Sandia National Laboratories/New Mexico

PROPOSAL FOR NO FURTHER ACTION ENVIRONMENTAL RESTORATION PROJECT SITE 149, BUILDING 9930 SEPTIC SYSTEM OPERABLE UNIT 1295

June 1996

Environmental Restoration Project

United States Department of Energy
Albuquerque Operations Office

PROPOSAL FOR NO FURTHER ACTION ENVIRONMENTAL RESTORATION PROJECT

SITE 149, BUILDING 9930 SEPTIC SYSTEM OPERABLE UNIT 1295 June 1996

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Prepared for the
United States Department of Energy

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1. INTRODUCTION

1.1 ER Site 149, Building 9930 Septic System

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a no further action (NFA) decision based on confirmatory sampling for Environmental Restoration (ER) Site 149, Building 9930 Septic System, Operable Unit (OU) 1295. ER Site 149 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 a NFA decision based on confirmatory sampling was prepared using the criteria presented in Section 4.5.3 of the SNL/NM Program Implementation Plan (PIP) (SNL/NM February 1995) . Specifically, this proposal "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" (as proposed in 40 CFR 264.514[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)."

If the available archival evidence is not considered convincing, SNL/NM performs confirmatory sampling to increase the weight of the 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 149 is based primarily on results of a passive soil-gas survey (NERI June 1995) and 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) or other relevant background limits. If no SNL/NM 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 (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 presented in 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 149 soil sample analytical data indicate that concentrations of COCs detected in soils at this site are less than (1) SNL/NM or other applicable background concentrations, or (2) proposed Subpart S or other action levels, or (3) derived risk assessment action levels. Thus ER Site 149 is being proposed for an NFA decision based on 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 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. 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 149 is located in the Coyote Test Field on KAFB and is approximately 0.9 miles east of Technical Area III (TA III). Access to the site is provided by graded dirt roads that extend southwest from Lovelace Road (Figure 1-1). ER Site 149 consists of the immediate area around the seepage pit and septic tank southwest of Building 9930 (Figure 1-2). The site encompasses approximately 0.11 acres of land at an average mean elevation of 5,531 feet above mean sea level (AMSL).

The surficial geology at ER Site 149 is a thin layer of colluvium that may be underlain by either bedrock or a thin layer of well-cemented alluvium (SNL/NM March 1996). This site is in the vicinity of the Tijeras fault zone. The Travertine Hills, consisting mainly of a limestone-boulder conglomerate overlain by a granite-pebble conglomerate, are located just to the east of the site (SNL/NM October 1993). A trace of one of the faults within the Tijeras fault zone is visible about 800 feet south of the site, just west of the water tank at the base of the northern-most Travertine Hill (Krumhansl and McConnell November 1994). From excavations and borings completed at the site, it is evident that the depth to bedrock at this site is on the order of 12 to 16 feet (SNL, October 1994, January 1995a and January 1995b).

Vegetation consists predominantly of grasses, including gramma, 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 (SNL/NM March 1993).

Using the most recent map of the potentiometric surface for KAFB, the water-table elevation is approximately 5,300 feet AMSL at this location (SNL/NM March 1996). The corresponding depth to ground-water is 231 feet. However, the Tijeras fault zone complicates the potentiometric surface near this location: the potentiometric surface drops about 300 feet less than 1/2 mile west of ER Site 149. Groundwater flow at KAFB is believed to be in a generally west to northwest direction in the vicinity of this site (SNL/NM March 1996). The nearest production wells are northwest of the site and include KAFB-2, KAFB-4, and KAFB-7 which are approximately 4.7 to 5.9 miles away. The nearest ground-water monitoring 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 1.1 miles southwest of ER Site 149 (SNL/NM October 1995).

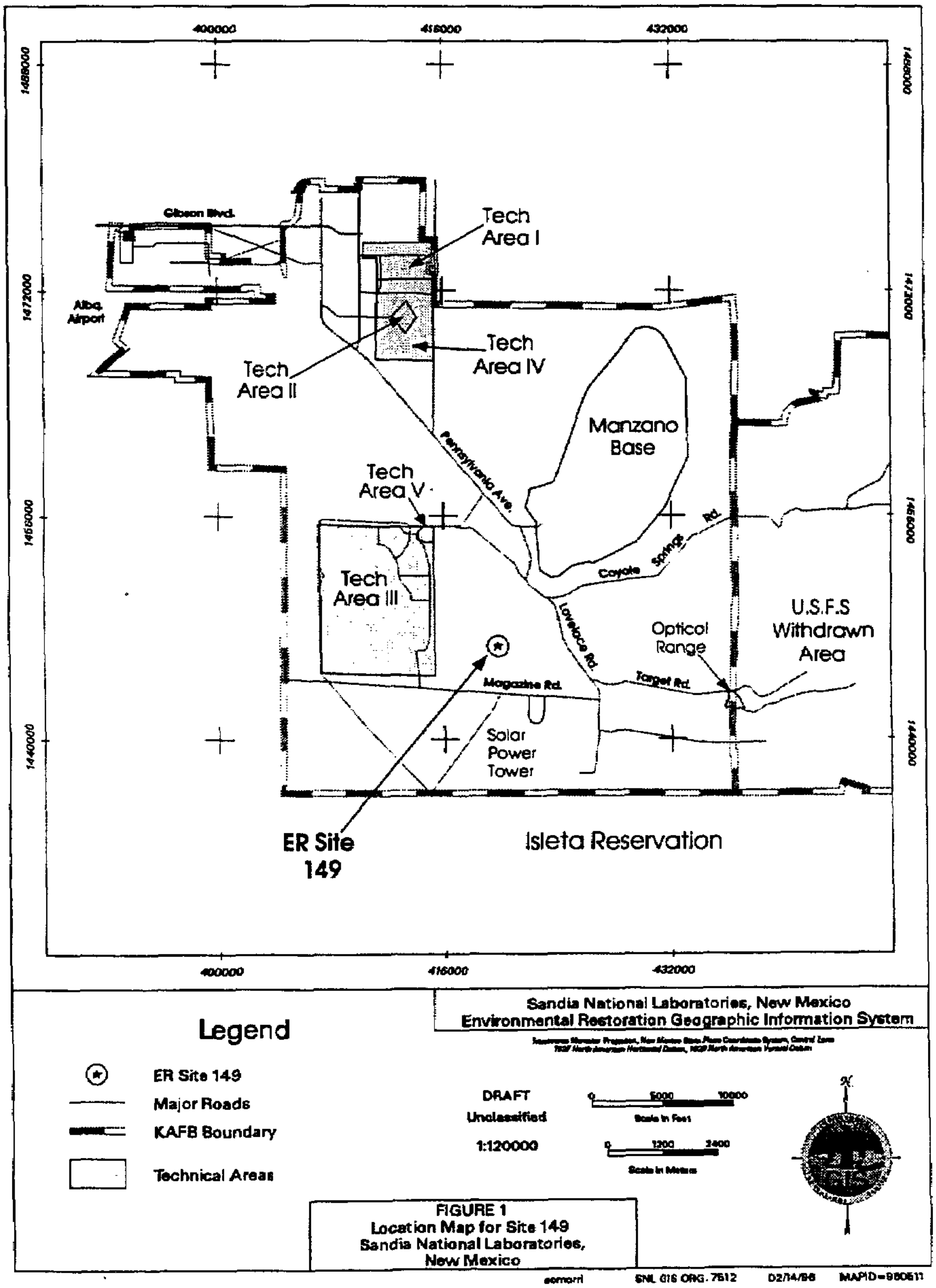

Figure 1-1: ER Site 149 Location Map

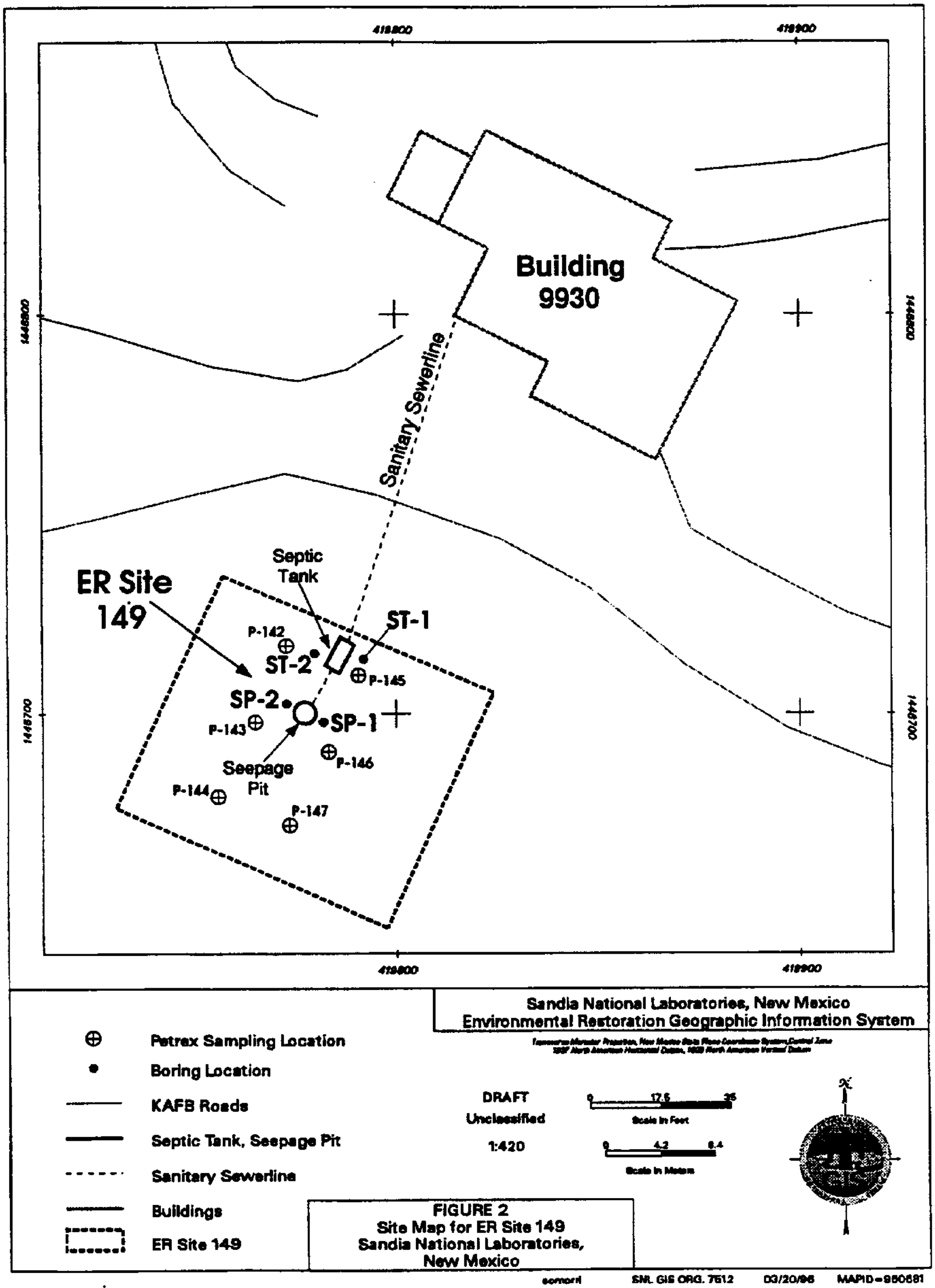

Figure 1-2: ER Site 149 Site Map

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2. HISTORY OF THE SWMU

2.1 Sources of Supporting Information

In preparing the confirmatory sampling NFA proposal for ER Site 149, 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 149:

- Confirmatory subsurface soil sampling conducted in January 1995 (SNL/NM January 1995b, c);
- Two survey reports, including a geophysical survey (Lamb 1994), and a passive soil gas survey (NERI June 1995);
- Backhoe excavations and borings completed to collect soil samples and determine depth to bedrock (SNL/NM October 1994 and January 1995a, b);
- Results of analyses of samples collected from the septic tank in 1992 and 1994 (SNL/NM June 1993);
- RCRA Facility Investigation Work Plan for OU 1295, Septic Tanks and Drainfields (SNL/NM March 1993);
- Photographs and field notes collected at the site by SNL/NM ER staff at ER Site 149;
- SNL/NM Facilities Engineering building drawings (SNL/NM April 1961);
- SNL/NM Geographic Information System (GIS) data; and
- The RCRA Facility Assessment (RFA) report (EPA April 1987).

2.2 Previous Audits, Inspections, and Findings

ER Site 149 was first listed as a potential release site in the RFA report to the EPA in 1987 (EPA April 1987). This report contained a generic statement about this and many other SNL/NM septic and drain systems that sanitary and industrial wastes may have been discharged to septic tanks and drainfields during past operations. This SWMU was included in the RFA report as Site number 79, along with other septic and drain systems at SNL/NM. All the sites included in Site 79 are now designated by individual SWMU numbers.

2.3 Historical Operations

The following historical information has been excerpted from SNL/NM March 1993 and SNL/NM October 1994.

Building 9930 was constructed in 1961 and is located in Coyote Test Field in the former Area Y. The building included a darkroom, lab and shop area, bathroom, and a compressor room. There is: (1) a sink and floor drain with a cleanout in the darkroom, (2) a sink in the lab and shop area, and (3) floor drains in the bathroom and in the compressor room. These areas were served by a septic system consisting of one 750-gallon septic tank and a 4-foot diameter seepage pit with a gravel bottom that is 7 feet below grade. The septic system is located southwest of the building across the access road (Figure 1-2).

In the past, the following operations contributed to the waste at Building 9930 and may have resulted in uncontrolled releases of waste to the environment from Building 9930: photographic reproduction, explosives testing, and general lab operations. Photochemicals, including alkaline-based developers, acetic acid, ammonium thiosulfate fixer, and small quantities of sulfuric acid associated with photographic reproduction, were disposed directly into the septic system. Explosives testing was performed adjacent to the building in a concrete-bunkered area that contains no drains.

These practices have changed. Building 9930, as of 1993, is connected to an extension of the City of Albuquerque sanitary sewer system. Any photographic chemicals or lab wastes are being recovered in containers and disposed of properly. Raw explosives residue is collected as scrap and sent to the 6000 Igloo Area for disposal, while solid burned residue is collected and disposed of as solid waste.

3. EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics

There are no safeguards inherent in the drain systems from Buildings 9930, or in facility operations that could have prevented past releases to the environment.

3.2 Operating Practices

As discussed in Section 2.3, effluent was released to the Building 9930 septic tank and seepage pit when the septic system was active. Hazardous wastes were not managed or contained at ER Site 149.

3.3 Presence or Absence of Visual Evidence

No visible evidence of soil discoloration, staining, or odors indicating residual contamination was observed when boring and backhoe work exposed below-surface soil near the seepage pit and septic tank in October 1994 (SNL/NM October 1994) and January 1995 (SNL/NM January 1995a and b).

3.4 Results of Previous Sampling/Surveys

Aqueous and sludge samples were collected from the ER Site 149 septic tank in June 1992 (SNL/NM June 1993). The sludge sample was analyzed for selected heavy metal and radionuclide constituents. The liquid sample was analyzed for volatile organic compounds (VOCs), semivolatile organics (SVOCs), polychlorinated biphenyls (PCBs), pesticides, total cyanide, phenolics, nitrate/nitrite, oil and grease, total metals and selected radionuclide constituents. The analytical constituents of concern noted in the brief narrative accompanying these sample results were as follows: (1) phenol was detected in the aqueous sample at a level of 0.120 mg/l, and total phenolic compounds were detected at a level of 0.18 mg/l.; (2) chromium was detected in the aqueous sample at a level of 0.14 mg/l; and (3) silver was detected in the aqueous sample at a level of 0.16 mg/l. There were no significant findings regarding the radiological data (SNL/NM June 1993). The analytical results of these samples are presented in Appendix A.1.

A second round of septic tank sludge samples were collected for waste characterization purposes in April 1994 (SNL/NM April 1994) and were analyzed for VOCs, explosives, cyanide, total phenols, and Toxicity Characteristic Leaching Procedure (TCLP) metals. Concentrations of four VOC compounds (acetone, 1,1-dichloroethane, methylene chloride, and toluene), cyanide, and total phenols were identified in the sludge. Explosive compounds were not detected. One of the eight RCRA metals, barium, was detected in the TCLP leachate derived from the sludge sample. The analytical results of the second round of septic tank samples are presented in Appendix A.2.

A third round of waste characterization sludge and liquid samples were collected in November 1994 (SNL/NM November 1994). The sludge and liquid samples were analyzed for isotopic uranium, tritium, and gamma spectroscopy radionuclides. The isotopic uranium, tritium, and gamma spectroscopy analyses did not include any significant findings.

The sludge was also analyzed for SVOCs. One SVOC (4-methylphenol) was identified in the sludge sample. The analytical results of the third round of septic tank sludge characterization samples are also presented in Appendix A.2.

A geophysical survey using a Geonics™ model EM-38 ground conductivity meter was performed at the site in May 1994 to try to determine if there were any areas of higher moisture surrounding the seepage pit (Lamb 1994). The area around the seepage pit at Site 149 was highly disturbed, with much metal scrap visible at the surface. Although an attempt was made to remove the visible metal, the resulting high concentration of interference prevented a definitive interpretation regarding areas of higher moisture content. This site was included in the Lamb geophysics report in a summary table entitled "No Survey Findings."

A passive soil-gas survey conducted in June and July 1994 used PETREX™ sampling tubes to identify any releases of VOCs and SVOCs from the seepage pit that may have occurred (SNL/NM June 1994). A PETREX™ tube soil-gas survey is a semi-quantitative screening procedure that can be used to identify many volatile and semivolatile organic compounds. This technique may be used to guide VOC and SVOC site investigations. The advantages of this sampling methodology are that large areas can be surveyed at relatively low cost, the technique is highly sensitive to organic vapors, and the result produces a measure of soil vapor chemistry over a two- to three-week period rather than at one point in time. Each PETREX™ soil-gas sampler consists of two activated charcoal coated wires housed in a reusable glass test tube container. At each sampling location, sample tubes are buried in an inverted position so that the mouth of the sampler is about 1 foot below grade. Samplers are left in place for a two- to three-week period, and are then removed from the ground and sent to the manufacturer, Northeast Research Institute (NERI), for analysis using thermal desorption-gas chromatography/mass spectrometry. The analytical laboratory reports all sample results in terms of "ion counts" instead of concentrations, and identifies those samples that contain compounds above the PETREX™ technique detection limits. In NERI's experience, levels below 100,000 ion counts for a single compound (such as perchloroethene [PCE] or trichloroethene[TCE]), and 200,000 ion counts for mixtures (such as BTEX or aliphatic compounds [C4-C11 cycloalkanes]), under normal site conditions, would not represent detectable levels by standard quantitative methods for soils and/or groundwater (NERI June 1995).

Six PETREX™ tube samplers were placed in a grid pattern that covered the area around the seepage pit and septic tank (SNL/NM June 1994). Aliphatic and/or BTEX compounds at potentially detectable concentrations were identified in soil gas at three of the six sampling locations. There were no detectable levels of PCE or TCE at any of the sample locations. The analytical results of the ER Site 149 passive soil gas survey are presented in Appendix A.3. Sample locations are shown in Figure 1-2.

3.5 Assessment of Gaps in Information

The most recent material in the tank was not necessarily representative of all discharges to the unit that have occurred since it was put into service in 1961.

The analytical results of the various rounds of septic tank sampling were used, along with process knowledge and other available information, to help identify the most likely COCs that might be found in soils surrounding the septic tank and seepage pit, to help select the types of analyses to be performed on soil samples collected from the site. While the history of past releases at the site is incomplete, analytical data from confirmatory soil samples collected in January 1995 (discussed below) are sufficient to determine whether releases of COCs occurred at the site.

3.6 Confirmatory Sampling

Although the likelihood of significant release of hazardous constituents at ER Site 149 was considered low, confirmatory soil sampling was conducted to determine whether COCs above background or detectable levels were released at this site. An attempt was made to collect both shallow and deep samples using the Geoprobe™ near the seepage pit in October 1994 (SNL/NM October 1994). After several attempts, it proved impossible to obtain any samples below 12 to 12.5 feet. A very resistant layer, later determined to be bedrock or well-cemented alluvium, would not allow the Geoprobe™ to advance, and this sampling effort, shown in the upper photograph of Figure 3-1, was abandoned. In January 1995, a larger Geoprobe™ was brought in to collect samples from the area immediately around the seepage pit and the septic tank (SNL/NM January 1995b). The larger Geoprobe™ also met refusal at shallow depths of 11 to 14 feet. Thus, there are only shallow soil samples available for this site. Also, because of the shallow refusal depth, the sampling interval for the seepage pit samples was started at 8 feet below ground surface (BGS) rather than 10 feet BGS (10 feet BGS was projected to be the bottom of the septic tank). With these exceptions, the confirmatory soil sampling program was performed in accordance with the rationale and procedures described in the Septic Tank and Drainfields (ADS-1295) RCRA Facility Investigation Work Plan (SNL/NM March 1993), and addenda to the Work Plan developed during the OU 1295 project approval process (IT March 1994 and SNL/NM November 1994). 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 3-1.

Attempting to collect soil samples on the west side of the septic tank with the Geoprobe™, 10/4/94. View looking northwest.

Steam cleaning the septic tank following removal of contents, 10/16/95. View looking east.

Figure 3-1: ER Site 149 Photographs

Table 3-1
ER Site 149: Confirmatory Sampling Summary Table

Sampling Location	Analytical Parameters	Number of Borehole Locations	Top of Sampling Intervals at Each Boring Location	Total Number of Investigative Samples	Total Number of Duplicate Samples	Date(s) Samples Collected
Seepage pit	VOCs	2	8'	2	1	1/23/95
	SVOCs	2	8'	2	1	
	RCRA metals + Cr^{6+}	2	8'	2	1	
	Cyanide	2	8'	2	1	
	TNT screen	2	8'	2	1	
	Soil pH	2	8'	2		
	Gamma spec. composite	2	8	1		
	Tritium composite	2	8'	1		
Septic tank	VOCs	2	7'	2		1/23-24/95
	SVOCs	2	7'	2		
	RCRA metals + Cr^{6+}	2	7'	2		
	Cyanide	2	7'	2		
	TNT screen	2	7'	2		
	Soil pH	2	7'	2		

Notes
Cr^{6+} = Hexavalent chromium
RCRA = Resource Conservation and Recovery Act
Spec. = Spectroscopy
SVOCs = Semivolatile organic compounds
VOCs = Volatile organic compounds
TNT = Trinitrotoluene

A shallow soil sample was collected from each of two borings located on opposite sides of the seepage pit, and also on opposite sides of the septic tank, in January 1995. The depth interval for the shallow boring for the seepage pit soil samples was 8 to 14 feet BGS, and that for the septic tank soil samples 7 to 11 feet BGS (SNL/NM, January 1995b).

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. In order to minimize the potential for loss of volatile compounds (if present), the soil to be analyzed for VOCs was not emptied from the BA sleeve into another sample container. The filled BA sleeve was removed from the sampling tool, and the top seven inches were cut off. 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 in this section of sleeve was submitted for a VOC analysis.

Soil from the remainder of the sleeve was then emptied into a decontaminated mixing bowl. Following this, additional two-foot sampling runs were completed in order to recover enough soil to satisfy sample volume requirements for the interval. Soil recovered from these additional runs was also emptied into the mixing bowl, and blended with soil from the first sampling run. The soil was then transferred from the bowl into sample containers using a decontaminated plastic spatula.

Seepage pit and septic tank samples were analyzed for VOCs, SVOCs, cyanide, RCRA metals, and hexavalent chromium by an offsite commercial laboratory. Samples were shipped to the offsite commercial laboratories by an overnight delivery service. Additional soil samples were also collected from the seepage pit and septic tank sampling intervals and were submitted to the SNL/NM ER field laboratory for trinitrotoluene (TNT) analyses using a field screening immunoassay technique, as well as soil pH determinations. Also, to determine if radionuclides were released from past activities at this site, composite samples were collected from the seepage pit borings for analysis by an offsite commercial laboratory for tritium, and were screened for other radionuclides using SNL/NM in-house gamma spectroscopy.

Routine SNL/NM chain-of-custody and sample documentation procedures were employed for all samples collected at this site.

Quality assurance/quality control (QA/QC) samples collected during this effort consisted of a set of duplicate soil samples from one of the seepage pits and a set of aqueous equipment rinsate samples that were analyzed for most of the same non-radiological constituents as the other seepage pit soil samples. No significant concentrations of COCs were detected in the equipment blank samples, and the concentrations of constituents detected in the duplicate soil samples were in good agreement with those detected in the equivalent field sample from the same interval. Also, a soil trip blank sample was included with the ER Site 149 seepage pit and septic tank soil samples sent to the offsite laboratory. It was analyzed for VOCs only. The following compounds were detected in the trip blank: acetone, 2-hexanone, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), methylene chloride, toluene and total xylenes. These common laboratory contaminants were either not detected, or were found in lower concentrations in the site samples than in the trip blank. Soil used for the trip blank was prepared by heating the material, and then transferring it immediately to the sample container. This heating process drives off any residual organic compounds (if present), and soil moisture, that may be contained in the material. It is thought that when the soil trip blank container was opened at the laboratory, it immediately adsorbed both moisture and VOCs present in the laboratory atmosphere, and therefore became contaminated.

Summaries of all constituents detected in these confirmatory samples by either commercial laboratories or by the SNL/NM field laboratory are presented in Tables 3-2, 3-3, and 3-4. Results of the SNL/NM in-house gamma spectroscopy composite soil sample screening for other radionuclides are presented in Appendix A.4. Complete soil sample analytical data packages are archived in the SNL/NM Environmental Operations Records Center and are readily available for review and verification (SNL/NM, January 1995c).

Table 3-2

ER Site 149
Summary of Organic and Other Constituents, and pH Measurements in Confirmatory Soil Samples
Collected Around the Seepage Pit and Septic Tank

Sample Number	Sample Matrix	ample Type	Sample Date	Sample Location (Figure 2)	Top of Sample Interval (fbgs)	VOCs Method 8240 Acetone	2-Hexa-none	MEK	MIBK	Meth. Chloride	Toluene	Total Xylenes	SVOCs Method 8270	Cyanide Method 9010/9012	TNT Screen Colorimetric method based on EPA 8515	Units	Soil pH ASTM Method 4972 (pH units)
Seepage Pit Soil Samples:																	
018936-1,2	Soil	Field	1/23/95	SP-1	8	9.1 J	ND	ND	ND	2.1 J	ND	ND	ND	ND	ND	ug/kg	7.5
018938-1,2	Soil	Field	1/23/95	SP-2	8	4.1 J	ND	ND	ND	1.5 B,J	ND	ND	ND	ND	ND	ug/kg	7.5
018939-1,2	Soil	Dupl.	1/23/95	SPD-2	8	ND	ND	ND	ND	1.6 B,J	ND	ND	ND	ND	NS	ug/kg	NS
Septic Tank Soil and QA Samples:																	
018937-1,2	Soil	Field	1/23/95	ST-1	7	5.5 J	ND	ND	ND	2 J	ND	ND	ND	ND	ND	ug/kg	7.6
018940-1,2	Soil	Field	1/24/95	ST-2	7	ND	ND	ND	ND	2.2 B,J	ND	ND	ND	ND	ND	ug/kg	7.9
018941-1,2,	Water	EB	1/24/95	Site 149	NA	ND	9.7 J	ND	ND	ND	ND	ND	ND	ND	NS	ug/L	NS
021555-1	Soil	TB	1/24/95	Site 149	NA	110	7.7 J	54	3.5 J	4.6 B,J	1.1 J	1.6 J	NS	NS	NS	ug/kg	NS
Laboratory Reporting Limit for Soil						10	10	10	10	5	5	5	330 or 1,600	1,000	1,000	ug/kg	
Laboratory Reporting Limit for Water						10	10	10	10	5	5	5	10, 20, or 50	10	NA	ug/L	
Proposed Subpart S Action Level For Soil						8E+06	None	5E+07	4E+06	9E+04	2E+07	2E+08	NA	2E+06	4E+04	ug/kg	

Notes:
B = Compound detected in associated blank sample
Dupl. = Duplicate soil sample
EB = Equipment blank
fbgs = feet below ground surface
J = Result is detected below the reporting limit or is an estimated concentration.
MEK = Methyl ethyl ketone
Meth. chloride = Methylene chloride
MIBK = Methyl isobutyl ketone, or 4-Methyl-2-pentanone
NA = Not applicable

ND = Not detected
NS = No sample
QA = Quality assurance
SVOCs = Semivolatile organic compounds
TB = Trip blank
TNT = Trinitrotoluene
ug/kg = Micrograms per kilogram
ug/L = Micrograms per liter
VOCs = Volatile organic compounds

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Table 3-3

ER Site 149

Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples Collected Around the Seepage Pit and Septic Tank

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Figure 2)	Top of Sample Interval (fbgs)	RCRA Metals, Methods 6010 and 7471: As	Ba	Cd	Cr, total	Pb	Hg	Se	Ag	Other Metals: Cr^{6+} Method 7196	Units
Seepage Pit Soil Samples:															
018936-2	Soil	Field	1/23/95	SP-1	8	2	50.6	ND	3.3	7.4	ND	ND	ND	ND	mg/kg
018938-2	Soil	Field	1/23/95	SP-2	8	2.7	82.7	ND	3.5	4.8 J	ND	ND	0.55 J	ND	mg/kg
018939-2	Soil	Dupl.	1/23/95	SPD-2	8	2.1	58	ND	2.5	ND	ND	ND	ND	ND	mg/kg
Septic Tank Soil and QA Samples:															
018937-2	Soil	Field	1/23/95	ST-1	7	4.1	147	ND	3.9	4.2 J	ND	ND	ND	ND	mg/kg
018940-2	Soil	Field	1/24/95	ST-2	7	2.8	38.8	ND	2.6	ND	ND	ND	ND	ND	mg/kg
018941-3,4	Water	EB	1/24/95	Site 149	NA	ND	0.0023 J	ND	0.0028 J	ND	ND	ND	ND	NS	mg/L
Laboratory Reporting Limit for Soil						1	1	0.5	1	5	0.1	0.5	1	0.05 - 0.1	mg/kg
Laboratory Reporting Limit for Water						0.01	0.01	0.005	0.01	0.003	0.0002	0.005	0.01	NA	mg/L
Number of SNL/NM Background Soil Sample Analyses *						15	727	1,740	647	536	1,724	2,134	2,302	393	NA
SNL/NM Soil Background Range *						2.1-7.9	0.5-495	0.0027-6.2	0.5-31.4	0.75-103	0.0001-0.68	0.037-17.2	0.0016-8.7	0.02-<2.5	mg/kg
SNL/NM Soil Background UTL or 95th Percentile *						7	214	0.9	15.9	11.8	<0.1	<1.0	<1.0	<2.5	mg/kg
Proposed Subpart S Action Level For Soil						0.50	6,000	80	80,000 **	400 ***	20	400	400	400 **	mg/kg

Notes:

As = Arsenic. Arsenic background concentrations presented above are based on analyses of subsurface soil samples collected in the Coyote Test Field (CTF) area.
Ba = Barium. Barium background concentrations presented above are based on analyses of subsurface soil samples collected in the Southwest and CTF areas.
Cd = Cadmium. Cadmium background concentrations presented above are based on analyses of subsurface soil samples collected in the North, Tijeras, Southwest, CTF, and Offsite areas.
Cr = Chromium. Chromium background concentrations presented above are based on analyses of subsurface soil samples collected in the Southwest area.
Cr^{6+} = Hexavalent chromium. Hexavalent chromium background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.
Pb = Lead. Lead background concentrations presented above are based on analyses of subsurface samples collected in the Southwest and Offsite areas.
Hg = Mercury. Mercury background concentrations presented above are based on analyses of subsurface soil samples collected in the North, Tijeras, Southwest, CTF and Offsite areas.
Se = Selenium. Selenium background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the North, Tijeras, Southwest, CTF and Offsite areas.
Ag = Silver. Silver background concentrations presented above are based on analyses of subsurface soil samples collected in the North, Tijeras, Southwest, CTF, and Offsite areas.

Dupl. = Duplicate soil sample
EB = Equipment blank
fbgs = Feet below ground surface
J = Result is detected below the reporting limit or is an estimated concentration.
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
NA = Not applicable
ND = Not detected
QA = Quality assurance
UTL = Upper Tolerance Limit
* IT March 1998
** 80,000 mg/kg is for Cr^{3+} only. For Cr^{6+}, proposed Subpart S action level is 400 mg/kg.
*** No proposed Subpart S action level for lead in soil, 400 ppm is EPA [illegible] action level (EPA July 1994)

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Table 3-4

ER Site 149
Summary of Tritium in the Composite Confirmatory Soil Sample Collected Around the Seepage Pit

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Figure 2)	Top of Sample Interval (fbgs)	Tritium Method EPA-600 906.0 (pCi/L) Result	Error *	Minimum Detectable Activity
018936-3	Soil	Composite	1/23/95	SP-1/2	8	510	180	280
SNL/NM Soil Background Range						U		
SNL/NM Soil Background UTL, 95th %tile						U		
Nationwide Tritium Range in Precipation and Drinking Water **						100-400		

Notes:
fbgs = Feet below ground surface
ND = Not detected
pCi/L = Picocuries per liter
U = Undefined for SNL/NM soils
* Error = +- 2 sigma uncertainty
** EPA October 1993

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3.7 Risk Analysis

As shown in Table 3-4, tritium was detected in soil moisture from the seepage pit composite sample at an activity level of 510 picocuries per liter (pCi/L). Background tritium activity levels for SNL/NM soils were not reported in the IT background report (IT March 1996). The soil moisture contained in shallow soil samples such as these represents either infiltrated precipitation, or water discharged from Building 9930 to the seepage pit. It is therefore appropriate to compare the tritium activity level detected in the sample soil moisture to naturally occurring tritium levels found in precipitation or drinking water samples. The tritium activity level of 510 pCi/L detected in this sample was therefore compared to and was found to be slightly above the naturally occurring tritium activity range of 100 to 300 pCi/L found in precipitation samples collected from locations throughout the U.S., and 100 to 400 pCi/L in drinking water samples collected from locations around the country (EPA October 1993). A risk assessment was therefore performed to further evaluate this tritium activity level. The risk calculation was designed to produce a conservatively large estimate of radiation dose to counter uncertainties in the soil analytical data.

Appendix J, Section 1.3.6 of the PIP (SNL/NM February 1995) stipulates that, for the purpose of computing media action levels, the total radiation dose at a site should not be greater than 15 millirem/year (mrem/yr). Fifteen mrem/yr is also the maximum annual effective dose for all pathways that is being considered in the preliminary staff working draft of the EPA Radiation Site Cleanup regulation (EPA 1994). Therefore:

- if the dose estimate is unacceptable (greater than 15 mrem/yr), further investigation and remediation may be needed; or

- if the dose estimate is acceptable, the potential for health hazards at the site is extremely low, and further remedial actions are not needed.

The dose estimate for the tritium activity level cited above was computed using methods and equations promulgated in proposed Subpart S documentation (EPA July 1990). Accordingly, all calculations were based on the very conservative assumption that the receptor dose from radionuclides results from ingestion of 0.2 grams per day of contaminated soil for each of the 365 days in a year.

Calculation of radionuclide doses require values of dose conversion factors for internal radiation from ingestion [DCF(i)], which are used to convert radionuclide activities (in units of picocuries per gram [pCi/g]) into effective dose equivalents (in units of mrem/yr). A published DCF(i) value was found for tritium (0.000000063 [6.3E-08] mrem/pCi) (Gilbert et al. 1989); this DCF(i) value was used in the risk calculation.

To assure that the computed doses were conservatively large, the maximum observed activity of tritium detected at this site (510 pCi/L) was employed in the risk calculation. Analytical results for tritium in soil moisture are reported by the laboratory in units of pCi/L, and must be converted to units of pCi/g for the risk calculation presented below. The following conversion calculation was used:

Determined from laboratory results : 806 grams of sample, 1.2% by weight soil moisture in the sample, tritium result of 510 pCi/L in soil moisture.

(1) 510 pCi/L x 1 L/1000 g = 0.51 pCi/g of soil moisture

(2) 806 grams of sample x 0.012 = 9.67 g of soil moisture in sample

(3) 9.67 g of soil moisture x 0.51 pCi/g in soil moisture = 4.93 pCi of tritium activity in this 806 g soil sample

(4) 4.93 pCi in 806 g of soil sample= 0.006 pCi/g for this soil sample

Following proposed Subpart S methodology, the equation and parameter values used to calculate the summed radiation dose was:

$$DOSE = \sum[DSR(i) \times S(i)],$$

where DOSE = total effective dose equivalent (mrem/yr);

DSR(i) = dose-to-soil concentration ratio for the i^{th} radionuclide = I x DCF(i);
I = soil ingestion rate = 0.2 grams/day = 73 grams/year;
DCF(i) = internal radiation dose conversion factor for the ith radionuclide (mrem/pCi); and
S(i) = soil concentration of the ith radionuclide (pCi/g).

The result of the radionuclide risk calculation show that the radiation dose from the tritium activity level (510 pCi/L, or 0.006 pCi/g) found at this site is 2.8E-08 mrem/yr which is much less than 15 mrem/yr. Therefore, the site is considered to be risk-free in terms of tritium contamination.

3.8 Rationale for Pursuing a Risk-Based NFA Decision

As discussed in Section 3.4, the passive soil gas survey identified potentially detectable concentrations of aliphatic and BTEX compounds at three of the six PETREX™ soil-gas sampling locations at this site. However, no aliphatic or BTEX compounds were detected in soil samples collected around the seepage pit and septic tank at this site.

Confirmatory soil sampling around the seepage pit and septic tank did not identify any residual COCs indicating past discharges that could pose a threat to human health or the environment. As shown in Table 3-2, only two VOC compounds (acetone and methylene chloride), which are common laboratory contaminants, were detected in soil samples collected from this site. Both compounds were detected below the reporting level and were estimated concentrations. No SVOCs, cyanide or TNT were detected in any of the soil samples. Soil pH measurements of samples collected near the seepage pit and septic tank indicated that the soil was slightly alkaline.

As shown in Table 3-3, soil sample analytical results indicate that the nine metals that were targeted in the Site 149 investigation were either (1) not detected, or (2) were detected in concentrations below the background UTL or 95th percentile concentrations presented in the SNL/NM study of naturally-occurring constituents (IT March 1996).

The tritium activity level detected in the seepage pit sample was determined to result in a radiation dose much lower than the maximum acceptable radiation dose of 15 mrem/yr at a site presented in the PIP (SNL/NM February 1995). Also, the gamma spectroscopy semi-qualitative screening of the composite soil sample from the seepage pit did not indicate that the soil at this site had been contaminated by other radionuclides (Appendix A.4).

Finally, the ER Site 149 septic tank contents were removed and the tank was cleaned in October 1995 (SNL/NM October 1995). The tank was then inspected by a representative of the New Mexico Environment Department (NMED) to verify that the tank contents had been removed and the tank had been closed in accordance with applicable State of New Mexico regulations (SNL/NM November 1995).

4. CONCLUSION

Sample analytical results generated from this confirmatory sampling investigation have shown that detectable or significant concentrations of COCs are not present in soils at ER Site 149, and that additional investigations are unwarranted and unnecessary. Based on archival information, chemical and radiological analytical results of soil samples collected next to the seepage pit and septic tank, and comparison of the results with action levels, SNL/NM has demonstrated that any contaminants present at this site pose an acceptable level of risk under current and projected future land use (Criterion 5 of Section 1.2). Therefore, ER Site 149 is recommended for an NFA determination.

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