PROPOSAL FOR
NO FURTHER ACTION
Environmental Restoration Project

Site 137, Building 6540/6542 Septic System
Operable Unit 1295
January 1997

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1.0 INTRODUCTION

1.1 ER Site 137, Building 6540/6542 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 137, Building 6540/6542 Septic System, Operable Unit (OU) 1295. ER Site 137 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 process presented in Section 4.5.3 of the SNL/NM Program Implementation Plan (SNL/NM February 1995). It follows guidance proposed in Title 40, Code of Federal Regulations (CFR), Part 264.514(a) (2), which states that NFA proposals "... must 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." (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 137 is based primarily on 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 (UTL) concentrations of COCs found in SNL/NM soils (IT March 1996) or other relevant background limits. If no SNL/NM or other relevant background limit was available, or if the COC concentration exceeded the background limit, then the concentration was compared to the proposed 40 CFR Part 264 Subpart S (Subpart S) or other relevant soil action level for the particular compound (EPA July 1990, October 1993, and July 1994). If the COC concentration exceeded both the background limit (if such a limit was available) and the relevant action level for that compound, 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 Comprehensive Environmental Response, Compensation, and Liability Act (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 137 soil sample analytical data indicate that concentrations of COCs at this site are less than (1) SNL/NM or other applicable background limits, or (2) proposed Subpart S or other action levels, or (3) derived risk assessment action levels. Thus, ER Site 137 is being proposed for a 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).

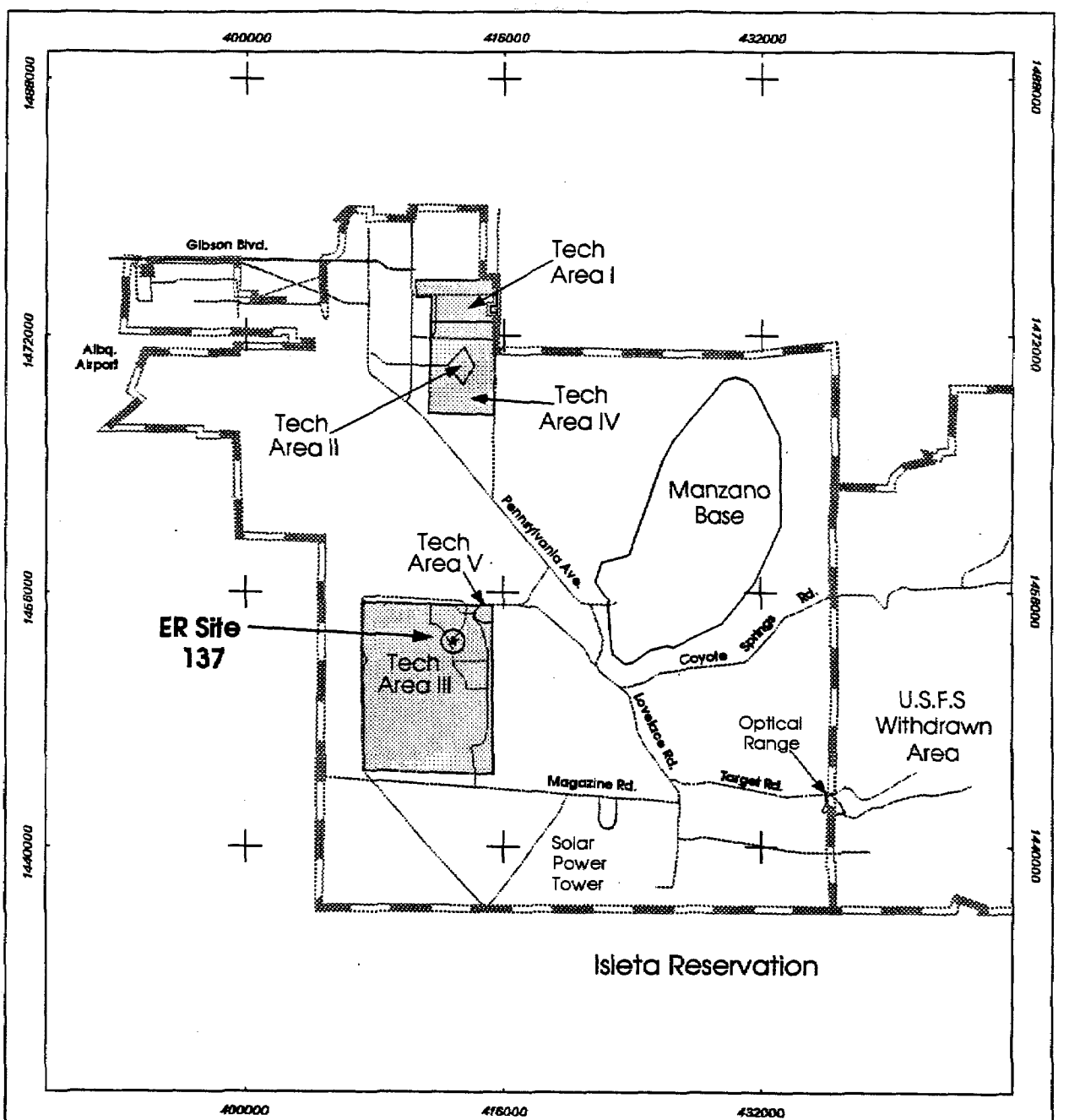
1.3 Local Setting

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, 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 137 is located on KAFB and is in the northeastern portion of SNL/NM Technical Area III (TA III). Access to the site is provided by a paved road that extends approximately 0.5 miles in a southwesterly direction from the entrance to TA-III (Figure 1-1). ER Site 137 consists of two contiguous areas that encompass two septic tank and drainfield systems located southwest of Building 6540/6542 (Figure 1-2). The northern system (designated ER Site 137-A on Figure 1-2) consisted of a 2.5-foot by 6-foot steel septic tank (SNL/NM July 1995) that has since been removed from the site, and six 4-inch diameter by 50-foot long parallel clay tile drainlines that were buried about 3 feet below the ground surface (bgs) (SNL/NM September 1994). The southern system (designated ER Site 137-B on Figure 1-2) consisted of a 7-foot wide by 11-foot long concrete septic tank (SNL/NM August 1995) and twelve 4-inch diameter by 70-feet long parallel clay tile drainlines buried about 5-feet bgs (SNL/NM September 1994). The two portions of ER Site 137 encompass a total of approximately 0.52 acres of flat-lying land at an average mean elevation of 5,403 feet above mean sea level (amsl).

The surficial geology at ER Site 137 is characterized by a veneer of aeolian sediments that are underlain by Upper Santa Fe Group alluvial fan deposits that interfinger with sediments of the ancestral Rio Grande west of the site. The alluvial fan materials originated from the Manzanita Mountains east of ER Site 137, and typically consist of moderate to high (sand + gravel)/(silt + clay) ratio, are poorly sorted, and exhibit moderately connected lenticular bedding. Individual beds range from 1 to 5 feet thick with a preferred east-west orientation, and have moderate to low hydraulic conductivities. These alluvial fan sediments extend eastward from the site to a north-south boundary line that is coincident with the Sandia fault and the southern extension of the Tijeras fault (SNL/NM March 1996). 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 (SNL/NM March 1993).

The water-table elevation is approximately 4,927 feet amsl at this location (SNL/NM March 1996), so depth to groundwater beneath the site is approximately 476 feet. Local groundwater flow is believed to be in a generally westerly direction in the vicinity of this site (SNL/NM March 1996). The nearest production wells are northwest of the site and include KAFB-1, 2, 4, 7, and 14, which are approximately 3.0 to 5.0 miles away. The nearest groundwater monitoring wells to the site are the group of wells installed around the Mixed Waste Landfill in the north-central portion of TA-III. These wells are located approximately 1,300 to 1,500 feet west of ER Site 137 (SNL/NM August 1996).



Legend

- ER Site 137
- Major Roads
- KAFB Boundary
- Technical Areas

Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone
1927 North American Horizontal Datum, 1929 North American Vertical Datum

DRAFT
Unclassified

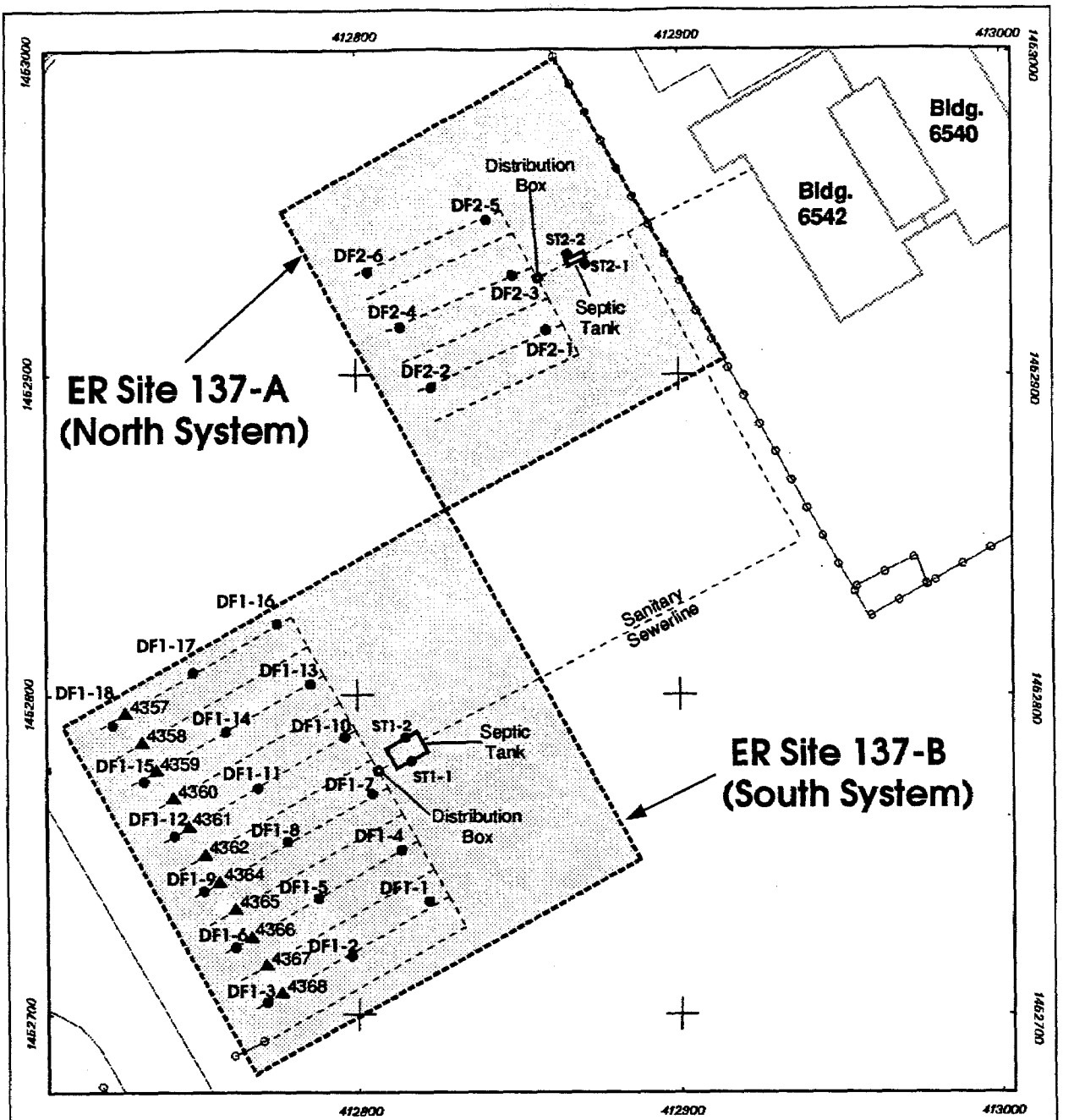
0 5000 10000
Scale in Feet

0 1200 2400
Scale in Meters

N

FIGURE 1-1
Location Map for Site 137
Sandia National Laboratories, New Mexico

scmarl SNL GIS ORG. 7512 06/20/96 MAPID-960962



Legend

- ▲ 1990 Sample Location
- ● 1994 Boring Location
- Fence
- KAFB Road
- Septic Tank, Distribution Box
- Sanitary Sewerline, Drainfield
- Building
- ER Site 137

Sandia National Laboratories, New Mexico
Environmental Restoration Geographic Information System

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone
1927 North American Horizontal Datum, 1929 North American Vertical Datum

DRAFT
Unclassified

0 25 50
Scale in Feet

0 6 12
Scale in Meters

FIGURE 1-2
Site Map for ER Site 137
Sandia National Laboratories, New Mexico

dahalfr SNL GIS ORG. 7512 07/23/96 MAPID=961059

2.0 HISTORY OF THE SWMU

2.1 Sources of Supporting Information

In preparing the confirmatory sampling NFA proposal for ER Site 137, 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 the site operational history. The following sources of information, hierarchically listed with respect to assigned validity, were used to evaluate ER Site 137:

- Confirmatory subsurface soil sampling conducted in November 1990 (IT February 1991), November and December 1994 (SNL/NM November 1994a), and October 1995 (SNL/NM October 1995a);
- Two survey reports, including a geophysical survey (Lamb 1994), and a passive soil gas survey (NERI June 1995);
- Results of samples collected from the north and south septic tanks in 1992 (SNL/NM June 1993), 1994 (SNL/NM June 1994a), and 1995 (SNL/NM October 1995a);
- SNL/NM Geographic Information System data.
- Approved RFI Work Plan for OU 1295, Septic Tanks and Drainfields (SNL/NM March 1993), and addenda (EPA September 1994, SNL/NM November 1994b and December 1994b, EPA January 1995, SNL/NM January 1995, March 1995a and March 1995b, EPA March 1995, and SNL/NM May 1995);
- Photographs and field notes collected at the site by SNL/NM ER staff;
- SNL/NM Facilities Engineering building drawings.

2.2 Previous Audits, Inspections, and Findings

ER Site 137 was first listed as a potential release site in Module IV of the SNL/NM Hazardous Waste Management Facility permit issued in August 1993 (EPA August 1993).

2.3 Historical Operations

The following historical information has been excerpted from several sources, including SNL/NM March 1993, IT March 1994, and SNL/NM November 1994b.

Building 6540/6542 was constructed in 1959 to house instrumentation for the short rocket sled track, the centrifuge, and high-explosive test facilities; the north septic system was installed at this time. The building contained bathroom facilities from the time of the original construction. In the mid-1960s a darkroom was constructed to develop black and white and high-speed color photographs of various experiments. The darkroom was in use from 1966 until 1989. Approximately 5 gallons each of spent fixer and developer solutions from the darkroom were discharged to the septic system every two to three months. At one time, small quantities of trichloroethene (TCE) were used for cleaning parts; the amount of TCE used and the method of disposal are unknown. Estimated effluent discharge rates range between 60 and 800 gallons/day.

An SNL/NM Facilities Engineering drawing dated April 4, 1975 (SNL/NM April 1975) shows that only the north septic system was present at the facility in April 1975. It is therefore apparent that the south septic system was installed sometime after 1975 to replace the under-sized north system. It is assumed that the north system was abandoned when the south septic system was constructed after 1975, and that the south system was abandoned shortly after Building 6540/6542 was connected to an extension of the City of Albuquerque sanitary sewer line into TA-III that was being constructed west of the building in November 1990 (IT February 1991). An SNL/NM memo dated July 26, 1993 contains a list of TA-III septic tanks removed from service with the construction of the TA-III sanitary sewer system; the Building 6540/6542 tank is included in the list (SNL/NM July 1993).

3.0 EVALUATION OF RELEVANT EVIDENCE

3.1 Unit Characteristics

There are no safeguards inherent in the drain systems from Buildings 6540/6542 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 6540/6542 septic tanks and drainfields when the septic systems were active. Hazardous wastes were not managed or contained at ER Site 137.

3.3 Presence or Absence of Visual Evidence

Field notes recorded during the November 1990 sampling event from the south system drainfield indicate that the six samples collected from northern portion of the drainfield were dry and exhibited no unusual odors or discoloration. The notes also indicate that the five samples collected from around the southern portion of the drainfield were moist with vegetation matter and dark material around rocks, especially the samples from locations 4367 and 4368 on Figure 1-2 (IT February 1991). No visible evidence of soil discoloration, staining, or odors indicating residual contamination was observed when soil samples were collected in the north and south system drainfields and around the septic tanks with the Geoprobe™ in November and December 1994 (SNL/NM November 1994a). Also, soil surrounding the north system septic tank was partially excavated in July 1995, and the tank was completely removed from the ground in October 1995 (SNL/NM July 1995 and October 1995a); the removal operation is shown in the top photograph of Figure 3-1. The tank was found to be constructed of steel that was very degraded and rusted through, and had apparently not been capable of containing liquid effluent for some period of time. Again, no evidence of contamination was noted in soil from around and under the tank when it was removed from the ground.

3.4 Results of Previous Sampling/Surveys

Multiple rounds of samples have been collected from the Building 6540/6542 septic tanks. The results of the individual sampling events from the north system tank will be summarized first, followed by a discussion of the south system sample analytical results.

North System Septic Tank Samples

A sludge sample was collected from the north system septic tank in August 1992 and was analyzed for selected radionuclide constituents. Low activity levels of several radionuclide constituents were detected in the material (SNL/NM June 1993). Although not specifically stated in the report, it is apparent that no liquid was present in the tank at the time of sampling because the analytical summary table for the north tank sludge sample (presented in Appendix A.1) shows that a tritium analysis was not performed because the sample was dry.

Removing the degraded steel septic tank from the Building 6540/6542 north septic system with the backhoe, October 18, 1995. View looking southeast.

Building 6540/6542 south system septic tank septage removal and cleaning operation, January 11, 1996. View looking southwest.

Figure 3-1. ER Site 137 Photographs

A second round of dry sludge/soil samples were collected for waste characterization purposes in June 1994; no liquid was present in the tank at the time of sampling (SNL/NM June 1994a). The sludge/soil samples were analyzed for volatile organic compounds (VOC), semivolatile organic compounds (SVOC), the eight RCRA total and Toxicity Characteristic Leaching Procedure (TCLP) metals, hexavalent chromium, and cyanide (SNL/NM June 1994a). Low concentrations of 1 VOC and 12 SVOC compounds were identified in the material. All eight RCRA metals (including 371 milligrams per kilogram [mg/kg] of silver) were detected in the total metals analysis of the sludge/soil, but only two of the eight metals (barium and cadmium) were also detected in the TCLP-derived leachate from the material. Hexavalent chromium and cyanide were not detected in the material. The analytical results of the June 1994 north system septic tank samples are presented in Appendix A.2.

A third set of waste characterization samples was collected from the bottom of the north system tank in October 1995 when the tank was removed from the ground. The dry sludge consisted of a 2-inch thick layer of decomposed humus-like material mixed with dirt from around the tank (SNL/NM October 1995a). These dry sludge samples were analyzed for isotopic uranium and tritium by a commercial laboratory, and were also screened for other radionuclides by SNL/NM in-house gamma spectroscopy. Tritium was not detected, and anomalous activity levels of isotopic uranium or other radionuclides were not identified in the material relative to the radionuclide background activity levels for SNL/NM soils (IT March 1996). The results of this final round of north septic tank sludge/soil samples are also presented in Appendix A.2. Also, additional confirmatory samples of the soil from approximately 2 feet below the bottom of the septic tank were collected immediately after the tank was removed from the ground in October 1995 to determine if COCs had escaped from the degraded tank (SNL/NM October 1995a). The results of these soil samples are summarized in Section 3.6.

South System Septic Tank Samples

A sludge sample was collected from the south system septic tank in August 1992 and was analyzed for selected radionuclide constituents. No liquid sample was collected at this time. Low activity levels of several radionuclide constituents were detected in the sludge (SNL/NM June 1993). The analytical results of this 1992 south system septic tank sample are presented in Appendix A.1.

A second round of both liquid and sludge samples were collected for waste characterization purposes in June 1994 (SNL/NM June 1994a). They were analyzed for VOCs, SVOCs (sludge sample only), RCRA total and TCLP (sludge sample only) metals, hexavalent chromium, cyanide, isotopic uranium, tritium (liquid sample only), and gamma spectroscopy radionuclides. Low concentrations of several VOC and SVOC compounds were identified in the liquid and/or sludge. A number of RCRA total metals were identified in the liquid and sludge (including 372 mg/kg of silver in the sludge), but only two out of eight of these metals (barium and silver) were detected in the TCLP-derived leachate from the sludge. Hexavalent chromium and cyanide were not detected in the liquid or sludge. Very low levels of isotopic uranium and several other radionuclides detected by gamma spectroscopy were found in the material. In addition, 440 picocuries per liter (pCi/L) of tritium was detected in the liquid septage fraction, and was considered also to be representative of the highly liquid sludge fraction. The analytical results of the June 1994 south septic tank samples are also presented in Appendix A.2.

Other Sampling/Surveys

Two geophysical surveys using Geonics™ Model EM-31 and EM-38 ground conductivity meters were performed at the site in June 1994, and two areas of low conductivity (indicating possible areas of disturbed soils) were identified in the suspected areas of the two ER Site 137 drainfields (Lamb 1994). Geophysical techniques were not used to precisely determine the drainfield locations; actual locations of the two drainfields (Figure 1-2) were later determined using a backhoe (SNL/NM September 1994).

A passive soil-gas survey conducted in the two drainfield areas in May and June 1994 used PETREX™ sampling tubes to identify any releases of VOCs and SVOCs from the drainfield that may have occurred (SNL/NM May 1994). A PETREX™ tube soil-gas survey is a semi-quantitative screening procedure that can be used to identify many VOCs and SVOCs, and 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 TCE) and 200,000 ion counts for mixtures (such as benzene, toluene, ethylbenzene/xylene [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).

Fourteen PETREX™ tube samplers (numbers 224 through 237) were placed in a grid pattern that covered the north drainfield area, and 22 samplers (numbers 238 through 259) were placed in a grid pattern that covered the south drainfield area at this site (SNL/NM May 1994). A map showing the ER Site 137 PETREX™ tube sampling locations and the analytical results of the ER Site 137 passive soil gas survey are included in Appendix A.3. Significant concentrations of PCE or TCE were not detected in soil gas at any of the 36 PETREX™ sampling locations at this site. BTEX and/or aliphatic compounds at potentially detectable concentrations were identified at only 1 (location number 231) of the 14 north drainfield locations. However, except for trace levels of laboratory-introduced contaminants, VOCs and SVOCs were not detected in shallow or deep interval soil samples collected from the two nearest boreholes, which were within 18 and 25 feet of location 231, or in any of the other north drainfield soil samples. The BTEX compounds identified in soil gas at location 231 could have originated from vehicles driven over or parked on the site.

Potentially detectable BTEX and/or aliphatic compounds were also identified at only 1 (location number 255) of the 22 south drainfield sampling locations. Again, except for laboratory-introduced contaminants, VOCs and SVOCs were not detected in shallow or deep interval soil samples collected from a borehole within about 7 feet of this PETREX™ location, or in any of the other south drainfield soil samples collected at this site.

3.5 Assessment of Gaps in Information

The most recent material in the septic tanks was not necessarily representative of all discharges to the units that have occurred since they were put into service starting in 1959. 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 tanks and beneath the drainfields, and 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 soil samples collected in November 1990, November/December 1994, and October 1995 (discussed below) are sufficient to determine whether releases of COCs occurred at the site.

3.6 Confirmatory Sampling

Soil sampling at ER Site 137 was conducted in 1990, 1994, and 1995 to determine whether COCs above background or action levels were released at this site. The confirmatory soil sampling program was performed in accordance with the rationale and procedures described in the approved Septic Tanks and Drainfields (ADS-1295) RFI Work Plan (SNL/NM March 1993) and ER Site 137-pertinent addenda to the Work Plan (referenced in bullet item #4 in Section 2.1 above) developed during the OU 1295 project approval process (EPA September 1994, SNL/NM November 1994b and December 1994b, EPA January 1995, SNL/NM January 1995, March 1995a and March 1995b, EPA March 1995, and SNL/NM May 1995). A summary of the types of samples, number of sample locations, sample depths, and analytical requirements for the confirmatory soil samples collected at this site is presented in Table 3-1.

In November 1990, construction activities for the City of Albuquerque sanitary sewer extension into TA-III were taking place west of Building 6540/6542. These activities included digging a trench for the new sewer line that intercepted the western end of the ER Site 137 south system drainfield, cutting through and exposing the western ends of the 12 drainlines in this drainfield.

While the trench was open, soil samples were collected from immediately around and beneath 11 of the 12 exposed drainlines (IT February 1991). The 11 sampling locations are shown and designated by triangular symbols on Figure 1-2. Soil sample numbers 4357 through 4362 were collected from next to the six northern drainlines, and samples 4364 through 4368 were collected from next to five of the six southern lines. An aliquot of soil from each of the six discrete samples 4357 through 4362 from the northern part of the drainfield were then composited into one sample (composite #1), and aliquots of soil from each of the five discrete samples 4364 through 4368 from the southern portion of the drainfield were composited into a second composite sample (composite #2). These two composite samples were analyzed for SVOC compounds and the eight RCRA total metals.

No SVOC compounds or anomalous concentrations of any of the eight metals were identified in composite sample #1 from the northern part of the drainfield. Composite soil sample #2 from the southern part of the drainfield contained only one SVOC compound (diethyl phthalate at

Table 3-1
ER Site 137: Confirmatory Soil Sampling Summary Table

Sampling Location	Analytical Parameters	Number of Sample or Borehole Locations	Top of Sampling Intervals at Each Boring Location	Total Number of Investigative Samples	Total Number of Duplicate Samples	Date(s) Samples Collected
1994 North System	VOCs	6	5', 15'	12	1	12/8,12/94
Drainfield Soil	SVOCs	6	5', 15'	12	1	"
Samples	RCRA metals + Cr^{6+}	6	5', 15'	12	1	"
	Cyanide	6	5', 15'	12	1	"
	Isotopic uranium comp.	6	5', 15'	2		"
	Tritium composite	6	5', 15'	2		"
	Gamma spec. composite	6	5', 15'	2		"
1994 North System	VOCs	2	9'	2		12/12/94
Septic Tank Soil	SVOCs	2	9'	2		"
Samples	RCRA metals + Cr^{6+}	2	9'	2		"
	Cyanide	2	9'	2		"
1995 Soil Samples	VOCs	1	11'	1		10/18/95
Beneath the North	SVOCs	1	11'	1		"
System Septic Tank	RCRA metals + Cr^{6+}	1	11'	1		"
	Isotopic uranium	1	11'	1		"
	Tritium	1	11'	1		"
	Gamma spectroscopy	1	11'	1		"
1990 South System	SVOCs composite	11	7'	2		11/5/90
Drainfield Soil	RCRA metals composite	11	7'	2		"
Samples	Silver only	5	7'	5		"
1994 South System	VOCs	18	7', 17'	36	4	12/5-8/94
Drainfield Soil	SVOCs	18	7', 17'	36	4	"
Samples	RCRA metals + Cr^{6+}	18	7', 17'	36	4	"
	Cyanide	18	7', 17'	36	4	"
	Isotopic uranium comp.	18	7', 17'	2		"
	Tritium composite	18	7', 17'	2		"
	Gamma spec. composite	18	7', 17'	2		"
1994 South System	VOCs	2	11'	2		11/30/94 &
Septic Tank Soil	SVOCs	2	11'	2		12/5/94
Samples	RCRA metals + Cr^{6+}	2	11'	2		"
	Cyanide	2	11'	2		"

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

0.5 mg/kg, which is a common laboratory-introduced contaminant), and also contained 191 mg/kg of silver (IT February 1991). As a result of the relatively high silver concentration in composite sample #2, the five individual samples from which the composite was taken were each analyzed for silver; these analyses are discussed in Section 3.7. A report that describes and summarizes results of this sampling event was included as Attachment H in SNL/NM November 1994b.

A backhoe was used in September 1994 to determine the precise location, dimensions, and drainline depths of the two ER Site 137 drainfields, which had no surface expression (SNL/NM September 1994). Once the drainfields were located, soil samples were collected in November and December 1994 from boreholes in each of the two drainfields, and from either side of the two septic tanks at this site (SNL/NM November 1994a).

As shown on Figure 1-2, soil samples were collected from one boring on either side of and within 1 foot of the outside of each of the two septic tanks to determine if COCs had been released from a leaking or failed unit. Samples were also collected from six borings located next to and near the ends of alternating north system drainfield lateral lines, and from 18 locations near each end and at the midpoint of alternating south drainfield system drainlines (Figure 1-2). As shown in Table 3-1 above, the septic tank boring samples were collected from one interval in each borehole starting at the outside bottom of the tank, which was 9 feet bgs for the north system tank, and 11 feet bgs for the south system tank. For drainfield borings, samples were collected from two intervals in each borehole. The top of the north system shallow interval started at the bottom of the drain line trenches (average of 5 feet bgs), and the lower (deep) interval started at 10 feet below the top of the upper interval, or 15 feet bgs. For the south system drainfield, the shallow interval started at the bottom of the drainline trenches at 7 feet bgs, and the deep sampling interval started at 10 feet below the upper interval, or 17 feet bgs.

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 2 feet in order to fill the 2-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 7 inches were cut off. Both ends of the 7-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, one or two more 2-foot sampling runs were then completed at each interval in order to recover enough soil to satisfy sample volume requirements for other analyses from 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.

Soil samples collected next to the septic tanks and in the drainfields were analyzed for VOCs, SVOCs, cyanide, RCRA metals, hexavalent chromium, and cyanide by an off-site commercial laboratory. Also, to determine if radionuclides were released from past activities at this site, composite samples were collected from shallow and deep sampling intervals in both the north and south system drainfields. These samples were analyzed by an off-site commercial laboratory for isotopic uranium and tritium, and were also screened for other radionuclides using SNL/NM in-house gamma spectroscopy. Samples were shipped to the off-site commercial laboratories by an overnight delivery service. 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 the late 1994 sampling effort included one set of duplicate soil samples from the shallow sampling interval at the north system drainfield borehole DF2-1 (Figure 1-2) and four sets of duplicate samples from the south system drainfield. South system drainfield duplicate samples were collected from the shallow sampling intervals in boreholes DF1-4, 13, and 14, and from the deep interval in borehole DF1-13 (Figure 1-2). Concentrations of organic and inorganic constituents detected in the duplicate soil samples were for the most part in good agreement with those detected in the equivalent field samples from the same intervals. Two soil trip blank samples were included with shipments of ER Site 137 VOC soil samples to the off-site laboratory and were analyzed for VOCs only. As shown in Table 3-2, acetone, methyl ethyl ketone (MEK), methylene chloride, and toluene were detected in the trip blanks. These common laboratory contaminants were either not detected, or were for the most part found in lower concentrations in the site samples compared to the trip blanks. Soil used for the trip blanks 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.

A final set of ER Site 137 soil samples was collected from directly beneath the north system septic tank when it was removed from the ground on October 18, 1995 (SNL/NM October 1995a). These samples were collected to determine if significant concentrations of COCs had leaked from the degraded tank into surrounding soils. They were analyzed for VOCs, SVOCs, RCRA metals, hexavalent chromium, isotopic uranium, and tritium, and were also screened for other radionuclides using SNL/NM in-house gamma spectroscopy.

Summaries of constituents analyzed for and detected by commercial laboratory analyses in the 1990, 1994, and 1995 confirmatory soil and associated QA samples are presented in Tables 3-2, 3-3, and 3-4. Results of the SNL/NM in-house gamma spectroscopy soil sample screenings for other radionuclides are presented in Appendices A.4 through A.8. Complete soil and septic tank septage sample analytical data packages for samples collected in 1994 and 1995 are archived in the SNL/NM Environmental Operations Records Center and are readily available for review and verification (SNL/NM June 1994b, December 1994a, and October 1995b).

Table 3-2

ER Site 137
Summary of Organic and Other Constituents in Confirmatory Soil Samples
Collected Around and Beneath the Two Septic Tanks, and in the Two Drainfields

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Fig. 1-2)	Top of Sample Interval (fbgs)	VOCs Method 8240					SVOCs Method 8270				Cyanide	
						Acetone	MEK	MIBK	Meth. Chloride	Toluene	Diethyl phthalate	BEHP	2-4 Dichloro-phenol	Di-n-butyl phthalate	Method 9010/9012	Units
December 1994 North Drainfield Soil and QA Samples:																
018816-1,2	Soil	Field	12/12/94	DF2-1	5	10	ND	ND	3 J	ND	ND	ND	ND	ND	ND	ug/kg
018818-1,2	Soil	Dupl.	12/12/94	DFD2-1	5	12	ND	ND	3.2 J	ND	ND	ND	ND	ND	ND	ug/kg
018817-1,2	Soil	Field	12/12/94	DF2-1	15	16	ND	ND	3.4 J	ND	ND	ND	ND	ND	ND	ug/kg
018806-1,2	Soil	Field	12/8/94	DF2-2	5	15 B	ND	ND	6.3 B	ND	ND	ND	ND	ND	ND	ug/kg
018807-1,2	Soil	Field	12/8/94	DF2-2	15	7.9 B,J	ND	ND	3.5 B,J	2 B,J	ND	ND	ND	ND	ND	ug/kg
018814-1,2	Soil	Field	12/8/94	DF2-3	5	3.8 B,J	ND	ND	6.6 B	ND	ND	ND	ND	ND	ND	ug/kg
018815-1,2	Soil	Field	12/8/94	DF2-3	15	4.6 B,J	ND	ND	6.4 B	ND	ND	ND	ND	ND	ND	ug/kg
018808-1,2	Soil	Field	12/8/94	DF2-4	5	5 B,J	ND	ND	6.2 B	ND	ND	ND	ND	ND	ND	ug/kg
018809-1,2	Soil	Field	12/8/94	DF2-4	15	12 B	ND	ND	6.8 B	ND	ND	ND	ND	ND	ND	ug/kg
018812-1,2	Soil	Field	12/8/94	DF2-5	5	8.5 B,J	ND	ND	6.4 B	ND	ND	ND	ND	ND	ND	ug/kg
018813-1,2	Soil	Field	12/8/94	DF2-5	15	4.5 B,J	ND	ND	6.1 B	ND	ND	ND	ND	ND	ND	ug/kg
018810-1,2	Soil	Field	12/8/94	DF2-6	5	2.8 B,J	ND	ND	6.9 B	ND	ND	ND	ND	ND	ND	ug/kg
018811-1,2	Soil	Field	12/8/94	DF2-6	15	6.1 B,J	ND	ND	6.7 B	ND	ND	ND	ND	ND	ND	ug/kg
021288-1	Soil	TB	12/8/94	Site 137	NA	49 B	21	ND	13 B	2 J	NT	NT	NT	NT	NT	ug/kg
December 1994 North Septic Tank Soil Samples:																
018819-1,2	Soil	Field	12/12/94	ST2-1	9	2.3 J	ND	ND	2.9 J	ND	ND	ND	ND	ND	ND	ug/kg
018820-1,2	Soil	Field	12/12/94	ST2-2	9	15	ND	ND	3 J	ND	ND	ND	ND	ND	ND	ug/kg
October 1995 Soil Samples From Beneath the North Septic Tank:																
026085-1	Soil	Field	10/18/95	Below ST2	11	ND	ND	ND	ND	ND	NT	NT	NT	NT	NT	ug/kg
026085-2	Soil	Field	10/18/95	Below ST2	11	NT	NT	NT	NT	NT	ND	ND	ND	ND	NT	ug/kg
026085-6	Soil	TB	10/18/95	Site 137	NA	7.3 J	ND	ND	1.1 J	ND	NT	NT	NT	NT	NT	ug/kg

Table 3-2, continued:

ER Site 137
Summary of Organic and Other Constituents in Confirmatory Soil Samples
Collected Around and Beneath the Two Septic Tanks, and in the Two Drainfields

						VOCs Method 8240					SVOCs Method 8270				Cyanide	
Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Fig. 1-2)	Top of Sample Interval (fbgs)	Acetone	MEK	MIBK	Meth. Chloride	Toluene	Diethyl phthalate	BEHP	2-4 Dichloro-phenol	Di-n-butyl phthalate	Method 9010/9012	Units
November 1990 South Drainfield Soil Samples:																
4357-4362	Soil	Compos.	11/5/90	4357-4362	7	NT	NT	NT	NT	NT	ND	ND	ND	ND	NT	ug/kg
4364-4368	Soil	Compos.	11/5/90	4364-4368	7	NT	NT	NT	NT	NT	500	ND	ND	ND	NT	ug/kg
December 1994 South Drainfield Soil and QA Samples:																
018765-1,2	Soil	Field	12/5/94	DF1-1	7	18 B	ND	3.3 J	5.5 B	ND	ND	ND	ND	ND	ND	ug/kg
018766-1,2	Soil	Field	12/5/94	DF1-1	17	15 B	ND	ND	6.9 B	ND	ND	ND	ND	ND	ND	ug/kg
018767-1,2	Soil	Field	12/5/94	DF1-2	7	ND	ND	ND	5.6 B	ND	ND	ND	ND	ND	ND	ug/kg
018768-1,2	Soil	Field	12/5/94	DF1-2	17	ND	ND	ND	6.7 B	ND	ND	ND	ND	ND	ND	ug/kg
018769-1,2	Soil	Field	12/5/94	DF1-3	7	9.7 B,J	ND	ND	6 B	ND	ND	ND	ND	ND	ND	ug/kg
018770-1,2	Soil	Field	12/5/94	DF1-3	17	ND	ND	ND	5.3 B	ND	ND	ND	ND	770	ND	ug/kg
018775-1,2	Soil	Field	12/5/94	DF1-4	7	ND	ND	ND	6.3 B	ND	ND	ND	ND	35 J	ND	ug/kg
018776-1,2	Soil	Dupl.	12/5/94	DFD1-4	7	11 B	ND	ND	6.2 B	ND	ND	ND	ND	63 J	ND	ug/kg
018777-1,2	Soil	Field	12/5/94	DF1-4	17	8.9 J	ND	ND	4.7 B,J	1.3 J	ND	ND	ND	ND	ND	ug/kg
018773-1,2	Soil	Field	12/5/94	DF1-5	7	ND	ND	4.8 J	7.3 B	ND	ND	ND	ND	ND	ND	ug/kg
018774-1,2	Soil	Field	12/5/94	DF1-5	17	ND	ND	ND	5.6 B	ND	ND	ND	330	160 J	ND	ug/kg
018771-1,2	Soil	Field	12/5/94	DF1-6	7	ND	ND	ND	6.8 B	ND	ND	ND	ND	ND	ND	ug/kg
018772-1,2	Soil	Field	12/5/94	DF1-6	17	14 B	ND	2 J	6.7 B	ND	ND	56 J	ND	ND	ND	ug/kg
018782-1,2	Soil	Field	12/6/94	DF1-7	7	23 B	ND	ND	5.3 B	ND	ND	ND	ND	ND	ND	ug/kg
018783-1,2	Soil	Field	12/6/94	DF1-7	17	23 B	ND	ND	5.4 B	ND	ND	ND	ND	ND	ND	ug/kg
018780-1,2	Soil	Field	12/6/94	DF1-8	7	15 B	ND	ND	5.1 B	ND	ND	ND	ND	ND	ND	ug/kg
018781-1,2	Soil	Field	12/6/94	DF1-8	17	16 B	ND	ND	4.8 B,J	ND	ND	ND	ND	ND	920	ug/kg
018778-1,2	Soil	Field	12/6/94	DF1-9	7	5.3 B,J	ND	ND	5.4 B	ND	ND	ND	ND	250 B,J	ND	ug/kg
018779-1,2	Soil	Field	12/6/94	DF1-9	17	23 B	ND	ND	5.4 B	ND	ND	ND	ND	ND	ND	ug/kg
018784-1,2	Soil	Field	12/6/94	DF1-10	7	22 B	ND	ND	5.1 B	ND	ND	ND	ND	ND	ND	ug/kg
018785-1,2	Soil	Field	12/6/94	DF1-10	17	15 B	ND	ND	5.2 B	ND	ND	ND	ND	ND	ND	ug/kg

Table 3-2, continued:

ER Site 137
Summary of Organic and Other Constituents in Confirmatory Soil Samples
Collected Around and Beneath the Two Septic Tanks, and in the Two Drainfields

						VOCs Method 8240					SVOCs Method 8270				Cyanide	
Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Fig. 1-2)	Top of Sample Interval (fbgs)	Acetone	MEK	MIBK	Meth. Chloride	Toluene	Diethyl phthalate	BEHP	2-4 Dichloro-phenol	Di-n-butyl phthalate	Method 9010/9012	Units
December 1994 South Drainfield Soil and QA Samples, continued:																
018786-1,2	Soil	Field	12/6/94	DF1-11	7	22 B	ND	ND	5.2 B	ND	ND	ND	ND	ND	ND	ug/kg
018787-1,2	Soil	Field	12/6/94	DF1-11	17	13 B	ND	ND	5 B	ND	ND	ND	ND	ND	ND	ug/kg
018788-1,2	Soil	Field	12/6/94	DF1-12	7	15 B	ND	ND	5.5 B	ND	ND	ND	ND	ND	ND	ug/kg
018789-1,2	Soil	Field	12/6/94	DF1-12	17	8.8 B,J	ND	ND	5.4 B	ND	ND	ND	ND	ND	ND	ug/kg
018790-1	Soil	TB	12/6/94	Site 137	NA	66	62	ND	16 B	1.6 J	NT	NT	NT	NT	NT	ug/kg
018791-1,2	Soil	Field	12/7/94	DF1-13	7	8.8 B,J	ND	ND	4.9 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018793-1,2	Soil	Dupl.	12/7/94	DFD1-13	7	13 B	ND	ND	3.9 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018792-1,2	Soil	Field	12/7/94	DF1-13	17	18 B	ND	ND	4.6 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018794-1,2	Soil	Dupl.	12/7/94	DFD1-13	17	21 B	ND	ND	4 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018795-1,2	Soil	Field	12/7/94	DF1-14	7	6 B,J	ND	ND	3.7 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018796-1,2	Soil	Dupl.	12/7/94	DFD1-14	7	11 B	ND	ND	3.7 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018797-1,2	Soil	Field	12/7/94	DF1-14	17	9.3 B,J	ND	ND	4.2 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018798-1,2	Soil	Field	12/7/94	DF1-15	7	4.5 B,J	ND	ND	4.1 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018799-1,2	Soil	Field	12/7/94	DF1-15	17	5.2 B,J	ND	ND	3.9 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018804-1,2	Soil	Field	12/8/94	DF1-16	7	3 B,J	ND	ND	4.8 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018805-1,2	Soil	Field	12/8/94	DF1-16	17	3.1 B,J	ND	ND	5.5 B	ND	ND	35 J	ND	ND	ND	ug/kg
018802-1,2	Soil	Field	12/7/94	DF1-17	7	13 B	ND	ND	3.6 B,J	2.3 J	ND	ND	ND	120 J	ND	ug/kg
018803-1,2	Soil	Field	12/7/94	DF1-17	17	3.8 B,J	ND	ND	3.9 B,J	ND	ND	ND	ND	ND	ND	ug/kg
018800-1,2	Soil	Field	12/7/94	DF1-18	7	6.8 B,J	ND	ND	4.2 B,J	1.3 J	ND	ND	ND	ND	ND	ug/kg
018801-1,2	Soil	Field	12/7/94	DF1-18	17	7.6 B,J	ND	ND	4.1 B,J	ND	ND	ND	ND	ND	ND	ug/kg
November, December 1994 South Septic Tank Soil Samples:																
018763-1,2	Soil	Field	11/30/94	ST1-1	11	19 B	ND	ND	ND	ND	ND	ND	ND	ND	ND	ug/kg
018764-1,2	Soil	Field	12/5/94	ST1-2	11	9.6 B,J	ND	ND	7.1 B	2.4 J	ND	ND	ND	ND	ND	ug/kg
Laboratory Reporting Limit For 1994 Soil Samples						10	10	10	5	5	330	330	330	330	500-1,000	ug/kg
Laboratory Reporting Limit For 1995 Soil Samples						10 or 11	10 or 11	10 or 11	5 or 5.4	5 or 5.4	730	730	730	730	NT	ug/kg
Proposed Subpart S Action Level For Soil						8E+06	5E+07	4E+06	9E+04	2E+07	6E+07	5E+04	2E+05	8E+06	2E+06	ug/kg

Table 3-2, concluded:

ER Site 137
Summary of Organic and Other Constituents in Confirmatory Soil Samples
Collected Around and Beneath the Two Septic Tanks, and in the Two Drainfields

Notes:
B = Compound detected in associated blank sample
BEHP = Bis(2-Ethylhexyl)phthalate
Dupl. = Duplicate soil sample
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 = 4-Methyl-2-pentanone
NA = Not applicable
ND = Not detected
NT = Not tested (sample either not collected, or not tested for a particular analyte or group of analytes)
QA = Quality assurance
SVOCs = Semivolatile organic compounds
TB = Trip blank
ug/kg = Micrograms per kilogram
VOCs = Volatile organic compounds

Table 3-3

ER Site 137
Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples
Collected Around and Beneath the Two Septic Tanks, and in the Two Drainfields

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Fig. 1-2)	Top of Sample Interval (fbgs)	RCRA Metals, Methods 6010 and 7471								Other Metals: Cr^{6+} Method 7196	Units
						As	Ba	Cd	Cr, total	Pb	Hg	Se	Ag		
1994 North Drainfield Soil Samples:															
018816-2	Soil	Field	12/12/94	DF2-1	5	3.8	119	ND	10.6	6.1	ND	ND	4.2	ND G	mg/kg
018818-2	Soil	Dupl.	12/12/94	DFD2-1	5	2.9	137	ND	9.5	5.5	ND	ND	18	ND G	mg/kg
018817-2	Soil	Field	12/12/94	DF2-1	15	2.7	100	ND	10.1	5.6	ND	ND	5.4	ND G	mg/kg
018806-2	Soil	Field	12/8/94	DF2-2	5	4.1	82.9	ND	8.9	5.1	ND	ND	0.8 J	ND	mg/kg
018807-2	Soil	Field	12/8/94	DF2-2	15	3	133	ND	8.3	6	ND	ND	ND	ND	mg/kg
018814-2	Soil	Field	12/8/94	DF2-3	5	3.9	153	ND	7.3	5.3	ND	ND	3.2	ND	mg/kg
018815-2	Soil	Field	12/8/94	DF2-3	15	6.2	94.6	ND	8.7	6.2	ND	ND	5.8	ND	mg/kg
018808-2	Soil	Field	12/8/94	DF2-4	5	3.5	172	ND	6.9	4.1 J	ND	ND	34.9	ND	mg/kg
018809-2	Soil	Field	12/8/94	DF2-4	15	3.9	129	ND	10.7	6.6	ND	ND	0.41 J	ND	mg/kg
018812-2	Soil	Field	12/8/94	DF2-5	5	3.3	58.9	ND	7.5	5	ND	ND	12.5	ND	mg/kg
018813-2	Soil	Field	12/8/94	DF2-5	15	2.9	113	ND	8.8	4.8 J	ND	ND	39.5	ND	mg/kg
018810-2	Soil	Field	12/8/94	DF2-6	5	3.3	74.9	ND	8.2	6.1	ND	ND	0.9 J	ND	mg/kg
018811-2	Soil	Field	12/8/94	DF2-6	15	3.3	98.8	ND	8.7	5.7	ND	ND	ND	ND	mg/kg
1994 North Septic Tank Soil Samples:															
018819-2	Soil	Field	12/12/94	ST2-1	9	2.4	136	ND	10.2	5.6	ND	ND	ND	ND	mg/kg
018820-2	Soil	Field	12/12/94	ST2-2	9	2.6	126	ND	8	3.7 J	ND	ND	ND	ND G	mg/kg
1995 Soil Sample Beneath the North Septic Tank:															
026085-2	Soil	Field	10/18/95	Below ST2	11	2.4	120	ND	7.7	4.2	ND	0.86 J	2.4	ND	mg/kg

Table 3-3, continued:

ER Site 137

Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples

Collected Around and Beneath the Two Septic Tanks, and in the Two Drainfields

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Fig. 1-2)	Top of Sample Interval (fbgs)	RCRA Metals, Methods 6010 and 7471								Other Metals: Cr^{6+} Method 7196	Units
						As	Ba	Cd	Cr, total	Pb	Hg	Se	Ag		
November 1990 South Drainfield Soil Samples:															
4357-4362	Soil	Compos.	11/5/90	4357-4362	7	0.6	130	ND	4.5	3.6	ND	ND	0.73	NT	mg/kg
4364-4368	Soil	Compos.	11/5/90	4364-4368	7	0.61	101	ND	2.7	2.7	0.05	ND	191	NT	mg/kg
4364	Soil	Field	11/5/90	4364	7	NT	NT	NT	NT	NT	NT	NT	38	NT	mg/kg
4365	Soil	Field	11/5/90	4365	7	NT	NT	NT	NT	NT	NT	NT	1,170	NT	mg/kg
4366	Soil	Field	11/5/90	4366	7	NT	NT	NT	NT	NT	NT	NT	8.6	NT	mg/kg
4367	Soil	Field	11/5/90	4367	7	NT	NT	NT	NT	NT	NT	NT	920	NT	mg/kg
4368	Soil	Field	11/5/90	4368	7	NT	NT	NT	NT	NT	NT	NT	8.8	NT	mg/kg
December 1994 South Drainfield Soil Samples:															
018765-2	Soil	Field	12/5/94	DF1-1	7	3.3	198	ND	11.3	6.1	ND	ND	11.2	ND	mg/kg
018766-2	Soil	Field	12/5/94	DF1-1	17	2.3	56.1	ND	8.5	3.9 J	ND	ND	3.8	ND	mg/kg
018767-2	Soil	Field	12/5/94	DF1-2	7	3.4	126	ND	10.1	6.1	ND	ND	40.9	ND	mg/kg
018768-2	Soil	Field	12/5/94	DF1-2	17	2.3	86.5	ND	11.4	3 J	ND	ND	0.83 J	ND	mg/kg
018769-2	Soil	Field	12/5/94	DF1-3	7	3.2	145	ND	10.7	4.9 J	ND	ND	2.8	ND	mg/kg
018770-2	Soil	Field	12/5/94	DF1-3	17	2.9	85.9	ND	9.9	5.6	ND	ND	0.75 J	ND	mg/kg
018775-2	Soil	Field	12/5/94	DF1-4	7	3.3	197	ND	11	5	ND	ND	10.6	ND	mg/kg
018776-2	Soil	Dupl.	12/5/94	DFD1-4	7	2.9	241	ND	9.1	4.2 J	ND	ND	4	ND	mg/kg
018777-2	Soil	Field	12/5/94	DF1-4	17	1.7	57.3	ND	6.2	ND	ND	ND	0.43 J	ND	mg/kg
018773-2	Soil	Field	12/5/94	DF1-5	7	3.4	107	ND	10.2	5.4	ND	ND	5.2	ND	mg/kg
018774-2	Soil	Field	12/5/94	DF1-5	17	2.5	55.2	ND	8.4	3.5 J	ND	ND	ND	ND	mg/kg
018771-2	Soil	Field	12/5/94	DF1-6	7	3.4	224	ND	8.4	4.8 J	ND	ND	1.5	ND	mg/kg
018772-2	Soil	Field	12/5/94	DF1-6	17	2.2	124	ND	12.8	4.6 J	ND	ND	ND	ND	mg/kg
018782-2	Soil	Field	12/6/94	DF1-7	7	3.4	158	ND	7.1	4.6 J	ND	ND	ND	ND	mg/kg
018783-2	Soil	Field	12/6/94	DF1-7	17	2.6	76.7	0.73	12	3.7 J	ND	ND	ND	ND	mg/kg

Table 3-3, continued:

ER Site 137

Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples

Collected Around and Beneath the Two Septic Tanks, and in the Two Drainfields

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Fig. 1-2)	Top of Sample Interval (fbgs)	RCRA Metals, Methods 6010 and 7471								Other Metals: Cr^{6+} Method 7196	Units
						As	Ba	Cd	Cr, total	Pb	Hg	Se	Ag		
December 1994 South Drainfield Soil Samples, continued:															
018780-2	Soil	Field	12/6/94	DF1-8	7	3.6	205	ND	6.2	4.6 J	ND	ND	0.51 J	ND	mg/kg
018781-2	Soil	Field	12/6/94	DF1-8	17	2.6	78.9	ND	12.8	4.7 J	ND	ND	1.1	ND	mg/kg
018778-2	Soil	Field	12/6/94	DF1-9	7	3.4	108	ND	7	6.3	ND	ND	ND	ND	mg/kg
018779-2	Soil	Field	12/6/94	DF1-9	17	1.8	49.8	ND	5.5	3.3 J	ND	ND	ND	ND	mg/kg
018784-2	Soil	Field	12/6/94	DF1-10	7	3.4	174	ND	7.2	7	ND	ND	ND	ND	mg/kg
018785-2	Soil	Field	12/6/94	DF1-10	17	2.4	107	ND	5.5	4.7 J	ND	ND	ND	ND	mg/kg
018786-2	Soil	Field	12/6/94	DF1-11	7	3.2	136	ND	6.5	4.5 J	ND	ND	ND	ND	mg/kg
018787-2	Soil	Field	12/6/94	DF1-11	17	1.9	44.3	ND	5	3.6 J	ND	ND	ND	ND	mg/kg
018788-2	Soil	Field	12/6/94	DF1-12	7	2.5	144	ND	6.9	4.9 J	ND	ND	ND	ND	mg/kg
018789-2	Soil	Field	12/6/94	DF1-12	17	2.6	52.8	ND	4.8	3.9 J	ND	ND	ND	ND	mg/kg
018791-2	Soil	Field	12/7/94	DF1-13	7	2.6	99.6	0.5	5.6	4.1 J	ND	ND	6	ND	mg/kg
018793-2	Soil	Dupl.	12/7/94	DFD1-13	7	3	105	0.54	6.4	5.3	ND	ND	4.7	ND	mg/kg
018792-2	Soil	Field	12/7/94	DF1-13	17	2.4	59.1	ND	9.2	3.6 J	ND	ND	5.4	ND	mg/kg
018794-2	Soil	Dupl.	12/7/94	DFD1-13	17	1.8	97.1	ND	25.7	ND	ND	ND	5	ND	mg/kg
018795-2	Soil	Field	12/7/94	DF1-14	7	1.9	60.7	ND	4.5	4.1 J	ND	ND	ND	ND	mg/kg
018796-2	Soil	Dupl.	12/7/94	DFD1-14	7	1.5	69.2	ND	4.9	3.8 J	ND	ND	ND	ND	mg/kg
018797-2	Soil	Field	12/7/94	DF1-14	17	2.9	74.4	ND	8.2	4.7 J	ND	ND	ND	ND	mg/kg
018798-2	Soil	Field	12/7/94	DF1-15	7	2.5	74.2	ND	5.1	3.9 J	ND	ND	ND	ND	mg/kg
018799-2	Soil	Field	12/7/94	DF1-15	17	2	96.6	ND	46.7	3.5 J	ND	ND	ND	ND	mg/kg

Table 3-3, continued:

ER Site 137

Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples

Collected Around and Beneath the Two Septic Tanks, and in the Two Drainfields

Sample Number	Sample Matrix	Sample Type	Sample Date	Sample Location (Fig. 1-2)	Top of Sample Interval (fbgs)	RCRA Metals, Methods 6010 and 7471								Other Metals: Cr^{6+} Method 7196	Units
						As	Ba	Cd	Cr, total	Pb	Hg	Se	Ag		
December 1994 South Drainfield Soil Samples, continued:															
018804-2	Soil	Field	12/8/94	DF1-16	7	3.7	166	ND	6	5.3	ND	ND	31.3	ND	mg/kg
018805-2	Soil	Field	12/8/94	DF1-16	17	2.4	56.6	ND	7	3.7 J	ND	ND	ND	ND	mg/kg
018802-2	Soil	Field	12/7/94	DF1-17	7	3.6	120	ND	5.7	6.5	ND	ND	ND	ND	mg/kg
018803-2	Soil	Field	12/7/94	DF1-17	17	2	70.4	ND	5.4	4.6 J	ND	ND	ND	ND	mg/kg
018800-2	Soil	Field	12/7/94	DF1-18	7	3	157	ND	7.5	3.9 J	ND	ND	ND	ND	mg/kg
018801-2	Soil	Field	12/7/94	DF1-18	17	1.9	53.4	ND	5.1	3.5 J	ND	ND	ND	ND	mg/kg
December 1994 South Septic Tank Soil Samples:															
018763-2	Soil	Field	11/30/94	ST1-1	11	3.3	93.6	ND	10.5	4.1 J	ND	ND	ND	ND	mg/kg
018764-2	Soil	Field	12/5/94	ST1-2	11	2.8	235	ND	7	4 J	ND	ND	ND	ND	mg/kg
Laboratory Reporting Limit For 1990 Soil Samples						0.1	1	0.25	1	1	0.04	0.1	0.5	NT	mg/kg
Laboratory Reporting Limit For 1994 Soil Samples						1	1	0.5	1	5	0.1	0.5	1	0.05 - 0.1	mg/kg
Laboratory Reporting Limit For 1995 Soil Samples						2.2	44	1.1	2.2	0.66	0.1	1.1	2.2	0.2	mg/kg
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

Table 3-3, concluded:

ER Site 137

Summary of RCRA Metals and Hexavalent Chromium in Confirmatory Soil Samples Collected Around and Beneath the Two Septic Tanks, and in the Two Drainfields

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.
Compos. = Composite sample
Dupl. = Duplicate soil sample
fbgs = Feet below ground surface
G = Raised detection limit due to sample dilution
J = Result is detected below the reporting limit or is an estimated concentration.
mg/kg = Milligrams per kilogram
ND = Not detected
NT = Not tested (sample either not collected, or not tested for a particular analyte or group of analytes)
UTL = Upper Tolerance Limit
* IT March 1996
** 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 proposed action level (EPA July 1994)

Table 3-4

ER Site 137
Summary of Isotopic Uranium and Tritium in Confirmatory Soil Samples
Collected Around and Beneath the Two Septic Tanks, and in the Two Drainfields

						Isotopic Uranium Method HASL-300 (pCi/g)									Tritium Methods EPA-600 906.0 (1994 samples), LAL-91-SOP-0108 and LAL-91-SOP-0067 (1995 samples) (pCi/L)		
Sample Number	Sample Matrix	Sample Type	Sample Date	Sample (Fig. 1-2)	Top of Sample (fbgs)	U-233/ U-234 Result	U-233/ U-234 Error *	U-233/ U-234 M.D.A.	U-235 Result	U-235 Error *	U-235 M.D.A.	U-238 Result	U-238 Error *	U-238 M.D.A.	Result	Error *	M.D.A.
1994 North Drainfield Soil Samples:																	
018806-5	Soil	Composite	12/8/94	DF2-1/6	5	0.91	0.15	0.055	ND	0.022	0.036	0.97	0.15	0.046			
018807-5	Soil	Composite	12/8/94	DF2-1/6	15	0.94	0.15	0.03	0.031	0.022	0.022	0.85	0.14	0.046			
018806-4	Soil	Composite	12/8/94	DF2-1/6	5										ND	150	270
018807-4	Soil	Composite	12/8/94	DF2-1/6	15										ND	150	270
1995 Soil Sample Beneath the North Septic Tank:																	
026085-3	Soil	Field	10/18/95	Below ST2	11	0.462	0.052	0.014	0.029	0.012	0.009	0.499	0.054	0.009	ND	150	71
1994 South Drainfield Soil Samples:																	
018765-5	Soil	Composite	12/5/94	DF1-1/18	7	0.84	0.14	0.038	0.024	0.02	0.022	0.88	0.15	0.048			
018766-5	Soil	Composite	12/5/94	DF1-1/18	17	1	0.16	0.033	ND	0.016	0.031	0.94	0.15	0.04			
018765-4	Soil	Composite	12/5/94	DF1-1/18	7										ND	150	270
018766-4	Soil	Composite	12/5/94	DF1-1/18	17										ND	150	270
Number of SNL/NM Background Soil Sample Analyses **						14			283			90			U		
SNL/NM Soil Background Range **						0.44-<5.02			0.004-3			0.153-2.3			U		
SNL/NM Soil Background 95th Percentile **						<5.02			0.16			1.4			U		
Nationwide Tritium Range in Precipation and Drinking Water ***						NA			NA			NA			100-400		

Notes:
U-233 = Uranium 233
U-234 = Uranium 234. Uranium 233/234 background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.
U-235 = Uranium 235. Uranium 235 background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.
U-238 = Uranium 238. Uranium 235 background concentrations presented above are based on analyses of surface and subsurface soil samples collected in the Southwest area.

fbgs = Feet below ground surface
M.D.A. = Minimum detectable activity
ND = Not detected

pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
U = Undefined for SNL/NM soils

* Error = +- 2 sigma uncertainty
** IT March 1996
*** EPA October 1993

3.7 Risk Analysis

Barium, total chromium, and silver were detected in some ER Site 137 soil samples at concentrations greater than the applicable SNL/NM background concentrations for these metals, and silver was also detected in two of the 1990 south drainfield samples at levels greater than the proposed Subpart S action level of 400 mg/kg for silver (Table 3-3). Because the highest level of silver detected is greater than 1/10 of the proposed Subpart S action level, the site failed the Subpart S screening criteria. Only those contaminants detected at concentrations above the applicable background levels (barium, total chromium, and silver) are included in the risk assessment analysis.

Silver was detected at a concentration of 2.4 mg/kg in the October 1995 soil sample from beneath the north septic tank, and was not detected in two samples collected in 1994 from either side of the same tank. Silver was detected in 11 of the 13 soil samples from the north system drainfield at concentrations ranging from 0.41 to 39.5 mg/kg. Eight of the 11 samples contained silver above the Southwest area background 95th percentile concentration of less than 1 mg/kg (IT March 1996), but all detected concentrations were substantially below 400 mg/kg.

Silver was not detected in the two samples collected in 1994 from either side of the south tank. Forty soil samples were collected from shallow and deep intervals in the south drainfield in 1994, and silver was detected in 18 of the 40 samples up to a concentration of 40.9 mg/kg. Also, as described above, the composite sample collected in 1990 from the southern part of the south drainfield, and three of the five discrete samples from the southern part of the drainfield contained silver between 1 and 400 mg/kg. The other two discreet samples (numbers 4365 and 4367 on Figure 1-2) contained 1,170 and 920 mg/kg of silver, respectively, which are above the proposed Subpart S action level of 400 mg/kg.

Barium was detected in all 60 of the 1990, 1994, and 1995 north and south system soil samples analyzed for barium (Table 3-3). No barium concentrations above the Southwest area background UTL of 214 mg/kg were detected in any of the 16 north system soil samples. Barium above the background UTL was detected in only 3 of the 44 south system soil samples. The three samples included the sample from the north side of the septic tank (location ST1-2 on Figure 1-2), the duplicate sample from the shallow interval in borehole DF1-4, and the shallow interval sample from borehole DF1-6 (Figure 1-2), which contained 235, 241, and 224 mg/kg of barium, respectively.

Chromium was detected in all 60 of the 1990, 1994, and 1995 north and south system soil samples analyzed for chromium (Table 3-3). In addition, all of the 58 north and south septic tank and drainfield soil samples collected in 1994 and 1995 were analyzed for hexavalent chromium and none was detected, so it is apparent that all chromium detected in these samples is in the trivalent form. No chromium concentrations above the Southwest area background UTL of 15.9 mg/kg were detected in any of the 16 north system soil samples. Chromium above the background UTL was detected in only 2 of the 44 south system soil samples. These included the deep interval sample from borehole DF1-15 and the duplicate

sample from the deep interval in borehole DF1-13 (Figure 1-2), which contained 46.7 and 25.7 mg/kg of chromium, respectively. However, the equivalent deep interval field sample from the DF1-13 contained only 9.2 mg/kg of chromium.

Risk Characterization

The highest barium, trivalent chromium, and silver concentrations (241, 46.7, and 1,170 mg/kg, respectively) found at this site were used in the risk calculations in order to produce a conservative estimate of risk to counter uncertainties in the soil analytical data. Although the site has a designated industrial land-use scenario, the risk values for a residential land-use scenario are presented to show the potential for risk to human health under the more restrictive land-use scenario. EPA generally recommends that the inhalation pathway not be included in a residential land-use scenario because a typical residential site normally would be considered to be covered with vegetation (EPA 1991), but this pathway is considered because of the potential for soil at KAFB to be a dust source due to erosion, or possibly construction or excavation activities. However, there are no inhalation pathway toxicity values for barium, chromium, and silver, so no risk analysis was done for this pathway. Therefore, for purposes of this risk assessment, it is assumed that oral ingestion of the three metals in soil will be the most likely exposure route for COCs at this site. Long-term ingestion of COCs is, in fact, considered highly unlikely because the COCs at ER Site 137 were discharged directly from drainlines into subsurface rather than surface soils. Contact with COCs is therefore unlikely, but is nonetheless possible for brief periods if contaminated soils are exposed or brought to the surface by excavation activities.

The general equation for calculating potential ingestion of chemicals in soil is shown below, and is taken from the Risk Assessment Guidance for Superfund: Volume 1 (EPA 1989 and 1991):

$$\text{Intake (mg/kg-day)} = \frac{CS \times IR \times EF \times FI \times ED \times (10^{-6}\ kg/mg)}{BW \times AT}$$

where

Intake = total intake of the particular COC, expressed as mg/kg of body weight per day;

- CS = chemical concentration in soil (mg/kg);
- IR = ingestion rate: 200 mg/day (residential scenario);
- EF = exposure frequency: 350 days/year);
- FI = fraction ingested: default to 1;
- ED = exposure duration: 30 years;
- BW = body weight: 16 kg for 6 years, then 70 kg for 24 years, or a weighted average of 59.2 kg (residential scenario), and
- AT = averaging time: ED x 350 days/year, or 10,500 days (for non-carcinogenic effects).

Using the above formula and as shown in Table 3-5, intake of barium, trivalent chromium, and silver is calculated to be 0.0008, 0.0002, and 0.004 mg/kg-day, respectively.

The final step of the risk evaluation process is to calculate the potential toxicity effects for the three COCs at this site. None of the COCs is classified as a carcinogen, so cancer risk will not

be evaluated. The toxic effect is evaluated by calculating a Hazard Index (HI) for each of the three metals, and then summing the individual HIs into a total HI. HI is defined in EPA 1989 as

HI = intake/RfD

where

intake = the total intake of the particular COC, as calculated above, and

RfD = the Reference Dose for each of the COCs (EPA March 1996).

The values used to calculate the individual HIs for barium, trivalent chromium, and silver are shown in Table 3-5. As shown on the table, the total of the individual HIs (residential scenario) for the highest concentrations of barium, trivalent chromium, and silver detected at this site is calculated to be 0.8, which is less than the maximum HI of 1.0 recommended by EPA (EPA 1989). We therefore conclude that the maximum concentration of the three COCs detected at this site will not pose a significant risk to human health or the environment.

Table 3-5
ER Site 137: Values Used for the Toxicological Risk Calculation

COC Name	Highest COC concentration detected at the site (mg/kg)	Intake (mg/kg-day)	RfD_o (mg/kg-day)	RfD confi-dence	HI	Slope Factor (carcinogens)	Data Source
Barium	241	0.0008	7E-02	medium	0.0	None	EPA March 1996
Trivalent chromium	46.7	0.0002	1E+00	low	0.0	None	EPA March 1996
Silver	1,170	0.004	5E-03	low	0.8	None	EPA March 1996
Total HI for all COCs					**0.8**		

Notes
HI = Hazard Index
mg/kg = Milligrams per kilogram
RfD_o= Reference dose for oral ingestion intake

Uncertainty Discussion
The risk analysis shows that the calculated risk assessment values are lower than the applicable numerical standard (HI of 1) established by the EPA. The uncertainty in this conclusion is also considered to be small. Because of the location and history of the site, there is low uncertainty in the designated land-use scenario and the potentially affected populations that were considered in making the risk assessment analysis. A Reasonable Maximum Exposure (RME) approach was used to calculate the risk assessment values, which means that the factors used in the intake and HI calculations were conservative, and that the calculated intakes are likely overestimates. Maximum measured values of the concentrations of the COCs were used to provide conservative results. Because the COCs in the septic system effluent

were discharged to subsurface rather than surface soils, assumptions made about the exposure pathways are uncertain and are likely overestimates for purposes of the analysis.

Table 3-5 also shows the uncertainties in the toxicological reference dose values. Because of the conservative nature of the RME approach, the uncertainties in the toxicological values are not expected to be of high enough concern to change the conclusion from the risk assessment analysis. The overall uncertainty in all of the steps in the risk assessment process is therefore considered to be not significant with respect to the conclusion reached.

Risk Summary

Site history and process knowledge suggest that relatively minor amounts of COCs (primarily silver) were released to the environment via the Building 6540/6542 septic system. Because of the location of the site on KAFB, the designated land-use scenario, and the nature of the contamination, the potential exposure pathways identified for this site include soil ingestion and dust inhalation of chemical constituents. However, there are no inhalation pathway toxicity values for barium, chromium, and silver, so no risk analysis was performed to evaluate this pathway. As discussed above, ingestion or inhalation of COCs other than for a brief period of time (from construction or excavation activities) is considered very unlikely. Nonetheless, using primarily conservative assumptions and employing a RME approach to the risk assessment, the calculations show that for the residential land-use scenario, the total HI is 0.8, and the three COCs are not classified as carcinogens. It is therefore concluded that this site does not have significant potential to affect human health under either a residential (or industrial) land-use scenario.

Ecological risk has not been addressed in this NFA proposal because the ecological risk analysis for ER Site 137 has not been estimated at this time. Site-wide ecological risk analyses are being conducted and the relevant analysis for this site will be presented when available. However, analytical results of samples that have been collected suggest that concentrations of COCs identified at this site will not result in a significant level of ecological risk.

3.8 Rationale for Pursuing a Confirmatory Sampling NFA Decision

As discussed in Section 3.4, the passive soil-gas survey did not indicate any anomalies or areas of VOC or SVOC contamination in the two drainfield areas of this site.

As shown in Table 3-2, only low concentrations of four VOC compounds (acetone, methyl isobutyl ketone, methylene chloride, and toluene), which are common laboratory contaminants, were detected in soil samples collected from this site. These four VOCs were also detected in associated soil trip blanks shipped with the samples, and are believed to be artifacts of laboratory contamination. A low concentration of one SVOC (diethyl phthalate) was detected in one of the two 1990 composite samples from the south drainfield, and near or below-reporting limit concentrations of three other SVOCs (bis[2-ethylhexyl]phthalate, 2-4 dichlorophenol, and di-n-butyl phthalate) were detected in a few of the 1994 soil samples from the south drainfield shallow and deep sampling intervals. Also, all detected concentrations of VOCs and SVOCs were much less than the proposed Subpart S action levels for the respective compounds. Cyanide was detected at a near-reporting-limit concentration of 920 micrograms per kilogram (µg/kg) in one deep interval soil sample from the south drainfield. This concentration is much lower than the proposed Subpart S soil action level of 2,000,000 ug/kg for cyanide (EPA July 1990).

As shown on Table 3-3, soil sample analytical results indicate that, except for silver from two of the 1990 sampling locations, the nine metals that were targeted in the Site 137 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), or (3) were less than the proposed Subpart S action levels for these metals. Also, as discussed in Section 3.7 above, the risk assessment calculations using the highest concentrations of the three metals (barium, trivalent chromium, and silver) that were identified at above-background concentrations at this site demonstrates that these metals will not pose a significant risk to human health or the environment.

Isotopic uranium activity levels detected in the shallow and deep interval composite soil samples from the north and south drainfields, and in the grab sample from beneath the north septic tank, were found to be below the corresponding 95th percentile background activity levels presented in the IT March 1996 report for those radionuclides (Table 3-4). Tritium was not detected in soil moisture from any of these three samples. Also, the gamma spectroscopy semiqualitative screening of the composite soil samples from north and south drainfield shallow and deep sampling intervals, and from directly beneath the north septic tank, did not indicate the presence of contamination from other radionuclides in soils at this location (Appendices A.4 through A.8).

As discussed in Section 3.3 above, the north system septic tank was uncovered and removed from the site on October 18, 1995. Approximately 2 inches of dark humus-like material was found at the bottom of the tank, and was assumed to represent decomposed septage. This material was transferred from the degraded tank into drums before the tank was removed from the ground and disposed of (SNL/NM October 1995a). The south system septic tank contents were removed and the tank was thoroughly cleaned in January 1996 (SNL/NM January 1996a). The septage removal and cleaning operation is shown in the bottom photograph of Figure 3-1. The empty and clean 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 January 1996b).

4.0 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 137, and that additional investigations are unwarranted and unnecessary. Based on archival information and chemical and radiological analytical results of soil samples collected next to and beneath the two septic tanks, and beneath the two drainfields at this site, SNL/NM has demonstrated that hazardous waste or COCs that were released from this SWMU into the environment pose an acceptable level of risk under current and projected future land use (Criterion 5 of Section 1.2), and the site does not pose a threat to human health or the environment. ER Site 137 is therefore recommended for an NFA determination.

5.0 REFERENCES

5.1 ER Site 137 References

IT Corporation (IT), February 1991, "Results of Building 6540 Drain Field Analyses," Summary report for November 1990 soil sampling at the south system drainfield by IT Corporation, IT project number 301181.13.01, Albuquerque, New Mexico, February 20, 1991.

Sandia National Laboratories/New Mexico (SNL/NM), April 1975, Facilites Engineering drawing #93748 dated April 4, 1975 showing only the north drainfield (and not the south drainfield) at the facility in 1975.

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Appendix A

OU 1295, Site 137
Results of Previous Sampling and Surveys

Appendix A.1

ER Site 137
Summary of Constituents Detected in 1992 Septic Tank Samples

Note: The text and tables included in Appendix A.1 have been taken directly from the Sandia National Laboratories/New Mexico Septic Tank Monitoring Report, 1992 Report" (SNL/NM March 1993), and have not been altered from their original form. Unresolved discrepancies and errors contained in the text and tables addressing the Building 6540/6542 septic tank samples include:

1) The text indicates that ^{226}Radium was measured at 1.29 pCi/mL and ^{212}Lead was measured at 0.155 pCi/L in the north tank sludge, whereas the table summarizing the analytical results for the north tank sludge sample indicates activity levels of 0.129 and 0.466 pCi/L for ^{226}Radium and ^{212}Lead, respectively.

2) "Acentium" is listed on the north tank table. This is a typographical error, and is most likely actinium

Appendix A.1

ER Site 137
Summary of Constituents Detected in 1992 Septic Tank Samples

Buildings 6540 and 6542, North and South Tanks
Area 3
Sample ID No. SNLA008582 and SNLA008583
Tank ID No. AD 8900R

On July 29, 1992, sludge samples were collected from the northern and southern septic tanks serving Buildings 6540 and 6542. During review of the sludge radiochemistry data, the following items were noted:

North Tank

- ^{226}Ra was measured at 1.29 pCi/mL and ^{214}Pb was measured at 0.405 pCi/mL, which are above the respective investigation levels (IL) calculated during this monitoring effort. These are progeny of naturally occurring ^{238}U, and the findings suggest elevated levels of ^{238}U exist at this location. The ^{214}Pb level was less than 0.1 percent of the U.S. Department of Energy (DOE) derived concentration guideline (DCG) constraints.

- ^{212}Pb was measured at 0.155 pCi/mL, ^{212}Bi was measured at 0.357 pCi/mL, and ^{208}Tl was measured at 0.139 pCi/mL, which are above the respective ILs. ^{212}Bi and ^{212}Pb levels were within DOE DCG constraints.

South Tank

During review of the radiological data, no parameters were detected that exceed U.S. Department of Energy (DOE) derived concentration guideline (DCG) limits or the investigation levels (IL) established during this investigation.

Appendix A.1, continued:

ER Site 137
Summary of Constituents Detected in 1992 Septic Tank Samples

Results of Septic Tank Analyses (Sludge Sample)			
Building No./Area:	**6540/42 N TANK A-3** (NORTH SYSTEM TANK)		
Tank ID No.:	**AD89009R**		
Date Sampled:	**7/29/92**		
Sample ID No.:	**SNLA008582**		
Analytical Parameter	**Measured Concentration**	**± 2 Sigma Uncertainty**	**Units**
Gross Alpha	1E+1	2E+1	pCi/g
Gross Beta	1E+1	5E+1	pCi/g
Gross Alpha	1E+1	2E+1	pCi/g
Gross Beta	-2E+1	4E+1	pCi/g
Gross Alpha	0E+1	2E+1	pCi/g
Gross Beta	-3E+1	4E+1	pCi/g
Gross Alpha	2E+1	2E+1	pCi/g
Gross Beta	-1E+1	4E+1	pCi/g
Tritium	Dry sample. No H3 analysis performed.		
Acentium	0.499	0.0354	pCi/mL
Bismuth-212	0.357	0.0465	pCi/mL
Bismuth-214	0.369	0.0188	pCi/mL
Cesium-137	0.0478	0.00685	pCi/mL
Potassium-40	0.108	0.312	pCi/mL
Lead-212	0.466	0.0236	pCi/mL
Lead-214	0.405	0.0227	pCi/mL
Radium-226	0.129	0.189	pCi/mL
Thorium-234	1.52	0.156	pCi/mL
Thallium-208	0.139	0.00884	pCi/mL

ND = Not Detected
NA = Not Applicable

Appendix A.1, concluded:

ER Site 137
Summary of Constituents Detected in 1992 Septic Tank Samples

Results of Septic Tank Analyses (Sludge Sample)			
Building No./Area:	**6540/42 S TANK A-3** (SOUTH SYSTEM TANK)		
Tank ID No.:	**AD89009R**		
Date Sampled:	**7/29/92**		
Sample ID No.:	**SNLA008583**		
Analytical Parameter	**Measured Concentration**	**± 2 Sigma Uncertainty**	**Units**
Gross Alpha	2E+0	2E+1	pCi/g
Gross Beta	-2E+0	5E+1	pCi/g
Gross Alpha	2E+0	20.000000	pCi/g
Gross Beta	3E+1	50.000000	pCi/g
Gross Alpha	8E+0	2E+1	pCi/g
Gross Beta	3E+1	4E+1	pCi/g
Gross Alpha	-1E+0	2E+1	pCi/g
Gross Beta	3E+1	4E+1	pCi/g
Tritium	-1E+02	3E+02	pCi/L
Bismuth-214	<0.0319	NA	pCi/mL
Cesium-137	0.00519	0.00310	pCi/mL
Potassium-40	0.810	0.00908	pCi/mL
Lead-212	0.0271	0.00028	pCi/mL
Lead-214	0.0372	0.00715	pCi/mL
Radium-226	0.479	0.0732	pCi/mL
Thorium-234	0.437	0.0596	pCi/mL
Thallium-208	0.0138	0.00392	pCi/mL

ND = Not Detected
NA = Not Applicable

Appendix A.2

ER Site 137
Summary of Constituents Detected in 1994 and 1995 Septic Tank Septage Samples

Appendix A.2

ER Site 137
Summary of Constituents in 1994 and 1995 Septic Tank Septage Samples

Sample Number	Sample Matrix	Sample Type	Sample Date	Method	Compound Name	Result	Det. Limit or M.D.A.	Error *	Units
NORTH SYSTEM SAMPLES:									
June 1994 North Septic Tank Samples:									
015474-1	Sludge/soil	Field	6/1/94	8240 (VOCs)	Methylene chloride	0.21 B,J	0.5	NA	mg/kg
015474-5	Sludge/soil	Field	6/1/94	8270 (SVOCs)	Fluorene	1.5 J	6.6	NA	mg/kg
				8270 (SVOCs)	Phenanthrene	25	6.6	NA	mg/kg
				8270 (SVOCs)	Anthracene	5.6 J	6.6	NA	mg/kg
				8270 (SVOCs)	Fluoranthene	52	6.6	NA	mg/kg
				8270 (SVOCs)	Pyrene	39	6.6	NA	mg/kg
				8270 (SVOCs)	Benzo(a)anthracene	23	6.6	NA	mg/kg
				8270 (SVOCs)	Bis(2-Ethylhexyl) phthalate	3.2 J	6.6	NA	mg/kg
				8270 (SVOCs)	Chrysene	25	6.6	NA	mg/kg
				8270 (SVOCs)	Benzo(b)fluoranthene	25	6.6	NA	mg/kg
				8270 (SVOCs)	Benzo(k)fluoranthene	14	6.6	NA	mg/kg
				8270 (SVOCs)	Benzo(a)pyrene	16	6.6	NA	mg/kg
				8270 (SVOCs)	Indeno(1,2,3-cd)pyrene	10	6.6	NA	mg/kg
015474-3	Sludge/soil	Field	6/1/94	6010	Arsenic	28 J	50	NA	mg/kg
				6010	Barium	106	5	NA	mg/kg
				6010	Cadmium	3.9	2.5	NA	mg/kg
				6010	Chromium	27.8	5	NA	mg/kg
				6010	Lead	48.8	25	NA	mg/kg
				7471	Mercury	0.24	0.1	NA	mg/kg
				6010	Selenium	90.9 J	100	NA	mg/kg
				6010	Silver	371	5	NA	mg/kg
015474-4	Sludge/soil	Field	6/1/94	TCLP/6010	Arsenic	ND	0.2	NA	mg/L
				TCLP/6010	Barium	0.19 B	0.02	NA	mg/L
				TCLP/6010	Cadmium	0.011	0.01	NA	mg/L
				TCLP/6010	Chromium	ND	0.02	NA	mg/L
				TCLP/6010	Lead	ND	0.1	NA	mg/L
				TCLP/7470	Mercury	ND	0.0002	NA	mg/L
				TCLP/6010	Selenium	ND	0.4	NA	mg/L
				TCLP/6010	Silver	ND	0.02	NA	mg/L
015474-2	Sludge/soil	Field	6/1/94	7196	Hexavalent chromium	ND	0.05	NA	mg/kg
015474-3	Sludge/soil	Field	6/1/94	9010/9012	Cyanide	ND	0.05	NA	mg/kg
October 1995 North Septic Tank Samples:									
026084-1	Sludge/soil	Field	10/18/95	LAL-91-SOP-0108	Uranium 238	0.90	0.015	0.11	pCi/g
				LAL-91-SOP-0108	Uranium 235	0.062	0.014	0.029	pCi/g
				LAL-91-SOP-0108	Uranium 233/234	1.50	0.020	0.15	pCi/g
026084-1	Sludge/soil	Field	10/18/95	LAL-91-SOP-0067	Tritium	ND	200	220	pCi/L

Appendix A.2, continued:

ER Site 137
Summary of Constituents in 1994 and 1995 Septic Tank Septage Samples

Sample Number	Sample Matrix	Sample Type	Sample Date	Method	Compound Name	Result	Det. Limit or M.D.A.	Error *	Units
October 1995 North Septic Tank Samples, continued:									
026084-3	Sludge/soil	Field	10/18/95		Uranium Series:				
				Gamma Spec.	Radium-226	0.64	0.62	0.41	pCi/g
				Gamma Spec.	Lead-214	0.24	0.05	0.05	pCi/g
				Gamma Spec.	Bismuth-214	0.23	0.05	0.05	pCi/g
					Thorium Series:				
				Gamma Spec.	Thorium-232	0.18	0.14	0.09	pCi/g
				Gamma Spec.	Radium-228	0.21	0.14	0.1	pCi/g
				Gamma Spec.	Lead-212	0.26	0.04	0.08	pCi/g
				Gamma Spec.	Bismuth-212	0.24	0.26	0.17	pCi/g
					Other Radionuclides:				
				Gamma Spec.	Cesium-137	0.03	0.02	0.02	pCi/g
				Gamma Spec.	Potassium-40	5.86	0.32	0.9	pCi/g
SOUTH SYSTEM SAMPLES:									
June 1994 South Septic Tank Samples:									
015943-1	Liquid	Field	6/1/94	8240 (VOCs)	1,1-Dichloroethane	54	25	NA	ug/L
				8240 (VOCs)	Methylene chloride	10 B,J	25	NA	ug/L
015943-7	Sludge	Field	6/1/94	8240 (VOCs)	1,1-Dichloroethane	8.3	0.5	NA	mg/kg
				8240 (VOCs)	Trichloroethene	4.9	0.5	NA	mg/kg
				8240 (VOCs)	Toluene	0.84	0.5	NA	mg/kg
				8240 (VOCs)	Xylenes (total)	1.5	0.5	NA	mg/kg
015943-8	Sludge	Field	6/1/94	8270 (SVOCs)	Phenol	2.8 J	13	NA	mg/kg
				8270 (SVOCs)	4-Methylphenol	5.9 J	13	NA	mg/kg
				8270 (SVOCs)	Bis(2-Ethylhexyl) phthalate	5 J	13	NA	mg/kg
015943-2	Liquid	Field	6/1/94	6010	Barium	0.034	0.01	NA	mg/L
				6010	Cadmium	ND	0.005	NA	mg/L
				6010	Chromium	ND	0.01	NA	mg/L
				6010	Silver	0.0064 J	0.01	NA	mg/L
				6010	Arsenic	ND	0.01	NA	mg/L
				6010	Lead	ND	0.003	NA	mg/L
				6010	Selenium	ND	0.021	NA	mg/L
015943-3	Liquid	Field	6/1/94	7470	Mercury	0.00013 J	0.0002	NA	mg/L
015943-6	Liquid	Field	6/1/94	7196	Hexavalent Chromium	ND	0.01	NA	mg/L
015943-5	Liquid	Dupl.	6/1/94	7196	Hexavalent Chromium	ND	0.01	NA	mg/L
015943-10	Sludge	Field	6/1/94	6010	Arsenic	ND	10	NA	mg/kg
				6010	Barium	70.8	1	NA	mg/kg
				6010	Cadmium	2.7	0.5	NA	mg/kg
				6010	Chromium	7.8	1	NA	mg/kg
				6010	Lead	40.6	5	NA	mg/kg
				6010	Selenium	ND	20	NA	mg/kg
				6010	Silver	372	1	NA	mg/kg
				7471	Mercury	0.21	0.1	NA	mg/kg
015943-9	Sludge	Field	6/1/94	7196	Hexavalent Chromium	ND	0.5	NA	mg/kg

Appendix A.2, concluded:

ER Site 137
Summary of Constituents in 1994 and 1995 Septic Tank Septage Samples

Sample Number	Sample Matrix	Sample Type	Sample Date	Method	Compound Name	Result	Det. Limit or M.D.A.	Error *	Units
June 1994 South Septic Tank Samples, continued:									
015943-11	Sludge	Field	6/1/94	TCLP/6010	Arsenic	ND	0.2	NA	mg/L
				TCLP/6010	Barium	0.96 B	0.02	NA	mg/L
				TCLP/6010	Cadmium	ND	0.01	NA	mg/L
				TCLP/6010	Chromium	ND	0.02	NA	mg/L
				TCLP/6010	Lead	ND	0.1	NA	mg/L
				TCLP/6010	Selenium	ND	0.4	NA	mg/L
				TCLP/6010	Silver	0.012 J	0.02	NA	mg/L
				TCLP/7471	Mercury	ND	0.0002	NA	mg/L
015943-4	Liquid	Field	6/1/94	9012	Cyanide	ND	0.01	NA	mg/L
015943-10	Sludge	Field	6/1/94	9010/9012	Cyanide	ND	0.5	NA	mg/kg
015943-13	Liquid	Field	6/1/94	HASL-300	Uranium 238	0.21	0.057	0.09	pCi/L
				HASL-300	Uranium 235	0.024	0.022	0.028	pCi/L
				HASL-300	Uranium 233/234	0.53	0.022	0.16	pCi/L
015943-12	Sludge	Field	6/1/94	HASL-300	Uranium 238	0.99	0.019	0.13	pCi/g
				HASL-300	Uranium 235	0.032	0.019	0.02	pCi/g
				HASL-300	Uranium 233/234	1.9	0.007	0.22	pCi/g
015943-14	Liquid	Field	6/1/94	EPA-600 906.0	Tritium	440	290	180	pCi/L
015943-15	Liquid	Field	6/1/94	Gamma Spec.	Multiple Radionuclides	ND	0.008-5.72	NR	pCi/g
015943-16	Sludge	Field	6/1/94		Thorium Series:				
				Gamma Spec.	Thorium-228	0.05	NR	0.042	pCi/g
					Other Radionuclides:				
				Gamma Spec.	Cesium 137	0.04	NR	0.022	pCi/g
				Gamma Spec.	Potassium 40	1.33	NR	0.27	pCi/g
				Gamma Spec.	Strontium-85	0.01	NR	0.009	pCi/g

Notes

B = Compound detected in asociated blank sample
Det. = Detection
J = Result is detected below the reporting limit or is an estimated concentration.
M.D.A. = Minimum detectable activity
mg/kg = Milligrams per kilogram
mg/L = Milligrams per liter
ug/L = micrograms per liter
NA = Not Applicable
ND = Not Detected
NR = Not reported by laboratory
pCi/g = Picocuries per gram
pCi/L = Picocuries per liter
pCi/mL = Picocuries per milliliter
SVOCs = Semivolatile organic compounds
TCLP = Toxicity Characteristic Leaching Procedure
VOCs = Volatile organic compounds
* Error = plus or minus 2 sigma uncertainty

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Appendix A.3

ER Site 137
Summary of 1994 PETREX™ Passive Soil-Gas Survey Results

Appendix A.3

ER Site 137
Summary of 1994 PETREX™ Passive Soil-Gas Survey Results

PETREX Relative Soil Gas Response Values
(in ion counts)
STD SITE 137

Sample	PCE	TCE	BTEX	Aliphatics
224	ND	ND	10151	60921
226	ND	ND	3193	10456
227	ND	ND	140901	29858
228	1162	ND	37124	48426
229	ND	ND	ND	ND
230	ND	ND	2499	2484
231	7329	ND	1413324	568239
232	ND	ND	ND	10971
233	ND	ND	1197	10357
234	ND	ND	3156	7098
235	ND	ND	6221	4561
236	ND	ND	ND	ND
237	ND	ND	4620	1751
238	2648	ND	1944	72368
239	1295	ND	12988	30551
240	1134	3524	18266	23522
241	ND	1967	5456	2908
242	ND	ND	3949	25813
243	ND	1253	12322	3186
244	1308	ND	7505	5250
245	1233	1360	21181	8582
246	ND	ND	ND	15537
247	2410	ND	29768	19176
248	ND	ND	19540	23251
249	2030	1322	45421	97158
250	ND	ND	ND	ND
251	ND	ND	29025	12489
252	ND	ND	40978	28417
253	ND	ND	2332	1961
254	ND	ND	1186	3809
255	ND	ND	661793	91690
256	8397	ND	63286	72999
257	ND	ND	65497	29015
258	5811	2452	65422	107875
259	ND	ND	5092	31024
D-1224	ND	ND	27346	44317
D-1236	ND	ND	ND	4072
D-1246	ND	ND	3554	8792

Appendix A.3, continued:

ER Site 137
Summary of 1994 PETREX™ Passive Soil-Gas Survey Results

PETREX Relative Soil Gas Response Values
(in ion counts)
STD SITE 137

D-1250	ND	ND	3897	3262
* 900	ND	ND	4553	6219
* 901	ND	ND	4732	ND

PCE - Tetrachloroethene
Indicator Mass Peak(s) 164

TCE - Trichloroethene
Indicator Mass Peak(s) 130

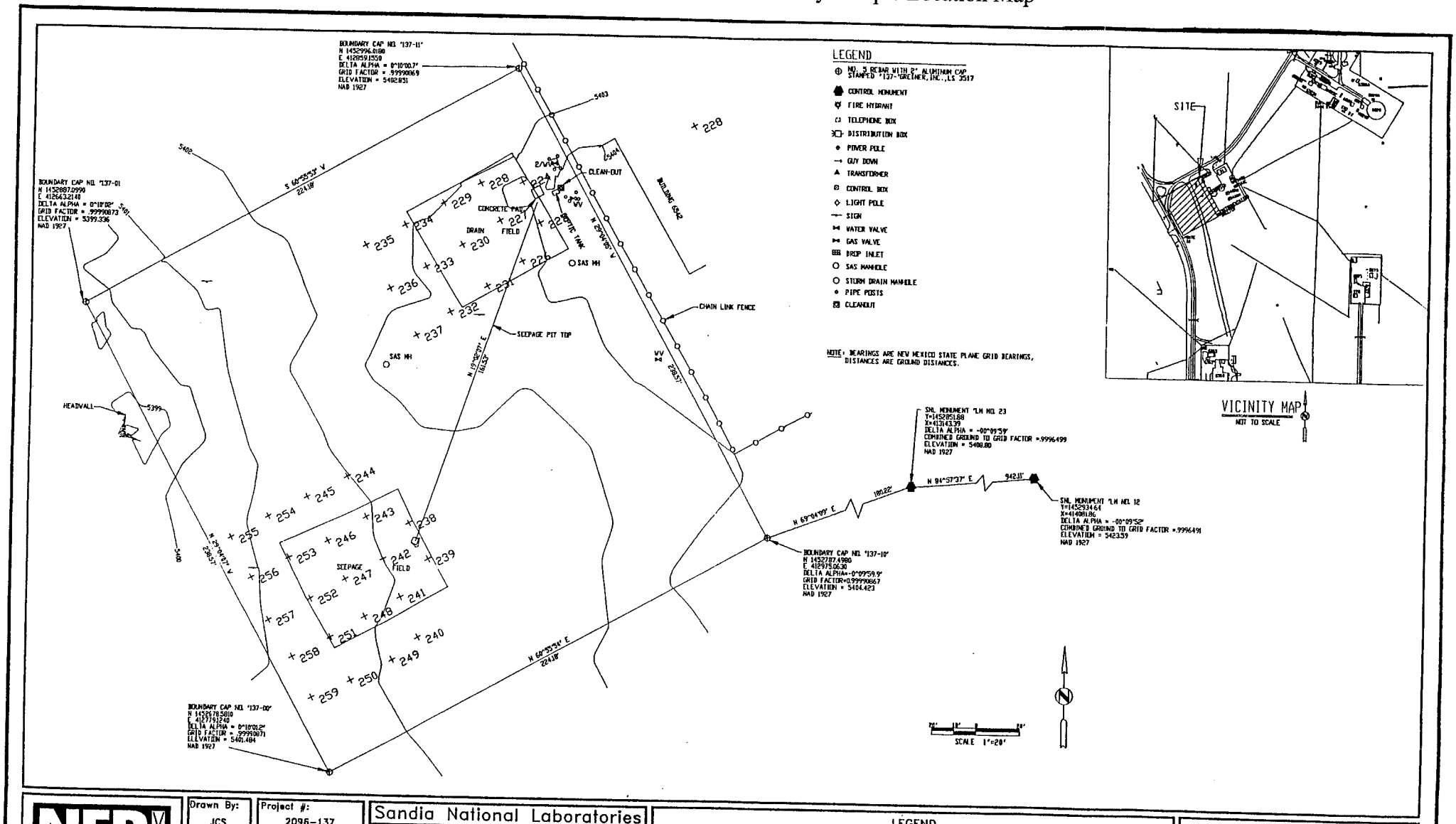
BTEX - Benzene, Toluene, Ethylbenzene/Xylene(s)
Indicator Mass Peak(s) 78, 92, 106

Aliphatics - C4-C11 Cycloalkanes/Alkenes
Indicator Mass Peak(s) 56, 70, 84, 98, 112,
126, 140, 154

D - Duplicate Sample
Sample numbers in thousands duplicate of sample numbers in hundreds

* QA/QC Blank Sample - No Compounds Detected
above the PETREX Normal reporting Limits

ER Site 137
1994 PETREX™ Passive Soil-Gas Survey Sample Location Map



NER Northeast Research Institute LLC, 805 Parfet Street, Suite 100, Lakewood, Colorado 80215, (303) 238-0090	Drawn By: JCS	Project #: 2096-137	Sandia National Laboratories
	Checked By:	Date: 5/23/1995	STD Site 137, Albuquerque, New Mexico
	Project Manager: JOG	File Name: a16fpl.dwg	PETREX FINGERPRINT TECHNOLOGY®

LEGEND

Features:

+ PETREX Sample Location

Sample Locations

Plate 15

October 13, 2003

ADDITIONAL /SUPPORTING DATA

CAN BE VIEWED AT THE
ENVIRONMENTAL, SAFETY, HEALTH
AND SECURITY (ES&H and Security)
RECORD CENTER

FOR ASSISTANCE CALL
844-4688