7-1-2004

Justification for Class III Permit Modification July 2004 DSS Site 1093 Operable Unit 1295 Building 6584 West Septic System (TA-III)

Sandia National Laboratories/NM

Sandia National Laboratories

Justification for Class III Permit Modification

July 2004

DSS Site 1093
Operable Unit 1295
Building 6584 West Septic System (TA-III)

NFA (SWMU Assessment Report) Submitted December 2003

Environmental
Restoration
Project

United States Department of Energy
Albuquerque Operations Office

Sandia National Laboratories

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United States Department of Energy
Albuquerque Operations Office

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

DEC 1 7 2003

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:

Enclosed is one of two NMED copies of the SWMU Assessment Reports and Proposals for No Further Action (NFA) for Drain and Septic Systems (DSS) Sites 1009, 1025, 1026, 1027, 1033, 1093, 1101, 1105, and 1112 at Sandia National Laboratories, New Mexico, EPA ID No. NM5890110518. Per our verbal agreement, the second NMED copy is being sent directly to the Albuquerque Group Manager.

This submittal includes descriptions of the site characterization work, soil characterization data, and risk assessments for the nine DSS sites listed above. The risk assessments conclude that for these 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,

Karen L. Boardman
Manager

Enclosure

cc w/enclosure:
L. King, EPA, Region 6 (2 copies, via Certified Mail)
W. Moats, NMED-HWB (via Certified Mail)
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Sandia National Laboratories/New Mexico
Environmental Restoration Project

SWMU ASSESSMENT REPORT AND PROPOSAL FOR NO FURTHER ACTION DRAIN AND SEPTIC SYSTEMS SITE 1093, BUILDING 6584 WEST SEPTIC SYSTEM

December 2003

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
GS	Gore-Sorber™
HE	high explosive(s)
HI	hazard index
HWB	Hazardous Waste Bureau
KAFB	Kirtland Air Force Base
kg	kilogram(s)
L	liter(s)
MDL	method detection limit
mg	milligram(s)
NFA	no further action
NMED	New Mexico Environment Department
OU	Operable Unit
PCB	polychlorinated biphenyl
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
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 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 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 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, 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 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 1093: BUILDING 6584 WEST SEPTIC SYSTEM

2.1 Summary

The SNL/NM ER Project conducted an assessment of DSS Site 1093, the Building 6584 west 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 1093. 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 west septic system, and that it does not pose a threat to human health or the environment under either an industrial or residential land-use scenario. Current operations at the site are conducted in accordance with applicable laws and regulations that are protective of the environment. Effluent discharges from the facility are now directed to the City of Albuquerque sewer system.

Review and analysis of all relevant data for DSS Site 1093 indicate that concentrations of constituents of concern (COCs) at this site were found to be below applicable risk assessment action levels. Thus DSS Site 1093 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 1093 is located in SNL/NM Technical Area (TA)-III on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (Figure 2.2.1-1). DSS Site 1093 is located approximately 90 feet west of Building 6584 (Figure 2.2.1-2). The abandoned septic system consisted of a septic tank and distribution box that emptied to a drainfield consisting of five 80- to 100-foot-long drain lines (Figure 2.2.1-2). Construction details are based upon engineering drawings (SNL/NM September 1983), site inspections, and backhoe excavations of the system.

The surface geology at DSS Site 1093 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 1093, 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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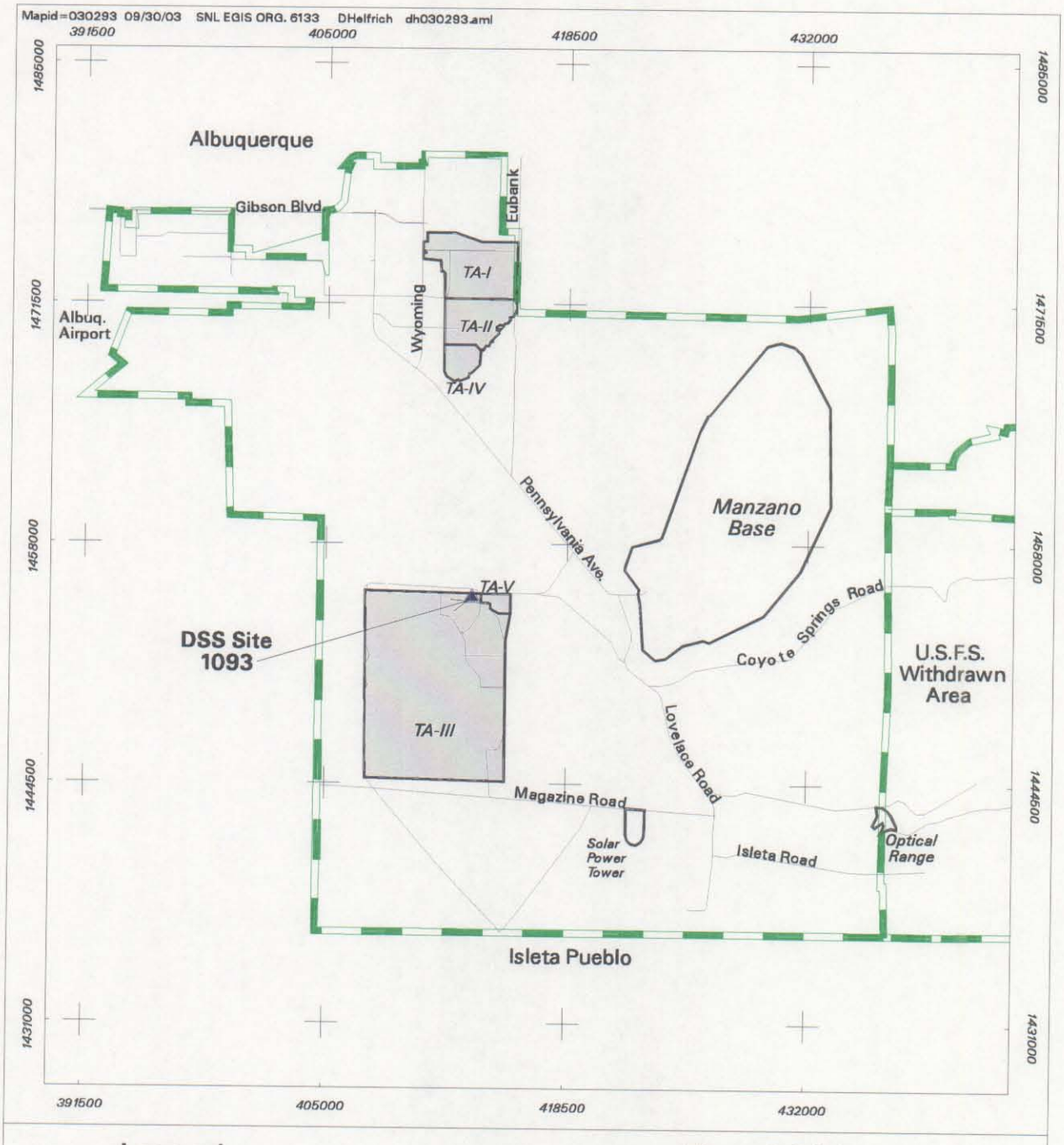


Legend

- DSS Site 1093
- Major Road
- KAFB Boundary
- SNL Technical Area

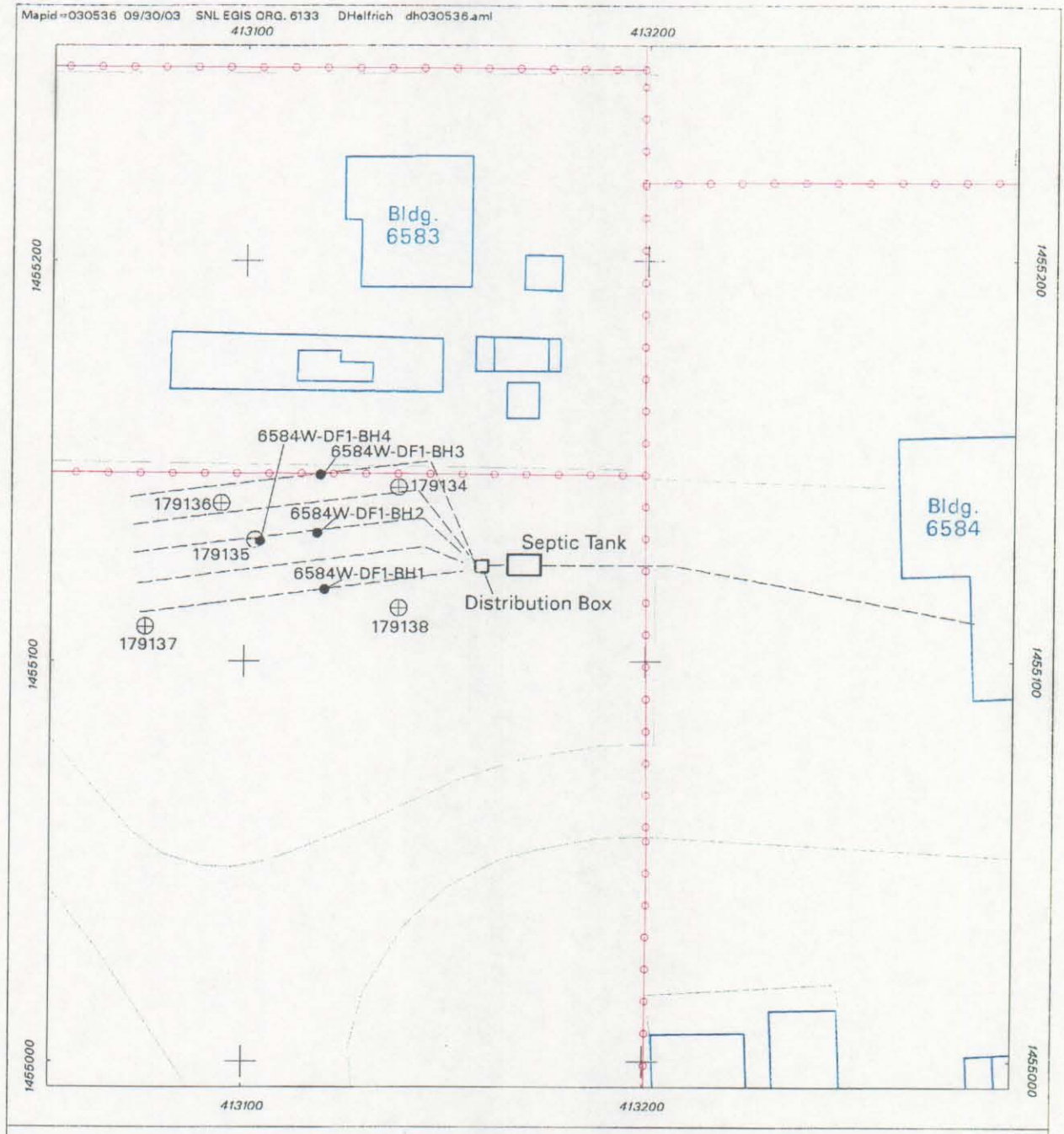
Figure 2.2.1-1
Location Map of Drain and Septic Systems (DSS) Site Number 1093, Bldg. 6584 West Septic System, TA-III

0 4500 9000
Scale in Feet

0 1080 2160
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000A50



Legend

- Borehole Location
- Gore-Sorber Sample Location
- Septic Tank / Distribution Box
- Fence
- Unpaved Road
- Building / Structure
- Septic Drain Line

Figure 2.2.1-2
Site Map of Drain and Septic Systems (DSS) Site Number 1093, Bldg. 6584 West Septic System, TA-III

0 20 40
Scale in Feet

0 4.8 9.6
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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conductivities (SNL/NM March 1996). Site vegetation primarily consists of desert grasses, shrubs, and cacti.

The ground surface in the vicinity of the site is flat to very slightly inclined to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.23 miles east 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 (Thompson and Smith 1985, SNL/NM March 1996).

The site lies at an average elevation of approximately 5,404 feet above mean sea level (SNL/NM April 1995). Depth to groundwater is approximately 483 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 1093 are KAFB-4, approximately 2.7 miles to the northwest and KAFB-11, approximately 3.0 miles to the northeast. The nearest groundwater monitoring well is TAV-MW5, approximately 150 feet north of the site.

2.2.2 Operational History

Available information indicates that Building 6584, currently known as the Administrative Center for Test Engineering Facility, was constructed in 1963 (SNL/NM March 2003), and it is that assumed the septic system was constructed at the same time. 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.

In the early 1990s, the Building 6584 west septic system was connected to an extension of the City of Albuquerque sanitary sewer system (Jones July 1993). The old septic system line was disconnected and capped, and the system was 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 1093 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1093 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 the late 1990s or early 1991 (SNL/NM April 1991), July 1992 (SNL/NM June 1993), and July 1995 (SNL/NM December 1995) waste characterization samples were collected from the septic tank (Investigation 1). In May 1997, a backhoe was used to physically locate the buried drainfield drain lines at the site (Investigation 2). In July 1998 and August 1999, near-surface soil samples were collected from four borings in the drainfield area (Investigation 3). In late April and early May 2002, a passive soil-vapor survey was conducted to determine whether significant volatile organic compound (VOC) contamination was present in the soil around the drainfield (Investigation 4). Investigations 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.

In December 1990 or January 1991, July 1992, and July 1995, as part of the SNL/NM Septic System Monitoring Program, aqueous and sludge samples were collected from the Building 6584 west septic tank (SNL/NM April 1991, SNL/NM June 1993, SNL/NM December 1995). In December 1990 or January 1991, an aqueous sample was analyzed at an off-site laboratory for VOCs, semivolatile organic compounds (SVOCs), phenolics, metals, and radiological constituents. On July 28 and July 29, 1992, a sludge sample was collected from the septic tank and analyzed at an off-site laboratory for radiological constituents. On July 6, 1995, an off-site laboratory analyzed an aqueous sample for VOCs, SVOCs, pesticides/ polychlorinated biphenyls (PCBs), metals, formaldehyde, fluoride, nitrate plus nitrite, oil and grease, total phenol, and radiological constituents. The analytical results are presented in Annex A. 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.

On February 15, 1996, the residual contents consisting of approximately 1,900 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 22, 1997, a backhoe was used to determine the location, dimensions, and average depth of the DSS Site 1093 drainfield system. The drainfield was found to have five laterals, arranged as shown on Figure 2.2.1-2, with an average drain line depth of 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). An initial round of soil sampling was conducted on July 1, 1998. Samples were collected from three drainfield boreholes. However, because of auger refusal problems at 7 feet bgs in borehole 6584W-DF1-BH2, only the shallow interval samples (5 feet bgs) were successfully collected. On July 18, 1998, deep interval samples (10 feet bgs) were collected from a new, fourth boring location (6584W-DF1-BH4) (Figure 2.2.1-2).

On August 19, 1999, additional VOC, PCB, total cyanide, and hexavalent chromium samples were collected from the original three sample locations. Refusal problems at depth were not experienced in any of the three borehole locations during this sampling round.

Soil boring locations are shown on Figure 2.2.1-2. Figure 3.4-1 shows soil samples being collected at DSS Site 1093. A summary of the boreholes, sample depths, sample analyses, analytical methods, laboratories, and sample dates are presented in Table 3.4-1.

3.4.1 Soil Sampling Methodology

An auger drill rig was used to sample all boreholes at two depth intervals. In drainfields, 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-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 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 1093 soil samples are summarized in Table 3.4-1.

Figure 3.4-1
Collecting soil samples with the Geoprobe at DSS Site 1093, Building 6584
west septic system drainfield area.
View to the northeast. August 19, 1999

Table 3.4-1
Summary of Area Sampled, Analytical Methods, and Laboratories Used for
DSS Site 1093, Building 6584 West Septic System Soil Samples

Sampling Area	Number of Borehole Locations	Top of Sampling Intervals in Each Borehole (ft bgs)	Total Number of Soil Samples	Total Number of Duplicate Samples	Analytical Parameters and EPA Methods[a]	Analytical Laboratory	Date Samples Collected
Drainfield	3	5, 10	6	0	VOCs EPA Method 8260	GEL	08-19-99
	4	5, 10	6	0	SVOCs EPA Method 8270	GEL	07-01-98 07-13-98
	3	5, 10	6	1	PCBs EPA Method 8082	GEL	08-19-99
	4	5, 10	6	0	HE EPA Method 8095	ERCL	07-01-98 07-13-98
	4	5, 10	6	0	RCRA Metals EPA Methods 6020/7000	ERCL	07-01-98 07-13-98 08-19-98
	3	5, 10	6	1	Hexavalent Chromium EPA Method 7196A	GEL	08-19-99
	3	5, 10	6	1	Total Cyanide EPA Method 9012A	GEL	08-19-99
	4	5, 10	6	0	Gamma Spectroscopy EPA Method 901.1	RPSD	07-01-98 07-13-98
	4	5, 10	6	0	Gross Alpha/ Beta Activity EPA Method 900.0	GEL	07-01-98 07-13-98

[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 1093 are summarized and discussed below. Samples were collected from the borehole locations shown on Figure 2.2.1-2.

VOCs

VOC analytical results for the six soil samples collected from the three drainfield boreholes are summarized in Table 3.4.2-1. The method detection limits (MDLs) for the VOC analyses are presented in Table 3.4.2-2. The compound 2-butanone was detected in all six of the soil samples, and toluene was detected in four of the six samples. These compounds are common laboratory contaminants and may not indicate soil contamination at this site.

SVOCs

SVOC analytical results for the six soil samples collected from the drainfield boreholes are summarized in Table 3.4.2-3. The MDLs for the SVOC analyses are presented in Table 3.4.2-4. No SVOCs were detected in the six soil samples or the associated equipment blank (EB).

PCBs

PCB analytical results for the six soil samples and one duplicate soil sample collected from the drainfield boreholes are summarized in Table 3.4.2-5. The MDLs for the PCB analyses are presented in Table 3.4.2-6. No PCBs were detected in either the six soil samples or one duplicate soil sample.

HE Compounds

High explosives (HE) compound analytical results for the six soil samples collected from the drainfield boreholes are summarized in Table 3.4.2-7. The MDLs for the HE analyses are presented in Table 3.4.2-8. No HE compounds were detected in the six soil samples or the associated EB.

RCRA Metals and Hexavalent Chromium

Resource Conservation and Recovery Act (RCRA) metals and hexavalent chromium analytical results for the six soil samples and one duplicate soil sample collected from the drainfield boreholes are presented in Table 3.4.2-9. The MDLs for the metals analyses are presented in Table 3.4.2-10.

Arsenic was detected at 4.5 milligrams (mg)/kilogram (kg), slightly above the NMED-approved background concentration of 4.4 mg/kg, in the 10-foot-bgs sample from the borehole 6584W-DF1-BH3.

Table 3.4.2-1
Summary of DSS Site 1093, Building 6584 West 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	Toluene
602763	6584W-DF1-BH1-5-S	5	11	**0.9 J (1)**
602763	6584W-DF1-BH1-10-S	10	20	1.8
602763	6584W-DF1-BH2-5-S	5	23	ND (0.9)
602763	6584W-DF1-BH2-10-S	10	23	1.5
602763	6584W-DF1-BH3-5-S	5	27	ND (0.9)
602763	6584W-DF1-BH3-10-S	10	22	3.8

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.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
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.
VOC = Volatile organic compound.
W = West.

Table 3.4.2-2
Summary of DSS Site 1093, Building 6584 West 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 1093, Building 6584 West 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)	
600441	6584W-DF1-BH1-5-S	5	ND
600441	6584W-DF1-BH1-10-S	10	ND
600441	6584W-DF1-BH2-5-S	5	ND
600441	6584W-DF1-BH3-5-S	5	ND
600441	6584W-DF1-BH3-10-S	10	ND
600451	6584W-DF1-BH4-10-S	10	ND
Quality Assurance/Quality Control Samples (µg/L)			
600441	6584W-DF1-EB	NA	ND

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
EB = Equipment blank.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.
S = Soil sample.
SVOC = Semivolatile organic compound.
W = West.

Table 3.4.2-4
Summary of DSS Site 1093, Building 6584 West 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 1093, Building 6584 West 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 1093, Building 6584 West 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)	
602763	6584W-DF1-BH1-5-S	5	ND
602763	6584W-DF1-BH1-10-S	10	ND
602763	6584W-DF1-BH2-5-S	5	ND
602763	6584W-DF1-BH2-10-S	10	ND
602763	6584W-DF1-BH2-10-DU	10	ND
602763	6584W-DF1-BH3-5-S	5	ND
602763	6584W-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.
µg/kg = Microgram(s) per kilogram.
ND = Not detected.
PCB = Polychlorinated biphenyl.
S = Soil sample.
W = West.

Table 3.4.2-6
Summary of DSS Site 1093, Building 6584 West Septic System
Confirmatory Soil Sampling, PCB Analytical MDLs
August 1999
(Off-Site Laboratory)

Analyte	EPA Method 8082[a] Detection Limit (µg/kg)
Aroclor-1016	1.21
Aroclor-1221	2.8
Aroclor-1232	1.62
Aroclor-1242	1.66
Aroclor-1248	0.901
Aroclor-1254	1.16
Aroclor-1260	0.937

[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 biphenyl.

Table 3.4.2-7
Summary of DSS Site 1093, Building 6584 West Septic System
Confirmatory Soil Sampling, HE Compound Analytical Results
July 1998
(On-Site Laboratory)

Sample Attributes			HE (EPA Method 8095[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
600440	6584W-DF1-BH1-5-S	5	ND
600440	6584W-DF1-BH1-10-S	10	ND
600440	6584W-DF1-BH2-5-S	5	ND
600440	6584W-DF1-BH3-5-S	5	ND
600440	6584W-DF1-BH3-10-S	10	ND
600450	6584W-DF1-BH4-10-S	10	ND
Quality Assurance/Quality Control Samples (µg/L)			
600440	6584W-DF1-EB	NA	ND

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
EB = Equipment blank.
ER = Environmental Restoration.
ft = Foot (feet).
HE = High explosive(s).
ID = Identification.
µg/L = Microgram(s) per liter.
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
ND = Not detected.
S = Soil sample.
W = West.

Table 3.4.2-8
Summary of DSS Site 1093, Building 6584 West Septic System
Confirmatory Soil Sampling, HE Compound Analytical MDLs
July 1998
(On-Site Laboratory)

Analyte	EPA Method 8095[a] Detection Limit (mg/kg)
2-Amino-4,6-dinitrotoluene	0.12–0.13
4-Amino-2,6-dinitrotoluene	0.099–0.11
1,3-Dinitrobenzene	0.069–0.075
2,4-Dinitrotoluene	0.23–0.25
2,6-Dinitrotoluene	0.27–0.29
HMX	0.12–0.13
Nitrobenzene	0.16–0.17
2-Nitrotoluene	0.14–0.15
3-Nitrotoluene	0.14–0.15
4-Nitrotoluene	0.12–0.13
Pentaerythritol tetranitrate	0.32–0.34
RDX	0.17–0.18
1,3,5-Trinitrobenzene	0.099–0.11
2,4,6-Trinitrotoluene	0.27–0.29

[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.

Table 3.4.2-9
Summary of DSS Site 1093, Building 6584 West Septic System
Confirmatory Soil Sampling, Metals Analytical Results
July 1998 and August 1999
(On- and Off-Site Laboratories)

Sample Attributes			Metals (EPA Method 6020/7000/7196A[a]) (mg/kg)								
Record Number[b]	ER Sample ID	Sample Depth (ft)	Arsenic	Barium	Cadmium	Chromium	Chromium (VI)	Lead	Mercury	Selenium	Silver
600440, 602763	6584W-DF1-BH1-5-S	5	3.6	82	0.12 J (0.16)	5	ND (0.0592)	3.9	0.047 J (0.16)	0.71 J (1.2)	ND (0.039)
600440, 602763	6584W-DF1-BH1-10-S	10	4.1	87	0.078 J (0.17)	5.6	0.111 J (0.202)	5.5	0.049 J (0.17)	ND (0.32)	ND (0.043)
600440, 602763	6584W-DF1-BH2-5-S	5	4.3	95	0.15 J (0.16)	7.5	ND (0.0605)	6	ND (0.041)	0.6 J (1.2)	ND (0.041)
602763	6584W-DF1-BH2-10-S	10	NS	NS	NS	NS	0.06 J (0.2)	NS	NS	NS	NS
602763	6584W-DF1-BH2-10-DU	10	NS	NS	NS	NS	ND (0.0603)	NS	NS	NS	NS
600440, 602763	6584W-DF1-BH3-5-S	5	2.9	77	0.15 J	7.9	ND (0.0594)	4.6	ND (0.039)	ND (0.3)	ND (0.039)
600440, 602763	6584W-DF1-BH3-10-S	10	4.5	97	0.1 J	10	ND (0.06)	6.1	ND (0.045)	ND (0.33)	ND (0.045)
600450	6584W-DF1-BH4-10-S	10	3.3	69	0.072 J (0.17)	11	NS	6.4	ND (0.042)	ND (0.31)	ND (0.042)
Background Concentration—Southwest Area Supergroup[c]			4.4	214	0.9	15.9	1	11.8	<0.1	<1	<1
Quality Assurance/Quality Control Samples (µg/L)											
600440	6584W-DF1-EB	NA	ND (3.4)	ND (4)	ND (0.23)	ND (8.5)	NS	ND (1.7)	ND (0.23)	2.1 J (6.8)	ND (0.23)

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

[a]EPA November 1986.

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

[c]Dinwiddie September 1997.

BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate.
EB = Equipment blank.
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/L = Microgram(s) per liter.
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
NS = Not sampled.
S = Soil sample.
W = West.

Table 3.4.2-10
Summary of DSS Site 1093, Building 6584 West Septic System
Confirmatory Soil Sampling, Metals Analytical MDLs
July 1998 and August 1999
(On- and Off-Site Laboratories)

Analyte	EPA Method 6020/7196A[a] Detection Limit (mg/kg)
Arsenic	0.58–0.65
Barium	0.49–0.54
Cadmium	0.039–0.043
Chromium	0.68–0.76
Chromium (VI)	0.0589–0.0607
Lead	0.29–0.32
Mercury	0.039–0.043
Selenium	0.29–0.32
Silver	0.039–0.043

[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 soil sample collected from the drainfield boreholes are summarized in Table 3.4.2-11. The MDLs for the cyanide analyses are presented in Table 3.4.2-12. Cyanide was detected in the 5-foot-bgs sample from borehole 6584W-DF1-BH2 drilled on August 19, 1999.

Radionuclides

Gamma spectroscopy results for the six soil samples collected from the drainfield boreholes are presented in Table 3.4.2-13. No activities above NMED-approved background activity levels were detected in any sample analyzed.

Gross Alpha/Beta Activity

Gross alpha/beta analytical results for the six soil samples collected from the drainfield boreholes are presented in Table 3.4.2-14. No gross alpha or beta activity above the New Mexico-established background levels (Miller September 2003) was detected in any of the samples. These results indicate no significant levels of radioactive material are present in the soil at the site.

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

Quality assurance/quality control samples were collected at an approximate frequency of 1 per 20 field samples. These typically included duplicate, EB, and trip blank (TB) samples. Typically, samples were shipped to the laboratory in batches of 20, 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. Aqueous TB samples were used for VOC analysis only and were included in every sample cooler containing VOC soil samples. The analytical results for the EB and TB samples appear only on the data tables for the last site sampled in any one shipment, although the results were used in the data validation process for all the samples in that batch.

A set of aqueous EB samples were collected following completion of soil sampling in the Building 6584 west drainfield in July 1998 and were analyzed for the same constituents as the soil collected at that time (SVOCs, RCRA metals and HE compounds). No SVOCs or HE compounds were detected in the EB samples. However, selenium was detected at 2.1 J µg/liter [L]) in the EB sample.

As shown in Tables 3.4.2-5, 3.4.2-9, and 3.4.2-11, to assess the precision and repeatability of sampling and analytical procedures, duplicate soil samples (designated 'DU') were collected and analyzed at the off-site laboratory for PCBs, total cyanide, and hexavalent chromium.

Table 3.4.2-11
Summary of DSS Site 1093, Building 6584 West 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)	
602763	6584W-DF1-BH1-5-S	5	ND (0.137)
602763	6584W-DF1-BH1-10-S	10	ND (0.137)
602763	6584W-DF1-BH2-5-S	5	**0.158 J (0.468)**
602763	6584W-DF1-BH2-10-S	10	ND (0.13)
602763	6584W-DF1-BH2-10-DU	10	ND (0.134)
602763	6584W-DF1-BH3-5-S	5	ND (0.131)
602763	6584W-DF1-BH3-10-S	10	ND (0.129)

Note: Values in **bold** represent detected cyanide.
[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 ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
mg/kg = Milligram(s) per kilogram.
MDL = Method detection limit.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.
W = West.

Table 3.4.2-12
Summary of DSS Site 1093, Building 6584 West 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	0.128–0.137

[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 1093, Building 6584 West Septic System
Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
July 1998
(On-Site Laboratory)

Sample Attributes			Activity (EPA Method 901.1[a])(pCi/g)							
Record Number[b]	ER Sample ID	Sample Depth (ft)	Cesium-137		Thorium-232		Uranium-235		Uranium-238	
			Result	Error[c]	Result	Error[c]	Result	Error[c]	Result	Error[c]
600442	6584W-DF1-BH1-5-S	5	ND (0.0169)	--	0.557	0.256	0.0878	0.0595	0.661	0.194
600442	6584W-DF1-BH1-10-S	10	ND (0.0169)	--	0.729	0.361	ND (0.108)	--	1.01	0.333
600442	6584W-DF1-BH2-5-S	5	0.0109	0.00640	0.615	0.301	ND (0.110)	--	0.704	0.259
600442	6584W-DF1-BH3-5-S	5	ND (0.0155)	--	0.526	0.256	ND (0.112)	--	0.482	0.260
600442	6584W-DF1-BH3-10-S	10	ND (0.0145)	--	0.676	0.312	ND (0.109)	--	0.816	0.351
600512	6584W-DF1-BH4-10-S	10	ND (0.0182)	--	ND (0.112)	--	0.136	0.0950	ND (0.467)	--
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.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
MDA = Minimum detectable activity.
NA = Not applicable.
ND ( ) = Not detected above the MDA, shown in parentheses.
pCi/g = Picocurie(s) per gram.
S = Soil sample.
W = West.
-- = Error not provided for nondetected results.

Table 3.4.2-14
Summary of DSS Site 1093, Building 6584 West Septic System
Confirmatory Soil Sampling, Gross Alpha/Beta Activity Analytical Results
July 1998
(*Off-Site* Laboratory)

Sample Attributes			Activity (EPA Method 900.0[a])(pCi/g)			
			Gross Alpha		Gross Beta	
Record Number[b]	ER Sample ID	Sample Depth (ft)	Result	Error[c]	Result	Error[c]
600441	6584W-DF1-BH1-5-S	5	10	3.45	18.6	3.79
600441	6584W-DF1-BH1-10-S	10	8.87	3.22	22.8	4.02
600441	6584W-DF1-BH2-5-S	5	11	3.6	19.5	3.8
600441	6584W-DF1-BH3-5-S	5	6.26	2.79	16	3.56
600441	6584W-DF1-BH3-10-S	10	10.8	3.5	20.5	3.72
600451	6584W-DF1-BH4-10-S	10	9.52	2.3	20.5	2.54
Background Activity[d]			17.4	NA	35.4	NA

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]Two standard deviations around 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.
W = West.

As shown in Table 3.4.2-5, PCB concentrations in both sample 6584W-DF1-BH2-10-S and duplicate sample 6584W-DF1-BH2-10-DU from the same sampling interval were not detected for all PCB cogeners. As shown in Table 3.4.2-9, hexavalent chromium concentrations in sample 6584W-DF1-BH2-10-S and duplicate sample 6584W-DF1-BH2-10-DU from the same sampling interval were 0.06 J mg/kg and not detected, respectively. As shown in Table 3.4.2-11, total cyanide concentrations were nondetections in sample 6584W-DF1-BH2-10-S and the duplicate sample 6584W-DF1-BH2-10-DU.

All laboratory data were reviewed and verified/validated according to "Data Verification/ Validation Level 3, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project Data Validation Procedure for Chemical and Radiochemical Data, AOP [Administrative Operating Procedure] 00-03, Rev. 0 (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 at the Building 6584 west septic system drainfield area. This survey was required at this site by NMED/HWB regulators and was conducted to determine whether areas of significant VOC contamination were 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 mg 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 26, 2002, and were retrieved on May 10, 2002. Only three of the five GS samplers could be retrieved because of ongoing construction activities at the site. 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 11 VOCs were detected in the GS samplers installed at this site. The analytical results indicated 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 1093.

4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS Site 1093, the Building 6584 west 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 1093 are VOCs, SVOCs, PCBs, HE compounds, cyanide, RCRA metals, hexavalent chromium, radionuclides detected by gamma spectroscopy, and gross alpha/beta activity. No SVOCs, PCBs, HE compounds, hexavalent chromium, or radionuclides were detected in any of the soil samples collected at this site. Arsenic was detected in one sample at a concentration above the approved maximum background concentration for SNL/NM Southwest Area Supergroup soil (Dinwiddie September 1997). When a metal concentration exceeded its maximum background screening value or the nonquantifiable background value, it was carried forward in the risk assessment process. None of the four representative gamma spectroscopy radionuclides were detected at activities exceeding the corresponding background levels. Finally, no gross alpha or beta activity was detected above the New Mexico-established background levels (Miller September 2003).

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 483 feet bgs) 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 1093.

Table 4.2-1 summarizes the potential COCs for DSS Site 1093. 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 1093 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, this is a realistic possibility 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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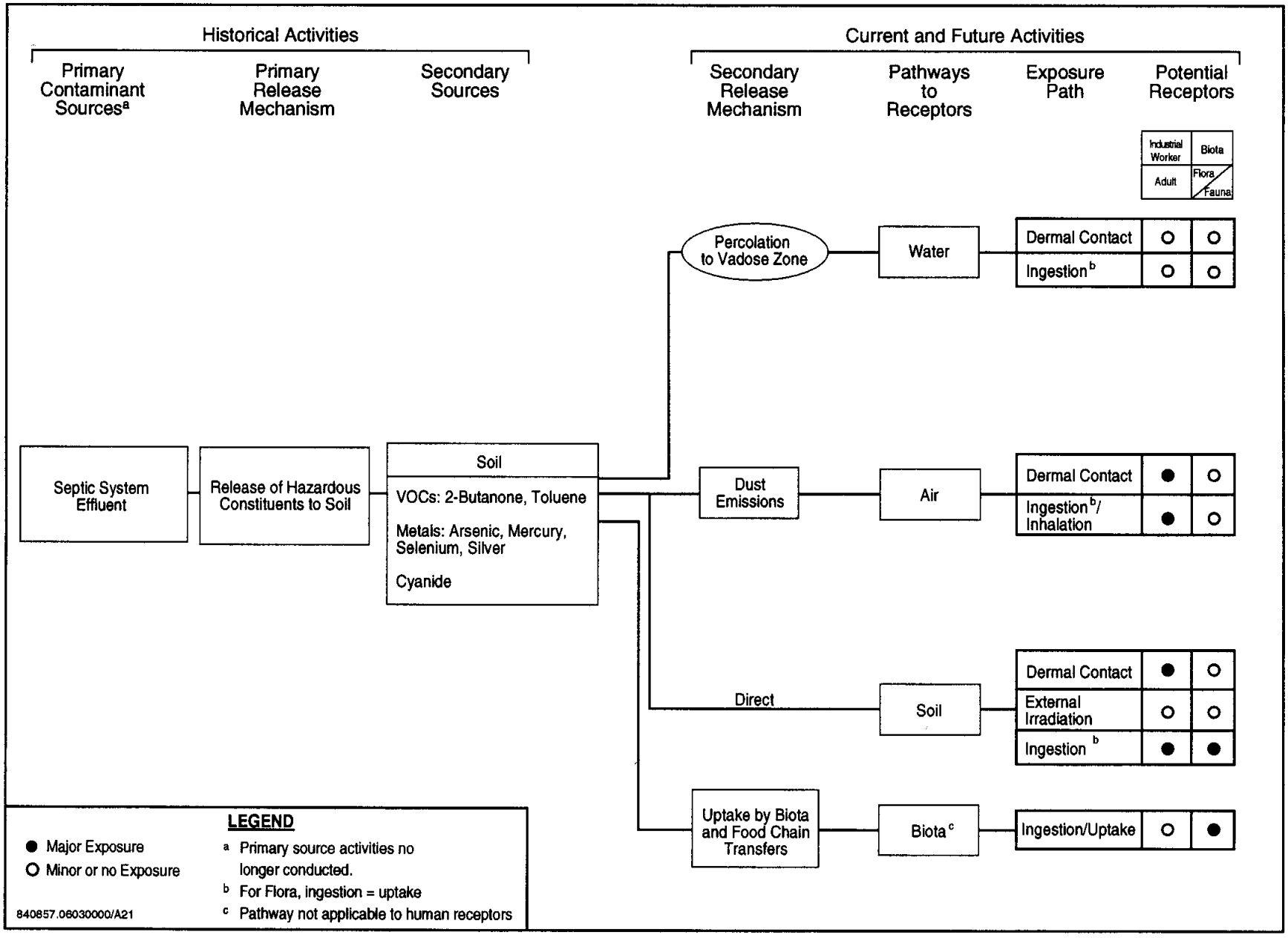

Figure 4.2-1

Conceptual Site Model Flow Diagram for DSS Site 1093, Building 6584 West Septic System

Table 4.2-1
Summary of Potential COCs for the DSS Site 1093, Building 6584 West Septic System

COC Type		Number of Samples[a]	COCs Greater than Background	Maximum Background Limit/Southwest Area Super Group[b] (mg/kg)	Maximum Concentration[c] (mg/kg)	Average Concentration[d] (mg/kg)	Number of Samples Where Background Concentration Exceeded[e]
VOCs		6	2-Butanone	NA	0.027	0.021	6
		6	Toluene	NA	0.0038	0.00148	4
SVOCs		6	None	NA	NA	NA	None
PCBs		7	None	NA	NA	NA	None
HE		6	None	NA	NA	NA	None
RCRA Metals		6	Arsenic	4.4	4.5	3.78	1
Hexavalent Chromium		7	None	NA	NA	NA	None
Cyanide		7	Cyanide	NA	0.158	0.0796	1
Radionuclides (pCi/g)	Gamma Spectroscopy	6	None	NA	NA	NC[f]	None
	Gross Alpha	6	None	17.4[g]	10.8	NC[f]	None
	Gross Beta	6	None	35.4[g]	22.8	NC[f]	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 nondetected results, divided by the number of samples.
[e]See appropriate data table for sample locations.
[f]An average MDA is not calculated because of the variability in instrument counting error and the number of reported nondetected activities for gamma spectroscopy.
[g]Miller September 2003.

COC = Constituent of concern.
DSS = Drain and Septic Systems.
HE = High explosive(s).
MDA = Minimum detectable activity.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NC = Not calculated.
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, ingesting 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 1093.

4.3 Site Assessment

Site assessment at DSS Site 1093 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 1093 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1093 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 1093. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1093 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because VOCs, cyanide, RCRA metals, and hexavalent chromium are present, it was necessary to perform a human health risk assessment analysis for the site, which included all COCs detected. 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 1093 is 0.02 under the industrial land-use scenario, which is lower 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 0.00. The quantifiable excess cancer risk for DSS Site 1093 under an industrial land-use setting is 3E-6. 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 below the suggested acceptable risk value. The estimated incremental excess cancer risk for DSS Site 1093 is 6E-8. Both these incremental risk calculations are below NMED guidelines under the industrial land-use scenario.

The HI calculated for the COCs at DSS Site 1093 is 0.21 under the residential land-use scenario, which is lower 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 0.01. The excess cancer risk for DSS Site 1093 COCs is 1E-5 for a residential land-use setting. 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 slightly above the suggested acceptable risk value. The incremental HI is 0.01 and the estimated incremental excess cancer risk for DSS Site 1093 is 3E-7.

The HI for the residential land-use scenario is below NMED guidelines. Although the estimated excess cancer risk is slightly above the NMED guideline for the residential land-use scenario, maximum concentrations were used in the risk calculation. Because the site has been adequately characterized, average concentrations are more representative of actual site conditions. The 95% upper confidence limit of the average concentration for arsenic, the main contributor to excess cancer risk (4.3 mg/kg), is below the background value; therefore, arsenic is eliminated from further evaluation and there is no total or incremental excess cancer risk. Thus by using realistic concentrations in the risk calculations that more accurately depict actual site conditions, the total and incremental estimated excess cancer risks are below NMED guidelines.

For the radiological COCs, none of the constituents had a minimum detectable activity or reported value greater than the corresponding background values; therefore no risk was calculated for either the industrial or the residential land-use scenarios.

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 1093, Building 6584 West Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	6E-8	0.0	6E-8
Residential	3E-7	0.0	3E-7

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. No hazard quotients greater than 1 were predicted. Therefore, ecological risks associated with this site are 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 1093 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 1093 are expected to be low, a baseline ecological risk assessment is not required for the site.

5.0 NFA 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 1093 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 above, DSS Site 1093 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 1093
Septic Tank Sampling Results

4-17-91

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

DBDionne

4-17-91

Nick Durand,

For your information.

David Dionne

TABLE 11

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

BUILDING 6584 W

SAMPLE NUMBERS SNLA004890, SNLA004891

Parameter	Results	Units
VOLATILE ORGANICS		
Acetone*	24	µg/l
SEMIVOLATILE ORGANICS		
4-Methylphenol*	230	µg/l
INORGANICS		
Phenolics	0.095	mg/l
METALS		
Barium	0.058	mg/l
Copper	0.074	mg/l
Manganese	0.039	mg/l
Zinc	0.064	mg/l
RADIOLOGICAL		
Gross Beta	46	pCi/l
Uranium 235	2.2	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 W TANK A-3**		
Tank ID No.:	**AD89002R**		
Date Sampled:	**7/28/92**		
Sample ID No.:	**SNLA008578**		
Analytical Parameter	**Measured Concentration**	**± 2 Sigma Uncertainty**	**Units**
Gross Alpha	3	17	pCi/g
Gross Beta	27	47	pCi/g
Gross Alpha	6	16	pCi/g
Gross Beta	15	40	pCi/g
Gross Alpha	1	15	pCi/g
Gross Beta	23	35	pCi/g
Gross Alpha	12	17	pCi/g
Gross Beta	32	37	pCi/g
Tritium	1E+02	3E+02	pCi/L
Bismuth-214	0.332	0.0165	pCi/mL
Cesium-137	<0.0119	NA	pCi/mL
Potassium-40	0.472	0.00600	pCi/mL
Lead-212	0.0351	0.00603	pCi/mL
Lead-214	0.212	0.0131	pCi/mL
Radium-226	0.324	0.0566	pCi/mL
Thorium-234	<0.190	NA	pCi/mL
Thallium-208	0.0147	0.00324	pCi/mL

ND = Not Detected
NA = Not Applicable

RESULTS OF SEPTIC TANK SAMPLING
CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg 6584 W
Sample ID Number: 024393
Date Sampled: 7-06-95

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Volatile Organics (8260)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Acetone	0.008J	0.010	NR	NR	
Semivolatile Organics (8270)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
bis(2-Ethylhexyl)Phthalate	0.003J	0.010	NR	TTO = 5.0	
Pesticides/PCBs (8080)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
None detected above DL	ND	various	NR / PCBs = 0.001	TTO = 5.0	
Metals (6010/7470)	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Arsenic	0.0025J	0.010	0.1	2.0	
Barium	0.0290J	0.200	1.0	20.0	
Cadmium	ND	0.005	0.01	2.8	
Chromium	ND	0.020	0.05	20.0	
Copper	0.0176J	0.025	1.0	16.5	
Lead	ND	0.003	0.05	3.2	
Manganese	0.0392	0.015	0.2	20.0	
Nickel	0.0167J	0.040	0.2	12.0	
Selenium	0.0044J	0.005	0.05	2.0	
Silver	ND	0.010	0.05	5.0	
Thallium	ND	0.010	NR	NR	
Zinc	0.0326	0.020	10.0	28.0	
Mercury	ND	0.0002	0.002	0.1	
Miscellaneous Analyses	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Field pH	7.6 pH units	0 -14 pH units	6 – 9 pH units	5 – 11 pH units	
Formaldehyde (NIOSH 3500)	1.3	0.25	NR	260.0	
Fluoride (300.0)	ND	0.10	1.6	180.0	
Nitrate + Nitrite (353.1)	15.20	2.50	10.0	NR	

Refer to footnotes at end of table.

RESULTS OF SEPTIC TANK SAMPLING

CHEMICAL ANALYSES OF AQUEOUS SAMPLE

Building ID: Bldg 6584 W

Sample ID Number: 024393

Date Sampled: 7-06-95

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit[a]	COA Discharge Limit[b]	Comments
Miscellaneous Analyses	*(mg/L)*	*(mg/L)*	*(mg/L)*	*(mg/L)*	
Oil + Grease (9070)	ND	0.95	NR	150.0	
Total Phenol (9066)	ND	0.050	0.005	4.0	

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 AQUEOUS SAMPLE

Building ID: Bldg 6584 W

Sample ID Number: 024393

Date Sampled: 7-06-95

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit[a]	Comments
Radiological Analyses	*(pCi/L ± 2-σ)*	*(pCi/L)*	*(pCi/L)*	*(pCi/L)*	
Gross Alpha (9310)	3.56 ± 1.32	2.04	0.91	NR	
Gross Beta (9310)	26.4 ± 2.9	1.7	0.81	NR	
Isotopic Analyses	*(pCi/L ± 2-σ)*	*(pCi/L)*	*(pCi/L)*	*(pCi/L)*	
Tritium (906.0)	67.6 ± 56.0	92.8	45.9	NR	
Uranium-238[b]	1.29 ± 0.42	0.10	0.081	NR	
Uranium-235/236[b]	0.27 ± 0.18	0.13	0.10	NR	
Uranium-234[b]	2.2 ± 0.62	0.16	0.11	NR	
Gamma Spectroscopy[c]	*(pCi/mL ± 2-σ)*	*(pCi/mL)*	*(pCi/L)*	*(pCi/L)*	
None detected above MDA	ND	various	NL	NR	

Notes:

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

[b] Isotopic uranium analyzed by NAS-NS-3050.

[c] Analyzed in-house by SNL/NM Department 7715.

MDA = Minimum detectable activity.

ND = Not detected above MDA indicated.

NL = Not listed.

NR = Not regulated.

ANNEX B
DSS Site 1093
Soil Sample Data Validation Results

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

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600440

Fridge 3 shelf 2
Fridge 4 shelf 4

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: N/A (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 W6584 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
041487-001	ER-1295-W6584-DF1-BH1-5-S	5	N/A	7/1/98 0720	S	AC	300ml	4C	G	SA	VOCs (8260)	
041488-001	ER-1295-W6584-DF1-BH1-10-S	10	N/A	0735	S	AC	300ml	4C	G	SA	VOCs (8260)	
041489-001	ER-1295-W6584-DF1-BH2-5-S	5	N/A	0905	S	AC	300ml	4C	G	SA	VOCs (8260)	
~~041490-001~~	~~ER-1295-W6584-DF1-BH2-10-S~~	~~10~~	~~N/A~~		~~S~~	~~AC~~	~~300ml~~	~~4C~~	~~G~~	~~SA~~	~~VOCs (8260)~~	
041491-001	ER-1295-W6584-DF1-BH3-5-S	5	N/A	0950	S	AC	300ml	4C	G	SA	VOCs (8260)	
041492-001	ER-1295-W6584-DF1-BH3-10-S	10	N/A	1005	S	AC	300ml	4C	G	SA	VOCs (8260)	
041487-004	ER-1295-W6584-DF1-BH1-5-S	5	N/A	0720	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
041488-004	ER-1295-W6584-DF1-BH1-10-S	10	N/A	0735	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
041489-004	ER-1295-W6584-DF1-BH2-5-S	5	N/A	0905	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	
~~041490-004~~	~~ER-1295-W6584-DF1-BH2-10-S~~	~~10~~	~~N/A~~		~~S~~	~~G~~	~~125ml~~	~~4C~~	~~G~~	~~SA~~	~~RCRA Metals, HE(8330)~~	

RMMA ☐Yes XNo Ref. No.

Sample Disposal ☐Return to Client XDisposal by lab

Sample Tracking (SMO USE)
Date Entered (mm/dd/yy): N/A
Entered by:
QC Info:

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 Catechis	Chris Catechis	CC	MSM / 6131 / 881-3196
	CHRIS SEARS	Chris Sears	CS	SNL/6131/844-1132

1. Relinquished by	Chris Sears	Org. 6131	Date 7/1/98	Time 1550	4. Relinquished by	Org.	Date	Time
1. Received by		Org. 6133	Date 7/1/98	Time 15:50	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)

SF 2001-COC (10-97)

Supersedes (5-97) issue

ANALYSIS REQUEST AND CHAIN OF CUSTODY (Continuation)

Press F1 for instructions for each field.

AR/COC- 600440

Project Name: 101 Non-ER Septic Fields Project/Task Manager: Mike Sanders Case No.: 7223.230

Location Tech Area III

Building w6584 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)						LAB USE	
					Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	Lab Sample
041491-004	ER-1295-W6584-DF1-BH3-5-S	5	N/A	7/1/98 0950	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
041492-004	ER-1295-W6584-DF1-BH3-10-S	10	N/A	7/1/98 1005	S	G	125ml	4C	G	SA	RCRA Met, HE(8330)	
041503-001	ER-1295-W6584-EB	NA	NA	7/1/98 1045	DCW	~~G~~ VOA	3X40ml	HCl+4C	G	SA EB	VOCs	
041504-001	ER-1295-W6584-TB	NA	NA	7/1/98 1045	DIW	G	2X40ml	HCl+4C	G	SA TB	VOCs	
041503-007	ER-1295-W6584-EB	NA	NA	7/1/98 1035	DCW	P	500ml	HNO_3+4C	G	SA EB	RCRA MET	
041503-008	ER-1295-W6584-EB	NA	NA	7/1/98 1037	DCW	AG	1L	4C	G	SA EB	HE	

Abnormal Conditions on Receipt — **LAB USE**

Recipient Initials

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)

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	✓	✓	EB & TB not run: 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. 600440 Reviewed by Margie Marley Date 8/24/98

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

SNL/NM ENVIRONMENTAL RESTORATION CHEMISTRY LABORATORY
NONCONFORMANCE AND CORRECTIVE ACTION REPORT (NCAR)

NCAR No. 98-104 (completed by ERCL QA Officer)

PART I - INITIATION (completed by originator)

Description of Nonconformance:
ICV and CCV's failed for Zn; affected samples will be rerun in a separate run batch. Bi (an IS) went slightly high during the MDIL sample. ICS A shows Ag present at a level above the PQL. LRS failed for As. LMB had As, Hg, and Pb present at levels between the MDL and PQL. MS and MSD recoveries for Ba were out of criteria, and the rpd is also out of criteria. MDUP rpd out of criteria for Ba.

Effect of Nonconformance:
As stated above, those samples that have Zn as a requested analyte will be rerun. The high Bi during the MDIL sample has no effect on the data, because the elements in this batch which use Bi as their internal standard (Hg and Pb) are not required to have MDIL recoveries due to their low concentration. The ICS A Ag result indicates possible matrix interference for Ag, however, all recovery samples and blanks pass for this element, thus any matrix effect appears to be minimal. The LRS failure for As has no effect because no sample concentration was that high, anyway. Samples will be reported with "B" qualifiers for As, Hg, and Pb due to their presence in the LMB. Because the MPS recovery for Ba was acceptable, the MS/MSD poor recovery/poor rpd is likely due to sample nonhomogeneity. Likewise, the MDUP rpd is also attributable to nonhomogeneity, which is a common problem when analyzing soils.

Associated Samples: 9806-600431-05, -06, -07, -08; 9807-600434-05, -06, -07; 9807-600440-07, -08, -09
Associated Batch #s: SI9819
Associated COCs: 600431, 600434, 600440

PART II - CORRECTIVE ACTION

Corrective Action Required? ☑ YES ☐ NO

Describe Corrective Action Required: Rerun Zn for samples which need it. (600431 rerun data with batch WI98
Date(s) for completion of Corrective Actions 7/16/98

PART III - ACCEPTANCE AND APPROVAL

Linda Kear	[signature]	7/16/98
Originator (print)	Signature	Date
MARGIE MARLEY	Margie Marley	8/17/98
ERCL QA Officer (print)	Signature	Date

PART IV - VERIFICATION OF COMPLETION OR CLOSE OUT

Comments:

MARGIE MARLEY	Margie Marley	8/17/98
ERCL QA OFFICER	SIGNATURE	DATE

SNL/NM ENVIRONMENTAL RESTORATION CHEMISTRY LABORATORY
NONCONFORMANCE AND CORRECTIVE ACTION REPORT (NCAR)

NCAR No. 98-105 (completed by ERCL QA Officer)

PART I - INITIATION (completed by originator)

Description of Nonconformance:

Acetone and MEK were low out of criteria in the CCV.

Effect of Nonconformance:

The low out of criteria recovery for Acetone and MEK in the CCV could indicate a negative bias and compromised detection limit for these analytes. Due to the low recoveries of Acetone and MEK the MDL could be comprimised by 50% for Acetone and 30% for MEK. The original standard was near expiration and could be attributed to the low bias in Acetone and MEK. This standard was remade on 7/15/98 and recoveries for these analytes were in control. Recalibration of the instrument is not required by EPA method 8260B in this situation unless the CCC or SPCC compounds are out of control. Therefore batch will be validated based on the fact that the CCC and SPCC compounds were recovered in control. These samples were not rerun because their hold time would have been exceede on 7/16/98, and because of a large sample load which would have push other samples further into their hold time.

Associated Samples:9807-600428-01, -02, -03, -04, 9807-600434-03, -04, 9807-600440-01, -02, -03, -05, -06
Associated Batch #s: SVOC-043
Associated COCs:600428, 600434, 600440

PART II - CORRECTIVE ACTION

Corrective Action Required? ☐YES ☑NO

Date(s) for completion of Corrective Actions N/A

PART III - ACCEPTANCE AND APPROVAL

Justin Klavetter		7/24/98
Originator (print)	Signature	Date
Margie Marley	Margie Marley	8/17/98
ERCL QA Officer (print)	Signature	Date

PART IV - VERIFICATION OF COMPLETION OR CLOSE OUT

Comments

Margie Marley	Margie Marley	8/17/98
ERCL QA Officer (print)	Signature	Date

SNL/NM ENVIRONMENTAL RESTORATION CHEMISTRY LABORATORY
NONCONFORMANCE AND CORRECTIVE ACTION REPORT (NCAR)

NCAR No. 98-108 (completed by ERCL QA Officer)

PART I - INITIATION (completed by originator)

Description of Nonconformance:
Both middle and ending CCV high for Hg. ICS A showed Co present above the PQL. ICS AB was not run due to analyst error (tube in wrong autosampler position). LRS failed for Na, Mg, Al, Ca, Ni, and Ba. LMB had Na, Ca, Ni, and Zn present at levels between the MDL and PQL. LCS recovery high out of criteria for Al, Ca, Zn, and Hg. MS/MSD recovery high for Hg, rpd good. MDIL recovery high for Mg.

Effect of Nonconformance:
Any sample that showed Hg present will be rerun. Those samples that were U for Hg will not be rerun, because the CCV's indicate potential high bias, thus samples with results below the MDL are judged to be valid. Because the ICS A indicates a possible interference effect for Co, any samples showing Co present will be rerun to verify the results. Although the ICS AB was not run, the data is not compromised because the MS and MSD recoveries were acceptable (except for Hg, but that is due to a different problem—see below). The LRS failure is only significant for Ca, because none of the other failed elements exceeded the high calibration level. Ca results above the high cal will be reported with an "E" qualifier. All relevant samples will carry a "B" qualifier for Na, Ca, Ni and Zn due to their presence in the LMB; this problem is likely caused by contamination. The out of criteria LCS results for Al, Ca, and Zn are most likely contamination related. The high Hg recoveries in the LCS, MS, and MSD are all a result of being spiked with bad ICAL-B solution. The ICAL-B has been remade so the problem will not recur. The high MDIL recovery for Mg is likely a matrix effect, as the level of Mg in the sample is fairly high.

Associated Samples: 9807-600375-02; 9807-600386-04; 9807-600374-02; 9807-600377-02; 9807-600378-02; 9807-600379-01; 9807-600380-01; 9807-600381-01; 9807-600382-01; 9807-600383-01; 9807-600440-15; 9807-600446-09

Associated Batch #s: ~~WI9812~~ WI98-12

Associated COCs: 600375, 600386, 600374, 600377, 600378, 600379, 600380, 600381, 600382, 600383, 600440, 600446

PART II - CORRECTIVE ACTION

Corrective Action Required? ☑ YES ☐ NO

Describe Corrective Action Required: Rerun affected samples for Co and Hg.

Date(s) for completion of Corrective Actions 7/28/98

PART III - ACCEPTANCE AND APPROVAL

Linda Kear		7/22/98
Originator (print)	Signature	Date

MARGIE MARLEY ERCL QA Officer (print)	Margie Marley Signature	8/19/98 Date

PART IV - VERIFICATION OF COMPLETION OR CLOSE OUT

Comments:

MARGIE MARLEY ERCL QA Officer (print)	Margie Marley Signature	8/19/98 Date

94-03
Rev. 1
Attachment A
November 1995

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.: 600440 | 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)	—		Note: not requested		
2.6	Narrative provided	—				
2.7	TAT met	NA				
2.8	Hold times met	—				
2.9	All requested result data provided		—	Two VOC samples not analyzed		

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: Jeffrey T. Rabe Date: 10/19/98 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 15 soil samples and 2 water samples (see analytical report)

AR/COC No. 600440 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?		—	W198-12 (metals) ⇒ Hg (biased high) ①
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique?	—		

Reviewed by: Jeffrey J. Rale

Date: 10/19/98

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?		—	W198-12 (metals) ⇒ Hg ① S198-19 (metals) ⇒ Ba ⑤
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?		—	S198-19 (metals) ⇒ Ba ②
7) Blank data a) Method or reagent blank data reported and met for all samples?		—	S198-19 ⇒ "J" values reported for As, Hg and Pb in the metals (soil) LMB. ③
b) Sampling blank (e.g., field, trip, and equipment) data reported and met?		—	W198-12 ⇒ "J" value reported for Se in the metals (H_2O) EB. ④
8) Narrative included, correct, and complete?	—		

©*b0M
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 The percent recovery for mercury was biased high in the LCS, MS, and MSD (W198-12). This analyte was detected "J" value in two of the submitted samples

Reviewed by: Jeffrey J. Rohe

Date: 10/19/98

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

2.0 COMMENTS CONTINUATION SHEET

② Percent recoveries for Ba were outside of QC limits in the MS/MSD samples (biased high in the MS and biased low in the MSD). The relative percent difference for the MS/MSD pair was biased high. This analyte was detected above the PQL in all of the submitted samples (excluding the EB sample).

③ "J" values were reported for As, Hg, and Pb in the LMB. Blank contamination affects As and Hg in the submitted sample results

④ "J" value detected for Se in the equipment blank ER-1295-W6584-EB.

10/19/98 JR

Reviewed by: Jeffrey L. Rabe

Date: 10/19/98

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

see page 5 of 5 10/19/98 JR

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 limit 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: Jeffrey A. Rale

Date: 10/19/98

Site: 101 Non-ER Septic Fields

AR COC: 600440 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-W65BH1 -DF1-BH1-5-S	7439-97-6	U1	
ER-1295-W65BH1 -DF1-BH1-10-S	〃	〃	
ER-1295-W65BH1 -DF1-	778-49-2	B2	
BH1-5-S	〃	〃	
BH1-10-S	〃	〃	
BH2-5-S	〃	〃	
BH3-5-S	〃	〃	
BH3-10-S	〃	〃	
EPA 6020	7782-49-2	B2	
		JR	
			10/19/98

dmt 3/11/99

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: Jeffrey A. Rabe Date: 10/19/98

List of Data Qualifiers used in Data Validation and Associated Comment Responses.

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) 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 (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
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.
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.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03. Notify Tina Sanchez to revise list.

Attachment A
November 1995

Revised 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.: 600440 | 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)	✓		Note: not requested		
2.6	Narrative provided	✓				
2.7	TAT met	NA				
2.8	Hold times met	✓				
2.9	All requested result data provided		✓	Two VOC samples not analyzed		

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: Jeffrey A. Rabe Date: 10/19/98 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 15 soil samples and 2 water samples (see analytical report)

AR/COC No. 600440 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?		—	W198-12 (metals) ⇒ Hg (biased high) ①
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique?	—		

Reviewed by: J. Hoy, J. Rale

Date: 10/19/98

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?		—	W198-12 (metals) ⇒ Hg ① S198-19 (metals) ⇒ Ba ②
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?		—	S198-19 (metals) ⇒ Ba ②
7) Blank data a) Method or reagent blank data reported and met for all samples?		—	S198-19 ⇒ "J" values reported for As, Hg and Pb in the metals (soil) LMB. ③
b) Sampling blank (e.g., field, trip, and equipment) data reported and met?		—	W198-12 ⇒ "J" value reported for Se in the metals (H_2O) EB. ④
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 The percent recovery for mercury was biased high in the LCS, MS, and MSD (W198-12). This analyte was detected "J" value in two of the submitted samples

Reviewed by: Jeffrey A. Rabe

Date: 10/19/98

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

2.0 COMMENTS CONTINUATION SHEET

② Percent recoveries for Ba were outside of QC limits in the MS/MSD samples (biased high in the MS and biased low in the MSD). The relative percent difference for the MS/MSD pair was biased high. This analyte was detected above the PQL in all of the submitted samples (excluding the EB sample).

③ "J" values were reported for As, Hg, and Pb in the LMB. Blank contamination affects As and Hg in the submitted sample results

④ "J" value detected for Se in the equipment blank ER-1295-W6584-EB.

10/19/98 JR

Reviewed by: Jeffrey A. Rabe

Date: 10/19/98

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

see page 5 of 5 10/19/98 JR

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: Jeffrey A. Rale

Date: 10/19/98

Site: 101 Non-ER Septic Fields

AR COC: 600440 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-W6584-DF1	7440-39-3	J A2, P1	
-BH1-5-S -BH1-10-S	↓	↓	
-BH2-5-S -BH3-5-S	↓	↓	
-BH3-10-S	↓	↓	
ER-1295-W6584-DF1-BH2-5-S	7439-97-6	B	
ER-1295-W6584-DF1-BH3-5-S	↓	↓	
ER-1295-W6584-DF1-BH3-10-S	↓	↓	
ER-1295-W6584-DF1-	7440-38-2	U1	
-BH1-5-S -BH1-10-S	↓	↓	
-BH2-5-S -BH3-5-S	↓	↓	
-BH3-10-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, EPA7470 1, EPA8015B, EPA8081, EPA8260, EPA8260-MS, EPA8270, HACH_ALK, HACH_NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: Jeffrey T. Rabe Date: 10/19/98

List of Data Qualifiers used in Data Validation and Associated Comment Responses

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) 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 (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
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.
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.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03. Notify Tina Sanchez to revise list.

600441

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

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

SAR/WR No.

COC- 600441

OF 12/22/98 SMO STATUS SHEET

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: Edie Kent/803-556-8171 Lab Destination: GEL SMO Contact/Phone: Doug Salmi/844-3110 Send Report to SMO: Suzi Montano	Contract No.: AJ-248 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 W6584 Room

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
041487-002	ER-1295-W6584-DF1-BH1-5-S	5	N/A	7/1/98 0720	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041488-002	ER-1295-W6584-DF1-BH1-10-S	10	N/A	0735	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041489-002	ER-1295-W6584-DF1-BH2-5-S	5	N/A	0905	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041490-002	ER-1295-W6584-DF1-BH2-10-S	10	N/A		S	AG	500ml	4C	G	SA	~~SVOCs (8270) Gross A/B~~	
041491-002	ER-1295-W6584-DF1-BH3-5-S	5	N/A	0950	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041492-002	ER-1295-W6584-DF1-BH3-10-S	10	N/A	1005	S	AG	500ml	4C	G	SA	SVOCs (8270) Gross A/B	
041505-001	ER-1295-W6584-TB	n/a	n/a	7/1/98 1045	DIW	G	2X40ml	HCl/4C	G	TB	VOCs DON'T USE 1994 VOCs IN 1999	
041503-006	ER-1295-W6584-EB	n/a	n/a	7/1/98 1039	DIW	AG	1L	4C	G	EB	SVOCs	

Reference LOV (available at SMO)

LAB USE

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

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Chris Catechis	C. Catechis	CC	MDM / 6131 / 881-3196
	CHRIS SEARS	Chris Sears	CS	SNL/6431/844-1134

1. Relinquished by	Chris Sears	Org. 6131	Date 7/1/98	Time 1515	4. Relinquished by	Org.	Date Time
1. Received by	[signature]	Org. 7577	Date 7/1/98	Time 1515	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)

Site: NON ER Septic TANKS — ORGANIC SVOCs (8270)

AR/COC: 600441 — Data Classification: RAD: Gross A/B

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER 1295 W6584 BF1 BH1-5	8270 SVOC's	UJ JH	Samples Received @ LMS @ Ambient 11Dec98
BH10	✓		(UNspecified) TEMP. July 1998
BH25	✓		
BH35			
BH310			
9807120-06 ER-1295-W-6584-TB	Methylene chloride (75-09-2)	SU	Less THAN 10x
~~ER-1295W 6584-08~~	4-Nitrophenol (100-02-7)		→ JH 11Dec98
~~9807120-06~~	~~Methyl~~ Chloroform	U	Less THAN 10x JH 11 Dec98
ER 1295-W 6581-TB	VOC 8260	R	Sample Received @ LMS @ UNSpecified Ambient Temp
ER 1295 W 6854 -ES	SVOC ✓	UJ	"

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: _____ Date: 11 Dec 98

Verified 6/4/10

SF 2001-COC (10-97)
Supersedes (5-87) issue

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

AR/COC- 600450

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: 7/14 SMO Use
Carrier/Waybill No.: 7/14

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 W6584 — 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
041490-001	ER-1295-W6584-DF1-BH[illegible]10-S	10	N/A	7/13/96 0930	S	AC	300ml	4C	G	SA	VOCs (8260)	
041490-004	ER-1295-W6584-DF1-BH[illegible]10-S	10	N/A	7/13/96 0930	S	G	125ml	4C	G	SA	RCRA Metals, HE(8330)	

RMMA ☐Yes XNo Ref. No.

Sample Disposal ☐Return to Client XDisposal by lab

Sample Tracking SMO Use
Date Entered (mm/dd/yy): 7/14
Entered by:

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

QC Initials:

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	CHRIS SEARS	Chris Sears	CS	SNL/6831/844-1136
	Chris Cutchis	C. Cutchis	C.C.	MDA/6831/881-3136

Please list as separate report.

1. Relinquished by	C. Cutchis	Org. 6131	Date 7/13/96	Time 1110	4. Relinquished by	Org.	Date	Time
1. Received by		Org. 6133	Date 7/13/96	Time 11:10	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)

VOC Peer Review Check List

Batch ID: SVOC-049

Did BFB Pass?	Yes ☑	No ☐	
Did the ICAL Pass %RSD ≤ 30%	Yes ☐	No ☑	see NCAR/Case Narrative
Did the ICAL and CCV pass:			
± 20% recovery for the individual analytes?	Yes ☐	No ☑	See 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 / Linda Kear Date: 8/7/98

SNL/NM ENVIRONMENTAL RESTORATION CHEMISTRY LABORATORY
NONCONFORMANCE AND CORRECTIVE ACTION REPORT (NCAR)

NCAR No. 98-120 (completed by ERCL QA Officer)

PART I - INITIATION (completed by originator)

Description of Nonconformance:

Acetone, MEK, MIBK, and MBK recoveries were high out of criteria in the CCV.

High out of criteria %RSD for MBK in the ICAL

Effect of Nonconformance:

The high out of criteria recovery for Acetone, MEK, MIBK, and MBK in the CCV could indicate a positive bias~~, and uncompromised detection limit for these analytes. Due to the high recoveries of Acetone, MEK, MIBK, and MBK the MDL could be comprimised high, by at least 21% for Acetone 43% for MEK, 39% for MIBK, and 76% for MBK.~~ Samples (9807-600450-01, 9807-600465-02, -03) were non-detect for these analytes. Recalibration of the instrument is not required by EPA method 8260B in this situation unless the CCC or SPCC compounds are out of control. Therefore batch will be validated based on the fact that the CCC and SPCC compounds were recovered in control in the CCV. These samples were not rerun because, their hold times would have been exceede after 7/27/98. Also a large sample load and consecutive power outages that occurred, July 16th, 17th and 20th, 1998 would have push other samples further into their hold time.

High out of criteria %RSD for MBK in the ICAL is an indication of a non-linear curve which results in a high bias for MBK at the upper portion of the curve. However the curve at the lower concentrations is very linear, therefore the data is unaffected.

Associated Samples: 9807-600450-01, 9807-600465-01, 02, -03
Associated Batch #s: [redacted]
Associated COCs:600450, 600465

PART II - CORRECTIVE ACTION

Corrective Action Required? ☐YES ☒NO

Date(s) for completion of Corrective Actions NA

PART III - ACCEPTANCE AND APPROVAL

Justin Hawkins		8/14/98
Originator (print)	Signature	Date
Margie Marley	Margie Marley	9/9/98
ERCL QA Officer (print)	Signature	Date

PART IV - VERIFICATION OF COMPLETION OR CLOSE OUT

Comments

MARGIE MARLEY	Margie Marley	9/9/98
ERCL QA Officer (print)	Signature	Date

Site: 101-Non-ER Septic Fields

AR COC: 600450 Data Classification: DV-2

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER-1295-W6584-DF1-BH4-10-S	7440-39-3	J, A2	

JR 10/14/98

AWT 3/11/99

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: Jeffrey A. Rabe Date: 10/14/98

List of Data Qualifiers used in Data Validation and Associated Comment Responses

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) 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 (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
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.
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.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03. Notify Tina Sanchez to revise list.

Rev. 1
ument A
mber 1995
Printed 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.: 600450 | 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)	✓		Note: not requested		
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: Jeffrey A. Rabe 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-W6584-OF1-BH4-10-S

AR/COC No. 600450 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: J. Hoy J. 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?		✓	5198-24 ⇒ barrium (biased low) ①
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?	✓		
7) Blank data a) Method or reagent blank data reported and met for all samples?	✓		
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 The percent recovery for barrium was biased low in the MS Sample (5198-24). The percent recovery for barrium in the MSD sample was within control limits. The RPD for

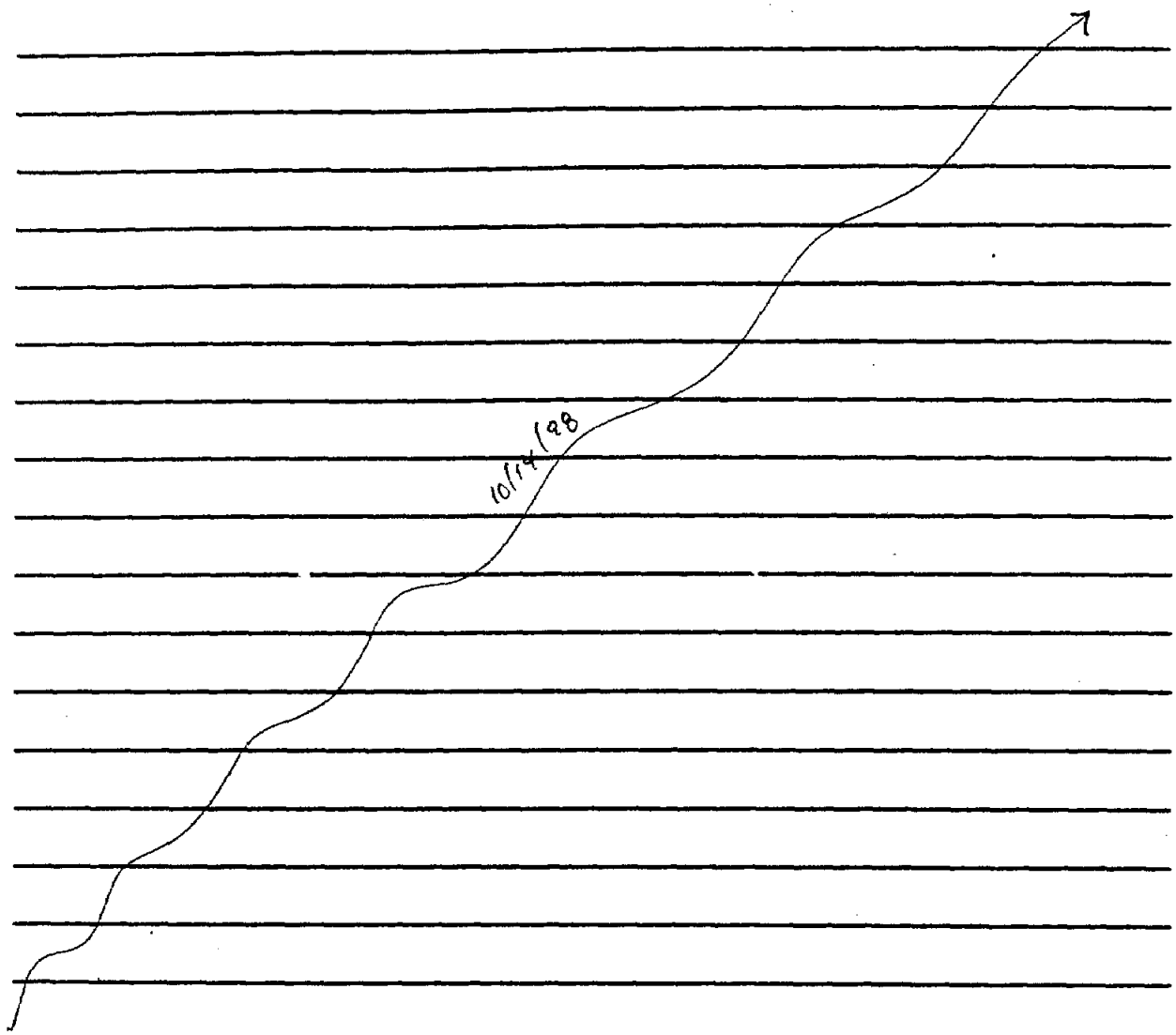
Reviewed by: Jeffrey A. Rabe

Date: 10/14/98

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

2.0 COMMENTS CONTINUATION SHEET

MS / MSD pair was also within control limits.



Reviewed by: 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

see page 5 of 5

10/14/98 JK

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: Jeffrey J. Rahn

Date: 10/14/98

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- 600451

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: 7/13/98 (SMO USE)
Carrier/Waybill No.: 710.274

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.: T223.230
SMO Authorization: [signature]
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location Tech Area III
Building W6584 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
041490-002	ER-1295-W6584-DF1-BH2-10-S	10	N/A	7/13/98 0930	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): 7/20/98
Entered by: [signature]
QC Initials: CMM

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

Abnormal Conditions on Receipt (Y/N/NA)

Turnaround Time XNormal ☐Rush Required Report Date

Please list as separate report.

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	CHRIS SEARS	[signature]	CS	SNL/6431/844-1136
	Chris Catechis	[signature]	C.C.	MON/6731/883196

1. Relinquished by	[signature]	Org. 6131	Date 7/13/98	Time 0940	4. Relinquished by	Org.	Date	Time
1. Received by	[signature]	Org. 7524	Date 7/13/98	Time 0940	4. Received by	Org.	Date	Time
2. Relinquished by	[signature]	Org. 7577	Date 7/14/98	Time 1095	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)

Contract Verification Review (CVR)

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

AR/COC No. 600447/600426/ 600438/600451 | Analytical Lab GEL | SDG No. 9807351A, B,C,D

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./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	MANY ANALYTES OUTSIDE QC RECOVERY LIMITS FOR SVOC LCS/LCD AS NOTED IN CASE NARRATIVE
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	MANY SVOC RPDs OUTSIDE QC ACCEPTANCE LIMITS LEAD OUTSIDE RPD QC LIMITS—MS/MSD & SERIAL DILUTION ACCEPTABLE
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		

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. Palenscia Date: 9-18-98 Closed by: _____ Date: _____

List of Data Qualifiers used in Data Validation and Associated Comment Responses

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) 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 (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
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.
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.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03. Notify Tina Sanchez to revise list. **Updated:March 10, 1998**

600 42
600 45
600 44
600 4

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST (CONTINUED)

Project Name	N·N ER Septic Fields			Site Name	ER 1295
Laboratory Name/Job No./Batch No.	GEL			Chain of Custody No.	
Analytic Method	HASL 300 EPA 900			Parameter List:	Gamma Spec GA/B
REVIEW ITEM	YES	NO	NA	COMMENTS	
4. Preparation: Entire procedure?	✓			Looks good	
H. ANALYTE DETECTION					
1. Detection limit sample/batch specific?	✓				
2. Errors evaluated?	✓		X		
3. False positives/negatives suspected?		X			

Reviewed by: E Ted Monk 12/24/98

600426
600451
600447
600438

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST

Project Name NOW ER Septic Fields	Site Name ER 1295
Laboratory Name/Job No./Batch No. GEL	Chain of Custody No.
Analysis Method HASL 300 EPA 900	Parameter List: Gamma Spec GAS

REVIEW ITEM	YES	NO	NA	COMMENTS
A. HOLDING TIMES				
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				LCS/LCSD met acceptance criteria
1. Standard: Independent, certified reference material?	✓			
2. Frequency: Each batch?	✓			
3. % Recovery 80-120% or ____?	✓			
D. METHOD BLANK				No Target Analytes above RL
1. Frequency: Each batch?	✓			
2. Matrix: Matrix specific?	✓			
3. Preparation: Entire procedure?	✓			
4. Blanks show contamination?		✓		
E. MATRIX SPIKE				Spr 12/1/98
1. Frequency: Each batch?	✓		✓	LCW
2. Matrix: Matrix specific?			✓	12/1/98
3. Preparation: Entire procedure?	✓			
4. % Recovery: 75-125% or ____?	✓			
F. ANALYTICAL YIELDS/OTHER			✓	
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				Duplicate error ratio
1. Type: Lab or field?	✓			met acceptance criteria
2. Frequency: Each batch?	✓			
3. Matrix: Matrix specific?	✓			

Site: NW ER Septic Fields

AR/COC: ARCOC 600438 Data Classification: Inorganic

Sample Fraction No.	Analysis	DV Qualifiers	Comments
ER 1295-6500-DFI-BH	Cobalt	J	Blank value > IDL. Detected results < 5x
	Silver	J	blank concentration " "
	Barium	J	% Recovery low. Barium detected in Sample
	Data	are	acceptable
	QC measures	appear 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: E Todd Martin Date: 12-24-98

Site: Non ER Septic Fields

AR/COC: Organics Data Classification: organics

	Sample Fraction No.	Analysis	DV Qualifiers	Comments
600438	ER 1295-6500-DFI-BH 041486-001	methylene chloride	J	Sample concentration < 10 X blank Concentration
600426	ER 1295-896 DFI-BH3 041307-002	Pyrene	J	Recovery lower than lower acceptance limit. Sample results ND
600447	ER 1295-56585-spt-B 041498-002	Pyrene	J	Recovery low. Sample results are ND
600426	ER 1295-896 DFI-BH3 041307-002	SVOC (entire sample)	UJ	RPD does not meet criteria (high). Sample results are ND. Entire Sample qualified UJ.
600451	ER 1295-W6584-DFI-B 041490-002	SVOC (entire sample)	UJ	" "
				" "
		- Data	is	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: C T S Mark Date: 12-24-98

List of Data Qualifiers used in Data Validation and Associated Comment Responses

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) 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 (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
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.
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.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03. Notify Tina Sanchez to revise list. **Updated:March 10, 1998**

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

Case# T223.230

SITE OR PROJECT Non-ER Septic Fields
SAMPLE IDS 18 soil 1 aqueous
ANALYTICAL LABORATORY GEL
NO. OF SAMPLES See ARCOC's
LABORATORY REPORT # 980735 1A, 980735 1B, 980735 1C, 980735 1D
CASE NO.

ARCOC's
600447
600426
600438
600451

DATA ASSESSMENT SUMMARY

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

		VOC	SVOC	PEST/PCB	OTHER HCPCC
1.	HOLDING TIMES/PRESERVATION	✓	✓	NA	✓
2.	GC/MS INST. PERFORM.	✓	✓		✓
3.	CALIBRATIONS/WINDOWS	✓	✓		✓
4.	BLANKS	✓	J		✓
5.	SURROGATES	✓	✓		✓
6.	MATRIX SPIKE/DUP	✓	J		✓
7.	LABORATORY CONTROL SAMPLES	✓	J, UJ		✓
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: See Sample Findings Summary

AREAS OF CONCERN:

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

PROJECT/TASK LEADER: See Sample Findings Summary

ACTION ITEMS:

AREAS OF CONCERN:

OVERALL DATA QUALITY ASSESSMENT

Reviewed By: E Tod Mark

Date: 01/20/95

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

2.0 GC/MS TUNING CRITERIA

Has a GC/MS tuning performance been analyzed for every twelve hours of sample analysis for each GC/MS instrument used? Yes ☑ No ☐

Was the correct standard (listed in the EPA Method) used? Yes ☑ No ☐

Have the ion abundance criteria been met for each tune? Yes ☑ No ☐

NOTE: GC/MS abundance criteria is specified by EPA method for GC/MS analysis (EPA 8240A or 8270A).

If no for any of the above, list all the data associated with the tune that either failed criteria or in which there was no tune.

Date/Time	Problem	Sample Affected (Action)
	met criteria	

Check for transcription/calculation errors. If errors are present, briefly summarize necessary changes:

Is the spectra of the mass calibration acceptable? Yes ☑ No ☐

Reviewed By: E Todd Martin
Date: 10/10/96

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
			Not		
			Criteria		

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

STDm1

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

5.0 CONTINUING CALIBRATION

Have continuing calibration standards been analyzed at the frequency specified in the EPA method?
Yes ☑ No ☐

List below all compounds which did not meet continuing calibration requirements.

Instrument ID	Date	Compound	RF/%D	Action	Samples Affected
		Meet criteria			

Check for transcription and calculation errors. If errors are found, briefly summarize necessary corrections below:

Reviewed By: E Todd Monk
Date: 12/24/98

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 matr 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 ☑

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

Sample Conc

Date	Blank ID	Compound	Conc. ( )	PQL ( )	Action Level	Samples Affe (Action
7/17/98	523768	Methylene Chloride	5.249/kg	.55	Sample concentration	
7/20/98	525953		1.209/kg	.55	10 times blank co	
					Results are qualified	
					Methylene is a comm	
					laboratory contaminan	

Batch 126958

PQL = Practical Quantitation Limit from EPA Method.

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

Are there any TICs present in the blanks that are also present in the samples? Yes ☐ No ☑
If yes, list below.

7.0 SURROGATE RECOVERY

Were surrogate recoveries evaluated for each of the samples analyzed by GC or GC/MS?
Yes ☐ No ☐

If surrogate standards other than those presented by SW-846 are used, list below with reference to applicable control limits used to evaluate the percent recoveries.

Surrogate Compound	Control Limits
	lab Specified

List below the percent recoveries which did not meet either SW-846 criteria or criteria listed above.

Date	Sample ID/Matrix	Surrogate Compound	%Rec	(Range)	Action
7/29/98 1718	LCSD/Soil	2 Fluorophenol	7.44	(25-121)	<10% Recovery. Se 15 ND. RDP also o
1718		Nitrobenzene d5	15.7	(23-120)	> out of Specifi
8/6/98 1518	LCSD/Soil	2 Fluorophenol	16.9	(44-102)	low. Recovery >10
					Samples are ND. RPD on for QC sample (041490-
					Entire samples ER1295-0 DF2-B
				and	041307-002/ER1295-B98-[

BH3) -qualified UJ if ND. J if detected.

Reviewed By: E Tod Mush

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

If surrogate recovery was outside of control limits, were the samples or method blank reanalyzed?

Yes ☑ No ☐

Are method blank surrogate recoveries outside of limits upon reanalysis? Yes ☑ No ☐

Are transcription/calculation errors present? Yes ☐ No ☑

If yes, note necessary corrections. _____

_____

_____

_____

_____

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

8.0 MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD) ANALYSIS

Were MS/MSDs analyzed at the frequency required by the EPA method or QAPjP for each matrix type?

Yes ☑ No ☐

List below % recoveries and RPDs of compounds which did not meet criteria. Indicate on chart criteria used to evaluate recoveries and RPDs.

Batch 126124

Date	Sample ID/Matrix	Compound	%Rec / RPD	Action
7/29/98 1718	MS/Soil	Pyrene %. Rec =	0%	Range 52-115
	MSD/Soil	Pyrene RPD	587	(0-30) recovery lower than
				lower acceptance limit
				Sample results are ND. Sample
				results are qualified J

Reviewed By: E Todd Monk

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

9.0 LABORATORY CONTROL SAMPLE ANALYSIS

Have laboratory control samples containing a representative number of the compounds of interest been analyzed at the frequency specified in the EPA method or QAPjP?
Yes ☑ No ☐

Evaluate percent recoveries based on control limits established in individual EPA methods, or use established laboratory control limits. List below recoveries of compounds which did not meet criteria with reference to control limits used.

Batch ID 126118 LCS

Date	Compound	%Rec	Control Limits	Action	Samples Affected
8/3/98 1710	Pyrene	59.7	60.6-115	Sample results ND, Data qualified J, % recovery low	

Control Limit Reference: _____

Evaluate RPD based on control limits established in individual EPA methods, or use established laboratory control limits. List below recoveries of compounds which did not meet criteria with reference to control limits used.

Batch ID 126124 LCSD

RPD

Date	Compound	%Rec	Control Limits	Action	Samples Affected
7/29/98 1248	1,2,4-Trichlorobenzene	123	0-24.9	RPD does not meet criteria (high). Sample results are ND. Entire sample qualified as "UJ"	
	2-Chlorophenol	123	0-20		
	4-Nitrophenol	31.2	0-31.1		
	4 chloro-3 methyl phenol	21	0-20		

Control Limit Reference: Sample ER 1295-898

Acenaphthene 24.3 0-23.2
N-Nitrosodipropylamine 65.1 0-25.4
Phenol 80.1 0-24.9
(continued on extra insert)

DFI - BHJ 041307

<TOP 1

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

10.0 INTERNAL STANDARDS EVALUATION

List below the internal standard areas of samples or blanks which did not meet criteria.

Date	Sample ID	Internal Out	Acceptable Range	Action
		Not Applicable		

Are retention times of the internal standards within 30 seconds of the associated calibration standard?
Yes ☑ No ☐

11.0 TARGET COMPOUND LIST ANALYTES
11.1 GC/MS Analyses

Are the reconstructed ion chromatograms, the mass spectra for the identified compounds, and the data system printouts included? Yes ☑ No ☐

Is chromatographic performance acceptable with respect to:

Baseline stability? Yes ☑ No ☐

Resolution? Yes ☑ No ☐

Peak shape? Yes ☑ No ☐

Full-scale graph (attenuation)? Yes ☑ No ☐

Reviewed By: Ed Mark

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

Samples affected: _____

Check chromatograms for false negatives, especially for the multiple peak components (toxaphene and PCBs). If false negatives are apparent and the appropriate PCB standards were not analyzed, or if confirmed analysis was not present, flag the affected data.

Samples affected: _____

NOTE: Due to the complexities of PCB pesticide analysis, each analytical run should be reviewed to verify identification and column performance.

12.0 FIELD DUPLICATE ANALYSIS

Were field duplicates submitted for analysis? Yes ☑ No ☐

If yes, calculate RPD and use professional judgment to determine if the data needs to be qualified. List results below.

Date	Sample ID	Compound	Sample Result	Duplicate Result	RPD	Affected Samples
			Target			
		NO	detected			
		Analytes				
		above	pl			

13.0 COMPOUND QUANTITATION/REPORTED DETECTION LIMITS

Are there any transcription/calculation errors from raw data to reported results (check at least 10% of positive results)? Yes ☐ No ☑

In addition, verify that the correct internal standard, quantitation ion, and RRF were used to calculate the result for a minimum of 10% of sample data.

Reviewed By: E Tod Monk
Date: 12-1-95

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 ☐ N/A Applicable

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: S Tad Mumbo

List of Data Qualifiers used in Data Validation and Associated Comment Responses

Qualifier	Comment
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A1	Laboratory accuracy and/or bias measurements for the associated Surrogate Spike do not meet acceptance criteria.
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B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
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.
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.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
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UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

* This is not a definitive list. Other qualifiers are potentially available, see TOP 94-03. Notify Tina Sanchez to revise list. **Updated:March 10, 1998**

7223.230

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

SITE OR PROJECT Non ER Septic Fields CASE NO. 7223.230

ANALYTICAL LABORATORY GEL SAMPLE IDS See organic data assessment summary

LABORATORY REPORT # 980735 1A, 980735 1B, 980735 1C, 980735 1D

TASK LEADER Sanders

NO. OF SAMPLES 18 soil, 1 aqueous

ARLOC's
600447
600426
600438
600451

DATA ASSESSMENT SUMMARY

		ICP	AA	MERCURY	CYANIDE
1.	HOLDING TIMES	✓	NA	✓	NA
2.	CALIBRATIONS	✓		✓	
3.	BLANKS	J		✓	
4.	ICS	✓			
5.	LCS	✓			
6.	DUPLICATE ANALYSIS	✓		✓	
7.	MATRIX SPIKE	J		✓	
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: See Sample findings Summary

AREAS OF CONCERN:

REVIEWED BY: E Tod Monks

DATE REVIEWED: 12/24/96

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

ACTION ITEMS: See Sample Findings Summary

AREAS OF CONCERN:

OVERALL DATA QUALITY ASSESSMENT

Reviewed By: E T Plumb Date: 12/24/98

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

1.0 HOLDING TIMES

List holding time criteria used to evaluate samples, indicating which samples exceed the holding time. Holding time begins with validated time of sample collection.

Parameter	Holding Time Criteria	Sample ID	Days Holding Time was Exceeded	Action

Were the correct preservatives used? Yes ☐ No ☐

List below samples that were incorrectly preserved.

Sample No.	Type of Samples	Deficiency	Action

Reviewed By: E Todd Martin Date: 12/24/98

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

2.0 INSTRUMENT CALIBRATION

2.1 Percent Recovery Criteria

Indicate %Recovery (%R) criteria used to evaluate calibration standards:

Metals: _____
Mercury: _____
Cyanide: Not Applicable
Other: Not Applicable

List below the analytes which did not meet %R criteria for initial and continuing calibration standards:

Analysis Date	ICV/CCV #	Analyte	%R	Action	Samples Affected
		None			
		Or: Noted			

2.2 Analytical Sequence

Did the laboratory use the proper number of standards for calibration as described in the EPA method? Yes ☑ No ☐

Have initial calibrations been performed at the beginning of each analysis and at the frequency indicated by the EPA method? Yes ☑ No ☐

Have continuing calibration standards been analyzed at the beginning of sample analysis and at a *minimum* frequency indicated by the EPA method and at the end of the analysis sequence? Yes ☑ No ☐

If no for any of the above, outline deviations and actions taken below:

_____

_____

_____

Reviewed By: E T Palmer Date: 12/29/98

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

Were the correlation coefficients for the calibration curves for AA, Hg, CN, and other spectrophotometric methods ≥0.995? (Check calculations performed for calibration curves.) Yes ☑ No ☐

If no, list: _____

Date	Analyte	Coefficient	Action	Samples Affected

Not Applicable

Check for transcription and calculation errors involving calibration summary forms and raw data. Briefly summarize errors and associated actions when data quality might have been affected.

3.0 BLANK ANALYSIS

3.1 Initial and Continuing Calibration Blanks

Have Initial and Continuing Calibration Blanks (ICB/CCB) been analyzed at the frequency required in the EPA method? Yes ☑ No ☐

If no, summarize problems and resolutions in the narrative report.

List analytes detected in ICB and CCBs below:

NOTE: For soil samples, convert blank values to mg/kg using digestion weights and volumes.

Analysis Date	ICB/CCB No.	Analyte	Conc.	Required Detection Limits	Action Level	Samples Affected

Reviewed By: E Todd Munk Date: 12/24/98

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

3.2 Method Blank

Was one method blank analyzed for:

Each of 20 samples? Yes ☑ No ☐
Each digestion batch? Yes ☐ No ☐
Each matrix type? Yes ☐ No ☐
Both AA and ICP when both are used for the same analyte? Yes ☐ No ☐
or
At the frequency indicated in the EPA method or QAPjP? Yes ☐ No ☐

NOTE: Method blank is the same as the calibration blank for mercury and for wet chemistry analysis.

List analytes detected in method blank samples below. NOTE: For soil samples, be sure to calculate blank values using digestion weights and volumes.

Preparation Date	Analyte	Conc. mg/kg	Required Detection Limits	Sample Results / Action Level		Samples Affected
Batch 126165 7/17/98	Lead	.0967	.339	3.33	.339	041486-003
	Silver	.115	.031	.383	.031	↓
			Blank	values > IDL.		
			Detected	results < 5	x blank	
			concentration,	Results		
			qualified	"J".		

Is concentration in the method blank below the detection limit? Yes ☐ No ☑

Affected samples: 041486-003

Reviewed By: E Todd Martin Date: 12/24/98

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

3.3 Field/Rinse/Equipment Blanks

Was a field/equipment blank analyzed as required by the EPA method or QAPjP? Yes ☐ No ☒

List below analytes detected in the field blanks. NOTE: For soil samples, calculate blank values using digestion weights and volumes.

N/A Not Applicable

Collection Date	Blank ID	Analyte	Conc.	Required Detection Limits	Action Level	Samples Affected

4.0 ICP INTERFERENCE CHECK SAMPLE ANALYSIS

Was an ICP interference check sample (ICS) analyzed at the beginning and end of a run or at least twice every 8 hours? (Not required for Ca, Mg, K, and Na) Yes ☒ No ☐

Samples affected: _____

Are the values of the ICS for solution AB within 80-120%R? Yes ☒ No ☐

If no, is the concentration of Al, Ca, Fe, or Mg lower than in ICS? Yes ☐ No ☐

Reviewed By: E Todd Monk Date: 12/24/98

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

If no, list below all analytes which did not meet %R criteria and in which the concentration of Al, Ca, Fe, or Mg is higher than in the ICS:

Date	Analyte	%R	Action	Samples Affected
			Not	
			Applicable	

Are any results > IDL for those analytes which are not present in the ICS solution A? Yes ☐ No ☐

If yes, results >2 (absolute value of the IDL) indicate either a positive or negative interference and must be qualified.

Samples affected: _____

_____

Check for transcription/calculation errors. Briefly summarize errors and associated actions when data quality might have been affected.

5.0 LABORATORY CONTROL SAMPLES (LCS)

Was an LCS analyzed at required frequency? Yes ☑ No ☐

Samples affected: 044486-003 / ER 1255-6500-DF1-BH

_____

_____

_____

_____

_____

Reviewed By: E Todd Martin Date: 12/24/96

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

List below any LCS recoveries not within limits.

Batch

Preparation Date	Analyte	%R	Action	Samples Affected
		N.T.		
		Applicable		

6.0 LABORATORY DUPLICATE ANALYSIS

Were laboratory duplicates analyzed at required frequency? Yes ☑ No ☐

Samples affected: _____

_____

Was laboratory duplicate analysis performed on field or equipment blanks? Yes ☐ No ☑

Samples affected: _____

_____

_____

Is any value for sample duplicate pair <PQL and the other value >10xPQL? Yes ☐ No ☑

Samples affected: _____

_____

_____

Reviewed By: E Todd Martin Date: 12/24/98

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

List below concentrations of any analyte that did not meet criteria for duplicate precision:

Batch 126165 LCS DUP

ET 12/21/98

Sample ID	Matrix	Preparation Date	Analyte	PQL	RPD	~~Action~~ Limits	Samples Affected
~~[illegible]~~	Soil	7/17/98	Lead		12.6	0-9.47	041486-003
					LCS	met % recovery	
					criteria (no data		
						qualified)	

Check for transcription/calculation errors. Briefly summarize errors and associated actions when data quality might have been affected.

7.0 FIELD DUPLICATE SAMPLE ANALYSIS

Were field duplicates collected at the frequency indicated in the EPA method or QAPjP?
Yes ☑ No ☐

If yes, qualify data associated only with the field duplicate pair. Calculate RPDs for each analyte in which both values are greater than the IDL.

Is any value for sample duplicate < practical quantitation limit (PQL) and other value >10xPQL? Yes ☐ No ☑

Reviewed By: E Tod Mork Date: 12/24/98

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

Samples affected: _____

List below the analytes that do not meet RPD or PQL criteria. Use the same criteria as those used for laboratory duplicate analysis or criteria specified in EPA method or sampling plan.

Sample ID	Matrix	Collection Date	RPD	Control Limit	Action	Samples Affected
			N/A			
			Applicable			

Check for transcription/calculation errors. Briefly summarize errors and associated actions when data quality might have been affects.

8.0 MATRIX SPIKE ANALYSIS

NOTE: *This matrix spike is a predigestion/predistallation spike.*

Was a matrix spike prepared and analyzed at the required frequency? Yes ☑ No ☐

Reviewed By: E Todd Monkman Date: 12/28/98

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

Were matrix spikes performed at the concentrations specified by the EPA method? Yes ☑ No ☐

Samples affected: _____

Was matrix spike analysis performed on field or equipment blanks? Yes ☐ No ☑

If equipment or field blanks are the only aqueous samples, matrix spike analysis may be performed; however, matrix spike samples must be present for the other matrices.

Samples affected: _____

List below the % recoveries for analytes that did not meet the criteria:

Batch

LCS DUP

Sample ID	Matrix	Preparation Date	Analyte	%R	Action	Samples Affected
	Soil	7/17/98	Barium	60%	67-131	
		(% Rec low)	Barium detected at 9			4.8 mg/kg
			in Sample ; Sample			was V/ to
			qual'd field		as "J"	

Check for transcription/calculation errors. Also check to ensure matrix spike concentrations are not affected by sample dilutions performed. If matrix spike concentrations are diluted below or close to IDL based on sample dilutions performed, use professional judgment in qualifying data. Ensure that the laboratory performed sample dilutions only when necessary as indicated by QA/QC requirements. Briefly summarize errors and associated actions when data quality might have been affected.

Reviewed By: E Tod Monks Date: 12/24/98

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

NOTE: If preparation blank spikes are analyzed, evaluate recoveries. These recoveries can indicate whether excursions in matrix spike recovery are caused by sample matrix effects or poor digestion efficiencies and/or problems with matrix spike solution. For example, if matrix spike recovery for selenium is 0% and preparation blank spike recovery for selenium is 92%, this may indicate sample matrix effects.

9.0 FURNACE ATOMIC ABSORPTION ANALYSIS

Were duplicate injections present for each sample, including required QC analyses (not required if MSA is done)? Yes ☐ No ☐

Samples affected: _____

_____

_____

Were postdigestion spikes analyzed for samples, including QC samples? Yes ☐ No ☐ Not Applicable

Were postdigestion spikes analyzed at the required concentration? Yes ☐ No ☐

Samples affected: _____

_____

_____

Was a dilution analyzed for samples with postdigestion spike recovery <40%? Yes ☐ No ☐

Samples affected: _____

_____

_____

MSA Analysis (Method of Standard Additions)—MSA is required when serial dilutions are not with ± 10%. Was MSA required for any sample but not performed? Yes ☐ No ☐

Are MSA calculations outside the linear range of the calibration curve? Yes ☐ No ☐

Reviewed By: E Todd Monk Date: 12/28/98

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

NOTE: Ensure the spiking concentrations used for MSA analysis were at 50–100% and 150% of sample concentration or absorbance.

Samples affected: ______________________________

10.0 SERIAL DILUTION ANALYSIS

NOTE: Serial dilution analysis (ICP) is required only for initial concentrations equal to or greater than 10xIDL.

If applicable, was a serial dilution ~~performed~~ set for: ETM 12/21/98

Each 20 samples? Yes ☑ No ☑
Each matrix type? Yes ☐ No ☐

Samples affected: ______________________________

List below results which did not meet criteria of %D <10% for analyte concentrations greater than 50xIDL before dilution:

Analysis Date	Sample ID	Analyte	IDL	%D	Action	Samples Affected
			met criteria			

Check for calculation errors and negative interferences.

Reviewed By: E Tod Monk Date: 12/24/98

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 ☐

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

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? 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: E Tod Munk Date: 12/24/98

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:

Checked 10%.

Approved By:* E Todd Monhan

Date: 12/21/98

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

Reviewed By: E Todd Monhan Date: 12/24/98

Internal Lab

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Page 1 of 2

AR/COC 602763

Batch No. SAR/WR No. SMO Use

Dept. No./Mail Stop:	6135/1147 T. Raybal	[redacted]		Contract No.:	AJ-2480A
Project/Task Manager:	NON-ER Septic Sys/M Sanders	[redacted]		Case No.:	7223.230
Project Name:	Non-ER Septic Systems	Lab Contact:	E Kent 803 556 8171	SMO Authorization:	S. on. Gilbert
Record Center Code:	ER/1295/DAT	Lab Destination:	GEL	Bill To: Sandia National Laboratories	
Logbook Ref. No.:	035	SMO Contact/Phone:	D Salmi 844-3110	Supplier Services Dept.:	
Service Order No.	CF 0686	Send Report to SMO:	S Jensen 844-3184	P.O. Box 5800 MS 0154	
Location	Tech Area				
Building	Room	Reference LOV(available at SMO)			

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Beginning Depth/ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Use Lab Sample ID
048395-001	MD146/MD235/T40-DA-BH5-5	5.5ft	N/A	081999 0858	S	AG	125ml	4C	GR	SA	VOC	[redacted]
048395-002	MD146/MD235/T40-DFI-BH1-5.5	5.5ft	N/A	081999 0858	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
048396-001	MD146/MD235/T40-DFI-BH2-10.5-5	10.5ft	N/A	081999 0924	S	AG	125ml	4C	GR	SA	VOC	
048396-002	MD146/MD235/T40-DFI-BH2-10.5-5	10.5ft	N/A	081999 0924	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
048397-001	MD146/MD235/T40-DFI-BH2-5.5-5	5.5ft	N/A	081999 1000	S	AG	125ml	4C	GR	SA	VOC	
048397-002	MD146/MD235/T40-DFI-BH2-5.5-5	5.5ft	N/A	081999 1000	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
048398-001	MD146/MD235/T40-DFI-BH2-10.5-5	10-5 5.5ft	N/A	081999 1045	S	AG	125 250ml	4C	GR	SA	VOC	
048398-002	MD146/MD235/T40/DFI-BH2-10.5-5	10.5ft	N/A	081999 1045	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
048399-001	B6583 DFI-BH1-6.5-5	6.5ft	N/A	081999 1132	S	AG	125ml	4C	GR	SA	VOC	
048399-002	B6583 DFI-BH1-6.5-5	6.5ft	N/A	081999 1132	S	AG	250ml	4C	GR	SA	~~TBE~~ PCB CN Cr6+	

RMMA ☐ Yes ☒ No Ref. No.

Sample Disposal ☐ Return to Client ☒ Disposal by lab

Turnaround Time ☒ Normal ☐ Rush

Required Report Date

Special Instructions/QC Requirements

EDD ☒ Yes ☐ No

Raw Data Package ☒ Yes ☐ No

Send info to Mike Sanders + All sites o with alpha

VOC (EPA 8260) 9012 A w 9010B prep

CN (EPA 9010B) 9012 A w 9010B prep

PCB (EPA 8082)

Cr6+ (EPA 7196A) 7196A w 3060A

Please list as separate report.

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	Margaret Sanchez	Margaret Sanchez	MS	Weston/6118/845-3267
	~~Gilbert Quintana~~			IT/6118/238-9417

1. Relinquished by	Margaret Sanchez	Org. 6118	Date 8/23/99	Time 1345	4. Relinquished by	Org.	Date Time
1. Received by	[redacted]	Org. 7577	Date 8/23/99	Time 1345	4. Received by	Org.	Date Time
2. Relinquished by	[redacted]	Org. 7577	Date 8/24/99	Time 1000	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

048395
048414 >20

ORIGINAL

3, MM

Analysis Request And Chain Of Custody (Continuation)

AR/COC- 602763

Project Name: Non-ER Septic Systems Project/Task Manger: Mike Sanders Case No. 12223

Reference LOV (available at SMO)

Location / Building / Sample No- Fraction	Tech Area / Room / 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	Lab use Lab Sample ID	
048400-001	B6583-DFI-BH1-11.5-5	11.5 Ft	N/A	081999 1150	S	AC	125ml	4C	GR	SA	VOC		15
048400-002	B6583-DFI-BH1-11.5-5	11.5 Ft	N/A	081999 1150	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		16
048401-001	B6583-DFI-BH2-65-5	65 Ft	N/A	081999 1400	S	AC	125ml	4C	GR	SA	VOC		17
048401-002	B6583-DFI-BH2-65-5	65 Ft	N/A	081999 1400	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		18
048402-001	B6583-DFI-BH2-11.5-5	11.5 Ft	N/A	081999 1503	S	AC	125ml	4C	GR	SA	VOC		19
048402-002	B6583-DFI-BH2-11.5-5	11.5 Ft	N/A	081999 1503	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		20
048403-001	B6584W-DFI-BH1-5-5	5 Ft	N/A	081999 1542	S	AC	125ml	4C	GR	SA	VOC		21
048403-002	B6584W-DFI-BH1-5-5	5 Ft	N/A	081999 1542	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		22
048404-001	B6589W-DFI-BH1-10-5	10 Ft	N/A	081999 1030	S	AC	125ml	4C	GR	SA	VOC		23
048404-002	B6584W-DFI-BH1-10-5	10 Ft	N/A	081999 1030	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		24
048405-001	B6584W-DFI-BH2-5-5	5 Ft	N/A	082099 1037	S	AC	125ml	4C	GR	SA	VOC		25
048405-002	B6584W-DFI-BH2-5-5	5 Ft	N/A	082099 1037	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		26
048406-001	B6584W-DFI-BH2-10-5	10 Ft	N/A	082099 1230	S	AC	125ml	4C	GR	SA	VOC		27
048406-002	B6584W-DFI-BH2-10-5	10 Ft	N/A	082099 1230	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		28
048406-002	B6584W-DFI-BH2-10-DU	10 Ft	N/A	082099 1230	S	AG	250ml	4C	GR	DU	PCB CN Cr6+		29
048407-002	B6589W-DFI-BH2-10-MS/MSD	10 Ft	N/A	082099 1230	S	AG	250ml	4C	GR	MSD	PCB CN Cr6+		30
048408-001	B6584W-DFI-BH3-5-5	5 Ft	N/A	082099 1420	S	AC	125ml	4C	GR	SA	VOC		31
048408-002	B6584W-DFI-BH3-5-5	5 Ft	N/A	082099 1420	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		32
048409-001	B6584W-DFI-BH3-10-5	10 Ft	N/A	082099 1510	S	AC	125ml	4C	GR	SA	VOC		33
048409-002	B6584W-DFI-BH3-10-5	10 Ft	N/A	082099 1510	S	AG	250ml	4C	GR	SA	PCB CN Cr6+		34
													35

Analysis Request And Chain Of Custody (Continuation)

AR/COC- 602763

Project Name: Non-ER Sypetic System | Project/Task Manger: M Sanders | Case No.:7223.230

Location: Tech Area | Building | Room

Reference LOV (available at SMO)

Lab use

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	Lab Sample ID
048411-001	M0231/234-DF1-BH2-5-S	5 ft	N/A	082399 0910	S	AC	125 ml	4C	GR	SA	VOC	
048411-002	M0231/234-DF1-BH2-5-S	5 ft	N/A	082399 0910	S	AG	250 ml	4C	GR	SA	PCB CN Cr6+	
048412-001	M0231/234-DF1-BH2-10-S	10 ft	N/A	082399 0927	S	AC	125 ml	4C	GR	SA	VOC	
048412-002	M0231/234-DF1-BH2-10-S	10 ft	N/A	082399 0927	S	AG	250 ml	4C	GR	SA	PCB CN Cr6+	
048413-001	M0231/234-DF1-BH1-5-S	5 ft	N/A	082399 1007	S	AC	125 ml	4C	GR	SA	VOC	
048413-002	M0231/234-DF1-BH1-5-S	5 ft	N/A	082399 1007	S	AG	250 ml	4C	GR	SA	PCB CN Cr6+	
048414-001	M0231/234-DF1-BH1-10-S	10 ft	N/A	082399 1020	S	AC	125 ml	4C	GR	SA	VOC	
048414-002	M0231/234-DF1-BH1-10-S	10 ft	N/A	082399 1020	S	AG	250 ml	4C	GR	SA	PCB CN Cr6+	
048443-001	T12/T42/T43-SP1-BH1-14-S	14 ft	N/A	082399 1150	S	AC	125 ml	4C	GR	SA	VOC	
048443-002	T12/T42/T43-SP1-BH1-14-S	14 ft	N/A	082399 1150	S	AG	~~125 ml~~ 250 ml	4C	GR	SA	PCB CN Cr6+	
048444-001	T12/T42/T43-SP1-BH1-19-S	19 ft	N/A	082399 1201	S	AC	125 ml	4C	GR	SA	VOC	
048444-002	T12/T42/T43-SP1-BH1-19-S	19 ft	N/A	082399 1201	S	AG	250 ml	4C	GR	SA	PCB CN Cr6+	
048445-005	T12/T42/T43-SP1-BH1-19-CN	N/A	N/A	082399 1100	DIW	P	1L	NaOH	GR	EB	Total Cyanide	
048446-005	T12/T42/T43-SP1-BH1-19-Cr	N/A	N/A	082399 1100	DIW	P	500 ml	4C	GR	EB	Chrome 6	
048447-005	T12/T42/T43-SP1-BH1-19-PCB	N/A	N/A	082399 1100	DIW	AG	2x1L	4C	GR	EB	PCB	
048448-005	T12/T42/T43-SP1-BH1-19-EB	N/A	N/A	082399 1100	DIW	G	3x40 ml	HCL	GR	EB	VOC	
048449-005	T12/T42/T43-SP1-BH1-19-TB	N/A	N/A	082399 1100	DIW	G	3x40 ml	HCL	GR	TB	VOC	

Abnormal Conditions on Receipt | Lab Use

Recipient Initials

048443 } 10
048452

048414

SAMPLE FINDINGS SUMMARY

Site: Non ER Septic Systems

AR/COC: 602763 Data Classification: General Chemistry

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
See Attached Table			

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: _____ Date: 11/5/99

General Chem.

SAMPLE FINDINGS SUMMARY

COC: 602763 **Sample Number**	total cyanide (57-12-5)	hexavalent chromium (18540-29-9)											
M0146/M0235/T40-DF1-BH1-5.5-S	JB												
M0146/M0235/T40-DF1-BH1-10.5-S	JB												
M0146/M0235/T40-DF1-BH2-10.5-S	JB												
B6583-DF1-BH1-6.5-S	JB												
B6583-DF1-BH2-11.5-S	JB												
B6584W-DF1-BH2-5-S	JB												
B6584W-DF1-BH2-10-S	UJA2												
B6584W-DF1-BH2-10-DU	UJA2												
B6584W-DF1-BH2-10-MSDS	UJA2												
B6584W-DF1-BH3-5-S	UJA2												
B6584W-DF1-BH3-10-S	UJA2												
M0231/234-DF1-BH2-5-S	UJA2												
M0231/234-DF1-BH2-10-S	UJA2												
M0231/234-DF1-BH1-5-S	UJA2												
M0231/234-DF1-BH1-10-S	UJA2												
T12/T42/T43-SP1-BH1-14-S	UJA2												
T12/T42/T43-SP1-BH1-19-S	UJA2												
T12/T42/T43-SP1-BH1-19-CR		UJ2											

SAMPLE FINDINGS SUMMARY

Site: Non-ER Spots

AR/COC: 602763 Data Classification: Organic

Sample/ Fraction No.	Analysis	DV Qualifiers	Comments
T12/T42/T43-SB-BH1-17-PCB	EPA 8082 PCB	UJ	low surrogate recovery
M0146/M0235/T40-DF1-BH2-5.5-S	Aroclor 1016 12674-11-2	J	lack of confirmation info.

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: [redacted] Date: 11/5/99

DATA VALIDATION SUMMARY:

SITE/PROJECT: Non-ER Septic CASE #: 7223.230
ARCOC #: 602763
LABORATORY: CEL
LABORATORY REPORT #: 9908918

OF SAMPLES: 42 MATRIX: Soil
LAB SAMPLE IDs: 9908918-05 thru - 46

ANALYSIS/ QC ELEMENT	VOC	~~SVOC~~	~~PEST/ PCB~~	~~HPLC (HE)~~	~~TCP/AES~~	~~GFAA/ AA~~	~~CVAA (Hg)~~	CN	~~BAD~~	~~GC6+ EITHER~~
1. HOLDING TIMES/ PRESERVATION	✓		✓					✓		✓
2. CALIBRATIONS	✓		✓					✓		✓
3. METHOD BLANKS	✓		✓					JB		✓
4. MS/MSD	✓		✓					UJA2		✓
5. LABORATORY CONTROL SAMPLES	✓		✓					✓		✓
6. REPLICATES								✓		✓
7. SURROGATES	✓		~~UJ~~ J							
8. INTERNAL STDS	✓									
9. TCL COMPOUND IDENTIFICATION	✓									
10. ICP INTERFERENCE CHECK SAMPLE										
11. ICP SERIAL DILUTION										
12. CARRIER/CHEM TRACER RECOVERIES										
13. OTHER QC	—		J					/		/

CHECK MARK (√) – ACCEPTABLE
J – ESTIMATED
U – NOT DETECTED
SHADED CELLS – NOT APPLICABLE
UJ – NOT DETECTED, ESTIMATED
R – UNUSABLE

REVIEWED BY: [signature] DATE: 11/5/99

DATA VALIDATION SUMMARY:

SITE/PROJECT: Non-ER Septic CASE #: 7223.230
ARCOC #: 602763
LABORATORY: CEL
LABORATORY REPORT #: 9908918

OF SAMPLES: 5 MATRIX: aqueous
LAB SAMPLE IDs: 9908918 - 47 thru -51

ANALYSIS/ QC ELEMENT	VOC	SVOC	PEST/ PCB	HPLC (HE)	ICP/AES	GFAA/ AA	CVAA (Hg)	CN	RAD	OTHER
1. HOLDING TIMES/ PRESERVATION	✓		✓					UJ2 mH		UJ2
2. CALIBRATIONS	✓		✓					✓		✓
3. METHOD BLANKS	✓		✓					✓		✓
4. MS/MSD	—		—					✓		✓
5. LABORATORY CONTROL SAMPLES	✓		✓					✓		✓
6. REPLICATES								✓		✓
7. SURROGATES	✓		UJ							
8. INTERNAL STDS	✓									
9. TCL COMPOUND IDENTIFICATION	✓									
10. ICP INTERFERENCE CHECK SAMPLE										
11. ICP SERIAL DILUTION										
12. CARRIER/CHEM TRACER RECOVERIES										
13. OTHER QC	—							✓		✓

CHECK MARK (√) – ACCEPTABLE
J – ESTIMATED
U – NOT DETECTED

SHADED CELLS – NOT APPLICABLE
UJ – NOT DETECTED, ESTIMATED
R – UNUSABLE

REVIEWER: _____ DATE: 11/5/99

Memorandum

Date: 11/05/99

To: File

From: Marcia Hilchey

Subject: General Chemistry Data Review and Validation
Site: Non-ER Septic Systems
AR/COC: 602763
Case: 7223.230
Laboratory: GEL
SDG: 9908918

See 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 with specified methods (total cyanide EPA9012, hexavalent chromium EPA7196). All components were successfully analyzed.

Qualifications were applied to CN sample results due to blank contamination and failure to meet matrix spike sample acceptance criteria.

Qualification was applied to a Cr6+ sample result due to exceeded holding time.

Holding Times

The CN samples were analyzed within the prescribed holding time.

The Cr6+ equipment blank sample was received 2 days and analyzed 3 days after the prescribed 24hr. holding time. Sample results were UJ2 qualified.

Calibration

Initial and continuing calibrations met QC acceptance criteria.

Blanks

The Cr6+ method blanks and equipment blanks were free of target analyte above reporting limits. The Cr6+ equipment blank result was previously qualified UJ2 (see Holding Times section above). This qualification has no affect on soil sample data quality.

Several samples exhibited CN at less than 5 times the associated method blank value. These sample results were qualified JB. See attached Sample Findings Summary. The CN equipment blank was free of target analyte above the reporting limit.

Matrix Spike Analysis

The CN matrix spike associated with several soil samples failed to meet recovery acceptance criteria (low). These sample results were qualified UJA2. See attached Sample Findings Summary.

The Cr6+ matrix spike sample analyses met QC acceptance criteria.

Laboratory Control/Laboratory Control Duplicate Samples

The Cr6+ LCS/LCSD samples met QC acceptance criteria.

One CN LCS result was not reported, but the associated LCSD was acceptable. No sample results were qualified.

Laboratory Replicate Analysis

The replicate sample analyses met QC acceptance criteria.

Other QC

Field duplicate soil sample analyses met RPD acceptance criteria.

No other specific issues were identified which affect data quality.

Please contact me if you have any questions or comments regarding the review of this package.

GENERAL CHEMISTRY:

SITE/PROJECT: Non-ER Static ARCOC #: 602763
LABORATORY: CEL LABORATORY REPORT #: 9908918
METHODS: total CN, Cr6+

QC/ Analyte	CAS #	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	REP RPD	Serial Dilution	Field Dup RPD	Equip. Blks	Field Blks			
total cyanide	57-12-5	✓	✓	n/a	n/a	0.15[1]	✓[2]	✓	✓	57.5[3]	n/a	n/a	✓	n/a	✓	✓	n/a			
Cr6+	18540-29-9	✓	✓	n/a	n/a	✓	✓	✓	✓	✓	n/a	n/a	✓	n/a	✓	UJ2	n/a			

Comments:

1 Blank 643446 only. Associated with samples -06, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26. all other blks OK.
2 No LCS QC643459. Associated with -47. All other LCS OK
3 MS QC643680 only. Associated with samples -28, 29, 30, 32, 34, 36, 38, 40, 42, 44, 46. All other MS OK.

Memorandum

Date: 11/05/99

To: File

From: Marcia Hilchey

Subject: Organic Data Review and Validation
Site: Non-ER Septic Systems
AR/COC: 602763
Case: 7223.230
Laboratory: GEL
SDG: 9908918

See 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 with specified methods (VOC EPA8270, PCB EPA8082). All compounds were successfully analyzed.

No qualifications were applied to VOC sample data.

Qualifications were applied to PCB sample results due to failure to meet acceptance criteria for surrogate recovery, and lack of positive target analyte result confirmation.

Holding Times

The samples were analyzed within the prescribed holding times.

Calibration

Several VOC CCVs had greater than 20% and less than 40%D. Since all other QC acceptance criteria were met for these analytes, no sample results were qualified.

The PCB laboratory case narrative states that several Aroclors failed to meet CCV acceptance criteria. For the purposes of data validation, only the CCV results of Aroclors 1016 and 1260 are assessed. The CCV for Aroclor 1016 analyzed on 9/4/99 at 1213 (associated with several field samples) had greater than 20 and less than 40%D. No sample results were qualified.

Blanks

No target analytes were detected above the reporting limit in the method, equipment, or trip blanks.

The results for the PCB equipment blank were qualified UJ (see Surrogate section below). This qualification has no affect on the data quality of the associated PCB samples.

Surrogates

All VOC surrogate recoveries met acceptance criteria.

The recovery for DCB in samples B6584W-DF1-BH110-S and M0231/234-DF1-BH1-10-S was slightly low. The samples were not reextracted, but were reinjected with similar results. Sample results were not qualified.

The laboratory case narrative states that DCB recovery was low for samples T12/T42/T43-SP1-BH1-14-S and T12/T42/T43-SP1-BH1-19-S. The results report pages for these samples indicate that surrogate recovery acceptance criteria were met. Sample results were not qualified.

Surrogate recovery was low for sample T12/T42/T43-SP1-GB1-19-PCB (EB). Results for this sample were qualified UJ.

Matrix Spike/Matrix Spike Duplicates (MS/MSD)

Matrix spike sample analysis for soil VOC and PCB met acceptance criteria.

No matrix spike samples were analyzed for aqueous VOC or PCB. No sample data were qualified as a result.

Internal Standards

All VOC internal standard QC acceptance criteria were met.

Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)

VOC LCS/LCSD samples met all acceptance criteria.

One soil PCB LCSD failed to meet acceptance criteria (high) for recovery and RPD. All associated sample results were non-detect, with the exception of sample M0146/M0235/T40-DF1-BH2-5.5-S. Non-detect sample results were not qualified; no further qualifications were applied to the positive sample result (see Confirmation section below).

Confirmation

Sample M0146/M0235/T40-DF1-BH2-5.5-S exhibited a positive result for Aroclor 1260. The reviewer could find no explicit evidence of secondary column confirmation of this result. This sample result was qualified J.

Other QC

No field duplicate samples were submitted for VOC analysis in this SDG.

PCB field duplicate analysis met RPD acceptance criteria.

No other specific issues were identified which affect data quality.

Please contact me if you have any questions or comments regarding the review of this package.

VOLATILE ORGANICS: Page 1 of 2
SW-846 - Method 8260

SITE/PROJECT: Non-ER Septic ARCOC #: 602763 99.
LABORATORY: CEL LABORATORY REPORT #: 9908918

n/a + n/a

IS	GC/MS		Min RF	Intercept	Calib RF	Calib RSD / R^2	CCV %D	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup RPD	Eq. Blks	Trip Blks	TAL		
	Name	CAS #			>.05	<20% / 0.99	20%									✓	✓			
1	Chloromethane	74-87-3	0.10	✓	✓	✓	✓	✓				n								
1	Bromomethane	74-83-9	0.10																	
1	vinyl chloride	75-01-4	0.10																	
1	Chloroethane	75-00-3	0.01																	
1	methylene chloride (10xblk)	75-09-2	0.01																	
1	acetone(30xblk)	67-64-1	0.01				30.5													
1	carbon disulfide	75-15-0	0.10				27.1													
1	1,1-dichloroethene	75-35-4	0.20				✓		✓	✓	✓	✓	✓	✓						
1	1,1-dichloroethane	75-34-3	0.10																	
1	Chloroform	67-66-3	0.20																	
1	1,2-dichloroethane	107-06-2	0.10																	
1	2-butanone(10xblk)	78-93-3	0.01																	
2	1,1,1-trichloroethane	71-55-6	0.10																	
2	carbon tetrachloride	56-23-5	0.10																	
2	Bromodichloromethane	75-27-4	0.20																	
2	1,2-dichloropropane	78-87-5	0.01																	
2	cis-1,3-dichloropropene	10061-01-5	0.20																	
2	Trichloroethene	79-01-6	0.30						✓	✓	✓	✓	✓	✓						
2	Dibromochloromethane	124-48-1	0.10																	
2	1,1,2-trichloroethane	79-00-5	0.10																	
2	Benzene	71-43-2	0.30						✓	✓	✓	✓	✓	✓						
2	trans-1,3-dichloropropene	10061-02-6	0.10																	
2	Bromoform	75-25-2	0.10																	
3	4-methyl-2-pentanone	108-10-1	0.10																	
3	2-hexanone	591-78-6	0.01				31.4													
3	Tetrachloroethene	127-18-4	0.30																	
3	1,1,2,2-tetrachloroethane	79-34-5	0.30																	
3	toluene(10xblk)	108-88-3	0.40						✓	✓	✓	✓	✓	✓						
3	Chlorobenzene	108-90-7	0.50						✓	✓	✓	✓	✓	✓						
3	Ethylbenzene	100-41-4	0.10																	
3	Styrene	100-42-5	0.30																	
3	xylenes(total)	1330-20-7	0.30																	
	1,2-dichloroethylene(total)	540-59-0	0.01																	
	2-chloroethyl vinyl ether	110-75-8																		
	Vinyl acetate			↓	↓	↓	↓	↓								↓	↓			

Comments:

REVIEWED BY: _____ DATE: 11/5/99

VOLATILE ORGANICS: Page 2 of 2
SW-846 - Method 8260

SITE/PROJECT: _____ ARCOC #: 602763 aq.
LABORATORY: _____ LABORATORY REPORT #: _____

Surrogate Recovery and Internal Standard Outliers

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			
		OK										

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

IS 1: Bromochloromethane
IS 2: 1,4-Difluorobenzene
IS 3: Chlorobenzene-d5

Comments:

VOLATILE ORGANICS: Page 1 of 2
SW-846 - Method 8260

SITE/PROJECT: NonER Spill ARCOC #: 602763 soil
LABORATORY: GEL LABORATORY REPORT #: 9908918

IS	GC/MS			Min RF	Intercept	Calib RF	Calib RSD / R^2	CCV %D	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup RPD	Eq. Blks	Trip Blks	TAL	CCV	
	Name	CAS #				>.05	<20% / 0.99	20%													
1	Chloromethane	74-87-3	0.10	✓	✓	✓	✓	✓									✓	✓			
1	Bromomethane	74-83-9	0.10																		
1	vinyl chloride	75-01-4	0.10																		
1	Chloroethane	75-00-3	0.01																		
1	methylene chloride (10xblk)	75-09-2	0.01																		
1	acetone(10xblk)	67-64-1	0.01					37.9													
1	carbon disulfide	75-15-0	0.10																		
1	1,1-dichloroethene	75-35-4	0.20							✓	✓	✓	✓	✓	✓						
1	1,1-dichloroethane	75-34-3	0.10																		
1	Chloroform	67-66-3	0.20																		
1	1,2-dichloroethane	107-06-2	0.10																		
1	2-butanone(10xblk)	78-93-3	0.01					24.9													
2	1,1,1-trichloroethane	71-55-6	0.10																		
2	carbon tetrachloride	56-23-5	0.10																		
2	Bromodichloromethane	75-27-4	0.20																		
2	1,2-dichloropropane	78-87-5	0.01																		
2	cis-1,3-dichloropropene	10061-01-5	0.20																		
2	Trichloroethene	79-01-6	0.30							✓	✓	✓	✓	✓	✓						
2	Dibromochloromethane	124-48-1	0.10																		
2	1,1,2-trichloroethane	79-00-5	0.10																		
2	Benzene	71-43-2	0.50							✓	✓	✓	✓	✓	✓						
2	trans-1,3-dichloropropene	10061-02-6	0.10																		
2	Bromoform	75-25-2	0.10																		
3	4-methyl-2-pentanone	108-10-1	0.10																		
3	2-hexanone	591-78-6	0.01					39.9													
3	Tetrachloroethene	127-18-4	0.20																		
3	1,1,2,2-tetrachloroethane	79-34-5	0.30							✓	✓	✓	✓	✓	✓						
3	toluene(10xblk)	108-88-3	0.40																		
3	Chlorobenzene	108-90-7	0.50							✓	✓	✓	✓	✓	✓						
3	Ethylbenzene	100-41-4	0.10																		
3	Styrene	100-42-5	0.30																		
3	xylenes(total)	1330-20-7	0.30																		
	1,2-dichloroethylene(total)	540-59-0	0.01																		
	2-chloroethyl vinyl ether	110-75-8																			
	vinyl acetate				✓	✓	✓	✓	✓												

Comments:

REVIEWED BY _____ DATE: 11/5/99

VOLATILE ORGANICS: Page 2 of 2
SW-846 - Method 8260

SITE/PROJECT: _____ ARCOC #: 602763 sol
LABORATORY: _____ LABORATORY REPORT #: _____

Surrogate Recovery and Internal Standard Outliers

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			
					OK							

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

IS 1: Bromochloromethane
IS 2: 1,4-Difluorobenzene
IS 3: Chlorobenzene-d5

Comments:

PCBs:
SW846 - Method 8082

SITE/PROJECT: Non-ER Septic ARCOC #: 602763 soil
LABORATORY: GEL LABORATORY REPORT #: 9908918

n/a

Name	CAS #	Intercept	Calib RSD / R^2	OCV RPD	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup RPD	Eq. Blks	Field Blks			
			<20% / 0.99	<20%				20%			20%						
PCBs																	
Aroclor-1016	12674-11-2	✓	✓	23.0	✓	✓	132	36.6	✓	✓	✓	✓	✓				
Aroclor-1221	11104-28-2																
Aroclor-1232	1114-16-5																
Aroclor-1242	53469-21-9																
Aroclor-1248	12672-29-6																
Aroclor-1254	11097-69-1																
Aroclor-1260	11096-82-5					✓	132[2]	36.6[2]	✓	✓	✓						

Sample	SMC % REC	~~SMC RT~~		Sample	SMC % REC	SMC RT
-24	46.6	DCB				
-42	46.6	"				
~~-49~~	25.5	"				

pH

Confirmation

Sample	CAS #	RPD > 25%		Sample	CAS #	RPD > 25%
-10	11096-82-5	3				

Comments: [1] CCV on 9/4/99 @ 1213 only. Associated with samples -6, -8, 10, 13, 14, 16, 18, 20, 22, 24, 26
[2] QC sample 642962 associated with samples ~~-56~~ only. -06 thru -42
[3] no explicit evidence of confirmation

REVIEWED BY: _____ DATE: 11/5/99

PCBs:
SW846 - Method 8082

SITE/PROJECT: Non-ER Septic ARCOC #: 602763 99.
LABORATORY: CEL LABORATORY REPORT #: 9908918

Name	CAS #	Intercept	Calib RSD / R^2	CCV RPD	Method Blks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup RPD	Eq. Blks	Field Blks			
			<20% / 0.99	<20%				20%	n/a		20%	n/a					
PCBs																	
Aroclor-1016	12674-11-2	✓	✓	✓	✓	✓	✓	✓									
Aroclor-1221	11104-28-2																
Aroclor-1232	1114-16-5																
Aroclor-1242	53469-21-9																
Aroclor-1248	12672-29-6																
Aroclor-1254	11097-69-1																
Aroclor-1260	11096-82-5					✓	✓	✓									

Sample	SMC % REC	SMC RT		Sample	SMC % REC	SMC RT
-49	25.5	DCB				

Confirmation

Sample	CAS #	RPD > 25%		Sample	CAS #	RPD > 25%
	n/a					

Comments:

REVIEWED BY: _____ DATE: _____

Contract Verification Review (CVR)

Project Leader A. Roybal | Project Name Non ER Septic Systems | Case No. 7223.230

AR/COC No. 602763 | Analytical Lab GEL | SDG No. 9908918

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	The equipment blank (aqueous) Chromium 6 hold time (24 hours) was not met.		
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	Some PCB surrogate recoveries were slightly out. See page 125
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 PCB archlor 1260 was slightly high. See page 128
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
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	X		
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	X		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and pesticides/PCBs	X		

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)	NA		
a) Initial calibration provided	NA		
b) Continuing calibration provided	NA		
c) Instrument run logs provided	NA		
4.3 Inorganics (metals)	X		
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) ICP interference check sample data provided	X		
d) ICP serial dilution provided	X		
e) Instrument run logs provided	X		
4.4 Radiochemistry	NA		
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
048404-002 Soil	PCB	PCB surrogate recoveries were slightly out of acceptance window. See page 125
048414-002 Soil	PCB	PCB surrogate recoveries were slightly out of acceptance window. See page 125
048447-005 Water	PCB	PCB surrogate recoveries were slightly out of acceptance window. See page 239
048408-002 Water	Cyanide	Due to matrix interference, the MS was not with-in window
048446-005 Water	Cyanide	EB done outside the 24 hour hold time

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 _____ and date correction request was submitted: _____

Reviewed by: [signature] Date: 10-7-99 Closed by: _____ Date: _____

Analysis Reques nd Chain Of Custody (Continuation)

AR/COC- 602763

Project Name: Non-ER Sypetic System	Project/Task Manger: M Sanders	Case No.: 7223.230

Location: Building / Tech Area / Room	Sample No-Fraction	ER Sample ID or Sample Location detail	Depth in Ft	ER Site No.	Date/Time Collected	Reference LOV (available at SMO): Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Methods	Sample Type	Parameter & Method Requested	Lab use Lab Sample ID
	048411-001	MO231/234-DFI-BH1-5-5	5ft	N/A	092399 0913	S	AC	125ml	4C	GR	SA	VOC 35	
	048411-002	MO231/234-DFI-BH1-5-S	5 ft	N/A	092399 0913	S	AG	250ml	4C	GR	SA	PCB CN Cr6 36	
	048412-001	MO231/234-DFI-BH2-10-S	10 ft	N/A	092399 0927	S	AC	125ml	4C	GR	SA	VOC 39	
	048412-002	MO231/234-DFI-BH2-10-S	10 ft	N/A	092399 0927	S	AG	250ml	4C	GR	SA	PCB CN Cr6 40	
	048413-001	MO231/234-DFI-BH1-5-S	5ft	N/A	092399 1007	S	AC	125ml	4C	GR	SA	VOC 39	
	048413-002	MO231/234-DFI-BH1-5-S	5 ft	N/A	092399 1007	S	AG	250ml	4C	GR	SA	PCB CN C16 40	
	048414-001	MO231/234-DFI-BH1-10-S	10 ft	N/A	092399 1020	S	AC	125ml	4C	GR	SA	VOC 41	
	048414-002	MO231/234-DFI-BH1-10-S	10 ft	N/A	092399 1020	S	AG	250ml	4C	GR	SA	PCB CN C16 42	
	048443-001	T12/T42/T43-SPI-BH1-14-S	14ft	N/A	092399 1150	S	AC	125ml	4C	GR	SA	VOC 43	
	048443-002	T12/T42/T43-SPI-BH1-14-S	14 ft	N/A	092399 1150	S	AG	250 125ml	4C	GR	SA	PCB CN Cr6 44	
	048444-001	T12/T42/T43-SPI-BH1-19-S	19ft	N/A	092399 1201	S	AC	125ml	4C	GR	SA	VOC 45	
	048444-002	T12/T42/T43-SPI-BH1-19-S	19 ft	N/A	092399 1201	S	AG	250ml	4C	GR	SA	PCB CN Cr6 46	
	048445-005	T12/T42/T43-SPI-BH1-19-CN	N/A	N/A	092399 1100	QW	P	1L	NaOH	GR	EB	Total Cyanide 47	
	048446-005	T12/T42/T43-SPI-BH1-19-Cr	N/A	N/A	092399 1100	QW	P	500ml	4C	GR	EB	Chrome 6 48	
	048447-005	T12/T42/T43-SPI-BH1-19-PCB	N/A	N/A	092399 1100	QW	AG	2x1L	4C	GR	EB	PCB 49	
	048448-005	T12/T42/T43-SPI-BH1-19-EB	N/A	N/A	092399 1100	QW	G	3x40ml	HCL	GR	GB	VOC 50	
	048449-005	T12/T42/T43-SPI-BH1-19-TB	N/A	N/A	092399 1100	QW	G	3x40ml	HCL	GR	TB	VOC 51	

Abnormal Condition(s) Noted: [redacted] LAB USE

Relinquished by: [redacted]

048443 > 10

048452

Internal Lab

ANALYSIS REQUEST AND CHAIN OF CUSTODY

Page 1 of

AR/COC 602763

Batch No. SAR/WR No. SMO Use

ORIGINAL

Dept. No./Mail Stop:	6135/1147	Date Samples Shipped: [redacted]	Contract No.: AJ-2480A
Project/Task Manager:	NON-ER Septic Sys/M Sanders	[redacted]	Case No.: 7223.230
Project Name:	Non-ER Septic Systems	Lab Contact: E Kent 803 556 8171	SMO Authorization: D. On. Gilbert
Record Center Code:	ER/1295/DAT	Lab Destination: GEL	Bill To: Sandia National Laboratories
Logbook Ref. No.:	0.35	SMO Contact/Phone: D Salmi 844-3110	Supplier Services Dept.:
Service Order No.	CF 0686	Send Report to SMO: S Jensen 844-3184	P.O. Box 5800 MS 0154

99089189 Lab Use

Reference LOV(available at SMO)

Sample No./Fraction	ER Sample ID or Sample Location Detail	Beginning Depth/ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
048396-001	MO146/MO235/TAN-DFI-BH1-5.5	5.5Ft	N/A	081999 0853	S	AG	125ml	4C	GR	SA	VOC	[redacted]
048396-002	MO146/MO235/TAN-DFI-BH1-5.5	5.5Ft	N/A	081999 0853	S	AG	250ml	4C	GR	SA	PCB, CN, Cr6+	
048396-001	MO146/MO235/TAN-DFI-BH1-10.5	10.5Ft	N/A	081999 0924	S	AG	125ml	4C	GR	SA	VOC	
048396-002	MO146/MO235/TAN-DFI-BH1-10.5	10.5Ft	N/A	081999 0924	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
048397-001	MO146/MO235/TAN-DFI-BH2-5.5	5.5Ft	N/A	081999 1000	S	AG	125ml	4C	GR	SA	VOC	
048397-002	MO146/MO235/TAN-DFI-BH2-10.5-5	5.5Ft	N/A	081999 1000	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
048398-001	MO146/MO235/TAN-DFI-BH2-10.5-5	10.5 5.5Ft	N/A	081999 1045	S	AG	125 250ml	4C	GR	SA	VOC	
048398-002	MO146/MO235/TAN-DFI-BH2-10.5-5	10.5Ft	N/A	081999 1045	S	AG	250ml	4C	GR	SA	PCB CN Cr6+	
048399-001	B6593 DFI-BH1-6.5-5	6.5Ft	N/A	081999 1132	S	AG	125ml	4C	GR	SA	VOC	
048399-002	B6593 DFI-BH1-6.5-5	6.5Ft	N/A	081999 1132	S	AG	250ml	4C	GR	SA	VOC PCB, CN, Cr6+	

RMMA	☐ Yes ☒ No	Ref. No.	[redacted]	Special Instructions/QC Requirements
Sample Disposal	☐ Return to Client	☒ Disposal by lab		EDD ☒ Yes ☐ No
Turnaround Time	☒ Normal	☐ Rush		Raw Data Package ☒ Yes ☐ No
	Required Report Date			Send info to Mike Sanders + All sites o

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	Margaret Sanchez	Margaret Sanchez	MS	Weston/6118/845-3267
	~~Gilbert Quintana~~			(6118)238-9417

VOC (EPA 8260) with asphalt
CN (EPA 9010A) 9012A w 9010B prep
PCB (EPA 8082)
Cr6+ (EPA 7196A) 7196A with 3060A
Please list as separate report

	Org.	Date	Time		Org.	Date	Time
1. Relinquished by	6118	8/23/99	1345	4. Relinquished by			
1. Received by	7577	8/23/99	1345	4. Received by			
2. Relinquished by	7577	8/24/99	0900	5. Relinquished by			
2. Received by	GEL	8/25/99	945	5. Received by			
3. Relinquished by				6. Relinquished by			
3. Received by				6. Received by			

048395 >20

Contract Verification Review (CVR)

Project Leader A. Roybal | Project Name Non ER Septic Systems | Case No. 7223.230

AR/COC No. 602763 | Analytical Lab GEL | SDG No. 9908918

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	The equipment blank (aqueous) Chromium 6 hold time (24 hours) was not met.		
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	Some PCB surrogate recoveries were slightly out. See page 125
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 PCB archlor 1260 was slightly high. See page 126
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
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	X		
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	X		
3.8 Narrative included, correct, and complete	X		
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)	NA		
a) Initial calibration provided	NA		
b) Continuing calibration provided	NA		
c) Instrument run logs provided	NA		
4.3 Inorganics (metals)	X		
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) ICP interference check sample data provided	X		
d) ICP serial dilution provided	X		
e) Instrument run logs provided	X		
4.4 Radiochemistry	NA		
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
048404-002 Soil	PCB	PCB surrogate recoveries were slightly out of acceptance window. See page 125
048414-002 Soil	PCB	PCB surrogate recoveries were slightly out of acceptance window. See page 125
048447-005 Water	PCB	PCB surrogate recoveries were slightly out of acceptance window. See page 239
048408-002 Water	Cyanide	Due to matrix interference, the MS was not with-in window
048446-005 Water	Cyanide	EB done outside the 24 hour hold time

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 _____ and date correction request was submitted: _____

Reviewed by: Doug Sabori Date: 10-7-99 Closed by: _____ Date: _____

ANNEX C
DSS Site 1093
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® 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

I:\MAPPING\PROJECTS\10960025\020606R.DOC

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
 # Modules Retrieved: 131
 # Modules Lost in Field: 4
 # Modules Not Returned: 1

Exposure Time: ~15 **[days]**
 # Trip Blanks Returned: 3
 # Unused Modules Returned: 3

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 DUAIN+ SEPTIC (B)
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: 505-284-2614	Customer P.O. #: 28518 Quote #: 211946

Serial # of Modules Shipped			# of Modules for Installation 135 # of Trip Blanks 7
# 179087 - # 179144	# 179087 - # 179134		Total Modules Shipped: 142 Pieces
# 179150 - # 179233	# 179135 - # 179136		Total Modules Received: 142 Pieces
# - #	# 179139 - #		Total Modules Installed: 135 Pieces
# - #	# 179142 - # 179144		Serial # of Trip Blanks (*Client Decides*) #
- #	# 179150 - # 179151	# 171227	# #
- #	# - #	#	# # #
- #	# - #	#	# # #
# - #	# - #	#	# # #
# - #	# - #	#	# # #
# - #	# - #	#	# # #
		#	# # #
		#	# # #

Prepared By: Suzanne Valdez
Verified By: Mary Ann Meyer

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 1094 01 : (AM) PM

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

Total Modules Retrieved: _____ Pieces
Total Modules Lost in Field: _____ Pieces
Total Unused Modules Returned: _____ Pieces

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

	Date	Time		Date	Time
Relinquished By: [signature]			Received By: Mike Sanders		
Affiliation: W.L. Gore & Associates, Inc.	3-4-02	12:00	Affiliation: Sandia / ER	3-6-02	
Relinquished By: William J Quintana			Received By:		
Affiliation: 6135	5-14-02	12:58	Affiliation:		
Relinquished By:			Received By: Mary Ann Meyer		
Affiliation:			Affiliation: W.L. Gore & Associates, Inc.	5/7/02	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				# of Modules for Installation 135 # of Trip Blanks 7		
# 179087 - # 179144	#179152 - # 179187			Total Modules Shipped: 142 Pieces		
# 179150 - # 179233	#179188 - #179226			Total Modules Received: 142 Pieces		
# - #	# - #			Total Modules Installed: 135 Pieces		
# - #	# - #			Serial # of Trip Blanks (*Client Decides*)	#	
- #	# - #			#179228	#	#
- #	# - #			#179229	#	#
- #	# - #			#	#	#
# - #	# - #			#	#	#
# - #	# - #			#	#	#
# - #	# - #			#	#	#
				#	#	#
				#	#	#
				#	#	#

Prepared By: Suzanne Tift
Verified By: Mary Ann Wright

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 1094 01 : (AM) PM

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

Total Modules Retrieved: 74 Pieces
Total Modules Lost in Field: 4 Pieces
Total Unused Modules Returned: 63 Pieces

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

Relinquished By: [signature] Affiliation: W.L. Gore & Associates, Inc.	Date 3-4-02	Time 12:00	Received By: Mike Sanders Affiliation: Sandia 6133	Date 3-7-02	Time
Relinquished By: [signature] Affiliation: Sandia NL 6135	Date 5-21-02	Time 0935	Received By: Affiliation:	Date	Time
Relinquished By: Affiliation:	Date	Time	Received By: Mary Ann Wright Affiliation: W.L. Gore & Associates, Inc.	Date 5-24-02	Time 13:30

GORE-SORBER® Screening Survey Installation and Retrieval Log

SITE NAME & LOCATION

1 of 4

LINE #	MODULE #	INSTALLATION DATE/TIME	RETRIEVAL DATE/TIME	EVIDENCE OF LIQUID HYDROCARBONS (LPH) or HYDROCARBON ODOR (Check as appropriate)			MODULE IN WATER (check one)		COMMENTS
				LPH	ODOR	NONE	YES	NO	
1.	179087	4/23/02, 0815	05-08-02, 0800					✓	1001/898-GS-5
2.	179088	0822							GS-3
3.	179089	0830							GS-2
4.	179090	0840							GS-1
5.	179091 ✓	0852						✓	GS-4
6.	179092	0952	0830					✓	1052/803-GS-1
7.	179093	1000							-4
8.	179094	1010							-3
9.	179095	1018						✓	-2
10.	179096	1135	0900						1030/6587- -5
11.	179097	1151							-6
12.	179098	1238							-4
13.	179099	1247							-3
14.	179100	1254							-2
15.	179101	1309							-1
16.	179102	1347	0920						1082/6620- -4
	179103	1355							-5
18.	179104	1404							-1
19.	179105 ✓	1431							-3
20.	179106	1440							-2
21.	179107	4/24/02, 0848	5-9-02, 0930						1108/6531- -5
22.	179108	0853							-6
23.	179109	0900							-4
24.	179110	0907							-2
25.	179111	0916							-3
26.	179112	0936							-1
27.	179113	4/25/02, 0746	5-10-02, 0812						1027/6530- -5
28.	179114	0754							-2
29.	179115	0800							-3
30.	179116	0810							-4
31.	179117	0818	0917						-1
32.	179118	0915	5-10-02, 0925						1010/6536- 5
33.	179119	0922							6
34.	179120	0931							4
35.	179121	0942							2
36.	179122	0947							1
37.	179123	0956	1002						3
38.	179124	1026	5-10-02, 1013						1028/6560- 1
39.	179125	1043							4
40.	179126	1052							3
41.	179127	1103	1041						2
42.	179128	1420	5-10-02 1045						1026/6501- 2

GORE-SORBER® Screening Survey Installation and Retrieval Log

SITE NAME & LOCATION

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
43.	179129	4/25/02, 1428	5-10-02, 1047						1026/6504-65-3
44.	179130	1437	5-10-02, 1051						1
45.	179131	1442	5-10-02, 1053						1025/6504- 1
46.	179132	1446	↓						2
47.	179133	↓ 1509	5-10-02, 11:06						3
48.	179134	4/26/02, 0905	5-10-02 1247						1093/6584- 1
49.	179135	0914	↓ 1254						4
50.	179136	0930	5-10-02, 1305						2
51.	179137	0938	Lost						3
52.	179138	0948	Lost						5
53.	179139	1018	5-10-02, 1322						1034/6600- 2
54.	179140	1026	Lost						3
55.	179141	1030	Lost						4
56.	179142	1038	5-10-02, 1343						1
57.	179143	1136	5-10-02, 11:36						276/829X- 2
	179144	1142	↓						3
	179150	1150	↓						4
60.	179151	↓ 1155	5-10-02, 11:54						1
61.	179152	4/29/02, 0814	5-14-02 09:42						1084/6505- 1
62.	179153	0822	↓						5
63.	179154	0829	↓						3
64.	179155	0903	↓						2
65.	179156	0845	5-14-02 ↓ 10:21						4
66.	179157	0930	05-14-02 0959						1083/6570- 4
67.	179158	0934	↓						1
68.	179159	0946	↓						2
69.	179160	0948	↓ 0940						3
70.	179161	1050	05-14-02, 1026						1032/6610- 1
71.	179162	1100	↓						2
72.	179163	1110	↓						4
73.	179164	1114	↓						3
74.	179165	1120	↓						5
75.	179166	1126	05-14-02, 11:03						6
76.	179167	1222	05-14-02, 11:06						1120/6643- 2
77.	179168	1230	↓						3
78.	179169	1237	↓						4
79.	179170	1242	05-14-02 ↓ 11:32						1
80.	179171	1320	5-14-02 - 0844						1034/6710- 4
	179172	1325	↓ 0917						3
82.	179173	1332	↓ 0851						2
83.	179174	1340	↓ 0855						1
84.	179175	↓ 1423	5-14-02, 0814						1035/6715- ↓ 4

GORE-SORBER® Screening Survey Installation and Retrieval Log

SITE NAME & LOCATION

p 3 of 4

LINE #	MODULE #	INSTALLATION DATE/TIME	RETRIEVAL DATE/TIME	EVIDENCE OF LIQUID HYDROCARBONS (LPH) or HYDROCARBON ODOR (Check as appropriate)			MODULE IN WATER (check one)		COMMENTS	
				LPH	ODOR	NONE	YES	NO		
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, 0917							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								-6
103.	179194	1318	5-15-02, 1032							-9
104.	179195	1445	5-15-02, 14:05						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, 0941						1004/6969-	2
118.	179209	0952								4
119.	179210	1000								3
120.	179211	1009								5
121.	179212	1016	5-16-02, 0907							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						1094/6582-	2
126.	179217	1218	5-16-02 - 0935							1

GORE-SORBER® Screening Survey Installation and Retrieval Log

4 of 4

SITE NAME & LOCATION

LINE #	MODULE #	INSTALLATION DATE/TIME	RETRIEVAL DATE/TIME	EVIDENCE OF LIQUID HYDROCARBONS (LPH) or HYDROCARBON ODOR (Check as appropriate)			MODULE IN WATER (check one)		COMMENTS
				LPH	ODOR	NONE	YES	NO	
127.	179218	5/1/02, 1225	5-16-02, 0942						1094/LFR-65-3
128.	179219	1231	5-16-02, 0950						-4
129.	179220	5/6/02, 0850	5-21-01, 07:57						1081/6650 -1
130.	179221	0857							-3
131.	179222	0909							-2
132.	179223	0918							-4
133.	179224	0926							-6
134.	179225	0933							-5
135.	179226	0940	5-21-01, 0851						-7
136.	179227								
137.	179228								
138.	179229								
139.	179230								
140.	179231								
141.	179232								
142.	179233								
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GORE SORBER SCREE 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	
5/21/2002	179125	0.10	nd	0.08	nd	0.02	nd	0.05	0.04	0.01	bdl	0.00
5/21/2002	179126	0.00	nd	nd	nd	bdl	nd	0.04	0.03	0.02	bdl	0.00
5/21/2002	179127	0.09	nd	0.05	nd	0.02	0.01	0.04	0.04	bdl	bdl	0.00
5/21/2002	179128	0.07	nd	0.05	nd	0.02	nd	0.08	0.04	0.01	0.03	0.00
5/21/2002	179129	0.02	nd	nd	nd	0.02	nd	0.06	0.03	0.03	bdl	0.00
5/21/2002	179130	0.21	nd	0.15	nd	0.04	0.02	0.15	0.07	0.03	0.05	0.00
5/21/2002	179131	nd	nd	nd	nd	nd	nd	0.07	0.04	0.01	0.02	nd
5/21/2002	179132	nd	nd	nd	nd	nd	nd	0.05	bdl	0.02	0.02	0.00
5/21/2002	179133	0.08	nd	0.08	nd	nd	nd	0.19	0.04	0.09	0.05	nd
5/21/2002	179134	nd	nd	nd	nd	nd	nd	0.05	0.03	0.02	bdl	0.00
5/21/2002	179135	0.11	nd	0.10	nd	0.01	nd	0.16	0.04	0.04	0.08	0.00
5/21/2002	179136	0.09	nd	0.09	nd	nd	nd	0.04	0.02	0.01	bdl	0.00
5/21/2002	179139	nd	nd	nd	nd	nd	nd	0.68	0.07	0.10	0.51	0.00
5/21/2002	179142	0.11	nd	0.07	nd	0.03	0.01	0.25	0.12	0.07	0.06	0.00
5/21/2002	179143	nd	nd	nd	nd	nd	nd	0.07	0.03	0.02	0.03	nd
5/21/2002	179144	0.17	nd	0.09	0.02	0.05	0.01	0.08	0.04	0.01	0.02	0.00
5/21/2002	179150	0.40	nd	0.19	0.04	0.13	0.04	0.07	0.05	0.02	bdl	0.00
5/21/2002	179151	nd	nd	nd	nd	nd	nd	0.03	0.03	bdl	bdl	0.00
5/28/2002	179152	0.09	nd	0.05	nd	0.03	0.02	0.19	0.06	0.02	0.11	0.08
5/28/2002	179153	0.13	nd	0.08	nd	0.04	0.02	0.13	0.03	0.02	0.08	0.13
5/28/2002	179154	nd	nd	nd	nd	nd	nd	0.11	0.02	0.01	0.07	0.00
5/28/2002	179155	nd	nd	nd	nd	nd	nd	0.06	bdl	0.02	0.04	0.00
5/28/2002	179156	nd	nd	nd	nd	nd	nd	0.22	0.15	0.01	0.06	0.00
5/28/2002	179157	nd	nd	nd	nd	nd	nd	0.12	0.04	0.02	0.06	0.00
5/28/2002	179158	0.01	nd	nd	nd	0.01	nd	0.11	0.05	0.01	0.05	0.00
5/28/2002	179159	0.00	nd	nd	nd	bdl	nd	0.07	0.03	0.01	0.03	0.00
5/28/2002	179160	nd	nd	nd	nd	nd	nd	0.02	bdl	0.02	bdl	0.00
5/28/2002	179161	0.00	nd	nd	nd	bdl	nd	0.08	0.03	0.02	0.03	0.00
5/28/2002	179162	0.01	nd	nd	nd	0.01	nd	0.10	0.03	0.03	0.04	0.00
5/28/2002	179163	0.01	nd	nd	nd	0.01	nd	0.07	0.02	0.02	0.03	0.00
5/28/2002	179164	0.02	nd	nd	nd	0.02	bdl	0.14	0.06	0.02	0.06	0.00
5/28/2002	179165	nd	nd	nd	nd	nd	nd	0.08	0.03	bdl	0.05	0.00
5/28/2002	179166	0.00	nd	bdl	nd	nd	nd	0.05	0.03	0.01	bdl	0.00
5/28/2002	179167	nd	nd	nd	nd	nd	nd	0.02	0.02	bdl	bdl	0.00
5/28/2002	179168	0.04	nd	0.03	nd	0.01	nd	0.09	0.04	0.02	0.03	0.00
5/28/2002	179169	nd	nd	nd	nd	nd	nd	0.06	0.03	0.01	0.02	nd
5/28/2002	179170	0.03	nd	nd	nd	0.03	nd	0.06	0.04	0.02	bdl	0.00
5/28/2002	179171	nd	nd	nd	nd	nd	nd	0.04	0.03	0.02	bdl	0.00

JSS Sites 1093

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 SCREEN 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
179125	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179126	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179127	nd	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179128	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179129	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179130	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179131	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179132	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	bdl	nd
179133	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179134	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179135	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179136	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179139	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179142	bdl	bdl	nd	nd	nd	0.01	0.01	bdl	nd	nd	nd	nd
179143	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179144	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179150	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	bdl	nd
179151	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd	bdl	nd
179152	0.06	0.03	nd	nd	nd	0.11	0.05	0.06	nd	nd	nd	nd
179153	0.09	0.03	nd	nd	nd	0.16	0.09	0.07	nd	nd	nd	nd
179154	bdl	bdl	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179155	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179156	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179157	bdl	bdl	nd	nd	nd	0.03	nd	0.03	nd	nd	nd	nd
179158	bdl	bdl	nd	nd	nd	0.04	0.02	0.03	nd	nd	nd	nd
179159	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179160	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179161	nd	bdl	nd	nd	nd	0.11	0.05	0.06	nd	nd	nd	nd
179162	bdl	nd	nd	nd	nd	0.05	0.02	0.03	nd	nd	nd	nd
179163	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179164	bdl	bdl	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179165	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179166	bdl	nd	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179167	bdl	nd	nd	nd	nd	0.04	nd	0.04	nd	nd	nd	nd
179168	bdl	bdl	nd	nd	nd	0.07	0.02	0.04	nd	nd	nd	nd
179169	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179170	bdl	nd	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179171	bdl	bdl	nd	nd	nd	0.08	0.03	0.05	nd	nd	nd	nd

DSS sites 1093

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 SCREEN 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
179125	0.03	nd	1.24	nd	nd	nd	nd
179126	nd	nd	0.52	nd	nd	nd	nd
179127	nd	nd	0.55	nd	nd	nd	nd
179128	nd	nd	nd	nd	nd	nd	nd
179129	nd	nd	0.01	nd	nd	nd	nd
179130	nd	0.12	0.02	nd	nd	nd	nd
179131	nd	nd	nd	nd	nd	nd	nd
179132	nd	nd	0.75	nd	nd	nd	nd
179133	nd	nd	0.18	nd	nd	nd	nd
179134	nd	nd	0.33	nd	nd	nd	nd
179135	nd	nd	0.38	bdl	nd	nd	nd
179136	nd	nd	0.65	nd	0.05	nd	nd
179139	nd	nd	0.14	nd	nd	nd	nd
179142	nd	0.12	0.42	nd	nd	nd	nd
179143	0.41	nd	0.25	nd	nd	nd	nd
179144	0.84	0.13	0.21	nd	nd	nd	nd
179150	2.50	0.14	0.18	bdl	nd	nd	nd
179151	0.71	nd	0.32	nd	nd	nd	nd
179152	nd	nd	0.06	0.02	nd	nd	nd
179153	nd	nd	0.03	nd	0.08	nd	nd
179154	nd	nd	nd	nd	nd	nd	nd
179155	nd	nd	nd	nd	nd	bdl	nd
179156	nd	nd	nd	nd	nd	nd	nd
179157	nd	nd	0.38	nd	nd	nd	nd
179158	nd	nd	0.56	nd	nd	nd	nd
179159	nd	nd	0.60	nd	nd	nd	nd
179160	nd	nd	0.37	nd	nd	nd	nd
179161	nd	nd	nd	nd	nd	nd	nd
179162	nd	nd	bdl	nd	nd	nd	nd
179163	nd	nd	nd	nd	nd	nd	nd
179164	nd	nd	0.01	nd	nd	nd	nd
179165	nd	nd	nd	nd	nd	nd	nd
179166	nd	nd	nd	nd	nd	nd	nd
179167	nd	nd	nd	nd	nd	nd	nd
179168	nd	nd	nd	nd	nd	bdl	nd
179169	nd	nd	nd	nd	nd	nd	nd
179170	nd	nd	nd	nd	nd	nd	nd
179171	nd	nd	nd	nd	nd	nd	nd

DSS Site 1093

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 1093
Risk Assessment

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DSS Site 1093: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1093, the Building 6584 west septic system, at Sandia National Laboratories/New Mexico (SNL/NM), is located in Technical Area III on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (DOE). The septic system consisted of a septic tank connected to a drainfield with five 80- to 100-foot-long 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 the early 1990s, 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 (Romero September 2003).

Environmental concern about DSS Site 1093 is based upon the potential for the release of constituents of concern (COCs) in effluent discharged to the environment via the drainfield at this site. Because operational records are not available, the investigation for DSS Site 1093 was planned to be consistent with other DSS site investigations and to sample for the most commonly anticipated COCs found at similar facilities.

The ground surface in the vicinity of the site is flat to very slightly inclined to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.23 miles east 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 (Thompson and Smith 1985, SNL/NM March 1996). Most of the area immediately around DSS Site 1093 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS Site 1093 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 silt, sands, and gravels. The depth to groundwater is approximately 483 feet below ground surface (bgs). The direction of groundwater flow is to the west in this area (SNL/NM March 2002). The nearest groundwater monitoring well is approximately 150 feet north of the site. The nearest production wells are north of the site and include KAFB-4 and KAFB-11, which are approximately 2.7 and 3.0 miles away, 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 1093 was effluent discharged to the environment from the drainfield at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1093 Sampling Areas	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	4	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 in four locations across DSS Site 1093 with a Geoprobe™ from two 3-foot-long sampling intervals at each boring location. Drainfield sampling intervals started at 5 and 10 feet bgs in each of the four 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 1093 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, 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 methods and data quality requirements from the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001).

Table 2
Number of Confirmatory Soil and QA/QC Samples Collected from DSS Site 1093

Sample Type	VOCs	SVOCs	PCBs	HE	RCRA Metals	Hexavalent Chromium	Cyanide	Gamma Spectroscopy Radionuclides	Gross Alpha/Beta
Soil	6	6	6	6	6	6	6	6	6
Duplicates	0	0	1	0	0	1	1	0	0
EBs and TBs (VOCs only)	0	1	0	1	1	0	0	0	0
Total Samples	6	7	7	7	7	7	7	6	6
Analytical Laboratory	GEL	GEL	GEL	ERCL	ERCL	GEL	GEL	RPSD	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 1093

Analytical Method[a]	Data Quality Level	GEL	ERCL	RPSD
VOCs EPA Method 8260	Defensible	6 samples	None	None
SVOCs EPA Method 8270	Defensible	6 samples	None	None
PCBs EPA Method 8082	Defensible	6 samples	None	None
HE Compounds EPA Method 8330	Defensible	None	6 samples	None
RCRA Metals EPA Method 6020/7000	Defensible	None	6 samples	None
Hexavalent Chromium EPA Method 7196A	Defensible	6 samples	None	None
Total Cyanide EPA Method 9012A	Defensible	6 samples	None	None
Gamma Spectroscopy Radionuclides EPA Method 901.1	Defensible	None	None	6 samples
Gross Alpha/Beta Activity EPA Method 900.0	Defensible	6 samples	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 Conversation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

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 field duplicate and one set of equipment blank samples. No significant QA/QC problems were identified in the QA/QC samples.

All of the baseline soil sample results were verified/validated by SNL/NM according to Data Verification/Validation Level 3 (SNL/NM July 1994) or SNL/NM ER Project Data Validation Procedure for Chemical and Radiochemical Data, AOP [Administrative Operating Procedure] 00-03, Rev. 0 (SNL/NM December 1999). The data validation reports are presented in the associated DSS Site 1093 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. 02 (SNL/NM July 1996). The gamma spectroscopy

results are presented in the NFA proposal. The reviews confirmed 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 1093 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 1093, which is presented in Section 4.0 of the associated NFA proposal. The quality of the data used to specifically 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 1093 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 any potential degradation products at DSS Site 1093.

III.3 Rate of Contaminant Migration

The septic system at DSS Site 1093 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 drainfield 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 predominantly dependent upon precipitation, although it is highly unlikely that sufficient precipitation has fallen on 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 at the site are adequate to characterize the rate of COC migration at DSS Site 1093.

III.4 Extent of Contamination

Subsurface baseline soil samples were collected from boreholes drilled at four locations beneath the drainfield at the site to assess whether releases of effluent from the drainfield caused any environmental contamination.

The 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 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 1093 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 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 constituents 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 included inorganic and organic compounds.

Tables 4 and 5 list the nonradiological COCs for the human health and ecological risk assessments at DSS Site 1093, respectively. Tables 6 and 7 list the radiological COCs for the human health and ecological risk assessments, respectively. Both tables show the associated SNL/NM maximum background concentration values (Dinwiddie September 1997). Section VI.4 discusses the results presented in Tables 4 and 6; Sections VII.2 and VII.3 discuss Tables 5 and 7.

V. Fate and Transport

The releases of COCs at DSS Site 1093 occurred in the subsurface soil resulting from the discharge of effluents from Building 6584 to the septic tank and drainfield. Because these discharges were to the subsurface, soil, wind, surface water, and biota are considered to be of low significance as transport mechanisms at this site.

Water at DSS Site 1093 is received as precipitation (approximately 8.1 inches annually) that will either infiltrate into the soil, evaporate, or form runoff. Infiltration at this site is enhanced by the sandy nature of the soil and the relatively flat topography of the site. However, because of the high evapotranspiration rate, which accounts for 95 to 99 percent of the annual precipitation in this area, most of the water that infiltrates into the soil is eventually lost to the atmosphere. Therefore, the leaching of COCs by the percolation of water through the soil will be limited and

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1093 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	4.5	4.4	**No**	44[c]	NA	**Yes**
Barium	97	214	Yes	170[d]	NA	**Yes**
Cadmium	0.15 J	0.9	Yes	64[c]	NA	**Yes**
Chromium, total	11	15.9	Yes	16[c]	NA	No
Chromium VI	0.111 J	1	Yes	16[c]	NA	No
Cyanide	0.158 J	NA	**Unknown**	NC	NA	**Unknown**
Lead	6.4	11.8	Yes	49[c]	NA	**Yes**
Mercury	0.049 J	<0.1	**Unknown**	5500[c]	NA	**Yes**
Selenium	0.71 J	<1	**Unknown**	800[e]	NA	**Yes**
Silver	0.0225[f]	<1	**Unknown**	0.5[c]	NA	No
Organic						
2-Butanone	0.027	NA	**NA**	1[g]	0.29[g]	No
Toluene	0.0038	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]Callahan et al. 1979.

[f]Parameter was not detected. Concentration is one-half the detection limit.

[g]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.

Table 5
Nonradiological COCs for Ecological Risk Assessment at DSS Site 1093 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	4.3	4.4	Yes	44[c]	NA	**Yes**
Barium	95	214	Yes	170[d]	NA	**Yes**
Cadmium	0.15 J	0.9	Yes	64[c]	NA	**Yes**
Chromium, total	7.9	15.9	Yes	16[c]	NA	No
Chromium VI	0.03025[e]	1	Yes	16[c]	NA	No
Cyanide	0.158 J	NC	**Unknown**	NC	NA	**Unknown**
Lead	6	11.8	Yes	49[c]	NA	**Yes**
Mercury	0.047 J	<0.1	**Unknown**	5,500[c]	NA	**Yes**
Selenium	0.71 J	<1	**Unknown**	800[f]	NA	**Yes**
Silver	0.0205[e]	<1	**Unknown**	0.5[c]	NA	No
Organic						
2-Butanone	0.027	NA	**NA**	1[g]	0.29[g]	No
Toluene	0.0009 J	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]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.

Table 6
Radiological COCs for Human Health Risk Assessment at DSS Site 1093 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	ND (0.018)	0.079	Yes	900[c]	**Yes**
Th-232	0.73	1.01	Yes	900[c]	**Yes**
U-235	0.136	0.16	Yes	3,000[d]	**Yes**
U-238	1.01	1.4	Yes	3,000[d]	**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]Yanicak 1997.
[d]Baker and Soldat 1992.
BCF = Bioconcentration factor.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected above the MDA, shown in parentheses.
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 1093 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	ND (0.0169)	0.079	Yes	900[c]	**Yes**
Th-232	0.615	1.01	Yes	900[c]	**Yes**
U-235	ND (0.11)	0.16	Yes	3,000[d]	**Yes**
U-238	0.704	1.4	Yes	3,000[d]	**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]Yanicak 1997.
[d]Baker and Soldat 1992.
BCF = Bioconcentration factor.
bgs = Below ground surface.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
ft = Foot (feet).
MDA = Minimum detectable activity.
ND ( ) = Not detected above the MDA, shown in parentheses.
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.

is unlikely to be a significant transport mechanism for COCs. Because groundwater at this site is approximately 483 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

COCs can enter the food chain through uptake by plants. Once in the food web, COCs can be transported from the site by the movements of the organisms that contain them or other surficial transport mechanisms. However, because of the small size of DSS Site 1093, the aridity of the environment, and the disturbed nature of the habitat, food chain transport is not expected to be a significant transport mechanism at this site.

COCs at DSS Site 1093 include both inorganic and organic constituents (Tables 4 and 5). Because no radiological analytes exceed background screening values (Tables 6 and 7), all COCs are nonradiological in nature. With the exception of cyanide, the inorganic COCs are elemental in form and not considered to be degradable. Potential 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 biota. Because of the arid environment at this site and the lack of potential contact with biota, none of these mechanisms is expected to result in significant losses or transformations of the inorganic COCs.

The organic COCs at DSS Site 1093 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. The organic COCs at this site (2-butanone and toluene) may be lost through volatilization, with subsequent degradation in the air.

Table 8 summarizes the fate and transport processes at DSS Site 1093. 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. Significant leaching into the subsurface soil is unlikely, and leaching into the groundwater at this site is highly unlikely. The potential for transformation of inorganic COCs is low. For the organic COCs, loss through volatilization and eventual degradation may be of moderate significance.

Table 8
Summary of Fate and Transport at DSS Site 1093

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 to moderate

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 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 1093. 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 1093 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 1093 is approximately 483 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 model flow diagram for DSS Site 1093.

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. The SNL/NM maximum background concentration was selected to provide the background screen in Table 4 and was 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 (MDA) were carried through the risk assessment at 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 1093 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, one constituent was measured at a concentration greater than its background screening value. Four constituents do not have quantified background screening concentrations. Two nonradiological COCs were organic compounds that do not have corresponding background screening values.

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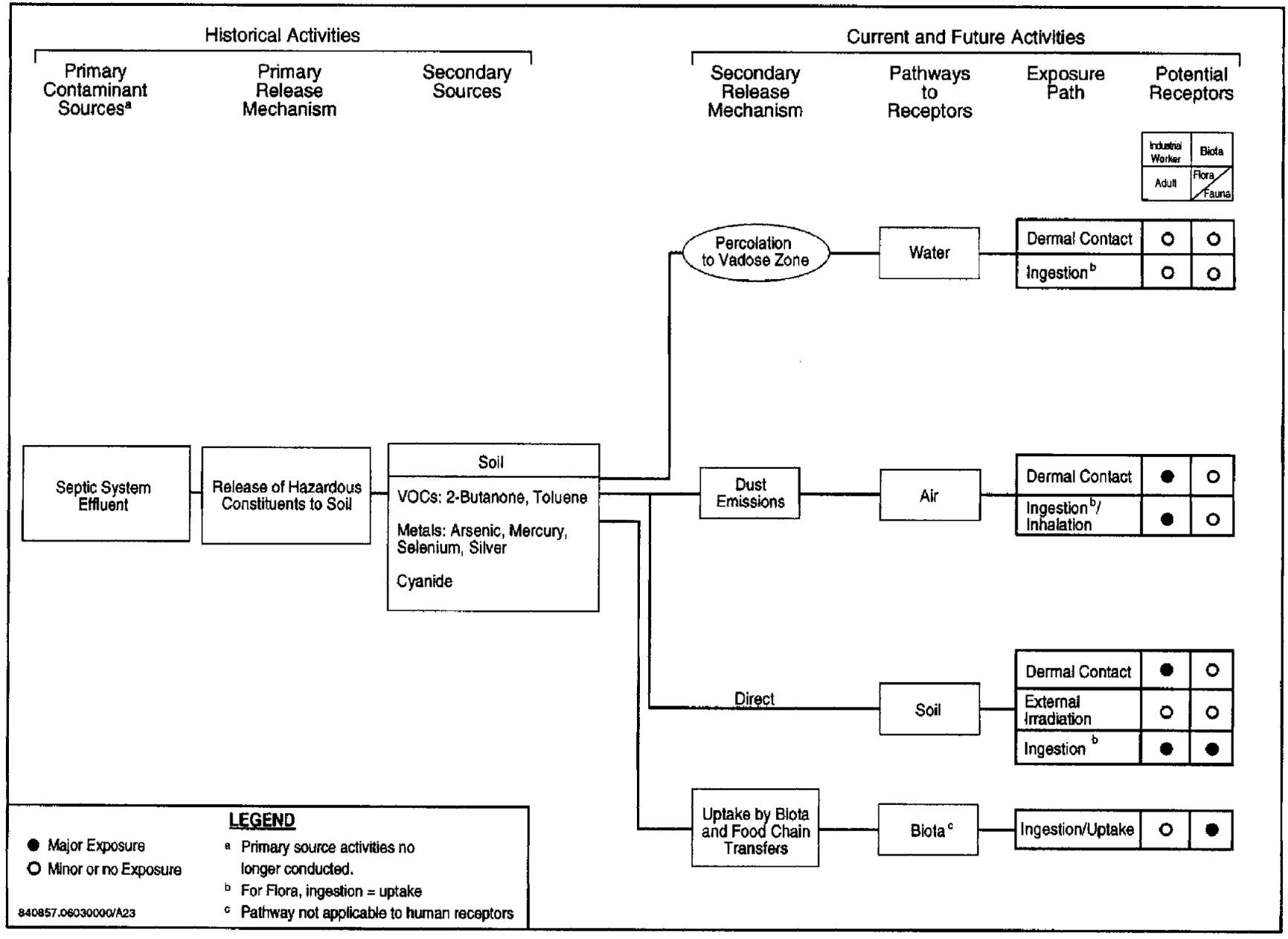

Figure 1

Conceptual Site Model Flow Diagram for DSS Site 1093, Building 6584 West Septic System

For the radiological COCs, none of the constituents (Cs-137, Th-232, U-235 and U-238) had MDA values greater than the background screening levels.

VI.5 Step 4. Identification of Toxicological Parameters

Table 9 lists the COCs retained in the risk assessment and the values for the available toxicological information. The toxicological values for 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 Technical Background Document for Development of Soil Screening Levels (NMED December 2000).

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 the excess cancer risk, for both the potential nonradiological COCs and associated background for industrial and residential land uses.

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 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).

VI.6.2 Risk Characterization

Table 10 shows an HI of 0.02 for the DSS Site 1093 nonradiological COCs and an estimated excess cancer risk of 3E-6 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 an HI of 0.02 and an estimated excess cancer risk of 3E-6 for the DSS Site 1093 associated background constituents for the designated industrial land-use scenario.

For the residential land-use scenario nonradiological COCs, the HI is 0.21 and the estimated excess cancer risk is 1E-5 (Table 10). The numbers in the table include exposure from soil ingestion, dermal contact, and dust and volatile inhalation. Although the EPA (EPA 1991) generally recommends that inhalation not be included in a residential land-use scenario, this pathway is 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

Table 9
Toxicological Parameter Values for DSS Site 1093 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								
2-Butanone	6E-1[c]	L	2.9E-1[c]	L	–	–	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.

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).

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.
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 1093 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	4.5	0.02	3E-6	0.21	1E-5
Cyanide	0.158 J	0.00	–	0.00	–
Mercury	0.049 J	0.00	–	0.00	–
Selenium	0.71 J	0.00	–	0.00	–
Silver	0.0225[b]	0.00	–	0.00	–
Organic					
2-Butanone	0.027	0.00	–	0.00	–
Toluene	0.0038	0.00	–	0.00	–
Total		**0.02**	**3E-6**	**0.21**	**1E-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 1093 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 1997, Southwest Area Supergroup.
[b]EPA 1989.
COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
mg/kg = Milligram(s) per kilogram.
NC = Not calculated.
– = Information not available.

nature of the local soil, other exposure pathways are not considered (see Appendix 1). Table 11 shows that for the DSS Site 1093 associated background constituents, the HI is 0.20 and the estimated excess cancer risk is 1E-5.

Because no constituent exceeded background for the radiological COCs, no doses were calculated for either the industrial or 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 nonradiological COCs under the industrial land-use scenario, the HI is 0.02 (less than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). Excess cancer risk is estimated at 3E-6. 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 below the suggested acceptable risk value. This assessment also determined risks considering background concentrations of potential nonradiological COCs for both the industrial and residential land-use scenarios. Assuming the industrial land-use scenario, the HI is 0.02 and the excess cancer risk is 3E-6 for the nonradiological COCs. 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 0.00, and the estimated incremental cancer risk is 6E-8 for the industrial land-use scenario. These incremental risk calculations are below NMED guidelines considering an industrial land-use scenario.

For the nonradiological COCs under the residential land-use scenario, the calculated HI is 0.21, which is below the numerical guidance. The excess cancer risk is estimated to be 1E-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 slightly above the suggested acceptable risk value. The HI for associated background for the residential land-use scenario is 0.20; the estimated excess cancer risk is 1E-5. The incremental HI is 0.01, and the estimated incremental cancer risk is 3E-7 for the residential land-use scenario. The incremental excess cancer risk calculation is below NMED guidelines considering a residential land-use scenario.

Because no constituent exceeded background for the radiological COCs, no doses were calculated for either the industrial or residential land-use scenario.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1093 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), and 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 screening assessment at DSS Site 1093.

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 level) in the nonradiological toxicological parameter values. There is a mixture of estimated values and values from the IRIS (EPA 2003), HEAST (EPA 1997a), and the 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), the Risk Assessment Information System (ORNL 2003) or the EPA regions (EPA 2002a, 2002b, 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.

Risk assessment values for nonradiological COCs are within the acceptable range for human health under the industrial land-use scenario compared to established numerical guidance.

The HI for the residential land-use scenario is below NMED guidelines. Although the estimated excess cancer risk is slightly above the NMED guideline for the residential land-use scenario, maximum concentrations were used in the risk calculation. Because the site has been adequately characterized, average concentrations are more representative of actual site conditions. The 95% upper confidence limit (UCL) of the average concentration for arsenic, the main contributor to excess cancer risk (4.3 milligrams [mg]/kilogram [kg]), is below the background value; therefore, arsenic is eliminated from further evaluation, and there is no total or incremental excess cancer risk. Thus by using realistic concentrations in the risk calculations that more accurately depict actual site conditions, the total and incremental estimated excess cancer risks are below NMED guidelines.

For the radiological COCs, the conclusion of the risk assessment is that potential effects on human health for both industrial and residential land-use scenarios are within guidelines 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 1093 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 (0.02) is below the accepted numerical guidance from the EPA. Estimated excess cancer risk is 3E-6. Thus, excess cancer risk is below the acceptable risk value provided by the NMED for an industrial land-use scenario (Bearzi January 2001). The incremental HI is 0.00, and the incremental excess cancer risk is 6E-8 for the industrial land-use scenario. Incremental risk calculations are below 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 (0.21) is below the accepted numerical guidance from the EPA. Estimated excess cancer risk is 1E-5. Thus, excess cancer risk is slightly above the acceptable risk value provided by the NMED for a residential land-use scenario (Bearzi January 2001). The incremental HI is 0.01, and the incremental excess cancer risk is 3E-7 for the residential land-use scenario.

The HI for the residential land-use scenario is below NMED guidelines. Although the estimated excess cancer risk is above the NMED guideline for the residential land-use scenario, maximum concentrations were used in the risk calculation. Because the site has been adequately characterized, average concentrations are more representative of actual site conditions. The 95% UCL of the average concentration for arsenic, the main contributor to excess cancer risk (4.3 mg/kg), is below the background value; therefore, arsenic is eliminated from further evaluation, and there is no total or incremental excess cancer risk. Thus by using realistic concentrations in the risk calculations that more accurately depict actual site conditions, the total and incremental estimated excess cancer risks are below NMED guidelines.

Because no constituent exceeded background for the radiological COCs, no doses were calculated for either the industrial or residential land-use scenario.

The summation of the nonradiological and radiological carcinogenic risks is tabulated in Table 12.

Table 12
Summation of Radiological and Nonradiological Risks from DSS Site 1093 Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	6E-8	0.0	6E-8
Residential	3E-7	0.0	3E-7

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 1093. A component of the NMED Risk-Based Decision Tree (NMED March 1998) is to conduct an ecological assessment that corresponds with that presented in EPA's Ecological RAGS (EPA 1997b). The current methodology is tiered and contains an initial scoping assessment followed by a more detailed risk assessment. Initial components of 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 estimation of ecological risk is conducted. Although this assessment incorporates conservatisms in the estimation of ecological risks, ecological relevance and professional judgment also are used as recommended by the EPA (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 a summary of 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), all inorganic constituents in soil within the 0- to 5-foot depth interval for which background screening values have been determined had maximum detected concentrations less than the background concentration. In four cases, sufficient background information is not available to determine screening values. For this reason, the comparison to background could not be used to eliminate the following constituents as COPECs:

- Cyanide
- Mercury
- Selenium
- Silver

In addition to these four inorganic constituents, the following organic analytes were detected within the upper 5 feet of soil:

- 2-Butanone
- Toluene

As shown in Table 7, all radiological analytes in the upper 5 feet of soil were within background levels. Therefore, 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, Table 5):

- Mercury
- Selenium

It should be noted, however, that as directed by the NMED (NMED March 1998), bioaccumulation for inorganic constituents 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 for the inorganic COPECs, but may be of moderate significance for the organic COPECs. Volatile COPECs (i.e., 2-butanone 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 also 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 1093. The risk assessment performed for the site involves a quantitative estimation 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 the "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 1093 is less than 1 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. The site is unpaved and open to use by wildlife. 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 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 is 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

Discharge of waste water from Building 6584 to the septic tank and drainfield was the primary source of COPECs at DSS Site 1093. 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 (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 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 surface soil samples 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.

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. The HQs are used to quantify the comparison with benchmarks for plant and wildlife exposure.

None of the HQs calculated for the COPECs at DSS Site 1093 exceeded unity. Because of a lack of sufficient toxicity information, HQs for plants could not be determined for cyanide and 2-butanone. Similarly, HQs for the burrowing owl could not be determined for cyanide, silver, and the two 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 less than unity for all five ecological receptors.

VII.3.5 Uncertainty Assessment

Many uncertainties are associated with the characterization of ecological risks at DSS Site 1093. 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

Table 13
Exposure Factors for Ecological Receptors at DSS Site 1093

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% 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 1093

COPEC	Soil-to-Plant Transfer Factor	Soil-to-Invertebrate Transfer Factor	Food-to-Muscle Transfer Factor
Inorganic			
Cyanide	0.0E+0[a]	0.0E+0[a]	0.0E+0[a]
Mercury	1.0E+0[b]	1.0E+0[c]	2.5E-1[d]
Selenium	5.0E-1[b]	1.0E+0[c]	1.0E-1[b]
Silver	1.0E+0[b]	2.5E-1[e]	5.0E-3[b]
Organic[f]			
2-Butanone	2.6E+1	1.4E+1	3.7E-8
Toluene	1.0E+0	1.8E+1	1.3E-5

[a]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.
[b]NCRP January 1989.
[c]Default value.
[d]Baes et al. 1984.
[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 based upon 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 1093

COPEC	Soil (maximum)[a]	Plant Foliage[b]	Soil Invertebrate[b]	Deer Mouse Tissues[c]
Inorganic				
Cyanide	1.6E-1[d]	0.0E+0	0.0E+0	0.0E+0
Mercury	4.7E-2[d]	4.7E-2	4.7E-2	3.7E-2
Selenium	7.1E-1[d]	3.6E-1	7.1E-1	1.7E-1
Silver	2.1E-2[e]	2.1E-2	5.1E-3	2.1E-4
Organic				
2-Butanone	2.7E-2	7.1E-1	3.7E-1	6.2E-8
Toluene	9.0E-4[d]	9.0E-4	1.6E-2	3.4E-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]Estimated value.
[e]Maximum concentration of parameter was one-half the detection limit.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.

Table 16
Toxicity Benchmarks for Ecological Receptors at DSS Site 1093

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							
Cyanide	–	rat[h]	68.7	126	–	–	–
Mercury (organic)	0.3	rat	0.03	0.06	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							
2-Butanone	–	rat	1771	3464	–	–	–
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.
[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 LOAEL of 89 mg/kg-d (EPA 2003) and an uncertainty factor of 0.2.

COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
kg = Kilogram(s).
LOAEL = Lowest-observed-adverse-effect level.
mg = Milligram(s).
mg/kg-d = Milligram(s) per kilogram day.
NOAEL = No-observed-adverse-effect level.
– = Insufficient toxicity data.

Table 17
HQs for Ecological Receptors at DSS Site 1093

COPEC	Plant HQ	Deer Mouse HQ (Herbivorous)	Deer Mouse HQ (Omnivorous)	Deer Mouse HQ (Insectivorous)	Burrowing Owl HQ
Inorganic					
Cyanide	–	3.9E-6	3.9E-6	3.9E-6	–
Mercury (organic)	1.6E-1	1.2E-1	1.2E-1	1.2E-1	6.7E-1
Mercury (inorganic)	1.6E-1	5.3E-4	5.3E-4	5.3E-4	9.5E-3
Selenium	7.1E-1	1.5E-1	2.2E-1	2.9E-1	4.7E-2
Silver	1.0E-2	9.3E-5	5.9E-5	2.5E-5	–
Organic					
2-Butanone	–	3.2E-5	2.4E-5	1.7E-5	–
Toluene	4.5E-6	5.2E-6	4.9E-5	9.2E-5	–
HI[a]	8.8E-1	2.7E-1	3.4E-1	4.1E-1	7.2E-1

[a]The HI is the sum of individual HQs.
COPEC = Constituents of potential ecological concern.
DSS = Drain and Septic Systems.
HI = Hazard index.
HQ = Hazard quotient.
– = Insufficient toxicity data available for risk estimation purposes.

assessment include the use of maximum analyte concentrations measured in soil to evaluate risk; the assumptions of 100-percent bioavailability, area use, and seasonal use; the use of wildlife toxicity benchmarks based upon chronic 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).

Because all calculated HQs are based upon conservative estimates of exposure and toxicity, and because none of the calculated HQs or HIs exceeded unity, the results of this risk assessment support a conclusion that the COPECs identified at DSS Site 1093 do not pose a risk to ecological receptors. However, because of the lack of plant and avian toxicity information, HQs could not be determined for some of these COPECs. Therefore, a degree of uncertainty exists with regard to the potential for risk to these receptors. The small size of the site and disturbed nature of the habitat make it unlikely that such risks exist. In the case of the burrowing owl, the fact that the home range of this receptor (35 acres) is much larger than the area of DSS Site 1093 (less than 1 acre) indicates that the application of an area use factor of 0.03 (or less) to the owl's estimated exposure would be justified for these COPECs. Because all HQs for cyanide, silver, 2-butanone, and toluene for the deer mouse are less than 1E-4, and the exposure of the burrowing owl to these COPECs is much lower than that of the deer mouse (based upon the area use factor), it is highly unlikely that these COPECs will pose a risk to the burrowing owl.

Based upon this uncertainty analysis, the potential for ecological risks at DSS Site 1093 is expected to be very low. No HQs greater than unity were predicted. Because of the use of conservative toxicity benchmarks and conservative assumptions in the estimation of exposure, such as the use of maximum soil concentrations, maximum area use, and maximum bioavailability, these HQs are more likely to overestimate potential risk to these receptors than to underestimate it.

VII.3.6 Risk Interpretation

Ecological risks associated with DSS Site 1093 were estimated through a risk assessment that incorporated site-specific information when available. No predictions of potential risk to ecological receptors resulted from the initial calculation of HQs. Due to a lack of toxicity information, HQs for some COPECs for plants and the burrowing owl could not be determined. However, the low concentration levels of these COPECs in the soil coupled with the small size of the site and the disturbed nature of the habitat indicate that risk to the ecological community as a whole is unlikely for this site. Based upon this final analysis, the potential for ecological risks associated with DSS Site 1093 is expected to be very 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 very 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 December 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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