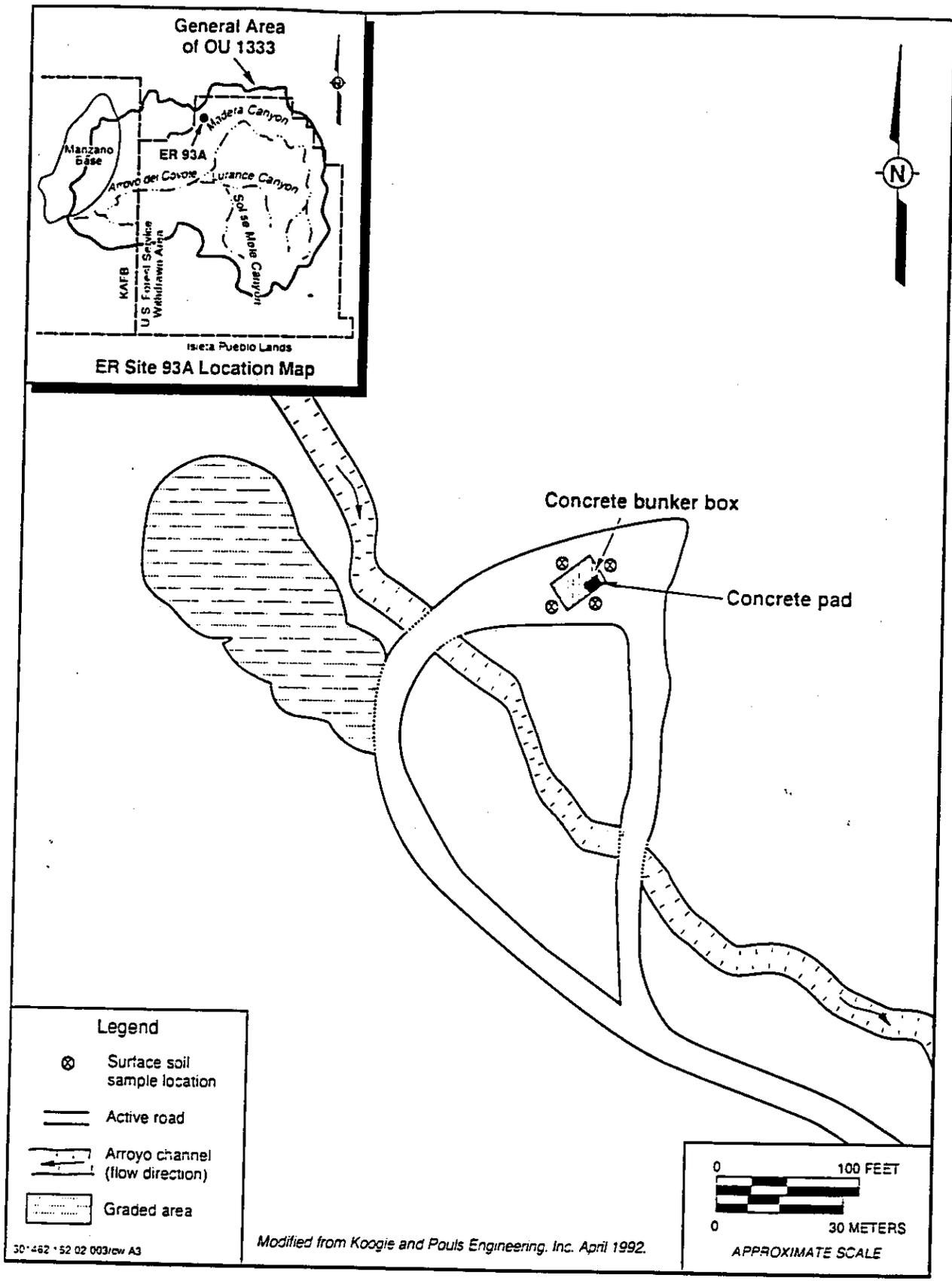


Figure 3-1
 Sampling Locations at ER Site 93A

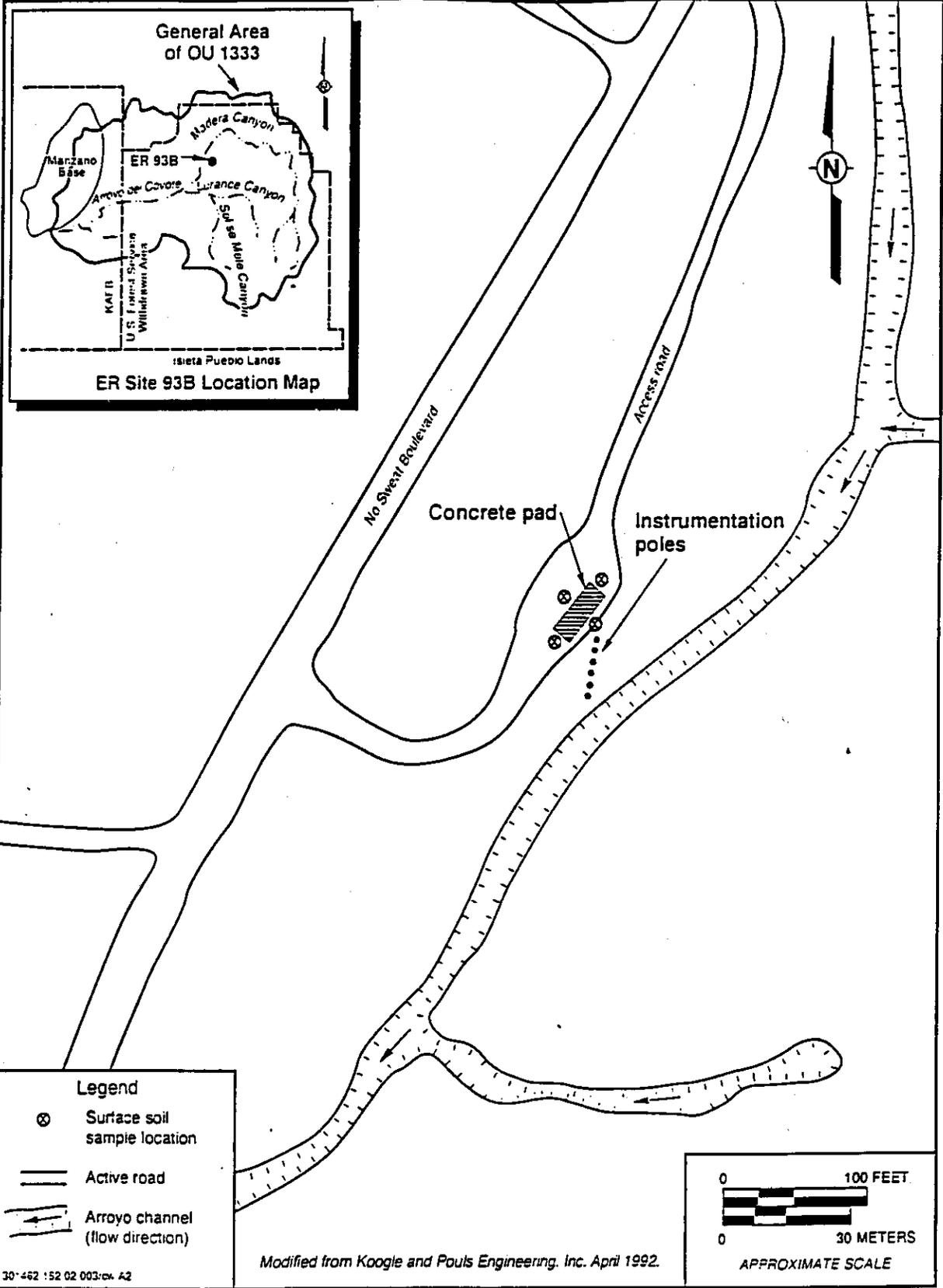


Figure 3-2
Sampling Locations at ER Site 93B

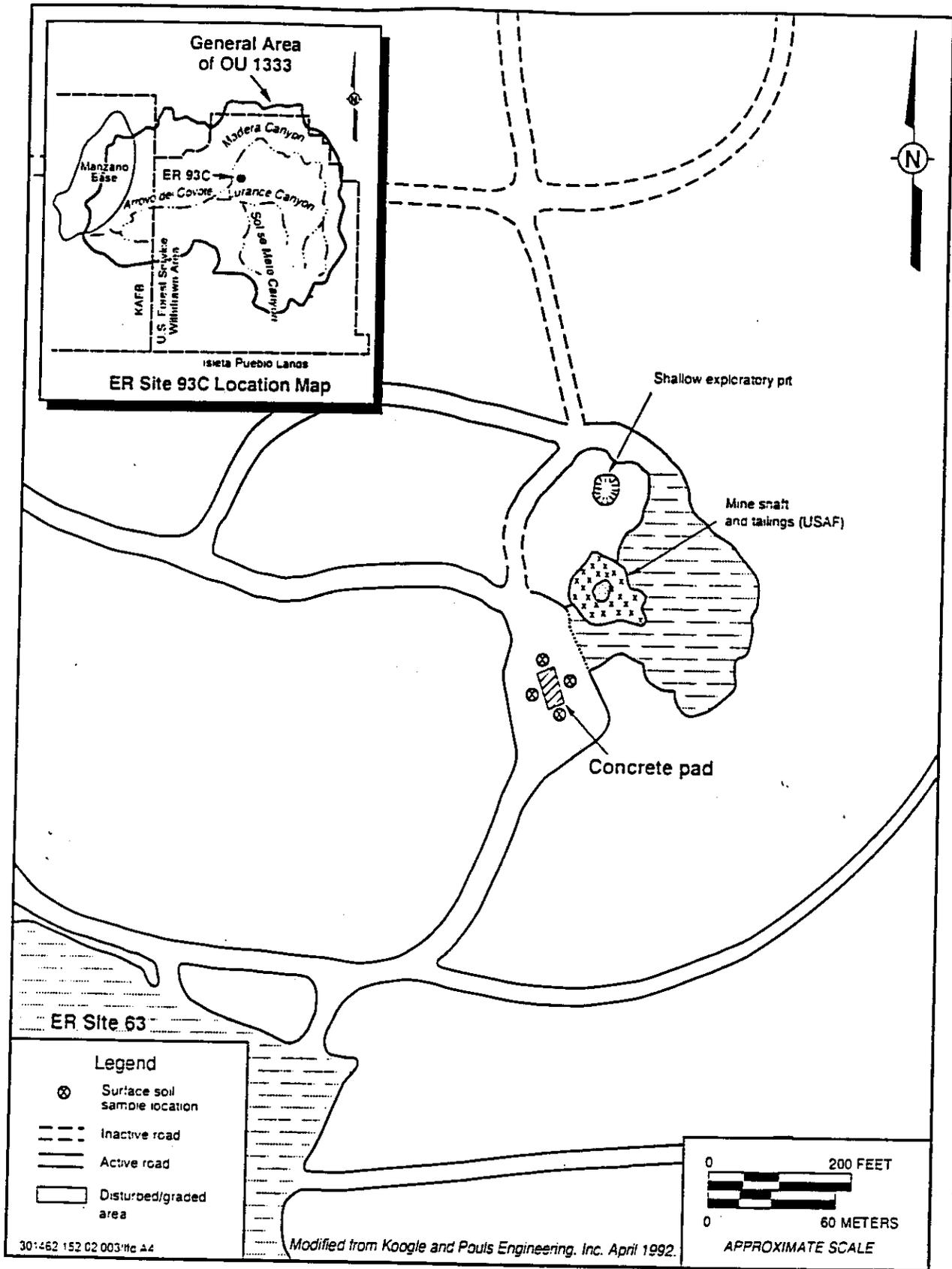


Figure 3-3
Sampling Locations at ER Site 93C

**Table 3-2
Summary of Offsite Soil Sample Analytical Results for Lead**

Subunit/Sample ID	Result 0-6 in. [mg/kg]	Result 6-12 in. [mg/kg]	UTL ^a [mg/kg]	Soil Action Level ^b [mg/kg]
93A/CY93A-GR-013	9.2/9.6	8.1	52.1	2,000
93A/CY93A-GR-014	11.3	4.7	52.1	2,000
93A/CY93A-GR-015	8.1	6.2	52.1	2,000
93A/CY93A-GR-016	8.7	8.0	52.1	2,000
93B/CY93B-GR-017	9.1/8.6	8.4	52.1	2,000
93B/CY93B-GR-018	9.0	7.4	52.1	2,000
93B/CY93B-GR-019	8.8	10.0	52.1	2,000
93B/CY93B-GR-020	9.6	8.2	52.1	2,000
93C/CY93C-GR-021	8.6/9.7	9.2	52.1	2,000
93C/CY93C-GR-022	9.6	10.2	52.1	2,000
93C/CY93C-GR-023	9.6	9.7	52.1	2,000
93C/CY93C-GR-024	9.7	8.6	52.1	2,000

^aBackground Concentrations of Constituents of Concern to the Sandia National Laboratories/New Mexico Environmental Restoration Project and the Kirtland Air Force Base Installation Restoration Program.

^bRCRA 40 CFR Part 264, Subpart S, *Proposed Soil Action Levels*.

CFR = Code of Federal Regulations.

mg/kg = Milligram per kilogram.

RCRA = Resource Conservation and Recovery Act.

UTL = upper tolerance limit.

Subunit 93

4.0 CONCLUSION

Based upon the evidence cited above, no potential remains for a significant release of hazardous waste (including hazardous constituents) that may pose a threat to human health or the environment. Therefore, ER Site 93 is recommended for an NFA determination.



5.0 REFERENCES

5.1 ER Site Bibliography

Section 5.1 contains a comprehensive bibliographical list of the documents relating to ER Site 93. This list is arranged numerically by the numbers assigned to each document.

ER Site Reference Number	Reference
93-1.	Sandia National Laboratories/New Mexico, May 1993, Environmental Operations Record Center Record Number ER/1333 093/INT/95-001, Sandia National Laboratories, Albuquerque, New Mexico.
93-2.	Sandia National Laboratories/New Mexico, October 1985, Environmental Operations Record Center Record Number ER/1333 093/INT/95-002, Sandia National Laboratories, Albuquerque, New Mexico.
93-3.	Reference removed/not applicable to site.
93-4.	Notes Relating to Site 93, [n.d.]. Sandia National Laboratories, Albuquerque, New Mexico.
93-5.	Sandia National Laboratories, March 1987. "CEARP Phase I, Preliminary Draft," Sandia National Laboratories, Albuquerque, New Mexico.
93-6.	Sandia National Laboratories, May 1986. "CEARP Phase I, Draft," Sandia National Laboratories, Albuquerque, New Mexico.
93-7.	Gaither, K., May 1992. Field Notes Relating to Site 13, Sandia National Laboratories, Albuquerque, New Mexico.
93-8.	Young, M. Memorandum to Distribution, Sandia National Laboratories, Albuquerque, New Mexico, September 1, 1994.
93-9.	Notes Relating to Site 93, August 1993. Sandia National Laboratories, Albuquerque, New Mexico.
93-10.	Sandia National Laboratories, 1993. "Base Map for ER Site 93, ADS 1282," GIS Map ID 930060, Albuquerque, New Mexico.

- 93-11. Gaither, K., Memorandum to K. Karp, Sandia National Laboratories, Albuquerque, New Mexico, October 28, 1992.
- 93-12. Sandia National Laboratories, November 1994. Environmental Restoration Project Information Sheet for ER Site 93, Madera Canyon Rocket Launcher Pads, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-13. Palmieri, D., and E. Larsen. Memorandum to Project File, OU 1333, Canyons Test Area, Sandia National Laboratories, Albuquerque, New Mexico, December 6, 1994.
- 93-14. Sandia National Laboratories/New Mexico, June 1994, Environmental Operations Record Center Record Number ER/1333 093/INT/95-003, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-15. Sandia National Laboratories/New Mexico, November 1994, Environmental Operations Record Center Record Number ER/1333 093/INT/95-004, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-16. Sandia National Laboratories/New Mexico, December 1994, Environmental Operations Record Center Record Number ER/1333 093/INT/95-005, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-17. Sandia National Laboratories/New Mexico, November 1994, Environmental Operations Record Center Record Number ER/1333 093/INT/95-006, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-18. Sandia National Laboratories/New Mexico, November 1994, Environmental Operations Record Center Record Number ER/1333 093/INT/95-007, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-19. Brouillard, L. Memorandum to Project File, ADS 1333, Canyons Test Area, Sandia National Laboratories, Albuquerque, New Mexico, March 30, 1994.
- 93-20. Sandia National Laboratories/New Mexico, January 1995, Environmental Operations Record Center Record Number ER/1333 093/INT/95-008, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-21. Sandia National Laboratories/New Mexico, January 1995, Environmental Operations Record Center Record Number ER/1333 093/INT/95-009, Sandia National Laboratories, Albuquerque, New Mexico.

- 93-22. Sandia National Laboratories/New Mexico, January 1995, Environmental Operations Record Center Record Number ER/1333 093/INT/95-010, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-23. Sandia National Laboratories/New Mexico, January 1995, Environmental Operations Record Center Record Number ER/1333 093/INT/95-011, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-24. Sandia National Laboratories/New Mexico, January 1995, Environmental Operations Record Center Record Number ER/1333 093/INT/95-012, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-25. Sandia National Laboratories/New Mexico, January 1995, Environmental Operations Record Center Record Number ER/1333 093/INT/95-013, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-26. Taylor, J.M., Memorandum to Distribution, Sandia National Laboratories, Albuquerque, New Mexico, June 8, 1983.
- 93-27. Sandia National Laboratories/New Mexico, March 1994, Environmental Operations Record Center Record Number ER/1333 093/INT/95-014, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-28. Tachau, R.D.M. Memorandum to S. Chavez, Sandia National Laboratories, Albuquerque, New Mexico, January 17, 1991.
- 93-29. Sandia National Laboratories/New Mexico, January 1995, Environmental Operations Record Center Record Number ER/1333 093/INT/95-015, Sandia National Laboratories, Albuquerque, New Mexico.
- 93-30. Sandia National Laboratories/New Mexico, January 1995, Environmental Operations Record Center Record Number ER/1333 093/INT/95-016, Sandia National Laboratories, Albuquerque, New Mexico.

5.2 Reference Documents

Bay Geophysical Associates, Inc. (BGA), October 1994. Final Report: Comparison of Geophysical Techniques, Lurance Canyon, Sandia National Laboratories, Albuquerque, New Mexico.

BGA, see Bay Geophysical Associates, Inc.

DOE, see U.S. Department of Energy.



EPA, see U.S. Environmental Protection Agency.

IT, see IT Corporation.

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," prepared by IT Corporation for Sandia National Laboratories/New Mexico, Albuquerque, New Mexico.

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

Sandia National Laboratories/New Mexico (SNL/NM), August 1994. "Historical Aerial Photo Interpretation of the Canyons Test Area, OU 1333," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), July 1994. "Ownership (Land Use), Canyons Test Area—ADS 1333," GIS Group, Environmental Restoration Department, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), February 1994, draft. "Program Implementation Plan for Albuquerque Potential Release Sites," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), September 1994. "Mean elevation and Acreage Computation Report," GIS Group, Environmental Restoration Department, Sandia National Laboratories, Albuquerque, New Mexico.

SNL/NM, see Sandia National Laboratories/New Mexico.

USDA, see U.S. Department of Agriculture.

U.S. Department of Agriculture (USDA), June 1977. "Soil Survey of Bernalillo County and Parts of Sandoval and Valencia Counties, New Mexico," Soil Conservation Service, U.S. Department of Agriculture, Washington D.C.

U.S. 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 I: Installation Assessment, Sandia National Laboratories, Albuquerque," Albuquerque Operations Office, U.S. Department of Energy, Albuquerque, New Mexico.

U.S. Department of Energy (DOE), Albuquerque Operations Office, September 1992, draft. "Special Technical Reports, Coyote Canyon Test Complex Environmental Assessment, Sandia National Laboratories, Albuquerque," Albuquerque Operations Office, U.S. Department of Energy, Albuquerque, New Mexico.

U.S. Environmental Protection Agency (EPA), August 1993. Module IV of RCRA Permit No. NM 5890110518, EPA Region 6, issued to Sandia National Laboratories, Albuquerque, New Mexico.

U.S. Environmental Protection Agency (EPA), August 1992. Hazardous Waste Management Facility Permit No. NM 5890110518, EPA Region 6, issued to Sandia National Laboratories, Albuquerque, New Mexico.

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, Washington, D.C.

U.S. Environmental Protection Agency (EPA), April 1987. "Final RCRA Facility Assessment Report of Solid Waste Management Units at Sandia National Laboratories, Albuquerque, New Mexico," Contract No. 68-01-7038, EPA Region 6, Sandia National Laboratories, Albuquerque, New Mexico.

5.3 Aerial Photographs

Koogle and Pouls Engineering, Inc., April 10, 1992. Aerial Photograph, KAFB 1-2-5, Albuquerque, New Mexico