

3-1-2005

Justification for Class III Permit Modification March 2005, DSS Site 1086, Operable Unit 1295, Building 6523 Septic System at Technical Area III

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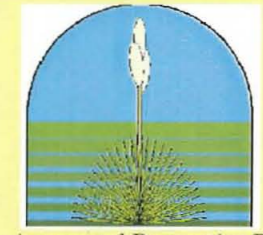
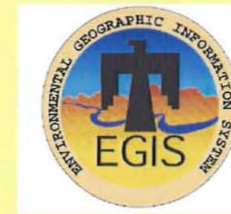
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Drain and Septic Systems (DSS) Area of Concern (AOC) Sites 1006, 1007, 1010, 1015, 1020, 1024, 1028, 1029, 1083, 1086, 1108, and 1110



Environmental Restoration Project

Site Histories

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

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

Depth to Groundwater

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

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

Constituents of Concern

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

Investigations

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

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

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

Summary of Data Used for NFA Justification

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

Recommended Future Land Use

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

Results of Risk Analysis

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

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

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

For More Information Contact

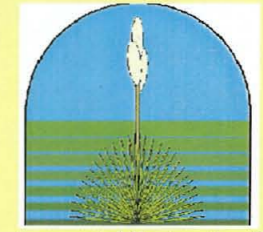
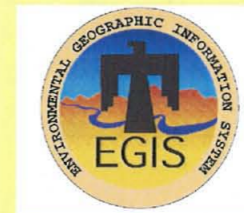
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Sandia National Laboratories
Environmental Restoration Project
Task Leader: Brenda Langkopf
Telephone (505) 284-3272

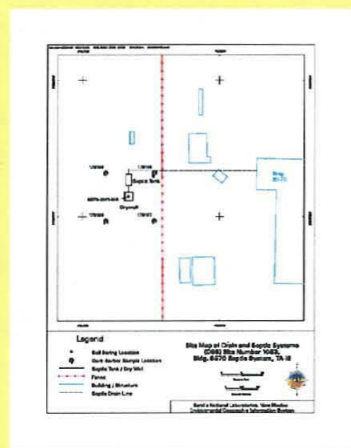
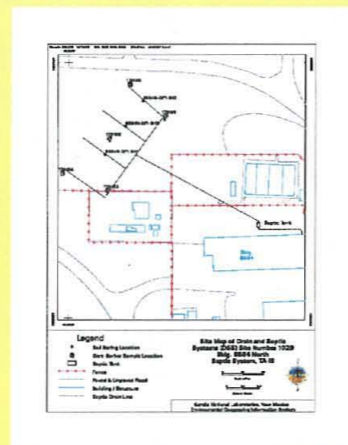
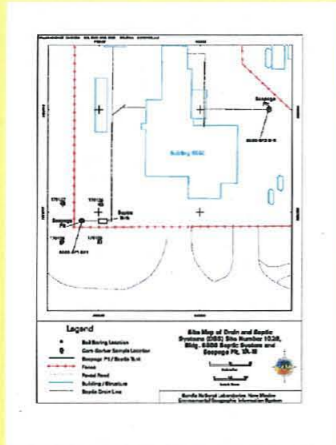


This work supported by the United States Department of Energy under contract DE-AC04-94AL85000.

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



Environmental Restoration Project



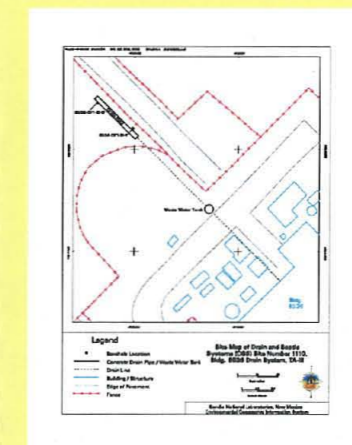
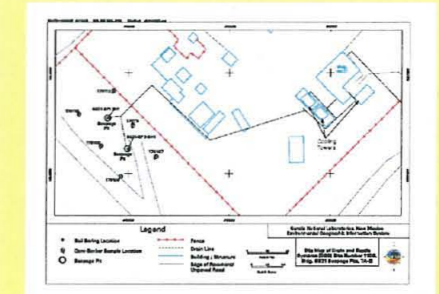
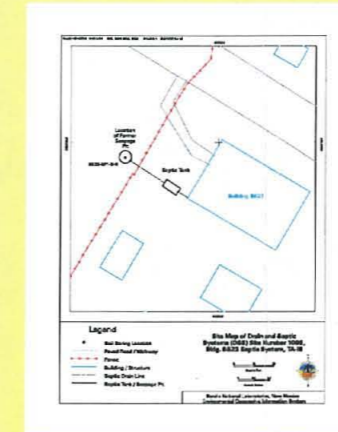
Collecting soil samples with the Geoprobe.



Subsurface soil recovered for analyses.



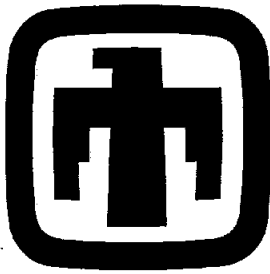
Seepage pit demolition and backfilling.



For More Information Contact

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Sandia National Laboratories

Justification for Class III Permit Modification

March 2005

DSS Site 1086

Operable Unit 1295

Building 6523 Septic System at
Technical Area III

NFA (SWMU Assessment Report) Submitted June 2004

Environmental
Restoration
Project



United States Department of Energy
Sandia Site Office

NFA



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



JUN 1 8 2004

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

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

Dear Mr. Kieling,

On behalf of the Department of Energy (DOE) and Sandia Corporation, DOE is submitting the enclosed Solid Waste Management Unit (SWMU) Assessment Reports and Proposals for No Further Action (NFA) for Drain and Septic Systems (DSS) Sites 1010, 1028, 1083, and 1086. DOE is also submitting the Request for Supplemental Information (RSI) responses for SWMUs 48, 135, 136, 159, 165, 166, and 167; and a soil vapor summary report for Technical Area II at Sandia National Laboratories, New Mexico, EPA ID No. NM5890110518. These documents are compiled as DSS Round 5 and NFA Batch 23.

On April 29, 2004, the final Compliance Order on Consent (Consent Order) for Sandia National Laboratories was issued, replacing the HSWA Module as the sole enforceable mechanism for corrective action. The enclosed SWMU Assessment Reports/NFA Proposals and RSI responses were in the final stage of preparation when the Order was issued; thus, the enclosed documents contain language related to a NFA determination. We are requesting, consistent with the terminology in the Consent Order, an NMED determination of corrective action complete for each of these DSS sites.

This submittal includes descriptions of the site characterization work and risk assessments for DSS Sites 1010, 1028, 1083, and 1086, and SWMUs 48, 135, 136, 159, 165, 166, and 167. The risk assessments conclude that for these eleven 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.

Based on the information provided, DOE and Sandia are requesting a determination of corrective action complete without controls for these DSS sites.

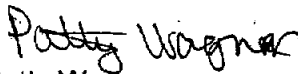
Mr. J. Kieling

(2)

JUN 1 8 2004

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

Sincerely,


Patty Wagner
Manager

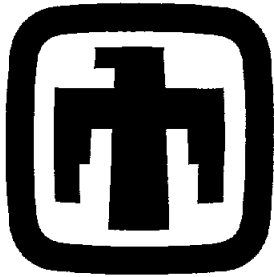
Enclosure

cc w/ enclosure:

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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 1086,
BUILDING 6523 SEPTIC SYSTEM**

June 2004



United States Department of Energy
Sandia Site Office

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- B DSS Site 1086 Soil Sample Data Validation Results
- C DSS Site 1086 Risk Assessment

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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
ER	Environmental Restoration
FIP	Field Implementation Plan
HE	high explosive(s)
HI	hazard index
HWB	Hazardous Waste Bureau
KAFB	Kirtland Air Force Base
MDL	method detection limit
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
TOP	Technical Operating Procedure
VOC	volatile organic compound

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1.0 PROJECT BACKGROUND

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

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

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

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

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

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

2.0 DSS SITE 1086: BUILDING 6523 SEPTIC SYSTEM

2.1 Summary

The SNL/NM ER Project conducted an assessment of DSS Site 1086, the Building 6523 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 1086. This NFA proposal provides documentation that the site was sufficiently characterized, that no significant releases of contaminants to the environment occurred via the Building 6523 Septic System, and that it does not pose a threat to human health or the environment under either industrial or residential land-use scenarios. Current operations at the site are conducted in accordance with applicable laws and regulations that are protective of the environment, and effluent discharges from Building 6523 are now directed to the City of Albuquerque sewer system.

Review and analysis of all relevant data for DSS Site 1086 indicate that concentrations of constituents of concern (COCs) at this site were found to be below applicable risk assessment action levels. Thus, DSS Site 1086 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).

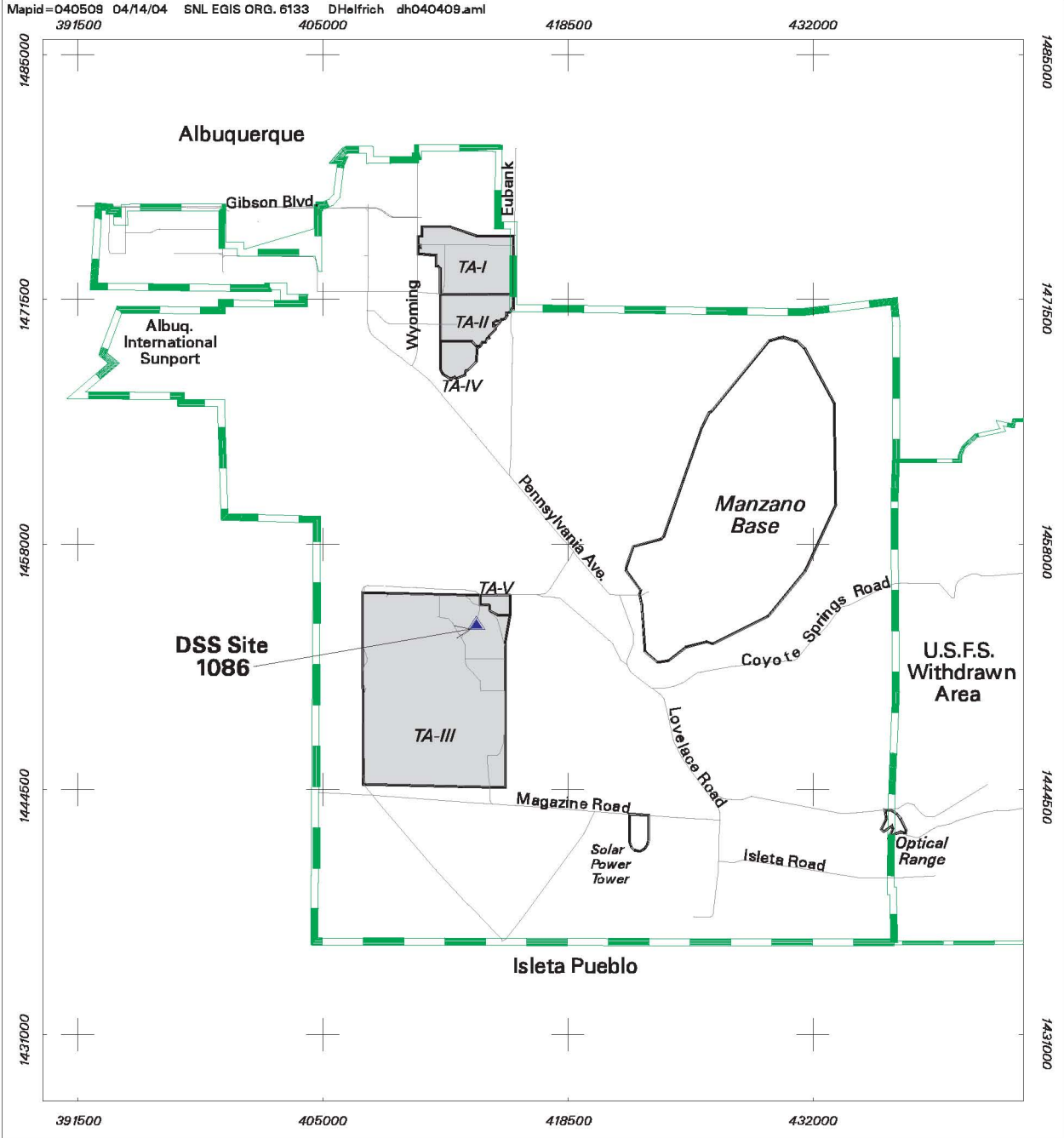
2.2 Site Description and Operational History

2.2.1 Site Description






DSS Site 1086 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). The site is located approximately 1,500 feet south of the entrance into TA-III. The septic system is located on the northwest side of Building 6523 (Figure 2.2.1-2). The abandoned septic system consisted of a septic tank that emptied to a seepage pit (Figure 2.2.1-2). Construction details are based upon site inspections and backhoe excavations conducted at the site.

The surface geology at DSS Site 1086 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 1086, 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

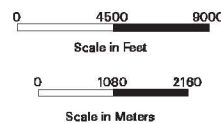
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Legend

-  DSS Site 1086
-  Major Road
-  KAFB Boundary
-  USFS Withdrawn Area Boundary
-  SNL Technical Area

**Figure 2.2.1-1
Location Map of Drain and Septic Systems (DSS) Site Number 1086,
Bldg. 6523 Septic System, TA-III**



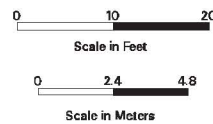
Sandia National Laboratories, New Mexico
Environmental Geographic Information System



Legend

- Soil Boring Location
- Paved Road / Walkway
- ○ ○ ○ Fence
- ▭ Building / Structure
- - - Septic Drain Line
- ▭ Septic Tank / Seepage Pit

Figure 2.2.1-2
Site Map of Drain and Septic
Systems (DSS) Site Number 1086,
Bldg. 6523 Septic System, TA-III



Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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 sloping to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.4 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 (SNL/NM March 1996).

The site lies at an average elevation of approximately 5,414 feet above mean sea level (SNL/NM April 2003). Depth to groundwater is approximately 492 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 production wells nearest to DSS Site 1086 are KAFB-4, approximately 3.0 miles to the northwest, and KAFB-11, approximately 3.3 miles to the northeast. The nearest groundwater monitoring well is located approximately 1,000 feet northeast of the site.

2.2.2 Operational History

Available information indicates that Building 6523 was constructed in 1954 (SNL/NM March 2003) as a centrifuge facility and it is assumed the septic system was constructed at the same time. Because operational records are not available, the site investigation was planned to be consistent with other DSS site investigations and to sample for the COCs most commonly found at similar facilities.

In June 1991, Building 6523 was connected to an extension of the City of Albuquerque sanitary sewer system (Jones June 1991). The old septic system line was disconnected and capped, and the system was abandoned in place concurrent with this change (Romero September 2003).

2.3 Land Use

2.3.1 Current Land Use

The current land use for DSS Site 1086 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1086 is industrial (DOE et al. September 1995).

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3.0 INVESTIGATORY ACTIVITIES

3.1 Summary

Three assessment investigations have been conducted at this site. In late 1990 or early 1991 (SNL/NM April 1991), waste characterization samples were collected from the septic tank (Investigation 1). In September 2002, near-surface soil samples were collected from one boring that was drilled through the center and beneath the seepage pit (Investigation 2). In December 2003, a backhoe was used to locate the septic tank at the site (Investigation 3). Investigations 2 and 3 were required by the NMED/HWB to adequately characterize the site and was 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, as part of the SNL/NM Septic System Monitoring Program, aqueous samples were collected from the Building 6523 septic tank (SNL/NM April 1991). Aqueous samples were analyzed at an off-site laboratory for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total metals, phenolic compounds, oil and grease, gross alpha/beta activity, and uranium-238. 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.

3.3 Investigation 2—Soil Sampling

Soil sampling at the site was conducted in accordance with the rationale and procedures in the SAP (SNL/NM October 1999) approved by the NMED. On September 6, 2002, soil samples were collected from one seepage pit borehole. The soil boring location is shown on Figure 2.2.1-2. Figure 3.3-1 shows soil samples being collected at DSS Site 1086. A summary of the borehole, sample depths, sample analyses, analytical methods, laboratories, and sample dates is presented in Table 3.3-1.

3.3.1 Soil Sampling Methodology

An auger drill rig was used to sample all boreholes at two depth intervals. In the borehole drilled through the center of the seepage pit, the shallow sample interval started at the estimated base of the gravel aggregate in the seepage pit bottom, and the lower (deep) interval started 5 feet below the top of the upper interval. Once the auger rig had reached the top of the

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Figure 3.3-1
Collecting soil samples with the Geoprobe™ at DSS Site 1086 seepage pit.
View to the east. September 6, 2002

Table 3.3-1
 Summary of Area Sampled, Analytical Methods, and Laboratories Used for
 DSS Site 1086, Building 6523 Septic System Soil Samples

Sampling Area	Number of Borehole Locations	Top of Sampling Intervals in each Borehole (ft bgs)	Total Number of Soil Samples	Analytical Parameters and EPA Methods ^a	Analytical Laboratory	Date Samples Collected
Seepage Pit	2	10,15	2	VOCs EPA Method 8260	GEL	09-06-02
	2	10,15	2	SVOCs EPA Method 8270	GEL	09-06-02
	2	10,15	2	PCBs EPA Method 8082	GEL	09-06-02
	2	10,15	2	HE Compounds EPA Method 8330	GEL	09-06-02
	2	10,15	2	RCRA Metals EPA Methods 6000/7000	GEL	09-06-02
	2	10,15	2	Hexavalent Chromium EPA Method 7196A	GEL	09-06-02
	2	10,15	2	Total Cyanide EPA Method 9012A	GEL	09-06-02
	2	10,15	2	Gamma spectroscopy EPA Method 901.1	RPSD	09-06-02
	2	10,15	2	Gross Alpha/Beta Activity EPA Method 900.0	GEL	09-06-02

^aEPA November 1986.

- bgs = Below ground surface.
- DSS = Drain and Septic Systems.
- EPA = U.S. Environmental Protection Agency.
- 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.

sampling interval, a 3- or 4-foot-long by 1.5-inch inside diameter Geoprobe™ sampling tube lined with a butyl acetate (BA) sampling sleeve was inserted into the borehole and hydraulically driven downward 3 or 4 feet to fill the tube with soil.

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

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

All samples were documented and handled in accordance with applicable SNL/NM operating procedures and transported to on- and off-site laboratories for analysis.

3.3.2 Soil Sampling Results and Conclusions

Analytical results for the soil samples collected at DSS Site 1086 are presented and discussed in this section.

VOCs

VOC analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.3.2-1. Method detection limits (MDLs) for the VOC soil analyses are presented in Table 3.3.2-2. Only one VOC (2-butanone) was detected in the 15-foot-bgs sample from the borehole. This compound was not detected in the associated trip blank (TB). It is a common laboratory contaminant and may not indicate soil contamination at this site.

SVOCs

SVOC analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.3.2-3. MDLs for the SVOC soil analyses are presented in Table 3.3.2-4. One SVOC (bis[2-ethylhexyl] phthalate) was detected in both samples collected from the borehole. This compound is a common laboratory contaminant as well as a component found in plastics and may not indicate soil contamination at the site.

PCBs

Polychlorinated biphenyl (PCB) analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.3.2-5. MDLs for the PCB soil analyses are presented in Table 3.3.2-6. Aroclor-1260 was detected in the 10-foot-bgs sample from the borehole.

Table 3.3.2-1
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, VOC Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			VOCs (EPA Method 8260 ^a) ($\mu\text{g}/\text{kg}$)
Record Number ^b	ER Sample ID	Sample Depth (ft)	2-Butanone
605668	6523-SP1-BH1-10-S	10	ND (3.6)
605668	6523-SP1-BH1-15-S	15	4.62 J (4.81)
Quality Assurance/Quality Control Samples ($\mu\text{g}/\text{L}$)			
605667	6589-6600-SP2-TB ^c		ND (2.31)

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

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

^cER sample ID reflects the final site for VOC samples included in this shipment.

BH = Borehole.

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.

$\mu\text{g}/\text{kg}$ = Microgram(s) per kilogram.

$\mu\text{g}/\text{L}$ = Microgram(s) per liter.

ND () = Not detected above the MDL, shown in parentheses.

S = Soil sample.

SP = Seepage pit.

TB = Trip blank.

VOC = Volatile organic compound.

Table 3.3.2-2
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, VOC Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 8260 ^a Detection Limit (µg/kg)
Acetone	3.45–3.59
Benzene	0.441–0.459
Bromodichloromethane	0.48–0.5
Bromoform	0.48–0.5
Bromomethane	0.49–0.51
2-Butanone	3.67–3.82
Carbon disulfide	2.31–2.41
Carbon tetrachloride	0.48–0.5
Chlorobenzene	0.402–0.418
Chloroethane	0.794–0.827
Chloroform	0.51–0.531
Chloromethane	0.363–0.378
Dibromochloromethane	0.49–0.51
1,1-Dichloroethane	0.461–0.48
1,2-Dichloroethane	0.422–0.439
1,1-Dichloroethene	0.49–0.51
cis-1,2-Dichloroethene	0.461–0.48
trans-1,2-Dichloroethene	0.52–0.541
1,2-Dichloropropane	0.471–0.49
cis-1,3-Dichloropropene	0.422–0.439
trans-1,3-Dichloropropene	0.245–0.255
Ethylbenzene	0.373–0.388
2-Hexanone	3.7–3.85
Methylene chloride	1.32–1.38
4-Methyl-2-pentanone	3.95–4.11
Styrene	0.382–0.398
1,1,2,2-Tetrachloroethane	0.892–0.929
Tetrachloroethene	0.373–0.388
Toluene	0.333–0.347
1,1,1-Trichloroethane	0.52–0.541
1,1,2-Trichloroethane	0.529–0.551
Trichloroethene	0.441–0.459
Vinyl acetate	1.75–1.82
Vinyl chloride	0.549–0.571
Xylene	0.382–0.398

^aEPA 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 3.3.2-3
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, SVOC Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			SVOCs (EPA Method 8270 ^a) (µg/kg)
Record Number ^b	ER Sample ID	Sample Depth (ft)	bis(2-Ethylhexyl) phthalate
605668	6523-SP1-BH1-10-S	10	95.5 J (333)
605668	6523-SP1-BH1-15-S	15	90.2 J (333)

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

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

BH = Borehole.

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.

S = Soil sample.

SP = Seepage pit.

SVOC = Semivolatile organic compound.

Table 3.3.2-4
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, SVOC Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 8270 ^a Detection Limit (µg/kg)
Acenaphthene	8
Acenaphthylene	16.7
Anthracene	16.7
Benzo(a)anthracene	16.7
Benzo(a)pyrene	16.7
Benzo(b)fluoranthene	16.7
Benzo(g,h,i)perylene	16.7
Benzo(k)fluoranthene	16.7
4-Bromophenyl phenyl ether	34
Butylbenzyl phthalate	28.7
Carbazole	16.7
4-Chlorobenzenamine	167
bis(2-Chloroethoxy)methane	12.3
bis(2-Chloroethyl)ether	37.3
bis-Chloroisopropyl ether	11
4-Chloro-3-methylphenol	167
2-Chloronaphthalene	13.7
2-Chlorophenol	15.3
4-Chlorophenyl phenyl ether	19.7
Chrysene	16.7
o-Cresol	26
Dibenz[a,h]anthracene	16.7
Dibenzofuran	17
1,2-Dichlorobenzene	10
1,3-Dichlorobenzene	11.3
1,4-Dichlorobenzene	15.7
3,3'-Dichlorobenzidine	167
2,4-Dichlorophenol	20.7
Diethylphthalate	17.7
2,4-Dimethylphenol	167
Dimethylphthalate	18.3
Di-n-butyl phthalate	24
Dinitro-o-cresol	167
2,4-Dinitrophenol	167
2,4-Dinitrotoluene	25.3
2,6-Dinitrotoluene	33.3
Di-n-octyl phthalate	30.3
Diphenyl amine	22.3
bis(2-Ethylhexyl) phthalate	30
Fluoranthene	16.7
Diethylphthalate	17.7
Dimethylphthalate	18.3

Refer to footnotes at end of table.

Table 3.3.2-4 (Concluded)
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, SVOC Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 8270 ^a Detection Limit (µg/kg)
Dinitro-o-cresol	167
Diphenyl amine	22.3
bis(2-Ethylhexyl) phthalate	30
Fluoranthene	16.7
Fluorene	4
Hexachlorobenzene	20
Hexachlorobutadiene	12.7
Hexachlorocyclopentadiene	167
Hexachloroethane	22
Indeno(1,2,3-cd)pyrene	16.7
Isophorone	16
2-Methylnaphthalene	16.7
4-Methylphenol	33.3
Naphthalene	16.7
2-Nitroaniline	167
3-Nitroaniline	167
4-Nitroaniline	37
Nitrobenzene	20.3
2-Nitrophenol	17
4-Nitrophenol	167
n-Nitrosodipropylamine	22.7
Pentachlorophenol	167
Phenanthrene	16.7
Phenol	12.7
Pyrene	16.7
1,2,4-Trichlorobenzene	12.7
2,4,5-Trichlorophenol	17.3
2,4,6-Trichlorophenol	27.3

^aEPA 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 3.3.2-5
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, PCB Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			PCB (EPA Method 8082 ^a) (µg/kg)
Record Number ^b	ER Sample ID	Sample Depth (ft)	Aroclor-1260
605668	6523-SP1-BH1-10-S	10	1.3 J (3.33) H
605668	6523-SP1-BH1-15-S	15	ND (1) H

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

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

BH = Borehole.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

ER = Environmental Restoration.

ft = Foot (feet).

H = The holding time was exceeded for the associated sample analysis.

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.

PCB = Polychlorinated biphenyl.

S = Soil sample.

SP = Seepage pit.

Table 3.3.2-6
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, PCB Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 8082 ^a Detection Limit (µg/kg)
Aroclor-1016	1
Aroclor-1221	2.82
Aroclor-1232	1.67
Aroclor-1242	1.67
Aroclor-1248	1
Aroclor-1254	0.5
Aroclor-1260	1

^aEPA 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.

HE Compounds

High explosive (HE) compound analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.3.2-7. MDLs for the HE soil analyses are presented in Table 3.3.2-8. No HE compounds were detected in the samples collected at the site.

RCRA Metals and Hexavalent Chromium

Resource Conservation and Recovery Act (RCRA) metals and hexavalent chromium analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.3.2-9. MDLs for the metals in soil analyses are presented in Table 3.3.2-10. None of the metal concentrations detected in the samples exceed the corresponding NMED-approved background concentrations.

Total Cyanide

Total cyanide analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.3.2-11. MDLs for the cyanide soil analyses are presented in Table 3.3.2-12. Cyanide was detected in both the 10- and 15-foot-bgs samples from the borehole.

Table 3.3.2-7
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, HE Compound Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			HE (EPA Method 8330 ^a) (µg/kg)
Record Number ^b	ER Sample ID	Sample Depth (ft)	
605668	6523-SP1-BH1-10-S	10	ND
605668	6523-SP1-BH1-15-S	15	ND

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

BH = Borehole.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

ER = Environmental Restoration.

ft = Foot (feet).

HE = High explosive(s).

ID = Identification.

µg/kg = Microgram(s) per kilogram.

ND = Not detected.

S = Soil sample.

SP = Seepage pit.

Table 3.3.2-8
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, HE Compound Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 8330 ^a Detection Limit ($\mu\text{g}/\text{kg}$)
2-Amino-4,6-dinitrotoluene	18.1
4-Amino-2,6-dinitrotoluene	34.1
1,3-Dinitrobenzene	34.1
2,4-Dinitrotoluene	55
2,6-Dinitrotoluene	48
HMX	48
Nitrobenzene	48
2-Nitrotoluene	24
3-Nitrotoluene	24
4-Nitrotoluene	24
RDX	48
Tetryl	22.1
1,3,5-Trinitrobenzene	29
2,4,6-Trinitrotoluene	48

^aEPA 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.

$\mu\text{g}/\text{kg}$ = Microgram(s) per kilogram.

RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.

Tetryl = Methyl-2,4,6-trinitrophenylnitramine.

Table 3.3.2-9
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, Metals Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			Metals (EPA Method 6000/7000/7196A ^a) (mg/kg)								
Record Number ^b	ER Sample ID	Sample Depth (ft)	Arsenic	Barium	Cadmium	Chromium	Chromium (VI)	Lead	Mercury	Selenium	Silver
605668	6523-SP1-BH1-10-S	10	3.43	191 J	0.212 J (0.49)	10.1	ND (0.0547)	6.33	0.00511 J (0.00888)	ND (0.159)	ND (0.0884)
605668	6523-SP1-BH1-15-S	15	3.31	139 J	0.189 J (0.455)	8.32	ND (0.0532)	5.02	0.0043 J (0.0096)	ND (0.147)	ND (0.082)
Background Concentration—Southwest Area Supergroup ^c			4.4	214	0.9	15.9	1	11.8	<0.1	<1	<1

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

^cDinwiddie September 1997.

BH = Borehole.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

ER = Environmental Restoration.

ft = Foot (feet).

ID = Identification.

J = Estimated concentration.

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.

mg/kg = Milligram(s) per kilogram.

ND () = Not detected above the MDL, shown in parentheses.

S = Soil sample.

SP = Seepage pit.

Table 3.3.2-10
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, Metals Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 6000/7000/7196A ^a Detection Limit (mg/kg)
Arsenic	0.188–0.202
Barium	0.0606–0.0654
Cadmium	0.0435–0.0469
Chromium	0.146–0.158
Chromium (VI)	0.0532–0.0547
Lead	0.258–0.278
Mercury	0.000872–0.000944
Selenium	0.147–0.159
Silver	0.082–0.0884

^aEPA November 1986.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

MDL = Method detection limit.

mg/kg = Milligram(s) per kilogram.

Table 3.3.2-11
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, Total Cyanide Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			Total Cyanide (EPA Method 9012 ^a) (mg/kg)
Record Number ^b	ER Sample ID	Sample Depth (ft)	Total Cyanide
605668	6523-SP1-BH1-10-S	10	0.178 J (0.278)
605668	6523-SP1-BH1-15-S	15	0.0487 J (0.25)

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

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

BH = Borehole.

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.

mg/kg = Milligram(s) per kilogram.

S = Soil sample.

SP = Seepage pit.

Table 3.3.2-12
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, Total Cyanide Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 9012 ^a Detection Limit (mg/kg)
Total Cyanide	0.0419–0.0466

^aEPA November 1986.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

MDL = Method detection limit.

mg/kg = Milligram(s) per kilogram.

Radionuclides

Analytical results for the gamma spectroscopy analysis of the two soil samples collected from the seepage pit borehole are summarized in Table 3.3.2-13. No activities above NMED-approved background levels were detected in any sample analyzed.

Gross Alpha/Beta Activity

Gross alpha/beta analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.3.2-14. No gross alpha or beta activity was detected above the New Mexico-established background levels (Miller September 2003) in any of the samples. These results indicate no significant levels of radioactive material are present in the soil at the site.

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

Throughout the DSS Project, quality assurance/quality control samples were collected at an approximate frequency of 1 per 20 field samples. These included duplicate, equipment blank (EB), and TB samples. Typically, samples were shipped to the laboratory in batches of up to 20 samples, so that any one shipment might contain samples from several sites. Aqueous EB samples were collected at an approximate frequency of 1 per 20 site samples. The EB samples were analyzed for the same analytical suite as the soil samples in that shipment. The analytical results for the EB samples appear only on the data tables for the site where they were collected. However, the results were used in the data validation process for all the samples in that batch.

Aqueous TB samples, for VOC analysis only, were included in every sample cooler containing VOC soil samples. The analytical results for the TB samples appear on the VOC data tables for the sites in that shipment. The results were used in the data validation process for all the samples in that batch. No VOCs were detected in the TB for DSS Site 1086 (Table 3.3.2-1).

No duplicate samples were collected at this site.

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

Table 3.3.2-13
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
 September 2002
 (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
605747	6523-SP1-BH1-10-S	10	ND (0.0353)	--	0.619	0.317	0.0912	0.178	ND (0.541)	--
605747	6523-SP1-BH1-15-S	15	ND (0.036)	--	0.663	0.333	0.134	0.186	ND (0.522)	--
Background Activity—Southwest Area Supergroup ^d			0.079	NA	1.01	NA	0.16	NA	1.4	NA

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

^cTwo standard deviations about the mean detected activity.

^dDinwiddie September 1997.

BH = Borehole.

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.

SP = Seepage pit.

-- = Error not calculated for nondetect results.

Table 3.3.2-14
 Summary of DSS Site 1086, Building 6523 Septic System
 Confirmatory Soil Sampling, Gross Alpha/Beta Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			Activity (EPA Method 900.0 ^a) (pCi/g)			
Record Number ^b	ER Sample ID	Sample Depth (ft)	Gross Alpha		Gross Beta	
			Result	Error ^c	Result	Error ^c
605668	6523-SP1-BH1-10-S	10	8.67	1.61	26.9	2.01
605668	6523-SP1-BH1-15-S	15	9.29	1.79	18	1.85
Background Activity ^d			17.4	NA	35.4	NA

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

^cTwo standard deviations about the mean detected activity.

^dMiller September 2003.

BH = Borehole.

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.

SP = Seepage pit.

3.4 Investigation 3—Backhoe Excavation

No records were found to indicate that the septic tank at DSS Site 1086 had been sampled after late 1990 or early 1991 or that it had been pumped out. It was also unknown whether the tank was still intact, as no surface expression of the unit was found at the site. Therefore, backhoe and hand excavations were conducted on December 3, 2003, to attempt to uncover and locate the tank. The remains of the cast concrete tank were found, and it was determined at that time that the top of the unit had been removed, and the tank had been cleaned out and backfilled with soil at some point in the past.

3.5 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 1086.

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4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS Site 1086, the Building 6523 Septic System, is based upon the COCs identified in the soil samples collected from beneath the seepage pit 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 1086 are VOCs, SVOCs, PCBs, HE compounds, cyanide, RCRA metals, hexavalent chromium, and radionuclides. One VOC, one SVOC, the PCB Aroclor-1260, and cyanide were detected in the soil samples collected at the site. There were no HE compounds or hexavalent chromium detected in any of the soil samples collected at this site. None of the eight RCRA metals were detected at concentrations above the approved maximum background concentrations for SNL/NM Southwest Area Supergroup soils (Dinwiddie September 1997) or above the nonquantified background concentrations.

When a metal concentration exceeded its maximum background screening value, or had no quantified background value, it was considered further 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/beta activity was detected above the New Mexico-established background levels.

4.2 Environmental Fate

Potential COCs may have been released into the vadose zone via aqueous effluent discharged from the septic system seepage pit. Possible secondary release mechanisms include the uptake of COCs that may have been released into the soil beneath the seepage pit (Figure 4.2-1). The depth to groundwater at the site (approximately 492 feet bgs) most likely precludes migration of potential COCs into the groundwater system. The potential pathways to receptors include soil ingestion, dermal contact, and inhalation, which could occur as a result of receptor exposure to contaminated subsurface soil at the site. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Annex C provides additional discussion on the fate and transport of COCs at DSS Site 1086.

Table 4.2-1 summarizes the potential COCs for DSS Site 1086. 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 1086 is industrial (DOE et al. September 1995).

The potential human receptors at the site are considered to be an industrial worker and resident. The exposure routes for the receptors are dermal contact and ingestion/inhalation; however, these are realistic possibilities only if contaminated soil is excavated at the site. The

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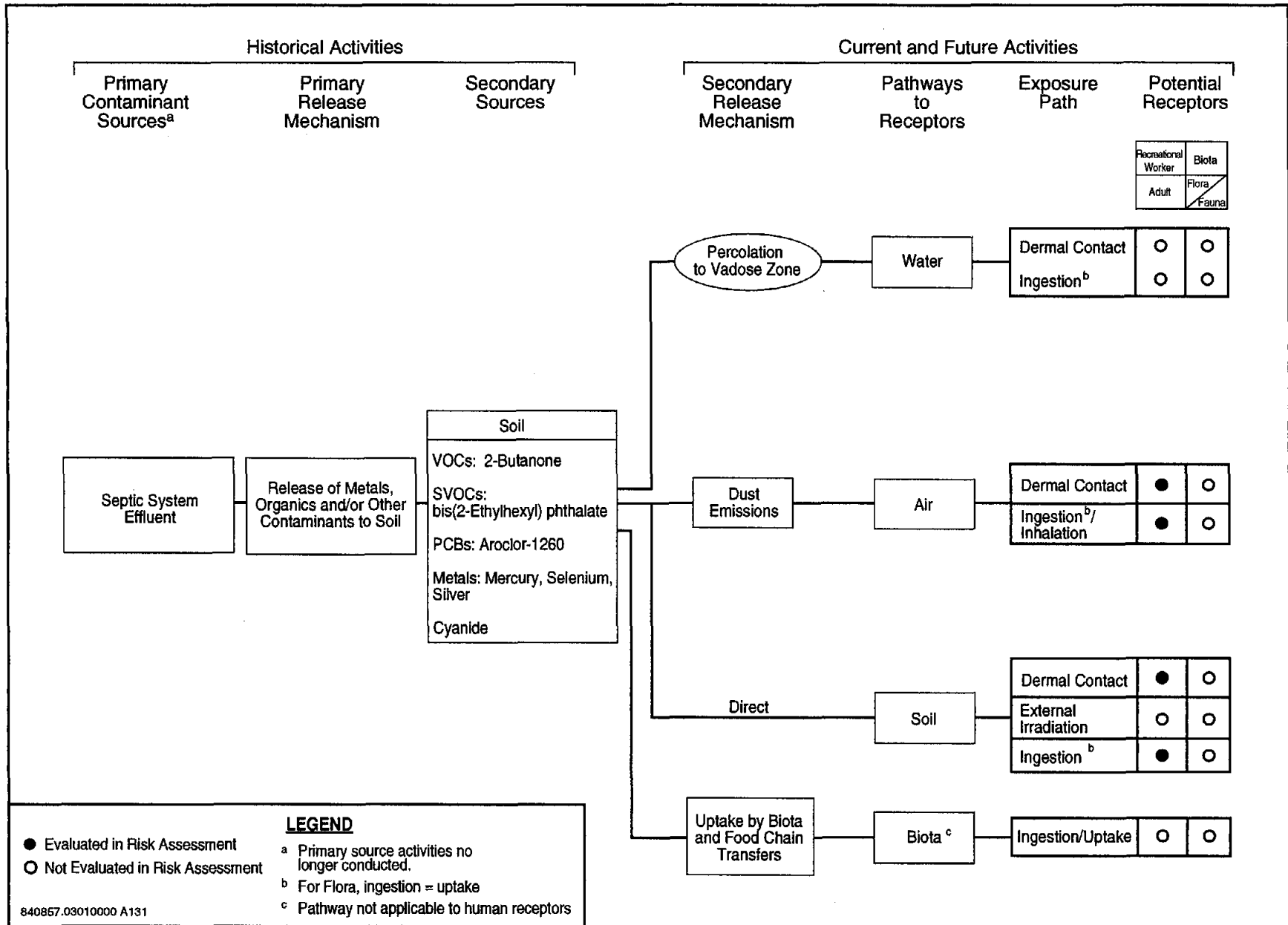


Figure 4.2-1
Conceptual Site Model Flow Diagram for DSS Site 1086, Building 6523 Septic System

Table 4.2-1
Summary of Potential COCs for DSS Site 1086, Building 6523 Septic System

COC Type	Number of Samples ^a	COCs Detected or with Concentrations Greater than Background or Nonquantified Background	Maximum Background Limit/Southwest Area Supergroup ^b (mg/kg)	Maximum Concentration ^c (All Samples) (mg/kg)	Average Concentration ^d (mg/kg)	Number of Samples Where COCs Detected or with Concentrations Greater than Background or Nonquantified Background ^e
VOCs	2	2-Butanone	NA	0.00462 J	0.00321	1
SVOCs	2	bis(2-Ethylhexyl) phthalate	NA	0.0955 J	0.09285	2
PCBs	2	Aroclor-1260	NA	0.0013 J	0.00090	1
HE Compounds	2	None	NA	NA	NA	None
RCRA Metals	2	Mercury	NQ	0.0051	0.0047	None
	2	Selenium	NQ	ND (0.159)	0.0765	None
	2	Silver	NQ	ND (0.0884)	0.0426	None
Hexavalent Chromium	2	None	NA	NA	NA	None
Cyanide	2	Cyanide	NQ	0.178 J	0.1134	2
Radionuclides (pCi/g)	Gamma Spectroscopy	2	None	NA	NA	None
	Gross Alpha	2	None	NA	NA	None
	Gross Beta	2	None	NA	NA	None

^aNumber of samples includes duplicates and splits.

^bDinwiddie September 1997.

^cMaximum concentration is either the maximum amount detected, or if nothing was detected, the maximum MDL or MDA above background or nonquantified background.

^dAverage concentration includes all samples except blanks. The average is calculated as the sum of detected amounts and one-half of the MDLs for nondetect results, divided by the number of samples.

^eSee appropriate data table for sample locations.

COC = Constituent of concern.

DSS = Drain and Septic Systems.

HE = High explosive(s).

J = Estimated concentration.

MDA = Minimum detectable activity.

MDL = Method detection limit.

mg/kg = Milligram(s) per kilogram.

NA = Not applicable.

ND () = Not detected above the MDL, shown in parentheses.

NQ = Nonquantified background value.

PCB = Polychlorinated biphenyl.

pCi/g = Picocurie(s) per gram.

RCRA = Resource Conservation and Recovery Act.

SVOC = Semivolatile organic compound.

VOC = Volatile organic compound.

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.

No pathways to groundwater and no intake routes through flora or fauna are considered appropriate for either the industrial or residential land-use scenarios. Annex C provides additional discussion of the exposure routes and receptors at DSS Site 1086.

4.3 Site Assessment

Site assessment at DSS Site 1086 included risk assessments for both human health and ecological risk. This section briefly summarizes the site assessment results, and Annex C discusses the risk assessment performed for DSS Site 1086 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1086 poses no significant threat to human health under either the industrial or residential land-use scenarios.

Ecological risks were found to be insignificant because no pathways exist.

4.3.2 Risk Assessments

Risk assessments were performed for both human health and ecological risk at DSS Site 1086. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1086 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because 2-butanone, bis(2-ethylhexyl) phthalate, Aroclor-1260, mercury, selenium, silver, and cyanide are present above background or have nonquantified background levels, it was necessary to perform a human health risk assessment analysis for the site, which included these COCs. Annex C 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 1086 is 0.00 for the industrial land-use scenario, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.00. The estimated excess cancer risk for DSS Site 1086 is 5E-10 for an industrial land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. The incremental

estimated excess cancer risk is 4.98E-10. Both the incremental HI and excess cancer risk are below NMED guidelines.

The HI calculated for the COCs at DSS Site 1086 is 0.00 for the residential land-use scenario, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.00. The estimated excess cancer risk for DSS Site 1086 is 2E-9 for a residential land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. The estimated incremental cancer risk is 2.16E-9. Both the incremental HI and incremental excess cancer risk 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.

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

Table 4.3.2-1
Summation of Incremental Radiological and Nonradiological Risks from
DSS Site 1086, Building 6523 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	4.98E-10	0.0E+0	4.98E-10
Residential	2.16E-9	0.0E+0	2.16E-9

DSS = Drain and Septic Systems.

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

4.3.2.2 Ecological

An ecological assessment that corresponds with the procedures in the EPA's Ecological Risk Assessment Guidance for Superfund (EPA 1997) also was performed as set forth by the NMED Risk-Based Decision Tree in the "RPMP Document Requirement Guide" (NMED March 1998). An early step in the evaluation compared COC concentrations and identified potentially bioaccumulative constituents (see Annex C, Sections IV, VII.2, and VII.2.1). 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.

All COCs at DSS Site 1086 are located at depths greater than 5 feet bgs. Therefore, no complete ecological pathways exist at this site, and a more detailed ecological risk assessment is not necessary.

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 1086 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 no complete pathways exist at DSS Site 1086, a baseline ecological risk assessment is not required for the site.

5.0 NO FURTHER ACTION PROPOSAL

5.1 Rationale

Based upon field investigation data and the human health and ecological risk assessment analyses, an NFA decision is recommended for DSS Site 1086 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 because no complete pathways exist at the site.

5.2 Criterion

Based upon the evidence provided in Section 5.1, DSS Site 1086 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 1086
Septic Tank Sampling Results

4-17-91

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

DD Dionne

4-17-91

Nick Durand,

For your information.

David Dionne

not pumped 10/21/90

TABLE 3

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

BUILDING 6523

SAMPLE NUMBERS SNLA004841, SNLA004842

Parameter	Results	Units
VOLATILE ORGANICS		
Acetone*	58	µg/l
Toluene	18	µg/l
SEMIVOLATILE ORGANICS		
Phenol	26	µg/l
4-Methylphenol*	240	µg/l
Benzoic Acid*	1000	µg/l
INORGANICS		
Oil and Grease	4.3	mg/l
Phenolics	0.25	mg/l
METALS		
Barium	0.072	mg/l
Copper	0.017	mg/l
Lead	0.013	mg/l
Manganese	0.030	mg/l
Zinc	0.39	mg/l
RADIOLOGICAL		
Gross Beta	26	pCi/l
Uranium 238	1.4	pCi/l

*Not on total toxic organic list

ANNEX B
DSS Site 1086
Soil Sample Data Validation Results

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab

Page 1 of 1

Batch No. <i>N/A</i>		SMO Use		Project/Task No. 722.02.03.02		AR/COC		605668					
Dept. No./Mail Stop: 6135/1089		Date Samples Shipped: 9-9-02		Project/Task No. 722.02.03.02		<input type="checkbox"/> Waste Characterization							
Project/Task Manager: Mike Sanders		Carrier/Waybill No. 13162		SMO Authorization: <i>[Signature]</i>		-Send preliminary/copy report to:							
Project Name: DSS soil sampling		Lab Contact: Edie Kant 803-668-8171		Contract # PD 21671		<input type="checkbox"/> Released by COC No.:							
Record Center Code: ER/1295/DSS/DAT		Lab Destination: GEL		SMB Attached Bottle <i>OROWA</i>		<input checked="" type="checkbox"/> Validation Required							
Logbook Ref. No.: ER 080		SMO Contact/Phone: Pam Puleant/505-844-3185		Send Report to SMO: Wendy Palencia/505-844-3132		Bill To: Santa National Labs (Accounts Payable)							
Service Order No. CF032-02						P.O. Box 5800 MS 0154 Albuquerque, NM 87185-0154							
Location		Tech Area		Reference LOV (available at SMO) <i>66780%</i>									
Building 6523-889		Rooms											
Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time (hr) Collected	Sample Matrix	Container Type	Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID	
059793-001	6523/1088-SP1BH1-10-S	10'	1086	9/6/02/0910	S	AS	4oz	4c	G	SA	VOC(8260B)	908	
059794-001	6523/1088-SP1BH1-15-S	15'	↑	0930	S	AS	4oz	4c	G	SA	VOC(8260B)	009	
059793-002	6523/1088-SP1BH1-10-S	10'	↑	0915	S	AG	500ml	4c	G	SA	see below for parameter	019	
059794-002	6523/1088-SP1BH1-15-S	15'	↓	0935	S	AG	500ml	4c	G	SA	see below for parameter	020	
059795-001	889/1102-SP1-BH1-25-S	25'	1102	1340	S	AS	4oz	4c	G	SA	VOC(8260B)	010	
059796-001	889/1102-SP1-BH1-30-S	30'	↑	1425	S	AS	4oz	4c	G	SA	VOC(8260B)	011	
059795-002	889/1102-SP1-BH1-25-S	25'	↑	1545	S	AG	500ml	4c	G	SA	see below for parameter	021	
059798-002	889/1102-SP1-BH1-30-S	30'	↑	1430	S	AG	500ml	4c	G	SA	see below for parameter	022	
059800-001	889/1102-SP1-BH1-30-S	N/A	↓	1440	S	AG	500ml	4c	G	SA	VOC(8260B)		
RMMA <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Ref. No.		Sample Tracking		Smo Use		Special Instructions/QC Requirements				Abnormal Conditions on Receipt	
Sample Disposal <input type="checkbox"/> Return to Client <input checked="" type="checkbox"/> Disposal by lab				Date Entered (mm/dd/yy)				EDD <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				Lab Use Temp 4°	
Turnaround Time <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Rush				Entered by:				Level C Package <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No					
Return Samples By:		Level of Rush:		QC Inits.				*Send report to:					
Sample Team Members	Name	Signature	Ink	Company/Organization/Phone/Celular				Mike Sanders					
	J. Lee	<i>[Signature]</i>	<i>[Ink]</i>	Weston/6135/505-284-3309				Depts 135/MS/1089					
	W. Gibson	<i>[Signature]</i>	<i>[Ink]</i>	MDM/6135/505-845-3287				Phone/505-284/2478					
	G. Quintana	<i>[Signature]</i>	<i>[Ink]</i>	Shaw/6135/505-284-3309				See Coc 605667 for TB.					
								*Please list as separate report.					
1. Relinquished by <i>[Signature]</i>		Org. 6135		Date 9/9/02		Time 0810		4. Relinquished by		Org.		Date	
1. Received by <i>[Signature]</i>		Org. 6135		Date 9/9/02		Time 0810		4. Received by		Org.		Date	
2. Relinquished by <i>[Signature]</i>		Org. 6135		Date 9/9/02		Time 1030		5. Relinquished by		Org.		Date	
2. Received by <i>[Signature]</i>		Org. 6135		Date 9/9/02		Time 0930		5. Received by		Org.		Date	
3. Relinquished by		Org.		Date		Time		6. Relinquished by		Org.		Date	
3. Received by		Org.		Date		Time		6. Received by		Org.		Date	

SAMPLE RECEIPT & REVIEW FORM

Date 9-10-02 Client SANDIA Received by MLC

SAMPLE REVIEW CRITERIA		YES	NO	N/A	COMMENTS/QUALIFIERS
1	Were shipping containers received intact and sealed? If no, notify the Project Manager	✓			
2	Were chain of custody documents included?	✓			
3	Shipping container temperature(s) checked?	✓			4°
4	Is temperature documented on Chain of Custody?	✓			
5	Was shipping container temperature within specifications (4 +/- 2 C)? If no, notify Project Manager	✓			
6	Are any of the samples identified by the client as radioactive? If yes, complete radioactive receipt form		✓		
	Any samples not indentified by the client as radioactive must be screened for radioactivity.			40	observed background CPM
	If screening results indicate > x2 background inform the RSO.			50	Max. observed sample CPM
7	Were chain of custody documents completed correctly? (Ink, signed, match containers)	✓			
8	Were sample containers received intact and sealed? If no, notify the Project Manager		✓		*
9	Were all sample containers properly labeled?	✓			
10	Were correct sample containers received?	✓			
11	Preserved samples checked for pH?			✓	Soils + uo9
12	Were samples preserved correctly? If no, notify Project Manager	✓			
13	Were samples received within holding time? If No, notify Project Manager	✓			
14	Were VOA vials free of headspace?	✓			
15	ARCOC#	✓			605667
18	SDG#				

PM(A) Review: Jenna Shurg Date Reviewed: 9/10/02

Cooler Air Bill #'s, Associated Temperatures, & Additional Comments:

* SAMPLE 059785-002 ARRIVED BROKEN - CONTAINER
STILL IN BAG
FED EX # 4703 8609 4384

SAMPLE RECEIPT & REVIEW FORM

Date 9-10-02 Client SANDIA Received by MIC

SAMPLE REVIEW CRITERIA		YES	NO	N/A	COMMENTS/QUALIFIERS
1	Were shipping containers received intact and sealed? If no, notify the Project Manager	✓			
2	Were chain of custody documents included?	✓			
3	Shipping container temperature(s) checked?	✓			40
4	Is temperature documented on Chain of Custody?	✓			
5	Was shipping container temperature within specifications (4 +/- 2 C)? If no, notify Project Manager	✓			
6	Are any of the samples identified by the client as radioactive? If yes, complete radioactive receipt form		✓		
	Any samples not indentified by the client as radioactive must be screened for radioactivity.			40	observed background CPM
	If screening results indicate > x2 background inform the RSO.			50	Max. observed sample CPM
7	Were chain of custody documents completed correctly? (Ink, signed, match containers)	✓			
8	Were sample containers received intact and sealed? If no, notify the Project Manager	✓			
9	Were all sample containers properly labeled?	✓			
10	Were correct sample containers received?	✓			
11	Preserved samples checked for pH?			✓	soils
12	Were samples preserved correctly? If no, notify Project Manager	✓			
13	Were samples received within holding time? If No, notify Project Manager	✓			
14	Were VOA vials free of headspace?			✓	
15	ARCOC#	✓			605668
16	SDG#				

PM(A) Review: Jana Slus Date Reviewed: 9/10/02

Cooler Air Bill #'s, Associated Temperatures, & Additional Comments:

Fed Ex # 4708 8609 4.384

Contract Verification Review (CVR)

Project Leader Collins

Project Name DSS Soil Sampling

Case No. 7223_02.03.02

AR/COC No. 605667, 605668

Analytical Lab GEL

SDG No. 66780A, 66780B

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?		If no, explain	Resolved?	
		Yes	No		Yes	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		056785-002 arrived broken		

2.0 Analytical Laboratory Report

Line No.	Item	Complete?		If no, explain	Resolved?	
		Yes	No		Yes	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	X				
2.10	Narrative provided	X				
2.11	TAT met	X				
2.12	Hold times met		X	HE & PCBs re-extractions out of holding		
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	two HE LSC analytes not within acceptance limits with all re-extraction LSC analytes within acceptance limits (re-extracted out of holding)
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique		X	PCB sample 059795-002RE re-extracted sample failed surrogate recovery
c) Matrix spike recovery data reported and met		X	Barium not within inorganic acceptance limits
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
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	bis(2-Ethylhexyl)phthalate detected in SVOC method blank; cyanide detected in total cyanide method blank
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 8082 (pesticides/PCBs)	X		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

Item	Yes	No	Comments
4.1 GC/MS (8260, 8270, etc.)			
a) 12-hour tune check provided	X		
b) Initial calibration provided	X		
c) Continuing calibration provided	X		
d) Internal standard performance data provided	X		
e) Instrument run logs provided	X		
4.2 GC/HPLC (8330 and 8010 and 8082)			
a) Initial calibration provided	X		
b) Continuing calibration provided	X		
c) Instrument run logs provided	X		
4.3 Inorganics (metals)			
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			
a) Instrument run logs provided	X		

Sample Filtration Summary

Site: DSS soil sampling

ARCOC:605667 and 605668

Data: Organic, Inorganic and Radiochemistry

Sample ID	VOC(s260)	76-83-3 (2-butanone)	SVOC(s270)	117-81-7 (bis(2-ethylhexyl)phthalate)	All PCBs (erocione) except:	11086-82-5 (eroclor 1280)	All HE(s330) compounds	479-45-8 (stryl)	Metals	7440-39-3 (barium)	General Chemistry	5655-70-0 (total cyanide)	Radiochemistry					
059785-001 6570/1083-DW1-BH1-14-S		J																
059786-001 6570/1083-DW1-BH1-9-DU		J																
059788-001 6589-8800/1031-SP1-BH1-15-S		J																
059789-001 6589-8800/1031-SP1-BH1-20-S		J																
059790-001 6589-8800/1031-SP2-BH1-10-S		J																
059784-002 6570/1083-DW1-BH1-9-S				333U,B				UJA		JA2		J,B,BS	All QC acceptance criteria were met. No data will be qualified.					
059785-002 6570/1083-DW1-BH1-14-S				333U,B				UJA		JA2		J,B,BS						
059787-001 6570/1083-DW1-BH1-9-DU				333U,B				UJA		JA2								
059788-002 6589-8800/1031-SP1-BH1-15-S				333U,B				UJA		JA2								
059789-002 6589-8800/1031-SP1-BH1-20-S				333U,B				UJA		JA2		J,B,BS						
059790-002 6589-8800/1031-SP2-BH1-10-S				333U,B				UJA		JA2		J,B						
059791-002 6589-8800/1031-SP2-BH1-15-S				333U,B				UJA		JA2		UJ,BS						
059793-002 6523/1086-SP1-BH1-10-S				333U,B				UJA		JA2		J,B,BS						
059794-002 6523/1086-SP1-BH1-15-S				333U,B				UJA		JA2		J,B,BS						
059795-002 889/1102-SP1-BH1-25-S				333U,B				UJA		JA2		J,B,BS						
059796-002 889/1102-SP1-BH1-30-S				670U,B				UJA		JA2		J,B,BS						
059784-002 6570/1083-DW1-BH1-9-S-RE					UJ,HT	UJ,HT	UJ,HT											
059785-002 6570/1083-DW1-BH1-14-S-RE							UJ,HT											
059787-001 6570/1083-DW1-BH1-9-DU-RE					UJ,HT	UJ,HT	UJ,HT											
059788-002 6589-8800/1031-SP1-BH1-15-S-RE					UJ,HT	UJ,HT	UJ,HT											
059789-002 6589-8800/1031-SP1-BH1-20-S-RE					UJ,HT	UJ,HT	UJ,HT											
059790-002 6589-8800/1031-SP2-BH1-10-S-RE					UJ,HT	UJ,HT	UJ,HT											
059791-002 6589-8800/1031-SP2-BH1-15-S-RE					UJ,HT	UJ,HT	UJ,HT											
059793-002 6523/1086-SP1-BH1-10-S-RE					UJ,HT	1,BJ,HT	UJ,HT											
059794-002 6523/1086-SP1-BH1-15-S-RE					UJ,HT	UJ,HT	UJ,HT											
059795-002 889/1102-SP1-BH1-25-S-RE					UJ,HT,A1	J,HT,A1	UJ,HT											
059796-002 889/1102-SP1-BH1-30-S-RE					UJ,HT	J,HT	UJ,HT											

Validated By:

K. Neal

Date: 11/06/02

Analytical Quality Associates, Inc.



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MEMORANDUM

DATE: 11/06/02
TO: File
FROM: Linda Thal
SUBJECT: Inorganic Data Review and Validation - SNL
Site: DSS soil sampling
ARCOC # 605667 and 605668 GEL SDG # 66780
Project/Task No. 7223.02.03.02

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. Data are evaluated using SNL/NM ER Project AOP 00-03.

Summary

The samples were prepared and analyzed with approved procedures using methods SW-846 6010 (ICP-AES metals), SW-846 7471A (Hg), SW-846 9012A (total CN) and SW-846 7196A (hexavalent chromium). Problems were identified with the data package that resulted in the qualification of data.

ICP-AES – Metals

The MS had a %R > QC acceptance criteria (75-125%) for barium. All associated sample results were detect and will be qualified "J, A2".

Total Cyanide

The method blank (MB) had a value > DL but < RL and the continuing calibration blank (CCB) had a negative value with an absolute value > DL but < RL: Samples 66780-012, -013, -016, -019 through -022 had values < 5X the MB value and < 5X DL and will be qualified "J, B, B3". Sample 66780-017 had a value < 5X MB but > 5X DL and will be qualified "J, B". Sample 66780-018 was non-detect and unaffected by the MB, and will be qualified "UJ, B3".

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

Holding Times/Preservation

All Analyses: The samples were analyzed within the prescribed holding time and properly preserved.

It should be noted that sample 66780-013 was received in a broken container in a plastic bag. The laboratory was instructed to proceed with the analysis. It is not known what affect this will have on the sample results and therefore no data will be qualified.

Calibration

All Analyses: The initial and continuing calibration data met QC acceptance criteria.

Blanks

All Analyses: All blank criteria were met except as mentioned above in the summary section and as follows:

ICP-AES – Metals

Arsenic was detected in the initial calibration blank (ICB) and the continuing calibration blank (CCB) at a value > DL but < RL. All associated sample results were > 5X the blank values and will not be qualified.

Total Cyanide

The method blank (MB) had a value > DL but < RL and the continuing calibration blank (CCB) had a negative value with an absolute value > DL but < RL. Sample 66780-014 and -015 had values > 5X MB and > 5X DL and will not be qualified.

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

All Analyses: The LCS met QC acceptance criteria. No LCSD was performed. No data will be qualified as a result.

Matrix Spike (MS) Analysis

All Analyses: The MS met QC acceptance criteria except as mentioned above in the summary section and as follows:

ICP-AES

The sample used for the MS was of similar matrix from another SNL SDG. No data will be qualified as a result.

Hexavalent Chromium Batch # 200893

The sample used for the MS was of similar matrix from another SNL SDG. No data will be qualified as a result.

Replicate Analysis

All Analyses: The replicate analysis met QC acceptance criteria except as follows:

ICP-AES

The sample used for the replicate was of similar matrix from another SNL SDG. No data will be qualified as a result.

Hexavalent Chromium Batch # 200893

The sample used for the replicate was of similar matrix from another SNL SDG. No data will be qualified as a result.

ICP Interference Check Sample (ICS)

ICP-AES: The ICS-AB met QC acceptance criteria.

All Other Analyses: No ICS required.

ICP Serial Dilution

ICP-AES: The serial dilution met QC acceptance criteria.

It should be noted that the sample used for the serial dilution was of similar matrix from another SNL SDG. No data will be qualified as a result.

All Other Analyses: No serial dilutions required.

Detection Limits/Dilutions

All Analyses: All detection limits were properly reported.

ICP-AES: All samples were diluted 2X.

All Other Analyses: No dilutions were performed.

Other QC

All Analyses: A field duplicate was submitted on the ARCOC. There are no "required" validation procedures for assessing a field duplicate.

No equipment blank or field blank was submitted on the ARCOC.

It should be noted that the COC requested that metals be analyzed by method SW-846 6020.

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

Analytical Quality Associates, Inc.



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MEMORANDUM

DATE: 11/01/02
TO: File
FROM: Linda Thal
SUBJECT: Organic Data Review and Validation - SNL
Site: DSS soil sampling
ARCOG # 605667 and 605668 GEL SDG # 66780 and 66782
Project/Task No. 7223.02.03.02

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. Data are evaluated using SNL/NM ER Project AOP 00-03.

Summary

The samples were prepared and analyzed with approved procedures using methods SW-846 8260A/B (VOC), 8270C (SVOC), 8082 (PCBs) and 8330 (HEs). Problems were identified with the data package that resulted in the qualification of data.

VOC - soil

2-Butanone had a %D > 20 but < 40% with a negative bias in the CCV preceding samples 66780-001 through -008. Samples 66780-002 through -006 were detect and will be qualified "J".

SVOC - Batch 200259 and 200577

Bis(2-ethylhexyl)phthalate was detected in the method blanks (MB) at a value > DL but < RL. Samples 66780-012 through -021 had bis(2-ethylhexyl)phthalate values > DL, < RL and <10X the MB value and will be qualified "U, B" at the RL. Sample 66780-022 had a bis(2-ethylhexyl)phthalate value > RL, but < 10X the MB value and will be qualified "U, B" at the reported value.

PCB

Samples 66780-012 and -014 through -021 were re-extracted out of hold time. Only the re-extracted sample results appear on the Certificate of Analysis and only the re-extracted sample results will be validated. All associated sample results were non-detect for all aroclors and will be qualified "UJ, HT", with the exception of samples 66780 -019, 021 and -022. These sample results were > DL but < RL for aroclor 1260 and these results will be qualified "J, HT".

The surrogate (4cmx) %R for sample 66780-021 was < QC acceptance criteria (31-120%) but > 10%. The sample results are already qualified "J" for detects and "UJ" for non-detects due to hold time infringements. The descriptive flag "A1" will be added to these qualifiers.

Sample 66780-019 had an aroclor 1260 value > DL but < RL. The RPD (32%) between the primary and confirmation column was > QC acceptance criteria (25%). The value reported will be changed to the highest value and is already qualified "J" due to hold time infringements.

HE

The samples were re-extracted and re-analyzed after the holding time had expired. Both sets of results appear on the Certificate of Analysis and both sets of data will be validated.

Batch 200966: The LCS %R was < QC acceptance criteria but > 10% for tetryl. All associated sample results are non-detect and will be qualified "UJ, A".

Batch 203692: The samples were re-extracted after their holding time had expired. Both sets of results, QC summary's and calibration data are provided. All the re-extracted sample results were non-detect and will be qualified "UJ, HT".

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

Holding Times/Preservation

All Analysis: The samples were properly preserved and analyzed within the method prescribed holding time except as mentioned above in the summary section.

It should be noted that sample 66780-013 was received in a broken container in a plastic bag. The laboratory was instructed to proceed with the analysis. It is not known what affect this will have on the sample results and therefore no data will be qualified.

Calibration

All Analysis: All initial and continuing calibration acceptance criteria were met except as mentioned above in the summary section and as follows:

VOC

2-Butanone had a %D > 20 but < 40% with a negative bias in the CCV preceding samples 66780-001 through -008. Samples 66780-001, -007 and -008 were non-detect and will not be qualified. Several other compounds had %D > 20% but < 40% (refer to DV worksheet). All associated sample results were non-detect and no data will be qualified.

SVOC - Batch 200259

The CCV preceding the samples had a %D > 20% but < 40% with a negative bias for 2,4-dinitrophenol (24.5%) and 2,4-dinitrotoluene (24%), and with a positive bias for 2-nitroaniline (23%). All associated sample results were non-detect and no data will be qualified.

PCB - Batch 200519

The CCV preceding sample 66780-013 had a %D > 20% but < 40% with a positive bias for aroclor 1016. The sample result was non-detect and therefore unaffected by a positive bias; no data will be qualified.

Blanks

All Analysis: All method blank and trip blank acceptance criteria were met except as mentioned above in the summary section.

Surrogates

All Analysis: All surrogate acceptance criteria were met except as mentioned above in the summary section.

Internal Standards (ISs)

All Analysis: All internal standard acceptance criteria were met.

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

All Analysis: All MS/MSD acceptance criteria were met except as follows:

VOC- water

The PS/PSD was run on a sample of similar matrix from another SNL SDG. No data will be qualified as a result.

SVOC – Batch 200259 and 200577

Several compounds (see DV worksheet) had %R < QC acceptance criteria (75 – 125%) and RPDs slightly higher than QC acceptance criteria (20%). Using professional judgment, no data will be qualified.

Laboratory Control Samples (LCS/LCSD) Analysis

All Analysis: The LCS/LCSD acceptance criteria were met except as mentioned above in the summary section and as follows:

VOC - soils

The LCS acceptance criteria were met by the successful analysis of a second source CCV.

VOC – Soils and Waters

It should be noted that no compound was associated with internal standard 1,4-dichlorobenzene-d4. No data will be qualified as a result.

SVOC

It should be noted that no compound was associated with internal standard perylene-d12. No data will be qualified as a result.

HE – Batch 200966

The LCS had a %R slightly < QC acceptance criteria (79-123%) for 4-amino-2,6-dinitrotoluene (75%). The MS/MSD %R was in criteria, and using professional judgment, no data will be qualified.

Detection Limits/Dilutions

All Analysis: All detection limits were properly reported. Samples were not diluted with the exception of 66780-021 and -022 that were diluted 5X for PCB analysis.

Confirmation Analyses

VOC and SVOC: No confirmation analyses required.

PCB: All confirmation acceptance criteria were met except as mentioned above in the summary section.

HE: The sample results were non-detect and therefore no confirmation analysis was required.

Other QC

VOC: A trip blank and a field dup were submitted on the ARCOG. There are no "required" criteria for assessing a field dup. No equipment blank was submitted on the ARCOG. It should be noted that vinyl acetate is on the TAL for soils but not for waters.

SVOC, PCB and HE: A field dup was submitted on the ARCOG. There are no "required" criteria for assessing a field dup. No equipment blank or field blank was submitted on the ARCOG.

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

Analytical Quality Associates, Inc.



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MEMORANDUM

DATE: November 06, 2002
TO: File
FROM: Linda Thal
SUBJECT: Radiochemical Data Review and Validation - SNL
Site: DSS soil sampling
ARCOG 605667 and 605668
GEL SDG # 66780 Project/Task No. 7223.02.03.02

See the attached Data Validation Worksheets for supporting documentation on the data review and validation. This validation was performed according to SNL/NM ER Project AOP 00-03.

Summary

All samples were prepared and analyzed with approved procedures using method EPA 900.0 (Gross Alpha/Beta). No problems were identified with the data package that resulted in the qualification of data.

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

Holding Times/Preservation

All Analyses: All samples were analyzed within the prescribed holding times and properly preserved.

It should be noted that sample 66780-013 was received in a broken container in a plastic bag. The laboratory was instructed to proceed with the analysis. It is not known what affect this will have on the sample results and therefore no data will be qualified.

Calibration

All Analyses: The case narrative stated the instruments used were properly calibrated.

Blanks

No target analytes were detected in the method blank at concentrations > the associated MDAs.

Matrix Spike (MS) Analysis

The MS/MSD analyses met all QC acceptance criteria.

Laboratory Control Sample (LCS) Analysis

The LCS analyses met all QC acceptance criteria.

Replicates

The replicate analyses met all QC acceptance criteria.

Tracer/Carrier Recoveries

No tracer/carrier required.

Negative Bias

All sample results met negative bias QC acceptance criteria.

Detection Limits/Dilutions

All detection limits were properly reported. No samples were diluted.

Other QC

A field duplicate was submitted on the ARCOG. There are however, no "required" data validation procedures for assessing a field duplicate.

No field blank or equipment blank was submitted on the ARCOG.

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

Data Validation Summary

Site/Project: DSS Soil Sampling Project/Task #: 7223.02.03.02 # of Samples: 22 of 1 Matrix: Soil & TB
 AR/COC #: 605667 605668 Laboratory Sample IDs: 66780
 Laboratory: QFL 66780-001 HRU -022
 Laboratory Report #: 66780 66782-001

QC Element	Analysis									RAD	Hexavalent Other Chromium
	Organics				Inorganics						
	VOC	SVOC	Pesticide/ PCB	HPLC (HE)	ICP/AES	GFAA/ AA	CVAA (Hg)	CN			
1. Holding Times/Preservation	✓	✓	✓ J, UJ, HT	✓ UJ, HT	✓	NA	✓	✓	✓	✓	
2. Calibrations	J	✓	✓	✓	✓		✓	✓	✓	✓	
3. Method Blanks	✓	U, B	✓	✓	✓		✓	J, UJ, B, B3	✓	✓	
4. MS/MSD	✓	✓	✓	✓	J, A2		✓	✓	✓	✓	
5. Laboratory Control Samples	✓	✓	✓	UJ, A ✓	✓		✓	✓	✓	✓	
6. Replicates					✓		✓	✓	✓	✓	
7. Surrogates	✓	✓	J, UJ, A1	✓						NA	
8. Internal Standards	✓	✓									
9. TCL Compound Identification	✓	✓									
10. ICP Interference Check Sample					✓						
11. ICP Serial Dilution					✓						
12. Carrier/Chemical Tracer Recoveries									NA		
13. Other QC	TB DUP	DUP.	* DUP	DUP	DUP		DUP	DUP	DUP	DUP	

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

Check (✓) = Acceptable
 Shaded Cells = Not Applicable (also "NA")
 NP = Not Provided

Other: * Confirmation > 25%
 value changed "J"

- 013 received broken

Reviewed By: D/Val Date: 11-06-02

Holding Time and Preservation

Site/Project: DSS Soil Sampling AR/COC #: 605667 - 68 Laboratory Sample IDs: 66780 - 001 thru - 022
 Laboratory: QEL Laboratory Report #: 605667 ¹²⁷ 66780 , -82 66782 - 001
 # of Samples: 22 4 / Matrix: SOIL 4 7B

Sample ID	Analytical Method	Holding Time Criteria	Days Holding Time was Exceeded	Preservation Criteria	Preservation Deficiency	Comments
66780 - 012-RE	SW-846 8330 8082	14 days	14 / 7 days	NA	NA	All UJ, HT 8330
- 014-RE			14 / 7 days			All UJ, HT
- 015-RE			12 / 5 days			
- 016-RE			12 / 5 days			
- 017-RE			12 / 5 days			
- 018-RE			12 / 5 days			
- 019-RE			11 / 4 days			All UJ, HT except J, HT 1260
- 020-RE			11 / 4 days			All UJ, HT
- 021-RE			11 / 4 days			All UJ, HT except J, HT 1260
- 022-RE			11 / 4 days			All UJ, HT except J, HT 1260
66780 - 013-RE	SW-846 8330	14 days	14 days	NA	NA	All UJ, HT

Reviewed By: d/hae Date: 11-06-02

Volatile Organics (SW 846 Method 8260)

Site/Project: DSS Soil Sampling AR/COC #: 605667, -68 # of Samples: 11 # 1 Matrix: Soil # 78
 Laboratory: GFA Laboratory Report #: _____ Laboratory Sample IDs: 66780-001 thru -011 66782-001 (TR)
 Methods: SW-846 8260A Batch #s: 200753¹ (Soil) 201029² (TR)

IS	CAS #	Name	TCL	Min. RF	Intercept	Calib. RF	Calib. RSD/R ²	CCV %D	Method Blks	LCS	LCS#	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Trip Blanks
1	71-55-6	1,1,1-trichloroethane		0.10	1.02	1.05	<20%/0.92	20%	1 2	1 2	1 2	NA	1 2	1 2	1 2		NA	✓
2	79-34-5	1,1,2,2-tetrachloroethane		0.30					✓									
2	79-00-5	1,1,2-trichloroethane		0.10					✓									
1	75-34-3	1,1-dichloroethane		0.10														
1	75-35-4	1,1-dichloroethane		0.20						✓	✓		✓	✓	✓	✓		
1	107-06-2	1,2-dichloroethane		0.10														
1	540-59-0	1,2-dichloroethane (total)		0.01														
1	78-87-5	1,2-dichloropropane		0.01														
1	78-93-3	2-butanone (MEK) (10xblk)		0.01				24.1										
1	110-75-8	2-chloroethyl vinyl ether																
2	591-78-6	2-hexanone (MBK)		0.01														
2	108-10-1	4-methyl-2-pentanone (MIBK)		0.10														
1	67-64-1	acetone (10xblk)		0.01	✓	✓		25.2										
1	71-43-2	benzene		0.50						✓	✓		✓	✓	✓	✓		
1	75-27-4	bromodichloromethane		0.20														
3	75-25-2	bromoform		0.10	✓	✓												
1	74-83-9	bromomethane		0.10				+25										
1	75-15-0	carbon disulfide		0.10														
1	56-23-5	carbon tetrachloride		0.10														
2	108-90-7	chlorobenzene		0.50						✓	✓		✓	✓	✓	✓		
1	75-00-3	chloroethane		0.01				+20.9										
1	67-66-3	chloroform		0.20														
1	74-87-3	chloromethane		0.10														
1	10061-01-5	cis-1,3-dichloropropene		0.20														
2	124-48-1	dibromochloromethane		0.10	✓	✓												
2	100-41-4	ethylbenzene		0.10														
1	75-09-2	methylene chloride (10xblk)		0.01	✓	✓												
2	100-42-5	styrene		0.30														
2	127-18-4	tetrachloroethene		0.20														
2	108-88-3	toluene (10xblk)		0.40						✓	✓		✓	✓	✓	✓		
2	10061-02-6	trans-1,3-dichloropropene		0.10	✓	✓												
1	79-01-6	trichloroethene		0.30						✓	✓		✓	✓	✓	✓		
1	75-01-4	vinyl chloride		0.10														
2	1330-20-7	xylenes (total)		0.30														
		cis-1,2-dichloroethane																
		trans-1,2-dichloroethane																

Comments: Vinyl Acetate (Soils) only

Note: Shaded rows are RCRA compounds.

-32
-30

Reviewed By: DJhal

Date: 11.05.02

Volatile Organics

Site/Project: _____ AR/COC #: 605667, -68 Batch #: _____
 Laboratory: _____ Laboratory Report #: _____ # of Samples: _____ Matrix: _____

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

Sample	SMC 1	SMC 2	SMC 3	IS 1 Area	IS 1 RT	IS 2 area	IS 2 RT	IS 3 area	IS 3 RT
<i>IN CRITERIA</i>									

SMC 1: 4-Bromofluorobenzene IS 1: Fluorobenzene
 SMC 2: Dibromofluoromethane IS 2: Chlorobenzene-d5
 SMC 3: Toluene-d8 IS 3: 1,4-Dichlorobenzene-d4

Comments: H₂O batch: PS/PSD ⁶⁶⁶⁰⁶ 66060 SNA SOG
 LT

Soils LCW & CCY same file ^{trv.}
 (SA 001 - 008) CCY 8.21 - 26W - 24 (SA 2 thru 6)
 009 - 011 CCY 28.09

* Applies to samples 001 thru -008
 1,7,8 NO NO Q
 2,3,5 7 RA AN AREA "J"
 4,6 70A

Semivolatile Organics (SW 846 Method 8270)

Site/Project: DSJ Soil Sampling AR/COC #: 605667, -68 Laboratory Sample IDs: 66780-012 thru 022

Laboratory: GFL Laboratory Report #: 66780

Methods: GW-846 8270C

of Samples: LT 10 11 Matrix: Soil Batch #: 200259 (Soil) 200577 (Soil) -013 only.

IS	BNA	CAS #	NAME	TCL	Min. RF	Intercept	Calib. RF	Calib. RSD/R ²	CCV %D	Method Blanks	LCS	LCS ²	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Field Blanks ²	Field Dup	
							>05	<20%/100%	20%												
2	BN	120-82-1	1,2,4-Trichlorobenzene	✓	0.20	1.82	✓	✓	✓	✓	✓	✓	NA	✓	✓	✓	MS 2	MSD 2	MS RPD	✓	✓
1	BN	95-50-1	1,2-Dichlorobenzene		0.40																
1	BN	541-73-1	1,3-Dichlorobenzene		0.60																
1	BN	106-46-7	1,4-Dichlorobenzene		0.50						✓	✓									
3	A	95-95-4	2,4,5-Trichlorophenol		0.20						✓	✓		✓	72	✓	✓	✓	✓	✓	
3	A	88-06-2	2,4,6-Trichlorophenol		0.20						✓	✓		✓	63	✓	70	✓	✓	✓	
2	A	120-83-2	2,4-Dichlorophenol		0.20																
2	A	105-67-9	2,4-Dimethylphenol		0.20																
3	A	51-28-5	2,4-dinitrophenol		0.01	✓	✓	✓	28%												
3	BN	121-14-2	2,4-Dinitrotoluene		0.20				24%		✓	✓		✓	✓	✓	✓	✓	✓	✓	
3	BN	606-20-2	2,6-Dinitrotoluene		0.20				✓												
3	BN	91-58-7	2-Chloronaphthalene		0.80																
1	A	95-57-8	2-Chlorophenol		0.80						✓	✓		✓	✓	✓	✓	✓	✓	✓	
2	BN	91-57-6	2-Methylnaphthalene		0.40																
1	A	95-48-7	2-Methylphenol (o-cresol)		0.70						✓	✓		✓	65	22	69	✓	✓	✓	
3	BN	88-74-4	2-Nitroaniline		0.01				23%												
2	A	88-75-5	2-Nitrophenol		0.10				✓												
5	BN	91-94-1	3,3'-Dichlorobenzidine		0.01																
3	BN	99-09-2	3-Nitroaniline		0.01	✓	✓	✓													
4	A	534-52-1	4,6-Dinitro-2-methylphenol		0.01																
4	BN	101-55-3	4-Bromophenyl-phenylether		0.10																
3	BN	7005-72-3	4-Chlorophenyl-phenylether		0.40																
2	A	59-50-7	4-Chloro-3-methylphenol		0.20						✓	✓		✓	✓	✓	✓	✓	✓	✓	
2	BN	106-47-8	4-Chloroaniline		0.01																
1	A	106-44-5	4-Methylphenol (p-cresol)		0.60																

Comments: m,p-cresol ✓

Notes: Shaded rows are RCRA compounds.

Reviewed By: D/hal Date: 11-01-02

Semivolatile Organics

Site/Project: _____ AR/COC #: 605667, -68 Batch #: _____
 Laboratory: _____ Laboratory Report #: _____ # of Samples: _____ Matrix: _____

I g	BNA	CAS #	NAME	T C L	Min. RF	Intercept	Calib.	Calib.	CCV	Method Blanks	LCS	LCS#	LCS RPD	MS	MSD	MS RPD	Field	Equip.	Field	Field Dup
							RF	RSD/ R ²	%D								Dup. RPD	Blanks	Blanks	
						182	>0.5 182	<20% 0.092	20%	2	1	2					MS 2	MSD 2	MSD RPD 2	
3	BN	100-01-6	4-Nitroaniline	✓	0.01	✓	✓	✓		✓			NA							✓
3	A	100-02-7	4-Nitrophenol		0.01						✓	✓		✓	✓	✓	✓	✓	✓	
3	BN	83-32-9	Acenaphthene		0.90						✓	✓		✓	✓	✓	✓	✓	✓	
3	BN	208-96-8	Acenaphthylene		0.90															
4	BN	120-12-7	Anthracene		0.70															
5	BN	56-55-3	Benzo(a)anthracene		0.80															
6	BN	50-32-8	Benzo(a)pyrene		0.70															
6	BN	205-99-2	Benzo(b)fluoranthene		0.70															
6	BN	191-24-2	Benzo(g,h,i)perylene		0.50															
6	BN	207-08-9	Benzo(k)fluoranthene		0.70															
2	BN	111-91-1	bis(2-Chloroethoxy)methane		0.30															
1	BN	111-44-4	bis(2-Chloroethyl)ether		0.70															
1	BN	108-60-1	bis(2-chloroisopropyl)ether		0.01															
5	BN	117-81-7	bis(2-Ethylhexyl)phthalate		0.01	✓	✓	✓												
5	BN	85-68-7	Butylbenzylphthalate		0.01															
4	BN	86-74-8	Carbazole		0.01															
5	BN	218-01-9	Chrysene		0.70															
6	BN	53-70-3	Dibenz(a,h)anthracene		0.40															
3	BN	132-64-9	Dibenzofuran		0.80															
3	BN	84-66-2	Diethylphthalate		0.01															
3	BN	131-11-3	Dimethylphthalate		0.01															
4	BN	84-74-2	Di-n-butylphthalate		0.01															
6	BN	117-84-0	Di-n-octylphthalate		0.01	✓	✓	✓												
4	BN	206-44-0	Fluoranthene		0.60															
3	BN	86-73-7	Fluorene		0.90															
4	BN	118-74-1	Hexachlorobenzene		0.10						✓	✓		✓	✓	✓	69	✓	✓	
2	BN	87-68-3	Hexachlorobutadiene		0.01						✓	✓		✓	64	21	74	✓	✓	
3	BN	77-47-4	Hexachlorocyclopentadiene		0.01															
1	BN	67-72-1	Hexachloroethane		0.30						✓	✓		✓	58	26	66	71	✓	

Comments:

Semivolatile Organics

Site/Project: _____ AR/COC #: 605667, -68

Batch #: _____

Laboratory: _____ Laboratory Report #: _____

of Samples: _____ Matrix: _____

IS	BNA	CAS #	NAME	TCL	Min. RF	Intercept	Calib. RF	Calib. RSD/R ²	CCV %D	Method Blanks	LCS	LCS B	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Field Blanks	Field Dup	
							795 792	<20%/ 100%	20%												
6	BN	193-39-5	Indeno(1,2,3-cd)pyrene	✓	0.50	182	✓	✓	✓	✓	1	2	1	1	1	1	MSD	MSD	MSD	MSD	✓
2	BN	78-59-1	Isophorone		0.40																
2	BN	91-20-3	Naphthalene		0.70																
2	BN	98-95-3	Nitrobenzene		0.20					✓	✓			✓	62	✓	69	74	✓		
4	BN	86-30-6	N-Nitrosodiphenylamine (I)		0.01																
1	BN	621-64-7	N-Nitroso-di-propylamine	✓	0.50					✓	✓		✓	✓	✓	✓	✓	✓	✓		
4	A	87-86-5	Pentachlorophenol		0.05					✓	✓		✓	✓	✓	✓	✓	✓	✓		
4	BN	85-01-8	Phenanthrene		0.70																
1	A	108-95-2	Phenol		0.80					✓	✓		✓	✓	✓	✓	✓	✓	✓		
5	BN	129-00-0	Pyrene		0.60					✓	✓		✓	✓	✓	✓	✓	✓	✓		
			Diphenylamine																		

Surrogate Recovery Outliers

Sample	SMC 1	SMC 2	SMC 3	SMC 4	SMC 5	SMC 6	SMC 7	SMC 8

Comments: -013 received broken container
 Pyridine on QC Summary not on TAA.
 # 22 > R_h bis (2)
 # 12 → 21 > D_h " "

SMC 1: Nitrobenzene-d5 (BN) SMC 2: 2-Fluorobiphenyl (BN) SMC 3: p-Terphenyl-d14 (BN)
 SMC 4: Phenol-d6 (A) SMC 5: 2-Fluorophenol (A) SMC 6: 2,4,6-Tribromophenol (A)
 SMC 7: 2,2-Chlorophenol-d4 (A) SMC 8: 1,2-Dichlorobenzene-d4 (BN)

Internal Standard Outliers

Sample	IS 1-area	IS 1-RT	IS 2-area	IS 2-RT	IS 3-area	IS 3-RT	IS 4-area	IS 4-RT	IS 5-area	IS 5-RT	IS 6-area	IS 6-RT

IS 1: 1,4-Dichlorobenzene-d4 (BN) IS 2: Naphthalene-d8 (BN) IS 3: Acenaphthene-d10 (BN)
 IS 4: Phenanthrene-d10 (BN) IS 5: Chrysene-d12 (BN) IS 6: Perylene-d12 (BN)

PCBs (SW 846 - Method 8082)

Site/Project: DSD Soil Sampling AR/COC #: 605667 Laboratory Sample IDs: 66780 - 012 thru -022
 Laboratory: GFL Laboratory Report #: 66780
 Methods: SW-846 8082
 # of Samples: 11 Matrix: Soils Batch #: ^{200578 XT 9/10} 200519 (-013 only) ^{203079 XT 9-24} 203080 (-012, -014 → 022)

CAS #	Name	T C L	Intercept		Calib RSD/R ²		CCV %D		Method Blanks		LCS	LCSB	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Field Blanks
			1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1
12674-11-2	Aroclor-1016	✓	NA	✓	✓	22%	✓	✓	✓	✓			NA				✓	NA	
11104-28-2	Aroclor-1221	✓							✓	✓							✓		
11141-16-5	Aroclor-1232	✓							✓	✓							✓		
53469-21-9	Aroclor-1242	✓		✓	✓				✓	✓							✓		
12672-29-6	Aroclor-1248	✓		✓	✓				✓	✓							✓		
11097-69-1	Aroclor-1254	✓		✓	✓				✓	✓							✓		
11096-82-5	Aroclor-1260	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		

Sample	SMC % REC	SMC RT	Sample	SMC % REC	SMC RT
66780-021	HCN _x 26%	(31-120%)			
	< lower acceptance criteria	> 10%			
	All deca (1260) J, A1	All non's "UJ, A1"			

Comments: SA-012, -014 thru -022
 all "UJ, HT" except
 19, 21, 22 1260 "JHT"

Confirmation

Sample	CAS #	RPD > 25%	Sample	CAS #	RPD > 25%
66780-019	1260	32%	Change to higher value		1-B

SA - 012, -014 thru -022
 Reextracted out of HT
 only 1 set of data
 on CoTA

No raw data!

Batch # 200255 XT 9/10
 200256

MS not delivered with samples not on CoTA
 not validated

SA - 021 & -022 5X
 (code next -021 - due
 to sample viscosity)

Reviewed By: A. Hall

Date: 11-06-02

High Explosives (SW 846 Method 8330)

Site/Project: DSS Soil Sampling AR/COC #: 605667, -68 Laboratory Sample IDs: 66780 - old thru - 022
 Laboratory: GFH Laboratory Report #: 66780
 Methods: SW-846 8330 ① ②
 # of Samples: 11 Matrix: Soil Batch #s: 200966 reextracted as 203692

CAS #	NAME	1 1	Intercept	Curve	CCV	Method	LCS	LCSB	LCS	MS	MSD	MS	Field	Equip.	Field
				R ²	%D	Blank			RPD	MS	MSD	RPD	Dup.	Blank	
				1.992	120%	U			20%	1	2	2	120%	U	U
2691-41-0	HMX	✓	NA	✓	✓	✓	✓	✓	NA	✓	✓	✓	✓	NA	
121-82-4	RDX						✓	✓							
99-35-4	1,3,5-Trinitrobenzene						✓								
99-65-0	1,3-dinitrobenzene						✓								
98-95-3	Nitrobenzene						(165-124%)								
479-45-8	Tetryl						11								
118-96-7	2,4,6-trinitrotoluene						✓								
35572-78-2	2-amino-4,6-dinitrotoluene						(179-123%)								
1946-51-0	4-amino-2,6-dinitrotoluene						75								
121-14-2	2,4-dinitrotoluene						✓								
606-20-2	2,6-dinitrotoluene						✓								
88-72-2	2-nitrotoluene						✓								
99-99-0	4-nitrotoluene						✓								
99-08-1	3-nitrotoluene						✓								
78-11-5	PETN														

Sample	SMC %REC	SMC RT	Sample	SMC %REC	SMC RT
NA					

Comments: 203692 All 90 "UJ HT" - CE

200966 All Tetryl 90 "UJ," A
 LCS > 10% but < lower acceptance criteria

Confirmation

Sample	CAS #	RPD > 25%	Sample	CAS #	RPD > 25%
NA					

Solids-to-aqueous conversion:

mg/kg = µg/g : [(µg/g) x (sample mass {g} / sample vol. {ml}) x (1000 ml / 1 liter)] / Dilution Factor = µg/l

Reviewed By: d/hal Date: 11.06.02

Inorganic Metals

Site/Project: DSD Soil Sampling AR/COC#: 605667 Laboratory Sample IDs: 66780 - 012 Aru - 022
 Laboratory: GFL Laboratory Report #: 66780
 Methods: SW-846 6010 (ICP-AES) 7471 (Hg-CVMA)
 # of Samples: 11 Matrix: AQUEOUS Batch #: 200317 (Hg) 201371 (METALS)

CAS # Analyte	QC Element																			
	TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD	ICS AB	Serial Dilu- tion	Field Dup. RPD	Equip. Blanks	Field Blanks		
7429-90-5 Al								NA			NA							NA	NA	
7440-39-3 Ba	✓	✓	✓	✓	✓	✓	✓			RT			✓	✓	✓	✓				
7440-41-7 Be																				
7440-43-9 Cd	✓	✓	✓	✓	✓	✓	✓			✓			✓	✓	✓	✓				
7440-70-2 Ca																				
7440-47-3 Cr	✓	✓	✓	✓	✓	✓	✓			NA			✓	✓	✓	✓				
7440-48-4 Co																				
7440-50-8 Cu																				
7439-89-6 Fe																				
7439-95-4 Mg																				
7439-96-5 Mn																				
7440-02-0 Ni																				
7440-09-7 K																				
7440-22-4 Ag	✓	✓	✓	✓	✓	✓	✓			✓			NA	✓	NA	✓				
7440-23-5 Na																				
7440-62-2 V																				
7440-66-6 Zn																				
7439-92-1 Pb	✓	✓	✓	✓	✓	✓	✓			✓			✓	✓	NA	✓				5.8
7782-49-2 Se	✓	✓	✓	✓	✓	✓	✓			✓			NA	✓	NA	✓				
7440-38-2 As	✓	✓	✓	2.50	2.41	✓	✓			✓			✓	✓	✓	✓				12.5 12.0
7440-36-0 Sb																				
7440-28-0 Tl																				
7439-97-6 Hg	✓	✓	✓	✓	✓	✓	✓			✓			NA							
Cyanide CN																				

Notes: Shaded rows are RCRA metals. Solids-to-aqueous conversion: mg/kg = µg/g : (µg/g) x (sample mass (g) / sample vol. (ml)) x (1000 ml / 1 liter) / Dilution Factor = µg/l

Comments: ICP-AES 2X dil

METALS 66765 dup/MW/SD
SNR 50%

Reviewed By: dhal Date: 11-06-02

All SA > 5 ICB/CCB NO Q AS. B-14
All SA > RL Ba "J, A2"

General Chemistry

Site/Project: DSS Soil Sampling AR/COC #: 605 667 - 68 Laboratory Sample IDs: 66780 - 012 thru - 022
 Laboratory: GFA Laboratory Report #: 60780
 Methods: SW-846 9012A (TCV) 7196A (CC₆) -012 → -015 -016 → -022
 # of Samples: 11 Matrix: Soil Batch #: 201253 (TCV) 200893 (C⁶) / 200895

CAS#	Analyte	QC Element																				
		TAL	ICV	CCV	ICB	CCB	ug/lc	ug/kg	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD	ICS AB	Serial Dilution	Field Dup. RPD	Equip. Blanks	Field Blanks	
5955-70-0	Total Cr		✓	✓	✓	[1.78]	0.129 J		✓	NA	NA	✓	NA	NA	NA	NA	NA	✓?	NA	NA	NA	ALL < SX DL = J ALL < DL = UJ MBX5 = 0.645 ug/kg
SA-012 thru -015	Hexavalent Chromium		✓	✓	✓	✓	✓	✓	✓	NA	NA	✓	NA	NA	✓ NA	NA	NA	✓	NA	NA	NA	
SA-016 thru -022	Hexavalent Chromium		✓	✓	✓	✓	✓	✓	✓	NA	NA	✓	NA	NA	NA	NA	NA	✓	NA	NA	NA	

Comments: C⁶ Batch 200893: MS/Dup 66NSH 57AS 504. 66610

TCV
 MB 12. < SX MB J, B 13. 16. 17. 19. 20. 21 22
 CC₆ 12. < SX DL J, B₃ 13. 16. 19. 20. 21. 22

CC₆ 18 = NO = UJ, B₃ Reviewed By: Dhal Date: 11.06.02

MB, CC₆ > SX MB NO Q. 15.
 > SX DL 15. 17.

Radiochemistry

Site/Project: DSS Soil Sampling AR/COC #: 605667, -68 Laboratory Sample IDs: 66780 - 012 thru - 022
 Laboratory: CEH Laboratory Report #: 66780
 Methods: EPA 900.0
 # of Samples: 11 Matrix: Soils Batch #: 201305

Analyte	QC Element												
	Method Blanks	LCS	MS	Rep RER	Equip. Blanks	Field Dup. RER	Field Blanks	Sample ID	Isotope	IS/Trace	Sample ID	Isotope	IS/Trace
Criteria	U	20%	25%	<1.0	U	<1.0	U	NA		50-105			50-105
H3													
U-238													
U-234													
U-235/236													
Th-232													
Th-228													
Th-230													
Pu-239/240													
Gross Alpha	✓	✓	✓	✓	NA	✓	NA						
Nonvolatile Beta	✓	✓	✓	✓	NA	✓	NA						
Ra-226													
Ra-228													
Ni-63													
Gamma Spec. Am-241													
Gamma Spec. Cs-137													
Gamma Spec. Co-60													

Parameter	Method	Typical Tracer	Typical Carrier
Iso-U	Alpha spec.	U-232	NA
Iso-Pu	Alpha spec.	Pu-242	NA
Iso-Th	Alpha spec.	Th-229	NA
Am-241	Alpha spec.	Am-242	NA
Sr-90	Beta	Y ingrowth	NA
Ni-63	Beta	NA	Ni by ICP
Ra-226	Deamination	NA	NA
Ra-226	Alpha spec.	Ba-133 or Ra-225	NA
Ra-228	Gamma spec.	Ba-133	NA

Comments:

Gamma spec. LCS contains: Am-241, Cs-137, and Co-60

Reviewed By: R/hal Date: 11-06-02

ANNEX C
DSS Site 1086
Risk Assessment

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DSS SITE 1086: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1086, the Building 6523 Septic System, at Sandia National Laboratories/New Mexico (SNL/NM), is located in Technical Area (TA)-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 single seepage pit. Available information indicates that Building 6523 was constructed in 1954 (SNL/NM March 2003), and it is assumed that the septic system was also constructed at that time. By 1991, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones June 1991). The old septic tank was filled with dirt and the system was abandoned in place concurrent with this change (Romero September 2003).

Environmental concern about DSS Site 1086 is based upon the potential for the release of constituents of concern (COCs) in effluent discharged to the environment via the seepage pit at this site. Because operational records were not available, the investigation was planned to be consistent with other DSS site investigations and to sample for the COCs most commonly found at similar facilities.

The ground surface in the vicinity of the site is flat or slopes slightly to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.4 miles east of the site. No springs or perennial surface-water bodies are located within two 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 or slopes to the west. Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996). Most of the area immediately surrounding DSS Site 1086 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS Site 1086 lies at an average elevation of approximately 5,414 feet above mean sea level. The groundwater beneath the site occurs in unconfined conditions in essentially unconsolidated silts, sands, and gravels. The depth to groundwater is approximately 492 feet below ground surface (bgs). Groundwater flow is thought to be to the west in this area (SNL/NM March 2002). The nearest groundwater monitoring wells are approximately 1,000 feet northeast of the site. The nearest production wells are northwest and northeast of the site and include KAFB-4 and KAFB-11, which are approximately 3.0 and 3.3 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 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 1086 was effluent discharged to the environment from the seepage pit at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1086 Sampling Area	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil beneath the septic system seepage pit	Effluent discharged to the environment from the seepage pit	1	NA	Evaluate potential COC releases to the environment from effluent discharged from the seepage pit

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

The soil samples were collected at one boring location at DSS Site 1086 with a Geoprobe™ from two 3- or 4-foot-long sampling intervals. Sampling intervals started at 10 and 15 feet bgs in the seepage pit boring. 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 1086 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 Chemistry Laboratory and Radiation Protection Sample Diagnostics (RPSD) Laboratory. Table 3 summarizes the analytical methods and the 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 1086

Sample Type	VOCs	SVOCs	PCBs	HE	RCRA Metals	Hexavalent Chromium	Cyanide	Gamma Spectroscopy Radionuclides	Gross Alpha/Beta
Confirmatory	2	2	2	2	2	2	2	2	2
Duplicates	0	0	0	0	0	0	0	0	0
EBs and TBs (VOCs only)	1	0	0	0	0	0	0	0	0
Total Samples	3	2	2	2	2	2	2	2	2
Analytical Laboratory	GEL	GEL	GEL	GEL	GEL	GEL	GEL	RPSD	GEL

DSS = Drain and Septic Systems.
 EB = Equipment blank.
 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 1086

Analytical Method^a	Data Quality Level	GEL	RPSD
VOCs EPA Method 8260	Defensible	2	None
SVOCs EPA Method 8270	Defensible	2	None
PCBs EPA Method 8082	Defensible	2	None
HE Compounds EPA Method 8330	Defensible	2	None
RCRA Metals EPA Method 6000/7000	Defensible	2	None
Hexavalent Chromium EPA Method 7196A	Defensible	2	None
Total Cyanide EPA Method 9012A	Defensible	2	None
Gamma Spectroscopy Radionuclides EPA Method 901.1	Defensible	None	2
Gross Alpha/Beta Activity EPA Method 900.0	Defensible	2	None

Note: The number of samples does not include QA/QC samples such as duplicates, trip blanks, and equipment blanks.

^aEPA November 1986.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

GEL = General Engineering Laboratories, Inc.

HE = High explosive(s).

PCB = Polychlorinated biphenyl.

QA = Quality assurance.

QC = Quality control.

RCRA = Resource Conservation and Recovery Act.

RPSD = Radiation Protection Sample Diagnostics Laboratory.

SVOC = Semivolatile organic compound.

VOC = Volatile organic compound.

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

All of the soil sample results were verified/validated by SNL/NM according to "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00-03 (SNL/NM December 1999). The data validation reports are presented in the associated DSS Site 1086 proposal for no further action (NFA). The gamma spectroscopy data from the RPSD Laboratory were reviewed according to "Laboratory Data Review Guidelines," Procedure No: RPSD-02-11, Issue No. 2 (SNL/NM July 1996). The gamma spectroscopy

results are presented in the NFA proposal. The reviews 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 1086 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, and soil 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 1086, which is presented in Section 4.2.1 of the associated NFA proposal. The quality of the data specifically used to determine the nature, migration rate, and extent of contamination are described below.

III.2 Nature of Contamination

Both the nature of contamination and the potential for the degradation of COCs at DSS Site 1086 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 1086.

III.3 Rate of Contaminant Migration

The septic system at DSS Site 1086 was deactivated in the early 1990s when Building 6523 was connected to an extension of the City of Albuquerque sanitary sewer system. The migration rate of COCs that may have been introduced into the subsurface via the septic system at this site was therefore dependent upon the volume of aqueous effluent discharged to the environment from this system when it was operational. Any migration of COCs from this site after use of the septic system was discontinued has been predominantly dependent upon precipitation. However, 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 1086.

III.4 Extent of Contamination

Subsurface soil samples were collected from one borehole drilled beneath the seepage pit at DSS Site 1086 to assess whether releases of effluent from the septic system caused any environmental contamination.

The DSS Site 1086 soil samples were collected at sampling depths starting at 10 and 15 feet beneath the seepage pit. Sampling intervals started at the depths that effluent discharged from the seepage pit would have entered the subsurface environment at the site. This sampling procedure was required by the New Mexico Environment Department (NMED) regulators and has been used at numerous DSS-type of sites at SNL/NM. The soil samples are considered to be representative of the soil potentially contaminated with the COCs at DSS Site 1086 and are sufficient to determine the vertical extent, if any, of COCs.

IV. Comparison of COCs to Background Levels

Site history and characterization activities are used to identify potential COCs. The DSS Site 1086 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 evaluated in this risk assessment include all detected organic and all inorganic and radiological COCs for which samples were analyzed. When the detection limit of an organic compound is too high (i.e., could possibly cause an adverse effect to human health or the environment), the compound is 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 uses 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 and 5.

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

Table 4 lists the nonradiological COCs and Table 5 lists the radiological COCs for the human health risk assessment at DSS Site 1086. All samples were collected from depths greater than 5 feet bgs; therefore, evaluation of ecological risk was not performed. 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 5.

V. Fate and Transport

The primary releases of COCs at DSS Site 1086 were to the subsurface soil resulting from the discharge of effluents from the Building 6523 Septic System. Wind, water, and biota are natural mechanisms of COC transport from the primary release point; however, because the discharge was to subsurface soil, none of these are considered to be of potential significance as transport mechanisms at this site. Because the septic system is no longer active, additional infiltration of water is not expected. Infiltration of precipitation is essentially nonexistent at DSS Site 1086, as virtually all of the moisture either drains away from the site, or evaporates. Because groundwater at this site is approximately 492 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1086 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	3.43	4.4	Yes	44 ^c	–	Yes
Barium	191 J	214	Yes	170 ^d	–	Yes
Cadmium	0.212 J	0.9	Yes	64 ^c	–	Yes
Chromium, total	10.1	15.9	Yes	16 ^c	–	No
Chromium VI	0.0274 ^e	1	Yes	16 ^c	–	No
Cyanide	0.178 J	NC	Unknown	NC	–	Unknown
Lead	6.33	11.8	Yes	49 ^c	–	Yes
Mercury	0.0051	<0.1	Unknown	5,500 ^c	–	Yes
Selenium	0.0795 ^e	<1	Unknown	800 ^f	–	Yes
Silver	0.0442 ^e	<1	Unknown	0.5 ^c	–	No
Organic						
2-Butanone	0.00462 J	NA	NA	1 ^g	0.29 ^g	No
bis(2-Ethylhexyl) phthalate	0.0955 J	NA	NA	851 ^h	7.6 ⁱ	Yes
PCBs (Aroclor 1260) ^j	0.0013 J	NA	NA	31,200 ^c	6.72 ^c	Yes

Note: **Bold** indicates the COCs that exceed the background screening values and/or are bioaccumulators.

^aDinwiddie September 1997, Southwest Area Supergroup.

^bNMED March 1998.

^cYanicak March 1997.

^dNeumann 1976.

^eParameter was not detected. Concentration listed is one-half the maximum detection limit.

^fCallahan et al. 1979.

^gHoward 1990.

^hHoward 1989.

ⁱMicromedex, Inc. 1998.

^jValue listed is the greater of either the maximum detection or one-half of the maximum detection limit.

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1086 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

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.
PCB	= Polychlorinated biphenyl.
SNL/NM	= Sandia National Laboratories/New Mexico.
-	= Information not available.

Table 5
Radiological COCs for Human Health Risk Assessment at DSS Site 1086 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 (0.036)	0.079	Yes	3,000 ^c	Yes
Th-232	0.663	1.01	Yes	3,000 ^c	Yes
U-235	ND (0.134)	0.16	Yes	900 ^c	Yes
U-238	ND (0.541)	1.4	Yes	900 ^c	Yes

Note: **Bold** indicates COCs that exceed the background screening values and/or are bioaccumulators.

^aDinwiddie September 1997, Southwest Area Supergroup.

^bNMED March 1998.

^cBaker 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.

pCi/g = Picocurie(s) per gram.

SNL/NM = Sandia National Laboratories/New Mexico.

COCs at DSS Site 1086 include both inorganic and organic constituents. The inorganic COCs are nonradiological analytes only (radiological analytes were all below background). With the exception of cyanide, the inorganic COCs are elemental in form, and are not considered to be degradable. Transformations of these inorganic constituents could include changes in valence (oxidation/reduction reactions) or incorporation into organic forms (e.g., the conversion of selenite or selenate from soil to seleno-amino acids in plants). Cyanide can be metabolized by soil biota.

The organic COCs at DSS Site 1086 are 2-butanone, bis(2-ethylhexyl) phthalate, and PCBs. Organic COCs may be degraded through photolysis, hydrolysis, and biotransformation. Photolysis requires light and therefore takes place in the air, at the ground surface, or in surface water. Hydrolysis includes chemical transformations in water and may occur in the soil solution. Biotransformation (i.e., transformation caused by plants, animals, and microorganisms) may occur; however, biological activity may be limited by the arid environment at this site. Because of the depth of the COCs in the soil, the loss of 2-butanone through volatilization is expected to be minimal.

Table 6 summarizes the fate and transport processes that can occur at DSS Site 1086. The COCs at DSS Site 1086 include nonradiological inorganic analytes and organic analytes. Wind, surface water, and biota are considered to be of low significance as potential transport mechanisms at this site. Significant leaching into the subsurface soil is unlikely, and leaching into the groundwater at this site is highly unlikely. The potential for transformation of COCs is low.

Table 6
Summary of Fate and Transport at DSS Site 1086

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

DSS = Drain and Septic Systems.

VI. Human Health Risk Assessment

VI.1 Introduction

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

Step 1.	Site data are described that provide information on the potential COCs, as well as the relevant physical characteristics and properties of the site.
Step 2.	Potential pathways are identified by which a representative population might be exposed to the COCs.

Step 3.	The potential intake of these COCs by the representative population is calculated using a tiered approach. The first component of the tiered approach is a screening procedure that compares the maximum concentration of the COC to an SNL/NM maximum background screening value. COCs that are not eliminated during the first screening procedure are carried forward in the risk assessment process.
Step 4.	Toxicological parameters are identified and referenced for COCs that were not eliminated during the screening procedure.
Step 5.	Potential toxicity effects (specified as a hazard index [HI]) and estimated excess cancer risks are calculated for nonradiological COCs and background. For radiological COCs, the incremental total effective dose equivalent (TEDE) and incremental estimated cancer risk are calculated by subtracting applicable background concentrations directly from maximum on-site contaminant values. This background subtraction applies only when a radiological COC occurs as contamination and exists as a natural background radionuclide.
Step 6.	These values are compared with guidelines established by the U.S. Environmental Protection Agency (EPA), NMED, and the 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 1086. 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 1086 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 1086 is approximately 492 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 1086.

Pathway Identification

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

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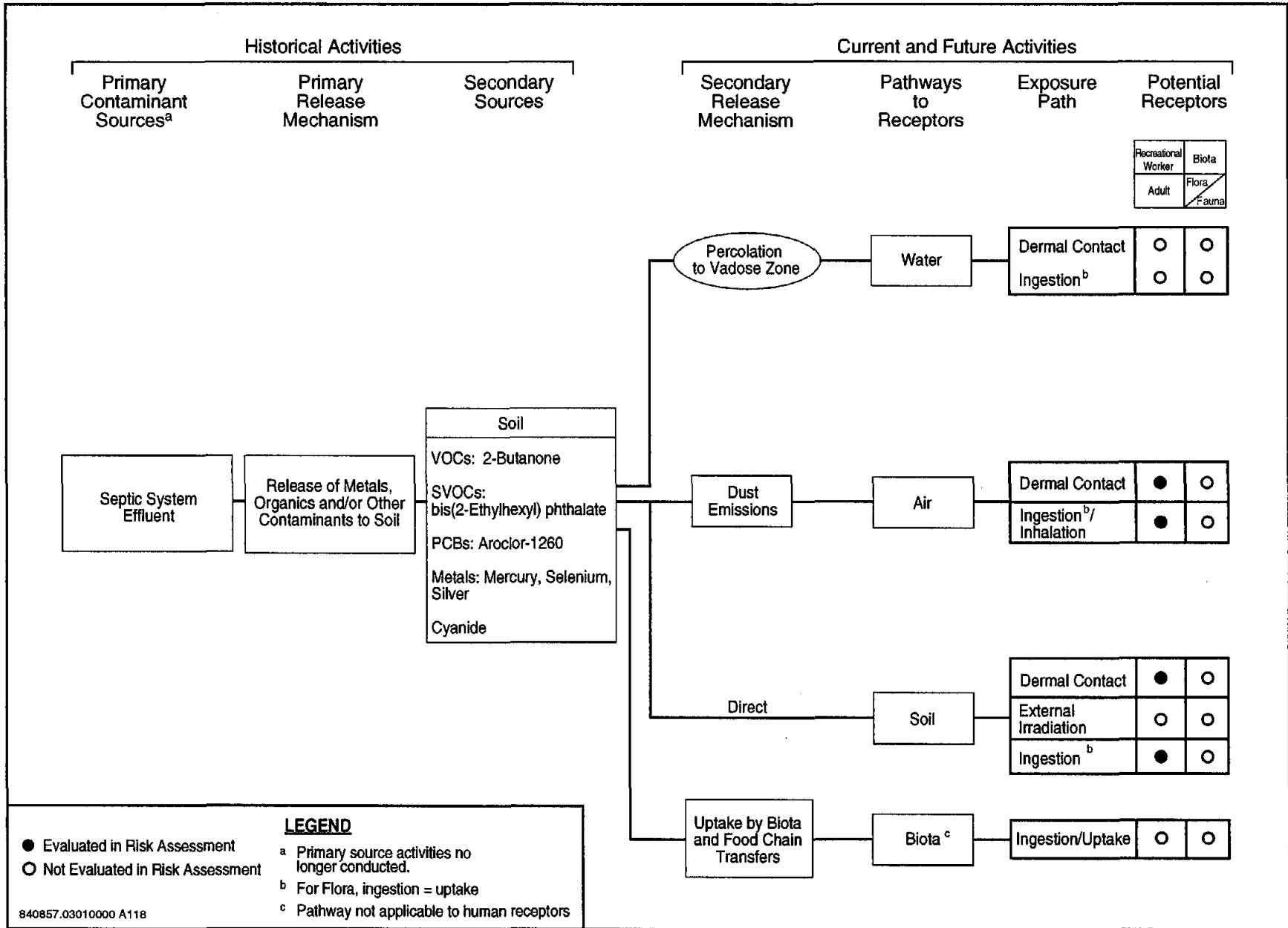


Figure 1
Conceptual Site Model Flow Diagram for DSS Site 1086, Building 6523 Septic System

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 are compared to the approved SNL/NM maximum screening levels for this area. The SNL/NM maximum background concentration was selected to provide the background screen in Table 4 and used to calculate risk attributable to background in Section VI.6.2. Only the COCs that were detected above the corresponding SNL/NM maximum background screening levels or that do not have either a quantifiable or calculated background screening level are considered in further risk assessment analyses.

For radiological COCs that exceed the SNL/NM background screening levels, background values are subtracted from the individual maximum radionuclide concentrations. Those that do not exceed these background levels are 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 are detected above the analytical minimum detectable activity are carried through the risk assessment at the maximum levels. The resultant radiological COCs remaining after this step are referred to as background-adjusted radiological COCs.

VI.4.2 Results

Tables 4 and 5 show the DSS Site 1086 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, four constituents do not have quantified background screening concentrations; therefore it is unknown whether these COCs exceed background. Three constituents are organic compounds that do not have corresponding background screening values.

The maximum concentration value for total PCBs is 0.0013 milligrams (mg)/kilogram (kg). This concentration is less than the EPA screening level of 1 mg/kg (Title 40, Code of Federal Regulations, Part 761). Because the maximum concentration for PCBs at this site is less than the screening value, PCBs are eliminated from further consideration in the human health risk assessment.

For the radiological COCs, none of the constituents exceed background concentration values. Therefore, the radiological COCs are eliminated from further evaluation in the risk assessment.

VI.5 Step 4. Identification of Toxicological Parameters

Table 7 list the COCs retained in the risk assessment and the values for the available toxicological information. The toxicological values for the nonradiological COCs presented in Table 7 were obtained from the Integrated Risk Information System (IRIS) (EPA 2003), the

Table 7
Toxicological Parameter Values for DSS Site 1086 Nonradiological COCs

COC	RfD _o (mg/kg-d)	Confidence ^a	RfD _{inh} (mg/kg-d)	Confidence ^a	SF _o (mg/kg-d) ⁻¹	SF _{inh} (mg/kg-d) ⁻¹	Cancer Class ^b	ABS
Inorganic								
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
bis(2-Ethylhexyl) phthalate	2E-2 ^f	-	2E-2 ^f	-	1.4E-2 ^f	1.4E-2 ^f	-	0.01 ^g

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

^bEPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 2003):

D = Not classifiable as to human carcinogenicity.

^cToxicological parameter values from IRIS electronic database (EPA 2003).

^dToxicological parameter values from NMED (December 2000).

^eToxicological parameter values from HEAST (EPA 1997a).

^fToxicological parameter values from EPA Region 6 (EPA 2002a).

^gToxicological parameter values from Risk Assessment Information System (ORNL 2003).

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-d)⁻¹ = Per milligram per kilogram-day.

NMED = New Mexico Environment Department.

RfD_{inh} = Inhalation chronic reference dose.

RfD_o = Oral chronic reference dose.

SF_{inh} = Inhalation slope factor.

SF_o = Oral slope factor.

- = Information not available.

Health Effects Assessment Summary Tables (HEAST) (EPA 1997a), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), and the EPA Region 6 (EPA 2002a), and the Risk Assessment Information System (ORNL 2003) electronic databases.

VI.6 Step 5. Exposure Assessment and Risk Characterization

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

VI.6.1 Exposure Assessment

Appendix 1 provides the equations and parameter input values used in calculating intake values and subsequent HI and excess cancer risk values for the individual exposure pathways.

The appendix shows parameters for both industrial and residential land-use scenarios. The equations for nonradiological COCs are based upon the Risk Assessment Guidance for Superfund (RAGS) (EPA 1989). Parameters are based upon information from the RAGS (EPA 1989), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), as well as other EPA and NMED guidance documents, and reflect the reasonable maximum exposure (RME) approach advocated by the RAGS (EPA 1989).

Although the designated land-use scenario for this site is industrial, risk and TEDE values for a residential land-use scenario are also presented.

VI.6.2 Risk Characterization

Table 8 shows an HI of 0.00 for the DSS Site 1086 nonradiological COCs and an estimated excess cancer risk of $5E-10$ 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 9 shows an HI of 0.00 and no quantified estimated excess cancer risk for the DSS Site 1086 associated background constituents under the designated industrial land-use scenario.

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

For nonradiological COCs under the residential land-use scenario, the HI is 0.00 with an estimated excess cancer risk of $2E-9$ (Table 8). The numbers in the table include exposure from soil ingestion, dermal contact, and dust and volatile inhalation. Although the EPA (1991) generally recommends that inhalation not be included in a residential land-use scenario, this pathway is included because of the potential for soil in Albuquerque, New Mexico, to be eroded and for dust to be present in predominantly residential areas. Because of the nature of the

Table 8
Risk Assessment Values for DSS Site 1086 Nonradiological COCs

COC	Maximum Concentration (mg/kg)	Industrial Land-Use Scenario ^a		Residential Land-Use Scenario ^a	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Cyanide	0.178 J	0.00	–	0.00	–
Mercury	0.0051 J	0.00	–	0.00	–
Selenium	0.0795 ^b	0.00	–	0.00	–
Silver	0.0442 ^b	0.00	–	0.00	–
Organic					
2-Butanone	0.00462 J	0.00	–	0.00	–
bis(2-Ethylhexyl) phthalate	0.0955 J	0.00	5E-10	0.00	2E-9
Total		0.00	5E-10	0.00	2E-9

^aEPA 1989.

^bConcentration is one-half the maximum detection limit.

COC = Constituent of concern.

DSS = Drain and Septic Systems.

J = Estimated concentration.

mg/kg = Milligram(s) per kilogram.

– = Information not available.

Table 9
Risk Assessment Values for DSS Site 1086 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
Cyanide	NC	–	–	–	–
Mercury	<0.1	–	–	–	–
Selenium	<1	–	–	–	–
Silver	<1	–	–	–	–
Total		–	–	–	–

^aDinwiddie September 1997, Southwest Area Supergroup.

^bEPA 1989.

COC = Constituent of concern.

DSS = Drain and Septic Systems.

mg/kg = Milligram(s) per kilogram.

NC = Not calculated.

– = Information not available.

local soil, other exposure pathways are not considered (see Appendix 1). Table 9 shows an HI of 0.00 and no quantified estimated excess cancer risk for the DSS Site 1086 associated background constituents under the residential land-use scenario.

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

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

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

For the nonradiological COCs under the industrial land-use scenario, the HI is 0.00 (less than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). The estimated excess cancer risk is $5E-10$. 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 the potential nonradiological COCs for both the industrial and residential land-use scenarios. Assuming the industrial land-use scenario, there is neither a quantifiable HI nor an excess cancer risk for 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 of 0.00. The incremental HI is 0.00 and the incremental estimated excess cancer risk is $4.98E-10$ for the industrial land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under an industrial land-use scenario.

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

The calculated HI for the nonradiological COCs under the residential land-use scenario is 0.00, which is below numerical guidance. The estimated excess cancer risk is $2E-9$. 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 incremental HI is 0.00 and the estimated incremental cancer risk is $2.16E-9$ for the residential land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under the residential land-use scenario.

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

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1086 is based upon an initial conceptual model that was validated with sampling conducted at the

site. The sampling was implemented in accordance with the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). The DQOs contained in these two documents are appropriate for use in risk assessments. The data from soil samples collected at effluent release points are representative of potential COC releases to the site. The analytical requirements and results satisfy the DQOs, and data quality was verified/validated in accordance with SNL/NM procedures. Therefore, there is no uncertainty associated with the data quality used to perform the risk assessment at DSS Site 1086.

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. Based upon the COCs found in the near-surface soil and the location and physical characteristics of the site, there is little uncertainty in the exposure pathways relevant to the analysis.

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

Table 7 shows the uncertainties (confidence levels) in nonradiological toxicological parameter values. There is a combination of estimated values and values from the IRIS (EPA 2003), HEAST (EPA 1997a), EPA Regions 6, 9, and 3 (EPA 2002a, EPA 2002b, EPA 2002c), and Technical Background Document for Development of Soil Screening Levels (NMED December 2000). Where values are not provided, information is not available from the HEAST (EPA 1997a), IRIS (EPA 2003), Technical Background Document for Development of Soil Screening Levels (NMED December 2000), Risk Assessment Information System (ORNL 2003), or EPA regions (EPA 2002a, EPA 2002b, EPA 2002c). Because of the conservative nature of the RME approach, uncertainties in toxicological values are not expected to change the conclusion from the risk assessment analysis.

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

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 1086 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 include 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 are 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 (0.00) is significantly lower than the accepted numerical guidance from the EPA. The estimated excess cancer risk is $5E-10$; thus, excess cancer risk is also 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 estimated excess cancer risk is 4.98E-10 for the industrial land-use scenario. Incremental risk calculations indicate insignificant risk to human health 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 (0.00) is below the accepted numerical guidance from the EPA. The estimated excess cancer risk is 2E-9. Thus, excess cancer risk is below the acceptable risk value provided by the NMED for a residential land-use scenario (Bearzi January 2001). The incremental HI is 0.00 and the incremental estimated excess cancer risk is 2.16E-9 for the residential land-use scenario. The incremental risk calculations indicate insignificant risk to human health for the residential land-use scenario.

Because none of the radiological COCs exceed background activity values, these COCs are eliminated from further evaluation in the risk assessment for the industrial and residential land-use scenarios.

The excess cancer risk from the nonradiological and radiological COCs should be summed to provide risk estimates for persons exposed to both types of carcinogenic contaminants, as noted in Office of Solid Waste and Emergency Response Directive No. 9200.4-18 (EPA 1997b). The summation of the nonradiological and radiological carcinogenic risks is tabulated in Table 10.

Table 10
Summation of Incremental Radiological and Nonradiological Risks from
DSS Site 1086, Building 6523 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	4.98E-10	0.0E+0	4.98E-10
Residential	2.16E-9	0.0E+0	2.16E-9

DSS = Drain and Septic Systems.

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

VII. Ecological Risk Assessment

VII.1 Introduction

This section addresses the ecological risks associated with exposure to constituents of potential ecological concern (COPECs) in the soil at DSS Site 1086. A component of the NMED Risk-Based Decision Tree (NMED March 1998) is to conduct an ecological risk assessment that corresponds with that presented in EPA's Ecological RAGS (EPA 1997c). The current methodology is tiered and contains an initial scoping assessment which is followed by a more detailed risk assessment if warranted by the results of the scoping 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. At the end of the scoping assessment, a determination is made as to whether a more detailed examination of potential ecological risk is necessary.

VII.2 Scoping Assessment

The scoping assessment focuses primarily on the likelihood of exposure of biota at, or adjacent to, the DSS Site 1086 to constituents associated with site activities. Included in this section is an evaluation of existing data with respect to the existence of complete ecological exposure pathways, an evaluation of bioaccumulation potential, and a summary of fate and transport potential. A scoping risk management decision (Section VII.2.4) summarizes the scoping results and assesses the need for further examination of potential ecological impacts is necessary.

VII.2.1 Data Assessment

As indicated in Section IV, all COCs at DSS Site 1086 are at depths greater than 5 feet bgs. Therefore, no complete ecological exposure pathways exist at this site and no COCs are considered to be COPECs.

VII.2.2 Bioaccumulation

Because no COPECs are associated with this site, bioaccumulation potential was not evaluated.

VII.2.3 Fate and Transport Potential

The potential for the COCs to migrate from the source of contamination to other media or biota is discussed in Section V. As noted in Table 6 (Section V), wind, surface water, and biota (food chain uptake) are expected to be of low significance as transport mechanisms for COCs at this site. Degradation, transformation, and radiological decay of the COC also are expected to be of low significance.

VII.2.4 Scoping Risk-Management Decision

Based upon information gathered through the scoping assessment, it is concluded that complete ecological pathways are not associated with COCs at DSS Site 1086. Therefore, no COPECs exist at the site, and a more detailed risk assessment was not deemed necessary to predict the potential level of ecological risk associated with the site.

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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):

$$I_s = \frac{C_s * IR * EF * ED * \left(\frac{1}{VF} \text{ or } \frac{1}{PEF} \right)}{BW * AT}$$

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 [m³]/day)
- EF = Exposure frequency (days/year)
- ED = Exposure duration (years)
- VF = soil-to-air volatilization factor (m³/kg)
- PEF = particulate emission factor (m³/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 (cm²/event)
- AF = Soil to skin adherence factor (mg/cm²)
- 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/m³)
 IR_i = Inhalation rate (m³/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)	25,550 ^{a,b}	25,550 ^{a,b}	25,550 ^{a,b}
for Noncarcinogenic Compounds (= ED x 365 day/yr)	9,125 ^{a,b}	10,950 ^{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

^aTechnical Background Document for Development of Soil Screening Levels (NMED December 2000).

^bRisk Assessment Guidance for Superfund, Vol. 1, Part B (EPA 1991).

^cExposure 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}

^aRisk Assessment Guidance for Superfund, Vol. 1, Part B (EPA 1991).

^bExposure Factors Handbook (EPA August 1997).

^cEPA Region VI guidance (EPA 1996).

^dFor radionuclides, RESRAD (ANL 1993).

^eSNL/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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