3-1-2005

Justification for Class III Permit Modification March 2005 DSS Site 1029 Operable Unit 1295 Building 6584 North Septic System at Technical Area III

Sandia National Laboratories/NM

Drain and Septic Systems (DSS) Area of Concern (AOC) Sites 1006, 1007, 1010, 1015 1020, 1024, 1028, 1029, 1083, 1086, 1108, and 1110

This work supported by the United States Department of Energy under contract DE-AC04-94AL85000.

Sandia National Laboratories

Environmental Restoration Project

Site Histories

Drain and septic system site histories for the twelve DSS AOCs are as follows:

AOC Site Number	Site Name	Location	Year Bldg. and System Built	Year Drain or Septic System Abandoned	Year(s) Septic Tank Effluent Sampled	Year Septic Tank Pumped For the Last Time
1006	Bldg 6741 Septic System	TA-III	1968	1994	1992, 1995	1996
1007	Bldg 6730 Septic System	TA-III	1964	Early 1990s	1992, 1995	1996
1010	Bldg 6536 Septic System and Seepage Pit	TA-III	1967	1991	1990/1991, 1992, 1995	1996
1015	Former MO 231-234 Septic System	TA-V	1988	1991	1990/1991, 1992, 1995	1996
1020	MO-146, MO-235, T-40 Septic System	TA-III	1978	1991	1990/1991, 1995	1996
1024	MO 242-245 Septic System	TA-III	1976	1991	1990/1991, 1992, 1995	1996
1028	Bldg 6560 Septic System and Seepage Pit	TA-III	1955	1991	1990/1991, 1992, 1995	1996
1029	Bldg 6584 North Septic System	TA-III	1963	1991	1990/1991, 1992, 1995	1996
1083	Bldg 6570 Septic System	TA-III	1956	1991	1990/1991	Unknown (backfilled before 1995)
1086	Bldg 6523 Septic System	TA-III	1954	1991	1990/1991	Unknown (backfilled before 1995)
1108	Bldg 6531 Seepage Pits	TA-III	1960	1991	No septic tank at this site.	NA
1110	Bldg 6536 Drain System	TA-III	1967	Early 1990s?	No septic tank at this site.	NA

Depth to Groundwater

Depth to groundwater at these twelve AOC sites is as follows:

DSS Site Number	Site Name	Location	Groundwater Depth (ft bgs)
1006	Bldg 6741 Septic System	TA-III	460
1007	Bldg 6730 Septic System	TA-III	465
1010	Bldg 6536 Septic System and Seepage Pit	TA-III	487
1015	Former MO 231-234 Septic System	TA-V	496
1020	MO-146, MO-235, T-40 Septic System	TA-III	487
1024	MO 242-245 Septic System	TA-III	485
1028	Bldg 6560 Septic System and Seepage Pit	TA-III	482
1029	Bldg 6584 North Septic System	TA-III	482
1083	Bldg 6570 Septic System	TA-III	493
1086	Bldg 6523 Septic System	TA-III	492
1108	Bldg 6531 Seepage Pits	TA-III	483
1110	Bldg 6536 Drain System	TA-III	480

Constituents of Concern

- VOCs, SVOCs, PCBs, HE compounds, metals, cyanide, and radionuclides.

Investigations

- A backhoe was used to positively locate buried components (drainfield drain lines, drywells) for placement of soil-vapor samplers and soil borings.
- Passive soil-vapor samples were collected in drainfield and seepage pit areas to screen for VOCs.
- Soil samples were collected from directly beneath drainfield drain lines, seepage pits, and drywells to determine if COCs were released to the environment from drain systems.

The years that site-specific characterization activities were conducted, and soil sampling depths at each of these twelve AOC sites are as follows:

DSS Site Number	Site Name	Buried Components (Drain Lines, Drywells) Located With A Backhoe	Soil Sampling Beneath Drainlines, Seepage Pits, Drywells	Type(s) of Drain System, and Soil Sampling Depths (ft bgs)	Passive Soil Vapor Sampling
1006	Bldg 6741 Septic System	1997	1998, 1999	Drainfield: 7, 12	2002
1007	Bldg 6730 Septic System	1997	1998, 1999	Drainfield: 4.5, 9.5	2002
1010	Bldg 6536 Septic System and Seepage Pit	None	2002	Septic System Seepage Pit: 15, 20 2nd Seepage Pit: 23, 28	2002
1015	Former MO 231-234 Septic System	1995	1998, 1999	Drainfield: 5, 10	None
1020	MO-146, MO-235, T-40 Septic System	1997	1998, 1999	Drainfield: 5.5, 10.5	None
1024	MO 242-245 Septic System	1997	1998, 1999	Drainfield: 5, 10	None
1028	Bldg 6560 Septic System and Seepage Pit	None	2002	Septic System Seepage Pit: 14, 19 2nd Seepage Pit: 7, 12	2002
1029	Bldg 6584 North Septic System	1997	1998, 1999	Drainfield: 5, 10	2002
1083	Bldg 6570 Septic System	2002	2002	Seepage Pit: 9, 14	2002
1086	Bldg 6523 Septic System	2003	2002	Seepage Pit: 10, 15	None
1108	Bldg 6531 Seepage Pits	None	2002	Seepage Pits: 10, 15	2002
1110	Bldg 6536 Drain System	1997	2002	Drain Pipe: 10, 15, 20	None

Summary of Data Used for NFA Justification

- Seven of the twelve DSS sites were selected by NMED for passive soil-vapor sampling to screen for VOCs, and no significant VOC contamination was identified at any of the seven sites.
- Soil samples were analyzed at on- and off-site laboratories for VOCs, SVOCs, PCBs, HE compounds, metals, cyanide, gross alpha/beta activity, and radionuclides by gamma spectroscopy.
- Very low levels of VOCs were detected at eleven sites, SVOCs and PCBs were detected at seven sites, and cyanide was identified at six of the sites. HE compounds were not detected at any of these sites.
- Arsenic was detected above background at six sites, and barium was detected above background at one site. No other metals were detected above background concentrations.
- Either U-235 or U-238 was detected at an activity slightly above the background activity at three of the twelve sites and, although not detected, the MDA for one or both of these two radionuclides exceeded background levels at five sites. Gross alpha activity was slightly above background in one sample from one of the twelve sites, and gross beta activity was below background in all samples from the twelve sites.
- All confirmatory soil sample analytical results were used for characterizing the sites, for performing the risk screening assessments, and as justification for the NFA proposals for these sites.

Recommended Future Land Use

- Industrial land use was established for these twelve DSS AOC sites.

Results of Risk Analysis

- Risk assessment results for the residential scenario are calculated per NMED risk assessment guidance as presented in "Supplemental Risk Document Supporting Class 3 Permit Modification Process" (SNL October 2003).
- Because COCs were present in concentrations greater than background-screening levels or because constituents were present that did not have background screening numbers, it was necessary to perform risk assessments for these twelve DSS sites. The risk assessment analyses evaluated the potential for adverse health effects for the residential land-use scenario.
- As shown in the table below, the total HIs and estimated excess cancer risks for six of the twelve DSS sites are below NMED guidelines for the residential land-use scenario.
- For five additional sites, the HIs are below the residential guideline, but the total estimated excess cancer risks are slightly above the residential guideline. However, the incremental excess cancer risk values for these five sites are below the NMED residential guideline.
- For one of the twelve sites (DSS Site 1029), the total HI and estimated excess cancer risk are slightly above the NMED guidelines for the residential land-use scenario due to an isolated detection of asphalt-like SVOCs in a single sample. With the removal of these SVOCs from the risk assessment, the incremental values are below the residential scenario guideline.
- The residential land-use scenario TEDEs ranged from none to 0.18 mrem/yr, all of which are substantially below the EPA guideline of 75 mrem/yr. Therefore, these DSS sites are eligible for unrestricted radiological release.
- Using the SNL predictive ecological risk assessment methodology, four of the twelve AOCs were evaluated for ecological risk based on the depth of the available data (i.e., 0 to 5 feet bgs). The ecological risk for all of these sites is acceptable.
- In conclusion, human health and ecological risks are acceptable per NMED guidance. Thus, these sites are proposed for CAC without institutional controls.

Residential land use scenario risk assessment values for COCs at the twelve AOCs are as follows:

DSS Site Number	DSS Site Name	Residential Land Use Scenario	
		Hazard Index	Excess Cancer Risk
1006	Bldg 6741 Septic System	0.26	1E-5 Total/2.62E-7 Incremental
1007	Bldg 6730 Septic System	0.22	1E-5 Total/7.72E-7 Incremental
1010	Bldg 6536 Septic System and Seepage Pit	0.00	2E-9
1015	Former MO 231-234 Septic Systems	0.23	1E-5 Total/1.29E-6 Incremental
1020	MO-146, MO-235, T-40 Septic System	0.00	none
1024	MO 242-245 Septic System	0.21	1E-5 Total/3.65E-7 Incremental
1028	Bldg 6560 Septic System and Seepage Pit	0.00	8E-10
1029	Bldg 6584 North Septic System	2.17 Total/0.06 Incremental (after removal of asphalt-like SVOCs)	8E-5 Total/2.93E-6 Incremental (after removal of asphalt-like SVOCs)
1083	Bldg 6570 Septic System	0.00	2E-9
1086	Bldg 6523 Septic System	0.00	2E-9
1108	Bldg 6531 Seepage Pits	0.26	1E-5 Total/2.98E-6 Incremental
1110	Bldg 6536 Drain System	0.00	3E-9
NMED Guidance		≤1	<1E-5

For More Information Contact

U.S. Department of Energy
Sandia Site Office
Environmental Restoration
Mr. John Gould
Telephone (505) 845-6089

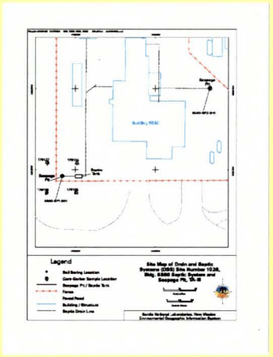
Sandia National Laboratories
Environmental Restoration Project
Task Leader: Brenda Langkopf
Telephone (505) 284-3272

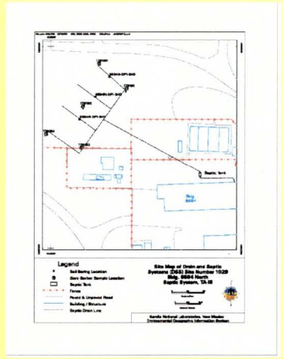
Drain and Septic Systems (DSS) Area of Concern (AOC) Sites 1028, 1029, 1083, 1086, 1108, and 1110

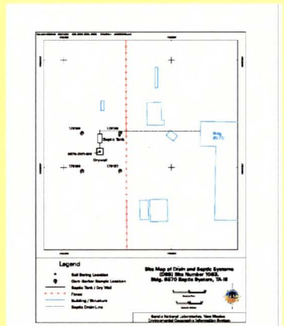
This work supported by the United States Department of Energy under contract DE-AC04-94AL85000.

Sandia National Laboratories

Environmental Restoration Project



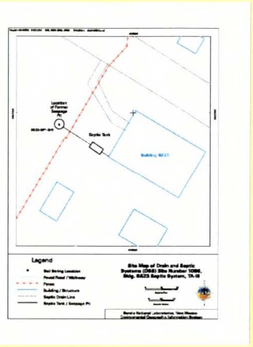


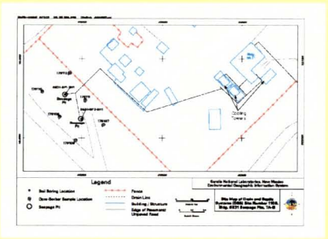


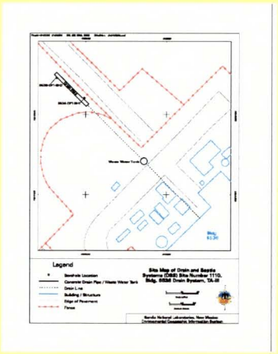
Collecting soil samples with the Geoprobe.

Subsurface soil recovered for analyses.

Seepage pit demolition and backfilling.







For More Information Contact

U.S. Department of Energy
Sandia Site Office
Environmental Restoration
Mr. John Gould
Telephone (505) 845-6089

Sandia National Laboratories
Environmental Restoration Project
Task Leader: Brenda Langkopf
Telephone (505) 284-3272

Sandia National Laboratories

Justification for Class III Permit Modification

March 2005

DSS Site 1029
Operable Unit 1295
Building 6584 North Septic System at Technical Area III

NFA (SWMU Assessment Report) Submitted March 2004

Environmental
Restoration
Project

United States Department of Energy
Sandia Site Office

Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

NFA

ESHSCL

National Nuclear Security Administration
Sandia Site Office
P.O. Box 5400
Albuquerque, New Mexico 87185-5400

MAR 2 3 2004

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. John E. Kieling, Manager
Permits Management Program
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Rd., Building E
Santa Fe, NM 87505

Dear Mr. Kieling:

On behalf of the Department of Energy (DOE) and Sandia Corporation, DOE is submitting the enclosed SWMU Assessment Reports and Proposals for No Further Action (NFA) for Drain and Septic Systems (DSS) Sites 1006, 1007, 1015, 1020, 1024, 1029, 1108, and 1110 at Sandia National Laboratories, New Mexico, EPA ID No. NM5890110518.

This submittal includes descriptions of the site characterization work, soil characterization data, and risk assessments for DSS Sites 1006, 1007, 1015, 1020, 1024, 1029, 1108, and 1110. The risk assessments conclude that for these eight sites (1) there is no significant risk to human health under both the industrial and residential land-use scenarios, and (2) that there are no ecological risks associated with these sites.

DOE and Sandia are requesting a determination that these DSS sites are acceptable for No Further Action.

If you have any questions, please contact John Gould at (505) 845-6089.

Sincerely,

Patty Wagner
Manager

Enclosure

cc w/enclosure:
L. King, EPA, Region 6 (2 copies, via Certified Mail)
W. Moats, NMED-HWB (via Certified Mail)
M. Gardipe, NNSA/SC/ERD
C. Voorhees, NMED-OB (Santa Fe)
D. Bierley, NMED-OB

cc w/o enclosure:
K. Thomas, EPA, Region 6
S. Martin, NMED-HWB
F. Nimick, SNL, MS 1089
D. Stockham, SNL, MS 1087
P. Freshour, SNL, MS 1087
M. Sanders, SNL, MS 1087
R. Methvin, SNL MS 1089
J. Pavletich, SNL MS 1087
A. Villareal, SNL, MS 1035
A. Blumberg, SNL, MS 0141
M. J. Davis, SNL, MS 1089
ESHSEC Records Center, MS 1087

Sandia National Laboratories/New Mexico
Environmental Restoration Project

SWMU ASSESSMENT REPORT AND PROPOSAL FOR NO FURTHER ACTION DRAIN AND SEPTIC SYSTEMS SITE 1029, BUILDING 6584 NORTH SEPTIC SYSTEM

March 2004

United States Department of Energy
Sandia Site Office

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
AOP	Administrative Operating Procedure
BA	butyl acetate
bgs	below ground surface
COC	constituent of concern
DSS	Drain and Septic Systems
EB	equipment blank
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FIP	Field Implementation Plan
g	gram(s)
GS	Gore-Sorber™
HE	high explosive(s)
HI	hazard index
HWB	Hazardous Waste Bureau
KAFB	Kirtland Air Force Base
MDL	method detection limit
MO	mobile office
NFA	no further action
NMED	New Mexico Environment Department
OU	Operable Unit
PCB	polychlorinated biphenyl
pCi	picocurie(s)
RCRA	Resource Conservation and Recovery Act
RPSD	Radiation Protection Sample Diagnostics
SAP	Sampling and Analysis Plan
SNL/NM	Sandia National Laboratories/New Mexico
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TA	Technical Area
TB	trip blank
TOP	Technical Operating Procedure
VOC	volatile organic compound

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1.0 PROJECT BACKGROUND

Environmental characterization of Sandia National Laboratories/New Mexico (SNL/NM) Drain and Septic Systems (DSS) started in the early 1990s. These units consist of either septic systems (one or more septic tanks plumbed to either drainfields or seepage pits), or other types of miscellaneous drain units without septic tanks (including drywells or french drains, seepage pits, and surface outfalls). Initially, 23 of these sites were designated as Solid Waste Management Units (SWMUs) under Operable Unit (OU) 1295, Septic Tanks and Drainfields. Characterization work at 22 of these 23 SWMUs has taken place since 1994 as part of SNL/NM Environmental Restoration (ER) Project activities. The twenty-third site did not require any characterization, and an administrative proposal for no further action (NFA) was granted in July 1995.

Numerous other DSS sites that were not designated as SWMUs were also present throughout SNL/NM. An initial list of these non-SWMU sites was compiled and summarized in an SNL/NM document dated July 8, 1996; the list included a total of 101 sites, facilities, or systems (Bleakly July 1996). For tracking purposes, each of these 101 individual DSS sites was designated with a unique four-digit site identification number starting with 1001. This numbering scheme was devised to clearly differentiate these non-SWMU sites from existing SNL/NM SWMUs, which have been designated by one- to three-digit numbers. As work progressed on the DSS site evaluation project, it became apparent that the original 1996 list was in need of field verification and updating. This process included researching SNL/NM's extensive library of facilities engineering drawings and conducting field verification inspections jointly with SNL/NM ER personnel and New Mexico Environment Department (NMED)/Hazardous Waste Bureau (HWB) regulatory staff from July 1999 through January 2000. The goals of this additional work included the following:

- Determine to the degree possible whether each of the 101 systems included on the 1996 list was still in existence, or had ever existed.
- For systems confirmed or believed to exist, determine the exact or apparent locations and components of those systems (septic tanks, drainfields, seepage pits, etc.).
- Identify which systems would, or would not, need initial shallow investigation work as required by the NMED.
- For systems requiring characterization, determine the specific types of shallow characterization work (including passive soil-vapor sampling and/or shallow soil borings) that would be required by the NMED.

A number of additional drain systems were identified from the engineering drawings and field inspection work. It was also determined that some of the sites on the 1996 list actually contained more than one individual drain or septic system that had been combined under one four-digit site number. In order to reduce confusion, a decision was made to assign each individual system its own unique four-digit number. A new site list containing a total of 121 individual DSS sites was generated in 2000. Of these 121 sites, the NMED required environmental assessment work at a total of 61. No characterization was required at the remaining 60 sites because the sites either were found not to exist, were the responsibility of

other non-SNL/NM organizations, were already designated as individual SWMUs, or were considered by the NMED to pose no threat to human health or the environment. Subsequent backhoe excavation at DSS Site 1091 confirmed that the system did not exist, which decreased the number of DSS sites requiring characterization to 60.

Concurrent with the field inspection and site identification work, NMED/HWB and SNL/NM ER Project technical personnel worked together to reach consensus on a staged approach and specific procedures that would be used to characterize the DSS sites, as well as the remaining OU 1295 Septic Tanks and Drainfield SWMUs that had not been approved for NFA. These procedures are described in detail in the "Sampling and Analysis Plan [SAP] for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico" (SNL/NM October 1999), which was approved by the NMED/HWB on January 28, 2000 (Bearzi January 2000). A follow-on document, "Field Implementation Plan [FIP], Characterization of Non-Environmental Restoration Drain and Septic Systems" (SNL/NM November 2001), was then written to formally document the updated DSS site list and the specific site characterization work required by the NMED for each of the 60 DSS sites. The FIP was approved by the NMED in February 2002 (Moats February 2002).

2.0 DSS SITE 1029: BUILDING 6584 NORTH SEPTIC SYSTEM

2.1 Summary

The SNL/NM ER Project conducted an assessment of DSS Site 1029, the Building 6584 North Septic System. There are no known or specific environmental concerns at this site. The assessment was conducted to determine whether environmental contamination was released to the environment via the septic system present at the site. This report presents the results of the assessment and, based upon the findings, recommends a risk-based proposal for NFA for DSS Site 1029. This NFA proposal provides documentation that the site was sufficiently characterized, that no significant releases of contaminants to the environment occurred via the Building 6584 North Septic System, and that it does not pose a threat to human health or the environment under either industrial or residential land-use scenarios. Current operations at the site are conducted in accordance with applicable laws and regulations that are protective of the environment. Septic system discharges are now directed to the City of Albuquerque sewer system.

Review and analysis of all relevant data for DSS Site 1029 indicate that concentrations of constituents of concern (COCs) at this site were found to be below applicable risk assessment action levels. Thus, DSS Site 1029 is proposed for an NFA decision based upon sampling data demonstrating that COCs released from the site into the environment pose an acceptable level of risk under current and projected future land uses as set forth by Criterion 5, which states: "The SWMU/AOC [Area of Concern] 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" (NMED March 1998).

2.2 Site Description and Operational History

2.2.1 Site Description

DSS Site 1029 is located on the north side of the northern boundary of SNL/NM Technical Area (TA)-III on federally owned land controlled by Kirtland Air Force Base (KAFB) (Figure 2.2.1 1). The center of the site is located approximately 500 feet west-northwest of the entrance to TA-III and is approximately 250 northwest of the northwest corner of Building 6584 (Figure 2.2.1-2). The abandoned septic system consisted of a septic tank of unknown volume that emptied to an exceptionally large drainfield consisting of four 100-foot-long parallel drain lines (Figure 2.2.1-2). Construction details are based upon site inspections and backhoe excavations of the system. The system received discharges from Building 6584.

The surface geology at DSS Site 1029 is characterized by a veneer of aeolian sediments underlain by Upper Santa Fe Group alluvial fan deposits that interfinger with sediments of the ancestral Rio Grande west of the site. These deposits extend to, and probably far below, the water table at this site. The alluvial fan materials originated in the Manzanita Mountains east of DSS Site 1029, and typically consist of a mixture of silts, sands, and gravels that are poorly sorted, and exhibit moderately connected lenticular bedding. Individual beds range from 1 to 5 feet in thickness with a preferred east-west orientation and have moderate to low hydraulic

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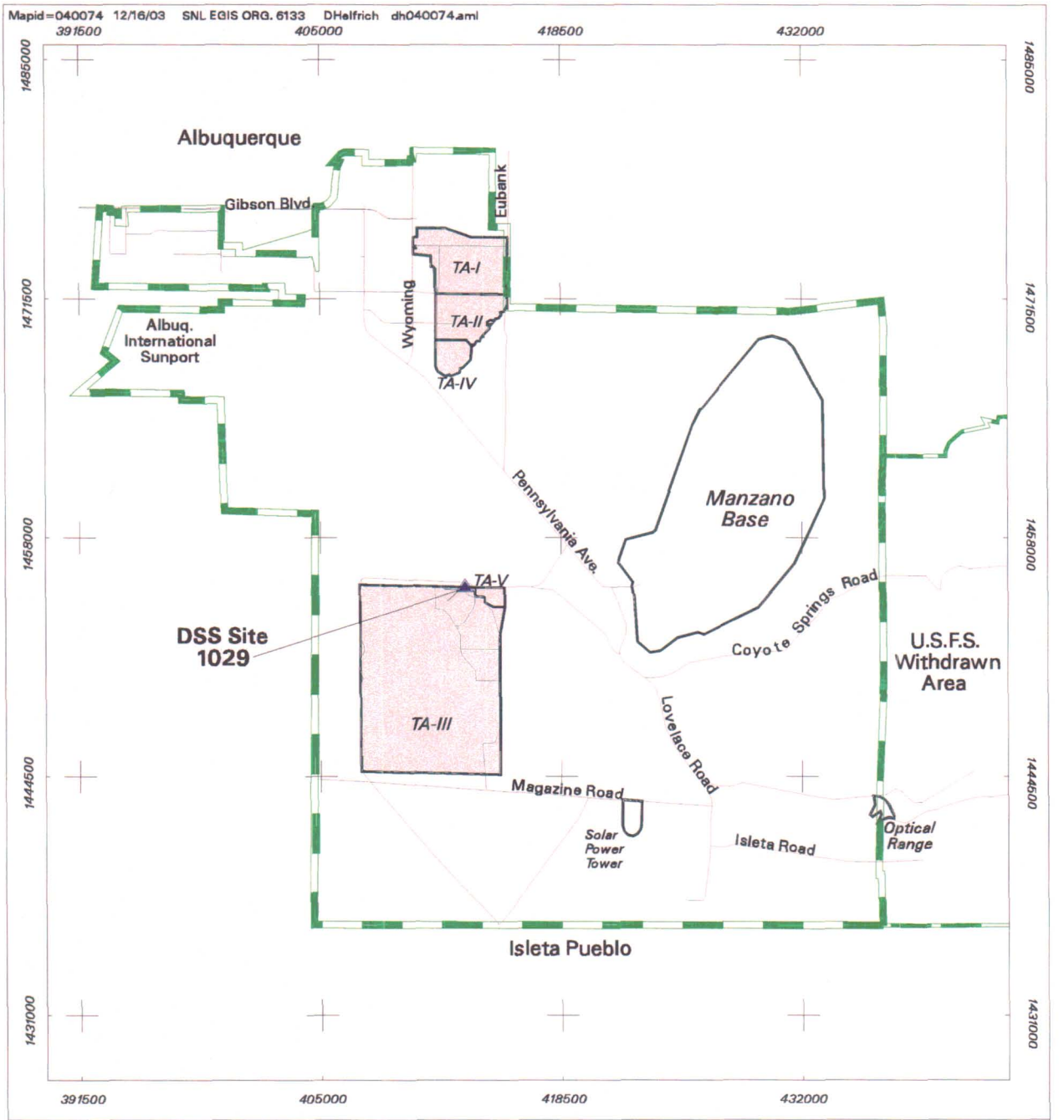

Legend

- DSS Site 1029
- Major Road
- KAFB Boundary
- USFS Withdrawn Area Boundary
- SNL Technical Area

Figure 2.2.1-1
Location Map of Drain and Septic Systems (DSS) Site Number 1029, Bldg. 6584 North Septic System, TA-III

0 4500 9000
Scale in Feet

0 1080 2160
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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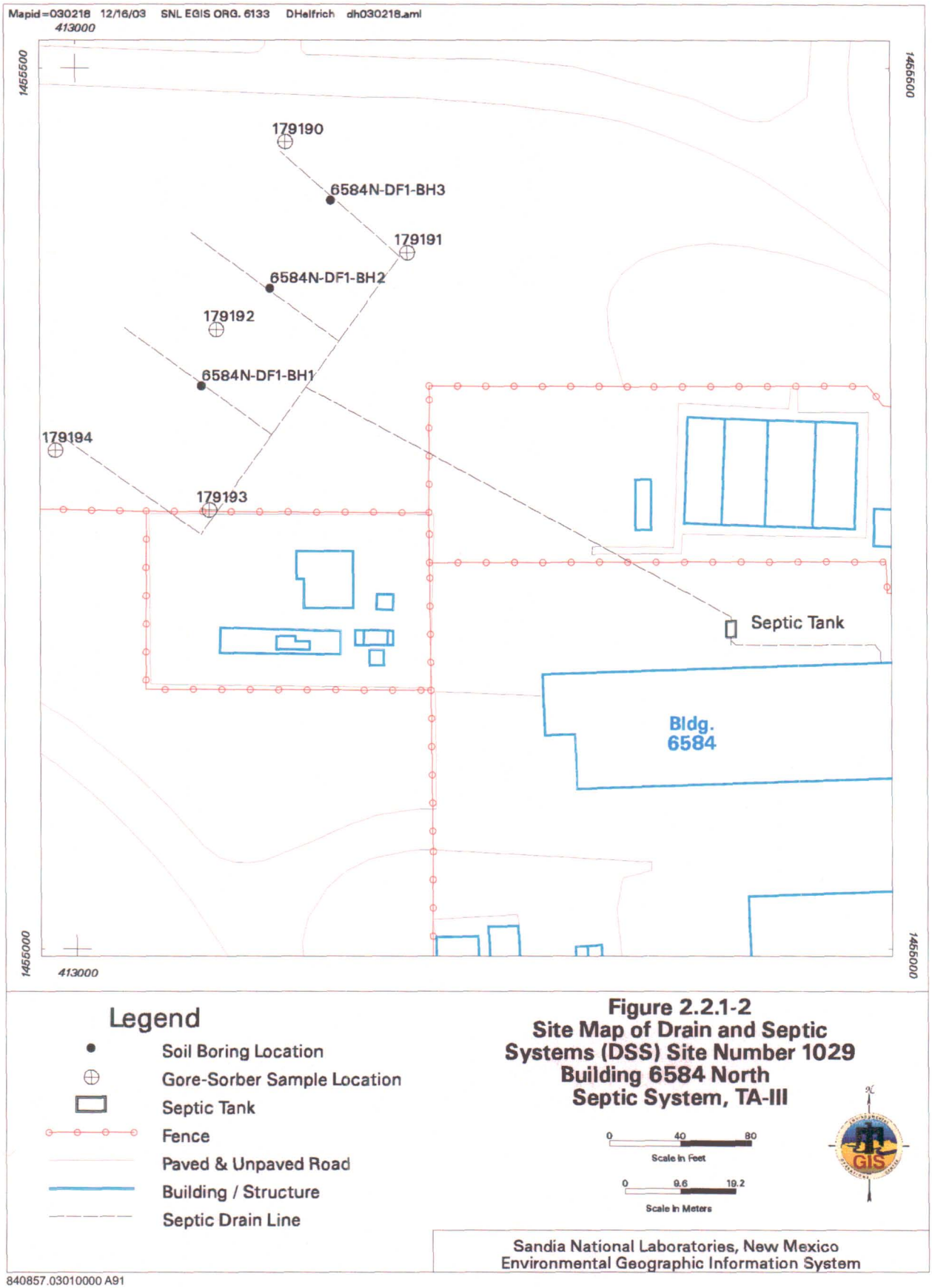

Figure 2.2.1-2
Site Map of Drain and Septic Systems (DSS) Site Number 1029
Building 6584 North Septic System, TA-III

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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conductivities (SNL/NM March 1996). Site vegetation in the general vicinity of DSS Site 1029 consists primarily of desert grasses, shrubs, and cacti.

The ground surface in the vicinity of the site is flat or slopes very slightly to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.2 miles north of the site. No perennial surface-water bodies are present in the vicinity of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration rates for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996).

The site lies at an average elevation of approximately 5,404 feet above mean sea level (SNL/NM April 2003). Depth to groundwater is approximately 482 feet below ground surface (bgs) at the site. Groundwater flow is thought to be generally to the west in this area (SNL/NM March 2002). The nearest production wells to DSS Site 1029 are KAFB-4 and KAFB-11, approximately 2.6 and 3.0 miles to the northwest and northeast, respectively. The nearest groundwater monitoring well (TAV-MW5) is approximately 100 feet south of the center of the DSS Site 1029 drainfield.

2.2.2 Operational History

Available information indicates that Building 6584 was constructed in 1963 and it is assumed the septic system was constructed at the same time. Building 6584 was extensively remodeled in 2002 and is currently known as the Administrative Center for Test Engineering (SNL/NM March 2003). Because operational records are not available, the investigation of this site was planned to be consistent with other DSS site investigations and to sample for the COCs most commonly found at similar facilities. By June 1991 the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones June 1991). The old septic system line would have been disconnected, capped, and the system abandoned in place concurrent with this change (Romero September 2003).

2.3 Land Use

2.3.1 Current Land Use

The current land use for DSS Site 1029 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1029 is industrial (DOE et al. September 1995).

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3.0 INVESTIGATORY ACTIVITIES

3.1 Summary

Four assessment investigations have been conducted at this site. In late 1990 or early 1991, 1992, and 1995, waste characterization samples were collected from the septic tank (Investigation 1). In 1997, a backhoe was used to physically locate the buried drainfield drain lines at the site (Investigation 2). In 1998 and 1999, near-surface soil samples were collected from three borings in the drainfield area (Investigation 3). In 2002, a passive soil-vapor survey was conducted to determine whether areas of significant volatile organic compound (VOC) contamination were present in the soil in the drainfield (Investigation 4). Investigations 2, 3, and 4 were required by the NMED/HWB to adequately characterize the site and were conducted in accordance with procedures presented in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001) described in Chapter 1.0. These investigations are discussed in the following sections.

3.2 Investigation 1—Septic Tank Sampling

Investigation 1 consisted of sampling efforts to characterize the waste contents of all SNL/NM septic tanks for chemical and radiological contamination. The primary goal of the sampling was to identify types and concentrations of potential contaminants in the waste within the tanks so that the appropriate waste disposal and remedial activities could be planned.

As part of the SNL/NM Septic System Monitoring Program, aqueous and/or sludge waste characterization samples were collected from the Building 6584 North Septic System septic tank in late 1990 or early 1991, 1992, and again in 1995 (SNL/NM April 1991, SNL/NM June 1993, SNL/NM December 1995). Aqueous samples collected in late 1990 or early 1991 were analyzed at an off-site laboratory for VOCs, semivolatile organic compounds (SVOCs), oil and grease, phenolics, metals, gross alpha/beta activity, and radionuclides. Sludge samples collected on July 28 and 29, 1992 were analyzed at an off-site laboratory for gross alpha/beta activity, tritium, and radionuclides by gamma spectroscopy. Sludge samples were also collected from the septic tank on July 10, 1995, and were analyzed at an off-site laboratory for VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), metals, and radiological constituents. A fraction of each sample was also submitted to the SNL/NM Radiation Protection Sample Diagnostics (RPSD) Laboratory for gamma spectroscopy analysis prior to off-site release. The analytical results for these three septic tank sampling events are presented in Annex A.

On February 27 and 29, 1996, the residual contents, approximately 1,800 gallons of waste and added water, were pumped out and managed according to SNL/NM policy (Shain August 1996).

3.3 Investigation 2—Backhoe Excavation

On May 30, 1997, a backhoe was used to determine the location, dimensions, and average depth of the DSS Site 1029 drainfield system. The drainfield was found to consist of four parallel drain lines, arranged as shown on Figure 2.2.1-2, with an average drain line depth of approximately 3 feet bgs. No visible evidence of stained or discolored soil or odors indicating

residual contamination was observed during the excavation. No samples were collected during the backhoe excavation at the site.

3.4 Investigation 3—Soil Sampling

Once the system drain lines were located, soil sampling was conducted in accordance with the rationale and procedures in the SAP (SNL/NM October 1999) approved by the NMED. On July 1 and 6, 1998, and again on August 24 and 25, 1999, soil samples were collected from three drainfield boreholes. Soil boring locations are shown on Figure 2.2.1-2. Figure 3.4-1 shows soil samples being collected in the drainfield area of DSS Site 1029. A summary of the boreholes, sample depths, sample analyses, analytical methods, laboratories, and sample dates are presented in Table 3.4-1. Refusal was repeatedly encountered in the 10-foot depth interval at the borehole BH2 location (Figure 2.2.1-2) in 1998, and as a result, no SVOC, high explosive (HE) compounds, metals, gross alpha/beta activity, or gamma spectroscopy samples were collected from this location and depth at the site. Additional samples (including VOCs, PCBs, total cyanide, and hexavalent chromium) were successfully collected from the 10-foot interval in borehole BH2 in 1999, although difficult drilling and sampling conditions were again encountered at this location.

3.4.1 Soil Sampling Methodology

An auger drill rig was used to sample all boreholes at two depth intervals, except as noted above. In the drainfield, the top of the shallow interval started at the bottom of the drain line trenches, as determined by the backhoe excavation, and the lower (deep) interval started at 5 feet beneath the top sample interval. Once the auger rig had reached the top of the sampling interval, a 3- or 4-foot-long by 1.5-inch inside diameter Geoprobe™ sampling tube lined with a butyl acetate (BA) sampling sleeve was inserted into the borehole and hydraulically driven downward 3- or 4-feet to fill the tube with soil.

Once the sample tube was retrieved from the borehole, the sample for VOC analysis was immediately collected by slicing off a 3- to 4-inch section from the lower end of the BA sleeve and capping the section ends with Teflon® film, then a rubber end cap, and finally sealing the tube with tape.

For the non-VOC analyses, the soil remaining in the BA liner was emptied into a decontaminated mixing bowl, and aliquots of soil were transferred into appropriate sample containers for analysis. On occasion, the amount of soil recovered in the first sampling run was insufficient for sample volume requirements. In this case, additional sampling runs were completed until an adequate soil volume was recovered. Soil recovered from these additional runs was emptied into the mixing bowl and blended with the soil already collected. Aliquots of the blended soil were then transferred into sample containers and submitted for analysis.

All samples were documented and handled in accordance with applicable SNL/NM operating procedures and transported to on-site and off-site laboratories for analysis. The area sampled, analytical methods, and laboratories used for the DSS Site 1029 soil samples are summarized in Table 3.4-1.

Figure 3.4-1
Collecting soil samples with the Geoprobe™ in the drainfield area of DSS Site 1029, Building 6584 North Septic System. View to the southeast. August 24, 1999

Table 3.4-1
Summary of Area Sampled, Analytical Methods, and Laboratories Used for
DSS Site 1029, Building 6584 North Septic System Soil Samples

Sampling Area	Number of Borehole Locations	Top of Sampling Intervals in each Borehole (ft bgs)	Total Number of Soil Samples	Analytical Parameters and EPA Methods[a]	Analytical Laboratory	Date Samples Collected
Drainfield	3	5, 10	6	VOCs EPA Method 8260	GEL	08/24/99- 08/25/99
	3	5, 10	5 + 1 Duplicate	SVOCs EPA Method 8270	GEL	07/01/98- 07/06/98
	3	5, 10	6 + 1 Duplicate	PCBs EPA Method 8082	GEL	08/24/99- 08/25/99
	3	5, 10	5 + 1 Duplicate	HE Compounds EPA Method 8330	ERCL, GEL	07/01/98- 07/06/98
	3	5, 10	5 + 1 Duplicate	RCRA Metals + Zinc EPA Methods 6000/7000	ERCL, GEL	07/01/98- 07/06/98
	3	5, 10	6 + 1 Duplicate	Hexavalent Chromium EPA Method 7196A	GEL	08/24/99- 08/25/99
	3	5, 10	6 + 1 Duplicate	Total Cyanide EPA Method 9012A	GEL	08/24/99- 08/25/99
	3	5, 10	5 + 1 Duplicate	Gamma Spectroscopy EPA Method 901.1	RPSD, GEL	07/01/98- 07/06/98
	3	5, 10	5	Gross Alpha/Beta Activity EPA Method 900.0	GEL	07/01/98- 07/06/98

[a]EPA November 1986.
bgs = Below ground surface.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ERCL = Environmental Restoration Chemistry Laboratory.
ft = Foot (feet).
GEL = General Engineering Laboratories, Inc.
HE = High explosive(s).
PCB = Polychlorinated biphenyl.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

3.4.2 Soil Sampling Results and Conclusions

Analytical results for the soil samples collected at DSS Site 1029 are presented and discussed in this section.

VOCs

VOC analytical results for the six soil samples collected from the drainfield boreholes are summarized in Table 3.4.2-1. Method Detection Limits (MDLs) for the VOC soil analyses are presented in Table 3.4.2-2. Three VOCs (2-butanone, methylene chloride, and toluene) were detected in the VOC soil samples collected from this site. Even though these compounds were not detected in the associated trip blank, they are common laboratory contaminants and may not be indicative of soil contamination at this site.

SVOCs

SVOC analytical results for the five soil samples and one duplicate collected from the drainfield boreholes are summarized in Table 3.4.2-3. MDLs for the SVOC soil analyses are presented in Table 3.4.2-4. Twelve SVOCs were detected in the duplicate sample collected at 5 feet bgs in borehole BH2 (Figure 2.2.1-2), and no SVOCs were detected in the primary sample from this interval, or in any other SVOC sample collected at this site. The 12 SVOCs appear to be common components of asphalt (NPS July 1997), and probably indicate the presence of asphalt material in the duplicate sample. The area of the DSS Site 1029 drainfield is undeveloped and is easily accessed by vehicles. Small amounts of construction debris were also noted at the site during the sampling, and it is possible that asphalt fragments could have been incorporated into the sample while it was being collected. The absence of SVOCs in the other samples collected at this site suggests an isolated SVOC source (e.g., asphalt), rather than any kind of significant or widespread SVOC contamination at the site.

PCBs

PCB analytical results for the six soil samples and one duplicate collected from the drainfield boreholes are summarized in Table 3.4.2-5. MDLs for the PCB soil analyses are presented in Table 3.4.2-6. No PCBs were detected in any of the samples collected from this site.

HE Compounds

High explosive (HE) compound analytical results for the five soil samples and one duplicate collected from the drainfield boreholes are summarized in Table 3.4.2-7. MDLs for the HE soil analyses are presented in Table 3.4.2-8. No HE compounds were detected in any of the samples collected from this site.

Table 3.4.2-1
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, VOC Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			VOCs (EPA Method 8260[a]) (µg/kg)		
Record Number[b]	ER Sample ID	Sample Depth (ft)	2-Butanone	Methylene Chloride	Toluene
602764	6584N-DF1-BH1-5-S	5	ND (3.2 J)	**1.7 J (5)**	**1.9**
602764	6584N-DF1-BH1-10-S	10	**11 J**	**2 J (5)**	**1.6**
602764	6584N-DF1-BH2-5-S	5	**5.9 J**	**7.3**	ND (0.9)
602764	6584N-DF1-BH2-10-S	10	ND (3.2 J)	**1.7 J (5)**	ND (0.9)
602764	6584N-DF1-BH3-5-S	5	**3.6 J (5)**	**1.6 J (5)**	**1.3**
602764	6584N-DF1-BH3-10-S	10	**4.9 J (5)**	**1.7 J (5)**	**1.1**
Quality Assurance/Quality Control Sample (µg/L)					
602763	T12/T42/T43-SP1-TB[c]	NA	ND (5.9)	ND (1.2)	ND (0.5)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]ER sample ID reflects the final site for VOC samples included in this shipment.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J = Analytical result was qualified as an estimated value.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.
SP = Seepage pit.
TB = Trip blank.
VOC = Volatile organic compound.

Table 3.4.2-2
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, VOC Analytical MDLs
August 1999
(Off-Site Laboratory)

Analyte	EPA Method 8260[a] Detection Limit (µg/kg)
Acetone	10.3
Benzene	0.5
Bromodichloromethane	0.1
Bromoform	0.3
Bromomethane	0.3
2-Butanone	3.2
Carbon disulfide	0.3
Carbon tetrachloride	0.5
Chlorobenzene	0.3
Chloroethane	0.3
Chloroform	0.1
Chloromethane	0.2
Dibromochloromethane	0.2
1,1-Dichloroethane	0.1
1,2-Dichloroethane	0.2
1,1-Dichloroethene	0.3
cis-1,2-Dichloroethene	0.1
trans-1,2-Dichloroethene	0.1
1,2-Dichloropropane	0.2
cis-1,3-Dichloropropene	0.2
trans-1,3-Dichloropropene	0.3
Ethylbenzene	0.3
2-Hexanone	2.8
Methylene chloride	1.4
4-Methyl-2-pentanone	3.1
Styrene	0.3
1,1,2,2-Tetrachloroethane	0.6
Tetrachloroethene	0.4
Toluene	0.9
1,1,1-Trichloroethane	0.1
1,1,2-Trichloroethane	0.3
Trichloroethene	0.3
Vinyl acetate	2.1
Vinyl chloride	0.4
Xylene	0.7

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
VOC = Volatile organic compound.

Table 3.4.2-3
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, SVOC Analytical Results
July 1998
(Off-Site Laboratory)

Sample Attributes			SVOCs (EPA Method 8270[a]) (µg/kg)					
Record Number[b]	ER Sample ID	Sample Depth (ft)	Anthracene	Benzo(a) anthracene	Benzo(a) pyrene	Benzo(b) fluoranthene	Benzo(g,h,i) perylene	Benzo(k) fluoranthene
600435	6584N-DF1-BH1-5-S	5	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)
600435	6584N-DF1-BH1-10-S	10	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)
600435	6584N-DF1-BH2-5-S	5	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)
600435	6584N-DF1-BH2-5-DU	5	**370 J**	**2,700 J**	**2,200 J**	**3,100 J**	**910 J**	**1,000 J**
600510	6584N-DF1-BH3-5-S	5	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)
600510	6584N-DF1-BH3-10-S	10	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)

Sample Attributes			SVOCs (EPA Method 8270[a]) (µg/kg)					
Record Number[b]	ER Sample ID	Sample Depth (ft)	Chrysene	Dibenz[a,h] anthracene	Fluoranthene	Indeno(1,2,3-cd) pyrene	Phenanthrene	Pyrene
600435	6584N-DF1-BH1-5-S	5	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)
600435	6584N-DF1-BH1-10-S	10	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)
600435	6584N-DF1-BH2-5-S	5	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)	ND (170 J)
600435	6584N-DF1-BH2-5-DU	5	**3,200 J**	**330 J (342)**	**4,100 J**	**880 J**	**1,600 J**	**3,500 J**
600510	6584N-DF1-BH3-5-S	5	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)
600510	6584N-DF1-BH3-10-S	10	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)

Note: Values in **bold** represent detected analytes.

[a]EPA November 1986.

[b]Analysis request/chain-of-custody record.

BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J = Analytical result was qualified as an estimated value.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.
SVOC = Semivolatile organic compound.

Table 3.4.2-4
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, SVOC Analytical MDLs
July 1998
(Off-Site Laboratory)

Analyte	EPA Method 8270[a] Detection Limit (µg/kg)
Acenaphthene	170
Acenaphthylene	170
Anthracene	170
Benzo(a)anthracene	170
Benzo(a)pyrene	170
Benzo(b)fluoranthene	170
Benzo(g,h,i)perylene	170
Benzo(k)fluoranthene	170
Benzoic acid	330
Benzyl alcohol	170
4-Bromophenyl phenyl ether	170
Butylbenzyl phthalate	170
4-Chlorobenzenamine	330
bis(2-Chloroethoxy)methane	170
bis(2-Chloroethyl)ether	170
bis-Chloroisopropyl ether	170
4-Chloro-3-methylphenol	170
2-Chloronaphthalene	170
2-Chlorophenol	170
4-Chlorophenyl phenyl ether	170
Chrysene	170
m,p-Cresol	170
o-Cresol	170
Dibenz[a,h]anthracene	170
Dibenzofuran	170
1,2-Dichlorobenzene	170
1,3-Dichlorobenzene	170
1,4-Dichlorobenzene	170
3,3'-Dichlorobenzidine	830
2,4-Dichlorophenol	170
Diethylphthalate	170
2,4-Dimethylphenol	170
Dimethylphthalate	170
Di-n-butyl phthalate	170
Dinitro-o-cresol	170
2,4-Dinitrophenol	330
2,4-Dinitrotoluene	170
2,6-Dinitrotoluene	170
Di-n-octyl phthalate	170
1,2-Diphenylhydrazine	170
bis(2-Ethylhexyl) phthalate	170
Fluoranthene	170

Refer to footnotes at end of table.

Table 3.4.2-4 (Concluded)
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, SVOC Analytical MDLs
July 1998
(Off-Site Laboratory)

Analyte	EPA Method 8270[a] Detection Limit (µg/kg)
Fluorene	170
Hexachlorobenzene	170
Hexachlorobutadiene	170
Hexachlorocyclopentadiene	170
Hexachloroethane	170
Indeno(1,2,3-cd)pyrene	170
Isophorone	170
2-Methylnaphthalene	170
Naphthalene	170
2-Nitroaniline	170
3-Nitroaniline	170
4-Nitroaniline	170
Nitrobenzene	170
2-Nitrophenol	170
4-Nitrophenol	330
n-Nitrosodiphenylamine	170
n-Nitrosodipropylamine	170
Pentachlorophenol	170
Phenanthrene	170
Phenol	170
Pyrene	170
1,2,4-Trichlorobenzene	170
2,4,5-Trichlorophenol	170
2,4,6-Trichlorophenol	170

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
SVOC = Semivolatile organic compound.

Table 3.4.2-5
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, PCB Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			PCBs (EPA Method 8082[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
602764	6584N-DF1-BH1-5-S	5	ND
602764	6584N-DF1-BH1-10-S	10	ND
602764	6584N-DF1-BH2-5-S	5	ND
602764	6584N-DF1-BH2-10-S	10	ND
602764	6584N-DF1-BH3-5-S	5	ND
602764	6584N-DF1-BH3-5-DU	5	ND
602764	6584N-DF1-BH3-10-S	10	ND

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drain field.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
µg/kg = Microgram(s) per kilogram.
ND = Not detected.
PCB = Polychlorinated biphenyls.
S = Soil sample.

Table 3.4.2-6
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, PCB Analytical MDLs
August 1999
(Off-Site Laboratory)

Analyte	EPA Method 8082[a] Detection Limit (µg/kg)
Aroclor-1016	1.22
Aroclor-1221	2.82
Aroclor-1232	1.63
Aroclor-1242	1.67
Aroclor-1248	0.907
Aroclor-1254	1.16
Aroclor-1260	0.943

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
PCB = Polychlorinated biphenyls.

Table 3.4.2-7
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, HE Compound Analytical Results
July 1998
(On- and Off-Site Laboratories)

Sample Attributes			HE (EPA Method 8330[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
600434	6584N-DF1-BH1-5-S	5	ND
600434	6584N-DF1-BH1-10-S	10	ND
600434	6584N-DF1-BH2-5-S	5	ND
600435	6584N-DF1-BH2-5-DU	5	ND
600449	6584N-DF1-BH3-5-S	5	ND
600449	6584N-DF1-BH3-10-S	10	ND

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
HE = High explosive(s).
ID = Identification.
mg/kg = Milligram(s) per kilogram.
ND = Not detected.
S = Soil sample.

Table 3.4.2-8
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, HE Compound Analytical MDLs
July 1998
(On- and Off-Site Laboratories)

Analyte	EPA Method 8330[a] Detection Limit (mg/kg)
2-Amino-4,6-dinitrotoluene	0.0066–0.12
4-Amino-2,6-dinitrotoluene	0.0055–0.1
1,3-Dinitrobenzene	0.0041–0.073
2,4-Dinitrotoluene	0.0062–0.24
2,6-Dinitrotoluene	0.0065–0.28
HMX	0.0053–0.12
Nitrobenzene	0.0052–0.17
2-Nitrotoluene	0.0078–0.15
3-Nitrotoluene	0.0011–0.15
4-Nitrotoluene	0.011–0.12
Pentaerythritol tetranitrate	0.0075–0.34
RDX	0.0097–0.18
1,3,5-Trinitrobenzene	0.0066–0.1
2,4,6-Trinitrotoluene	0.0057–0.28

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
HE = High explosive(s).
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

RCRA Metals Plus Zinc and Hexavalent Chromium

Resource Conservation and Recovery Act (RCRA) metals plus zinc and hexavalent chromium analytical results for the five soil samples and one duplicate (RCRA metals) and six soil samples and one duplicate (hexavalent chromium) collected from the drainfield boreholes are summarized in Table 3.4.2-9. MDLs for the metals soil analyses are presented in Table 3.4.2-10. Zinc was added to the metals analyte list for the soil samples because a relatively high amount of zinc was detected in a sludge sample collected from the septic tank in July 1995. With the exception of arsenic, none of the metal concentrations detected in the samples exceeded their corresponding NMED-approved background concentrations. Arsenic was detected at a concentration above the NMED-approved background in two of the six samples analyzed for arsenic from this site.

Table 3.4.2-9
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, Metals Analytical Results
July 1998 and August 1999
(On- and Off-Site Laboratories)

Sample Attributes			Metals (EPA Method 6000/7000/7196A[a]) (mg/kg)									
Record Number[a]	ER Sample ID	Sample Depth (ft)	Arsenic	Barium	Cadmium	Chromium	Chromium (VI)	Lead	Mercury	Selenium	Silver	Zinc
600434, 602764	6584N-DF1-BH1-5-S	5	**5**	120	0.14 J (0.16)	10	0.0608 J (0.203)	6.2	ND (0.041 J)	ND (0.31)	0.077 J (0.16)	31
600434, 602764	6584N-DF1-BH1-10-S	10	**5.5**	120	0.11 J (0.15)	12	0.0796 J (0.199)	6.2	ND (0.038 J)	0.34 J (1.1)	ND (0.038)	30
600434, 602764	6584N-DF1-BH2-5-S	5	3.8	94	0.22	11	ND (0.034)	7.2	ND (0.039 J)	0.3 J (1.2)	0.87	47
600435	6584N-DF1-BH2-5-DU	5	2.08	78.5	ND (0.0104)	4.72	NS	4.55	ND (0.0173)	ND (0.07)	0.171 J (1.22)	24.8
602764	6584N-DF1-BH2-10-S	10	NS	NS	NS	NS	0.07 J (0.2)	NS	NS	NS	NS	NS
600449, 602764	6584N-DF1-BH3-5-S	5	3	61	0.14 J (0.16)	5.2	0.0601 J (0.2)	3.6	ND (0.04)	ND (0.3)	ND (0.04)	20
602764	6584N-DF1-BH3-5-DU	5	NS	NS	NS	NS	ND (0.0341)	NS	NS	NS	NS	NS
600449, 602764	6584N-DF1-BH3-10-S	10	3	100 J	0.082 J (0.16)	8.1	0.0598 J (0.199)	4.4	ND (0.04)	0.33 J (1.2)	ND (0.04)	22
Background Concentration—Southwest Area[b]			4.4	214	0.9	15.9	1	11.8	<0.1	<1	<1	62

Note: Values in **bold** exceed background soil concentrations.

[a]Analysis request/chain-of-custody record.

[b]Dinwiddie September 1997.

BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J = Analytical result was qualified as an estimated value.
J ( ) = The reported value is greater than or equal to the method detection limit but is less than the practical quantitation limit, shown in parentheses.
mg/kg = Milligram(s) per kilogram.
ND ( ) = Not detected above the method detection limit, shown in parentheses.
NS = No sample.
S = Soil sample.

Table 3.4.2-10
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, Metals Analytical MDLs
July 1998 and August 1999
(On- and Off-Site Laboratories)

Analyte	EPA Method 6000/7000/7196A[a] Detection Limit (mg/kg)
Arsenic	0.149–0.62
Barium	0.0166–0.52
Cadmium	0.0104–0.041
Chromium	0.0365–0.72
Chromium (VI)	0.0338–0.0345
Lead	0.0339–0.31
Mercury	0.0173–0.041
Selenium	0.07–0.31
Silver	0.031–0.041
Zinc	0.0483–4.1

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method Detection Limit.
mg/kg = Milligram(s) per kilogram.

Total Cyanide

Total cyanide analytical results for the six soil samples and one duplicate collected from the drainfield boreholes are summarized in Table 3.4.2-11. MDLs for the soil cyanide analyses are presented in Table 3.4.2-12. Cyanide was not detected in any of the samples collected from this site.

Radionuclides

Gamma spectroscopy analytical results for the five soil samples and one duplicate collected from the drainfield boreholes are summarized in Table 3.4.2-13. No activities above the NMED-approved background levels were detected in any sample analyzed.

Gross Alpha/Beta Activity

Gross alpha/beta analytical results for the five soil samples collected from the drainfield boreholes are summarized in Table 3.4.2-14. The gross alpha activity of 19.7 picocuries (pCi)/gram (g) in the 5-foot sample from borehole BH3 was slightly above the New Mexico-established background activity of 17.4 pCi/g. No other gross alpha or beta activity was detected above the New Mexico-established background levels (Miller September 2003) in any of the samples. These results indicate no significant levels of radioactive material are present in the soil at the site.

Table 3.4.2-11
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, Total Cyanide Analytical Results
August 1999
(Off-Site Laboratory)

Sample Attributes			Total Cyanide (EPA Method 9012A[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	Total Cyanide
602764	6584N-DF1-BH1-5-S	5	ND
602764	6584N-DF1-BH1-10-S	10	ND
602764	6584N-DF1-BH2-5-S	5	ND
602764	6584N-DF1-BH2-10-S	10	ND
602764	6584N-DF1-BH3-5-S	5	ND
602764	6584N-DF1-BH3-5-DU	5	ND
602764	6584N-DF1-BH3-10-S	10	ND

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
mg/kg = Milligram(s) per kilogram.
ND = Not detected.
S = Soil sample.

Table 3.4.2-12
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, Total Cyanide Analytical MDLs
August 1999
(Off-Site Laboratory)

Analyte	EPA Method 9012A[a] Detection Limit (mg/kg)
Total Cyanide	0.131–0.139

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.

Table 3.4.2-13
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
July 1998
(On- and Off-Site Laboratories)

Sample Attributes			Activity (EPA Method 901.1[a]) (pCi/g)							
			Cesium-137		Thorium-232		Uranium-235		Uranium-238	
Record Number[b]	ER Sample ID	Sample Depth (ft)	Result	Error[c]	Result	Error[c]	Result	Error[c]	Result	Error[c]
600436	6584N-DF1-BH1-5-S	5	0.0210	0.00512	0.619	1.10	ND (0.0637)	--	0.477	0.374
600436	6584N-DF1-BH1-10-S	10	ND (0.0182)	--	0.641	0.310	ND (0.101	--	0.818	0.362
600436	6584N-DF1-BH2-5-S	5	0.0449	0.0178	0.578	0.283	ND (0.0522)	--	0.570	0.301
600435	6584N-DF1-BH2-5-DU	5	0.0306	0.0288	0.728	0.0919	0.0688	0.0823	ND (0.344)	--
600511	6584N-DF1-BH3-5-S	5	ND (0.0147)	--	0.555	0.541	0.102	0.0782	0.409	0.254
600511	6584N-DF1-BH3-10-S	10	ND (0.0146)	--	0.486	0.240	ND (0.0842)	--	0.312	0.246
Background Activity—Southwest Area Supergroup[d]			0.079	NA	1.01	NA	0.16	NA	1.4	NA

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]Two standard deviations about the mean detected activity.
[d]Dinwiddie September 1997.

BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
ER = Environmental Restoration.
EPA = U.S. Environmental Protection Agency.
ft = Foot (feet).
ID = Identification.
MDL = Method detection limit.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
pCi/g = Picocurie(s) per gram.
S = Soil sample.
-- = Error not calculated for nondetectable results.

Table 3.4.2-14
Summary of DSS Site 1029, Building 6584 North Septic System
Confirmatory Soil Sampling, Gross Alpha/Beta Analytical Results
July 1998
(Off-Site Laboratory)

Sample Attributes			Activity (EPA Method 900.0[a]) (pCi/g)			
Record Number[b]	ER Sample ID	Sample Depth (ft)	Gross Alpha		Gross Beta	
			Result	Error[c]	Result	Error[c]
600435	6584N-DF1-BH1-5-S	5	8.19	3	20	3.56
600435	6584N-DF1-BH1-10-S	10	7.05	2.78	16.1	3.46
600435	6584N-DF1-BH2-5-S	5	9.21	3.3	19.4	3.7
600510	6584N-DF1-BH3-5-S	5	**19.7**	4.27	31.9	4.13
600510	6584N-DF1-BH3-10-S	10	12.4	3.84	22.1	3.77
Background Activity[d]			17.4	NA	37.4	NA

Note: Values in **bold** represent analytes detected above their respective background activity level.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]Two standard deviations about the mean detected activity.
[d]Miller September 2003.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
NA = Not applicable.
pCi/g = Picocurie(s) per gram.
S = Soil sample.

3.4.3 Soil Sampling Quality Assurance/Quality Control Samples and Data Validation Results

Throughout the DSS project, quality assurance/quality control samples were collected at an approximate frequency of 1 per 20 field samples. These included duplicates, equipment blanks (EBs), and trip blanks (TBs). Typically, samples were shipped to the laboratory in batches of up to 20 samples, so that any one shipment might contain samples from several sites. Aqueous EB samples were collected at an approximate frequency of 1 per 20 samples and sent to the laboratory. The EB samples were analyzed for the same analytical suite as the soil samples in that shipment. The analytical results for the EB samples appear only on the data tables for the site where they were collected. However, the results were used in the data validation process for all the samples in that batch. No EB samples were collected at DSS Site 1029.

Aqueous TB samples, for VOC analysis only, were included in every sample cooler containing VOC soil samples. The analytical results for the TB samples appear on the VOC data tables for the sites in that shipment. The results were used in the data validation process for all samples in that batch. No VOCs were detected in this TB (Table 3.4.2-1).

As shown in Tables 3.4.2-3, -5, -7, -9, -11, and 3.4.2-13, to assess the precision and repeatability of sampling and analytical procedures, duplicate soil samples (designated 'DU') were collected and analyzed at both the on- and off-site laboratories for SVOCs, PCBs, HE compounds, RCRA metals plus zinc and hexavalent chromium, cyanide, and radionuclides by gamma spectroscopy.

As shown in Table 3.4.2-3, no SVOCs were detected in the primary sample from the 5-foot depth in borehole BH2, whereas twelve SVOCs were detected in duplicate sample from the same interval. As explained in Section 3.4.2 above, this difference may be due to asphalt fragments that may have been incorporated into the duplicate sample while it was being collected.

As shown in Table 3.4.2-5, PCBs were not detected in either the primary or duplicate samples from the 5-foot depth in borehole BH3.

As shown in Table 3.4.2-7, no HE compounds were detected in either the primary or duplicate samples from the 5-foot depth in borehole BH2.

As shown in Table 3.4.2-9, metals concentrations in the primary and duplicate samples from the 5-foot interval in borehole BH2 that were sent to different laboratories compared as follows:

- Arsenic and barium concentrations were comparable.
- Mercury was not detected in either the primary or duplicate sample.
- Low concentrations of cadmium and selenium were detected in the primary sample but were not detected in the duplicate sample.
- Chromium, lead, and zinc concentrations in the primary sample were approximately twice that in the duplicate sample, and the silver concentration in the primary sample was approximately 5 times that in the duplicate sample.

In addition, hexavalent chromium was detected in the primary sample from the 5-foot depth in borehole BH3, and was not detected in the duplicate sample from that interval.

As shown in Table 3.4.2-11, total cyanide was not detected in either the primary or the duplicate sample from the 5-foot depth in borehole BH3.

Finally, as shown in Table 3.4.2-13, cesium-137 and thorium-232 activities in the primary and duplicate samples from the 5-foot depth in borehole BH2 were comparable. Uranium-235 activity was not detected in the primary sample but was detected in the duplicate sample, as opposed to uranium-238 which was detected in the primary sample but not in the duplicate sample.

All laboratory data were reviewed and verified/validated according to "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94–03, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00–03 (SNL/NM December 1999). In addition, SNL/NM Department 7713 (RPSD Laboratory) reviewed all gamma spectroscopy results according to "Laboratory Data Review Guidelines," Procedure No. RPSD-02-11, Issue No. 2 (SNL/NM July 1996). Annex B contains the data validation

reports for the samples collected at this site. The data are acceptable for use in this NFA proposal.

3.5 Investigation 4—Passive Soil-Vapor Sampling

In April and May 2002, a passive soil-vapor survey was conducted in the Building 6584 North Septic System drainfield area. This survey was required at this site by NMED/HWB regulators and was conducted to determine whether significant VOC contamination was present in the soil at the site.

3.5.1 Passive Soil-Vapor Sampling Methodology

A Gore-Sorber™ (GS) passive soil-vapor survey is a qualitative screening procedure that can be used to identify many VOCs present in the vapor phase in soil. The technique is highly sensitive to organic vapors, and the result produces a qualitative measure of organic soil vapor chemistry over a two- to three-week period rather than at one point in time.

Each GS soil-vapor sampler consists of a 1-foot long, 0.25-inch diameter tube of waterproof, vapor-permeable fabric containing 40 milligrams of absorbent material. At each sampling location, a 3-foot-deep by 1.5-inch-diameter borehole was drilled with the Geoprobe™. A sample identification tag and location string were attached to the GS sampler and lowered into the open borehole to a depth of 1 to 2 feet bgs. The location string was attached to a numbered pin flag at the surface. A cork was placed in the borehole above the sampler as a seal, and the upper 1-foot of the borehole, from the cork to the ground surface, was backfilled with site soil.

The vapor samplers were left in the ground for approximately two weeks before retrieval. After retrieval, each sampler was individually placed into a pre-cleaned jar, sealed, and sent to W.L. Gore and Associates for analysis by thermal desorption and gas chromatography using a modified U.S. Environmental Protection Agency (EPA) Method 8260. Analytical results for the VOCs of interest are reported as mass (expressed in micrograms) of the individual VOCs absorbed by the sampler while it was in the ground (Gore June 2002). All samples were documented and handled in accordance with applicable SNL/NM operating procedures.

3.5.2 Soil-Vapor Survey Results and Conclusions

A total of five GS passive soil-vapor samplers were placed in the drainfield area of the site (Figure 2.2.1-2). Samplers were installed at the site on April 30, 2002, and were retrieved on May 15, 2002. Sample locations are designated by the same six-digit sample number both on Figure 2.2.1-2 and in the analytical results tables presented in Annex C.

As shown in the analytical results tables in Annex C, the GS samplers were analyzed for a total of 30 individual or groups of VOCs, including trichloroethene, tetrachloroethene, cis- and trans-dichloroethene, and benzene/toluene/ethylbenzene/xylene. Low to trace-level (but quantifiable) amounts of 12 VOCs were detected in the GS samplers installed at this site. The analytical results indicated there were no areas of significant VOC contamination at the site that would require additional characterization.

3.6 Site Sampling Data Gaps

Analytical data from the site assessment were sufficient for characterizing the nature and extent of possible COC releases. There are no further data gaps regarding characterization of DSS Site 1029.

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4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS Site 1029, the Building 6584 North Septic System, is based upon the COCs identified in the soil samples collected from beneath the drainfield at this site. This section summarizes the nature and extent of contamination and the environmental fate of the COCs.

4.1 Nature and Extent of Contamination

Potential COCs at DSS Site 1029 consist of VOCs, SVOCs, PCBs, HE compounds, or cyanide, RCRA metals plus zinc, hexavalent chromium, and radionuclides. Three VOCs and twelve SVOCs were detected, and no PCBs, HE compounds, or cyanide were identified in samples from this site. None of the eight RCRA metals plus zinc and hexavalent chromium were detected at concentrations above the approved maximum background concentrations for SNL/NM Southwest Area Supergroup soils (Dinwiddie September 1997) or above the nonquantified background concentrations, with the exception of arsenic in two boreholes. None of the four representative gamma spectroscopy radionuclides were detected at activities exceeding the corresponding background levels. Finally, the gross alpha activity in one of the six gross alpha soil samples from this site exceeded the New Mexico-established background gross alpha activity level. No gross beta activity exceeded the New Mexico-established gross beta background activity level.

4.2 Environmental Fate

Potential COCs may have been released into the vadose zone via aqueous effluent discharged from the septic system and drainfield. Possible secondary release mechanisms include the uptake of COCs that may have been released into the soil beneath the drainfield (Figure 4.2-1). The depth to groundwater at the site (approximately 482 feet bgs) most likely precludes migration of potential COCs into the groundwater system. The potential pathways to receptors include soil ingestion, dermal contact, and inhalation, which could occur as a result of receptor exposure to contaminated subsurface soil at the site. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Annex D provides additional discussion on the fate and transport of COCs at DSS Site 1029.

Table 4.2-1 summarizes the potential COCs for DSS Site 1029. All potential COCs were retained in the conceptual model and were evaluated in both the human health and ecological risk assessments. The current and future land use for DSS Site 1029 is industrial (DOE et al. September 1995).

The potential human receptors at the site are considered to be an industrial worker and resident. The exposure routes for the receptors are dermal contact and ingestion/inhalation; however, these are realistic possibilities only if contaminated soil is excavated at the site. The major exposure route modeled in the human health risk assessment is soil ingestion for COCs. The inhalation pathway is included because of the potential to inhale dust and volatiles. The dermal pathway is included because of the potential for receptors to be exposed to the contaminated soil.

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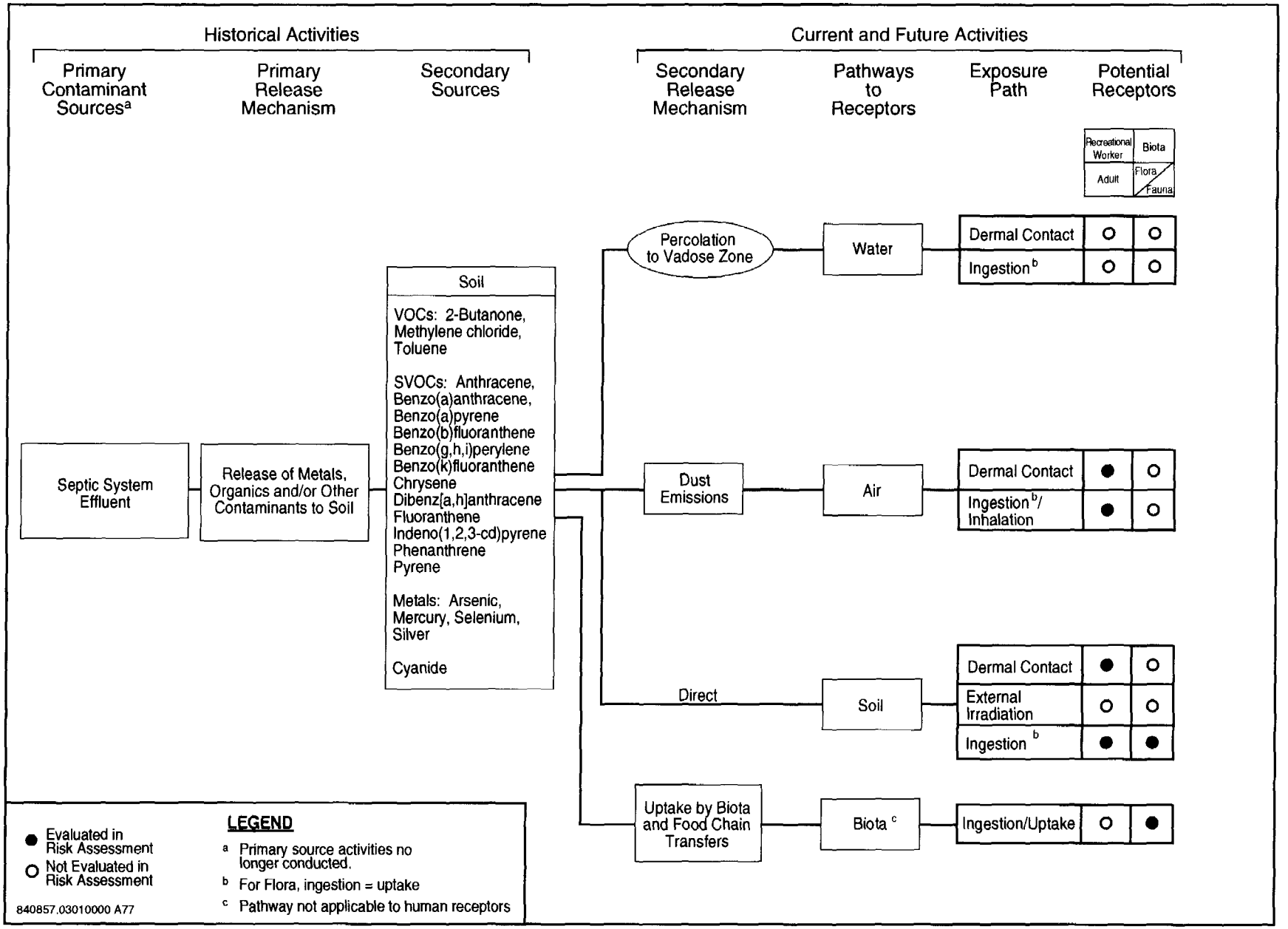

Figure 4.2-1

Conceptual Site Model Flow Diagram for DSS Site 1029, Building 6584 North Septic System

Table 4.2-1
Summary of Potential COCs for DSS Site 1029, Building 6584 North Septic System

COC Type		Number of Samples[a]	COCs Detected, or With Concentrations Greater Than Background or Nonquantified Background	Maximum Background Limit/Southwest Area Supergroup[b] (mg/kg)	Maximum Concentration[c] (All Samples) (mg/kg)	Average Concentration[d] (mg/kg)	Number of Samples Where COCs Detected, or With Concentrations Greater Than Background or Nonquantified Background[e]
VOCs		6	2-Butanone	NA	0.011 J	0.005 J	4
		6	Methylene chloride	NA	0.0073 J	0.003 J	6
		6	Toluene	NA	0.0019	0.001	4
SVOCs		6	Anthracene	NA	0.370 J	0.133 J	1
		6	Benzo(a)anthracene	NA	2.70 J	0.521 J	1
		6	Benzo(a)pyrene	NA	2.20 J	0.438 J	1
		6	Benzo(b)fluoranthene	NA	3.10 J	0.588 J	1
		6	Benzo(g,h,i)perylene	NA	0.910 J	0.226 J	1
		6	Benzo(k)fluoranthene	NA	1.00 J	0.238 J	1
		6	Chrysene	NA	3.20 J	0.604 J	1
		6	Dibenz[a,h]anthracene	NA	0.330 J	0.126 J	1
		6	Fluoranthene	NA	4.10 J	0.754 J	1
		6	Indeno(1,2,3-cd)pyrene	NA	0.880 J	0.218 J	1
		6	Phenanthrene	NA	1.60 J	0.338 J	1
		6	Pyrene	NA	3.50 J	0.654 J	1
PCBs		7	None	NA	NA	NA	None
HE Compounds		6	None	NA	NA	NA	None
RCRA Metals + Zinc		6	Arsenic	4.4	5.5	3.73	2
		6	Mercury	NQ	ND (0.041 J)	0.0179	None
		6	Selenium	NQ	0.34 J	0.138	None
		6	Silver	NQ	0.87	0.196	None
Hexavalent Chromium		7	None	NA	NA	NA	None
Cyanide		7	Cyanide	NQ	ND (0.139)	0.068	None
Radionuclides (pCi/g)	Gamma Spectroscopy	6	None	NA	NA	NA	None
	Gross Alpha	5	Gross Alpha	17.4[f]	19.7	NC[g]	1
	Gross Beta	5	None	NA	NA	NA	None

[a]Number of samples includes duplicates and splits.
[b]Dinwiddie September 1997.
[c]Maximum concentration is either the maximum amount detected, or the maximum MDL or MDA if nothing was detected.
[d]Average concentration includes all samples except blanks. The average is calculated as the sum of detected amounts and one-half of the MDLs for nondetect results, divided by the number of samples.

Table 4.2-1 (Concluded)
Summary of Potential COCs for the DSS Site 1029, Building 6584 North Septic System

[e]See appropriate data table for sample locations.
[f]Miller September 2003.
[g]An average MDA is not calculated because of the variability in instrument counting error and the number of reported nondetect activities for gamma spectroscopy.

COC = Constituent of concern.
DSS = Drain and Septic Systems.
HE = High explosive(s).
J = Analytical result was qualified as an estimated value.
MDA = Minimum detectable activity.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NC = Not calculated.
NQ = Nonquantified background value.
PCB = Polychlorinated biphenyl.
pCi/g = Picocurie(s) per gram.
RCRA = Resource Conservation and Recovery Act.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

Potential biota receptors include flora and fauna at the site. Major exposure routes for biota include direct soil ingestion, ingestion of COCs through food chain transfers, and direct contact with COCs in soil. Annex D provides additional discussion of the exposure routes and receptors at DSS Site 1029.

4.3 Site Assessment

Site assessment at DSS Site 1029 included risk assessments for both human health and ecological risk. This section briefly summarizes the site assessment results, and Annex D discusses the risk assessment performed for DSS Site 1029 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1029 poses no significant threat to human health under either the industrial or residential land-use scenarios. Ecological risks are expected to be very low.

4.3.2 Risk Assessments

Risk assessments were performed for both human health and ecological risk at DSS Site 1029. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1029 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because three VOCs, 12 SVOCs, arsenic, mercury, selenium, silver, and cyanide are present above background or have nonquantified background levels, it was necessary to perform a human health risk assessment analysis for the site, which included these COCs. Annex D provides a complete discussion of the risk assessment process, results, and uncertainties. The risk assessment process provides a quantitative evaluation of the potential adverse human health effects from constituents in the site's soil by calculating the hazard index (HI) and excess cancer risk for both industrial and residential land-use scenarios.

The HI calculated for the COCs at DSS Site 1029 is 0.60 under the industrial land-use scenario, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.59. The quantifiable excess cancer risk is 2E-5 for DSS Site 1029 COCs under an industrial land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is above the suggested acceptable risk value. The incremental excess cancer risk is 2.03E-5 . The incremental HI is below NMED guidelines and the incremental excess cancer risk is above NMED guidelines.

The HI calculated for the COCs at DSS Site 1029 is 2.17 under the residential land-use scenario, which is greater than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with

background from potential nonradiological COC risk (without rounding), is 1.96. The excess cancer risk for DSS Site 1029 COCs is 8E-5 for a residential land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is above the suggested acceptable risk value. The incremental excess cancer risk is 6.94E-5 . Both the incremental HI and incremental excess cancer risk are above NMED guidelines.

Because the HI and excess cancer risk values are above NMED guidelines for the industrial and residential land-use scenarios, additional evaluation of the data is warranted. SVOCs were the main risk drivers. SVOCs were detected in only one of the six SVOC soil samples collected from this site. The sample was located in the shallow (5-foot interval) duplicate soil sample in borehole 6584N-DF1-BH2. The twelve SVOC compounds detected in this sample are indicative of asphalt (NPS July 1997), and likely reflect asphalt fragments that were disposed at the site and that were collected in the sample. No significant VOC or metals contamination was detected in any of the samples from this site (except for arsenic slightly above background). It was noted during sampling that the Building 6584 drain field area contained small amounts of residual construction debris and appeared to be used on occasion as a vehicle parking area. It is therefore believed that the SVOC compounds detected in the single sample represent residual asphalt disposed at the site, and do not indicate significant or widespread SVOC contamination at the site that could pose a threat to human health or the environment. With the removal of the SVOCs from the risk calculation, the incremental HI is reduced to 0.06 for the residential land-use scenario, the incremental excess cancer risk is reduced to 7.39E-7 for the industrial land-use scenario, and the incremental excess cancer risk is reduced to 2.93E-6 for the residential land-use scenario. These are all well below NMED guidelines.

For the radiological COCs, none of the constituents had a minimum detected activity or reported value greater than the corresponding background values; therefore no risk was calculated.

The nonradiological and radiological carcinogenic risks are tabulated and summed in Table 4.3.2-1.

Table 4.3.2-1
Summation of Radiological and Nonradiological Risks from
DSS Site 1029, Building 6584 North Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	7.39E-7	0.0	7.39E-7
Residential	2.93E-6	0.0	2.93E-6

DSS = Drain and Septic Systems.

Uncertainties associated with the calculations are considered small relative to the conservatism of the risk assessment analysis. Therefore, it is concluded that this site poses insignificant risk to human health under both the industrial and residential land-use scenarios.

4.3.2.2 Ecological

An ecological assessment that corresponds with the procedures in the EPA's Ecological Risk Assessment Guidance for Superfund (EPA 1997) also was performed as set forth by the NMED Risk-Based Decision Tree in the "RPMP Document Requirement Guide" (NMED March 1998).

An early step in the evaluation compared COC concentrations and identified potentially bioaccumulative constituents (see Annex D, Sections IV VII.2, and VII.3). This methodology also required developing a site conceptual model and a food web model, as well as selecting ecological receptors, as presented in "Predictive Ecological Risk Assessment Methodology Environmental Restoration Program, Sandia National Laboratories, New Mexico" (IT July 1998). The risk assessment also includes the estimation of exposure and ecological risk.

Table 17 of Annex D presents the results of the ecological risk assessment. Site-specific information was incorporated into the risk assessment when such data were available. Initial predictions of potential risk (hazard quotient greater than unity) to omnivorous and insectivorous deer mice from exposures to 11 polynuclear aromatic hydrocarbons (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, indeno[1,2,3-cd]pyrene, phenanthrene, and pyrene) are attributable to conservative toxicity benchmarks, as well as assumption of 100 percent bioavailability and the use of maximum detected concentrations to estimate exposure. Based upon this final analysis, the potential for ecological risks associated with DSS Site 1029 is expected to be low.

4.4 Baseline Risk Assessments

This section discusses the baseline risk assessments for human health and ecological risk.

4.4.1 Human Health

Because the results of the human health risk assessment summarized in Section 4.3.2.1 indicate that DSS Site 1029 poses insignificant risk to human health under both the industrial and residential land-use scenarios, a baseline human health risk assessment is not required for this site.

4.4.2 Ecological

Because the results of the ecological risk assessment summarized in Section 4.3.2.2 indicate that ecological risks at DSS Site 1029 are expected to be low, a baseline ecological risk assessment is not required for the site.

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5.0 NO FURTHER ACTION PROPOSAL

5.1 Rationale

Based upon field investigation data and the human health and ecological risk assessment analyses, an NFA decision is recommended for DSS Site 1029 for the following reasons:

- The soil has been sampled for all potential COCs.
- No COCs are present in the soil at levels considered hazardous to human health for either an industrial or residential land-use scenario.

None of the COCs warrant ecological concern after conservative exposure assumptions are analyzed.

5.2 Criterion

Based upon the evidence provided in Section 5.1, DSS Site 1029 is proposed for an NFA decision according to Criterion 5, which states, "the SWMU/AOC 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" (NMED March 1998).

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ANNEX A
DSS Site 1029
Septic Tank Sampling Results

4-17-91

Results of septic tank sampling conducted between 12/18/90 and 1/8/91 for buildings noted.

DB Dionne

4-17-91

Nick Durand,

For your information.

David Dionne

TABLE 12

SUMMARY OF ANALYTICAL RESULTS FOR DETECTED PARAMETERS TECHNICAL AREA III AND COYOTE CANYON TEST FIELD SEPTIC TANK SAMPLING

BUILDING 6584 N

SAMPLE NUMBERS SNLA004919, SNLA004920

Parameter	Results	Units
VOLATILE ORGANICS		
Methylene Chloride	6.9	µg/l
Acetone*	13	µg/l
Toluene	27	µg/l
SEMIVOLATILE ORGANICS		
Phenol*	49	µg/l
Benzoic Acid*	450	µg/l
INORGANICS		
Oil and Grease	180	mg/l
Phenolics	0.45	mg/l
METALS		
Arsenic	0.12	mg/l
Barium	9.3	mg/l
Cadmium	0.20	mg/l
Chromium	0.44	mg/l
Copper	8.7	mg/l
Lead	0.96	mg/l
Manganese	2.7	mg/l
Mercury	0.0023	mg/l
Nickel	0.64	mg/l
Selenium	0.13	mg/l
Silver	0.15	mg/l
Zinc	68.9	mg/l
RADIOLOGICAL		
Gross Alpha	10	pCi/l
Gross Beta	36	pCi/l
Plutonium 239/240	1.3	pCi/l

*Not on total toxic organics list

Building 6584, West and North Tanks
Area 3
Sample ID Nos. SNLA008578 and SNLA008580
Tank ID Nos. AD89002 and AD89001R

On July 28 and July 29, 1992, sludge samples were collected from the western and northern septic tanks serving Building 6584.

North Tank

During review of the sludge radiochemistry data, the following item was noted:

- ^{226}Ra was measured at 0.673 pCi/mL, by gamma spectroscopy analysis, which does not exceed the IL calculated during this monitoring effort. However, this finding exceeds the DOE DCG of 0.5 pCi/mL. A more sensitive technique for assaying ^{226}Ra may be warranted.

West 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.

Results of Septic Tank Analyses
(Sludge Sample)

Building No./Area:	**6584 N TANK A-3**
Tank ID No.:	**AD89001R**
Date Sampled:	**7/29/92**
Sample ID No.:	**SNLA008580**

Analytical Parameter	Measured Concentration	± 2 Sigma Uncertainty	Units
Gross Alpha	14	17	pCi/g
Gross Beta	30	38	pCi/g
Gross Alpha	12	17	pCi/g
Gross Beta	37	37	pCi/g
Gross Alpha	12	17	pCi/g
Gross Beta	46	38	pCi/g
Gross Alpha	6	16	pCi/g
Gross Beta	32	38	pCi/g
Tritium	0E+02	3E+02	pCi/L
Bismuth-212	0.0376	0.0188	
Bismuth-214	0.150	0.0114	pCi/mL
Cesium-137	<0.0122	NA	pCi/mL
Potassium-40	1.19	0.0920	pCi/mL
Lead-212	0.0598	0.00689	pCi/mL
Lead-214	0.144	0.0105	pCi/mL
Radium-226	0.673	0.0818	pCi/mL
Thorium-234	0.722	0.105	pCi/mL
Thallium-208	0.0256	0.00428	pCi/mL

ND = Not Detected
NA = Not Applicable

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6584 N
Sample ID Number: 024392
Date Sampled: 7-10-95
Percent Moisture: 85.60

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Volatile Organics (8260)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
Methylene Chloride	17J	71	0.10	TTO = 5.0	
Acetone	320B	71	NR	NR	
Acetone (reanalyses)	590B	71	NR	NR	
Toluene	200	71	0.75	TTO = 5.0	
Toluene (reanalyses)	290	71	0.75	TTO = 5.0	
Ethylbenzene	11J	71	0.75	TTO = 5.0	
Semivolatile Organics (8270)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
1,2-Dichlorobenzene	410J	2300	NR	TTO = 5.0	
Phenanthrene	620J	2300	NR	TTO = 5.0	
Fluoranthene	630J	2300	NR	TTO = 5.0	
Pyrene	1800J	2300	NR	TTO = 5.0	
Benzo(a)Anthracene	460J	2300	NR	TTO = 5.0	
Chrysene	460J	2300	NR	TTO = 5.0	
bis(2-Ethylhexyl)Phthalate	3600	2300	NR	TTO = 5.0	
Benzo(a)Pyrene	510J	2300	0.0007	TTO = 5.0	
Pesticides/PCBs (8080)	*(µg/kg)*	*(µg/kg)*	*(mg/L)*	*(mg/L)*	
delta-BHC	13	12	NR	TTO = 5.0	
Aldrin	55	12	NR	TTO = 5.0	
4,4'-DDE	44	23	NR	TTO = 5.0	
Metals (6010/7470)	*(mg/kg)*	*(mg/kg)*	*(mg/L)*	*(mg/L)*	
Arsenic	6.2J	6.9	0.1	2.0	
Barium	363	139	1.0	20.0	
Cadmium	7.1	3.5	0.01	2.8	
Chromium	25.6	13.9	0.05	20.0	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6584 N

Sample ID Number: 024392

Date Sampled: 7-10-95

Percent Moisture: 85.60

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Metals (6010/7470)	*(mg/kg)*	*(mg/kg)*	*(mg/L)*	*(mg/L)*	
Copper	323	17.4	1.0	16.5	
Lead	42.2	2.1	0.05	3.2	
Manganese	222	10.4	0.2	20.0	
Nickel	28.6	27.8	0.2	12.0	
Selenium	8.3	3.5	0.05	2.0	
Silver	12.1	6.9	0.05	5.0	
Thallium	ND	6.9	NR	NR	
Zinc	2650	13.9	10.0	28.0	
Mercury	3.5	1.4	0.002	0.1	

Notes:

[a] New Mexico Water Quality Control Commission Regulations (1990), Section 3-103.

[b] City of Albuquerque Sewer Use and Wastewater Control Ordinance (1993), Section 8-9-3 M – maximum allowable concentration for grab sample.

B = Analyte detected in method blank.

DL = Detection limit indicated on laboratory report.

IDL = Instrument detection limit.

J = Estimated concentration of analyte, between DL and IDL.

ND = Not detected above DL indicated.

NR = Not regulated.

TTO = Total toxic organics.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6584 N
Sample ID Number: 024392
Date Sampled: 7-10-95
Percent Moisture: 85.60

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit[a]	Comments
Isotopic Analyses[b]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Tritium	1650 ± 188 pCi/L	121 pCi/L	59.6 pCi/L	NR	
Plutonium-239/240	0.004 ± 0.009	0.021	0.013	NR	
Plutonium-238	-0.002 ± 0.006	0.021	0.013	NR	
Strontium-90	-0.16 ± 0.02	0.38	0.19	NR	
Thorium-232	0.16 ± 0.07	0.032	0.025	NR	
Thorium-230	0.20 ± 0.09	0.040	0.030	NR	
Thorium-228	0.53 ± 0.17	0.064	0.042	NR	
Uranium-238	7.10 ± 1.34	0.030	0.020	NR	
Uranium-235/236	1.70 ± 0.36	0.020	0.017	NR	
Uranium-234	11.8 ± 2.2	0.025	0.018	NR	
Dry Gamma Spectroscopy[c]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Cesium-137	0.024 ± 0.009	0.010	0.005	NR	
Cesium-134	ND	0.009	0.004	NR	
Potassium-40	4.52 ± 0.50	0.10	0.046	NR	
Chromium-51	ND	0.11	0.052	NR	
Iron-59	ND	0.024	0.012	NR	
Cobalt-60	ND	0.011	0.005	NR	
Zirconium-95	ND	0.020	0.01	NR	
Ruthenium-103	ND	0.011	0.006	NR	
Ruthenium-106	ND	0.089	0.043	NR	
Cerium-144	ND	0.068	0.033	NR	
Thallium-208	0.11 ± 0.02	0.01	NL	NR	
Lead-212	0.36 ± 0.04	0.02	0.008	NR	
Lead-214	0.28 ± 0.03	0.02	0.011	NR	
Bismuth-212	0.29 ± 0.10	0.09	NL	NR	
Bismuth-214	0.24 ± 0.03	0.02	NL	NR	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE

Building ID: Bldg 6584 N

Sample ID Number: 024392

Date Sampled: 7-10-95

Percent Moisture: 85.60

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit[a]	Comments
Dry Gamma Spectroscopy[c]	*(pCi/g ± 2-σ)*	*(pCi/g)*	*(pCi/g)*	*(pCi/g)*	
Radium-226	0.26 ± 0.02	0.02	0.010	30.0[d]	
Radium-228	0.33 ± 0.04	0.04	0.018	30.0[d]	
Actinium-228	0.33 ± 0.04	0.04	0.018	NR	
Thorium-231	ND	0.33	0.16	NR	
Thorium-232	0.33 ± 0.04	0.04	0.018	NR	
Thorium-234	2.98 ± 0.52	0.32	0.16	NR	
Uranium-235	0.18 ± 0.02	0.08	0.037	NR	
Uranium-238	2.98 ± 0.52	0.32	0.16	NR	
Americium-241	ND	0.31	0.16	NR	

Notes:

[a] New Mexico Water Quality Control Commission Regulations (1990), Section 3-103.

[b] Isotopic uranium analyzed by NAS-NS-3050; plutonium by SL13028/SL13033; strontium by 7500-SR; thorium by NAS-NS-3004.

[c] Analyzed by method HASL 300 at Quanterra, St. Louis.

[d] NMWQCCR standard for Ra-226 + Ra-228 combined in pCi/L.

MDA = Minimum detectable activity.

ND = Not detected above MDA indicated.

NL = Not listed in lab report.

NR = Not regulated.

ANNEX B
DSS Site 1029
Soil Sample Data Validation Results

FOR AR/COC 600434
(DSS SITE 1029, ERCL 7/98)

HE-027

High Explosives by Capillary Electrophoresis QC Check List

Analyst: Jim BARNETT Date: 7/7-8/98

Peer Reviewer: Kathleen Swenson Date: 8/7/98

Instrument Run Date: 7/7-8/98 Instrument Run ID#:

Instrument-related QC:		
[1] Did ICAL pass?	Yes[X] No[ ]	and all Pearson Coefficients > 0.995
[2] Calibration Slopes Correct?	Yes[X] No[ ]	Are the slopes from the ICAL cut and pasted correctly into the CCV calculations?
[3] Did bracketing CCV pass?	Yes[ ] No[X]	Target analytes recovered 90-110%, bracketing CCV every 10 samples ~~Acc 15~~
Batch-related QC:	(A batch is less than or equal to 20 samples)	
[4] Did Surrogates Recover?	Yes[X] No[ ]	Recovery should be inside charted range.
[5] Did LMB Pass?	Yes[X] No[ ]	All analytes < PQL. Must prepare and analyze at least one LMB with each batch.
[6] Did LCS Pass?	Yes[X] No[ ]	All analytes recovered 80-120%. Must prepare and analyze at least one LCS with each batch of up to 20 samples.
[7] Did MS/MSD %REC Pass?	Yes[X] No[ ]	All analytes recovered 75-125% Must prepare and analyze an MS and MSD with each batch.
[8] Did MS/MSD RPD's Pass?	Yes[X] No[ ]	All analytes recovered less than +/- 20%
Sample-related QC:		
[9] Analytes inside Calibration?	Yes[X] No[ ]	Target analytes must be bracketed by calibration values or valid LRS.
[10] Migration Times?	Yes[X] No[ ]	Are migration times reasonable compared to bracketing CCV's and batch related QC such as LCS and MS/MSD?

3) ALL CCV's passed except 1-08 STD51649 TETRYL had a low recovery ~~See NCR~~ - all samples were ND - therefore the ccv had no affect on TETRYL.

RCRA + Zn

Metals by ICP-MS QC Check List

Analyst:	Linda Kear Date: 7/14/98	NCAR#:	98-104
Peer Reviewer:	Wayne Ross Date: 7/22/98	Preparation Batch ID#:	519819
Standards:		Instrument Run Date:	7/14/98
Cal Level 0 (ICB, CCB)	51-13	Instrument Run ID#:	519819
Cal Level 1	61-17	ICS-A	136-05
Cal Level 2	71-09	ICS-AB	146-09
Cal Level 3	81-09	LRS	118-01
Cal Level 4	n/a	ISS	156-02
ICV, CCV	196-07	ICP-TUNE	171-08

Instrument-related QC:

[1] Did Tune Pass?	Yes[✓]	No[ ]	4 reps < 5% RPD for internal standards Li, Y, In, Bi
[2a] Did ICV pass?	Yes[ ]	No[✓]	Target analytes recovered 90-110%
[2b] Did ICB Pass?	Yes[✓]	No[ ]	All analytes < PQL
[2c] Did CCV pass?	Yes[ ]	No[✓]	Target analytes recovered 90-110%
[2d] Did CCB Pass?	Yes[✓]	No[ ]	All analytes < PQL
[2e] Did ISS recovery pass?	Yes[ ]	No[✓]	Internal standards 60-125% of initial calibration values
[3] Did ICS_A's Pass?	Yes[ ]	No[✓]	All analytes not present < PQL
[4] Did ICS_AB's Pass?	Yes[✓]	No[ ]	All analytes present recovered 80-120%
[5] Did LRS pass?	Yes[ ]	No[✓]	Linear dynamic range check (if run) must agree to 95-105% of stated value to validate beyond calibration values

Batch-related QC: (A batch is less than or equal to 20 samples) ⇒ MDL

[6] Did LMB Pass?	Yes[ ]	No[✓]	All analytes < ~~PQL~~ Must prepare and analyze at least one LRB with each batch.
[7] Did LCS/LCSD Pass?	Yes[✓]	No[ ]	All analytes recovered 80-120%. Must prepare and analyze at least one LCS with each batch.
[8] Did MS/MSD Pass?	Yes[ ]	No[✓]	All analytes recovered 75-125%. Recovery not required if spike < 30% of sample analyte level Must prepare and analyze an MS and MSD with each batch.
[9] Did M/MDup Pass?	Yes[ ]	No[✓]	All analytes RPD 20% at 5 times the PQL. Must prepare and analyze at least one with each batch.
[10] Did M/Mdil Pass?	Yes[✓]	No[ ]	All analytes > 10X the MDL in the 5X dilution agree 90-110% with the undiluted reference. Must prepare and analyze at least one with each batch.
[11] Digestion Problems?	No[✓]	Yes[ ]	Digestion 3015, 3051 problems?

Sample-related QC:

[11] Did sample ISS pass?	Yes[✓]	No[ ]	Internal standards >= 60% or <= 125% or sample must be rerun at a 5X dilution.
[12] Analytes inside Calibration?	Yes[✓]	No[ ]	Target analytes must be bracketed by calibration values or valid LDR.
[13] Analyte carryover OK?	No[✓]	Yes[ ]	Using the sequence order, was carry over contamination probable?

Note: When the HP Enviroquant software refers to an IDL, we are using the ERCL MDL; when it refers to a CRDL, we are using the ERCL PQL which is 4 times the MDL

(2a) ICV failed for Zn – will rerun in separate run batch

(2c) CCV failed for Zn – see above

(2e) Bi went slightly high during the MDL sample – samples before and after it are ok, tho. Also, the only elements for this batch which use Bi as correction (Hg + Pb) are not required to have MDL recoveries, as their conc. is too low.

(3) ICSA has As present at a level above the PQL, which indicates possible matrix interference for As, however, all recovery samples and blanks pass for this element, thus any matrix effect appears to be minimal.

(5) LRS failed for As, but no effect because no sample was above the high cal anyway.

(6) LMB had As, Hg, and Pb present at levels between the MDL + PQL. Samples will be reported ≥ "B" qualifiers for these elements.

(8) MS/MSD were out of criteria for Ba (both %rec and rpd). MPS was ok, so this is likely due to sample nonhomogeneity.

(9) MDUP rpd out of criteria for Ba. Again, likely due to sample nonhomogeneity.

Received by QA 7/29/98

600434

Metals by ICP-MS QC Check List

Analyst:	Linda Kear Date: 7/16/98	NCAR#:	N/A
Peer Reviewer:	Kathleen Guenson Date: 7/27/98	Preparation Batch ID#:	W19811 and S19819
Standards:		Instrument Run Date:	7/16/98
I Level 0 (ICB, CCB)	51-14	Instrument Run ID#:	Zn rerun
Cal Level 1	61-17	ICS-A	136-05
Cal Level 2	71-09	ICS-AB	146-09
Cal Level 3	81-09	LRS	N/A
Cal Level 4	N/A	ISS	156-02
ICV, CCV	106-08	ICP-TUNE	171-09

Instrument-related QC:

[1] Did Tune Pass?	Yes[✓] No[ ]	4 reps < 5% RPD for internal standards Li, Y, In, Bi
[2a] Did ICV pass?	Yes[✓] No[ ]	Target analytes recovered 90-110%
[2b] Did ICB Pass?	Yes[✓] No[ ]	All analytes < PQL
[2c] Did CCV pass?	Yes[✓] No[ ]	Target analytes recovered 90-110%
[2d] Did CCB Pass?	Yes[✓] No[ ]	All analytes < PQL
[2e] Did ISS recovery pass?	Yes[✓] No[ ]	Internal standards 60-125% of initial calibration values
[3] Did ICS_A's Pass?	Yes[✓] No[ ]	All analytes not present < PQL
[4] Did ICS_AB's Pass?	Yes[✓] No[ ]	All analytes present recovered 80-120%
[5] Did LRS pass? N/A	Yes[ ] No[ ]	Linear dynamic range check (if run) must agree to 95-105% of stated value to validate beyond calibration values

Batch-related QC: (A batch is less than or equal to 20 samples)

[6] Did LMB Pass?	Yes[ ] No[✓]	All analytes < PQL. Must prepare and analyze at least one LRB with each batch.
[7] Did LCS/LCSD Pass?	Yes[ ] No[✓]	All analytes recovered 80-120%. Must prepare and analyze at least one LCS with each batch.
[8] Did MS/MSD Pass?	Yes[✓] No[ ]	All analytes recovered 75-125%. Recovery not required if spike < 30% of sample analyte level Must prepare and analyze an MS and MSD with each batch.
[9] Did M/MDup Pass?	Yes[✓] No[ ]	All analytes RPD 20% at 5 times the PQL. Must prepare and analyze at least one with each batch.
[10] Did M/Mdil Pass?	Yes[✓] No[ ]	All analytes > 10X the MDL in the 5X dilution agree 90-110% with the undiluted reference. Must prepare and analyze at least one with each batch.
Digestion Problems?	No[✓] Yes[ ]	Digestion 3015, 3051 problems?

Sample-related QC:

[11] Did sample ISS pass?	Yes[✓] No[ ]	Internal standards >= 60% or <= 125% or sample must be rerun at a 5X dilution.
[12] Analytes inside Calibration?	Yes[✓] No[ ]	Target analytes must be bracketed by calibration values or valid LDR.
[13] Analyte carryover OK?	No[✓] Yes[ ]	Using the sequence order, was carry over contamination probable?

Note: When the HP Enviroquant software refers to an IDL, we are using the ERCL MDL; when it refers to a CRDL, we are using the ERCL PQL which is 4 times the MDL

(6) LMB had Zn present at a level above the ~~between~~ PQL; samples will be reported ~~2~~ a "B" qualifier. Most likely due to contamination

(7) LCS Zn recovery high at of criteria. MS and MSD recoveries are good, thus this appears to be spot contamination. No net effect on data.

VOC Peer Review Check List

Batch ID: SVOC-042

Did BFB Pass?	Yes ☒	No ☐	
Did the ICAL Pass %RSD ≤ 30%	Yes ☒	No ☐	
Did the ICAL and CCV pass:			
± 20% recovery for the individual analytes?	Yes ☐	No ☒	See NCR/ Case Narrative
Calibration Check Compounds in criteria?	Yes ☒	No ☐	
System Performance Check Compounds in criteria?	Yes ☒	No ☐	
Did the blank pass?	Yes ☒	No ☐	
Did the MS/MSD pair pass accuracy and precision and criteria?	Yes ☒	No ☐	
Did LCS pass accuracy criteria?	Yes ☒	No ☐	N/A ☐
Were all IS areas within a factor of 2 of the average area in the ICAL	Yes ☒	No ☐	
Did Retention Times remain inside windows for all standards and samples?	Yes ☒	No ☐	
Did all surrogates pass criteria for each standard and sample?	Yes ☒	No ☐	

Check for:

Carry-over contamination	OK ☒
Correct interpretation of mass spectra	OK ☒
Errors in data entry, rounding and/or calculations	OK ☒

Reviewed by: Kathleen Swenson Date: 7/22/98

VOC Peer Review Check List

Batch ID: SVOC-043

Did BFB Pass?	Yes ☒	No ☐	
Did the ICAL Pass %RSD ≤ 30%	Yes ☒	No ☐	
Did the ICAL and CCV pass:			
± 20% recovery for the individual analytes?	Yes ☐	No ☒	See NCR/Case Narrative
Calibration Check Compounds in criteria?	Yes ☒	No ☐	
System Performance Check Compounds in criteria?	Yes ☒	No ☐	
Did the blank pass?	Yes ☒	No ☐	
Did the MS/MSD pair pass accuracy and precision and criteria?	Yes ☒	No ☐	
Did LCS pass accuracy criteria?	Yes ☒	No ☐	N/A ☐
Were all IS areas within a factor of 2 of the average area in the ICAL	Yes ☒	No ☐	
Did Retention Times remain inside windows for all standards and samples?	Yes ☒	No ☐	
Did all surrogates pass criteria for each standard and sample?	Yes ☒	No ☐	

Check for:	
Carry-over contamination	OK ☒
Correct interpretation of mass spectra	OK ☒
Errors in data entry, rounding and/or calculations	OK ☒

Reviewed by: Kathleen Swenson Date: 7/23/98

QA Officer Review Checklist

SNL/NM Environmental Restoration Chemistry Laboratory

	YES	NO	Comments
1. Samples were preserved and handled in accordance with QAPjP and LOPs	✓		
2. The appropriate number and type of laboratory QC check samples were analyzed	✓		
3. Laboratory QC checks met the established acceptance criteria		✓	See Case Narrative
4. Deviations from analytical methods are documented	N/A		
5. Data package is complete, per section 10.4 of the ERCL QAPjP	✓		

Data Package Checklist

	YES	NO	Comments
Date of Issue	✓		
Case Narrative	✓		
Description of data package	✓		
Index of samples, including sampling ID and laboratory ID	✓		
Description of any problems encountered in analysis	✓		
Circumstances leading to the use of data qualifiers	✓		
Type of digestion used for general inorganic analysis of soil samples	✓		
Analytical results for each sample - must include the parameter name, the parameter value, uncertainty value (where applicable), MDL and PQL, units of measure, data qualifier(s), method of analysis, and analysis date	✓		
Calibration ranges	✓		
QC Summaries	✓		
Surrogate data	✓		
Matrix spike or LCS recovery data for accuracy	✓		
MS/MSD or LCS/LCSD for precision	✓		
Method or reagent blank data	✓		
QA review documentation:	✓		
QA Officer Review Checklist	✓		
Electronic copy of the analytical data	✓		
COC	✓		

Data Package COC No. 600434 Reviewed by Margie Marley Date 8/18/98

c:\document\ercl\reports\qacheck.doc

SF 2001-COC (10-97)
Supersedes (5-97) issue

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600434

Dept. No./Mail Stop: 6133 MS-1147
Project/Task Manager: Mike Sanders
Project Name: 101 Non-ER Septic Fields
Record Center Code: ER/1295/DAT
Logbook Ref. No.:
Service Order No.: 0526

Date Samples Shipped: _____ SMO USE
Carrier/Waybill No.: _____
Lab Contact: Warren Strong/284-3313
Lab Destination: ERCL
SMO Contact/Phone: Doug Salmi/844-3110
Send Report to SMO: Suzi Montano

Contract No.:
Case No.: 7223.230
SMO Authorization: _____
Bill to: Sandia National Laboratories
Supplier Services, Dept. _____
P.O. Box 5800 MS 0154

fridge 3 shelf 2
fridge 4 shelf 4

Location — Tech Area III — Building NW6584 — Room

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV: Sample Matrix	Container: Type	Container: Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE: Lab Sample ID
041477-001	ER-1295-NW6584-DF1-BH1-5-S	5	N/A	7/1/98 1130	S	AC	300ml	4C	G	SA	VOCs (8260)	
041478-001	ER-1295-NW6584-DF1-BH1-10-S	10	N/A	1140	S	AC	300ml	4C	G	SA	VOCs (8260)	
041479-001	ER-1295-NW6584-DF1-BH2-5-S	5	N/A	1150	S	AC	300ml	4C	G	SA	VOCs (8260)	
041480-001	ER-1295-NW6584-DF1-BH2-10-S	10	N/A	1230	S	AC	300ml	4C	G	SA	VOCs (8260)	
041477-004	ER-1295-NW6584-DF1-BH1-5-S	5	N/A	1130	S	G	125ml	4C	G	SA	RCRA Met+Zn, HE(8330)	
041478-004	ER-1295-NW6584-DF1-BH1-10-S	10	N/A	1140	S	G	125ml	4C	G	SA	RCRA Met+Zn, HE(8330)	
041479-004	ER-1295-NW6584-DF1-BH2-5-S	5	N/A	↓ 1150	S	G	125ml	4C	G	SA	RCRA Met+Zn, HE(8330)	
~~041480-004~~	~~ER-1295-NW6584-DF1-BH2-10-S~~	~~10~~	~~N/A~~		~~S~~	~~G~~	~~125ml~~	~~4C~~	~~G~~	~~SA~~	~~RCRA Met+Zn, HE(8330)~~	

RMMA ☐Yes XNo Ref. No.
Sample Disposal ☐Return to Client XDisposal by lab

Sample Tracking SMO USE
Date Entered (mm/dd/yy) _____
Entered by _____
QC Inits. _____

Special Instructions/QC Requirements
EDD XYes ☐No
Raw data package XYes ☐No
Please list as separate report.

Abnormal Conditions on Receipt LAB USE

Turnaround Time XNormal ☐Rush Required Report Date

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	Chris Catechis	C. Catechis	CC	MDM / 6131 / 881-3196
	CHRIS SEARS	Chris Sears	CS	SNL / 6131 / 844-7136

1. Relinquished by	Chris Sears	Org.	6131	Date	7/1/98	Time	1551	4. Relinquished by	Org.	Date	Time
1. Received by		Org.	6133	Date	7/1/98	Time	15:51	4. Received by	Org.	Date	Time
2. Relinquished by		Org.		Date		Time		5. Relinquished by	Org.	Date	Time
2. Received by		Org.		Date		Time		5. Received by	Org.	Date	Time
3. Relinquished by		Org.		Date		Time		6. Relinquished by	Org.	Date	Time
3. Received by		Org.		Date		Time		6. Received by	Org.	Date	Time

Original To Accompany Samples, Laboratory Copy (White) — **1st Copy** To Accompany Samples, Return to SMO (Blue) — **2nd Copy** SMO Suspense Copy (Yellow) — **3rd Copy** Field Copy (Pink)

TOP 94-03
Rev. 1
Attachment A
November 1995

Mmd 11-9-95

DOCUMENTATION COMPLETENESS CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 1 - DV1)

Project Leader: Tony Roybal / Mike Sanders Project Name: 101 Non-ER Septic Fields Case No.: 7223.230

AR/COC No.: 600434 Analytical Lab: ERCL SDG No.: N/A

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	✓				
1.2	Container type(s) correct for analyses requested	✓				
1.3	Sample volume adequate for # and types of analyses requested	✓				
1.4	Preservative correct for analyses requested	✓				
1.5	Custody records continuous and complete	✓				
1.6	Lab sample number(s) provided	✓				
1.7	Condition upon receipt information provided	N/A		see narrative		
1.8	Tritium Screen data provided (Rad labs)	N/A		N/A		

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	✓				
2.2	Date samples received	✓				
2.3	Method reference number(s) complete and correct	✓				
2.4	Quality control data provided (MB, LCS, LCD, Detection Limit)	✓				
2.5	Matrix spike/matrix spike duplicate data provided(if requested)	✓		not request, data was reported		
2.6	Narrative provided	✓				
2.7	TAT met	N/A		N/A		
2.8	Hold times met	✓				
2.9	All requested result data provided	✓				

Based on the review, this data package is complete ☑ Yes ☐ No

If no, provide : correction request tracking # _____ and date correction request was submitted: _____

Reviewed by: _____ Date: 9/2/98 Closed by: _____ Date: _____

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

Project Name 101 Non-ER Septic Fields

Case Number 7223.230

Sample Numbers 041477, 041478, 041479, 041480

AR/COC No. 600434 Analytical laboratory ERCL SDG No. N/A

AR/COC No. _____ Analytical laboratory _____ SDG No. _____

AR/COC No. _____ Analytical laboratory _____ SDG No. _____

AR/COC No. _____ Analytical laboratory _____ SDG No. _____

1.0 EVALUATION

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
1) Sample volume, container, and preservation correct?	✓		
2) Holding times met for all samples?	✓		
3) Reporting units appropriate for the matrix and meet project-specific requirements?	✓		
4) Quantitation limit met for all samples?	✓ 19	✓	(5) VOCs → DF is 5X. MDL and PQL are elevated.
5) Accuracy a) Laboratory control sample accuracy reported and met for all samples?		✓	(4) Zn recovered outside QC limits.
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique?	✓		

Reviewed by: Tim Jacks

Date: 9/2/98

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
c) Matrix spike recovery data reported and met for all samples for which it was requested?	~~N/A~~	✓	② Not request, data was reported Ba recovered outside QC limits. for both ms/msD.
6) Precision a) Laboratory control sample precision reported and met for all samples?	N/A		LSC duplicate was not analyzed
b) Matrix spike duplicate RPD data reported and met for all samples for which it was requested?	~~N/A~~	✓	② The RPD for Ba was outside QC limits.
7) Blank data a) Method or reagent blank data reported and met for all samples?		✓	③ As, ~~Ba~~, Hg, and Pb were detected >MDL in the LMB
b) Sampling blank (e.g., field, trip, and equipment) data reported and met?		✓	④ No trip blank submitted with samples
8) Narrative included, correct, and complete?	✓		

2.0 COMMENTS: All items marked "No" above must be explained in this section. For each item, give SNL/NM ID No. and the analysis, if appropriate, of all samples affected by the finding.

① Zinc recovered (high) outside QC limits. Lab narrative states that spot contamination is the cause. The ms/msD for Zn is within QC limits.

Reviewed by: T. Quales

Date: 9/2/98

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

2.0 COMMENTS CONTINUATION SHEET

(2) ms/msD was not requested, but data was reported by lab; therefore, data was used. Both accuracy and bias for Ba were outside QC limits. The report states matrix interference.

(3) As, ~~Ba~~ Zn, Hg and Pb were detected > MDL in the lab method blank.

(4) No trip blank submitted for VOCs. No VOCs were detected in any env. samples.

(5) Note: The dilution factor for VOCs is 5X. MDLs and PQLs are elevated

TA

Reviewed by: T=Anderson

Date: 9/2/98

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

3.0 SUMMARY: Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted. Use the qualifiers given at the end of the table if possible. Explain any other qualifiers in the comments column.

Sample/ Fraction No.	Analysis	Qualifiers	Comments
		TH	
		9/2/98	

Attach continuation sheet for additional samples

QUALIFIERS:

J = Estimated quantity (provide reason)
B = Contamination in blank (indicate which blank)
P = Laboratory precision does not meet criteria
R = Reporting units inappropriate
N = There is presumptive evidence of the presence of the material
UJ = The material was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
Q = Quantitation limit does not meet criteria
A = Laboratory accuracy does not meet criteria
U = Analyte is undetected (indicate which analyte and reason for qualification)
NJ = There is presumptive evidence of the presence of the material at an estimated quantity.

Reviewed by: T-Parks

Date: 9/2/98

SAMPLE FINDINGS SUMMARY

Site: 101 Non-ER Septic Fields

AR COC: 600434 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-NW6584-DF1-BH1-5-S	7439-97-6	U, B	① analyte not detected in env. sample, but detected in LMB
↓	7440-66-6	B, A	
ER-1295-NW6584-DF1-BH1-10-S	7439-97-6	U, B	①
↓	7440-66-6	B, A	
ER-1295-NW6584-DF1-BH2-5-S	7439-97-6	U, B	①
↓	7440-66-6	B, A	
ER-1295-NW6584-DF1-BH1-5-S	All method 8260	Q	MDLs & PQL elevated due to dilution.
ER-1295-NW6584-DF1-BH1-10-S	↓	↓	↓
ER-1295-NW6584-DF1-BH2-5-S			
ER-1295-NW6584-DF1-BH2-10-S			

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method. use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed. contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate. needs modification because of an unusual circumstance. or additional clarification is warranted.

Test Methods - Anions_CE. EPA6010. EPA6020. EPA7470A. EPA8015B. EPA8081. EPA8260. EPA8260-MS. EPA8270. HACH_ALK. HACH_NO2. HACH_NO3. MEKC_HE. PCBRISC

Reviewed by: T. Franks Date: 9/2/98

INFORMATION COPY

SHEARS # 141171

FOR AR/COC 600449
(DSS SITE 1029, ERCL 7/98)

HE-028

High Explosives by Capillary Electrophoresis QC Check List

Analyst: Jim Barnett Date: 7/16 - 7/18/98

Peer Reviewer: Linda Kear Date: 8/10/98

Instrument Run Date: 7/16-7/18/98 Instrument Run ID#:

Instrument-related QC:		
[1] Did ICAL pass?	Yes[✓] No[ ]	and all Pearson Coefficients > 0.995
[2] Calibration Slopes Correct?	Yes[✓] No[ ]	Are the slopes from the ICAL cut and pasted correctly into the CCV calculations?
[3] Did bracketing CCV pass?	Yes[ ] No[✓]	Target analytes recovered ~~80-110%~~ 85-115%, bracketing CCV every 10 samples
Batch-related QC:	(A batch is less than or equal to 20 samples)	
[4] Did Surrogates Recover?	Yes[✓] No[ ]	Recovery should be inside charted range.
[5] Did LMB Pass?	Yes[✓] No[ ]	All analytes < PQL. Must prepare and analyze at least one LMB with each batch.
[6] Did LCS Pass?	Yes[✓] No[ ]	All analytes recovered 80-120%. Must prepare and analyze at least one LCS with each batch of up to 20 samples.
[7] Did MS/MSD %REC Pass?	Yes[✓] No[ ]	All analytes recovered 75-125% Must prepare and analyze an MS and MSD with each batch.
[8] Did MS/MSD RPD's Pass?	Yes[✓] No[ ]	All analytes recovered less than +/- 20%
Sample-related QC:		
[9] Analytes inside Calibration?	Yes[✓] No[ ]	Target analytes must be bracketed by calibration values or valid LRS.
[10] Migration Times?	Yes[✓] No[ ]	Are migration times reasonable compared to bracketing CCV's and batch related QC such as LCS and MS/MSD?

(3) CCV %rec low for Tetryl on "Stds 1649" but has no effect to data because tetryl is not a cmpd which is reported.

INFORMATION COPY

SHEARS # 144883

RCRA + Zn

Metals by ICP-MS QC Check List

Analyst:	Linda Kear	**Date:** 7/15/98	**NCAR#:** 98-102
Peer Reviewer:	Kathleen Gibson	**Date:** 7/29/98	**Preparation Batch ID#:** 519820
Standards:			**Instrument Run Date:** 7/15/98
Cal Level 0 (ICB, CCB)	51-14		**Instrument Run ID#:** 519820
Cal Level 1	61-17		**ICS-A** 136-05
Cal Level 2	71-09		**ICS-AB** 146-09
Cal Level 3	81-09		**LRS** 118-01
Cal Level 4	N/A		**ISS** 156-02
ICV, CCV	106-08		**ICP-TUNE** 171-08

Instrument-related QC:

[1] Did Tune Pass?	Yes[✓]	No[ ]	4 reps < 5% RPD for internal standards Li, Y, In, Bi
[2a] Did ICV pass?	Yes[✓]	No[ ]	Target analytes recovered 90-110%
[2b] Did ICB Pass?	Yes[✓]	No[ ]	All analytes < PQL
[2c] Did CCV pass?	Yes[✓]	No[ ]	Target analytes recovered 90-110%
[2d] Did CCB Pass?	Yes[✓]	No[ ]	All analytes < PQL
[2e] Did ISS recovery pass?	Yes[✓]	No[ ]	Internal standards 60-125% of initial calibration values
[3] Did ICS_A's Pass?	Yes[✓]	No[ ]	All analytes not present < PQL
[4] Did ICS_AB's Pass?	Yes[✓]	No[ ]	All analytes present recovered 80-120%
[5] Did LRS pass?	Yes[✓]	No[ ]	Linear dynamic range check (if run) must agree to 95-105% of stated value to validate beyond calibration values

Batch-related QC: (A batch is less than or equal to 20 samples) → MDL

[6] Did LMB Pass?	Yes[ ]	No[✓]	All analytes < ~~PQL~~ MDL. Must prepare and analyze at least one LRB with each batch.
[7] Did LCS/LCSD Pass?	Yes[✓]	No[ ]	All analytes recovered 80-120%. Must prepare and analyze at least one LCS with each batch.
[8] Did MS/MSD Pass?	Yes[✓]	No[ ]	All analytes recovered 75-125%. Recovery not required if spike < 30% of sample analyte level Must prepare and analyze an MS and MSD with each batch.
[9] Did M/MDup Pass?	Yes[✓]	No[ ]	All analytes RPD 20% at 5 times the PQL. Must prepare and analyze at least one with each batch.
[10] Did M/Mdil Pass?	Yes[ ]	No[✓]	All analytes > 10X the MDL in the 5X dilution agree 90-110% with the undiluted reference. Must prepare and analyze at least one with each batch.
[11] Digestion Problems?	No[✓]	Yes[ ]	Digestion 3015, 3051 problems?

Sample-related QC:

[11] Did sample ISS pass?	Yes[✓]	No[ ]	Internal standards >= 60% or <= 125% or sample must be rerun at a 5X dilution.
[12] Analytes inside Calibration?	Yes[✓]	No[ ]	Target analytes must be bracketed by calibration values or valid LDR.
[13] Analyte carryover OK?	No[✓]	Yes[ ]	Using the sequence order, was carry over contamination probable?

Note: When the HP Enviroquant software refers to an IDL, we are using the ERCL MDL; when it refers to a CRDL, we are using the ERCL PQL which is 4 times the MDL

(6) LMB had Pb & Hg present at levels between their MDL's & PQL's – samples will have a "B" qualifier for these 2 elements.

(13) MDil (for relevant samples) was 10x higher than the M sample. This is due to preparation error (i.e. the Dil sample was not really diluted and was a straight). Nonetheless, when this is taken into account recoveries are good (97% for Be & 99% for Pb), thus NO effect to the data. Data not affected – Did not mention in Case Narrative.

Received by QA 8/4/98

VOC Peer Review Check List

Batch ID: SVCC-045

Did BFB Pass?	Yes ☒	No ☐
Did the ICAL Pass %RSD ≤ 30%	Yes ☒	No ☐
Did the ICAL and CCV pass:		
± 20% recovery for the individual analytes?	Yes ☐	No ☒ See NCR/ Case Narrative
Calibration Check Compounds in criteria?	Yes ☒	No ☐
System Performance Check Compounds in criteria?	Yes ☒	No ☐
Did the blank pass?	Yes ☒	No ☐
Did the MS/MSD pair pass accuracy and precision and criteria?	Yes ☐	No ☒ See NCR/ Case Narrative
Did LCS pass accuracy criteria?	Yes ☒	No ☐ N/A ☐
Were all IS areas within a factor of 2 of the average area in the ICAL	Yes ☒	No ☐
Did Retention Times remain inside windows for all standards and samples?	Yes ☒	No ☐
Did all surrogates pass criteria for each standard and sample?	Yes ☒	No ☐

Check for:	
Carry-over contamination	OK ☒
Correct interpretation of mass spectra	OK ☒
Errors in data entry, rounding and/or calculations	OK ☒

Reviewed by: Kathleen Scanson Date: 8/10/95

600449

QA Officer Review Checklist

SNL/NM Environmental Restoration Chemistry Laboratory

	YES	NO	Comments
1. Samples were preserved and handled in accordance with QAPjP and LOPs	✓		
2. The appropriate number and type of laboratory QC check samples were analyzed	~~✓~~	✓	No MS or MSD; see Case Narrative
3. Laboratory QC checks met the established acceptance criteria		✓	See Case Narrative
4. Deviations from analytical methods are documented	N/A		
5. Data package is complete, per section 10.4 of the ERCL QAPjP	✓		

Data Package Checklist

	YES	NO	Comments
Date of Issue	✓		
Case Narrative	✓		
Description of data package	✓		
Index of samples, including sampling ID and laboratory ID	✓		
Description of any problems encountered in analysis	✓		
Circumstances leading to the use of data qualifiers	✓		
Type of digestion used for general inorganic analysis of soil samples	✓		
Analytical results for each sample - must include the parameter name, the parameter value, uncertainty value (where applicable), MDL and PQL, units of measure, data qualifier(s), method of analysis, and analysis date	✓		
Calibration ranges	✓		
QC Summaries	✓		
Surrogate data	✓		
Matrix spike or LCS recovery data for accuracy	✓		
MS/MSD or LCS/LCSD for precision	✓		
Method or reagent blank data	✓		
QA review documentation:	✓		
QA Officer Review Checklist	✓		
Electronic copy of the analytical data	✓		
COC	✓		

Data Package COC No. 600449 Reviewed by Margie Marley Date 8/25/98

c:\document\ercl\reports\qacheck.doc

600449

SF-2900-COC (10-97) & Supersedes (5-97) Issue

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600449

Fridge 3 shelf 5

Fridge 4 shelf 3

Dept. No./Mail Stop: 6133 MS-1147
Project/Task Manager: Mike Sanders
Project Name: 101 Non-ER Septic Fields
Record Center Code: ER/1295/DAT
Logbook Ref. No.:
Service Order No.: 0526

Date Samples Shipped: _____ SMO USE
Carrier/Waybill No.: _____
Lab Contact: Warren Strong/284-3313
Lab Destination: ERCL
SMO Contact/Phone: Doug Salmi/844-3110
Send Report to SMO: Suzi Montano

Contract No.:
Case No.: 7223.230
SMO Authorization _____
Bill to: Sandia National Laboratories
Supplier Services, Dept. _____
P.O. Box 5800 MS 0154

Location Tech Area III
Building NW6584 Room

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV (available at SMO) Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE Lab Sample ID
~~041480-004~~	~~ER-1295-NW6584-DF1-BH2-10-S~~	~~10~~	~~N/A~~		~~S~~	~~G~~	~~125ml~~	~~4C~~	~~G~~	~~SA~~	~~RCRA Met+Zn, HE(8330)~~	
041506-001	ER-1295-NW6584-DF1-BH3-5-S	5	N/A	7/6/98 0750	S	AC	300ml	4C	G	SA	VOCs (8260)	
041507-001	ER-1295-NW6584-DF1-BH3-10-S	10	N/A	7/6/98 0810	S	AC	300ml	4C	G	SA	VOCs (8260)	
041506-004	ER-1295-NW6584-DF1-BH3-5-S	5	N/A	7/6/98 0750	S	G	125ml	4C	G	SA	RCRA Met+Zn, HE(8330)	
041507-004	ER-1295-NW6584-DF1-BH3-10-S	10	N/A	7/6/98 0810	S	G	125ml	4C	G	SA	RCRA Met+Zn, HE(8330)	

RMMA ☐Yes XNo Ref. No.
Sample Disposal ☐Return to Client XDisposal by lab

Sample Tracking SMO USE
Date Entered (mm/dd/yy) _____
Entered by _____
QC Initials _____

Special Instructions/QC Requirements
EDD XYes ☐No
Raw data package XYes ☐No

Please list as separate report.

Abnormal Conditions on Receipt LAB USE

Turnaround Time XNormal ☐Rush Required Report Date

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	Chris Catechis	Chris Catechis	C.C.	MDM/6131/881-3946
	CHRIS SEARS	Chris Sears	RL	SNL/6131/844-1135

1. Relinquished by	Chris Sears	Org. 6131	Date 7/7/98	Time 1518	4. Relinquished by	Org.	Date	Time
1. Received by	[signature]	Org. 6133	Date 7/7/98	Time 23:15pm	4. Received by	Org.	Date	Time
2. Relinquished by		Org.	Date	Time	5. Relinquished by	Org.	Date	Time
2. Received by		Org.	Date	Time	5. Received by	Org.	Date	Time
3. Relinquished by		Org.	Date	Time	6. Relinquished by	Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date	Time

Original To Accompany Samples, Laboratory Copy (White) — 1st Copy To Accompany Samples, Return to SMO (Blue) — 2nd Copy SMO Suspense Copy (Yellow) — 3rd Copy Field Copy (Pink)

TOP 94-03
Rev. 1
Attachment A
November 1995

Rmd 11-9-95

DOCUMENTATION COMPLETENESS CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 1 - DV1)

Project Leader: Tony Roybal | Project Name: 101 Non-ER Septic Fields | Case No.: 7223.230

AR/COC No.: 600449 | Analytical Lab: ERCL | SDG No.: NA

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	NA		Not applicable		
1.2	Container type(s) correct for analyses requested	—				
1.3	Sample volume adequate for # and types of analyses requested	—				
1.4	Preservative correct for analyses requested	—				
1.5	Custody records continuous and complete	—				
1.6	Lab sample number(s) provided	—				
1.7	Condition upon receipt information provided	—				
1.8	Tritium Screen data provided (Rad labs)	NA		Not applicable, non-RMMA location		

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	—				
2.2	Date samples received	—				
2.3	Method reference number(s) complete and correct	—				
2.4	Quality control data provided (MB, LCS, LCD, Detection Limit)		—	LCD not analyzed with submitted samples.		
2.5	Matrix spike/matrix spike duplicate data provided(if requested)		—	Not requested (VOC analysis incomplete)		
2.6	Narrative provided	—				
2.7	TAT met	NA		Not applicable		
2.8	Hold times met	—				
2.9	All requested result data provided	—				

Based on the review, this data package is complete ☑ Yes ☐ No

If no, provide: correction request tracking # _____ and date correction request was submitted: _____

Reviewed by: [signature] J. Rule Date: 10/14/98 Closed by: _____ Date: _____

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

Project Name 101 Non-ER Septic Fields

Case Number 7223.230

Sample Numbers ER-1295-NW6584-DF1 - BH3-5 (BH3-10)-5

AR/COC No. 600449 Analytical laboratory ERCL SDG No. NA

AR/COC No. _____ Analytical laboratory _____ SDG No. _____

AR/COC No. _____ Analytical laboratory _____ SDG No. _____

AR/COC No. _____ Analytical laboratory _____ SDG No. _____

1.0 EVALUATION

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
1) Sample volume, container, and preservation correct?	✓		
2) Holding times met for all samples?	✓		
3) Reporting units appropriate for the matrix and meet project-specific requirements?	✓		
4) Quantitation limit met for all samples?	✓		
5) Accuracy a) Laboratory control sample accuracy reported and met for all samples?	✓		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique?	✓		

Reviewed by: Jeffrey A. Rabe

Date: 10/14/98

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
c) Matrix spike recovery data reported and met for all samples for which it was requested?		✓	S198-20 ⇒ No results reported for Ba ① SVOC-045 ⇒ not analyzed
6) Precision a) Laboratory control sample precision reported and met for all samples?	NA		Not applicable; LCS duplicate not analyzed with submitted samples
b) Matrix spike duplicate RPD data reported and met for all samples for which it was requested?		✓	S198-20 ⇒ No results reported for Ba. ① SVOC-045 ⇒ not analyzed
7) Blank data a) Method or reagent blank data reported and met for all samples?		✓	S198-20 ⇒ "J" values reported for Hg and Pb. ②
b) Sampling blank (e.g., field, trip, and equipment) data reported and met?	NA		Not applicable
8) Narrative included, correct, and complete?	✓		

2.0 COMMENTS: All items marked "No" above must be explained in this section. For each item, give SNL/NM ID No. and the analysis, if appropriate, of all samples affected by the finding.

① Percent recoveries for Ba were not reported for the MS and MSD sample (RPD not calculated).

Reviewed by: Jeffry J. Kole

Date: 10/14/98

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

2.0 COMMENTS CONTINUATION SHEET

② "J" values were reported for Hg and Pb in the LMB (s198-20). Lead was detected in both of the submitted samples, mercury was not.

Note: Due to power failures in TA III the VOC MS/MSD analysis was not completed. Because duplicate laboratory control samples were not ran precision can not be determined.

No analytes were detected during the VOC analyses.

10/14/98 JR

Reviewed by: Jeffrey A. Rabe

Date: 10/14/98

DATA QUALITY INDICATOR CHECKLIST
(DATA VERIFICATION/VALIDATION LEVEL 2—DV2)

3.0 SUMMARY: Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted. Use the qualifiers given at the end of the table if possible. Explain any other qualifiers in the comments column.

Sample/ Fraction No.	Analysis	Qualifiers	Comments

5 of 5

see page

JR 10/14/98

Attach continuation sheet for additional samples

QUALIFIERS:

J = Estimated quantity (provide reason)
B = Contamination in blank (indicate which blank)
P = Laboratory precision does not meet criteria
R = Reporting units inappropriate
N = There is presumptive evidence of the presence of the material
UJ = The material was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
Q = Quantitation limit does not meet criteria
A = Laboratory accuracy does not meet criteria
U = Analyte is undetected (indicate which analyte and reason for qualification)
NJ = There is presumptive evidence of the presence of the material at an estimated quantity.

Reviewed by: Jeffry J. Rale

Date: 10/14/98

SAMPLE FINDINGS SUMMARY

Site: 101 Non-ER Septic Fields

AR COC: 600449 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-NW6584 -DF 1-BH 3-5-S	EPA 8260	UJ, PZ	
ER-1295-NW6584 -DF 1-BH3-10-S	〃	〃	
〃	7439-97-6	B1	
〃	7440-39-3	J A2, P2	
		JR	

Sample No.-Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method. use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed. contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470 1, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: Jeffrey A. Rale Date: 10/14/98

FOR AR/COC 600435
(DSS SITE 1029, GEL 1995)

SAMPLE FINDINGS SUMMARY

Site: NON ER SEPTIC TANKS

AR/COC: 600435 Data Classification: INORGANIC

Sample Fraction No.	Analysis	DV Qualifiers	Comments
041481-003	7440-66-6 ZINC	B	~~Blow the MDL~~ Data conc. exceeds the MDL
	Data is Acceptable		

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method, use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470A, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: [signature] Date: 12/28/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

SITE OR PROJECT NON ER SEPTIC TANKS CASE NO. 7223.2300

ANALYTICAL LABORATORY GEL SAMPLE IDS 04481-003

LABORATORY REPORT # 9807121

TASK LEADER A Roybal

NO. OF SAMPLES 5 Soils

DATA ~~ASSESSMENT~~ SUMMARY CVAA 7471

		ICP (6010B)	AA	MERCURY	CYANIDE
1.	HOLDING TIMES	✓	NA	✓	NA
2.	CALIBRATIONS	✓		✓	
3.	BLANKS	✓		✓	
4.	ICS	✓			
5.	LCS	✓			
6.	DUPLICATE ANALYSIS	✓		✓	
7.	MATRIX SPIKE	~~✓~~ J			
8.	MSA				
9.	SERIAL DILUTION	~~✓~~ J			
10.	SAMPLE VERIFICATION	✓		✓	
11.	OTHER QC	✓		✓	
12.	OVERALL ASSESSMENT	✓	↓	✓	↓

✓ (check mark) — Acceptable
Other — Qualified:
- J - Estimate
- UJ - Undetected, estimated
- R - Unusable (analyte may or may not be present)

NA = NOT APPLICABLE

ACTION ITEMS: NONE

AREAS OF CONCERN:

REVIEWED BY: [signature]

DATE REVIEWED: 12 28 98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

11.0 SAMPLE RESULT VERIFICATION

11.1 Verification of Instrumental Parameters

Are instrument detection limits present and verified on a quarterly basis? Yes ☑ No ☐

Are IDLs present for each analyte and each instrument used? Yes ☑ No ☐

Is the IDL greater than the required detection limits for any analyte? Yes ☐ No ☑
(If IDL > required detection limits, flag values less than 5xIDL.)

Samples affected: _____

_____

_____

Are ICP Interelement Correction Factors established and verified annually? Yes ☐ No ☐ NA

Are ICP Linear Ranges established and verified quarterly? Yes ☐ No ☐ NA

If no for any of the above, review problems and resolutions in narrative report. _____

_____

_____

11.2 Reporting Requirements

Were sample results reported down to the PQL? Yes ☑ No ☐

If no, indicate necessary corrections. _____

_____

Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5xIDL? Yes ☑ No ☐

Were sample weights, volumes, and dilutions taken into account when reporting sample results and detection limits? Yes ☑ No ☐

Reviewed By: _____ Date: 12 23 98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

If no for any of the above, sample results may be inaccurate. Note necessary changes and if errors are present, request resubmittal of laboratory package.

Were any sample results higher than the linear range of calibration curve and not subsequently reanalyzed at the appropriate dilution? Yes ☐ No ☑

Samples affected: _____

11.3 Sample Quantitation

Check a minimum of 10% of positive sample results for transcription/calculation errors. Summarize necessary corrections. If errors are large, request resubmittal of laboratory package.

Comments:

OK - Looks to Be ACCEPTABLE

Approved By:* _____

Date: _____

*Task/Project Leader is responsible for approval of data set.

Reviewed By: _____ Date: 12 28 98

SAMPLE FINDINGS SUMMARY

Site: NON ER SEPTIC TANKS

AR/COC: 600435 Data Classification: Radiologics

Sample Fraction No.	Analysis	DV Qualifiers	Comments
041481-003	Cesium 137	B U1	
	Actinium 228	B U1	
	Radium 228	B	
	R-103	~~B~~ B	U1
	U-235	B	U1
∇	Y-88	B	UJ
	Data is conditionally Accepted		

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method, use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470/1, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: [signature] Date: 12/28/98

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST

Project Name	NON ER SEPTIC TANKS			Site Name	
Laboratory Name/Job No./Batch No.	GEL 125899/ 125814			Chain of Custody No.	600435
Analysis Method	EPA 900.0 HASL 300			Parameter List:	GROSS ALPHA/BETA - GAMMA SPEC

REVIEW ITEM	YES	NO	NA	COMMENTS
A. HOLDING TIMES				MET Criteria
1. Preparation and analysis holding times met?	✓			
2. Short-half life parameters analyzed for and checked?	✓			
B. CALIBRATION VERIFICATION				MET Criteria
1. Detectors numbered and documented?	✓			
2. Frequency: Daily ✓, weekly ____, or monthly ____?	✓			
3. Acceptance criteria: Met?	✓			
C. LABORATORY CONTROL SAMPLES				α/β - MET Criteria
1. Standard: Independent, certified reference material?	✓			
2. Frequency: Each batch?	✓			
% Recovery 80-120% or ____?	✓			
D. METHOD BLANK				NO TA IN BLANKS
1. Frequency: Each batch?	✓			> than Reported Conc.
2. Matrix: Matrix specific?	✓			
3. Preparation: Entire procedure?	✓			
4. Blanks show contamination?			✓	
E. MATRIX SPIKE				MS/MSD within Acceptance
1. Frequency: Each batch?	✓			
2. Matrix: Matrix specific?	✓			
3. Preparation: Entire procedure?	✓			
4. % Recovery: 75-125% or ____?	✓			
F. ANALYTICAL YIELDS/OTHER				Not Evaluated
1. Tracer: Correct type, recovery met?	✓		✓	
2. Ingrowth and/or decay: Correct factors applied?			✓	
3. Solids density: Planchette loading <5 mg/cm^2?			✓	
G. DUPLICATE				met Criteria
1. Type: Lab or field?	✓			
2. Frequency: Each batch?	✓			
3. Matrix: Matrix specific?	✓			

D Bennett
12/12/97

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST (CONTINUED)

Project Name NON ER SEPTIC TANKS				Site Name	
Laboratory Name/Job No./Batch No. GEL 125899 / 125814				Chain of Custody No. 60043	
Analysis Method EPA 900.0. HASL 300				Parameter List:	
REVIEW ITEM	YES	NO	NA	COMMENTS	
4. Preparation: Entire procedure?	✓				
H. ANALYTE DETECTION					
1. Detection limit sample/batch specific?	✓				
2. Errors evaluated?	✓				
3. False positives/negatives suspected?			–	TH-234 Not Qualified due to low ABUNDANCE	

Reviewed by: [signature] 12/28/98

Records Center Code: ER / 1295 / DAT

SMO ANALYTICAL DATA ROUTING FORM

Project Name: Non-ER Septic Tanks
Case No./Service Order: 7223.230/CF0526
SNL Task Leader: ROYBAL
Org/Mail Stop: 6133 / 1147
SMO Project Coordinator: SALMI
Sample Ship Date: 7/2/98

ARCOC	Lab	Lab ID	Preliminary Received	Final Received	EDD Req'd YES	EDD Req'd NO	EDD Rec'd YES	EDD Rec'd NO
600435	GEL	9807121		8/7/98	x		x	

	Date		
Correction Requested from Lab:	8/10/98	Correction Request #:	1125 – Case narrative unsigned
Corrections Received:	9/1/98	Requester:	MONTANO
Review Complete:	9-8-98	Signature:	W. Palencia
Priority Data Faxed:		Faxed To:	
Preliminary Notification:		Person Notified:	
Final Transmittal:	9-8-98	Transmitted To:	Roybal
		Transmitted By:	Palencia
TO ER: ~~Filed in Records Center~~:	9-8-98	Filed By:	Montano

Comments:

Received (Records Center) By:

SAMPLE FINDINGS SUMMARY

Site: NON ER SEPTIC TANKS

AR/COC: 600435 Data Classification: ORGANICS

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-NW6584-DF1-BH1-5-S	EPA8270	UJ	Temp. outside of criteria
" " " " -BH1-10-S	↓	↓	
" " " " -BH2-5S			
ER-1295-NW6584-DF1-BH2-5-SD	EPA8260	UJ	
ER-1295-NW6584-DF1-BH2-5-SD	EPA8330	UJ	
" " " " " " " "	EPA8270	UJ - all ND J - positive results	

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method, use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact *Tina Sanchez to coordinate* adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470/1, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: Kevin A Lambert Date: 1-8-99

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

SITE OR PROJECT NON ER SEPTIC TANKS. SAMPLE IDS 3 locations + Dup.
ANALYTICAL LABORATORY GEL NO. OF SAMPLES 5 smpls
LABORATORY REPORT # 9807121 ER-1295-NW6584-DFI
CASE NO. 7223.2800 041477-02/041478-02/041479-02/041481-01/041481-003

DATA ASSESSMENT SUMMARY

Describe problems/qualifications below (Action Items and Areas of Concern) HE

		VOC	SVOC	PEST/PCB	OTHER
1.	HOLDING TIMES/PRESERVATION	✓	✓	NA	Y
2.	GC/MS INST. PERFORM.	✓	✓		Y
3.	CALIBRATIONS/WINDOWS	✓	✓		Y
4.	BLANKS	✓	✓		Y
5.	SURROGATES	✓	✓		Y
6.	MATRIX SPIKE/DUP	✓	✓		
7.	LABORATORY CONTROL SAMPLES	NA	NA		NA
8.	INTERNAL STANDARDS	✓	✓		✓
9.	COMPOUND IDENTIFICATION	✓	✓		✓
10.	SYSTEM PERFORMANCE	✓	✓		✓
11.	OVERALL ASSESSMENT	✓	✓		✓

✓ (check mark) — Acceptable: Data had no problems or qualified due to minor problems
N - Data qualified due to major problems
X - Problems, but do not affect data
Qualifiers: J - Estimate
UJ - Undetected, estimated

ACTION ITEMS: NONE

AREAS OF CONCERN: NONE

Reviewed By: Dan Brunick
Date: 12/28/00

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

PROJECT/TASK LEADER: _____

ACTION ITEMS: None

AREAS OF CONCERN: NONE

OVERALL DATA QUALITY ASSESSMENT DATA IS Acceptable

NOTE - Holding Time Accepted by SWL/SMO.

Reviewed By: [signature]
Date: 12/28/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

4.0 INITIAL CALIBRATION

Has initial calibration been performed as required in the EPA method? Yes ☑ No ☐

Were the correct number of standards used to calibrate the instrument? Yes ☑ No ☐

For GC analyses of PCBs and Pesticides, did the laboratory follow the correct 72-hour sequence of analysis?
Yes ☐ No ☐ Not Applicable

List below compounds which did not meet initial calibration criteria outlined by the EPA method.

Instrument ID	Date	Compound	RF/%RSD	Action	Samples Affected
VOA8.i	21-may98	Acrolein	96.371	70.05 / ±30%	Not on TCL
		trichlorofluoromethane	52.395		Not on TCL
		Isobutyle Alcohol	52.312		on TCL
		Allychloride	37.992		on TCL
		methylene Chloride	107.461		on TCL,
		Ethyle Acetate	43.938		Not on TCL
		propionitrile	61.119		on TCL
		4,2, dichloro 3 chloropropene	26.720		on TCL

Check for transcription/calculation errors. If errors are present, summarize necessary corrections below:

Reviewed By: [signature]
Date: 11-25-98

Contract Verification Review (CVR)

Project Leader ROYBAL | Project Name NON-ER SEPTIC TANKS | Case No. 7223.230

AR/COC No. 600435 | Analytical Lab GEL | SDG No. 9807121

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record and Log-In Information

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	X				
1.2	Container type(s) correct for analyses requested	X				
1.3	Sample volume adequate for # and types of analyses requested	X				
1.4	Preservative correct for analyses requested	X				
1.5	Custody records continuous and complete	X				
1.6	Lab sample number(s) provided	X				
1.7	Date samples received	X				
1.8	Condition upon receipt information provided	X				

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, LCD)	X				
2.4	Matrix spike/matrix spike duplicate data provided(if requested)	NA				
2.5	Detection Limits provided; PQL and MDL(or IDL)	X				
2.6	QC batch numbers provided	X				
2.7	Dilution Factors provided	X				
2.8	Data reported using correct sig. fig. (2 for org.; 3 for inorg.)	X				
2.9	Rad analysis uncertainty provided (2 sigma error)	X				
2.10	Narrative provided	X				
2.11	TAT met	X				
2.12	Hold times met	X				
2.13	Were contractual qualifiers provided	X				
2.14	All requested result data provided	X				

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No.
3.1) Reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg). Units consistent between QC samples and sample data.	X		
3.2) Quantitation limit met for all samples?	X		
3.3) Accuracy a) Laboratory control sample accuracy reported and met for all samples?	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique?	X		
c) If requested, matrix spike recovery data reported and met .	NA		
3.4) Precision a) Laboratory control sample precision reported and met for all samples? For rad analysis, sample duplicate precision reported and met.	X		
b) If requested, matrix spike duplicate RPD data reported and met.	NA		
3.5) Blank data a) Method or reagent blank data reported and met for all samples?	X		
b) Sampling blank (e.g., field, trip, and equipment) data reported and met?	NA		
3.6) Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank; "U"- analyte undetected (results are below the MDL or L_c (rad)); "H"-analysis done beyond the holding time.	X		
3.7) Narrative included, correct, and complete?	X		

Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted.

Sample/ Fraction No.	Analysis	Qualifiers	Comments

Were deficiencies noted. ☹ Yes ☺ No

Based on the review, this data package is complete. ☺ Yes ☹ No

If no, provide : nonconformance report or correction request number _____ and date correction request was submitted _____

Reviewed by: W. Palencia Date: 9-8-98 Closed by: _____ Date: _____

SF 2001-COC (10-97)
Supersedes (5-97) issue

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600435

Dept. No./Mail Stop: 6133 MS-1147
Project/Task Manager: Mike Sanders
Project Name: 101 Non-ER Septic Fields
Record Center Code: ER/1295/DAT
Logbook Ref. No.:
Service Order No.: 0526

Date Samples Shipped: 7/2/98 SMO use
Carrier/Waybill No.: 707111
Lab Contact: Edie Kent/803-556-8171
Lab Destination: GEL
SMO Contact/Phone: Doug Salmi/844-3110
Send Report to SMO: Suzi Montano

Contract No.: AJ-2480A
Case No.: 7223.230
SMO Authorization
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location — Tech Area III — Building NW6584 — Room

	Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV (available at SMO): Sample Matrix	Container: Type	Container: Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE: Lab Sample ID
1	041477-002	ER-1295-NW6584-DF1-BH1-5-S	5	N/A	7/1/98 1130	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	001
2	041478-002	ER-1295-NW6584-DF1-BH1-10-S	10	N/A	1140	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	002
3	041479-002	ER-1295-NW6584-DF1-BH2-5-S	5	N/A	1150	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	003
~~4~~	~~041480-002~~	~~ER-1295-NW6584-DF1-BH2-10-S~~	~~10~~	~~N/A~~		~~S~~	~~AG~~	~~500ml~~	~~4C~~	~~G~~	~~SA~~	~~SVOCs (8270) Gross A/B~~	
4	041481-001	ER-1295-NW6584-DF1-~~BH2~~ 5 -SD	5	N/A	1230	S	AC	300ml	4C	G	DU	.VOCs (8260)	004
5	041481-003	ER-1295-NW6584-DF1-~~BH2~~ 5 -SD	5	N/A	1230	S	AG	1L	4C	G	DU	SVOC8270, HE 8330, G Spec, RCRA Met+Zn	005

RMMA ☐Yes XNo Ref. No.
Sample Disposal ☐Return to Client XDisposal by lab

Sample Tracking SMO use
Date Entered (mm/dd/yy):
Entered by:

Special Instructions/QC Requirements
EDD XYes ☐No
Raw data package XYes ☐No

Abnormal Conditions on Receipt Lab use
Ambient

Turnaround Time XNormal ☐Rush Required Report Date

QC Initials

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	Chris Catechis		CC	MDH / 6131 / 881-3196
	CHRIS EDENS		PA	SNL / 6131 / 844-1136

Please list as separate report.

1. Relinquished by		Org.	6131	Date	7/1/98	Time	1515	4. Relinquished by	Org.	Date	Time
1. Received by		Org.	7577	Date	7/1/98	Time	1515	4. Received by	Org.	Date	Time
2. Relinquished by		Org.	7577	Date	7/2/98	Time	1130	5. Relinquished by	Org.	Date	Time
2. Received by		Org.	GEL	Date	7/6/98	Time	12:05	5. Received by	Org.	Date	Time
3. Relinquished by		Org.		Date		Time		6. Relinquished by	Org.	Date	Time
3. Received by		Org.		Date		Time		6. Received by	Org.	Date	Time

Original To Accompany Samples, Laboratory Copy (White) — 1st Copy To Accompany Samples, Return to SMO (Blue) — 2nd Copy SMO Suspense Copy (Yellow) — 3rd Copy Field Copy (Pink)

SF 2001-COC (10-97)
Supersedes (5-97) issue

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600435

Dept. No./Mail Stop: 6133 MS-1147
Project/Task Manager: ~~Mike Sanders~~
Project Name: 101 Non-ER Septic Fields
Record Center Code: ER/1295/DAT
Logbook Ref. No.:
Service Order No.: 0526

Date Samples Shipped: 7/2/98 SMO USE
Carrier/Waybill No.: 707111
Lab Contact: Edie Kent/803-556-8171
Lab Destination: GEL
SMO Contact/Phone: Doug Salmi/844-3110
Send Report to SMO: Suzi Montano

Contract No.: AJ-2480A
Case No.: 7223.230
SMO Authorization
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location Tech Area III
Building NW6584 Room

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV (available at SMO): Sample Matrix	Container: Type	Container: Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE: Lab Samp ID
041477-002	ER-1295-NW6584-DF1-BH1-5-S	5	N/A	7/1/98 1130	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041478-002	ER-1295-NW6584-DF1-BH1-10-S	10	N/A	1140	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041479-002	ER-1295-NW6584-DF1-BH2-5-S	5	N/A	1150	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
~~041480-002~~	~~ER-1295-NW6584-DF1-BH2-10-S~~	~~10~~	~~N/A~~		~~S~~	~~AG~~	~~500ml~~	~~4C~~	~~G~~	~~SA~~	~~SVOCs (8270) Gross A/B~~	
041481-001	ER-1295-NW6584-DF1-~~BH2~~ 5 -SD	5	N/A	1230	S	AC	300ml	4C	G	DU	VOCs (8260)	
041481-003	ER-1295-NW6584-DF1-~~BH2~~ 5 -SD	5	N/A	1230	S	AG	1L	4C	G	DU	SVOC8270, HE 8330, G Spec, RCRA Met+Zn	

RMMA ☐Yes XNo Ref. No.
Sample Disposal ☐Return to Client XDisposal by lab

Sample Tracking SMO USE: Date Entered (mm/dd/yy) 7/2/98 Entered by
QC Initials

Special Instructions/QC Requirements
EDD XYes ☐No
Raw data package XYes ☐No

Abnormal Conditions on Receipt LAB USE

Turnaround Time XNormal ☐Rush Required Report Date

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Chris Gatechis		C.G.	mDH / 6131 / 881-3196
	CHRIS EVANS		PA	SNL / 6131 / 844-1136

Please list as separate report.

1. Relinquished by		Org.	6131	Date	7/1/98	Time	1515	4. Relinquished by
1. Received by		Org.	7577	Date	7/1/98	Time	1575	4. Received by
2. Relinquished by		Org.	7577	Date	7/2/98	Time	1130	5. Relinquished by
2. Received by		Org.		Date		Time		5. Received by
3. Relinquished by		Org.		Date		Time		6. Relinquished by
3. Received by		Org.		Date		Time		6. Received by

Original To Accompany Samples, Laboratory Copy (White) | 1st Copy To Accompany Samples, Return to SMO (Blue) | 2nd Copy SMO Suspense Copy (Yellow) | 3rd Copy Field Copy (Pink)

FOR AR/COC 600510
(DSS SITE 1029, GEL 7/98)

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

SITE OR PROJECT Non ER Septic Tanks CASE NO. 7223.2300

ANALYTICAL LABORATORY GEL SAMPLE IDS

LABORATORY REPORT # 9807247 A,B,C, AR/COC's 600400

TASK LEADER A Roybal 600429

NO. OF SAMPLES 14 soils. 600510

DATA ASSESSMENT SUMMARY CVAA

		ICP	AA	MERCURY	CYANIDE
1.	HOLDING TIMES	✓	NA	✓	NA
2.	CALIBRATIONS	✓		✓	
3.	BLANKS	✓		✓	
4.	ICS	✓			
5.	LCS	✓			
6.	DUPLICATE ANALYSIS	✓		✓	
7.	MATRIX SPIKE	✓		✓	
8.	MSA				
9.	SERIAL DILUTION	✓			
10.	SAMPLE VERIFICATION	✓		✓	
11.	OTHER QC	✓		✓	
12.	OVERALL ASSESSMENT	✓	▽	✓	▽

✓ (check mark) — Acceptable
Other — Qualified:
J - Estimate
UJ - Undetected, estimated
R - Unusable (analyte may or may not be present)

ACTION ITEMS: None

AREAS OF CONCERN: None — Except ICB1/CCB1 -> B detected small amounts of analyte in Blank - Does Not significantly impact data; Case narrative not supported by reported QC report for serial dilution and LCS/LCSD deficiencies written in narrative. Task leader may need to seek revised case narrative.

REVIEWED BY: D Bruneel

DATE REVIEWED: 12/29/98

Site: NON ER SEPTIC TANKS

AR/COC: 600400 600429 600510 Data Classification: INDIGANICS

Sample Fraction No.	Analysis	DV Qualifiers	Comments
~~044471-003~~	~~Pb~~	~~J~~	~~@ 0.0484 mg/kg.~~
ER-12915-M0231-DF1-B	Ag	U J	~~0.162 mg/kg~~ Detection Limit 0.595 mg/kg
ER-12915-M0231-DF1-B	BA	R J	MS out 60.9 with window (67.0 - 131) MSD 51 (67-131)
~~"~~	~~All~~	~~B3~~	~~Numerous Analytes detected in each CCB (1-13)~~
~~"~~	~~As, Cd, Cr, Cu, Pb, Hg, Se, Ag EN~~	~~A2~~	~~CRDL STANDARD for ICP All out of limits except for Pb.~~
	DATA IS	Acceptable	

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method. use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate. needs modification because of an unusual circumstance. or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010. EPA6020. EPA7470/1, EPA8015B. EPA8081. EPA8260. EPA8260-MS. EPA8270. HACH_ALK. HACH_NO2. HACH_NO3. MEKC_HE. PCBRISC

Reviewed by: [signature] Date: 12/29/98

[signature] 1/8/99

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

If no for any of the above, sample results may be inaccurate. Note necessary changes and if errors are present, request resubmittal of laboratory package.

Were any sample results higher than the linear range of calibration curve and not subsequently reanalyzed at the appropriate dilution? Yes ☐ No ☑

Samples affected: _____

11.3 Sample Quantitation

Check a minimum of 10% of positive sample results for transcription/calculation errors. Summarize necessary corrections. If errors are large, request resubmittal of laboratory package.

Comments:

OK- data is Good/ACCEPTABLE

Approved By:* _____

Date: _____

*Task/Project Leader is responsible for approval of data set.

Reviewed By: _____ Date: 12/29/98

INORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3—DV3)

11.0 SAMPLE RESULT VERIFICATION

11.1 Verification of Instrumental Parameters

Are instrument detection limits present and verified on a quarterly basis? Yes ☐ No ☐ NA

Are IDLs present for each analyte and each instrument used? Yes ☑ No ☐

Is the IDL greater than the required detection limits for any analyte? Yes ☐ No ☑
(If IDL > required detection limits, flag values less than 5xIDL.)

Samples affected: _____

_____

_____

Are ICP Interelement Correction Factors established and verified annually? Yes ☐ No ☐ NA

Are ICP Linear Ranges established and verified quarterly? Yes ☐ No ☐ NA

If no for any of the above, review problems and resolutions in narrative report. _____

_____

_____

11.2 Reporting Requirements

Were sample results reported down to the PQL? Yes ☑ No ☐

If no, indicate necessary corrections. _____

_____

Were sample results that were analyzed by ICP for Se, Tl, As, or Pb at least 5xIDL? Yes ☑ No ☐

Were sample weights, volumes, and dilutions taken into account when reporting sample results and detection limits? Yes ☑ No ☐

Reviewed By: _____ Date: 12/29/98

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST

Project Name	NON ER SEPTIC TANKS			Site Name	
Laboratory Name/Job No./Batch No.	GEL / 9807247			Chain of Custody No.	600400 600429 600510
Analysis Method	EPA 900 HASL 300			Parameter List:	
REVIEW ITEM	YES	NO	NA	COMMENTS	
A. HOLDING TIMES				MET CRITERIA	
1. Preparation and analysis holding times met?	✓				
2. Short-half life parameters analyzed for and checked?	✓				
B. CALIBRATION VERIFICATION				MET CRITERIA	
1. Detectors numbered and documented?	✓				
2. Frequency: Daily ✓, weekly ____, or monthly ____?	✓				
3. Acceptance criteria: Met?	✓				
C. LABORATORY CONTROL SAMPLES				MET CRITERIA	
1. Standard: Independent, certified reference material?	✓				
2. Frequency: Each batch?	✓				
% Recovery 80-120% or ____?	✓				
D. METHOD BLANK					
1. Frequency: Each batch?	✓				
2. Matrix: Matrix specific?	✓				
3. Preparation: Entire procedure?	✓				
4. Blanks show contamination?	✓				
E. MATRIX SPIKE				MET CRITERIA	
1. Frequency: Each batch?	✓			*	
2. Matrix: Matrix specific?	✓				
3. Preparation: Entire procedure?	✓				
4. % Recovery: 75-125% or ____?	✓				
F. ANALYTICAL YIELDS/OTHER				MET CRITERIA	
1. Tracer: Correct type, recovery met?	✓				
2. Ingrowth and/or decay: Correct factors applied?	✓		NA		
3. Solids density: Planchette loading <5 mg/cm^2?	✓		·		
G. DUPLICATE				MET CRITERIA	
1. Type: Lab or field?	✓				
2. Frequency: Each batch?	✓				
3. Matrix: Matrix specific?	✓				

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST (CONTINUED)

Project Name	NON ER SEPTIC TANKS			Site Name	
Laboratory Name/Job No./Batch No.	GEL / 9807247			Chain of Custody No.	600400, 600429, 600510
Analysis Method	EPA 900.0 HASL 300			Parameter List:	
REVIEW ITEM	YES	NO	NA	COMMENTS	
4. Preparation: Entire procedure?	✓				
H. ANALYTE DETECTION				met criteria	
1. Detection limit sample/batch specific?	✓				
2. Errors evaluated?	✓				
3. False positives/negatives suspected?		✓			

Reviewed by: [signature] 12/29/98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

6.0 BLANK ANALYSES

6.1 Method/Reagent and Instrument Blanks

Has a method/reagent blank been analyzed for each set of samples or for every 20 samples of similar matrix, whichever is more frequent? Yes ☑ No ☐

Has an instrument blank been analyzed at least once every twelve hours for each GC/MS system used? Yes ☐ No ☑

6.2 Field/Rinse/Equipment Blanks

Are there field rinse/equipment blanks associated with each sampling day or at frequency specified in the sampling plan. Yes ☐ No ☒ Not submitted w/ BRCOC

List below compounds for which analyses were requested that were detected in any of the blanks analyzed:

Date	Blank ID	Compound	Conc. ug/(kg)	PQL ( )	Action Level	Samples Affected (Action)
7/17/98	126458	methylene chloride	1.2	5 ug/kg	ND in sample	———

PQL = Practical Quantitation Limit from EPA Method.

Reviewed By: D Bruce
Date: 12 29 98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

SITE OR PROJECT NON ER SEPTIC TANK
ANALYTICAL LABORATORY GEL
LABORATORY REPORT # 9807247
CASE NO. 7223.230

SAMPLE IDS
NO. OF SAMPLES 16 Soils
COC - 600400 600429
600510

DATA ASSESSMENT SUMMARY

Describe problems/qualifications below (Action Items and Areas of Concern)

		VOC	SVOC	PEST/PCB	OTHER
1.	HOLDING TIMES/PRESERVATION	✓	✓	NA	NA
2.	GC/MS INST. PERFORM.	✓	✓		
3.	CALIBRATIONS/WINDOWS	W	W ✓		
4.	BLANKS	X	X		
5.	SURROGATES	✓	✓		
6.	MATRIX SPIKE/DUP	✓	✓		
7.	LABORATORY CONTROL SAMPLES	✓	✓		
8.	INTERNAL STANDARDS	✓	✓		
9.	COMPOUND IDENTIFICATION	✓	✓		
10.	SYSTEM PERFORMANCE	✓	✓		
11.	OVERALL ASSESSMENT	✓	✓		

✓ (check mark) — Acceptable: Data had no problems or qualified due to minor problems
N - Data qualified due to major problems
X - Problems, but do not affect data
Qualifiers: J - Estimate
UJ - Undetected, estimated

NA = NOT APPLICABLE

ACTION ITEMS: NONE to be taken

FOR VOC/SVOC
AREAS OF CONCERN: Small contamination in ICB/CCB's but does not significantly affect data.

HE - used MS from 126117 - missed @ D/O R on MS
All MSD w/in Acceptance

Reviewed By:
Date: 12-29-98

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

13.1 Chromatogram Quality

Were baselines stable? Yes ☑ No ☐

Were any negative peaks or unusual peaks present? Yes ☐ No ☑

Were early eluting peaks resolved to baseline? Yes ☑ No ☐

If incorrect quantitations are evident, note corrections necessary below: _____

_____

_____

Are the required quantitation limits (detection limits) adjusted to reflect sample dilutions and for soils, sample moisture? Yes ☑ No ☐

If no, make necessary corrections and note below.

_____

_____

_____

14.0 TENTATIVELY IDENTIFIED COMPOUNDS

Are Tentatively Identified Compounds (TIC) properly identified with scan number or retention time, estimated concentration, and J qualifier? Yes ☑ No ☐

Are the mass spectra for TICs and associated "best match" spectra included? Yes ☑ No ☐

Are any TCL compounds listed as TIC compounds? Yes ☐ No ☑

Are each of the ions present in the reference mass spectra with a relative intensity greater than 10% also present in the sample mass spectrum? Yes ☑ No ☐

Reviewed By: _____
Date: 12 29 94

ORGANIC DATA ASSESSMENT SUMMARY FORM
(Data Verification/Validation Level 3 DV-3)

Other: _____

Is the RRT of each reported compound within the limits given in the method of the standard RRT in the continuing calibration? Yes ☑ No ☐

Are all the ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the mass spectrum? Yes ☑ No ☐

Do sample and standard relative intensities agree within 20%? Yes ☑ No ☐

If no for any of the above, indicate below problems and qualifications made to data:

_____

_____

_____

11.2 GC Analyses

Are there any transcription/calculation errors between the raw data and the reporting forms?
Yes ☐ No ☐

If yes, review errors and necessary corrections below; if errors are large, resubmittal of laboratory package may be necessary.

_____

_____

_____

Are retention times of sample compounds within the calculated retention time windows for both quantitation and confirmation analysis? Yes ☑ No ☐

Was GC/MS confirmation performed when required by the EPA method? Yes ☐ No ☐

If no for any of the above, reject positive results except for retention time windows if associated standard compounds are similarly shifted.

Reviewed By: _____
Date: 12-29-98

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1) Reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg). Units consistent between QC samples and sample data.	X		
3.2) Quantitation limit met for all samples?	X		
3.3) Accuracy a) Laboratory control sample accuracy reported and met for all samples?	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique?	X		
c) If requested, matrix spike recovery data reported and met .	NA		
3.4) Precision a) Laboratory control sample precision reported and met for all samples? For rad analysis, sample duplicate precision reported and met.	X		
b) If requested, matrix spike duplicate RPD data reported and met.	NA		
3.5) Blank data a) Method or reagent blank data reported and met for all samples?	X		
b) Sampling blank (e.g., field, trip, and equipment) data reported and met?	NA		
3.6) Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank; "U"- analyte undetected (results are below the MDL or L_c (rad)); "H"-analysis done beyond the holding time.	X		
3.7) Narrative included, correct, and complete?	X		

Contract Verification Review (CVR)

Project Leader SANDERS | Project Name NON-ER SEPTIC FIELDS | Case No. 7223.230

AR/COC No. 600400/600429/600510 | Analytical Lab GEL | SDG No. 9607247

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record and Log-In Information

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	X				
1.2	Container type(s) correct for analyses requested	X				
1.3	Sample volume adequate for # and types of analyses requested	X				
1.4	Preservative correct for analyses requested	X				
1.5	Custody records continuous and complete	X				
1.6	Lab sample number(s) provided	X				
1.7	Date samples received	X				
1.8	Condition upon receipt information provided	X				

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, LCD)	X				
2.4	Matrix spike/matrix spike duplicate data provided(if requested)	NA				
2.5	Detection Limits provided; PQL and MDL(or IDL)	X				
2.6	QC batch numbers provided	X				
2.7	Dilution Factors provided	X				
2.8	Data reported using correct sig. fig. (2 for org.; 3 for inorg.)	X				
2.9	Rad analysis uncertainty provided (2 sigma error)	X				
2.10	Narrative provided	X				
2.11	TAT met	X				
2.12	Hold times met	X				
2.13	Were contractual qualifiers provided	X				
2.14	All requested result data provided	X				

4.0 Data Quality Evaluation Continuation

Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted.

Sample/ Fraction No.	Analysis	Qualifiers	Comments

Were deficiencies noted. ☹ Yes ☺ No

Based on the review, this data package is complete. ☺ Yes ☹ No

If no, provide : nonconformance report or correction request number _____ and date correction request was submitted _____

Reviewed by: W. Palencia Date: 9-17-98 Closed by: _____ Date: _____

SF 2001-COC (10-97)
Supersedes (5-97) Issue

Internal Lab Batch No. N/A

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600510

Dept. No./Mail Stop: 6133 MS-1147
Project/Task Manager: Mike Sanders
Project Name: 101 Non-ER Septic Fields
Record Center Code: ER/1295/DAT
Logbook Ref. No.:
Service Order No.: 0526

Date Samples Shipped: 7/8/98 SMO USE
Carrier/Waybill No. 710268
Lab Contact: Edie Kent/803-556-8171
Lab Destination: GEL
SMO Contact/Phone: Doug Salmi/844-3110
Send Report to SMO: Suzi Montano

Contract No.: AJ-2480A
Case No.: 7223.230
SMO Authorization
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location Tech Area III
Building NW6584 Room

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV (available at SMO) Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE Lab Sample ID
~~041480-002~~	~~ER-1295-NW6584-DF1-BH2-10-S~~	~~10~~	~~N/A~~		~~S~~	~~AG~~	~~500ml~~	~~4C~~	~~G~~	~~SA~~	~~SVOCs (8270) Gross A/B~~	
041506-002	ER-1295-NW6584-DF1-BH3-5-S	5	N/A	7/6/98 0750	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041507-002	ER-1295-NW6584-DF1-BH3-10-S	10	N/A	7/6/98 0810	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	

RMMA ☐Yes XNo Ref. No.
Sample Disposal ☐Return to Client XDisposal by lab

Sample Tracking SMO USE
Date Entered (mm/dd/yy) 7/7/98
Entered by LA
QC Inits YYY

Special Instructions/QC Requirements
EDD XYes ☐No
Raw data package XYes ☐No
Please list as separate report.

Abnormal Conditions on Receipt LAB USE

Turnaround Time XNormal ☐Rush Required Report Date

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Chris Gotcher's	C. Gotch	C.G.	MDM/6131/881-3196
	CHRIS SEARS	Chris Sears	CS	SNL/6131/844-1136

1. Relinquished by	Chris Sears	Org.	6131	Date 7/7/98	Time 1445	4. Relinquished by	Org.	Date	Time
1. Received by	[illegible]	Org.	7577	Date 7/7/98	Time 1445	4. Received by	Org.	Date	Time
2. Relinquished by	[illegible]	Org.	7577	Date 7/8/98	Time 1130	5. Relinquished by	Org.	Date	Time
2. Received by		Org.		Date	Time	5. Received by	Org.	Date	Time
3. Relinquished by		Org.		Date	Time	6. Relinquished by	Org.	Date	Time
3. Received by		Org.		Date	Time	6. Received by	Org.	Date	Time

Original To Accompany Samples, Laboratory Copy (White) **1st Copy** To Accompany Samples, Return to SMO (Blue) **2nd Copy** SMO Suspense Copy (Yellow) **3rd Copy** Field Copy (Pink)

FOR AR/COC 602764
(DSS SITE 1029, GEL 8/99)

Records Center Code: ER / 1295 / DAT

SMO ANALYTICAL DATA ROUTING FORM

Project Name:	Non-ER Septic Systems	**Case No./Service Order:**	7223.230 / CF0686
SNL Task Leader:	ROYBAL	**Org/Mail Stop:**	6135 / 1089
SMO Project Coordinator:	SALMI	**Sample Ship Date:**	8/25/99

ARCOC	Lab	Lab ID	Preliminary Received	Final Received	EDD Req'd YES	EDD Req'd NO	EDD Rec'd YES	EDD Rec'd NO
602764	GEL	9908965		9/27/99	x		x	

	Date		
Correction Requested from Lab:	10-13-99 ~~2177~~	**Correction Request #:**	2177
Corrections Received:	10-26-99	**Requester:**	Palencia
Review Complete:	10-13-99	**Signature:**	W. Palencia
Priority Data Faxed:		**Faxed To:**	
Preliminary Notification:		**Person Notified:**	
Final Transmittal:	10-13-99	**Transmitted To:**	Sanders
		Transmitted By:	Palencia
Filed in Records Center/ER:	10-26-99	**Filed By:**	Palencia

Comments:

RECEIVED
NOV 02 1999
RECORDS

Received (Records Center) By: _____

Data Validation Qualifiers and Descriptive Flags*

Note: Qualifiers may be used in conjunction with descriptive flags [e.g., J, A; UJ, P; U, B].

Qualifiers	Comment
J	The associated value is an estimated quantity.
J1	The method requirements for sample preservation/temperature were not met for the sample analysis. The associated value is an estimated quantity.
J2	The holding time was exceeded for the associated sample analysis. The associated value is an estimated quantity.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.
U	The associated result is less than ten times the concentration in any blank and is determined to be non-detect. The analyte is a common laboratory contaminant.
U1	The associated result is less than five times the concentration in any blank and is determined to be non-detect.
R	The data are unusable for their intended purpose. The analyte may or may not be present. (Note: Resampling and reanalysis is necessary for verification.)
Descriptive Flags	
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample and/or duplicate (LCS/LCSD) do not meet acceptance criteria.
A1	Laboratory accuracy and/or bias measurements for the associated Surrogate Spike do not meet acceptance criteria.
A2	Laboratory accuracy and/or bias measurements for the associated Matrix Spike and/or duplicate (MS/MSD) do not meet acceptance criteria.
A3	Insufficient quality control data to determine laboratory accuracy.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in calibration blank.
P	Laboratory precision measurements for the Laboratory Control Sample and duplicate (LCS/LCSD) do not meet acceptance criteria.
P1	Laboratory precision measurements for the Matrix Spike Sample and associated duplicate (MS/MSD) do not meet acceptance criteria.
P2	Insufficient quality control data to determine laboratory precision.

* This is not a definitive list. Other qualifiers are potentially available. Notify Tina Sanchez to revise list.

Updated: September 14, 1999

ARCOC #602764 Organic Analyses (VOCs) Sample No.-Fraction	75-15-0 (carbon disulfide)	75-09-2 (methylene chloride)	78-93-3 (2-butanone)	79-01-6 (trichloroethene)																
049955-001			UJ	UJ																
049956-001		7.8U,B	UJ	UJ																
049957-001		5U,B	J	UJ																
049958-001		5U,B	UJ	UJ																
049959-001	J	5U,B	J	UJ																
049960-001		5U,B	J	UJ																
049961-001		5U,B	UJ	UJ																
049962-001		5U,B	J	UJ																
049963-001		7.3U,B	J	UJ																
049964-001		5U,B	UJ	UJ																
049965-001		5U,B	J	UJ																
~~049958-001~~		5U,B	J	UJ																
049968-001																				

12/14/99

Per Kevin Lambert

SAMPLE FINDINGS SUMMARY

Site: Non-ER Septic Systems

AR/COC: 602764 Data Classification: Inorganics (EPA 9012A ↓ 7196A)

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
	No Data were qualified.		
	Data are acceptable.		
QC	Measures appear	to be	adequate.

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method, use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470/1, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_ NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: [signature] Date: 12/6/99

MEMORANDUM

DATE: December 6, 1999

TO: File

FROM: Kenneth Salaz KAS

SUBJECT: Organic Data Review and Validation
Non-ER Septic Systems, ARCOC #602764,
Project/Task No. 7223.02.02.01

See the attached Data Assessment Summary Forms for supporting documentation on the data review and validation.

Summary

All samples were prepared and analyzed with accepted procedures and specified methods: EPA8260A (VOCs) and EPA8082 (PCBs). Problems were identified with the data package that result in the qualification of data.

1. VOC Analysis: The initial calibration response factor (RF) of trichloroethene was less than (<) the required minimum. The associated results of samples 9908965-01, -03, -05, -07, -09, -11, -13, -15, -17, -19, -21, and -25 were non-detect (ND) and will be qualified "UJ." The continuing calibration verification (CCV) percent difference (%D) of 2-butanone was greater than (>) 40%. The associated results of samples -05, -09, -11, -15, -17, -21, and -25 were positive and will be qualified "J." The associated results of samples -01, -03, -07, -13, and -19 were ND and will be qualified "UJ." Carbon disulfide had a CCV %D >20%. The associated result of sample -09 was positive and will be qualified "J."

2. VOC Analysis: In the method blank, methylene chloride was detected. The associated results of samples 9908965-03 and -17 were positive, <10X the blank concentration, > the reporting limit (RL), and will be qualified "7.8U,B" and "7.3U,B," respectively. The associated results of samples -05, -07, -09, -11, -13, -15, -19, -21, and -25 were < the RL and will be qualified "5U,B."

3. PCB Analysis: The surrogate percent recovery (%REC) for sample 9908965-20 was < QC limits. The sample results were ND and will be qualified "UJ,A1."

Data are acceptable. QC measures appear to be adequate. The following sections discuss the data review and validation.

Holding Times

VOC Analysis: All samples were analyzed within the prescribed holding times.

PCB Analysis: All samples were analyzed within the prescribed holding times except the following. Sample 9908965-20 was re-extracted 1 day beyond the holding time as a result of an initial QC failure. However, the recoveries from the reanalysis were similar to the original, and the original results were reported. Thus, no data were qualified.

Calibration

VOC Analysis: The initial and continuing calibrations met QC acceptance criteria except as noted above in the summary section and the following. Chloromethane, bromomethane, chloroethane, acetone, 1,2-dichloroethane, 2-hexanone, trans-1,3-dichloropropene, 4-methyl-2-pentanone, and vinyl acetate had CCV %Ds outside QC limits. However, all associated sample results were ND. Thus, no data were qualified.

PCB Analysis: The initial and continuing calibrations met QC acceptance criteria.

Blanks

VOC Analysis: No target analytes were detected in the method blanks except as noted above in the summary section.

PCB Analysis: No target analytes were detected in the method blanks.

Surrogates

VOC Analysis: The surrogate %RECs met QC acceptance criteria.

PCB Analysis: The surrogate %RECs met QC acceptance criteria except as noted above in the summary section.

Internal Standards (ISs)

VOC Analysis: The IS areas and retention times (RTs) met QC acceptance criteria.

PCB Analysis: No internal standards were required for this method.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Analyses

VOC Analysis: The MS/MSD met QC acceptance criteria.

PCB Analysis: The MS/MSD met QC acceptance criteria except for the following. The MSD relative percent difference (RPD) of Aroclor-1260 was > QC limits. However, the MS/MSD %RECs met QC acceptance criteria. Thus, no data were qualified.

Data Validation Summary

Site/Project: Non-ER Septic Systems Project/Task #: 7223.02.02.01 # of Samples: 26 Matrix: soil

AR/COC #: 602764 Laboratory Sample IDs: 9908965-01 thru -26

Laboratory: GEL

Laboratory Report #: 9908965

QC Element	Analysis									
	Organics				Inorganics				RAD	Other (Cr6+)
	VOC	SVOC	Pesticide/ PCB	HPLC (HE)	ICP/AES	GFAA/ AA	CVAA (Hg)	CN		
1. Holding Times/Preservation	✓	NA	✓	NA	NA	NA	NA	✓	NA	✓
2. Calibrations	J; UJ		✓					✓		✓
3. Method Blanks	U, B		✓					✓		✓
4. MS/MSD	✓		✓					✓		✓
5. Laboratory Control Samples	✓		✓					✓		✓
6. Replicates								NA		NA
7. Surrogates	✓		UJ, A1							NA
8. Internal Standards	✓									
9. TCL Compound Identification	✓									
10. ICP Interference Check Sample										
11. ICP Serial Dilution										
12. Carrier/Chemical Tracer Recoveries										
13. Other QC	NA	↓	NA	↓	↓	↓	↓	NA	↓	↓

J = Estimated
U = Not Detected
UJ = Not Detected, Estimated
R = Unusable

Check (√) = Acceptable
Shaded Cells = Not Applicable (also "NA")
NP = Not Provided
Other _____

Reviewed By: _____ Date: 12/16/99

Holding Time and Preservation

Site/Project: Non-ER Septic Systems AR/COC #: 602764 Laboratory Sample IDs: 9908965-01 thru -26

Laboratory: GEL Laboratory Report #: 9908965

# of Samples: 26 Matrix: Soil

Sample ID	Analytical Method	Holding Time Criteria	Days Holding Time was Exceeded	Preservation Criteria	Preservation Deficiency	Comments
9908965-20	EPA 8082 (PCBs)	14 days	1	NA	NA	Re-extracted out of holding due to Surrogate failure, Original run used.

Reviewed By: [signature] Date: 10/6/99

Volatile Organics (SW 846 Method 8260)

Site/Project: Non-ER Septic Systems AR/COC #: 602764 # of Samples: 12 Matrix: Soil

Laboratory: GEL Laboratory Report #: 9908965 Laboratory Sample IDs: 9908965-01,-03,-05,-07,-09,-11,-13,-15,-17,-19,-21,-25

Methods: EPA 8260A Batch #s: 157266,

IS	CAS #	Name	TCL	Min. RF	Intercept	Calib. RF >.05	Calib. RSD/ R^2 <20%/ 0.99	CCV %D 20%	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks ①	Trip Blanks	Method Blank ②	CCV %D 20%
1	74-87-3	Chloromethane	✓	0.10	✓	✓	✓	✓	✓							NA	NA	NA	✓	-28.2
1	74-83-9	Bromomethane	✓	0.10	NA	✓	✓	35.0												✓
1	75-01-4	vinyl chloride	✓	0.10	↓	✓	✓	✓											↓	
1	75-00-3	Chloroethane	✓	0.01	↓	✓	✓	25.0												
1	75-09-2	methylene chloride (10xblk)	✓	0.01	✓	✓	✓	✓											1.6J	↓
1	67-64-1	acetone(10xblk)	✓	0.01	NA	✓	✓	32.9											✓	23.9
1	75-15-0	carbon disulfide	✓	0.10	↓	✓	✓	23.2												✓
1	75-35-4	1,1-dichloroethene	✓	0.20	↓	✓	✓	✓		✓	✓	✓	✓	✓	✓	↓	↓	↓	↓	↓
1	75-34-3	1,1-dichloroethane	✓	0.10	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
1	67-66-3	Chloroform	✓	0.20	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
1	107-06-2	1,2-dichloroethane	✓	0.10	↓	✓	✓	34.1	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
1	78-93-3	2-butanone(10xblk)	✓	0.01	↓	✓	✓	45.6	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	41.3
2	71-55-6	1,1,1-trichloroethane	✓	0.10	↓	✓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	✓
2	56-23-5	carbon tetrachloride	✓	0.10	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
2	75-27-4	Bromodichloromethane	✓	0.20	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
2	78-87-5	1,2-dichloropropane	✓	0.01	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
2	10061-01-5	cis-1,3-dichloropropene	✓	0.20	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
2	79-01-6	Trichloroethene	✓	0.30	↓	0.23	✓	↓	↓	✓	✓	✓	✓	✓	✓	↓	↓	↓	↓	↓
2	124-48-1	Dibromochloromethane	✓	0.10	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
2	79-00-5	1,1,2-trichloroethane	✓	0.10	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
2	71-43-2	Benzene	✓	0.30	↓	✓	✓	↓	↓	✓	✓	✓	✓	✓	✓	↓	↓	↓	↓	↓
2	10061-02-6	trans-1,3-dichloropropene	✓	0.10	↓	✓	✓	22.3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	23.0
2	75-25-2	Bromoform	✓	0.10	↓	✓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	✓
3	108-10-1	4-methyl-2-pentanone	✓	0.10	↓	✓	✓	24.0	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	✓
3	591-78-6	2-hexanone	✓	0.01	↓	✓	✓	34.6	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	25.7
3	127-18-4	Tetrachloroethene	✓	0.20	↓	✓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	✓
3	79-34-5	1,1,2,2-tetrachloroethane	✓	0.30	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
3	108-88-3	toluene(10xblk)	✓	0.40	↓	✓	✓	↓	↓	✓	✓	✓	✓	✓	✓	↓	↓	↓	↓	↓
3	108-90-7	Chlorobenzene	✓	0.50	↓	✓	✓	↓	↓	✓	✓	✓	✓	✓	✓	↓	↓	↓	↓	↓
3	100-41-4	Ethylbenzene	✓	0.10	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
3	100-42-5	Styrene	✓	0.30	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
3	1330-20-7	xylenes(total)	✓	0.30	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	540-59-0	1,2-dichloroethylene(total)	✓	0.01	↓	✓	✓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
	110-75-8	2-chloroethyl vinyl ether			↓	NA	NA	NA	NA										NA	NA
	108-05-4	Vinyl Acetate	✓		↓	✓	✓	21.7	✓							↓	↓	↓	✓	✓

Comments:
(1) No EB or FB submitted on the COC (or field dup.)
(2) Method blank applies to samples -03 and -17 only. (CCV also)

Notes: Shaded rows are RCRA compounds.

NA = Not Applicable

Reviewed By: [signature] Date: 12/16/05

Volatile Organics

Site/Project: Non-ER Septic Systems AR/COC #: 602764 Batch #s: 157266

Laboratory: GEL Laboratory Report #: 9908965 # of Samples: 12 Matrix: Soil

Surrogate Recovery and Internal Standard Outliers (SW 846 Method 8260)

Sample	SMC 1	SMC 2	SMC 3	IS 1 area	IS 1 RT	IS 2 area	IS 2 RT	IS 3 area	IS 3 RT
All									
Passed									

SMC 1: ~~4~~Bromofluorobenzene
SMC 2: ~~1,2-Dichloroethane-d4~~
SMC 3: Toluene-d8
Dibromofluoromethane

IS 1: ~~Bromochloromethane~~ Fluorobenzene
IS 2: 1,4-Di~~fluoro~~chlorobenzene-d4
IS 3: Chlorobenzene-d5

KMS 12/2/99

Comments:

*Summary:

Calibration:

⇒ Trichloroethene had a RF < the min. All results were ND and will be qualified "UJ."

⇒ 2-butanone had CCV %Ds > 40%. Results of samples -05, -09, -11, -15, -17, -21, and -25 were pos. and will be qualified "J" All other results were ND; qualified "UJ."

⇒ Carbon disulfide had a CCV %D > 20%. Result of -09 was pos.; qualified "J."

⇒ Chloromethane, bromomethane, chloroethane, acetone, 1,2-dichloroethane, 2-hexanone, trans-1,3-dichloropene, 4-methyl-2-pentanone, and vinyl acetate had CCV %Ds outside QC limits. All results were ND; No data were qualified.

Method Blank:

⇒ Methylene chloride was detected. The results of -03 and -17 were > the RL and will be qualified "7.8U,B" and "7.3U,B." respectively. The results of -05, -07, -09, -11, -13

PCBs (SW 846 - Method 8082)

Site/Project: Non-ER Septic Systems AR/COC #: 602764 Laboratory Sample IDs: 9908965-02, -04, -06, -08, -10, -12, -14, -16, -18, -20, -22, -23, -24, -26

Laboratory: GEL Laboratory Report #: 9908965

Methods: EPA 8082

# of Samples: 14 Matrix: Soil Batch #s: 157301

CAS #	Name	TCL	Intercept	Calib RSD / R^2 <20% / 0.99	CCV %D 20%	Method Blanks	LCS	LCSD	LCS RPD 20%	MS	MSD	MS RPD 20%	(1) Field Dup. RPD	(2) Equip. Blanks	Field Blanks		
12674-11-2	Aroclor-1016	✓	NA	✓	✓	✓							NA	NA	NA		
11104-28-2	Aroclor-1221	✓	↓	↓		↓							↓	↓	↓		
11141-16-5	Aroclor-1232	✓															
53469-21-9	Aroclor-1242	✓			✓												
12672-29-6	Aroclor-1248	✓			✓												
11097-69-1	Aroclor-1254	✓			✓												
11096-82-5	Aroclor-1260	✓	↓	↓	✓	↓	✓	✓	✓	✓	✓	47.3	↓	↓	↓		

NA = Not Applicable

Sample	SMC % REC	SMC RT	Sample	SMC % REC	SMC RT
9908965-20	44.3 ↓	✓			
9908965-24MSD	44.3 ↓	✓			

Comments:
(1) All results for the field duplicate pair were ND. Thus, no RPDs were calculated.
(2) No EB or FB submitted on the COC

Confirmation

Sample	CAS #	RPD > 25%	Sample	CAS #	RPD > 25%
All Passed					

*Summary:

MS/MSD:
The RPD was > QC limits. However, the MS/MSD %RECs met QC criteria. Thus, no data were qualified.

Surrogates:
The surrogate %REC for sample -20 was < QC limits. All results were

Reviewed By: [signature] Date: 12/8/09

General Chemistry

Site/Project: Non-ER Septic Systems AR/COC #: 602764 Laboratory Sample IDs: 9908965-02, -04, -06, -08, -10, -12, -14, -16,
" -18, -20, -22, -23, -24, -26

Laboratory: GEL Laboratory Report #: 9908965

Methods: EPA 9012A (CN), EPA 7196A (Cr6+)

# of Samples: 14 Matrix: Soil Batch #s: 157237 (-02 → -18), 157442

CAS #	Analyte	QC Element																	
		TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	(4) Rep. RPD	ICS (1) AB	Serial Dilution	Field (2) Dup. RPD	Equip. (3) Blanks	Field Blanks
5955-70-0	CN	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NA	NA	NA	NA	NA	NA	NA	NA
18540-29-9	Cr^{6+}	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	NA	NA	↓	↓	↓	↓	↓	↓

Comments:
(1) No ICS or serial dilution required for these methods.
(2) Field duplicate pair was submitted. However, results were < the RL. Thus, no RPDs were calculated.
(3) No EB or FB submitted on the COC.
(4) Replicate criteria do not apply to sample results < the RL.

* Summary
⇒ All QC criteria met. No data were qualified.

NA = Not Applicable

Reviewed By: [signature] Date: 12/6/09

EContract Verification Review (CVR)

Project Leader ROYBAL Project Name NON-ER SEPTIC SYSTEMS Case No. 7223.230

AR/COC No. 602764 Analytical Lab GEL SDG No. 9908965

In the tables below, mark any information that is missing or incorrect and give an explanation.

1.0 Analysis Request and Chain of Custody Record and Log-In Information

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	X				
1.2	Container type(s) correct for analyses requested	X				
1.3	Sample volume adequate for # and types of analyses requested	X				
1.4	Preservative correct for analyses requested	X				
1.5	Custody records continuous and complete	X				
1.6	Lab sample number(s) provided and SNL sample number(s) cross referenced and correct	X				
1.7	Date samples received	X				
1.8	Condition upon receipt information provided	X				

2.0 Analytical Laboratory Report

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, Replicate)	X				
2.4	Matrix spike/matrix spike duplicate data provided(if requested)	X				
2.5	Detection limits provided; PQL and MDL(or IDL), MDA and L_c	X				
2.6	QC batch numbers provided	X				
2.7	Dilution factors provided and all dilution levels reported	X				
2.8	Data reported in appropriate units and using correct significant figures	X				
2.9	Radiochemistry analysis uncertainty (2 sigma error) and tracer recovery (if applicable) reported	NA				
2.10	Narrative provided	X				
2.11	TAT met	X				
2.12	Hold times met		X	PCB SAMPLE #9908965-20 RE-EXTRACTED OUTSIDE HOLDNG TIME	X	
2.13	Contractual qualifiers provided	X				
2.14	All requested result and TIC (if requested) data provided	X				

Contract Verification Review (Continued)

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1 Are reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg)? Tritium reported in picocuries per liter with percent moisture for soil samples? Units consistent between QC samples and sample data	X		
3.2 Quantitation limit met for all samples	X		
3.3 Accuracy a) Laboratory control samples accuracy reported and met for all samples	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique		X	SURROGATES OUTSIDE RECOVERY LIMITS FOR PCB SAMPLES #9908965-06, -14 & -20
c) Matrix spike recovery data reported and met	X		
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples		x	RPD FOR CHROMIUM ABOVE ACCEPTANCE LIMITS FOR SAMPLE #9908965-24DUP
b) Matrix spike duplicate RPD data reported and met for all organic samples		X	RPD FOR PCB 1260 ABOVE ACCEPTANCE LIMITS
3.5 Blank data a) Method or reagent blank data reported and met for all samples		X	METHYLENE CHLORIDE DETECTED IN VOC METHOD BLANK
b) Sampling blank (e.g., field, trip, and equipment) data reported and met	NA		
3.6 Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"-analyte undetected (results are below the MDL, IDL, or MDA (radiochemical)); "H"-analysis done beyond the holding time	X		
3.7 Narrative addresses planchet flaming for gross alpha/beta	NA		
3.8 Narrative included, correct, and complete		X	SEVERAL PCB & CYANIDE SAMPLES NOT LISTED IN CASE NARRATIVES
3.9 Second column confirmation data provided for methods 8330 (high explosives) and pesticides/PCBs	X		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

Item	Yes	No	Comments
4.1 GC/MS (8260, 8270, etc.)			
a) 12-hour tune check provided	X		
b) Initial calibration provided	X		
c) Continuing calibration provided	X		
d) Internal standard performance data provided	X		
e) Instrument run logs provided	X		
4.2 GC/HPLC (8330 and 8010 and 8081)			
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) Instrument run logs provided	X		
4.3 Inorganics (metals)			
a) Initial calibration provided	NA		
b) Continuing calibration provided	NA		
c) ICP interference check sample data provided	NA		
d) ICP serial dilution provided	NA		
e) Instrument run logs provided	NA		
4.4 Radiochemistry			
a) Instrument run logs provided	NA		

Contract Verification Review (Concluded)

5.0 Problem Resolution

Summarize the findings in the table below. List only samples/fractions for which deficiencies have been noted.

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions
9908965-20	8082	NOT LISTED IN CASE NARRATIVE
9908965-20—26	9012A	NOT LISTED IN CASE NARRATIVE

Were deficiencies unresolved? ☑ Yes ☐ No

Based on the review, this data package is complete. ☐ Yes ☑ No

If no, provide: nonconformance report or correction request number 2177 and date correction request was submitted: 10-13-99

Reviewed by: W. Palencia Date: 10-13-99 Closed by: W. Palencia Date: 10-26-99

Analysis Request And Chain Of Custody (Continuation)

2 2

Page 1 of 1

AR/COC- 602764

Project Name:	Non-ER Sypetic System	Project/Task Manger: M Sanders			Case No.:7223.230									
Location	Tech Area				Reference LOV (available at SMO)									Lab use
Building	Room													Lab Sample ID
Sample No-Fraction	ER Sample ID or Sample Location detail	Depth in Ft	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Methods	Sample Type	Parameter & Method Requested			
049960-001	MO242/245-DFI-BH3-10-S	10ft	N/A	082499 1322	S	AC	125ml	5^{pc}	GR	SA	VOC			
049960-002	MO242/245-DFI-BH3-10-S	10ft	N/A	082499 1322	S	AG	250ml	5	GR	SA	PCB CN Cr6+			
049961-001	B6584NW-DFI-BH1-5-S	5Ft	N/A	082499 1402	S	AC	125ml	5	GR	SA	VOC			
049961-002	B6584NW-DFI-BH1-5-S	5ft	N/A	082499 1402	S	AG	250ml	5	GR	SA	PCB CN Cr6+			
049962-001	B6584NW-DFI-BH1-10-S	10Ft	N/A	082499 1511	S	AC	125ml	5	GR	SA	VOC			
049962-002	B6584NW-DFI-BH1-10-S	10Ft	N/A	082499 1511	S	AG	250ml	5	GR	SA	PCB CN Cr6+			
049963-001	B6584NW-DFI-BH2-5-S	5Ft	N/A	082499 1555	S	AC	125ml	5	GR	SA	VOC			
049963-002	B6584NW-DFI-BH2-5-S	5ft	N/A	082499 1555	S	AG	250ml	5	GR	SA	PCB CN Cr6+			
049964-001	B6584NW-DFI-BH2-10-S	10Ft	N/A	082599 0923	S	AC	125ml	5	GR	SA	VOC			
049964-002	B6584NW-DFI-BH2-10-S	10Ft	N/A	082599 0923	S	AG	250ml	5	GR	SA	PCB CN Cr6+			
049965-001	B6584NW-DFI-BH3-5-S	5Ft	N/A	082599 0945	S	AC	125ml	5	GR	SA	VOC			
049965-002	B6584NW-DFI-BH3-5-S	5Ft	N/A	082599 0945	S	AG	250ml	5	GR	SA	PCB CN Cr6+			
049965-003	B6584NW-DFI-BH3-5-DU	5Ft	N/A	082599 0945	S	AG	250ml	5	GR	DU	PCB CN Cr6+			
049967-002	B6584NW-DFI-BH3-5-MSDS	5Ft	N/A	082599 0945	S	AG	2x250ml	5	GR	MSDS	PCB CN Cr6+			
049968-001	B6584NW-DFI-BH3-10-S	10ft	N/A	082599 1000	S	AC	125ml	5	GR	SA	VOC			
049968-002	B6584NW-DFI-BH3-10-S	10Ft	N/A	082599 1000	S	AG	250ml	5	GR	SA	PCB CN Cr6+			
049968-														

ANNEX C
DSS Site 1029
Gore-Sorber™ Passive Soil-Vapor Survey Analytical Results

W. L. GORE & ASSOCIATES, INC.

100 CHESAPEAKE BLVD., P.O. BOX 10 • ELKTON, MARYLAND 21922-0010 • PHONE: 410/392-7600
FAX: 410/506-4780

GORE-SORBER® EXPLORATION SURVEY
GORE-SORBER® SCREENING SURVEY

June 6, 2002

Mike Sanders
Sandia National Laboratories
Mail Stop 0719
1515 Eubank, SE
Building 9925, Room 108
Albuquerque, NM 87123

Site Reference: Non-ER Drain & Septic, Kirtland AFB, NM
Gore Production Order Number: 10960025

Dear Mr. Sanders:

Thank you for choosing a GORE-SORBER® Screening Survey.

The attached package consists of the following information (in duplicate):

- **Final report**
- **Chain of custody and analytical data table (included in Appendix A)**
- **Stacked total ion chromatograms (included in Appendix A)**

Please contact our office if you have any questions or comments concerning this report. We appreciate this opportunity to be of service to Sandia National Laboratories, and look forward to working with you again in the future.

Sincerely,
W.L. Gore & Associates, Inc.

Jay W. Hodny, Ph.D.
Associate

Attachments
cc: Andre Brown (W.L. Gore & Associates, Inc.)

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W. L. GORE & ASSOCIATES, INC.

100 CHESAPEAKE BLVD., P.O. BOX 10 • ELKTON, MARYLAND 21922-0010 • PHONE: 410/392-7600
FAX: 410/506-4780

GORE-SORBER® Screening Survey
Final Report

Non-ER Drain & Septic
Kirtland AFB, NM

June 6, 2002

Prepared For:
Sandia National Laboratories
Mail Stop 0719, 1515 Eubank, SE
Albuquerque, NM 87123

W.L. Gore & Associates, Inc.

Written/Submitted by:
Jay W. Hodny, Ph.D., Project Manager

Reviewed/Approved by:
Jim E. Whetzel, Project Manager

Analytical Data Reviewed by:
Jim E. Whetzel, Chemist

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GORE-SORBER® Screening Survey
Final Report

REPORT DATE: June 6, 2002 **AUTHOR:** JWH

SITE INFORMATION

Site Reference: Non-ER Drain & Septic, Kirtland AFB, NM
Customer Purchase Order Number: 28518
Gore Production Order Number: 10960025 **Gore Site Code:** CCT, CCX

FIELD PROCEDURES

 # Modules shipped: 142
Installation Date(s): 4/23,24,25,26,29,30/2002; 5/1,6/2002
 # Modules Installed: 135
Field work performed by: Sandia National Laboratories

Retrieval date(s): 5/8,9,10,14,15,16,21/2002 **Exposure Time:** ~15 [days]
 # Modules Retrieved: 131 **# Trip Blanks Returned:** 3
 # Modules Lost in Field: 4 **# Unused Modules Returned:** 3
 # Modules Not Returned: 1

Date/Time Received by Gore: 5/17/2002 @ 2:00 PM; 5/24/2002@1:30PM **By:** MM
Chain of Custody Form attached: √
Chain of Custody discrepancies: None
Comments:
Modules #179227, -228, and -229 were identified as trip blanks.
Modules #179137, -138, -140, and -141 were not retrieved and considered lost from the field.
Module #179231 was not returned.
Modules #179230, 232, and –233 were returned unused.

GORE-SORBER® Screening Survey
Final Report

ANALYTICAL PROCEDURES

W.L. Gore & Associates' Screening Module Laboratory operates under the guidelines of its Quality Assurance Manual, Operating Procedures and Methods. The quality assurance program is consistent with Good Laboratory Practices (GLP) and ISO Guide 25, "General Requirements for the Competence of Calibration and Testing Laboratories", third edition, 1990.

Instrumentation consists of state of the art gas chromatographs equipped with mass selective detectors, coupled with automated thermal desorption units. Sample preparation simply involves cutting the tip off the bottom of the sample module and transferring one or more exposed sorbent containers (sorbers, each containing 40mg of a suitable granular adsorbent) to a thermal desorption tube for analysis. Sorbers remain clean and protected from dirt, soil, and ground water by the insertion/retrieval cord, and require no further sample preparation.

Analytical Method Quality Assurance:
The analytical method employed is a modified EPA method 8260/8270. Before each run sequence, two instrument blanks, a sorber containing 5µg BFB (Bromofluorobenzene), and a method blank are analyzed. The BFB mass spectra must meet the criteria set forth in the method before samples can be analyzed. A method blank and a sorber containing BFB is also analyzed after every 30 samples and/or trip blanks. Standards containing the selected target compounds at three calibration levels of 5, 20, and 50µg are analyzed at the beginning of each run. The criterion for each target compound is less than 35% RSD (relative standard deviation). If this criterion is not met for any target compound, the analyst has the option of generating second- or third-order standard curves, as appropriate. A second-source reference standard, at a level of 10µg per target compound, is analyzed after every ten samples and/or trip blanks, and at the end of the run sequence. Positive identification of target compounds is determined by 1) the presence of the target ion and at least two secondary ions; 2) retention time versus reference standard; and, 3) the analyst's judgment.

NOTE: All data have been archived. Any replicate sorbers not used in the initial analysis will be discarded fifteen (15) days from the date of analysis.

Laboratory analysis: thermal desorption, gas chromatography, mass selective detection
Instrument ID: # 2 **Chemist:** JW
Compounds/mixtures requested: Gore Standard VOC/SVOC Target Compounds (A1)
Deviations from Standard Method: None
Comments: Soil vapor analytes and abbreviations are tabulated in the Data Table Key (page 6).
Module #179091 was returned and noted as damaged, no carbonaceous sorbers; therefore, target compound masses reported in data table cannot be compared to the mass data from the other modules directly.
Module #179101, no identification tag was returned with this module.

GORE-SORBER® Screening Survey
Final Report

DATA TABULATION

 # CONTOUR MAPS ENCLOSED: No contour maps were generated.

NOTE: All data values presented in Appendix A represent masses of compound(s) desorbed from the GORE-SORBER Screening Modules received and analyzed by W.L. Gore & Associates, Inc., as identified in the Chain of Custody (Appendix A). *The measurement traceability and instrument performance are reproducible and accurate for the measurement process documented.* Semi-quantitation of the compound mass is based on either a single-level (QA Level 1) or three-level (QA Level 2) standard calibration.

General Comments:

- This survey reports soil gas mass levels present in the vapor phase. Vapors are subject to a variety of attenuation factors during migration away from the source concentration to the module. Thus, mass levels reported from the module will often be less than concentrations reported in soil and groundwater matrix data. In most instances, the soil gas masses reported on the modules compare favorably with concentrations reported in the soil or groundwater (e.g., where soil gas levels are reported at greater levels relative to other sampled locations on the site, matrix data should reveal the same pattern, and vice versa). However, due to a variety of factors, a perfect comparison between matrix data and soil gas levels can rarely be achieved.
- Soil gas signals reported by this method cannot be identified specifically to soil adsorbed, groundwater, and/or free-product contamination. The soil gas signal reported from each module can evolve from all of these sources. Differentiation between soil and groundwater contamination can only be achieved with prior knowledge of the site history (i.e., the site is known to have groundwater contamination only).
- QA/QC trip blank modules were provided to document potential exposures that were not part of the soil gas signal of interest (i.e., impact during module shipment, installation and retrieval, and storage). The trip blanks are identically manufactured and packaged soil gas modules to those modules placed in the subsurface. However, the trip blanks remain unopened during all phases of the soil gas survey. Levels reported on the trip blanks may indicate potential impact to modules other than the contaminant source of interest.

GORE-SORBER® Screening Survey
Final Report

- Unresolved peak envelopes (UPEs) are represented as a series of compound peaks clustered together around a central gas chromatograph elution time in the total ion chromatogram. Typically, UPEs are indicative of complex fluid mixtures that are present in the subsurface. UPEs observed early in the chromatogram are considered to indicate the presence of more volatile fluids, while UPEs observed later in the chromatogram may indicate the presence of less volatile fluids. Multiple UPEs may indicate the presence of multiple complex fluids.

Project Specific Comments:

- Stacked total ion chromatograms (TICs) are included in Appendix A. The six-digit serial number of each module is incorporated into the TIC identification (e.g.: 123456S.D represents module #123456).
- No target compounds were detected on the trip blanks and/or the method blanks. Thus, target analyte levels reported for the field-installed modules that exceed trip and method blank levels, and the analyte method detection limit, have a high probability of originating from on-site sources.
- A small subset of modules was placed at each of several site locations; therefore no contour mapping was performed. Larger and more comprehensive soil gas surveys may be warranted at the individual sites where elevated soil gas levels were observed.

GORE-SORBER® Screening Survey
Final Report

KEY TO DATA TABLE
Non-ER Drain & Septic, Kirtland AFB, NM

UNITS

µg	micrograms (per sorber), reported for compounds
MDL	method detection limit
bdl	below detection limit
nd	non-detect

ANALYTES

BTEX	combined masses of benzene, toluene, ethylbenzene and total xylenes (Gasoline Range Aromatics)
BENZ	benzene
TOL	toluene
EtBENZ	ethylbenzene
mpXYL	m-, p-xylene
oXYL	o-xylene
C11,C13&C15	combined masses of undecane, tridecane, and pentadecane (C11+C13+C15) (Diesel Range Alkanes)
UNDEC	undecane
TRIDEC	tridecane
PENTADEC	pentadecane
TMBs	combined masses of 1,3,5-trimethylbenzene and 1,2,4-trimethylbenzene
135TMB	1,3,5-trimethylbenzene
124TMB	1,2,4-trimethylbenzene
ct12DCE	cis- & trans-1,2-dichloroethene
t12DCE	trans-1,2-dichloroethene
c12DCE	cis-1,2-dichloroethene
NAPH&2-MN	combined masses of naphthalene and 2-methyl naphthalene
NAPH	naphthalene
2MeNAPH	2-methyl naphthalene
MTBE	methyl t-butyl ether
11DCA	1,1-dichloroethane
$CHCl_3$	chloroform
111TCA	1;1,1-trichloroethane
12DCA	1,2-dichloroethane
CCl_4	carbon tetrachloride
TCE	trichloroethene
OCT	octane
PCE	tetrachloroethene
ClBENZ	chlorobenzene
14DCB	1,4-dichlorobenzene

BLANKS

TBn	unexposed trip blanks, travels with the exposed modules
method blank	QA/QC module, documents analytical conditions during analysis

APPENDIX A:

1. CHAIN OF CUSTODY
2. DATA TABLE
3. STACKED TOTAL ION CHROMATOGRAMS

GORE-SORBER® Screening Survey Chain of Custody

For W.L. Gore & Associates use only
Production Order # 10960025

W. L. Gore & Associates, Inc., Survey Products Group
100 Chesapeake Boulevard • Elkton, Maryland 21921 • Tel: (410) 392-7600 • Fax (410) 506-4780

Instructions: Customer must complete ALL shaded cells

Customer Name: SANDIA NATIONAL LABS	Site Name: NON-ER DRAIN+ SEPTIC
Address: ACCOUNTS PAYABLE MS0154	Site Address: ~~KTVL 2ND~~ AFB, NM KIRTLAND
P.O.BOX 5130	Project Manager: MIKE SANDERS
ALBUQUERQUE NM 87185 U.S.A.	Customer Project No.:
Phone: 505-284-3303	Customer P.O. #: 28518 Quote #: 211946
FAX: 505-284-2616	

Serial # of Modules Shipped				# of Modules for Installation 135 # of Trip Blanks 7		
# 179087 - # 179144	# 171087 - # 171134			Total Modules Shipped: 142 Pieces		
# 179150 - # 179233	# 171135 - # 171136			Total Modules Received: 142 Pieces		
# - #	# 179139 - #			Total Modules Installed: 135 Pieces		
# - #	# 179142 - # 179144			Serial # of Trip Blanks (*Client Decides*)	#	#
- #	# 179150 - # 171151			# 171227	#	#
- #	# - #			#	#	#
- #	# - #			#	#	#
# - #	# - #			#	#	#
# - #	# - #			#	#	#
# - #	# - #			#	#	#
Prepared By: Dwayne Tilt				#	#	#
Verified By: MaryAnne Waugh				#	#	#

Installation Performed By:	Installation Method(s) (*circle those that apply*):
Name (*please print*): GILBERT QUINTANA	Slide Hammer Hammer Drill Auger
Company/Affiliation: SNL/NM	Other: GEOPROBE
Installation Start Date and Time: 4/23/02 1081ST :	AM PM
Installation Complete Date and Time: 5/6/02 1094O1 :	AM PM
Retrieval Performed By:	Total Modules Retrieved: Pieces
Name (*please print*): GILBERT QUINTANA	Total Modules Lost in Field: Pieces
Company/Affiliation: SNL/NM	Total Unused Modules Returned: Pieces
Retrieval Start Date and Time: 5/8/02 / / :	AM PM
Retrieval Complete Date and Time: / / :	AM PM

Relinquished By: Dwayne Tilt Affiliation: W.L. Gore & Associates, Inc.	Date: 3-4-02	Time: 13:00	Received By: Mike Sander Affiliation: Sandia / ER	Date: 3-6-02	Time:
Relinquished By: William J Zeh Affiliation: 6135	Date: 5-14-02	Time: 12:58	Received By: Affiliation:	Date:	Time:
Relinquished By: Affiliation:	Date:	Time:	Received By: MaryAnne Waugh Affiliation: W.L. Gore & Associates, Inc.	Date: 5/7/02	Time: 14:00

GORE-SORBER® Screening Survey Chain of Custody

For W.L. Gore & Associates use only
Production Order # 10960025

W. L. Gore & Associates, Inc., Survey Products Group

100 Chesapeake Boulevard • Elkton, Maryland 21921 • Tel: (410) 392-7600 • Fax (410) 506-4780

Instructions: Customer must complete ALL shaded cells

Customer Name: SANDIA NATIONAL LABS	Site Name: NON-ER DUAIN+ SEPTIC
Address: ACCOUNTS PAYABLE MS0154	Site Address: ~~KIVL 2ND~~ AFB, NM KIRTLAND
P.O.BOX 5130	
ALBUQUERQUE NM 87185 U.S.A.	Project Manager: MIKE SANDERS
Phone: 505-284-3303	Customer Project No.:
FAX: 505-284-2616	Customer P.O. #: 28518 Quote #: 211946

Serial # of Modules Shipped

# 179087	- # 179144	#179152	- # 179187					
# 179150	- # 179233	#179188	- #179226					
#	- #	#	- #					
#	- #	#	- #					
	- #	#	- #					
	- #	#	- #					
	- #	#	- #					
#	- #	#	- #					
#	- #	#	- #					
#	- #	#	- #					

# of Modules for Installation 135 # of Trip Blanks 7

Total Modules Shipped: 142 Pieces
Total Modules Received: 142 Pieces
Total Modules Installed: 135 Pieces

Serial # of Trip Blanks (*Client Decides*)

#179228	#	#
#179229	#	#
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#
#	#	#

Prepared By: Suzanne Tift
Verified By: MaryAnne Waugh

Installation Performed By:
Name (*please print*): GILBERT QUINTANA
Company/Affiliation: SNL/NM

Installation Method(s) (*circle those that apply*):
Slide Hammer Hammer Drill Auger
Other: GEOPROBE

Installation Start Date and Time: 4/23/02 1081ST : (AM) PM
Installation Complete Date and Time: 5/6/02 1099 01 : (AM) PM

Retrieval Performed By:
Name (*please print*): GILBERT QUINTANA
Company/Affiliation: SNL/NM

Total Modules Retrieved: 79 Pieces
Total Modules Lost in Field: 4 Pieces
Total Unused Modules Returned: 53 Pieces

Retrieval Start Date and Time: 5/8/02 / / : AM PM
Retrieval Complete Date and Time: / / : AM PM

Relinquished By	Affiliation	Date	Time	Received By	Affiliation	Date	Time
[signature]	W.L. Gore & Associates, Inc.	5-4-02	17:00	Mike Sanders	Sandia ; 6133	5-7-02	
William J Riley	Sandia N.L. 6135	5-21-02	0935				
				MaryAnne Waugh	W.L. Gore & Associates, Inc.	5-24-02	13:30

GORE-SORBER® Screening Survey Installation and Retrieval Log

SITE NAME & LOCATION

3. of 4

LINE #	MODULE #	INSTALLATION DATE/TIME	RETRIEVAL DATE/TIME	EVIDENCE OF LIQUID HYDROCARBONS (LPH) or HYDROCARBON ODOR (Check as appropriate) LPH	ODOR	NONE	MODULE IN WATER (check one) YES	NO	COMMENTS	
85.	179176	4/29/02, 1431							1035/6715-65-3	
86.	179177	1440								2
87.	179178	1445	5-14-02 0837							1
88.	179179	4/30/02, 0910	5-15-02 0842						1003/915-	3
89.	179180	0919								2
90.	179181	0926								1
91.	179182	0937								4
92.	179183	0943								5
93.	179184	0947	5-15-02, 0912							6
94.	179185	1108	5-15-02, 1146						1007/6730-	4
95.	179186	1113								3
96.	179187	1119								2
97.	179188	1132								5
98.	179189	1140	5-15-02 1213							1
99.	179190	1238	5-15-02, 10:09						1029/6584N-	1
100.	179191	1250								-2
	179192	1300								-3
102.	179193	1313								-5
103.	179194	1318	5-15-02, 1032							-4
104.	179195	1445	5-15-02, 1405						1006/6741-	5
105.	179196	1450								3
106.	179197	1455								4
107.	179198	1502								2
108.	179199	1508	5-15-02, 1143							1
109.	179200	1525	5-15-02, 1039						1087/6743-	2
110.	179201	1530								3
111.	179202	1534								4
112.	179203	1540	5-15-02, 1059							1
113.	179204	5/1/02, 0822	5-16-02, 0801						1008/6750	3
114.	179205	0835								4
115.	179206	0843								1
116.	179207	0851	5-16-02, 0832							2
117.	179208	0944	5-16-02, 0841						1004/6969-	2
118.	179209	0952								4
119.	179210	1000								3
120.	179211	1009								5
121.	179212	1016	5-16-02, 0905							1
122.	179213	1110	5-16-02, 1105						1095/9938-	3
123.	179214	1116								2
124.	179215	1122	5-16-02, 11:21							1
125.	179216	1205	5-16-02 - 0931						1094/LFR-	2
126.	179217	1218	5-16-02 - 0935							1

DSS SITE 1029

GORE SORBER SCREENING SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABS, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
NON-ER DRAIN AND SEPTIC, KIRTLAND AFB, NM
SITES CCT AND CCX - PRODUCTION ORDER #10960025

DATE ANALYZED	SAMPLE NAME	BTEX, ug	BENZ, ug	TOL, ug	EtBENZ, ug	mpXYL, ug	oXYL, ug	C11, C13, &C15, ug	UNDEC, ug	TRIDEC, ug	PENTADEC, ug	TMBs, ug
	MDL=		0.03	0.02	0.01	0.01	0.01		0.02	0.01	0.02	
5/28/2002	179172	nd	nd	nd	nd	nd	nd	0.05	0.03	0.02	bdl	nd
5/29/2002	179173	0.39	0.09	0.18	nd	0.09	0.03	0.19	0.10	0.04	0.05	0.09
5/29/2002	179174	0.03	nd	nd	nd	0.03	nd	0.00	bdl	bdl	bdl	0.00
5/29/2002	179175	nd	nd	nd	nd	nd	nd	0.05	0.05	bdl	bdl	nd
5/29/2002	179176	0.19	0.08	0.10	nd	0.02	nd	1.20	1.12	0.06	0.03	0.04
5/29/2002	179177	0.34	0.14	0.11	nd	0.07	0.03	0.10	0.08	0.02	bdl	0.14
5/29/2002	179178	0.08	nd	0.05	0.01	0.02	nd	0.14	0.06	0.03	0.05	0.00
5/29/2002	179179	0.03	nd	0.03	nd	nd	nd	0.07	0.03	0.02	0.02	0.04
5/29/2002	179180	nd	nd	nd	nd	nd	nd	0.04	0.02	0.01	bdl	0.00
5/29/2002	179181	0.00	nd	nd	nd	bdl	nd	0.10	0.03	0.02	0.05	0.00
5/29/2002	179182	0.09	nd	0.08	nd	0.01	nd	0.08	0.03	0.02	0.03	0.00
5/29/2002	179183	nd	nd	nd	nd	nd	nd	0.08	0.04	bdl	0.04	0.00
5/29/2002	179184	nd	nd	nd	nd	nd	nd	0.09	0.03	0.02	0.04	0.00
5/29/2002	179185	nd	nd	nd	nd	nd	nd	0.05	bdl	0.01	0.04	nd
5/29/2002	179186	nd	nd	nd	nd	nd	nd	0.05	0.03	bdl	0.03	0.04
5/29/2002	179187	0.60	0.18	0.30	0.03	0.06	0.03	0.15	0.05	0.05	0.05	0.11
5/29/2002	179188	0.02	nd	nd	nd	0.02	nd	0.10	bdl	0.02	0.07	0.00
5/29/2002	179189	0.02	nd	nd	nd	0.02	nd	0.07	0.04	0.03	bdl	0.00
5/29/2002	179190	0.06	nd	0.03	nd	0.03	nd	0.11	0.05	0.03	0.04	0.00
5/29/2002	179191	0.10	nd	0.04	nd	0.05	nd	0.08	0.02	0.01	0.05	0.00
5/29/2002	179192	0.01	nd	nd	nd	0.01	nd	0.11	0.04	0.02	0.05	0.00
5/29/2002	179193	nd	nd	nd	nd	nd	nd	0.07	0.03	0.01	0.02	0.00
5/29/2002	179194	0.04	nd	nd	nd	0.04	nd	0.08	0.04	bdl	0.04	0.00
5/29/2002	179195	0.04	nd	nd	nd	0.04	nd	0.08	0.04	0.02	0.02	0.00
5/29/2002	179196	0.02	nd	nd	nd	0.02	nd	0.09	0.04	0.02	0.03	0.00
5/29/2002	179197	0.03	nd	nd	nd	0.03	nd	0.15	0.05	0.04	0.06	0.04
5/29/2002	179198	0.07	nd	0.04	nd	0.03	nd	0.09	0.04	0.03	0.03	nd
5/29/2002	179199	nd	nd	nd	nd	nd	nd	0.05	0.03	0.01	bdl	0.00
5/29/2002	179200	0.00	nd	nd	nd	bdl	nd	0.08	0.03	0.02	0.03	0.00
5/29/2002	179201	0.02	nd	nd	nd	0.02	nd	0.04	0.04	bdl	bdl	0.00
5/29/2002	179202	0.02	nd	nd	nd	0.02	nd	0.04	0.03	0.01	bdl	0.00
5/29/2002	179203	0.04	nd	0.04	nd	nd	nd	0.06	0.04	0.02	bdl	0.03
5/29/2002	179204	0.27	nd	0.22	nd	0.03	0.02	0.29	0.06	0.14	0.09	0.00
5/29/2002	179205	0.12	nd	0.09	nd	0.03	bdl	1.28	1.13	0.08	0.07	0.03
5/29/2002	179206	nd	nd	nd	nd	nd	nd	0.02	0.02	bdl	bdl	nd
5/29/2002	179207	0.03	nd	nd	nd	0.03	nd	0.04	0.04	bdl	bdl	0.00
5/29/2002	179208	0.06	nd	0.04	nd	0.02	nd	0.09	0.04	0.03	0.03	0.00
5/29/2002	179209	0.07	nd	0.04	nd	0.03	nd	0.01	bdl	0.01	bdl	0.00

DSS SITE 1029

No mdl is available for summed combinations of analytes. In summed columns (eg., BTEX), the reported values should be considered ESTIMATED if any of the individual compounds were reported as bdl.

GORE SORBER SCREENING SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABS, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
NON-ER DRAIN AND SEPTIC, KIRTLAND AFB, NM
SITES CCT AND CCX - PRODUCTION ORDER #10960025

SAMPLE NAME	124TMB, ug	135TMB, ug	ct12DCE, ug	t12DCE, ug	c12DCE, ug	NAPH&2-MN, ug	NAPH, ug	2MeNAPH, ug	MTBE, ug	11DCA, ug	111TCA, ug	12DCA, ug
MDL=	0.03	0.02		0.14	0.03		0.01	0.02	0.04	0.04	0.02	0.02
179172	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179173	0.06	0.03	nd	nd	nd	0.09	0.03	0.06	nd	nd	nd	nd
179174	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179175	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179176	0.04	bdl	nd	nd	nd	0.05	0.02	0.02	nd	nd	nd	nd
179177	0.10	0.04	nd	nd	nd	0.10	0.06	0.04	nd	nd	nd	nd
179178	bdl	bdl	nd	nd	nd	0.06	0.02	0.03	nd	nd	nd	nd
179179	0.04	bdl	nd	nd	nd	0.06	0.02	0.04	nd	nd	nd	nd
179180	bdl	bdl	nd	nd	nd	0.07	0.02	0.05	nd	nd	nd	nd
179181	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179182	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179183	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179184	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179185	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179186	0.04	nd	nd	nd	nd	0.02	nd	0.02	nd	nd	nd	nd
179187	0.09	0.02	nd	nd	nd	0.05	0.02	0.03	nd	nd	nd	nd
179188	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179189	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179190	bdl	bdl	nd	nd	nd	0.07	0.02	0.04	nd	nd	nd	nd
179191	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179192	bdl	nd	nd	nd	nd	0.05	0.02	0.03	nd	nd	nd	nd
179193	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179194	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179195	bdl	bdl	nd	nd	nd	0.10	0.03	0.07	nd	nd	nd	nd
179196	bdl	nd	nd	nd	nd	0.05	0.02	0.02	nd	nd	nd	nd
179197	0.04	bdl	nd	nd	nd	0.11	0.04	0.07	nd	nd	nd	nd
179198	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179199	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179200	bdl	nd	nd	nd	nd	0.02	nd	0.02	nd	nd	nd	nd
179201	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179202	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179203	0.03	bdl	nd	nd	nd	0.03	0.03	bdl	nd	nd	nd	nd
179204	bdl	nd	nd	nd	nd	0.11	0.04	0.07	nd	nd	bdl	nd
179205	0.03	bdl	nd	nd	nd	0.13	0.05	0.07	nd	nd	0.05	nd
179206	nd	nd	nd	nd	nd	0.03	nd	0.03	nd	nd	0.02	nd
179207	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	0.03	nd
179208	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179209	bdl	bdl	nd	nd	nd	0.05	0.02	0.03	nd	nd	nd	nd

DSS SITE 1029

No mdl is available for summed combinations of analytes. In summed columns (eg., BTEX), the reported values should be considered ESTIMATED if any of the individual compounds were reported as bdl.

GORE SORBER SCREENING SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABS, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
NON-ER DRAIN AND SEPTIC, KIRTLAND AFB, NM
SITES CCT AND CCX - PRODUCTION ORDER #10960025

SAMPLE NAME	TCE, ug	OCT, ug	PCE, ug	14DCB, ug	CHCl3, ug	CCl4, ug	ClBENZ, ug
MDL=	0.02	0.02	0.01	0.01	0.03	0.03	0.01
179172	nd	nd	nd	nd	nd	nd	nd
179173	nd	0.14	0.02	nd	nd	nd	nd
179174	nd	nd	nd	nd	nd	nd	nd
179175	nd	nd	0.04	nd	nd	nd	nd
179176	nd	nd	0.03	nd	nd	nd	nd
179177	nd	0.09	0.02	nd	nd	nd	nd
179178	nd	nd	0.01	nd	nd	nd	nd
179179	0.13	nd	0.07	nd	0.05	nd	nd
179180	0.08	nd	0.02	nd	nd	nd	nd
179181	0.11	nd	0.03	nd	nd	nd	nd
179182	0.15	nd	0.04	nd	nd	nd	nd
179183	0.59	nd	0.08	nd	nd	nd	nd
179184	nd	nd	nd	nd	nd	nd	nd
179185	0.06	nd	nd	nd	nd	nd	nd
179186	nd	nd	nd	nd	nd	nd	nd
179187	0.13	nd	0.08	nd	nd	nd	nd
179188	nd	nd	0.11	nd	nd	nd	nd
179189	0.06	nd	0.02	nd	nd	nd	nd
179190	nd	nd	bdl	nd	nd	bdl	nd
179191	nd	nd	0.03	nd	nd	0.03	nd
179192	nd	nd	0.03	nd	nd	nd	nd
179193	nd	nd	0.08	nd	nd	nd	nd
179194	nd	nd	0.04	nd	nd	nd	nd
179195	nd	nd	nd	nd	nd	nd	nd
179196	nd	nd	nd	nd	nd	0.03	nd
179197	nd	nd	nd	nd	nd	bdl	nd
179198	nd	0.09	nd	nd	nd	nd	nd
179199	nd	nd	nd	nd	nd	bdl	nd
179200	nd	nd	0.09	nd	nd	nd	nd
179201	nd	nd	0.12	nd	nd	nd	nd
179202	nd	nd	0.12	nd	nd	nd	nd
179203	nd	nd	0.09	nd	nd	nd	nd
179204	1.49	nd	3.01	nd	nd	nd	nd
179205	4.14	nd	6.74	nd	nd	nd	nd
179206	4.72	nd	2.69	nd	nd	nd	nd
179207	2.89	nd	2.57	nd	nd	nd	nd
179208	nd	nd	nd	nd	0.05	nd	nd
179209	nd	nd	nd	nd	nd	nd	nd

DSS SITE 1029

No mdl is available for summed combinations of analytes. In summed columns (eg., BTEX), the reported values should be considered ESTIMATED if any of the individual compounds were reported as bdl.

ANNEX D
DSS Site 1029
Risk Assessment

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DSS Site 1029: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1029, the Building 6584 North Septic System, at Sandia National Laboratories/New Mexico (SNL/NM), is located north of the northern boundary of SNL/NM Technical Area III on federally owned land controlled by Kirtland Air Force Base (KAFB). The abandoned septic system consisted of a septic tank of unknown volume that emptied to an exceptionally large drainfield consisting of four 100-foot-long parallel drain lines. Available information indicates that Building 6584 was constructed in 1963 (SNL/NM March 2003), and it is assumed that the septic system was also constructed at that time. By June 1991, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones June 1991). The old septic system line was disconnected and capped, and the system was abandoned in place concurrent with this change (Romero September 2003).

Environmental concern about DSS Site 1029 is based upon the potential for the release of constituents of concern (COCs) in effluent discharged to the environment via the septic system drainfield at this site. Because operational records are not available, the investigation was planned to be consistent with other DSS site investigations and to sample for the COCs most commonly found at similar facilities.

The ground surface in the vicinity of the site is flat to very slightly sloping to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.2 miles north of the site. No springs or perennial surface-water bodies are located within 2 miles of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Surface-water runoff in the vicinity of the site is minor because the surface slope is flat to gently inclined to the west. Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996). Most of the area immediately surrounding DSS Site 1029 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS Site 1029 lies at an average elevation of approximately 5,404 feet above mean sea level. The groundwater beneath the site occurs in unconfined conditions in essentially unconsolidated silts, sands, and gravels. The depth to groundwater is approximately 482 feet below ground surface (bgs). Groundwater flow is to the west in this area (SNL/NM March 2002). The nearest groundwater monitoring well (TAV-MW8) is approximately 100 feet south of the center of the DSS Site 1029 drainfield. The production wells nearest to DSS Site 1029 are KAFB-4 and KAFB-11, approximately 2.6 and 3.0 miles to the northwest and northeast, respectively.

II. Data Quality Objectives

The Data Quality Objectives (DQOs) presented in the "Sampling and Analysis Plan [SAP] for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico" (SNL/NM October 1999) and "Field Implementation Plan [FIP], Characterization of Non-Environmental Restoration

Drain and Septic Systems" (SNL/NM November 2001) identified the site-specific sample locations, sample depths, sampling procedures, and analytical requirements for this and many other DSS sites. The DQOs outlined the quality assurance (QA)/quality control (QC) requirements necessary for producing defensible analytical data suitable for risk assessment purposes. The baseline sampling conducted at this site was designed to:

- Determine whether hazardous waste or hazardous constituents were released at the site.
- Characterize the nature and extent of any releases.
- Provide analytical data of sufficient quality to support risk assessments.

Table 1 summarizes the rationale for determining the sampling locations at this site. The source of potential COCs at DSS Site 1029 was effluent discharged to the environment from the drainfield at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1029 Sampling Area	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil beneath the septic system drainfield	Effluent discharged to the environment from the drainfield	3	NA	Evaluate potential COC releases to the environment from effluent discharged from the drainfield

COC = Constituent of concern.
DQO = Data Quality Objective.
DSS = Drain and Septic Systems.
NA = Not applicable.

The baseline soil samples were collected with a Geoprobe™ in three locations across DSS Site 1029 from two 3- to 4-foot-long sampling intervals at each boring location. Drainfield sampling intervals started at 5 and 10 feet bgs in each of the three drainfield borings. The soil samples were collected in accordance with the procedures described in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). Table 2 summarizes the types of confirmatory and QA/QC samples collected at the site and the laboratories that performed the analyses.

The DSS Site 1029 baseline soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, polychlorinated biphenyls (PCBs), Resource Conservation and Recovery Act (RCRA) metals plus zinc, hexavalent chromium, cyanide, radionuclides, and gross alpha/beta activity. The samples were analyzed by an off-site laboratory (General Engineering Laboratories, Inc.) and the on-site SNL/NM Environmental Restoration (ER) Chemistry Laboratory and Radiation Protection Sample Diagnostics (RPSD) Laboratory. Table 3 summarizes the analytical

Table 2
Number of Confirmatory Soil and QA/QC Samples Collected from DSS Site 1029

Sample Type	VOCs	SVOCs	PCBs	HE	RCRA Metals + Zinc	Hexavalent Chromium	Cyanide	Gamma Spectroscopy Radionuclides	Gross Alpha/Beta
Confirmatory	6	5	6	5	5	6	6	5	5
Duplicates	0	1	1	1	1	1	1	1	0
EBs and TBs (VOCs only)	1	0	0	0	0	0	0	0	0
Total Samples	7	6	7	6	6	7	7	6	5
Analytical Laboratory	GEL	GEL	GEL	ERCL, GEL	ERCL, GEL	GEL	GEL	RPSD, GEL	GEL

DSS = Drain and Septic Systems.
EB = Equipment blank.
ERCL = Environmental Restoration Chemistry Laboratory.
GEL = General Engineering Laboratories, Inc.
HE = High explosive(s).
PCB = Polychlorinated biphenyl.
QA = Quality assurance.
QC = Quality control.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
TB = Trip blank.
VOC = Volatile organic compound.

Table 3
Summary of Data Quality Requirements for DSS Site 1029

Analytical Method[a]	Data Quality Level	GEL	ERCL	RPSD
VOCs EPA Method 8260	Defensible	6	None	None
SVOCs EPA Method 8270	Defensible	5	None	None
PCBs EPA Method 8082	Defensible	6	None	None
HE Compounds EPA Method 8330	Defensible	None	5	None
RCRA metals + Zinc EPA Method 6000/7000	Defensible	None	5	None
Hexavalent Chromium EPA Method 7196A	Defensible	6	None	None
Total Cyanide EPA Method 9012A	Defensible	6	None	None
Gamma Spectroscopy Radionuclides EPA Method 901.1	Defensible	None	None	5
Gross Alpha/Beta Activity EPA Method 900.0	Defensible	5	None	None

Note: The number of samples does not include QA/QC samples such as duplicates, trip blanks, and equipment blanks.
[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
ERCL = Environmental Restoration Chemistry Laboratory.
GEL = General Engineering Laboratories, Inc.
HE = High explosive(s).
PCB = Polychlorinated biphenyl.
QA = Quality assurance.
QC = Quality control.
RCRA = Resource Conservation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

methods and the data quality requirements from the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001).

The QA/QC samples were collected during the baseline sampling effort according to the ER Project Quality Assurance Project Plan. The QA/QC samples consisted of one trip blank (for VOCs only) and three field duplicates. No significant QA/QC problems were identified in the QA/QC samples.

All laboratory data were reviewed and verified/validated according to "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00-03 (SNL/NM December

1999). The data validation reports are presented in the associated DSS Site 1029 proposal for no further action (NFA). The gamma spectroscopy data from the RPSD Laboratory were reviewed according to "Laboratory Data Review Guidelines," Procedure No. RPSD-02-11, Issue No. 2 (SNL/NM July 1996). The gamma spectroscopy results are presented in the NFA proposal. The reviews confirm that the analytical data are defensible and therefore acceptable for use in the NFA proposal. Therefore, the DQOs have been fulfilled.

III. Determination of Nature, Rate, and Extent of Contamination

III.1 Introduction

The determination of the nature, migration rate, and extent of contamination at DSS Site 1029 was based upon an initial conceptual model validated with confirmatory sampling at the site. The initial conceptual model was developed from archival site research, site inspections, soil sampling, and passive soil-vapor sampling. The DQOs contained in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001) identified the sample locations, sample density, sample depth, and analytical requirements. The sample data were subsequently used to develop the final conceptual model for DSS Site 1029, which is presented in Section 4.0 of the associated NFA proposal. The quality of the data specifically used to determine the nature, migration rate, and extent of contamination is described in the following sections.

III.2 Nature of Contamination

Both the nature of contamination and the potential for the degradation of COCs at DSS Site 1029 were evaluated using laboratory analyses of the soil samples. The analytical requirements included analyses for VOCs, SVOCs, HE compounds, PCBs, RCRA metals, hexavalent chromium, cyanide, radionuclides by gamma spectroscopy, and gross alpha/beta activity. The analytes and methods listed in Tables 2 and 3 are appropriate to characterize the COCs and potential degradation products at DSS Site 1029.

III.3 Rate of Contaminant Migration

The septic system at DSS Site 1029 was deactivated in the early 1990s when Building 6584 was connected to an extension of the City of Albuquerque sanitary sewer system. The migration rate of COCs that may have been introduced into the subsurface via the septic system at this site was therefore dependent upon the volume of aqueous effluent discharged to the environment from this system when it was operational. Any migration of COCs from this site after use of the septic system was discontinued has been dependent predominantly upon precipitation. However, it is highly unlikely that sufficient precipitation has fallen onto the site to reach the depth at which COCs may have been discharged to the subsurface from this system. Analytical data generated from the soil sampling conducted are adequate to characterize the rate of COC migration at DSS Site 1029.

III.4 Extent of Contamination

Subsurface baseline soil samples were collected from boreholes drilled at three locations beneath the effluent release points and area (the drainfield) at the site to assess whether releases of effluent from the septic system caused any environmental contamination.

The DSS Site 1029 baseline soil samples were collected at sampling depths starting at 5 and 10 feet bgs in the drainfield area. Sampling intervals started at the depths at which effluent discharged from the drainfield drain lines and seepage pit would have entered the subsurface environment at the site. This sampling procedure was required by New Mexico Environment Department (NMED) regulators and has been used at numerous DSS sites at SNL/NM. The baseline soil samples are considered to be representative of the soil potentially contaminated with the COCs at this site and are sufficient to determine the vertical extent, if any, of COCs.

IV. Comparison of COCs to Background Screening Levels

Site history and characterization activities are used to identify potential COCs. The DSS Site 1029 NFA proposal describes the identification of COCs and the sampling that was conducted in order to determine the concentration levels of those COCs across the site. Generally, COCs that were evaluated in this risk assessment included all detected organic compounds and all inorganic and radiological COCs for which samples were analyzed. When the detection limit of an organic compound was too high (i.e., could possibly cause an adverse effect to human health or the environment), the compound was retained. Nondetected organic compounds not included in this assessment were determined to have detection limits low enough to ensure protection of human health and the environment. In order to provide conservatism in this risk assessment, the calculation used only the maximum concentration value of each COC found for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 1997) was selected to provide the background screen listed in Tables 4 through 7.

Nonradiological inorganic compounds that are essential nutrients, such as iron, magnesium, calcium, potassium, and sodium, were not included in this risk assessment (EPA 1989). Both radiological and nonradiological COCs were evaluated. The nonradiological COCs evaluated in the risk assessment consisted of inorganic and organic compounds.

Tables 4 and 5 list the nonradiological COCs for the human health and ecological risk assessments at DSS Site 1029, respectively; Tables 6 and 7 list the radiological COCs for the human health and ecological risk assessments, respectively. All tables show the associated SNL/NM maximum background concentration values (Dinwiddie September 1997). Section VI.4.2 discusses Tables 4 and 6; Sections VII.2 and VII.3 discuss Tables 5 and 7.

V. Fate and Transport

The primary releases of COCs at DSS Site 1029 were to the subsurface soil resulting from the discharge of effluents from the Building 6584 North Septic System septic tank and drainfield. Wind, water, and biota are natural mechanisms of COC transport from the primary release point. However, because the discharge was to subsurface soil, none of these

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1029 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (All Samples) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Arsenic	5.5	4.4	**No**	44[c]	–	**Yes**
Barium	120	214	Yes	170[d]	–	**Yes**
Cadmium	0.22	0.9	Yes	64[c]	–	**Yes**
Chromium, total	12	15.9	Yes	16[c]	–	No
Chromium VI	0.0796 J	1	Yes	16[c]	–	No
Cyanide	0.0695[e]	NC	**Unknown**	NC	–	**Unknown**
Lead	7.2	11.8	Yes	49[c]	–	**Yes**
Mercury	0.0205[e]	<0.1	**Unknown**	5,500[c]	–	**Yes**
Selenium	0.34 J	<1	**Unknown**	800[f]	–	**Yes**
Silver	0.87	<1	**Unknown**	0.5[c]	–	No
Zinc	47	62	Yes	47[c]	–	**Yes**
Organic						
Anthracene	0.37 J	NA	**NA**	917[c]	4.45[c]	**Yes**
Benzo(a)anthracene	2.7 J	NA	**NA**	10,000[g]	5.61[g]	**Yes**
Benzo(a)pyrene	2.2 J	NA	**NA**	3,000[c]	6.04[c]	**Yes**
Benzo(b)fluoranthene	3.1 J	NA	**NA**	14,500[g]	6.124[g]	**Yes**
Benzo(g,h,i)perylene	0.91 J	NA	**NA**	58,884[g]	6.58[g]	**Yes**
Benzo(k)fluoranthene	1.0 J	NA	**NA**	93,325[g]	6.84[g]	**Yes**
2-Butanone	0.011 J	NA	**NA**	1[h]	0.29[h]	No
Chrysene	3.2 J	NA	**NA**	18,000[g]	5.91[g]	**Yes**
Dibenz[a,h]anthracene	0.33 J	NA	**NA**	51,000[g]	6.50[g]	**Yes**
Fluoranthene	4.1 J	NA	**NA**	12,302[g]	4.90[g]	**Yes**
Indeno(1,2,3-cd)pyrene	0.88 J	NA	**NA**	59,407[g]	6.58[g]	**Yes**

Refer to footnotes at end of table.

Table 4 (Concluded)
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1029 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (All Samples) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Methylene chloride	0.0073	NA	**NA**	5[h]	1.25[h]	No
Phenanthrene	1.6 J	NA	**NA**	23,800[c]	4.63[c]	**Yes**
Pyrene	3.5 J	NA	**NA**	36,300[c]	5.32[g]	**Yes**
Toluene	0.0019	NA	**NA**	10.7[c]	2.69[c]	No

Note: **Bold** indicates the COCs that exceed the background screening values and/or are bioaccumulators.
[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]NMED March 1998.
[c]Yanicak March 1997.
[d]Neumann 1976.
[e]Parameter was not detected. Concentration used is one-half of the highest detection limit.
[f]Callahan et al. 1979.
[g]Micromedex, Inc. 1998.
[h]Howard 1990.
BCF = Bioconcentration factor.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
J = Estimated concentration.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NC = Not calculated.
NMED = New Mexico Environment Department.
SNL/NM = Sandia National Laboratories/New Mexico.
– = Information not available.

Table 5
Nonradiological COCs for Ecological Risk Assessment at DSS Site 1029 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (Samples ≤ 5 ft bgs) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Arsenic	5	4.4	**No**	44[c]	–	**Yes**
Barium	120	214	Yes	170[d]	–	**Yes**
Cadmium	0.22	0.9	Yes	64[c]	–	**Yes**
Chromium, total	11	15.9	Yes	16[c]	–	No
Chromium VI	0.0608 J	1	Yes	16[c]	–	No
Cyanide	0.0695[e]	NC	**Unknown**	NC	–	**Unknown**
Lead	7.2	11.8	Yes	49[c]	–	**Yes**
Mercury	0.0205[e]	<0.1	**Unknown**	5,500[c]	–	**Yes**
Selenium	0.30 J	<1	**Unknown**	800[f]	–	**Yes**
Silver	0.87	<1	**Unknown**	0.5[c]	–	No
Zinc	47	62	Yes	47[c]	–	**Yes**
Organic						
Anthracene	0.37 J	NA	**NA**	917[c]	4.45[c]	**Yes**
Benzo(a)anthracene	2.7 J	NA	**NA**	10,000[g]	5.61[g]	**Yes**
Benzo(a)pyrene	2.2 J	NA	**NA**	3,000[c]	6.04[c]	**Yes**
Benzo(b)fluoranthene	3.1 J	NA	**NA**	14,500[g]	6.124[g]	**Yes**
Benzo(g,h,i)perylene	0.91 J	NA	**NA**	58,884[g]	6.58[g]	**Yes**
Benzo(k)fluoranthene	1.0 J	NA	**NA**	93,325[g]	6.84[g]	**Yes**
2-Butanone	0.0059 J	NA	**NA**	1[h]	0.29[h]	No
Chrysene	3.2 J	NA	**NA**	18,000[g]	5.91[g]	**Yes**
Dibenz[a,h]anthracene	0.33 J	NA	**NA**	51,000[g]	6.50[g]	**Yes**
Fluoranthene	4.1 J	NA	**NA**	12,302[g]	4.90[g]	**Yes**
Indeno(1,2,3-cd)pyrene	0.88 J	NA	**NA**	59,407[g]	6.58[g]	**Yes**

Refer to footnotes at end of table.

Table 5 (Concluded)
Nonradiological COCs for Ecological Risk Assessment at DSS Site 1029 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (Samples ≤ 5 ft bgs) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Methylene chloride	0.0073	NA	**NA**	5[h]	1.25[h]	No
Phenanthrene	1.6 J	NA	**NA**	23,800[c]	4.63[c]	**Yes**
Pyrene	3.5 J	NA	**NA**	36,300[c]	5.32[g]	**Yes**
Toluene	0.0019	NA	**NA**	10.7[c]	2.69[c]	No

Note: **Bold** indicates the COCs that exceed the background screening values and/or are bioaccumulators.
[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]NMED March 1998.
[c]Yanicak March 1997.
[d]Neumann 1976.
[e]Parameter was not detected. Concentration is one-half the detection limit.
[f]Callahan et al. 1979.
[g]Micromedex, Inc. 1998.
[h]Howard 1990.
BCF = Bioconcentration factor.
bgs = Below ground surface.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
ft = Foot (feet).
J = Estimated concentration.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NC = Not calculated.
NMED = New Mexico Environment Department.
SNL/NM = Sandia National Laboratories/New Mexico.
– = Information not available.

Table 6
Radiological COCs for Human Health Risk Assessment at DSS Site 1029 with Comparison to the Associated SNL/NM Background Screening Value and BCF

COC	Maximum Activity (All Samples) (pCi/g)	SNL/NM Background Activity (pCi/g)[a]	Is Maximum COC Activity Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Is COC a Bioaccumulator?[b] (BCF >40)
Cs-137	0.0449	0.079	Yes	3,000[c]	**Yes**
Th-232	0.728	1.01	Yes	3,000[c]	**Yes**
U-235	0.102	0.16	Yes	900[c]	**Yes**
U-238	0.818	1.4	Yes	900[c]	**Yes**

Note: **Bold** indicates COCs that exceed background screening values and/or are bioaccumulators.
[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]NMED March 1998.
[c]Baker and Soldat 1992.
BCF = Bioconcentration factor.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.

Table 7
Radiological COCs for Ecological Risk Assessment at DSS Site 1029 with Comparison to the Associated SNL/NM Background Screening Value and BCF

COC	Maximum Activity (Samples ≤ 5 ft bgs) (pCi/g)	SNL/NM Background Activity (pCi/g)[a]	Is Maximum COC Activity Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Is COC a Bioaccumulator?[b] (BCF >40)
Cs-137	0.0449	0.079	Yes	3,000[c]	**Yes**
Th-232	0.728	1.01	Yes	3,000[c]	**Yes**
U-235	0.102	0.16	Yes	900[c]	**Yes**
U-238	0.570	1.4	Yes	900[c]	**Yes**

Note: **Bold** indicates COCs that exceed background screening values and/or are bioaccumulators.
[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]NMED March 1998.
[c]Baker and Soldat 1992.
BCF = Bioconcentration factor.
bgs = Below ground surface.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
ft = Foot (feet).
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.

mechanisms are considered to be of potential significance as transport mechanisms at this site. Because the septic system is no longer active, additional infiltration of water is not expected. Infiltration of precipitation is essentially nonexistent at DSS Site 1029, as virtually all of the moisture either drains away from the site or evaporates. Because groundwater at this site is approximately 482 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low .

The COCs at DSS Site 1029 include both inorganic and organic constituents. The inorganic COCs are nonradiological analytes. With the exception of cyanide, the inorganic COCs are elemental in form and are not considered to be degradable. Transformations of these inorganic constituents could include changes in valence (oxidation/reduction reactions) or incorporation into organic forms (e.g., the conversion of selenite or selenate from soil to seleno-amino acids in plants). Cyanide can be metabolized by soil biota.

The organic COCs at DSS Site 1029 include both SVOCs and VOCs. Organic COCs may be degraded through photolysis, hydrolysis, and biotransformation. Photolysis requires light and therefore takes place in the air, at the ground surface, or in surface water. Hydrolysis includes chemical transformations in water and may occur in the soil solution. Biotransformation (i.e., transformation caused by plants, animals, and microorganisms) may occur; however, biological activity may be limited by the arid environment at this site. Because of the depth of the COCs in the soil, the loss of VOCs through volatilization is expected to be minimal.

Table 8 summarizes the fate and transport processes that can occur at DSS Site 1029. COCs at this site include nonradiological inorganic and organic analytes. Wind, surface water, and biota are considered to be of low significance as potential transport mechanisms at this site. Significant leaching into the subsurface soil is unlikely, and leaching into the groundwater at this site is highly unlikely. The potential for transformation of COCs is low.

Table 8
Summary of Fate and Transport at DSS Site 1029

Transport and Fate Mechanism	Existence at Site	Significance
Wind	Yes	Low
Surface runoff	Yes	Low
Migration to groundwater	No	None
Food chain uptake	Yes	Low
Transformation/degradation	Yes	Low

DSS = Drain and Septic Systems.

VI. Human Health Risk Assessment

VI.1 Introduction

The human health risk assessment of this site includes a number of steps that culminate in a quantitative evaluation of the potential adverse human health effects caused by constituents located at the site. The steps to be discussed include the following:

Step 1.	Site data are described that provide information on the potential COCs, as well as the relevant physical characteristics and properties of the site.
Step 2.	Potential pathways are identified by which a representative population might be exposed to the COCs.
Step 3.	The potential intake of these COCs by the representative population is calculated using a tiered approach. The first component of the tiered approach is a screening procedure that compares the maximum concentration of the COC to an SNL/NM maximum background screening value. COCs that are not eliminated during the first screening procedure are carried forward in the risk assessment process.
Step 4.	Toxicological parameters are identified and referenced for COCs that were not eliminated during the screening procedure.
Step 5.	Potential toxicity effects (specified as a hazard index [HI]) and estimated excess cancer risks are calculated for nonradiological COCs and background. For radiological COCs, the incremental total effective dose equivalent (TEDE) and incremental estimated cancer risk are calculated by subtracting applicable background concentrations directly from maximum on-site contaminant values. This background subtraction applies only when a radiological COC occurs as contamination and exists as a natural background radionuclide.
Step 6.	These values are compared with guidelines established by the U.S. Environmental Protection Agency (EPA), NMED, and the U.S. Department of Energy (DOE) to determine whether further evaluation and potential site cleanup are required. Nonradiological COC risk values also are compared to background risk so that an incremental risk can be calculated.
Step 7.	Uncertainties of the above steps are addressed.

VI.2 Step 1. Site Data

Section I of this risk assessment provides the site description and history for DSS Site 1029. Section II presents a comparison of results to DQOs. Section III discusses the nature, rate, and extent of contamination.

VI.3 Step 2. Pathway Identification

DSS Site 1029 has been designated with a future land-use scenario of industrial (DOE et al. September 1995) (see Appendix 1 for default exposure pathways and parameters). However, the residential land-use scenario is also considered in the pathway analysis. Because of the location and characteristics of the potential contaminants, the primary pathway for human exposure is considered to be soil ingestion for the nonradiological COCs and direct gamma exposure for the radiological COCs. The inhalation pathway for both nonradiological and radiological COCs is included because the potential exists to inhale dust and volatiles. Soil ingestion is included for the radiological COCs as well. The dermal pathway is included for the nonradiological COCs because of the potential for the receptor to be exposed to contaminated soil. No water pathways to the groundwater are considered. Depth to groundwater at DSS Site 1029 is approximately 482 feet bgs. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Figure 1 shows the conceptual site model flow diagram for DSS Site 1029.

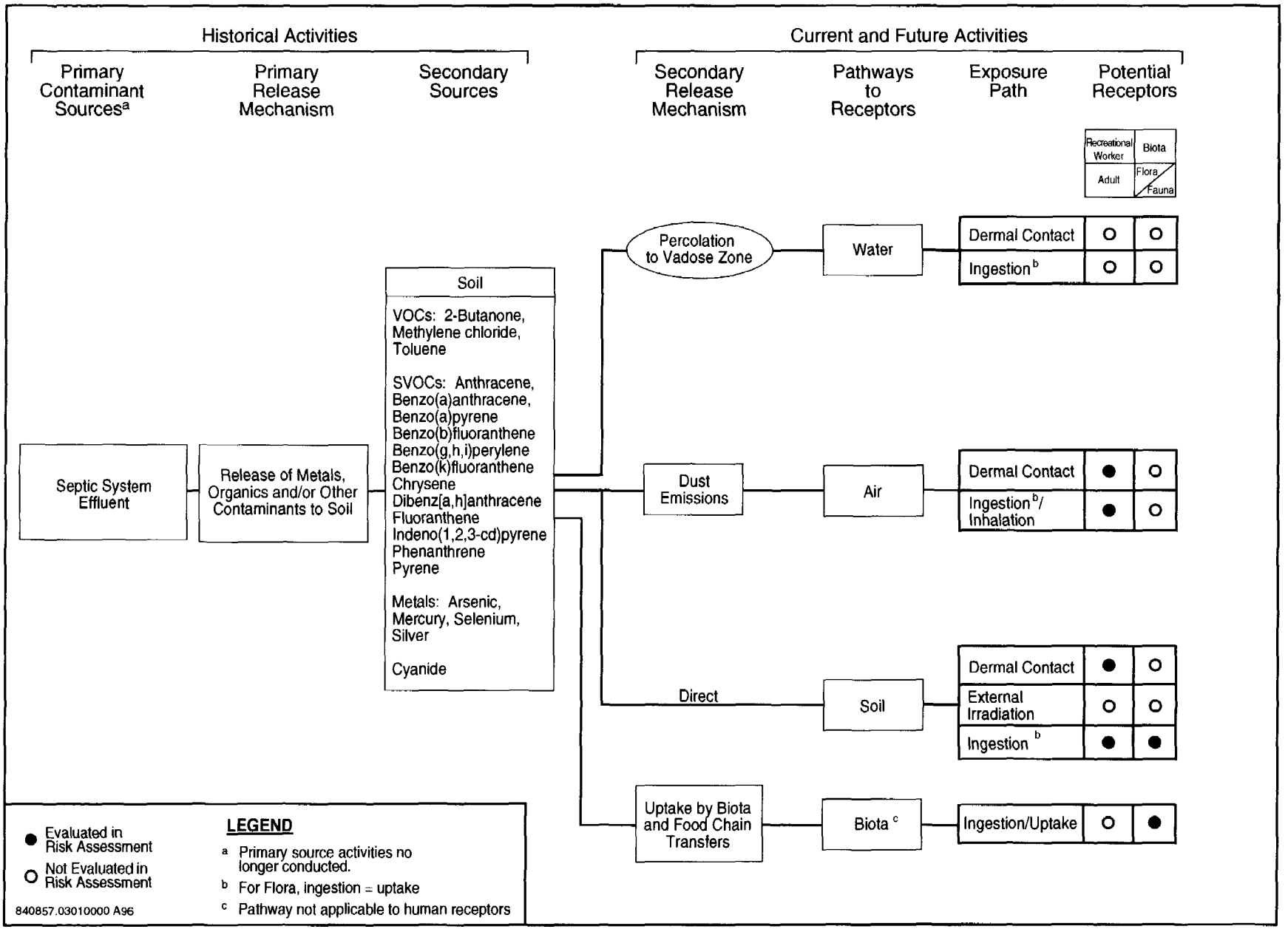

Figure 1

Conceptual Site Model Flow Diagram for DSS Site 1029, Building 6584 North Septic System

Pathway Identification

Nonradiological Constituents	Radiological Constituents
Soil ingestion	Soil ingestion
Inhalation (dust and volatiles)	Inhalation (dust)
Dermal contact	Direct gamma

VI.4 Step 3. Background Screening Procedure

This section discusses Step 3, the background screening procedure, which compares the maximum COC concentration to the background screening level. The methodology and results are described in the following sections.

VI.4.1 Methodology

Maximum concentrations of nonradiological COCs were compared to the approved SNL/NM maximum screening level for this area (Dinwiddie September 1997). The SNL/NM maximum background concentration was selected to provide the background screen in Table 4 and used to calculate risk attributable to background in Sections VI.6.2 and VI.7. Only the COCs that were detected above the corresponding SNL/NM maximum background screening levels or did not have either a quantifiable or calculated background screening level were considered in further risk assessment analyses.

For radiological COCs that exceeded the SNL/NM background screening levels, background values were subtracted from the individual maximum radionuclide concentrations. Those that did not exceed these background levels were not carried any further in the risk assessment. This approach is consistent with DOE Order 5400.5, "Radiation Protection of the Public and the Environment" (DOE 1993). Radiological COCs that do not have a background value and were detected above the analytical minimum detectable activity were carried through the risk assessment at the maximum levels. The resultant radiological COCs remaining after this step are referred to as background-adjusted radiological COCs.

VI.4.2 Results

Tables 4 and 6 show DSS Site 1029 maximum COC concentrations that were compared to the SNL/NM maximum background values (Dinwiddie September 1997) for the human health risk assessment. For the nonradiological COCs, the maximum concentration for one inorganic constituent exceeded the background screening concentration, and four inorganic constituents do not have quantified background screening concentrations; therefore, it is unknown whether these constituents exceeded background levels. Fifteen nonradiological COCs were organic compounds that do not have corresponding background screening values.

For the radiological COCs, no constituents exceeded background screening values. Therefore, the radiological COCs were eliminated from further evaluation in the risk assessment.

VI.5 Step 4. Identification of Toxicological Parameters

Table 9 lists the nonradiological COCs retained in the risk assessment and the values for the available toxicological information. The toxicological values for the nonradiological COCs presented in Table 9 were obtained from the Integrated Risk Information System (IRIS) (EPA 2003), the Health Effects Assessment Summary Tables (HEAST) (EPA 1997a), and the EPA Region 6 electronic database (EPA 2002a).

VI.6 Step 5. Exposure Assessment and Risk Characterization

Section VI.6.1 describes the exposure assessment for this risk assessment. Section VI.6.2 provides the risk characterization, including the HI and excess cancer risk for both the potential nonradiological COCs and associated background for industrial and residential land-use scenarios.

VI.6.1 Exposure Assessment

Appendix 1 provides the equations and parameter input values used in calculating intake values and subsequent HI and excess cancer risk values for the individual exposure pathways. The appendix shows parameters for both the industrial and residential land-use scenarios. The equations for nonradiological COCs are based upon the Risk Assessment Guidance for Superfund (RAGS) (EPA 1989). Parameters are based upon information from the RAGS (EPA 1989), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), as well as other EPA and NMED guidance documents, and reflect the reasonable maximum exposure (RME) approach advocated by the RAGS (EPA 1989). Although the designated land-use scenario is industrial for this site, risk and TEDE values for a residential land-use scenario are also presented.

VI.6.2 Risk Characterization

Table 10 shows an HI of 0.60 for the DSS Site 1029 nonradiological COCs and an estimated excess cancer risk of 2E-5 for the designated industrial land-use scenario. The numbers presented include exposure from soil ingestion, dermal contact, and dust and volatile inhalation for nonradiological COCs. Table 11 shows that for the DSS Site 1029 associated background constituents, the HI is 0.02 and the calculated excess cancer risk is 3E-6 for the industrial land-use scenario.

Because none of the radiological COCs exceeded background screening values, these COCs were eliminated from further evaluation in the risk assessment for the industrial land-use scenario.

For nonradiological COCs under the residential land-use scenario, the HI is 2.17 with an estimated excess cancer risk of 8E-5. The numbers in the table include exposure from soil ingestion, dermal contact, and dust and volatile inhalation. Although the EPA (1991) generally recommends that inhalation not be included in a residential land-use scenario, this pathway is

Table 9
Toxicological Parameter Values for DSS Site 1029 Nonradiological COCs

COC	RfD_o (mg/kg-d)	Confidence[a]	RfD_{inh} (mg/kg-d)	Confidence[a]	SF_o $(mg/kg\text{-}d)^{-1}$	SF_{inh} $(mg/kg\text{-}d)^{-1}$	Cancer Class[b]	ABS
Inorganic								
Arsenic	3E-4[c]	M	–	–	1.5E+0[c]	1.5E+1[c]	A	0.03[d]
Cyanide	2E-2[c]	M	–	–	–	–	D	0.1[d]
Mercury	3E-4[e]	–	8.6E-5[c]	M	–	–	D	0.01[d]
Selenium	5E-3[c]	H	–	–	–	–	D	0.01[d]
Silver	5E-3[c]	L	–	–	–	–	D	0.01[d]
Organic								
Anthracene	3E-1[c]	L	3E-1[f]	–	–	–	D	0.13[d]
Benzo(a)anthracene	–	–	–	–	7.3E-1[f]	3.1E-1[f]	B2	0.13[d]
Benzo(a)pyrene	–	–	–	–	7.3E+0[c]	3.1E+0[f]	B2	0.13[d]
Benzo(b)fluoranthene	–	–	–	–	7.3E-1[f]	3.1E-1[f]	B2	0.13[d]
Benzo(g,h,i)perylene[g]	–	–	–	–	7.3E+0[f]	3.1E+0[f]	B2	0.13[d]
Benzo(k)fluoranthene	–	–	–	–	7.3E-2[f]	3.1E-2[f]	B2	0.13[d]
2-Butanone	6E-1[c]	L	2.9E-1[c]	L	–	–	D	0.1[d]
Chrysene	–	–	–	–	7.3E-3[f]	3.1E-3[f]	B2	0.13[d]
Dibenz[a,h]anthracene	–	–	–	–	7.3E+0[f]	3.1E+0[f]	B2	0.13[d]
Fluoranthene	4E-2[c]	L	4E-2[f]	–	–	–	D	0.13[d]
Indeno(1,2,3-cd) pyrene	–	–	–	–	7.3E-1[f]	3.1E-1[f]	B2	0.13[d]
Methylene chloride	6E-2[c]	M	8.6E-1[e]	–	7.5E-3[c]	1.6E-3[c]	B2	0.1[d]
Phenanthrene[h]	3E-1[c]	L	3E-1[f]	–	–	–	D	0.1[d]
Pyrene	3E-2[c]	L	3E-2[f]	–	–	–	D	0.1[d]
Toluene	2E-1[c]	M	1.1E-1[c]	M	–	–	D	0.1[d]

[a]Confidence associated with IRIS (EPA 2003) database values. Confidence: L = low, M = medium, H = high.

[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 2003):

A = Human carcinogen.

B2 = Probable human carcinogen. Sufficient evidence in animals and inadequate or no evidence in humans.

D = Not classifiable as to human carcinogenicity.

[c]Toxicological parameter values from IRIS electronic database (EPA 2003).

[d]Toxicological parameter values from NMED December 2000.

[e]Toxicological parameter values from HEAST (EPA 1997a).

Table 9 (Concluded)
Toxicological Parameter Values for DSS Site 1029 Nonradiological COCs

[f]Toxicological parameter values from EPA Region 6 (EPA 2002a).
[g]Toxicological parameter values for benzo(g,h,i)perylene could not be found. Dibenz[a,h]anthracene was used as a surrogate.
[h]Toxicological parameter values for phenanthrene could not be found. Anthracene was used as a surrogate.

ABS	= Gastrointestinal absorption coefficient.
COC	= Constituent of concern.
DSS	= Drain and Septic Systems.
EPA	= U.S. Environmental Protection Agency.
HEAST	= Health Effects Assessment Summary Tables.
IRIS	= Integrated Risk Information System.
mg/kg-d	= Milligram(s) per kilogram day.
$(mg/kg\text{-}d)^{-1}$	= Per milligram per kilogram day.
NMED	= New Mexico Environment Department.
RfD_{inh}	= Inhalation chronic reference dose.
RfD_{o}	= Oral chronic reference dose.
SF_{inh}	= Inhalation slope factor.
SF_{o}	= Oral slope factor.
–	= Information not available.

Table 10
Risk Assessment Values for DSS Site 1029 Nonradiological COCs

COC	Maximum Concentration (All Samples) (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Arsenic	5.5	0.02	3E-6	0.25	1E-5
Cyanide	0.0695[b]	0.00	–	0.00	–
Mercury	0.0205[b]	0.00	–	0.00	–
Selenium	0.34 J	0.00	–	0.00	–
Silver	0.87	0.00	–	0.00	–
Organic					
Anthracene	0.37 J	0.00	–	0.00	–
Benzo(a)anthracene	2.7 J	0.00	1E-6	0.00	4E-6
Benzo(a)pyrene	2.2 J	0.00	1E-5	0.00	4E-5
Benzo(b)fluoranthene	3.1 J	0.00	1E-6	0.00	5E-6
Benzo(g,h,i)perylene	0.91 J	0.00	4E-6	0.00	1E-5
Benzo(k)fluoranthene	1.0 J	0.00	5E-8	0.00	2E-7
2-Butanone	0.011 J	0.00	–	0.00	–
Chrysene	3.2 J	0.00	2E-8	0.00	5E-8
Dibenz[a,h]anthracene	0.33 J	0.00	2E-6	0.00	5E-6
Fluoranthene	4.1 J	0.00	–	0.00	–
Indeno(1,2,3-cd)pyrene	0.88 J	0.00	4E-7	0.00	1E-6
Methylene chloride	0.0073	0.00	5E-8	0.00	1E-7
Phenanthrene	1.6 J	0.58	–	1.90	–
Pyrene	3.5 J	0.00	–	0.00	–
Toluene	0.0019	0.00	–	0.00	–
Total		**0.60**	**2E-5**	**2.17**	**8E-5**

[a]EPA 1989.
[b]Maximum concentration was one-half the detection limit.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
J = Estimated concentration.
mg/kg = Milligram(s) per kilogram.
– = Information not available.

Table 11
Risk Assessment Values for DSS Site 1029 Nonradiological Background Constituents

COC	Background Concentration[a] (mg/kg)	Industrial Land-Use Scenario[b]		Residential Land-Use Scenario[b]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Arsenic	4.4	0.02	3E-6	0.20	1E-5
Cyanide	NC	–	–	–	–
Mercury	<0.1	–	–	–	–
Selenium	<1	–	–	–	–
Silver	<1	–	–	–	–
Total		**0.02**	**3E-6**	**0.20**	**1E-5**

[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]EPA 1989.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
mg/kg = Milligram(s) per kilogram.
NC = Not calculated.
– = Information not available.

included because of the potential for soil in Albuquerque, New Mexico, to be eroded and, subsequently, for dust to be present in predominantly residential areas. Because of the nature of the local soil, other exposure pathways are not considered (see Appendix 1). Table 11 shows that for the DSS Site 1029 associated background constituents, the HI is 0.20 and the calculated excess cancer risk is 1E-5 for the residential land-use scenario.

Because none of the radiological COCs exceeded background screening values, these COCs were eliminated from further evaluation in the risk assessment for the residential land-use scenario.

VI.7 Step 6. Comparison of Risk Values to Numerical Guidelines

The human health risk assessment analysis evaluated the potential for adverse health effects for both the industrial (the designated land-use scenario for this site) and residential land-use scenarios.

For the nonradiological COCs under the industrial land-use scenario, the HI is 0.60 (less than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). The estimated excess cancer risk is 2E-5. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus, the excess cancer risk for this site is above the suggested acceptable risk value. This assessment also determined risks considering background concentrations of the potential nonradiological COCs for both the industrial and residential land-use scenarios. The incremental risk is determined by subtracting risk associated with background from potential COC risk. These numbers are not rounded before the difference is determined and therefore may appear to be inconsistent with numbers presented in tables and within the text. For conservatism, the background constituents that do not have quantified background screening concentrations are assumed to have a hazard

quotient (HQ) of 0.00. The incremental HI is 0.59 and the incremental estimated excess cancer risk is 2.03E-5 for the industrial land-use scenario. The incremental excess cancer risk calculation is above NMED guidelines, considering the industrial land-use scenario.

Because none of the radiological COCs exceeded background screening values, these COCs were eliminated from further evaluation in the risk assessment for the industrial land-use scenario.

The calculated HI for the residential land-use scenario nonradiological COCs is 2.17, which is slightly above numerical guidance. The estimated excess cancer risk is 8E-5. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus, the excess cancer risk for this site is above the suggested acceptable risk value. The incremental HI is 1.96 and the estimated incremental cancer risk is 6.94E-5 for the residential land-use scenario. These incremental risk calculations are both above NMED guidelines, considering the residential land-use scenario.

Because none of the radiological COCs exceeded background screening values, these COCs were eliminated from further evaluation in the risk assessment for the residential land-use scenario.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1029 was based upon an initial conceptual model that was validated with baseline sampling conducted at the site. The baseline sampling was implemented in accordance with the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). The DQOs contained in these two documents are appropriate for use in risk assessments. The data from soil samples collected at effluent release points are representative of potential COC releases to the site. The analytical requirements and results satisfy the DQOs, and data quality was verified/validated in accordance with SNL/NM procedures. Therefore, there is no uncertainty associated with the data quality used to perform the risk assessment at DSS Site 1029.

Because of the location, history of the site, and future land use (DOE et al. September 1995), there is low uncertainty in the land-use scenario and the potentially affected populations that were considered in performing the risk assessment analysis. Because the COCs are found in surface and near-surface soil and because of the location and physical characteristics of the site, there is little uncertainty in the exposure pathways relevant to the analysis.

An RME approach was used to calculate the risk assessment values. This means that the parameter values in the calculations are conservative and that calculated intakes are probably overestimated. Maximum measured values of COC concentrations are used to provide conservative results.

Table 9 shows the uncertainties (confidence levels) in the nonradiological toxicological parameter values. There is a combination of estimated values and values from the IRIS (EPA 2003), HEAST (EPA 1997a), EPA Regions 6, 9, and 3 (EPA 2002a, EPA 2002b, EPA 2002c), and Technical Background Document for Development of Soil Screening Levels (NMED December 2000). Where values are not provided, information is not available from the HEAST (EPA 1997a), IRIS (EPA 2003), Technical Background Document for Development of

Soil Screening Levels (NMED December 2000), Risk Assessment Information System (ORNL 2003), or EPA regions (EPA 2002a, EPA 2002b, EPA 2002c). Because of the conservative nature of the RME approach, uncertainties in toxicological values are not expected to change the conclusion from the risk assessment analysis.

Because the HI and excess cancer risk values are slightly above NMED guidelines for the industrial and residential land-use scenarios, additional evaluation of the data is warranted. SVOCs, the main risk drivers, were detected in only one of the six SVOC soil samples collected from this site. The sample was located in the shallow (5-foot interval) soil sample in borehole 6584N-DF1-BH2. The 12 SVOC compounds detected in this sample are indicative of asphalt (NPS July 1997) and likely reflect asphalt fragments disposed of at the site that were collected in the sample. No significant VOC or metals contamination was detected in any of the samples from this site (except for arsenic concentrations slightly above background). It was noted during sampling that the Building 6584 drainfield area contained small amounts of residual construction debris and appeared to have been used on occasion as a vehicle parking area. It is therefore believed that the SVOC compounds detected in the single sample represent residual asphalt disposed of at the site and do not indicate significant or widespread SVOC contamination that could pose a threat to human health or the environment. With the removal of the SVOCs from the risk calculation, the incremental HI is reduced to 0.06 for the residential land-use scenario, the incremental excess cancer risk is reduced to 7.39E-7 for the industrial land-use scenario, and the incremental excess cancer risk is reduced to 2.93E-6 for the residential land-use scenario. These values are all well below NMED guidelines.

For the radiological COCs, the conclusion of the risk assessment is that potential effects on human health for both the industrial and residential land-use scenarios are below background and represent only a small fraction of the estimated 360 millirem per year received by the average U.S. population (NCRP 1987).

The overall uncertainty in all of the steps in the risk assessment process is not considered to be significant with respect to the conclusion reached.

VI.9 Summary

DSS Site 1029 contains identified COCs consisting of some inorganic, organic, and radiological compounds. Because of the location of the site, the designated industrial land-use scenario, and the nature of contamination, potential exposure pathways identified for this site included soil ingestion, dermal contact, and dust and volatile inhalation for chemical COCs, and soil ingestion, dust inhalation, and direct gamma exposure for radionuclides. The same exposure pathways were applied to the residential land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the industrial land-use scenario the HI (0.60) is significantly lower than the accepted numerical guidance from the EPA. The estimated excess cancer risk is 2E-5; thus, excess cancer risk is also above the acceptable risk value provided by the NMED for an industrial land-use scenario (Bearzi January 2001). The incremental HI is 0.59, and the incremental estimated excess cancer risk is 2.03E-5 for the industrial land-use scenario. Incremental risk calculations are above NMED guidelines for the industrial land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the residential land-use scenario the HI (2.17) is slightly above the accepted numerical guidance from the EPA. The estimated excess cancer risk is 8E-5. Thus, excess cancer risk is also slightly above the acceptable risk value provided by the NMED for a residential land-use scenario (Bearzi January 2001). The incremental HI is 1.96 and the incremental estimated excess cancer risk is 6.94E-5 for the residential land-use scenario. Incremental risk calculations are above NMED guidelines for the residential land-use scenario.

Because the HI and excess cancer risk values are slightly above NMED guidelines for the industrial and residential land-use scenarios, additional evaluation of the data is warranted. SVOCs are the main risk drivers and were detected in only one of the six SVOC soil samples collected from this site. The sample was located in the shallow (5-foot interval) soil sample in borehole BH2. The 12 SVOC compounds detected in this sample are indicative of asphalt (NPS July 1997) and likely reflect asphalt fragments disposed of at the site that were collected in the sample. No significant VOC or metals contamination was detected in any of the samples from this site (except for arsenic concentrations slightly above background). It was noted during sampling that the Building 6584 drainfield area contained small amounts of residual construction debris and appeared to have been used on occasion as a vehicle parking area. It is therefore believed that the SVOC compounds detected in the single sample represent residual asphalt disposed of at the site and do not indicate significant or widespread SVOC contamination that could pose a threat to human health or the environment. With the removal of the SVOCs from the risk calculation, the incremental HI is reduced to 0.06 for the residential land-use scenario, the incremental excess cancer risk is reduced to 7.39E-7 for the industrial land-use scenario, and the incremental excess cancer risk is reduced to 2.93E-6 for the residential land-use scenario. These values are all well below NMED guidelines.

Because none of the radiological COCs exceeded background screening values, these COCs were eliminated from further evaluation in the risk assessment for both the industrial and residential land-use scenarios.

The excess cancer risk from the nonradiological and radiological COCs should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants, as noted in Office of Solid Waste and Emergency Response (OSWER) Directive No. 9200.4-18 (EPA 1997b). The summation of the nonradiological and radiological carcinogenic risks are tabulated in Table 12.

Table 12
Summation of Radiological and Nonradiological Risks from DSS Site 1029, Building 6584 North Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	7.39E-7	0.0	7.39E-7
Residential	2.93E-6	0.0	2.93E-6

DSS = Drain and Septic Systems.

Uncertainties associated with the calculations are considered small relative to the conservatism of the risk assessment analysis. Therefore, it is concluded that this site poses insignificant risk to human health under both the industrial and residential land-use scenarios.

VII. Ecological Risk Assessment

VII.1 Introduction

This section addresses the ecological risks associated with exposure to constituents of potential ecological concern (COPECs) in the soil at DSS Site 1029. A component of the NMED Risk-Based Decision Tree (NMED March 1998) is to conduct an ecological assessment that corresponds with that presented in the EPA's Ecological RAGS (EPA 1997c). The current methodology is tiered and contains an initial scoping assessment followed by a more detailed risk assessment. Initial components of the NMED's decision tree (a discussion of DQOs, data assessment, and evaluations of bioaccumulation as well as fate and transport potential) are addressed in previous sections of this report. Following the completion of the scoping assessment, a determination is made as to whether a more detailed examination of potential ecological risk is necessary. If deemed necessary, the scoping assessment proceeds to a risk assessment whereby a more quantitative estimate of ecological risk is conducted. Although this assessment incorporates conservatisms into the estimation of ecological risks, ecological relevance and professional judgment are also used as recommended by the EPA (1998) to ensure that predicted exposures of selected ecological receptors reflect those reasonably expected to occur at the site.

VII.2 Scoping Assessment

The scoping assessment focuses primarily on the likelihood of exposure of biota at, or adjacent to, the site to constituents associated with site activities. Included in this section are an evaluation of existing data and a comparison of maximum detected concentrations to background concentrations, examination of bioaccumulation potential, and fate and transport potential. A scoping risk-management decision (Section VII.2.4) involves summarizing the scoping results and determining whether further examination of potential ecological impacts is necessary.

VII.2.1 Data Assessment

As indicated in Section IV (Table 5), inorganic constituents in soil within the 0- to 5-foot depth interval that either exceeded background concentrations or have no quantified background concentration were as follows:

- Arsenic
- Cyanide
- Mercury
- Selenium
- Silver

Organic analytes detected in soil samples were as follows:

- Anthracene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(k)fluoranthene
- 2-Butanone
- Chrysene
- Dibenz[a,h]anthracene
- Fluoranthene
- Indeno(1,2,3-cd)pyrene
- Methylene chloride
- Phenanthrene
- Pyrene
- Toluene

As shown in Table 7, no radiological COPECs were identified for this site.

VII.2.2 Bioaccumulation

Among the COPECs listed in Section VII.2.1, the following were considered to have bioaccumulation potential in aquatic environments (Section IV, Tables 5 and 7):

- Arsenic
- Mercury
- Selenium
- Anthracene
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Chrysene
- Dibenz[a,h]anthracene
- Fluoranthene
- Indeno(1,2,3-cd)pyrene
- Phenanthrene
- Pyrene

It should be noted, however, that as directed by the NMED (March 1998), bioaccumulation for inorganic compounds is assessed exclusively based upon maximum reported bioconcentration factors (BCFs) for aquatic species. Because only aquatic BCFs are used to evaluate the bioaccumulation potential for metals, bioaccumulation in terrestrial species is likely to be overpredicted.

VII.2.3 Fate and Transport Potential

The potential for the COPECs to migrate from the source of contamination to other media or biota is discussed in Section V. As noted in Table 8 (Section V), wind, surface water, and biota are expected to be of low significance as transport mechanisms for COPECs at this site. Migration to groundwater is not anticipated. In general, transformation of COPECs is expected to be of low significance, but may be of moderate significance for some of the organic COPECs. Volatile COPECs (2-butanone, methylene chloride, and toluene) that are near the soil surface may be lost to the atmosphere.

VII.2.4 Scoping Risk-Management Decision

Based upon information gathered through the scoping assessment, it was concluded that complete ecological pathways may be associated with this site and that COPECs exist at the site. As a consequence, a risk assessment was deemed necessary to predict the potential level of ecological risk associated with the site.

VII.3 Risk Assessment

As concluded in Section VII.2.4, both complete ecological pathways and COPECs are associated with DSS Site 1029. The risk assessment performed for the site involves a quantitative estimate of current ecological risks using exposure models in association with exposure parameters and toxicity information obtained from the literature. The estimation of potential ecological risks is conservative to ensure that ecological risks are not underpredicted.

Components within the risk assessment include the following:

- Problem Formulation—sets the stage for the evaluation of potential exposure and risk.
- Exposure Estimation—provides a quantitative estimate of potential exposure.
- Ecological Effects Evaluation—presents benchmarks used to gauge the toxicity of COPECs to specific receptors.
- Risk Characterization—characterizes the ecological risk associated with exposure of the receptors to environmental media at the site.
- Uncertainty Assessment—discusses uncertainties associated with the estimation of exposure and risk.
- Risk Interpretation—evaluates ecological risk in terms of HQs and ecological significance.
- Risk Assessment Scientific/Management Decision Point—presents the decision to risk managers based upon the results of the ecological risk assessment.

VII.3.1 Problem Formulation

Problem formulation is the initial stage of the ecological risk assessment that provides the introduction to the risk evaluation process. Components that are addressed in this section include a discussion of ecological pathways and the ecological setting, identification of COPECs, and selection of ecological receptors. The conceptual model, ecological food webs, and ecological endpoints (other components commonly addressed in a risk assessment) are presented in "Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratories, New Mexico" (IT July 1998) and are not duplicated here.

VII.3.1.1 Ecological Pathways and Setting

DSS Site 1029 is less than an acre in size. The site is located in an area originally dominated by grassland habitat; however, this habitat has been highly disturbed in the area of the site. No threatened or endangered species are known to occur at this site (IT February 1995), and no surface-water bodies, seeps, or springs are associated with the site.

Complete ecological pathways may exist at this site through the exposure of plants and wildlife to COPECs in the soil. It was assumed that direct uptake of COPECs from soil is the major route of exposure for plants and that exposure of plants to wind-blown soil is minor. Exposure modeling for the wildlife receptors was limited to the food and soil ingestion pathways. Because of the lack of surface water at this site, exposure to COPECs through the ingestion of surface water was considered insignificant. Inhalation and dermal contact were also considered insignificant pathways with respect to ingestion (Sample and Suter 1994). Groundwater is not expected to be affected by COCs at this site.

VII.3.1.2 COPECs

Discharges of waste water from the Building 6584 North Septic System were the primary sources of COPECs at DSS Site 1029. Inorganic and organic COPECs identified for this site are listed in Section VII.2.1. The inorganic analytes were screened against background concentrations, and those that exceeded the approved SNL/NM background screening levels (Dinwiddie September 1997) for the area were considered to be COPECs. No radiological COPECs were identified for the site. Inorganic constituents that are essential nutrients, such as iron, magnesium, calcium, potassium, and sodium, were not included in this risk assessment as set forth by the EPA (1989). All organic analytes detected within the upper 5 feet of soil were considered to be COPECs for the site. In order to provide conservatism, this ecological risk assessment was based upon the maximum soil concentrations of the COPECs measured in the upper 5 feet of soil at this site. Table 5 presents maximum concentrations for the COPECs.

VII.3.1.3 Ecological Receptors

A nonspecific perennial plant was selected as the receptor to represent plant species at the site (IT July 1998). Vascular plants are the principal primary producers at the site and are key to the diversity and productivity of the wildlife community associated with the site. The deer mouse (*Peromyscus maniculatus*) and the burrowing owl (*Speotyto cunicularia*) were used to

represent wildlife use. Because of its opportunistic food habits, the deer mouse was used to represent a mammalian herbivore, omnivore, and insectivore. The burrowing owl was selected to represent a top predator at this site. The burrowing owl is present at SNL/NM and is designated a species of management concern by the U.S. Fish and Wildlife Service in Region 2, which includes the state of New Mexico (USFWS September 1995).

VII.3.2 Exposure Estimation

Direct uptake from the soil was considered the only significant route of exposure for terrestrial plants. Exposure modeling for the wildlife receptors was limited to food and soil ingestion pathways. Inhalation and dermal contact were considered insignificant pathways with respect to ingestion (Sample and Suter 1994). Drinking water was also considered to be an insignificant pathway because of the lack of surface water at this site. The deer mouse was modeled under three dietary regimes: as an herbivore (100 percent of its diet as plant material), as an omnivore (50 percent of its diet as plants and 50 percent as soil invertebrates), and as an insectivore (100 percent of its diet as soil invertebrates). The burrowing owl was modeled as a strict predator on small mammals (100 percent of its diet as deer mice). Because the exposure in the burrowing owl from a diet consisting of equal parts of herbivorous, omnivorous, and insectivorous mice would be equivalent to the exposure consisting of only omnivorous mice, the diet of the burrowing owl was modeled with intake of omnivorous mice only. Both species were modeled with soil ingestion comprising 2 percent of the total dietary intake. Table 13 presents the species-specific factors used in modeling exposures in the wildlife receptors. Justification for use of the factors presented in this table is described in the ecological risk assessment methodology document (IT July 1998).

Although home range is also included in this table, exposures for this risk assessment were modeled using an area use factor of 1.0, implying that all food items and soil ingested come from the site being investigated. The maximum COPEC concentrations measured in the upper 5 feet of soil were used to conservatively estimate potential exposures and risks to plants and wildlife at this site.

Table 14 provides the transfer factors used in modeling the concentrations of COPECs through the food chain. Table 15 presents maximum concentrations in soil and derived concentrations in tissues of the various food chain elements that are used to model dietary exposures for each of the wildlife receptors.

VII.3.3 Ecological Effects Evaluation

Table 16 shows benchmark toxicity values for the plant and wildlife receptors. For plants, the benchmark soil concentrations are based upon the lowest-observed-adverse-effect level (LOAEL). For wildlife, the toxicity benchmarks are based upon the no-observed-adverse-effect level (NOAEL) for chronic oral exposure in a taxonomically similar test species. Sufficient toxicity information was not available to estimate the LOAELs or NOAELs for some COPECs.

Table 13
Exposure Factors for Ecological Receptors at DSS Site 1029

Receptor Species	Class/Order	Trophic Level	Body Weight (kg)[a]	Food Intake Rate (kg/day)[b]	Dietary Composition[c]	Home Range (acres)
Deer Mouse (*Peromyscus maniculatus*)	Mammalia/ Rodentia	Herbivore	2.39E-2[d]	3.72E-3	Plants: 100% (+ Soil at 2% of intake)	2.7E-1[e]
Deer Mouse (*Peromyscus maniculatus*)	Mammalia/ Rodentia	Omnivore	2.39E-2[d]	3.72E-3	Plants: 50% Invertebrates: 50% (+ Soil at 2% of intake)	2.7E-1[e]
Deer Mouse (*Peromyscus maniculatus*)	Mammalia/ Rodentia	Insectivore	2.39E-2[d]	3.72E-3	Invertebrates: 100% (+ Soil at 2% of intake)	2.7E-1[e]
Burrowing Owl (*Speotyto cunicularia*)	Aves/ Strigiformes	Carnivore	1.55E-1[f]	1.73E-2	Rodents: 100% (+ Soil at 2% of intake)	3.5E+1[g]

[a]Body weights are in kg wet weight.
[b]Food intake rates are estimated from the allometric equations presented in Nagy (1987). Units are kg dry weight per day.
[c]Dietary compositions are generalized for modeling purposes. Default soil intake value of 2 percent of food intake.
[d]Silva and Downing 1995.
[e]EPA 1993, based upon the average home range measured in semiarid shrubland in Idaho.
[f]Dunning 1993.
[g]Haug et al. 1993.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
kg = Kilogram(s).

Table 14
Transfer Factors Used in Exposure Models for COPECs at DSS Site 1029

COPEC	Soil-to-Plant Transfer Factor	Soil-to-Invertebrate Transfer Factor	Food-to-Muscle Transfer Factor
Inorganic			
Arsenic	4.0E-2[a]	1.0E+0[b]	2.0E-3[a]
Cyanide	0.0E+0[c]	0.0E+0[c]	0.0E+0[c]
Mercury	1.0E+0[d]	1.0E+0[b]	2.5E-1[a]
Selenium	5.0E-1[d]	1.0E+0[b]	1.0E-1[d]
Silver	1.0E+0[d]	2.5E-1[c]	5.0E-3[d]
Organic[f]			
Anthracene	1.0E-1	2.2E+1	7.3E-4
Benzo(a)anthracene	2.2E-1	2.5E+1	1.2E-2
Benzo(b)fluoranthene	6.2E-3	2.8E+1	1.1E-1
Benzo(k)fluoranthene	4.3E-3	2.9E+1	2.1E-1
Benzo(g,h,i)perylene	6.1E-3	2.8E+1	1.2E-1
Benzo(a)pyrene	1.1E-2	2.7E+1	3.8E-2
2-Butanone	2.6E+1	1.4E+1	3.7E-8
Chrysene	1.5E-2	2.6E+1	2.3E-2
Dibenz[a,h]anthracene	6.8E-3	2.8E+1	9.5E-2
Fluoranthene	5.7E-2	2.3E+1	2.1E-3
Indeno(1,2,3-cd)pyrene	6.1E-3	2.8E+1	1.2E-1
Methylene chloride	7.3E+0	1.5E+1	3.6E-7
Phenanthrene	8.9E-2	2.2E+1	9.6E-4
Pyrene	3.3E-2	2.4E+1	5.8E-3
Toluene	1.0E+0	1.8E+1	1.3E-5

[a]Baes et al. 1984.
[b]Default value.
[c]No data found for food chain transfers of cyanide; however, because of its high metabolic activity, cyanide is assumed not to transfer in the food chain.
[d]NCRP January 1989.
[e]Stafford et al. 1991.
[f]Soil-to-plant and food-to-muscle transfer factors from equations developed in Travis and Arms (1988). Soil-to-invertebrate transfer factors from equations developed in Connell and Markwell (1990). All three equations are based upon the relationship of the transfer factor to the Log K_{ow} value of compound.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
NCRP = National Council on Radiation Protection and Measurements.

Table 15
Media Concentrations[a] for COPECs at DSS Site 1029

COPEC	Soil (Samples ≤ 5 ft bgs) (Maximum)[a]	Plant Foliage[b]	Soil Invertebrate[b]	Deer Mouse Tissues[c]
Inorganic				
Arsenic	5.0E+0	2.0E-1	5.0E+0	1.7E-2
Cyanide	7.0E-2[d]	0.0E+0	0.0E+0	0.0E+0
Mercury	2.1E-2[d]	2.1E-2	2.1E-2	1.6E-2
Selenium	3.0E-1[e]	1.5E-1	3.0E-1	7.2E-2
Silver	8.7E-1	8.7E-1	2.2E-1	8.8E-3
Organic				
Anthracene	3.7E-1[e]	3.8E-2	8.1E+0	9.3E-3
Benzo(a)anthracene	2.7E+0[e]	6.0E-2	6.8E+1	1.2E+0
Benzo(b)fluoranthene	3.1E+0[e]	1.9E-2	8.7E+1	1.5E+1
Benzo(k)fluoranthene	1.0E+0[e]	4.3E-3	2.9E+1	9.7E+0
Benzo(g,h,i)perylene	9.1E-1[e]	5.5E-3	2.6E+1	4.6E+0
Benzo(a)pyrene	2.2E+0[e]	2.5E-2	5.9E+1	3.5E+0
2-Butanone	5.9E-3[e]	1.6E-1	8.0E-2	1.4E-8
Chrysene	3.2E+0[e]	4.8E-2	8.3E+1	3.1E+0
Dibenz[a,h]anthracene	3.3E-1[e]	2.2E-3	9.2E+0	1.4E+0
Fluoranthene	4.1E+0[e]	2.3E-1	9.5E+1	3.2E-1
Indeno(1,2,3-cd)pyrene	8.8E-1[e]	5.4E-3	2.5E+1	4.5E+0
Methylene chloride	7.3E-3	5.4E-2	1.1E-1	9.3E-8
Phenanthrene	1.6E+0[e]	1.4E-1	3.6E+1	5.4E-2
Pyrene	3.5E+0[e]	1.1E-1	8.5E+1	7.7E-1
Toluene	1.9E-3	1.9E-3	3.4E-2	7.2E-7

[a]In milligrams per kilogram. All biotic media are based upon dry weight of the media. Soil concentration measurements are assumed to have been based upon dry weight. Values have been rounded to two significant digits after calculation.
[b]Product of the soil concentration and the corresponding transfer factor.
[c]Based upon the deer mouse with an omnivorous diet. Product of the average concentration ingested in food and soil times the food-to-muscle transfer factor times a wet weight-dry weight conversion factor of 3.125 (EPA 1993).
[d]Maximum concentration of parameter was one-half the detection limit.
[e]Estimated value.
bgs = Below ground surface.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
ft = Foot (feet).

Table 16
Toxicity Benchmarks for Ecological Receptors at DSS Site 1029

COPEC	Plant Benchmark[a,b]	Mammalian NOAELs			Avian NOAELs		
		Mammalian Test Species[c,d]	Test Species NOAEL[d,e]	Deer Mouse NOAEL[e,f]	Avian Test Species[d]	Test Species NOAEL[d,e]	Burrowing Owl NOAEL[e,g]
Inorganic							
Arsenic	10	mouse	0.126	6.42	mallard	5.14	–
Cyanide	–	rat[h]	68.7	126	–	–	–
Mercury (organic)	0.3	rat	0.032	0.063	mallard	0.0064	0.0064
Mercury (inorganic)	0.3	mouse	13.2	14.0	Japanese quail	0.45	0.45
Selenium	1	rat	0.2	0.391	screech owl	0.44	0.44
Silver	2	rat	17.8[i]	34.8	–	–	–
Organic							
Anthracene	18[j]	mouse	100[k]	106	–	–	–
Benzo(a)anthracene	18[j]	mouse	1.0[l]	1.1	–	–	–
Benzo(b)fluoranthene	18[j]	mouse	1.0[l]	1.1	–	–	–
Benzo(k)fluoranthene	18[j]	mouse	1.0[l]	1.1	–	–	–
Benzo(g,h,i)perylene	18[j]	mouse	1.0[l]	1.1	–	–	–
Benzo(a)pyrene	18[j]	mouse	1.0	1.1	–	–	–
2-Butanone	–	rat	1,771	3,464	–	–	–
Chrysene	18[j]	mouse	1.0[l]	1.1	–	–	–
Dibenz[a,h]anthracene	18[j]	mouse	1.0[l]	1.1	–	–	–
Fluoranthene	18[j]	mouse	12.5[k]	13.2	–	–	–
Indeno(1,2,3-cd)pyrene	18[j]	mouse	1.0[k]	1.1	–	–	–
Methylene chloride	–	rat	5.85	11.4	–	–	–
Phenanthrene	18[j]	mouse	1.0[l]	1.1	–	–	–
Pyrene	18[j]	mouse	7.5[k]	7.9	–	–	–
Toluene	200	mouse	26	27.5	–	–	–

[a]In mg/kg soil dry weight.
[b]Efroymson et al. 1997.
[c]Body weights (in kg) for the NOAEL conversion are as follows: lab mouse, 0.030; lab rat, 0.350 (except where noted).
[d]Sample et al. 1996, except where noted.
[e]In mg/kg body weight per day.
[f]Based upon NOAEL conversion methodology presented in Sample et al. (1996), using a deer mouse body weight of 0.0239 kg and a mammalian scaling factor of 0.25.

Table 16 (Concluded)
Toxicity Benchmarks for Ecological Receptors at DSS Site 1029

[g]Based upon NOAEL conversion methodology presented in Sample et al. (1996). The avian scaling factor of 0.0 was used, making the NOAEL independent of body weight.
[h]Body weight: 0.273 kg.
[i]Based upon a rat lowest-observed-adverse-effect level of 89 mg/kg/d (EPA 2003) and an uncertainty factor of 0.2.
[j]Sims and Overcash 1983.
[k]EPA (2003) with the application of a subchronic to chronic uncertainty factor of 0.5.
[l]No data available. Toxicity value based upon NOAEL for benzo(a)pyrene.

COPEC	= Constituent of potential ecological concern.
DSS	= Drain and Septic Systems.
EPA	= U.S. Environmental Protection Agency.
kg	= Kilogram(s).
mg	= Milligram(s).
mg/kg/d	= Milligram(s) per kilogram per day.
NOAEL	= No-observed-adverse-effect level.
–	= Insufficient toxicity data.

VII.3.4 Risk Characterization

Maximum concentrations in soil and estimated dietary exposures were compared to plant and wildlife benchmark values, respectively. Table 17 presents the results of these comparisons. HQs are used to quantify the comparison with benchmarks for plant and wildlife exposure. The only HQs that exceeded unity were for the omnivorous and/or insectivorous deer mice from exposure to the following:

- Arsenic
- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Chrysene
- Dibenz[a,h]anthracene (insectivorous deer mouse only)
- Fluoranthene (insectivorous deer mouse only)
- Indeno(1,2,3-cd)pyrene
- Phenanthrene
- Pyrene (insectivorous deer mouse only)

Because of a lack of sufficient toxicity information, HQs for plants could not be determined for cyanide, 2-butanone, and methylene chloride. Similarly, for the burrowing owl, HQs could not be determined for cyanide, silver, and all of the organic COPECs. As directed by the NMED, HIs were calculated for each of the receptors (the HI is the sum of chemical-specific HQs for all pathways for a given receptor). Total HIs were greater than unity for plants and both the omnivorous and insectivorous deer mice, with a maximum HI of 71 for the insectivorous deer mouse.

VII.3.5 Uncertainty Assessment

Many uncertainties are associated with the characterization of ecological risks at DSS Site 1029. These uncertainties result from assumptions used in calculating risk that could overestimate or underestimate true risk presented at the site. For this risk assessment, assumptions are made that are more likely to overestimate exposures and risk rather than to underestimate them. These conservative assumptions are used to be more protective of the ecological resources potentially affected by the site. Conservatisms incorporated into this risk assessment include the use of maximum analyte concentrations measured in soil samples to evaluate risk, the use of wildlife toxicity benchmarks based upon NOAEL values, and the incorporation of strict herbivorous and strict insectivorous diets for predicting the extreme HQ values for the deer mouse. Each of these uncertainties, which are consistent among each of the site-specific ecological risk assessments, is discussed in greater detail in the uncertainty section of the ecological risk assessment methodology document for the SNL/NM ER Program (IT July 1998).

Table 17
HQs for Ecological Receptors at DSS Site 1029

COPEC	Plant HQ[a]	Deer Mouse HQ (Herbivorous)[a]	Deer Mouse HQ (Omnivorous)[a]	Deer Mouse HQ (Insectivorous)[a]	Burrowing Owl HQ[a]
Inorganic					
Arsenic	5.0E-1	3.5E-1	**3.2E+0**	**6.0E+0**	2.5E-3
Cyanide	–	1.7E-6	1.7E-6	1.7E-6	–
Mercury (Organic)	6.8E-2	5.2E-2	5.2E-2	5.2E-2	2.9E-1
Mercury (Inorganic)	6.8E-2	2.3E-4	2.3E-4	2.3E-4	4.1E-3
Selenium	3.0E-1	6.2E-2	9.2E-2	1.2E-1	2.0E-2
Silver	4.4E-1	4.0E-3	2.5E-3	1.0E-3	–
Organic					
Anthracene	2.1E-2	6.7E-5	6.0E-3	1.2E-2	–
Benzo(a)anthracene	1.5E-1	1.7E-2	**5.0E+0**	**1.0E+1**	–
Benzo(b)fluoranthene	1.7E-1	1.2E-2	**6.4E+0**	**1.3E+1**	–
Benzo(k)fluoranthene	5.6E-2	3.6E-3	**2.1E+0**	**4.3E+0**	–
Benzo(g,h,i)perylene	5.1E-2	3.5E-3	**1.9E+0**	**3.8E+0**	–
Benzo(a)pyrene	1.2E-1	1.0E-2	**4.3E+0**	**8.6E+0**	–
2-Butanone	–	7.0E-6	5.3E-6	3.6E-6	–
Chrysene	1.8E-1	1.6E-2	**6.1E+0**	**1.2E+1**	–
Dibenz[a,h]anthracene	1.8E-2	1.3E-3	6.8E-1	**1.3E+0**	–
Fluoranthene	2.3E-1	3.7E-3	5.6E-1	**1.1E+0**	–
Indeno(1,2,3-cd)pyrene	4.9E-2	3.4E-3	**1.8E+0**	**3.6E+0**	–
Methylene chloride	–	7.3E-4	1.1E-3	1.5E-3	–
Phenanthrene	8.9E-2	2.6E-2	**2.6E+0**	**5.2E+0**	–
Pyrene	1.9E-1	3.6E-3	8.4E-1	**1.7E+0**	–
Toluene	9.5E-6	1.1E-5	1.0E-4	1.9E-4	–
HI[b]	**2.6E+0**	5.7E-1	**3.6E+1**	**7.1E+1**	3.1E-1

[a]**Bold** text indicates the HQ or HI exceeds unity.
[b]The HI is the sum of individual HQs.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
HI = Hazard index.
HQ = Hazard quotient.
– = Insufficient toxicity data available for risk estimation purposes.

In the estimation of ecological risk, background concentrations are included as a component of maximum on-site concentrations. Conservatisms in the modeling of exposure and risk can result in the prediction of risk to ecological receptors when exposed at background concentrations. As shown in Table 18, associated exposures to background are greater than 1.0 for arsenic. It is therefore likely that the actual risks from arsenic at DSS Site 1029 are overestimated by the HQs calculated in this risk assessment because of conservatisms incorporated into the exposure assessment and in the toxicity benchmarks for these COPECs. It should be noted that in the case of arsenic, exposure to background concentrations may account for the majority (88 percent) of the HQ values shown in Table 17.

Table 18
HQs for Ecological Receptors Exposed to
Background Concentrations at DSS Site 1029

COPEC	Plant HQ[a]	Deer Mouse HQ (Herbivorous)[a]	Deer Mouse HQ (Omnivorous)[a]	Deer Mouse HQ (Insectivorous)[a]	Burrowing Owl HQ[a]
Arsenic	4.4E-1	3.1E-1	**2.8E+0**	**5.2E+0**	2.2E-3

[a]**Bold** text indicates HQ or HI exceeds unity.
[b]The HI is the sum of individual HQs.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
HI = Hazard index.
HQ = Hazard quotient.

With regard to the toxicity benchmarks, it should be noted that for eight of the twelve polynuclear aromatic hydrocarbon (PAH) COPECs that resulted in HQs greater than unity (benzo[a]anthracene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, indeno[1,2,3-cd]pyrene, and phenanthrene), a chemical-specific toxicity benchmark was not available. The toxicity benchmarks for these eight PAHs were conservatively assumed to be equal to that of benzo(a)pyrene. Because benzo(a)pyrene is generally considered to be one of the most toxic PAHs, it is likely that the use of its toxicity benchmark for other PAHs could result in overestimation of actual risk.

A further source of uncertainty associated with the predictions of potential ecological risk at this site is the use of the maximum measured concentrations to evaluate exposure and risk. This results in a conservative exposure scenario that does not necessarily reflect actual site conditions. For DSS Site 1029, it should be noted that in the four soil samples used in the evaluation of ecological risk (i.e., the three samples from the 0-to-5-foot depth interval), all 11 of the maximum concentrations for PAHs that resulted in HQs greater than unity were from the same sample. Nondetections of these 11 COPECs were reported in the other three samples from this depth interval. Based upon one-half the detection limits for the nondetections, the average concentrations of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene are 0.74, 0.61, 0.84, 0.29, 0.31, 0.86, 0.15, 1.1, 0.28, 0.46, and 0.94 milligrams per kilogram, respectively. For the omnivorous deer mouse, these concentrations result in a reduction of all HQs to values lower than or equal to 1.7. For the insectivorous deer mouse these concentrations result in the reduction of all HQs to values lower than or equal to 3.5.

Because of the lack of avian toxicity information relative to that for mammals, only four toxicity benchmark values could be determined for the burrowing owl. Two of these were for the two forms of mercury and the others for arsenic and selenium. Because of this data gap, HQs for the burrowing owl could not be calculated for 17 of the 21 COPECs identified for this site. Therefore, a degree of uncertainty exists with regard to the potential for risk to this receptor. However, two factors make it unlikely that risk to this receptor exists. First, as shown in Table 15, the tissue concentrations in the small mammal prey of the burrowing owl are less than the tissue concentration modeled in the soil invertebrates for the COPECs lacking avian toxicity values (with the exception of cyanide). This, combined with the fact that the ingestion rate of the owl (normalized to body weight) is 71 percent of that of the deer mouse, results in the prediction that the exposures of the burrowing owl to these COPECs at this site are much lower (14 percent or less) than the exposures estimated for the insectivorous deer mouse. Second, the home range of the burrowing owl (35 acres) is much larger than the area of DSS Site 1029 (less than 1 acre). Therefore, an area use factor of 0.03 (or less) can be applied to the owl's exposure factors. This results in predicted exposures that are two or more orders of magnitude less than those of the insectivorous deer mouse. Based upon this difference in exposure, it is unlikely that the risk to the burrowing owl would be greater than the risk predicted for the insectivorous deer mouse in this assessment.

Finally, it should be noted that in this evaluation the COPECs are considered to be 100-percent bioavailable at this site. However, the releases of COPECs from the septic system at this site were to the subsurface soil. The soil samples upon which the risk assessment is based were from 5 feet bgs. This is the lower extreme of the soil considered accessible to ecological receptors, making it unlikely that burrowing animals will come into contact with these COPECs. The pathway resulting in the highest contribution to exposure in the deer mouse is the ingestion of soil invertebrates (see Table 14). These soil invertebrates are unlikely to be exposed to soil from these depths.

Based upon this uncertainty analysis, the potential for ecological risks at DSS Site 1029 is expected to be low. HQs greater than unity were predicted; however, closer examination of the exposure assumptions revealed an overestimation of risk primarily attributed to the use of conservative toxicity benchmarks, maximum concentrations, and maximum bioavailability to estimate exposure and risk to ecological receptors.

VII.3.6 Risk Interpretation

Ecological risks associated with DSS Site 1029 were estimated through a risk assessment that incorporated site-specific information when available. Initial predictions of potential risk to omnivorous and insectivorous deer mice from exposures to 11 PAHs (benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[g,h,i]perylene, benzo[k]fluoranthene, chrysene, dibenz[a,h]anthracene, fluoranthene, indeno[1,2,3-cd]pyrene, phenanthrene, and pyrene) can be attributed to conservative toxicity benchmarks, as well as the assumption of 100-percent bioavailability and the use of maximum detected concentrations to estimate exposure. Based upon this final analysis, the potential for ecological risks associated with DSS Site 1029 is expected to be low.

VII.3.7 Risk Assessment Scientific/Management Decision Point

After potential ecological risks associated with the site have been assessed, a decision is made regarding whether the site should be recommended for NFA or whether additional data should be collected to assess actual ecological risk at the site more thoroughly. With respect to this site, ecological risks are predicted to be low. The scientific/management decision is to recommend this site for NFA.

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APPENDIX 1
EXPOSURE PATHWAY DISCUSSION FOR CHEMICAL AND RADIONUCLIDE CONTAMINATION

Introduction

Sandia National Laboratories/New Mexico (SNL/NM) uses a default set of exposure routes and associated default parameter values developed for each future land-use designation being considered for SNL/NM Environmental Restoration (ER) Project sites. This default set of exposure scenarios and parameter values are invoked for risk assessments unless site-specific information suggests other parameter values. Because many SNL/NM solid waste management units (SWMUs) have similar types of contamination and physical settings, SNL/NM believes that the risk assessment analyses at these sites can be similar. A default set of exposure scenarios and parameter values facilitates the risk assessments and subsequent review.

The default exposure routes and parameter values used are those that SNL/NM views as resulting in a Reasonable Maximum Exposure (RME) value. Subject to comments and recommendations by the U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED), SNL/NM will use these default exposure routes and parameter values in future risk assessments.

At SNL/NM, all SWMUs exist within the boundaries of the Kirtland Air Force Base. Approximately 240 potential waste and release sites have been identified where hazardous, radiological, or mixed materials may have been released to the environment. Evaluation and characterization activities have occurred at all of these sites to varying degrees. Among other documents, the SNL/NM ER draft Environmental Assessment (DOE 1996) presents a summary of the hydrogeology of the sites and the biological resources present. When evaluating potential human health risk the current or reasonably foreseeable land use negotiated and approved for the specific SWMU/AOC, aggregate, or watershed will be used. The following references generally document these land uses: *Workbook: Future Use Management Area 2 (DOE et al. September 1995); Workbook: Future Use Management Area 1 (DOE et al. October 1995); Workbook: Future Use Management Areas 3, 4, 5, and 6 (DOE and USAF January 1996); Workbook: Future Use Management Area 7 (DOE and USAF March 1996).* At this time, all SNL/NM SWMUs have been tentatively designated for either industrial or recreational future land use. The NMED has also requested that risk calculations be performed based upon a residential land-use scenario. Therefore, all three land-use scenarios will be addressed in this document.

The SNL/NM ER Project has screened the potential exposure routes and identified default parameter values to be used for calculating potential intake and subsequent hazard index (HI), excess cancer risk and dose values. The EPA (EPA 1989) provides a summary of exposure routes that could potentially be of significance at a specific waste site. These potential exposure routes consist of:

- Ingestion of contaminated drinking water
- Ingestion of contaminated soil

- Ingestion of contaminated fish and shellfish
- Ingestion of contaminated fruits and vegetables
- Ingestion of contaminated meat, eggs, and dairy products
- Ingestion of contaminated surface water while swimming
- Dermal contact with chemicals in water
- Dermal contact with chemicals in soil
- Inhalation of airborne compounds (vapor phase or particulate)
- External exposure to penetrating radiation (immersion in contaminated air; immersion in contaminated water; and exposure from ground surfaces with photon-emitting radionuclides)

Based upon the location of the SNL/NM SWMUs and the characteristics of the surface and subsurface at the sites, we have evaluated these potential exposure routes for different land-use scenarios to determine which should be considered in risk assessment analyses (the last exposure route is pertinent to radionuclides only). At SNL/NM SWMUs, there is currently no consumption of fish, shellfish, fruits, vegetables, meat, eggs, or dairy products that originate on site. Additionally, no potential for swimming in surface water is present due to the high-desert environmental conditions. As documented in the RESRAD computer code manual (ANL 1993), risks resulting from immersion in contaminated air or water are not significant compared to risks from other radiation exposure routes.

For the industrial and recreational land-use scenarios, SNL/NM ER has, therefore, excluded the following four potential exposure routes from further risk assessment evaluations at any SNL/NM SWMU:

- Ingestion of contaminated fish and shellfish
- Ingestion of contaminated fruits and vegetables
- Ingestion of contaminated meat, eggs, and dairy products
- Ingestion of contaminated surface water while swimming
- Dermal contact with chemicals in water

That part of the exposure pathway for radionuclides related to immersion in contaminated air or water is also eliminated.

Based upon this evaluation, for future risk assessments the exposure routes that will be considered are shown in Table 1.

Table 1
Exposure Pathways Considered for Various Land-Use scenarios

Industrial	Recreational	Residential
Ingestion of contaminated drinking water	Ingestion of contaminated drinking water	Ingestion of contaminated drinking water
Ingestion of contaminated soil	Ingestion of contaminated soil	Ingestion of contaminated soil
Inhalation of airborne compounds (vapor phase or particulate)	Inhalation of airborne compounds (vapor phase or particulate)	Inhalation of airborne compounds (vapor phase or particulate)
Dermal contact (nonradiological constituents only) soil only	Dermal contact (nonradiological constituents only) soil only	Dermal contact (nonradiological constituents only) soil only
External exposure to penetrating radiation from ground surfaces	External exposure to penetrating radiation from ground surfaces	External exposure to penetrating radiation from ground surfaces

Equations and Default Parameter Values for Identified Exposure Routes

In general, SNL/NM expects that ingestion of compounds in drinking water and soil will be the more significant exposure routes for chemicals; external exposure to radiation may also be significant for radionuclides. All of the above routes will, however, be considered for their appropriate land-use scenarios. The general equation for calculating potential intakes via these routes is shown below. The equations are taken from "Assessing Human Health Risks Posed by Chemicals: Screening-Level Risk Assessment" (NMED March 2000) and "Technical Background Document for Development of Soil Screening Levels" (NMED December 2000). Equations from both documents are based upon the "Risk Assessment Guidance for Superfund" (RAGS): Volume 1 (EPA 1989, 1991). These general equations also apply to calculating potential intakes for radionuclides. A more in-depth discussion of the equations used in performing radiological pathway analyses with the RESRAD code may be found in the RESRAD Manual (ANL 1993). RESRAD is the only code designated by the U.S. Department of Energy (DOE) in DOE Order 5400.5 for the evaluation of radioactively contaminated sites (DOE 1993). The Nuclear Regulatory Commission (NRC) has approved the use of RESRAD for dose evaluation by licensees involved in decommissioning, NRC staff evaluation of waste disposal requests, and dose evaluation of sites being reviewed by NRC staff. EPA Science Advisory Board reviewed the RESRAD model. EPA used RESRAD in their rulemaking on radiation site cleanup regulations. RESRAD code has been verified, undergone several benchmarking analyses, and been included in the International Atomic Energy Agency's VAMP and BIOMOVS II projects to compare environmental transport models.

Also shown are the default values SNL/NM ER will use in RME risk assessment calculations for industrial, recreational, and residential land-use scenarios, based upon EPA and other governmental agency guidance. The pathways and values for chemical contaminants are discussed first, followed by those for radionuclide contaminants. RESRAD input parameters that are left as the default values provided with the code are not discussed. Further information relating to these parameters may be found in the RESRAD Manual (ANL 1993) or by directly accessing the RESRAD websites at: http://web.ead.anl.gov/resrad/home2/ or http://web.ead.anl.gov/resrad/documents/.

Generic Equation for Calculation of Risk Parameter Values

The equation used to calculate the risk parameter values (i.e., hazard quotients/HI, excess cancer risk, or radiation total effective dose equivalent [TEDE] [dose]) is similar for all exposure pathways and is given by:

Risk (or Dose) = Intake x Toxicity Effect (either carcinogenic, noncarcinogenic, or radiological)

$$= C \times (CR \times EFD/BW/AT) \times \text{Toxicity Effect} \quad (1)$$

where;

C = contaminant concentration (site specific)
CR = contact rate for the exposure pathway
EFD= exposure frequency and duration
BW = body weight of average exposure individual
AT = time over which exposure is averaged.

For nonradiological constituents of concern (COCs), the total risk/dose (either cancer risk or HI) is the sum of the risks/doses for all of the site-specific exposure pathways and contaminants. For radionuclides, the calculated radiation exposure, expressed as TEDE is compared directly to the exposure guidelines of 15 millirem per year (mrem/year) for industrial and recreational future use and 75 mrem/year for the unlikely event that institutional control of the site is lost and the site is used for residential purposes (EPA 1997).

The evaluation of the carcinogenic health hazard produces a quantitative estimate for excess cancer risk resulting from the COCs present at the site. This estimate is evaluated for determination of further action by comparison of the quantitative estimate with the potentially acceptable risk of 1E-5 for nonradiological carcinogens. The evaluation of the noncarcinogenic health hazard produces a quantitative estimate (i.e., the HI) for the toxicity resulting from the COCs present at the site. This estimate is evaluated for determination of further action by comparison of this quantitative estimate with the EPA standard HI of unity (1). The evaluation of the health hazard from radioactive compounds produces a quantitative estimate of doses resulting from the COCs present at the site. This estimated dose is used to calculate an assumed risk. However, this calculated risk is presented for illustration purposes only, not to determine compliance with regulations.

The specific equations used for the individual exposure pathways can be found in RAGS (EPA 1989) and are outlined below. The RESRAD Manual (ANL 1993) describes similar equations for the calculation of radiological exposures.

Soil Ingestion

A receptor can ingest soil or dust directly by working in the contaminated soil. Indirect ingestion can occur from sources such as unwashed hands introducing contaminated soil to food that is then eaten. An estimate of intake from ingesting soil will be calculated as follows:

$$I_s = \frac{C_s * IR * CF * EF * ED}{BW * AT}$$

where:

I_s = Intake of contaminant from soil ingestion (milligrams [mg]/kilogram [kg]-day)
C_s = Chemical concentration in soil (mg/kg)
IR = Ingestion rate (mg soil/day)
CF = Conversion factor (1E-6 kg/mg)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

It should be noted that it is conservatively assumed that the receptor only ingests soil from the contaminated source.

Soil Inhalation

A receptor can inhale soil or dust directly by working in the contaminated soil. An estimate of intake from inhaling soil will be calculated as follows (EPA August 1997):

$$I_s = \frac{C_s * IR * EF * ED * \left(1/VF \text{ or } 1/PEF\right)}{BW * AT}$$

where:

I_s = Intake of contaminant from soil inhalation (mg/kg-day)
C_s = Chemical concentration in soil (mg/kg)
IR = Inhalation rate (cubic meters [m^3]/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
VF = soil-to-air volatilization factor (m^3/kg)
PEF = particulate emission factor (m^3/kg)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Soil Dermal Contact

$$D_a = \frac{C_s * CF * SA * AF * ABS * EF * ED}{BW * AT}$$

where:

D_a = Absorbed dose (mg/kg-day)
C_s = Chemical concentration in soil (mg/kg)
CF = Conversion factor (1E-6 kg/mg)
SA = Skin surface area available for contact (cm^2/event)
AF = Soil to skin adherence factor (mg/cm^2)
ABS = Absorption factor (unitless)
EF = Exposure frequency (events/year)

ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Groundwater Ingestion

A receptor can ingest water by drinking it or through using household water for cooking. An estimate of intake from ingesting water will be calculated as follows (EPA August 1997):

$$I_w = \frac{C_w * IR * EF * ED}{BW * AT}$$

where:

I_w = Intake of contaminant from water ingestion (mg/kg/day)
C_w = Chemical concentration in water (mg/liter [L])
IR = Ingestion rate (L/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Groundwater Inhalation

The amount of a constituent taken into the body via exposure to volatilization from showering or other household water uses will be evaluated using the concentration of the constituent in the water source (EPA 1991 and 1992). An estimate of intake from volatile inhalation from groundwater will be calculated as follows (EPA 1991):

$$I_w = \frac{C_w * K * IR_i * EF * ED}{BW * AT}$$

where:

I_w = Intake of volatile in water from inhalation (mg/kg/day)
C_w = Chemical concentration in water (mg/L)
K = volatilization factor (0.5 L/m^3)
IR_i = Inhalation rate (m^3/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged—days)

For volatile compounds, volatilization from groundwater can be an important exposure pathway from showering and other household uses of groundwater. This exposure pathway will only be evaluated for organic chemicals with a Henry's Law constant greater than $1x10^{-5}$ and with a molecular weight of 200 grams/mole or less (EPA 1991).

Tables 2 and 3 show the default parameter values suggested for use by SNL/NM at SWMUs, based upon the selected land-use scenarios for nonradiological and radiological COCs,

respectively. References are given at the end of the table indicating the source for the chosen parameter values. SNL/NM uses default values that are consistent with both regulatory guidance and the RME approach. Therefore, the values chosen will, in general, provide a conservative estimate of the actual risk parameter. These parameter values are suggested for use for the various exposure pathways, based upon the assumption that a particular site has no unusual characteristics that contradict the default assumptions. For sites for which the assumptions are not valid, the parameter values will be modified and documented.

Summary

SNL/NM will use the described default exposure routes and parameter values in risk assessments at sites that have an industrial, recreational, or residential future land-use scenario. There are no current residential land-use designations at SNL/NM ER sites, but NMED has requested this scenario to be considered to provide perspective of the risk under the more restrictive land-use scenario. For sites designated as industrial or recreational land use, SNL/NM will provide risk parameter values based upon a residential land-use scenario to indicate the effects of data uncertainty on risk value calculations or in order to potentially mitigate the need for institutional controls or restrictions on SNL/NM ER sites. The parameter values are based upon EPA guidance and supplemented by information from other government sources. If these exposure routes and parameters are acceptable, SNL/NM will use them in risk assessments for all sites where the assumptions are consistent with site-specific conditions. All deviations will be documented.

Table 2
Default Nonradiological Exposure Parameter Values for Various Land-Use scenarios

Parameter	Industrial	Recreational	Residential
General Exposure Parameters			
Exposure Frequency (day/yr)	250[a,b]	8.7 (4 hr/wk for 52 wk/yr)[a,b]	350[a,b]
Exposure Duration (yr)	25[a,b,c]	30[a,b,c]	30[a,b,c]
Body Weight (kg)	70[a,b,c]	70 Adult[a,b,c] 15 Child[a,b,c]	70 Adult[a,b,c] 15 Child[a,b,c]
Averaging Time (days) for Carcinogenic Compounds (= 70 yr x 365 day/yr) for Noncarcinogenic Compounds (= ED x 365 day/yr)	25,550[a,b] 9,125[a,b]	25,550[a,b] 10,950[a,b]	25,550[a,b] 10,950[a,b]
Soil Ingestion Pathway			
Ingestion Rate (mg/day)	100[a,b]	200 Child[a,b] 100 Adult[a,b]	200 Child[a,b] 100 Adult[a,b]
Inhalation Pathway			
Inhalation Rate (m^3/day)	20[a,b]	15 Child[a] 30 Adult[a]	10 Child[a] 20 Adult[a]
Volatilization Factor (m^3/kg)	Chemical Specific	Chemical Specific	Chemical Specific
Particulate Emission Factor (m^3/kg)	1.36E9[a]	1.36E9[a]	1.36E9[a]
Water Ingestion Pathway			
Ingestion Rate (liter/day)	2.4[a]	2.4[a]	2.4[a]
Dermal Pathway			
Skin Adherence Factor (mg/cm^2)	0.2[a]	0.2 Child[a] 0.07 Adult[a]	0.2 Child[a] 0.07 Adult[a]
Exposed Surface Area for Soil/Dust (cm^2/day)	3,300[a]	2,800 Child[a] 5,700 Adult[a]	2,800 Child[a] 5,700 Adult[a]
Skin Adsorption Factor	Chemical Specific	Chemical Specific	Chemical Specific

[a]Technical Background Document for Development of Soil Screening Levels (NMED 2000).
[b]Risk Assessment Guidance for Superfund, Vol. 1, Part B (EPA 1991).
[c]Exposure Factors Handbook (EPA August 1997).
ED = Exposure duration.
EPA = U.S. Environmental Protection Agency.
hr = Hour(s).
kg = Kilogram(s).
m = Meter(s).
mg = Milligram(s).
NA = Not available.
wk = Week(s).
yr = Year(s).

Table 3
Default Radiological Exposure Parameter Values for Various Land-Use scenarios

Parameter	Industrial	Recreational	Residential
General Exposure Parameters			
Exposure Frequency	8 hr/day for 250 day/yr	4 hr/wk for 52 wk/yr	365 day/yr
Exposure Duration (yr)	25[a,b]	30[a,b]	30[a,b]
Body Weight (kg)	70 Adult[a,b]	70 Adult[a,b]	70 Adult[a,b]
Soil Ingestion Pathway			
Ingestion Rate	100 mg/day[c]	100 mg/day[c]	100 mg/day[c]
Averaging Time (days) (= 30 yr x 365 day/yr)	10,950[d]	10,950[d]	10,950[d]
Inhalation Pathway			
Inhalation Rate (m^3/yr)	7,300[d,e]	10,950[e]	7,300[d,e]
Mass Loading for Inhalation g/m^3	1.36 E-5[d]	1.36 E-5[d]	1.36 E-5[d]
Food Ingestion Pathway			
Ingestion Rate, Leafy Vegetables (kg/yr)	NA	NA	16.5[c]
Ingestion Rate, Fruits, Non-Leafy Vegetables & Grain (kg/yr)	NA	NA	101.8[b]
Fraction Ingested	NA	NA	0.25[b,d]

[a]Risk Assessment Guidance for Superfund, Vol. 1, Part B (EPA 1991).
[b]Exposure Factors Handbook (EPA August 1997).
[c]EPA Region VI guidance (EPA 1996).
[d]For radionuclides, RESRAD (ANL 1993).
[e]SNL/NM (February 1998).
EPA = U.S. Environmental Protection Agency.
g = Gram(s)
hr = Hour(s).
kg = Kilogram(s).
m = Meter(s).
mg = Milligram(s).
NA = Not applicable.
wk = Week(s).
yr = Year(s).

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