7-1-2004

Justification for Class III Permit Modification July 2004 DSS Site 1009 Operable Unit 1295 Building 6620 Internal Sump (TA-III)

Sandia National Laboratories/NM

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Sandia National Laboratories

Justification for Class III Permit Modification

July 2004

DSS Site 1009
Operable Unit 1295
Building 6620 Internal Sump (TA-III)

NFA (SWMU Assessment Report) Submitted December 2003

Environmental
Restoration
Project

United States Department of Energy
Albuquerque Operations Office

Sandia National Laboratories

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United States Department of Energy
Albuquerque Operations Office

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

DEC 17 2003

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

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

Dear Mr. Kieling:

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

This submittal includes descriptions of the site characterization work, soil characterization data, and risk assessments for the nine DSS sites listed above. The risk assessments conclude that for these sites (1) there is no significant risk to human health under both the industrial and residential land-use scenarios, and (2) that there are no ecological risks associated with these sites.

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

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

Sincerely,

Karen Boardman

Karen L. Boardman
Manager

Enclosure

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

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

Sandia National Laboratories/New Mexico
Environmental Restoration Project

SWMU ASSESSMENT REPORT AND PROPOSAL FOR NO FURTHER ACTION DRAIN AND SEPTIC SYSTEMS SITE 1009, BUILDING 6620 INTERNAL SUMP

December 2003

United States Department of Energy
Sandia Site Office

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ACRONYMS AND ABBREVIATIONS

AOC	Area of Concern
AOP	Administrative Operating Procedure
bgs	below ground surface
COC	constituent of concern
DSS	Drain and Septic Systems
EB	equipment blank
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FIP	field implementation plan
HE	high explosive(s)
HI	hazard index
HWB	Hazardous Waste Bureau
KAFB	Kirtland Air Force Base
MDA	minimum detectable activity
MDL	method detection limit
mrem	millirem
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
TEDE	total effective dose equivalent
VOC	volatile organic compound
yr	year(s)

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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 NMED.
- For systems requiring characterization, determine the specific types of shallow characterization work (including passive soil-vapor sampling and/or shallow soil borings) that would be required by NMED.

A number of additional drain systems were identified from the engineering drawings and field inspection work. It was also determined that some of the sites on the 1996 list actually contained more than one individual drain or septic system that had been combined under one four-digit site number. In order to reduce confusion, a decision was made to assign each individual system its own unique four-digit number. A new site list containing a total of 121 individual DSS sites was generated in 2000. Of these 121 sites, NMED required environmental assessment work at a total of 61. No characterization was required at the remaining 60 sites because the sites either were found not to exist, were the responsibility of other non-SNL/NM organizations, were already designated as individual SWMUs, or were considered by NMED to pose no threat to human health or the environment. Subsequent backhoe excavation at DSS Site 1091 confirmed that the system did not exist, which decreased the number of DSS sites requiring characterization to 60.

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

2.0 DSS SITE 1009: BUILDING 6620 INTERNAL SUMP

2.1 Summary

The SNL/NM ER Project conducted an assessment of DSS Site 1009, the Building 6620 Internal Sump. 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 internal sump 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 1009. This NFA proposal provides documentation that the site was sufficiently characterized, that no significant releases of contaminants to the environment occurred via the Building 6620 Internal Sump, 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. An inspection conducted inside Building 6620 on July 14, 1999, confirmed that the internal sump had been capped and/or filled with concrete at some point prior to the date of the inspection.

Review and analysis of all relevant data for DSS Site 1009 indicate that concentrations of constituents of concern (COCs) at this site were found to be below applicable risk assessment action levels. Thus, DSS Site 1009 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 1009 is located in SNL/NM Technical Area (TA)-III on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (Figure 2.2.1-1). DSS Site 1009 is in the east-central part of TA-III, and is situated approximately 4,300 feet south of the entrance to TA-III. The sump, located inside Building 6620 (Figure 2.2.1-2), consisted of a 6-foot-square by 6-foot-deep sump or vault with a floor drain in the center of the unit that drained to a 2-foot-square by 2-foot-deep drywell filled with pea gravel located beneath the sump (Figures 2.2.1-2 and 2.2.1-3). Construction details are based upon engineering drawings (SNL/NM February 1991) and site inspections. A second DSS site (Site 1082, the Building 6620 Septic System) is also shown on Figure 2.2.1-2, but it is not addressed in this report.

The surface geology at DSS Site 1009 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

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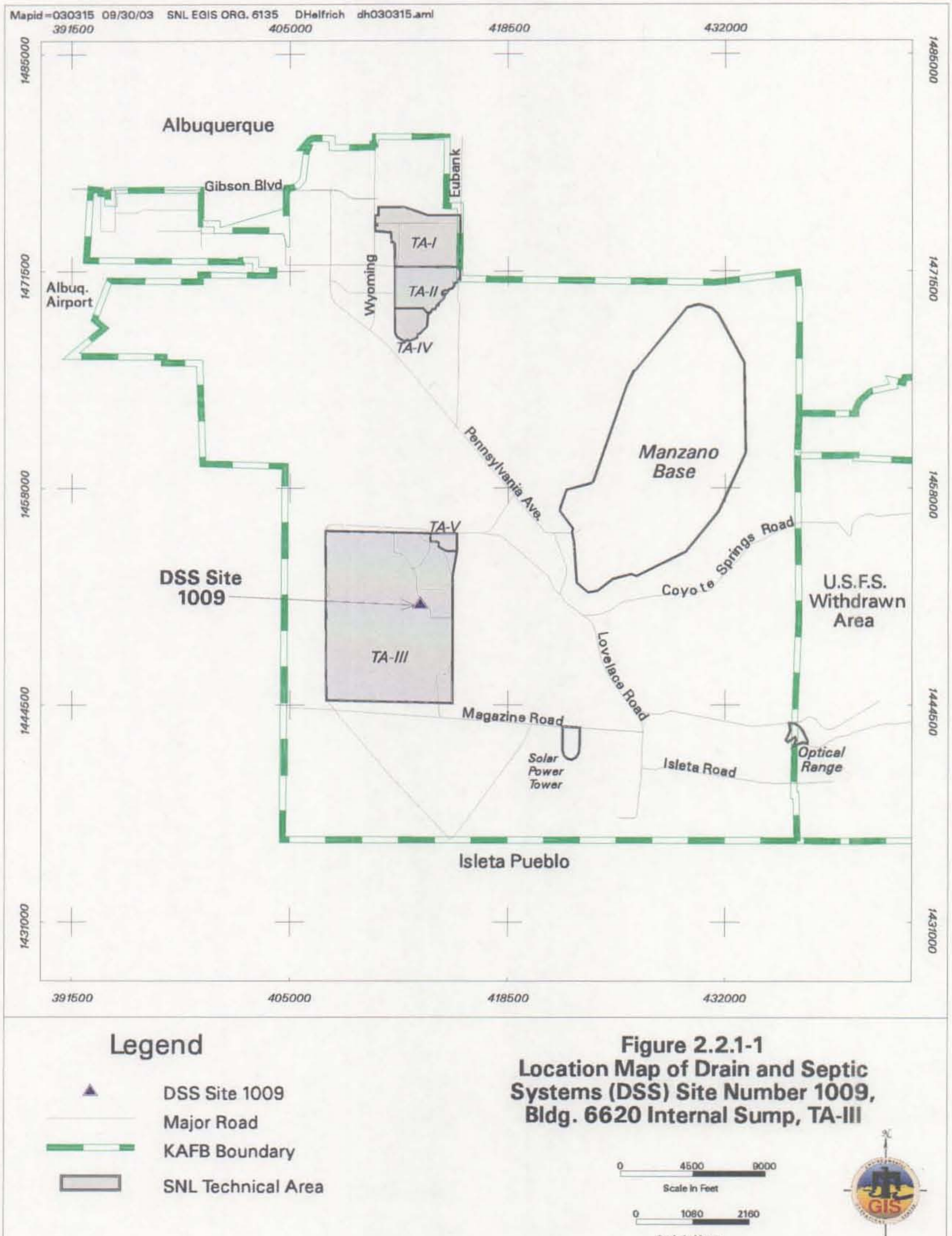


Figure 2.2.1-1
Location Map of Drain and Septic Systems (DSS) Site Number 1009, Bldg. 6620 Internal Sump, TA-III

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Mapid=030231 03/13/03 SNL EGIS ORG. 6135 DHelfrich dh030231.aml

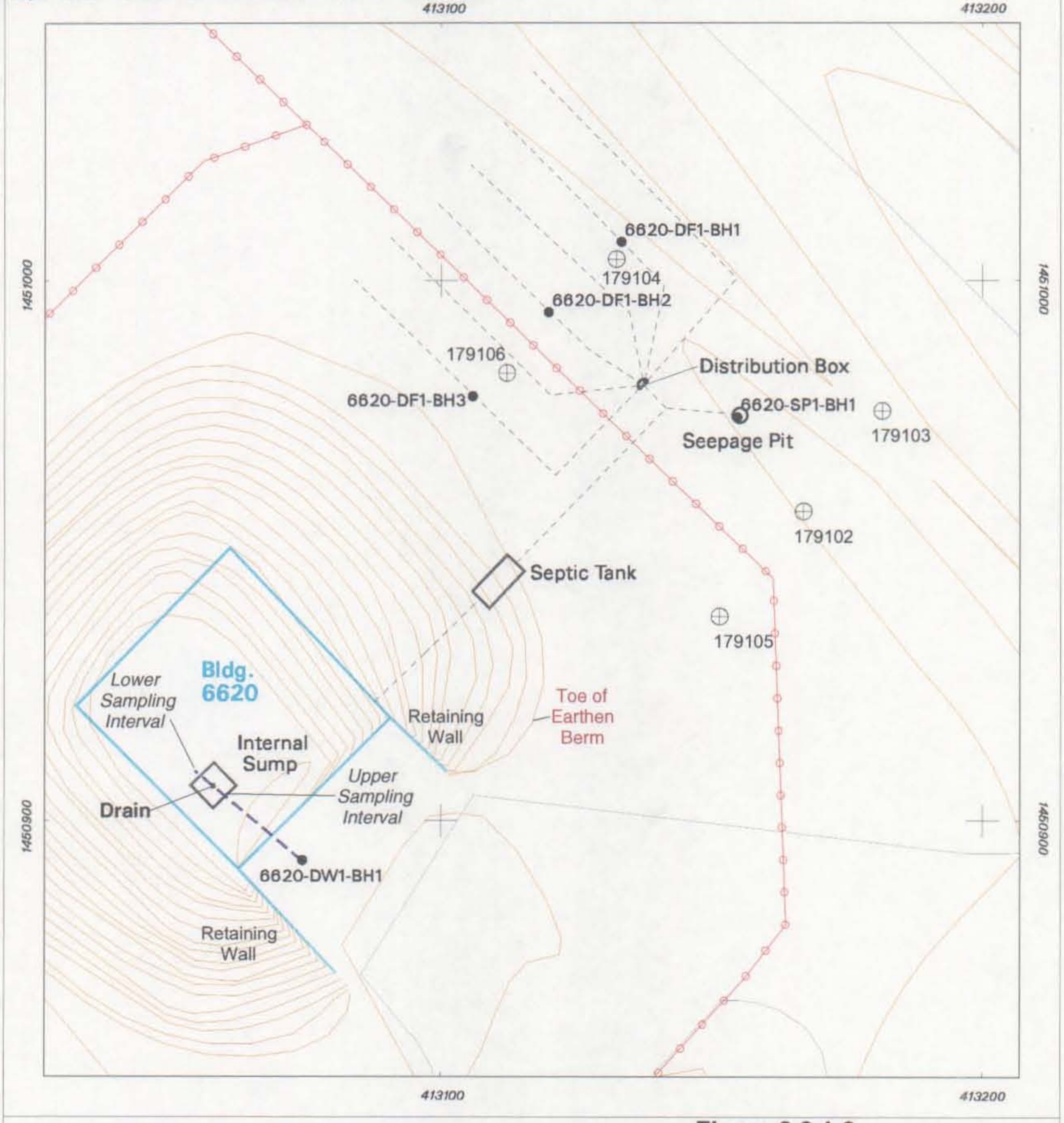


Figure 2.2.1-2
Site Map of Drain and Septic Systems (DSS) Site Numbers 1009, Bldg. 6620 Internal Sump, and 1082, Bldg. 9920 Septic System, TA-III

Legend

●	Soil Boring Location
⊕	Gore-Sorber Sample Location
———	Septic Tank / Seepage Pit Distribution Box / Internal Sump
-o-o-o-	Fence
———	Paved Road
———	Building
- - - -	Septic Drain Line
- - - -	Borehole Profile

0 15 30
Scale in Feet

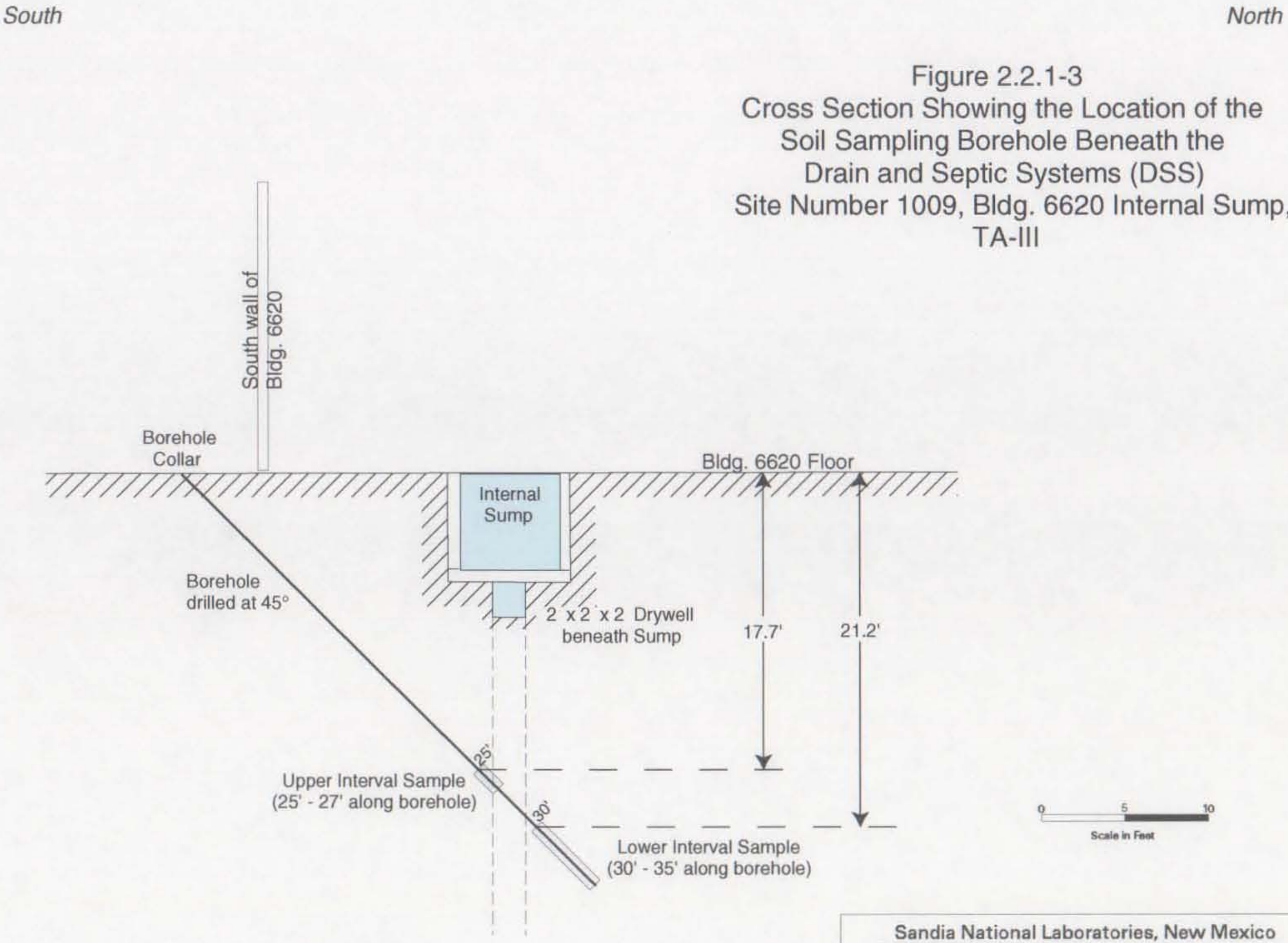
0 3.6 7.2
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

840857.03010000A69

Mapid= 040034.id 10/27/03 SNL EGIS ORG. 61

Figure 2.2.1-3
Cross Section Showing the Location of the
Soil Sampling Borehole Beneath the
Drain and Septic Systems (DSS)
Site Number 1009, Bldg. 6620 Internal Sump,
TA-III



Sandia National Laboratories, New Mexico
Environmental Geographic Information System

site. The alluvial fan materials originated in the Manzanita Mountains east of DSS Site 1009, 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 conductivities (SNL/NM March 1996). Site vegetation around Building 6620 primarily consists of desert grasses, shrubs, and cacti.

The ground surface in the vicinity of the site is flat to very slightly inclined to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.4 miles northeast of the site. No perennial surface-water bodies are present in the vicinity of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration rates for the KAFB area range from 95 to 99 percent of the annual rainfall (Thompson and Smith, 1985, SNL/NM March 1996).

The site lies at an average elevation of approximately 5,407 feet above mean sea level (SNL/NM April 1995). Depth to groundwater is approximately 487 feet below ground surface (bgs) at the site. Groundwater flow direction is thought to be generally to the west in this area (SNL/NM March 2002). The nearest production wells to DSS Site 1009 are KAFB-4 and KAFB-11, which are approximately 3.4 and 3.9 miles north of the site, respectively. The nearest groundwater monitoring wells are those installed around the Mixed Waste Landfill approximately 1,600 to 2,500 feet northwest of the site.

2.2.2 Operational History

Available information indicates that Building 6620 was constructed in 1958, and it is assumed that the internal sump was constructed at the same time. Building 6620 is currently known as the Hazardous Assembly Building (SNL/NM March 2003). Because operational records are not available, the investigation of the site was planned to be consistent with other DSS site investigations and to sample for the COCs most commonly found at similar facilities. An inspection conducted inside Building 6620 on July 14, 1999, determined that the internal sump had been capped and/or filled with concrete at some point prior to the date of the inspection.

2.3 Land Use

2.3.1 Current Land Use

The current land use for DSS Site 1009 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1009 is industrial (DOE et al. September 1995).

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3.0 INVESTIGATORY ACTIVITIES

3.1 Summary

One assessment investigation has been conducted at this site. In November 2002, subsurface soil samples were collected from an angled borehole drilled beneath the internal sump from outside of Building 6620. This investigation was 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. This investigation is discussed in the following sections.

3.2 Soil Sampling Investigation

Soil sampling beneath the internal sump was conducted in accordance with the rationale and procedures in the SAP approved by the NMED (SNL/NM October 1999). On November 1, 2002, soil samples were collected from a single, angled borehole drilled beneath the internal sump. The soil boring location is shown on Figures 2.2.1-2 and 2.2.1-3. Figures 3.2-1 and 3.2-2 show field activities pertaining to drilling of the angled borehole that was drilled at DSS Site 1009. A summary of the borehole sample depths, sample analyses, analytical methods, laboratories, and sample dates is presented in Table 3.2-1.

3.2.1 Soil Sampling Methodology

A truck-mounted auger drill rig was used to drill a borehole at a 45-degree angle beneath the internal sump from outside of Building 6620 and to sample the borehole at two depth intervals. As shown on Figure 2.2.1-3, the top of the shallow sampling interval in this borehole started near the vertical projection of the south side of the drywell beneath the internal sump, at a length of 25 feet along the borehole, or 17.7 vertical feet bgs. The top of the deep sampling interval started near the vertical projection of the north side of the drywell, at a length of 30 feet along the borehole, or 21.2 vertical feet bgs. The borehole was advanced to the top of the first sampling interval, and soil was then collected by inserting a split-spoon drive sampler inside the auger drill string and driving it into undisturbed soil ahead of the auger drill bit. Once a sufficient volume of soil was collected from the shallow interval, the borehole was advanced to the top of the deep sampling interval, and the same procedure was repeated to collect the deep interval sample. Several sample collection runs were required to collect an adequate volume of soil from the fairly rocky, deep sampling interval.

Soil retrieved from the borehole sampling intervals was immediately emptied out of the split spoon sampler into appropriate 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. The analytical methods and laboratories used for the DSS Site 1009 soil samples are summarized in Table 3.2-1.

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Figure 3.2-1
Auger rig set-up in preparation to drill an angled borehole beneath DSS Site 1009, the Building 6620 internal sump, from outside Building 6620. View to the northwest.
November 1, 2002

Figure 3.2-2
Drilling an angled borehole through the concrete slab on the south side of Building 6620
to collect soil samples from beneath DSS Site 1009, Building 6620 internal sump.
View to the southwest. November 1, 2002

Table 3.2-1
Summary of Areas Sampled, Analytical Methods, and Laboratories Used for DSS Site 1009, Building 6620 Internal Sump Soil Samples

Sampling Area	Number of Borehole Locations	Top of Sampling Intervals in Borehole (ft bgs)[a]	Total Number of Soil Samples	Total Number of Duplicate Samples	Analytical Parameters and EPA Methods[b]	Analytical Laboratory	Date Samples Collected
Internal Sump	1	17.7, 21.2	2	0	VOCs EPA Method 8260	GEL	11-01-02
	1	17.7, 21.2	2	0	SVOCs EPA Method 8270	GEL	11-01-02
	1	17.7, 21.2	2	0	PCBs EPA Method 8082	GEL	11-01-02
	1	17.7, 21.2	2	0	HE EPA Method 8330	GEL	11-01-02
	1	17.7, 21.2	2	0	RCRA Metals EPA Methods 6020/7000	GEL	11-01-02
	1	17.7, 21.2	2	0	Hexavalent Chromium EPA Method 7196A	GEL	11-01-02
	1	17.7, 21.2	2	0	Total Cyanide EPA Method 9012A	GEL	11-01-02
	1	17.7, 21.2	2	0	Gamma Spectroscopy EPA Method 901.1	RPSD	11-01-02
	1	17.7, 21.2	2	0	Gross Alpha/Beta Activity EPA Method 900.0	GEL	11-01-02

[a] Vertical ft bgs.
[b] EPA 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.

3.2.2 Soil Sampling Results and Conclusions

Analytical results for the soil samples collected at DSS Site 1009 are presented and discussed in this section. Samples were collected from the borehole location shown on Figure 2.2.1-2.

VOCs

Volatile organic compound (VOC) analytical results for the two soil samples collected from the internal sump borehole are summarized in Table 3.2.2-1. The method detection limits (MDLs) for the VOC analyses are presented in Table 3.2.2-2. Only one VOC (acetone) was detected in the two samples from this site. Even though this compound was not detected in the associated trip or equipment blank, it is a common laboratory contaminant and may not indicate soil contamination at this site.

SVOCs

Semivolatile organic compound (SVOC) analytical results for the two soil samples collected from the internal sump borehole are summarized in Table 3.2.2-3. The MDLs for the SVOC analyses are presented in Table 3.2.2-4. Only one SVOC (bis[2-ethylhexyl] phthalate) was detected in the two samples from this site. Even though this compound was not detected in the associated equipment blank, it is both a common plastic component and laboratory contaminant and may not indicate soil contamination at this site.

PCBs

Polychlorinated biphenyl (PCB) analytical results for the two soil samples collected from the internal sump borehole are summarized in Table 3.2.2-5. The MDLs for the PCB analyses are presented in Table 3.2.2-6. No PCBs were detected in either of the samples collected from this site.

HE Compounds

High explosive (HE) analytical results for the two soil samples collected from the internal sump borehole are summarized in Table 3.2.2-7. The MDLs for the HE analyses are presented in Table 3.2.2-8. No HE compounds were detected in either of the samples collected from this 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 internal sump borehole are summarized in Table 3.2.2-9. The MDLs for the metals analyses are presented in Table 3.2.2-10. None of the metal concentrations detected in these samples exceed the corresponding NMED-approved background concentrations.

Table 3.2.2-1
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, VOC Analytical Results
November 2002
(Off-Site Laboratory)

Sample Attributes			VOCs (EPA Method 8260[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	Acetone
605787	6620-DW1-BH1-25-S	17.7	**4.22 J (5)**
605787	6620-DW1-BH1-30-S	21.2	**4.31 J (5)**
Quality Assurance/Quality Control Samples (µg/L)			
605787	6620-DW1-EB	NA	ND (4.5)
605787	6620-DW1-TB	NA	ND (4.5)

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

[a] EPA November 1986.

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

BH = Borehole.
DSS = Drain and Septic Systems.
DW = Drywell.
EB = Equipment blank.
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.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.
TB = Trip blank.
VOC = Volatile organic compound.

Table 3.2.2-2
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, VOC Analytical MDLs
November 2002
(Off-Site Laboratory)

Analyte	EPA Method 8260[a] Detection Limit (µg/kg)
Acetone	3.52
Benzene	0.45
Bromodichloromethane	0.49
Bromoform	0.49
Bromomethane	0.5
2-Butanone	3.74
Carbon disulfide	2.36
Carbon tetrachloride	0.49
Chlorobenzene	0.41
Chloroethane	0.81
Chloroform	0.52
Chloromethane	0.37
Dibromochloromethane	0.5
1,1-Dichloroethane	0.47
1,2-Dichloroethane	0.43
1,1-Dichloroethene	0.5
cis-1,2-Dichloroethene	0.47
trans-1,2-Dichloroethene	0.53
1,2-Dichloropropane	0.48
cis-1,3-Dichloropropene	0.43
trans-1,3-Dichloropropene	0.25
Ethylbenzene	0.38
2-Hexanone	3.77
Methylene chloride	1.35
4-Methyl-2-pentanone	4.03
Styrene	0.39
1,1,2,2-Tetrachloroethane	0.91
Tetrachloroethene	0.38
Toluene	0.34
1,1,1-Trichloroethane	0.53
1,1,2-Trichloroethane	0.54
Trichloroethene	0.45
Vinyl acetate	1.78
Vinyl chloride	0.56
Xylene	0.39

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
VOC = Volatile organic compound.

Table 3.2.2-3
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, SVOC Analytical Results
November 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
605787	6620-DW1-BH1-25-S	17.7	**40.8 J (333)**
605787	6620-DW1-BH1-30-S	21.2	**48.2 J (333)**
Quality Assurance/Quality Control Sample (µg/L)			
605787	6620-DW1-EB	NA	ND (1.23)

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

[a] EPA November 1986.

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

BH = Borehole.
DSS = Drain and Septic Systems.
DW = Drywell.
EB = Equipment blank.
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.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.
SVOC = Semivolatile organic compound.

Table 3.2.2-4
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, SVOC MDLs
November 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
Fluorene	4
Hexachlorobenzene	20

Refer to footnotes at end of table.

Table 3.2.2-4 (Concluded)
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, SVOC MDLs
November 2002
(Off-Site Laboratory)

Analyte	EPA Method 8270[a] Detection Limit (µg/kg)
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

[a] EPA November 1986.

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

Table 3.2.2-5
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, PCB Analytical Results
November 2002
(Off-Site Laboratory)

Sample Attributes			PCBs
Record Number[b]	ER Sample ID	Sample Depth (ft)	(EPA Method 8082[a]) (µg/kg)
605787	6620-DW1-BH1-25-S	17.7	ND
605787	6620-DW1-BH1-30-S	21.2	ND
Quality Assurance/Quality Control Sample (µg/L)			
605787	6620-DW1-EB	NA	ND

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

Table 3.2.2-6
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, PCB Analytical MDLs
November 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

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

Table 3.2.2-7
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, HE Compounds Analytical Results
November 2002
(Off-Site Laboratory)

Sample Attributes			HE Compounds (EPA Method 8330[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
605787	6620-DW1-BH1-25-S	17.7	ND
605787	6620-DW1-BH1-30-S	21.2	ND
Quality Assurance/Quality Control Sample (µg/L)			
605787	6620-DW1-EB	NA	ND

[a] EPA November 1986.

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

BH = Borehole.
DSS = Drain and Septic Systems.
DW = Drywell.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
HE = High explosive(s).
ID = Identification.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected.
S = Soil sample.

Table 3.2.2-8
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, HE Compounds Analytical MDLs November 2002 (Off-Site Laboratory)

Analyte	EPA Method 8830[a] Detection Limit (µg/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
Nitro-benzene	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

[a] EPA November 1986.

DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
HE = High explosive(s)
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
Tetryl = Methyl-2,4,6-trinitrophenylnitramine.

Table 3.2.2-9
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, Metals Analytical Results
November 2002
(Off-Site Laboratory)

Sample Attributes			Metals (EPA Methods 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
605787	6620-DW1-BH1-25-S	17.7	3.67	98.5	0.094 J (0.472)	9.56	ND (0.052)	5.61	0.00452 J (0.00995)	ND (0.153)	ND (0.0851)
605787	6620-DW1-BH1-30-S	21.2	4.12	81.8	0.19 J (0.455)	10.4	ND (0.0523)	4.41	ND (0.000845 J)	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
Quality Assurance/Quality Control Sample (mg/L)											
605787	6620-DW1-EB	NA	ND (0.00224 J)	0.000237 J (0.005)	ND (0.000313)	0.000802 J (0.005)	ND (0.0054 J) H	ND (0.00172)	ND (0.000047)	ND (0.00281)	ND (0.000835)

[a] EPA November 1986.

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

[c] Dinwiddie September 1997.

BH = Borehole.
DSS = Drain and Septic Systems.
DW = Drywell.
EB = Equipment blank.
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.
J = Analytical result was qualified as an estimated value during data validation.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
mg/L = Milligram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected above the MDL shown in parentheses.
S = Soil sample.

Table 3.2.2-10
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, Metals MDLs
November 2002
(Off-Site Laboratory)

Analyte	EPA Method 6000/7000/7196A[a] Detection Limit (mg/kg)
Arsenic	0.188–0.195
Barium	0.0606–0.0629
Cadmium	0.0435–0.0451
Chromium	0.152–0.366
Chromium (VI)	0.052–0.0523
Lead	0.258–0.268
Mercury	0.000845–0.000978
Selenium	0.147–0.153
Silver	0.082–0.0851

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

Total Cyanide

Total cyanide analytical results for the two soil samples collected from the internal sump borehole are summarized in Table 3.2.2-11. The MDLs for the cyanide analyses are presented in Table 3.2.2-12. Cyanide was not detected in the sample collected at a depth of 25 feet along the borehole, or 17.7 vertical feet bgs. A trace amount (0.0633 J), was detected in the sample from the deep interval at 30 feet along the borehole, or 21.2 vertical feet bgs.

Radionuclides

Analytical results for the gamma spectroscopy analysis of the two soil samples collected from the internal sump borehole are summarized in Table 3.2.2-13. No radionuclides were detected at activities above NMED-approved background levels in any sample analyzed. However, although not detected, the minimum detectable activity (MDA) for uranium-235 exceeds the corresponding background activity because the standard gamma spectroscopy count time for soil samples (6,000 seconds) was not sufficient to reach the NMED-approved background activity established for SNL/NM soil. Even though the MDAs may be slightly elevated, the values are still very low, and the risk assessment outcome for the site is not significantly impacted by their use.

Gross Alpha/Beta Activity

Gross alpha/beta activity analytical results for the two soil samples collected from the internal sump borehole are summarized in Table 3.2.2-14. No gross alpha or beta activities

Table 3.2.2-11
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, Total Cyanide Analytical Results
November 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
605787	6620-DW1-BH1-25-S	17.7	ND (0.0399)
605787	6620-DW1-BH1-30-S	21.2	**0.0633 J (0.241)**
Quality Assurance/Quality Control Sample (µg/L)			
605787	6620-DW1-EB	NA	ND (0.00172)

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

[a] EPA November 1986.

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

BH = Borehole.
DSS = Drain and Septic Systems.
DW = Drywell.
EB = Equipment blank.
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/L = Microgram(s) per liter.
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
ND = Not detected above the MDL, shown in parentheses.
S = Soil sample.

Table 3.2.2-12
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, Total Cyanide MDLs
November 2002
(Off-Site Laboratory)

Analyte	EPA Method 9012[a] Detection Limit (mg/kg)
Total Cyanide	0.0399–0.0405

[a] EPA November 1986.

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

Table 3.3.2-13
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
November 2002
(On-Site Laboratory)

Sample Attributes			Activity (EPA Method[a] 901.1) (pCi/g)							
			Cesium-137		Thorium-232		Uranium-235		Uranium-238	
Record Number[b]	ER Sample ID	Sample Depth (ft)	Result	Error[c]	Result	Error[c]	Result	Error[c]	Result	Error[c]
605791	6620-DW1-BH1-25-S	17.7	ND (0.0281)	--	0.347	0.183	**ND (0.162)**	--	ND (0.404)	--
605791	6620-DW1-BH1-30-S	21.2	ND (0.0311)	--	0.515	0.264	**ND (0.176)**	--	ND (0.443)	--
Background Activity—Southwest Area Supergroup[d]			0.079	NA	1.01	NA	0.16	NA	1.4	NA

Note: Values in **bold** represent analytes detected above the corresponding background activities.

[a] EPA November 1986.

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

[c] Two standard deviations about the mean detected activity.

[d] Dinwiddie September 1997.

BH = Borehole.
DSS = Drain and Septic Systems.
DW = Drywell.
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.
ND ( ) = Not detected, but the MDA (shown in parentheses) exceeds background activity.
pCi/g = Picocuries per gram.
S = Soil sample.
-- = Error not calculated for nondetect results.

Table 3.2.2-14
Summary of DSS Site 1009, Building 6620 Internal Sump Confirmatory Soil Sampling, Gross Alpha/Beta Activity Analytical Results
November 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]
605787	6620-DW1-BH1-25-S	17.7	6.09	1.49	15.2	3.01
605787	6620-DW1-BH1-30-S	21.2	4.2	1.45	11.7	1.25
Background Activity[d]			17.4	NA	35.4	NA
Quality Assurance/Quality Control Sample (pCi/L)						
605787	6620-DW1-EB	NA	ND (0.181)	--	ND (0.387)	--

[a] EPA November 1986.

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

[c] Two standard deviations about the mean detected activity.

[d] Miller September 2003.

BH = Borehole.
DSS = Drain and Septic Systems.
DW = Drywell.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = foot (feet).
ID = Identification.
NA = Not applicable.
ND ( ) = Not detected above the minimum detectable activity, shown in parentheses.
pCi/g = Picocurie(s) per gram.
pCi/L = Picocurie(s) per liter.
S = Soil sample.
-- = Error not provided for nondetect results.

above the New Mexico-established background levels (Miller September 2003) were detected in any of the samples. These results indicate no significant levels of radioactive material are present in the soil at the site.

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

Quality assurance/quality control samples were collected at an approximate frequency of 1 per 20 field samples. These included duplicate samples, equipment blanks (EBs), and trip blanks (TBs). Typically, samples were shipped to the laboratory in batches of up to 20 samples, so that any one shipment might contain samples from several sites. Aqueous EB samples were collected at an approximate frequency of 1 per 20 samples and sent to the laboratory. The EB samples were analyzed for the same analytical suite as the soil samples in that shipment. Aqueous TB samples used for VOC analysis only were included in every sample cooler containing VOC soil samples. The analytical results for the EB and TB samples are only presented on the data tables for the last site sampled in any one shipment, although the results were used in the data validation process for all the samples in that batch.

An aqueous TB sample was included in the sample cooler containing the VOC soil samples collected from the Building 6620 internal sump borehole in November 2002. No VOCs were detected in this TB (Table 3.2.2-1).

A set of aqueous EB samples were collected following completion of soil sampling of the Building 6620 internal sump and were analyzed for the same off-site laboratory constituents as the soil collected at that time (including VOCs, SVOCs, PCBs, HE compounds, cyanide, metals, and gross alpha/beta activity). No VOCs, SVOCs, PCBs, HE compounds, cyanide, or detectable gross alpha/beta activity were detected in the EB samples. Only barium and chromium were detected in the metals EB sample (Table 3.2.2-9).

No duplicate samples were collected at this site.

All laboratory data were reviewed and verified/validated according to Data Verification/ Validation Level 3, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project Data Validation Procedure for Chemical and Radiochemical Data, AOP [Administrative Operating Procedure] 00-03, Rev. 0 (SNL/NM December 1999). In addition, SNL/NM Department 7713 (Radiation Protection Sample Diagnostics [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 A contains the data validation reports for the samples collected at this site. The data are acceptable for use in this NFA proposal.

3.3 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 1009.

4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS Site 1009, the Building 6620 internal sump, is based upon the COCs identified in the soil samples collected from beneath the internal sump 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 1009 are VOCs, SVOCs, PCBs, HE compounds, cyanide, RCRA metals, hexavalent chromium, and radionuclides. One VOC (acetone) and one SVOC [bis(2-ethylhexyl) phthalate] were detected in the two soil samples from the site. No PCBs or HE compounds were detected in any of the samples. Cyanide was detected in one of two cyanide samples collected from this site. None of the eight RCRA metals or hexavalent chromium were detected at concentrations above the approved maximum background concentrations for SNL/NM Southwest Area Supergroup soils (Dinwiddie September 1997). When a metal concentration exceeded its maximum background screening value or the nonquantifiable background value, it was carried forward in the risk assessment process. None of the four representative gamma spectroscopy radionuclides were detected at activities exceeding the corresponding background levels, but the MDAs for the two U-235 analyses exceeded the background activities. Finally, no gross alpha/beta activities were 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 that may have been discharged to the internal sump and underlying drywell at this site. If Building 6620 were removed from the site and no longer covered this unit, possible secondary release mechanisms could include the uptake of COCs that may have been released into the soil beneath the internal sump (Figure 4.2-1). The depth to groundwater at the site (approximately 487 feet bgs) precludes migration of potential COCs into the groundwater system. The potential pathways to receptors include soil ingestion, dermal contact, and inhalation, which could occur as a result of receptor exposure to contaminated subsurface soil at the site. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Annex B provides additional discussion on the fate and transport of COCs at DSS Site 1009.

Table 4.2-1 summarizes the potential COCs for DSS Site 1009. 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 1009 is industrial (DOE et al. September 1995).

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

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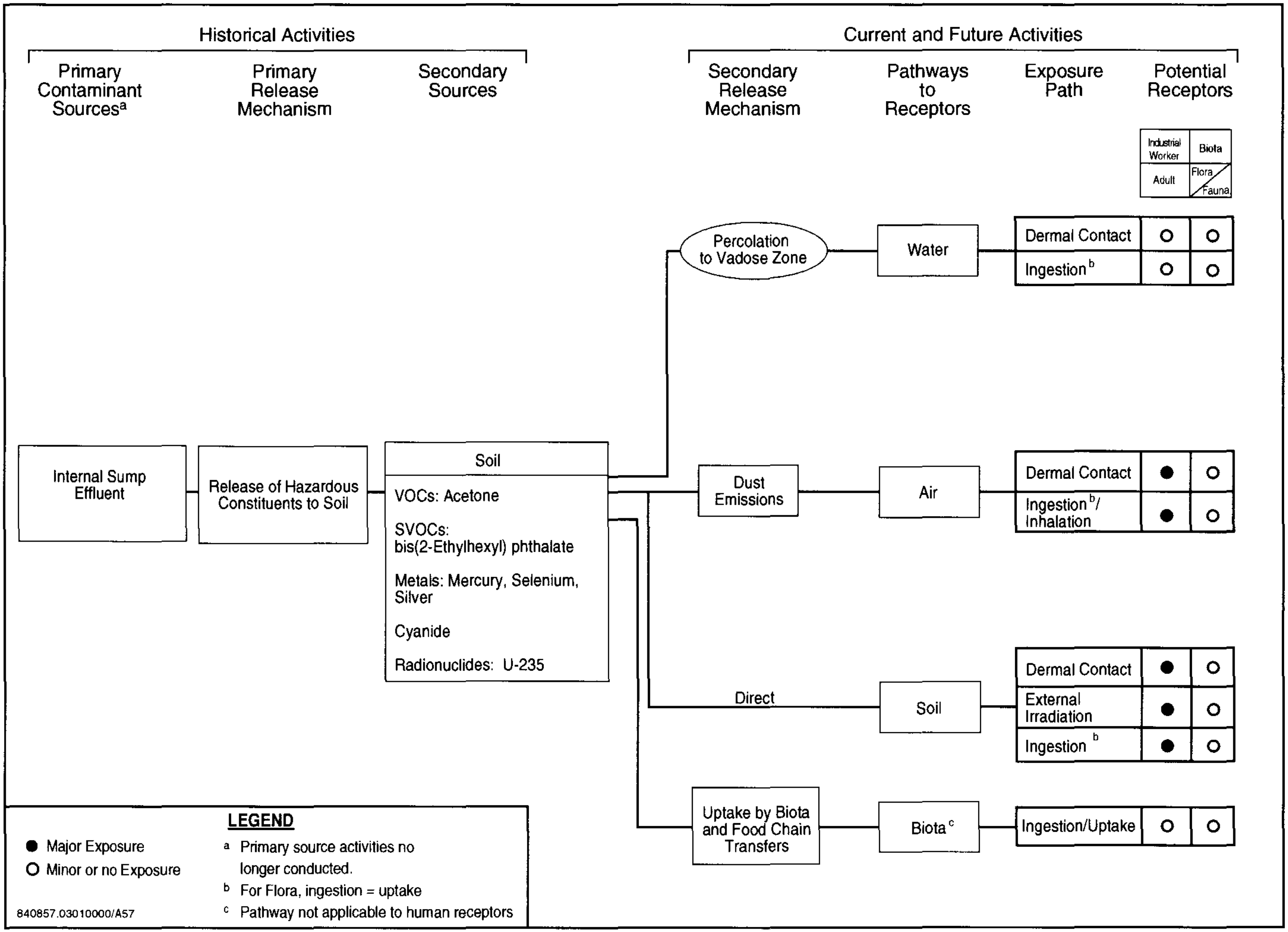

Figure 4.2-1

Conceptual Site Model Flow Diagram for DSS Site 1009, Building 6620 Internal Sump

Table 4.2-1
Summary of Potential COCs for DSS Site 1009, Building 6620 Internal Sump

COC Type		Number of Samples[a]	COCs Greater than Background	Maximum Background Limit/Southwest Area Supergroup[b] (mg/kg)	Maximum Concentration[c] (mg/kg)	Average Concentration[d] (mg/kg)	Number of Samples Where Background Concentration Exceeded[e]
VOCs		2	Acetone	NA	0.00431 J	0.00426 J	2
SVOCs		2	bis(2-Ethylhexyl) phthalate	NA	0.0482 J	0.0445 J	2
PCBs		2	None	NA	NA	NA	None
HE		2	None	NA	NA	NA	None
RCRA Metals		2	None	NA	NA	NA	None
Hexavalent Chromium		2	None	NA	NA	NA	None
Cyanide		2	Cyanide	NA	0.0633 J	0.0416	1
Radionuclides (pCi/g)	Gamma Spectroscopy	2	U-235	0.16	ND (0.176)	NC[f]	2
	Gross Alpha	2	None	NA	NA	NA	None
	Gross Beta	2	None	NA	NA	NA	None

[a] Number of samples includes duplicates and splits.

[b] Dinwiddie September 1997.

[c] Maximum concentration is either the maximum amount detected or the maximum MDL or MDA if nothing was detected.

[d] Average concentration includes all samples except blanks. The average is calculated as the sum of detected amounts and one-half of the MDLs for nondetected results, divided by the number of samples.

[e] See 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.
NC = Not calculated.
ND ( ) = Not detected above the MDA, shown in parentheses.
PCB = Polychlorinated biphenyl.
pCi/g = Picocurie(s) per gram.
RCRA = Resource Conservation and Recovery Act.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

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 B provides additional discussion of the exposure routes and receptors at DSS Site 1009.

4.3 Site Assessment

Site assessment at DSS Site 1009 included risk assessments for both human health and ecological risk. This section briefly summarizes the site assessment results, and Annex B discusses the risk assessment performed for DSS Site 1009 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1009 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 pathway exists.

4.3.2 Risk Assessments

Risk assessments were performed for both human health and ecological risk at DSS Site 1009. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1009 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because VOCs, SVOCs, metals, cyanide, and U-235 are present, it was necessary to perform a human health risk assessment analysis for the site, which included all COCs detected. Annex B 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 1009 is 0.00 under the industrial land-use scenario, which is lower than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.00. There is no quantifiable excess cancer risk for DSS Site 1009 COCs under an industrial land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001). Thus, the excess cancer risk for this site is below the suggested acceptable risk value. The incremental excess cancer risk is 2.51E-10. Both the incremental HI and excess cancer risk are below NMED guidelines.

The HI calculated for the COCs at DSS Site 1009 is 0.00 under the residential land-use scenario, which is lower than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.00. The excess cancer risk for DSS Site 1009 COCs is 1E-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 incremental excess cancer risk is 1.09E-9. Both the incremental HI and incremental excess cancer risk are below NMED guidelines.

The incremental total effective dose equivalent (TEDE) and corresponding estimated cancer risk from radiological COCs are much lower than U.S. Environmental Protection Agency (EPA) guidance values; the estimated TEDE is 2.9E-4 millirem (mrem)/year (yr) for the industrial land-use scenario. This value is much lower than the EPA's numerical guidance of 15 mrem/yr (EPA 1997a). The corresponding incremental estimated cancer risk value is 2.5E-9 for the industrial land-use scenario. Furthermore, the incremental TEDE for the residential land-use scenario that results from a complete loss of institutional control is 7.4E-4 mrem/yr with an associated risk of 7.5E-9. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS Site 1009 is eligible for unrestricted radiological release.

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

Table 4.3.2-1
Summation of Radiological and Nonradiological Risks from
DSS Site 1009, Building 6620 Internal Sump Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	2.51E-10	2.5E-9	2.8E-9
Residential	1.09E-9	7.5E-9	8.5E-9

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 1997b) 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 B, Sections IV and VII.2). 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 1009 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 1009 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 1009, a baseline ecological risk assessment is not required for the site.

5.0 NFA PROPOSAL

5.1 Rationale

Based upon field investigation data and the human health and ecological risk assessment analyses, an NFA decision is recommended for DSS Site 1009 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 1009 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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6.0 REFERENCES

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ANNEX A
DSS Site 1009
Soil Sample Data Validation Results

RECORDS CENTER CODE: ER/1295/DSS/DAT

SMO ANALYTICAL DATA ROUTING FORM

PROJECT NAME: DSS Soil Sampling

PROJECT/TASK: 7223_02.03.02

SNL TASK LEADER: Collins

ORG/MS/CF0#: 6133/1089/CF032-03

SMO PROJECT LEAD: Palencia

SAMPLE SHIP DATE: 11/4/2002

ARCOC	LAB	LAB ID	PRELIM DATE	FINAL DATE	EDD	EDD ON Q	BY
605767	GEL	69934		12/4/2002	X	X	JAC

	NAME	DATE
REVIEW COMPLETED BY/DATE:	W. Palencia	12/17/02
CORRECTIONS REQUESTED/RECEIVED:		
PROBLEM #:		
FINAL TRANSMITTED TO/DATE:	Sanders	12/17/02
SENT TO VALIDATION BY/DATE:	Conn	12/18/02
RUSH VALIDATION REQUIRED EST. TAT: ☐		
VALIDATION COMPLETED BY/DATE:	AJ	01.02.03
COPY TO WM BY/DATE:		
TO ERDMS OR RECORDS CENTER BY/DATE:	Conn	01/09/03

COMMENTS:

Sample Findings Summary

Site: DSS soil sampling

ARCOC: 605787

Data: Organic, Inorganic and Radiochemistry

Sample ID	VOC	SVOC	PCB	HE	479-45-8 (tetryl)	Metals	7440-39-3 (barium)	7440-47-3 (chromium)	7440-38-2 (arsenic)	7439-97-6 (mercury)	General Chemistry	18540-29-9 (hexavalent chromium)	Radiochemistry			
060279-004 6620/1009-EB	All QC acceptance criteria were met.No data will be qualified.	All QC acceptance criteria were met.No data will be qualified.	All QC acceptance criteria were met.No data will be qualified.		UJ,A2,P1								All QC acceptance criteria were met.No data will be qualified.			
060279-006 6620/1009-EB												UJ,HT				
060279-007 6620/1009-EB							J,B3	J,B,B2	UJ,B3							
060066-002 6620/1009-DW1-BH1-25-S										J,B3						
060067-002 6620/1009-DW1-BH1-30-S										UJ,B3						

Validated By:

Date: 01/02/03

Analytical Quality Associates, Inc.
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Email: minteer@aol.com

MEMORANDUM

DATE: 01/02/03

TO: File

FROM: Linda Thal

SUBJECT: Radiochemical Data Review and Validation - SNL
Site: DSS soil sampling
ARCOC 605787
GEL SDG # 69934 and 69936
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 samples were analyzed within the prescribed holding times and properly preserved.

Calibration

The case narrative stated the instruments used were properly calibrated.

Blanks

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

Matrix Spike (MS) Analysis

The MS/MSD analyses met all QC acceptance criteria. It should be noted that the sample used for the MS/MSD was of similar matrix from another SNL SDG. No data will be qualified as a result.

Laboratory Control Sample (LCS) Analysis

The LCS analyses met all QC acceptance criteria.

Replicates

The replicate analyses met all QC acceptance criteria. It should be noted that the sample used for the replicate was of similar matrix from another SNL SDG. No data will be qualified as a result.

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

An equipment blank was submitted on the ARCOC.
No field blank or field duplicate were submitted on the ARCOC.

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

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MEMORANDUM

DATE: 12/25/02

TO: File

FROM: Linda Thal

SUBJECT: Organic Data Review and Validation - SNL
Site: DSS soil sampling
ARCOC # 605787
GEL SDG # 69934 and 69936
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.

HE Batch # 213550 (Samples 69936-005 (EB))

The MSD had a %R <10% for tetryl (0%) which resulted in a RPD (200%) > QC acceptance criteria.. The MS and the LCS had %R in criteria and therefore, using professional judgment, the sample result which was non-detect, will be qualified "UJ, A2, P1".

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 properly preserved and analyzed within the method prescribed holding time.

Calibration

All Analyses: All initial and continuing calibration acceptance criteria were met except as follows:

VOC
The RF for trichloroethene in the initial calibration preceding the soil samples was < specified minimum (0.30) but > 0.01.The associated sample results were non-detect, and using professional judgment no data will be qualified.

Bromoform had %D > 40% but < 60% with a positive bias in the CCV preceding samples 69936-001 and -002. The sample results were non-detect and therefore unaffected by a positive bias: no data will be qualified.

Several compounds had %D > 20% but < 40% in the CCVs preceding all the samples. All associated sample results were non-detect and will not be qualified.

SVOC
Several compounds (see Data Validation Worksheet) had CCV %Ds > 20% but < 40% in the CCVs preceding the samples. All associated sample results were non-detect and will not be qualified.

Blanks

All Analyses: All method blank (MB), equipment blank (EB) and trip blank (TB) acceptance criteria were met.

Surrogates

All Analyses: All surrogate acceptance criteria were met.

Internal Standards (ISs)

All Analyses: All internal standard acceptance criteria were met.

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

All Analyses: All MS/MSD acceptance criteria were met except as mentioned above in the summary section and as follows:

VOC
It should be noted that the sample used for the MS/MSD was of similar matrix from another SNL SDG. No data will be qualified.

SVOC and PCB
It should be noted that only 500ml of sample was used in the extraction procedure. It is not know what affect this will have on the data, and therefore, no data will be qualified.

SVOC
Several compounds (see DV worksheet) had %Rs < QC acceptance criteria (75 – 125%). Using professional judgment, no data will be qualified.

HE Batch # 213550
It should be noted that the sample used for the MS/MSD was of similar matrix from another SNL SDG. No data will be qualified.
The MS/MSD %R for 2,4,6-trinitrotoluene (176/192%) were > QC acceptance criteria (56-137%). The associated sample result was non-detect and unaffected by a positive bias; no data will be qualified.

Laboratory Control Samples (LCS/LCSD) Analysis

All Analyses: The LCS acceptance criteria were met. No LCSD was analyzed. The MS/MSD is used to assess the precision for the batch. No data will be qualified as a result.

VOC
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.

Detection Limits/Dilutions

All Analyses: All detection limits were properly reported. Samples were not diluted.

Confirmation Analyses

VOC and SVOC: No confirmation analyses required.

PCB and HE: All sample results were non-detect; therefore, no confirmation analyses were required.

Other QC

VOC: A trip blank and an equipment blank were submitted on the ARCOC. No field duplicate was submitted.

SVOC, PCB and HE: An equipment blank was submitted on the ARCOC. No field duplicate or field blank were submitted on the ARCOC.

No raw data were submitted with the package.

No other specific issues were identified which affect data quality.

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MEMORANDUM

DATE: 01/02/03

TO: File

FROM: Linda Thal

SUBJECT: Inorganic Data Review and Validation - SNL
Site: DSS soil sampling
ARCOC # 605787
GEL SDG # 69934 and 69936
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 7471/7470 (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.

Hg – Batch # 216954 (Samples 69934-003 and -004)
Mercury was detected in the CCB at a negative value with an absolute value > DL but < RL. Sample 69934-003 was detect, < 5X MDL and will be qualified "J, B3"; sample 69934-004 was non-detect and will be qualified "UJ, B3".

ICP-AES – Metals Batch # 215810 (Sample 69936 –008 (EB))
Barium was detected in the CCB at a value > DL but < RL. Sample 69936 –008 was detect, < 5X the blank value and will be qualified "J, B3".

Chromium was detected in the ICB/CCB and the MB at a value > DL but < RL. Sample 69936 –008 was detect, < 5X the blank value and will be qualified "J, B, B2".

Arsenic was detected in the CCB at a negative value with an absolute value > DL but < RL. Sample 69936-008 was non-detect and will be qualified "UJ, B3".

Hexavalent Chromium – Batch # 213435 (Sample 69936-007)
Sample 69936-007 was received by the laboratory and analyzed after the holding time had expired, but within 2X the holding time. The sample result was 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 Analyses: The samples were analyzed within the prescribed holding times and properly preserved except as mentioned above in the summary section.

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 Batch # 216006 (Samples 69934-003 and -004)
Barium, chromium selenium and arsenic were detected in one or more of the blanks at values > DL but < RL. Both associated sample results were either non-detect or > 5X the blank values and will not be qualified.

ICP-AES – Metals Batch # 215810 (Sample 69936 –008 (EB))
Silver and selenium were detected in the CCB at values > DL but < RL. The sample results were non-detect and no data will be qualified.

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

All Analyses: The LCS/LCSD met QC acceptance criteria.

Matrix Spike (MS) Analysis

All Analyses: The MS met QC acceptance criteria except as follows:

Hg – Batch # 214030 (Sample 69936-008)
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 #213487 (Samples 69934-003 and -004)
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:

Hg – Batch # 214030 (Sample 69936-008)
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 #213487 (Samples 69934-003 and -004)
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 (All batches): The ICS-AB met QC acceptance criteria.

All Other Analyses: No ICS required.

ICP Serial Dilution

ICP-AES (All batches): The serial dilution met QC acceptance criteria.

All Other Analyses: No serial dilutions required.

Detection Limits/Dilutions

All Analyses: All detection limits were properly reported.

ICP-AES: All soil samples were diluted 2X with the exception of sample 69934-004 which was diluted 5X for chromium.

All Other Analyses: No dilutions were performed.

Other QC

All Analyses: An equipment blank was submitted on the ARCOC.
No field blank or equipment 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.

Data Validation Summary

Site/Project: OSS Soil Sampling Project/Task #: 7223.02.03.02 # of Samples: 4 & 9 Matrix: Soil & H_2O

AR/COC #: 605787 Laboratory Sample IDs: 69934 -001 thru -004

Laboratory: GEL 69936 -001 thru -009

Laboratory Report #: 69934

QC Element	Analysis									
	Organics				Inorganics				RAD	Hexavalent Other Chromium
	VOC	SVOC	Pesticide/ PCB	HPLC (HE)	ICP/AES	GFAA/ AA	CVAA (Hg)	CN		
1. Holding Times/Preservation	✓	✓	✓	✓	✓	NA	✓	✓ UJ,HT	✓	✓ UJ,HT
2. Calibrations	✓	✓	✓	✓	✓		✓	✓	✓	✓
3. Method Blanks	✓	✓	✓	✓	✓ J,UJ,B,B3,B5		J,UJ,B3 ✓	✓	✓	✓
4. MS/MSD	✓	✓	✓	✓ UJ,A2,A	✓		✓	✓	✓	✓
5. Laboratory Control Samples	✓	✓	✓	✓	✓		✓	✓	✓	✓
6. Replicates	▨	▨	▨	▨	✓		✓	✓	✓	✓
7. Surrogates	✓	✓	✓	✓	▨	▨	▨	▨	▨	NA
8. Internal Standards	✓	✓	▨	▨	▨	▨	▨	▨	▨	
9. TCL Compound Identification	✓	✓	▨	▨	▨	▨	▨	▨	▨	
10. ICP Interference Check Sample	▨	▨	▨	▨	✓	▨	▨	▨	▨	
11. ICP Serial Dilution	▨	▨	▨	▨	✓	▨	▨	▨	▨	
12. Carrier/Chemical Tracer Recoveries	▨	▨	▨	▨	▨	▨	▨	▨		
13. Other QC	TB EB	EB	EB	EB	EB		~~IJ~~ EB	EB	EB	EB

J	=	Estimated	Check (√)	=	Acceptable
U	=	Not Detected	Shaded Cells	=	Not Applicable (also "NA")
UJ	=	Not Detected, Estimated	NP	=	Not Provided
R	=	Unusable	Other:		

Reviewed By: Date: 01.02.03

Holding Time and Preservation

Site/Project: DSS soil sampling AR/COC #: 605787 Laboratory Sample IDs: 69934 - 001 thru - 004

Laboratory: GEL Laboratory Report #: 69934 69936 - 001 thru - 009

# of Samples: 4 & 9 Matrix: Soil & H2O

Sample ID	Analytical Method	Holding Time Criteria	Days Holding Time was Exceeded	Preservation Criteria	Preservation Deficiency	Comments
69936 - 007	SW - 846 7196A	24 hours	9hours 5mins	NA	NA	UJ, HT
			11/04 8.10 11/05 17.15			

Reviewed By: Date: 01.02.03

Volatile Organics (SW 846 Method 8260)

Page 1 of 2

Site/Project: DSS Soil Sampling AR/COC #: 605787 # of Samples: 2 Matrix: Soil

Laboratory: GEL Laboratory Report #: 69934 Laboratory Sample IDs: 69934-001 & -002 69936-001(TB), -002 (ES)

Methods: SW-846 8260A/B Batch #s: 213995 ① (soil) 213335 ② (H2O)

IS	CAS #	Name	TCL	Min. RF	Intercept	Calib. RF		Calib. RSD/ R²		CCV %D		Method Blks		LCS	LCSD	LCS RPD	MS		MSD		MS RPD		Field Dup. RPD	002 - Equip. Blanks	69936-001 Trip Blanks	
						>.05 1	2	<20% / 0.99 1	2	20% 1	2	①	②	①	②		1	2	1	2	1	2				
1	71-55-6	1,1,1-trichloroethane	✓	0.10		✓	✓	✓	✓	✓	✓	✓	✓			NA							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-dichloroethene		0.20										✓	✓		✓	✓	✓	✓	✓	✓				
1	107-06-2	1,2-dichloroethane		0.10																						
1	540-59-0	1,2-dichloroethene(total)		0.01																						
1	78-87-5	1,2-dichloropropane	✓	0.01																						
1	78-93-3	2-butanone (MEK) (10xblk)	✓	0.01							-20.8															
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																						
1	71-43-2	benzene		0.50										✓	✓		✓	✓	✓	✓	✓	✓				
1	75-27-4	bromodichloromethane		0.20																						
3	75-25-2	bromoform		0.10	✓	✓		✓		22.5	+43															
1	74-83-9	bromomethane		0.10	✓	✓		✓		✓	✓															
1	75-15-0	carbon disulfide		0.10							✓															
1	56-23-5	carbon tetrachloride		0.10	✓	✓		✓			[illegible]															
2	108-90-7	chlorobenzene		0.50							✓			✓	✓		✓	✓	✓	✓	✓	✓				
1	75-00-3	chloroethane		0.01																						
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		.23	[illegible]							✓	✓		✓	✓	✓	✓	✓	✓				
1	75-01-4	vinyl chloride		0.10		✓	✓																			
2	1330-20-7	xylenes(total)		0.30																						
cis-1,2-		Dichloroethene																								
trans-1,2-		Dichloroethene																								

Comments: Vinyl Acetate.

② 213335 - 69602 MS/MSD

SNAS SDG.

Notes: Shaded rows are RCRA compounds.

Reviewed By: [illegible] Date: 12.25.02

Volatile Organics

Site/Project: ______ AR/COC #: 605787 Batch #s: ______

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
IN CRITERIA									

SMC 1: 4-Bromofluorobenzene
SMC 2: Dibromofluoromethane
SMC 3: Toluene-d8

IS 1: Fluorobenzene
IS 2: Chorobenzene-d5
IS 3: 1,4-Dichlorobenzene-d4

Comments:

Semivolatile Organics (SW 846 Method 8270)

Page 1 of 3

Site/Project: DSS Soil Sampling AR/COC #: 605787 Laboratory Sample IDs: 69934 - 003 & - 004

Laboratory: GEL Laboratory Report #: 69934 69936 - 003 (EB)

Methods: SW-846 8270C 1 2

# of Samples: 2 & 1 Matrix: Soil & H2O Batch #s: 213362 (Soils) 213509 (EB)

IS	BNA	CAS #	NAME	TCL	Min. RF	Intercept	Calib. RF		Calib. RSD/ R^2		CCV %D		Method Blanks		LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	69936 -003 Equip. Blanks	Field Blanks	ms	msd	RPD
							1 >.05	2	<20% / 1 0.99	2	1 20%	2	1	2	1	2		1	1	1				2	2	2
2	BN	120-82-1	1,2,4-Trichlorobenzene	✓	0.20		✓	✓	✓	✓			✓	✓	✓	✓	NA	✓	✓	✓	NA	✓	NA	✓	✓	✓
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										✓	✓		60	62	✓				✓	✓	✓
3	A	88-06-2	2,4,6-Trichlorophenol		0.20										✓	✓		55	55	✓				✓	✓	✓
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	✓ ✓	✓	✓	✓	[illegible]																
3	BN	121-14-2	2,4-Dinitrotoluene		0.20										✓	✓		✓	✓	✓				✓	✓	✓
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	65	✓				✓	✓	✓
3	BN	88-74-4	2-Nitroaniline		0.01																					
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										✓	✓		64	66	✓				✓	✓	✓

Comments: m, p - cresol

Notes: Shaded rows are RCRA compounds.

Reviewed By: D Walt Date: 12.25.02

Semivolatile Organics

Page 2 of 3

Site/Project: ______ AR/COC #: 605787 Batch #s: ______

Laboratory: ______ Laboratory Report #: ______ # of Samples: ______ Matrix: ______

	BNA	CAS #	NAME	TCL	Min. RF	Intercept		Calib. RF		Calib. RSD/ R^2		CCV %D		Method Blanks		LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Field Blanks	mD	mSD	RPD
						1	2	>.05 1	2	<20%/ 0.99 1	2	20% 1	2	1	2	1	2								2	2	2
3	BN	100-01-6	4-Nitroaniline	✓	0.01			✓	✓	✓	✓	✓	✓	✓	✓			NA				NA	✓	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								-24														
6	BN	207-08-9	Benzo(k)fluoranthene		0.70								✓														
2	BN	111-91-1	bis(2-Chloroethoxy)methane		0.30							+24															
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	✓	✓	✓	✓	✓	✓		-25														
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											✓	✓		57	57	✓				✓	✓	✓
2	BN	87-68-3	Hexachlorobutadiene		0.01											✓	✓		60	63	✓				✓	✓	✓
3	BN	77-47-4	Hexachlorocyclopentadiene		0.01		✓		✓		✓																
1	BN	67-72-1	Hexachloroethane		0.30											✓	✓		57	59	✓				✓	74	✓

Comments:

PCBs (SW 846 - Method 8082)

Site/Project: DSS Soil Sampling AR/COC #: 605787 Laboratory Sample IDs: 69934 - 003

Laboratory: GEL Laboratory Report #: 69934 69936 - 004 (EB)

Methods: SW-846 8082 ① ②

# of Samples: 2 & 1 Matrix: Soils & H2O Batch #s: 213005 213002 (EB)

CAS #	Name	TCL	Intercept	Calib RSD / R²	CCV %D	Method Blanks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	69936 Equip. Blanks	Field Blanks	MS	MSD	RPD
				≤20% / 0.99	1 20% 2	1 2	1	2	20%	1	1	20% 1		004		②	②	②
12674-11-2	Aroclor-1016	✓	NA	✓ ✓	✓ ✓	✓ ✓			NA				NA	✓	NA			
11104-28-2	Aroclor-1221	✓				✓ ✓												
11141-16-5	Aroclor-1232	✓				✓ ✓												
53469-21-9	Aroclor-1242	✓		✓ ✓		✓ ✓												
12672-29-6	Aroclor-1248	✓		✓ ✓		✓ ✓												
11097-69-1	Aroclor-1254	✓		✓ ✓		✓ ✓												
11096-82-5	Aroclor-1260	✓		✓ ✓	✓ ✓	✓ ✓	✓	✓		✓	✓	✓				✓	✓	✓

Sample	SMC % REC	SMC RT	Sample	SMC % REC	SMC RT
IN CRITERIA					

Comments: 213002
MS/MSD Used 500ml.

Confirmation

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

Reviewed By: ____________ Date: 12.30.02

High Explosives (SW 846 Method 8330)

Site/Project: DSS soil sampling AR/COC #: 605787 Laboratory Sample IDs: 69934 - 003, -004

Laboratory: GEL Laboratory Report #: 69934 69936 - 005 (EB)

Methods: SW-846 8330 ① ②

# of Samples: 2 & 1 Matrix: soil & H2O Batch #s: 214228 213550 (EB)

CAS #	NAME	T / I	Intercept	Curve R^2	CCV %D	Method Blanks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field. Dup. RPD	Equip. Blanks	Field Blanks	ms	MSD	RPD
				1 .99 2	1 20% 2	1 U 2	1	2	20%	1	1	/20%		U	U	2	2	2
2691-41-0	HMX	✓	NA			✓ ✓	✓	✓	NA	✓	✓	✓	NA	✓	NA	✓	✓	✓
121-82-4	RDX																	
99-35-4	1,3,5-Trinitrobenzene																	
99-65-0	1,3-dinitrobenzene																	
98-95-3	Nitrobenzene																	
479-45-8	Tetryl															✓	0	200
118-96-7	2,4,6-trinitrotoluene														(56-137)	176	192	✓
35572-78-2	2-amino-4,6-dinitrotoluene															✓	✓	✓
1946-51-0	4-amino-2,6-dinitrotoluene																	
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
IN CRITERIA					

Comments: 213550 MS/MSD 69916. SNL SDG.

Tetryl UJ, A2, P1

Confirmation

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

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: Date: 12.30.02

WS 1 of 2 (soils)

Inorganic Metals

Site/Project: DSS Soil Sampling AR/COC #: 605787 Laboratory Sample IDs: 69934-003, -004

Laboratory: GEL Laboratory Report #: 69934

69936-008 (EB) } See

214030 (EB) ② 215810 (EB) } sep WS.

Methods: SW-846 7471A (Hg) 6010B (Metals)

# of Samples: 2 & 1 Matrix: Soil & H2O Batch #s: 216954 (Hg) ① 216006 (Metals)

CAS #/ Analyte	QC Element																			
				mg/l	mg/l	mg/kg							<35%				mg/l		Bx5		
	TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD Soils	ICS AB	Serial Dilution	Field Dup. RPD	Equip. Blanks	Field Blanks			
7429-90-5 Al								NA			NA					NA		NA			
7440-39-3 Ba	✓	✓	✓	✓	✓	✓	✓			NA			✓	✓	✓		.000237		1.165 ug/l		3. 4 >
7440-41-7 Be			x LT																		
7440-43-9 Cd	✓	✓	✓	✓	✓	✓	✓			✓			NA	✓	NA		✓				
7440-70-2 Ca																					
7440-47-3 Cr	✓	✓	✓	✓	✓	.244	✓			✓			✓	✓	✓		.000802		1.22 mg/kg		3 4 >
7440-48-4 Co																					
7440-50-8 Cu																			4.01 ug/l		3 4 >
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		✓				3 = ND
7782-49-2 Se	✓	✓	✓	.0021	✓	✓	✓			✓			NA	✓	NA		✓		10.8 ug/l		4 =
7440-38-2 As	✓	✓	✓	.00416	.00452	✓	✓			✓			✓	✓	NA		✓		22.6 ug/l		3 4 >
7440-36-0 Sb																					
7440-28-0 Tl																					
7439-97-6 Hg	✓	✓	✓	✓	[.000032]	✓	✓			✓			NA				✓		3 = < 5x MDL 4 = ND		J, B3 UJ, B3
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 dx Soils

SA-004 5x Cr.

~~ND and ICS-AB~~ LT

mg/kg → ug/l (x10) Reviewed By: D Hal Date: 12.30.02

WS 2 of 2 (EB)

Inorganic Metals

Site/Project: OSS soil sampling AR/COC #: 605787 Laboratory Sample IDs: 69936 - 008 (EB)

Laboratory: GEL Laboratory Report #: 69934

Methods: SW-846 7470A (Hg) 6010B (Metals)

# of Samples: 1 Matrix: H2O Batch #s: 214030 (Hg) 215810 (Metals)

CAS #/ Analyte	QC Element																			
				ug/l		ug/l														
	TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD	ICS AB	Serial Dilution	Field Dup. RPD	Equip. Blanks	Field Blanks	Bx 5		
7429-90-5 Al								NA			NA					NA					
7440-39-3 Ba	✓	✓	✓ LT	~~.000453~~	.000453	✓	✓			✓			NA	✓	NA				.0022	65 <	J, B3
7440-41-7 Be																					
7440-43-9 Cd	✓	✓	✓	✓		✓	✓			✓			NA	✓	NA						
7440-70-2 Ca																					
7440-47-3 Cr	✓	✓	✓	.00073	.00121	.000791	✓			✓			NA	✓	NA				.00605	.003	55 < UJ, BB2
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	✓	✓	✓ LT	~~.00166~~	.00166	✓	✓			✓			NA	✓	NA				.0083	ND	Noa
7440-23-5 Na																					
7440-62-2 V																					
7440-66-6 Zn																					
7439-92-1 Pb	✓	✓	✓	✓		✓	✓			✓			NA	✓	NA						
7782-49-2 Se	✓	✓	✓	✓	.00354	✓	✓			✓			NA	✓	NA				.0178	ND	Noa
7440-38-2 As	✓	✓	✓	✓	= .00238	✓	✓			✓			NA	✓	NA				-ve	ND	UJ, B3
7440-36-0 Sb																					
7440-28-0 Tl																					
													NA								
7439-97-6 Hg	✓	✓	✓	✓	✓	✓	✓			✓			↓								
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: 214030 : 69682-006 SNL SOG.

Reviewed By: Allal Date: 12. 30. 02

General Chemistry

Site/Project: DSS Soil Sampling AR/COC #: 605787 Laboratory Sample IDs: 69934 - 003 & -004

69936 - 006 (T CN) EB

-007 (Cr^{+6}) EB

Laboratory: GEL Laboratory Report #: 69934

Methods: SW - 846 9012A (TCN) 7196A (Cr^{+6})

# of Samples: 2 & 2 Matrix: Soils & H_2O

Batch #s: 213482 (TCN soil) 213487 (Cr^{+6} soil)
213480 EB 213435

	CAS #	Analyte	QC Element																	
			TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD	ICS AB	Serial Dilution	Field Dup. RPD	Equip. Blanks	Field Blanks
213482		Total Cyanide		✓	✓	✓	✓	✓	✓ ✓			✓			NA				✓	
213480				✓	✓	✓	✓	✓	✓			✓			NA				NA	
213487		Hexavalent Chromium		✓	✓	✓	✓	✓	✓			* 127 (49-130%)			NA				✓	
213435				✓	✓	✓	✓	✓	✓			✓ 75 ~~(80-~~	LT ~~120)~~		NA				NA	

Comments: 69936 - 007 > HT but < 2x HT UJ, HT ~~MS ↓ UJ, A2~~ LT
~~>30% but < SPC limits~~

213487 Cr^{6+} Soil — Dup/MS 68835 SNL
504.

* SPC limits for Cr^{6+} spike recoveries approved by Pam Puissant 10/21/02.

Reviewed By: Date: 01.02.03

Radiochemistry

Site/Project: DSS soil sampling AR/COC #: 605787 Laboratory Sample IDs: 69934 – 003 & -004

Laboratory: GEL Laboratory Report #: 69934 69936 – 009 (EB)

Methods: EPA 900.0

# of Samples: 2 & 1 Matrix: Soils & H20 Batch #s: LT ~~213562~~ 215116 (soil) 215093 (EB)

Analyte	QC Element												
	Method Blanks	LCS	MS/msd	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-28													
Ni-63													
Gamma Spec. Am-241													
Gamma Spec. Cs-137													
Gamma Spec. Co-60													
Gross α	✓	✓	✓ ✓	✓	NA	NA	NA						
β	✓	✓	✓ ✓	✓	NA	NA	NA						

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

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

Comments: 215093 EB ; 69682 MS/MSD DUP.
SNL SOG

Reviewed By: Date: 01.02.03

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab Batch No. N/A

SMO Use

Page 1 of 2

AR/COC 605787

Dept. No./Mail Stop:	6135/1089	Date Samples Shipped:	11-4-02	Project/Task No.:	7223.02.03.02
Project/Task Manager:	~~Mike Sanders~~ Sue Collins RK	Carrier/Waybill No.	15550	SMO Authorization:	
Project Name:	DSS soil sampling	Lab Contact:	Edie Kent 803-556-8171	Contract #:	PO 21671
Record Center Code:	ER/1295/DSS/DAT	Lab Destination:	GEL	SEE ATTACHED BOTTLE ORDER	
Logbook Ref. No.:	ER 090	SMO Contact/Phone:	Pam Puissant/505-844-3185		
Service Order No.	CF032-023 RK	Send Report to SMO:	Wendy Palencia/505-844-3132		
Location	Tech Area				
Building 6620	Room				

☐ Waste Characterization
-Send preliminary/copy report to:

☐ Released by COC No.:
☑ Validation Required

Bill To:Sandia National Labs (Accounts Payable)
P.O. Box 5800 MS 0154
Albuquerque, NM 87185-0154

Reference LOV(available at SMO)

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time(hr) Collected	Sample Matrix	Container Type	Container Volume	Preservative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
060066-001	6620/1009-DW1-BH1-25-S	25'	1009	11-1-02/1415	S	G	4oz	4c	G	SA	VOC(8260B)	
060067-001	6620/1009-DW1-BH1-30-S	30'		1505	S	G	4oz	4c	G	SA	VOC(8260B)	
060066-002	6620/1009-DW1-BH1-25-S	25'		1420	S	AG	500ml	4c	G	SA	see below for parameter *	
060067-002	6620/1009-DW1-BH1-30-S	30'		1535	S	AG	500ml	4c	G	SA	see below for parameter	
060068-001	6620/1009-DW1-BH1-TB	N/A		1540	DIW	G	3x40ml	HCL	G	TB	VOC(8260B)	
060279-001	6620/1009-EB			11-4-02/0745	L	G	3x40ml	HCL	G	SA	VOC (8260B)	
060279-002	6620/1009-EB			0750	L	AG	2x1lt	none	G	SA	SVOC (8270C)	
060279-003	6620/1009-EB			0755	L	AG	2x1lt	none	G	SA	PCB (8081)	
060279-004	6620/1009-EB			0800	L	AG	2x1lt	none	G	SA	HE (8330)	
060279-005	6620/1009-EB			0805	L	P	1lt	NaOH	G	SA	Total Cyanide(9010)	

RMMA ☐ Yes ☑ No Ref. No.

Sample Disposal ☐ Return to Client ☑ Disposal by lab

Turnaround Time ☑ Normal ☐ Rush

Return Samples By:

Level of Rush:

Sample Tracking — Smo Use
Date Entered(mm/dd/yy) 11/06/02
Entered by: RK
QC inits. JAC

Special Instructions/QC Requirements
EDD ☑ Yes ☐ No
Level C Package ☑ Yes ☐ No

*Send report to:
Mike Sanders
Dept6135/MS/1089
Phone/505-284/2478
* LAST SAMPLES FOR DSS-SOILS
*Please list as separate report.

* SVOC(8270C_
PCB(8082)HE(8330)
Total Cyanide(9010)
Cr6+(7197)
RCRA metals(6020, 7000,7471)Gross alpha-beta(900)

Abnormal Conditions on Receipt

Lab Use

Sample Team Members	Name	Signature	Init	Company/Organization/Phone/Cellular
	J.Lee			Weston/6135/505-284-3309
	W.Gibson			MDM/6135/505-845-3267
	G.Quintana			Shaw/6135/505-284-3309

	Org.	Date	Time		Org.	Date	Time
1.Relinquished by	6135	11/4/02	0925	4.Relinquished by			
1. Received by	6131	11/4/02	0925	4. Received by			
2.Relinquished by	6131	11-4-02	1045	5.Relinquished by			
2. Received by				5. Received by			
3.Relinquished by				6.Relinquished by			
3. Received by				6. Received by			

OFF-SITE LABORATORY

Analysis Request And Chain Of Custody (Continuation)

Page 2 of 2

AR/COC 605787

Project Name:		Project/Task Manger:	Project/Task No.: 7220.02.03.02
Location	Tech Area		
Building	Room	**Reference LOV (available at SMO)**	Lab use

Sample No-Fraction	ER Sample ID or Sample Location detail	Beginning Depth (ft)	ER Site No.	Date/Time (hr) Collected	Sample Matrix	Container		Preserv-ative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
						Type	Volume					
060279-006	6620/1009-EB	N/A	1009	1-4-02/0810	L	P	500ml	none	G	SA	Hex Chromium (7196)	
060279-007	6620/1009-EB	↑	↑	↑ 0815	L	P	500ml	HNO3	G	SA	RCRA metals (6010,7470)	
060279-008	6620/1009-EB	↓	↓	↓ 0920	L	P	1lt	HNO3	G	SA	Gross Alpha/Beta (900)	

Abnormal Conditions on Receipt

LAB USE

[illegible]

Contract Verification Review (CVR)

Project Leader COLLINS
Project Name DSS SOIL SAMPLING
Case No. 7223_02.03.02
AR/COC No. 605787
Analytical Lab GEL
SDG No. 69934

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				

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		SAMPLE #060279-006 RECEIVED PAST HOLDING TIME	X	
2.13	Contractual qualifiers provided	X				
2.14	All requested result and TIC (if requested) data provided	X				

Contract Verification Review (Continued)

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1 Are reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg)? Tritium reported in picocuries per liter with percent moisture for soil samples? Units consistent between QC samples and sample data	X		
3.2 Quantitation limit met for all samples	X		
3.3 Accuracy a) Laboratory control samples accuracy reported and met for all samples	X		
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique	X		
c) Matrix spike recovery data reported and met		X	HEXAVALENT CHROMIUM FAILED RECOVERY LIMITS FOR MATRIX SPIKE
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples		X	RPD FOR ARSENIC, BARIUM & LEAD OUTSIDE ACCEPTANCE LIMITS
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	CHROMIUM DETECTED IN METHOD BLANK
b) Sampling blank (e.g., field, trip, and equipment) data reported and met		X	BARIUM & CHROMIUM DETECTED IN EQUIPMENT BLANK
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		

Contract Verification Review (Concluded)

5.0 Problem Resolution

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

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions

Were deficiencies unresolved? ▶ Yes ▶ [✓ No]

Based on the review, this data package is complete. ▶ [✓ Yes] ▶ No

If no, provide: nonconformance report or correction request number ________ and date correction request was submitted:-____________

Reviewed by: W. Palencia Date: 12-17-2002 Closed by:________________ Date:____________

ANNEX B
DSS Site 1009
Risk Assessment

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LIST OF TABLES

LIST OF FIGURES

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DSS Site 1009: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1009, the Building 6620 Internal Sump, at Sandia National Laboratories/New Mexico (SNL/NM) is located in Technical Area III on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (DOE). The sump, which is located inside Building 6620, consisted of a 6-foot-square by 6-foot-deep sump or vault with a floor drain in the center of the unit that drained to a 2-foot-square by 2-foot-deep pea gravel-filled drywell located beneath the sump. Construction details are based upon engineering drawings (SNL/NM February 1991) and site inspections.

Available information indicates that Building 6620 was constructed in 1958 (SNL/NM March 2003), and it is assumed that the internal sump was also constructed at that time. An inspection conducted inside Building 6620 on July 14, 1999, determined that the internal sump had been capped and/or filled with concrete at some point prior to the date of the inspection.

Environmental concern about DSS Site 1009 is based upon the potential for the release of constituents of concern (COCs) in effluent that may have been discharged to the environment via the internal sump at this site. Because operational records are not available, the investigation of this site was planned to be consistent with other DSS site investigations and to sample for the COCs most commonly found at similar facilities.

The ground surface in the vicinity of DSS Site 1009 is flat to very slightly inclined to the west. The closest major drainage is the Arroyo del Coyote, located approximately 1.4 miles northeast of the site. No springs or perennial surface-water bodies are located within 2.4 miles of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Surface-water runoff in the vicinity of the site is minor because the surface slope is flat to gently inclined to the west. Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (Thompson and Smith 1985, SNL/NM March 1996). Most of the area in the immediate vicinity of DSS Site 1009 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS Site 1009 lies at an average elevation of approximately 5,407 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 487 feet below ground surface (bgs). The direction of groundwater flow is to the west in this area (SNL/NM March 2002). The nearest production wells to DSS Site 1009 are KAFB-4 and KAFB-11, which are approximately 3.4 and 3.9 miles north of the site, respectively. The nearest groundwater monitoring wells are those installed around the Mixed Waste Landfill that are located approximately 1,600 to 2,500 feet northwest of the site.

II. Data Quality Objectives

The Data Quality Objectives (DQOs) presented in the "Sampling and Analysis Plan [SAP] for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico" (SNL/NM October 1999) and "Field Implementation Plan [FIP], Characterization of Non-Environmental Restoration Drain and Septic Systems" (SNL/NM November 2001) identified the site-specific sample locations, sample depths, sampling procedures, and analytical requirements for this and many other DSS sites. The DQOs outlined the quality assurance (QA)/quality control (QC) requirements necessary for producing defensible analytical data suitable for risk assessment purposes. The baseline sampling conducted at this site was designed to:

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

Table 1 summarizes the rationale for determining the sampling locations at this site. The source of potential COCs at DSS Site 1009 was effluent that may have been discharged to the environment from the internal sump.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1009 Sampling Area	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil beneath the internal sump	Possible effluent discharged to the environment from the internal sump	1	NA	Evaluate potential COC releases to the environment from effluent discharged from the internal sump.

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

The baseline soil samples were collected at one location at DSS Site 1009. The samples were collected with a truck-mounted auger rig used to drill a borehole at a 45-degree angle beneath Building 6620 and the internal sump. The internal sump sampling intervals started at 25 and 30 feet in the borehole, or 17.7 and 21.2 vertical feet bgs, respectively. 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.

Table 2
Number of Confirmatory Soil and QA/QC Samples Collected from DSS Site 1009

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)	2	1	1	1	1	1	1	0	1
Total Samples	4	3	3	3	3	3	3	2	3
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.

The DSS Site 1009 baseline soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, polychlorinated biphenyls (PCBs), Resource Conservation and Recovery Act (RCRA) metals, hexavalent chromium, cyanide, radionuclides, and gross alpha/beta activity. The samples were analyzed by an off-site laboratory (General Engineering Laboratories, Inc.) and the on-site SNL/NM 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 3
Summary of Data Quality Requirements, DSS Site 1009

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 6020/7000	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.
[a] EPA 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 Conversation and Recovery Act.
RPSD = Radiation Protection Sample Diagnostics Laboratory.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

The QA/QC samples were collected during the baseline sampling effort according to the Environmental Restoration (ER) Project Quality Assurance Project Plan. The QA/QC samples consisted of one trip blank (for VOCs only) and one set of equipment blanks. No field duplicate samples were collected at this site. No significant QA/QC problems were identified in the QA/QC samples.

All of the baseline soil sample results were verified/validated by SNL/NM according to Data Verification/Validation Level 3 (SNL/NM July 1994) or SNL/NM ER Project Data Validation Procedure for Chemical and Radiochemical Data, AOP [Administrative Operating Procedure] 00-03, Rev. 0 (SNL/NM December 1999). The data validation reports are presented in the associated DSS Site 1009 proposal for no further action (NFA). The gamma spectroscopy data from the RPSD Laboratory were reviewed according to "Laboratory Data Review Guidelines," Procedure No. RPSD-02-11, Issue No. 02 (SNL/NM July 1996). The gamma spectroscopy results are presented in the NFA proposal. The reviews confirmed that the analytical data are defensible and therefore acceptable for use in the NFA proposal. Therefore, the DQOs have been fulfilled.

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

III.1 Introduction

The determination of the nature, migration rate, and extent of contamination at DSS Site 1009 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 1009, which is presented in Section 4.0 of the associated NFA proposal. The quality of the data used to specifically determine the nature, migration rate, and extent of contamination is described in the following sections.

III.2 Nature of Contamination

Both the nature of contamination and the potential for the degradation of COCs at DSS Site 1009 were evaluated using laboratory analyses of the soil samples. The analytical requirements included analyses for VOCs, SVOCs, HE compounds, PCBs, RCRA metals, hexavalent chromium, cyanide, radionuclides by gamma spectroscopy, and gross alpha/beta activity. The analytes and methods listed in Tables 2 and 3 are appropriate to characterize the COCs and potential degradation products at DSS Site 1009.

III.3 Rate of Contaminant Migration

An inspection conducted inside Building 6620 on July 14, 1999, confirmed that the internal sump had been capped and/or filled with concrete at some point prior to the date of the inspection. The migration rate of COCs that may have been introduced into the subsurface via the internal sump at this site was therefore dependent upon the volume of aqueous effluent that may have been discharged to the environment from this system when it was operational. Any migration of COCs from this site after use of the unit was discontinued would have been predominantly dependent upon infiltrating precipitation. However, it is highly unlikely that sufficient precipitation would have reached the depth at which COCs may have been discharged to the subsurface because Building 6620 covers the site. Analytical data generated from the soil sampling conducted at the site are adequate to characterize the rate of COC migration at DSS Site 1009.

III.4 Extent of Contamination

Subsurface baseline soil samples were collected at the site from a single angled borehole drilled beneath the effluent release point (the drywell beneath the internal sump) to assess whether releases of effluent from the unit caused any environmental contamination.

The DSS Site 1009 baseline soil samples were collected from directly beneath the internal sump, at sampling depths starting at 25 and 30 feet in the borehole, or 17.7 and 21.2 vertical feet bgs, respectively. The soil sampling borehole angle and bearing were designed to intercept the potential effluent release path vertically beneath the internal sump and associated drywell. This sampling procedure was required by New Mexico Environment Department (NMED) regulators and has been used at numerous DSS sites at SNL/NM. The baseline soil samples are considered to be representative of the soil potentially contaminated with the COCs at this site and are sufficient to determine the vertical extent, if any, of COCs.

IV. Comparison of COCs to Background Screening Levels

Site history and characterization activities are used to identify potential COCs. The DSS Site 1009 NFA proposal describes the identification of COCs and the sampling that was conducted in order to determine the concentration levels of those COCs across the site. Generally, COCs that were evaluated in this risk assessment included all detected organic and all inorganic and radiological COCs for which samples were analyzed. When the detection limit of an organic compound was too high (i.e., could possibly cause an adverse effect to human health or the environment), the compound was retained. Nondetected organic compounds not included in this assessment were determined to have detection limits low enough to ensure protection of human health and the environment. In order to provide conservatism in this risk assessment, the calculation used only the maximum concentration value of each COC found for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 1997) was selected to provide the background screen listed in Tables 4 and 5.

Nonradiological inorganic constituents that are essential nutrients, such as iron, magnesium, calcium, potassium, and sodium, were not included in this risk assessment (EPA 1989). Both radiological and nonradiological COCs were evaluated. The nonradiological COCs 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 1009. All samples were collected at 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.

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1009 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (All Samples) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Log K_{ow} (for organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Arsenic	4.12	4.4	Yes	44[c]	–	**Yes**
Barium	98.5	214	Yes	170[d]	–	**Yes**
Cadmium	0.19 J	0.9	Yes	64[c]	–	**Yes**
Chromium, total	10.4	15.9	Yes	16[c]	–	No
Chromium VI	0.02615[e]	1	Yes	16[c]	–	No
Cyanide	0.0633 J	NC	**Unknown**	NC	–	**Unknown**
Lead	5.61	11.8	Yes	49[c]	–	**Yes**
Mercury	0.00452 J	<0.1	**Unknown**	5,500[c]	–	**Yes**
Selenium	0.0765[e]	<1	**Unknown**	800[f]	–	**Yes**
Silver	0.04255[e]	<1	**Unknown**	0.5[c]	–	No
Organic						
Acetone	0.00431 J	NA	**NA**	0.69[g]	-0.24[g]	No
bis(2-Ethylhexyl) phthalate	0.0482 J	NA	**NA**	851[h]	7.6[i]	**Yes**

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

[a] Dinwiddie September 1997, Southwest Area Supergroup.

[b] NMED March 1998.

[c] Yanicak March 1997.

[d] Neumann 1976.

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

[f] *Callahan et al.* 1979.

[g] Howard 1990.

[h] Howard 1989.

[i] Micromedex, Inc. 1998.

BCF = Bioconcentration factor.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
J = Estimated concentration.
K_{ow} = *Octanol-water partition coefficient.*
Log = Logarithm (base 10).
mg/kg = Milligram(s) per kilogram.
NA = Not applicable.
NC = Not calculated.
NMED = New Mexico Environment Department.
SNL/NM = *Sandia National Laboratories/New Mexico.*
– = Information not available.

Table 5
Radiological COCs for Human Health Risk Assessment at DSS Site 1009 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 (0.031)	0.079	Yes	900[c]	**Yes**
Th-232	0.515	1.01	Yes	900[c]	**Yes**
U-235	**ND (0.176)**	0.16	**No**	3,000[c]	**Yes**
U-238	ND (0.44)	1.4	Yes	3,000[c]	**Yes**

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

[a] Dinwiddie September 1997, Southwest Area Supergroup.

[b] NMED March 1998.

[c] Baker and Soldat 1992.

BCF = Bioconcentration factor.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected above the MDA, shown in parentheses.
ND ( ) = Not detected, but the MDA (shown in parentheses) exceeds background activity.
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.

V. Fate and Transport

The primary releases of COCs at DSS Site 1009 occurred in the subsurface soil resulting from the discharge of effluents to the sump and drywell in Building 6620. Wind, water, and biota are natural mechanisms of COC transport from the primary release point; however, because the discharge occurred to subsurface soil beneath Building 6620, none of these mechanisms are considered to be of potential significance as transport mechanisms at this site. Because the sump is no longer active, additional input of water through infiltration from the drywell is not expected. Water received as precipitation (approximately 8.1 inches annually) will be diverted away from the site by the building; therefore, infiltration from this source is minimal. Because groundwater at this site is approximately 487 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

The COCs at DSS Site 1009 include both inorganic and organic constituents. The inorganic COCs include both radiological and nonradiological analytes. With the exception of cyanide, the inorganic COCs are elemental in form and 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. Radiological COCs will undergo decay to stable isotopes or radioactive daughter elements. However, because of the long half-life of the radiological COC (U-235), the aridity of the environment at this site, and the lack of potential contact with biota, none of these mechanisms is expected to result in significant losses or transformations of the inorganic COCs.

The organic COCs at DSS Site 1009 are acetone and bis(2-ethylhexyl) phthalate. Organic compounds 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 and the cover of Building 6620, the loss of acetone through volatilization is expected to be minimal.

Table 6 summarizes the fate and transport processes that can occur at DSS Site 1009. COCs at this site include radiological and nonradiological inorganic and organic analytes. Wind, surface water, and biota are considered to be of low significance as potential transport mechanisms at this site. Significant leaching into the subsurface soil is unlikely, and leaching into the groundwater at this site is highly unlikely. The potential for transformation of COCs is low, and loss through decay of the radiological COC is insignificant because of its long half-life.

Table 6
Summary of Fate and Transport at DSS Site 1009

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 1009. 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 1009 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 1009 is approximately 487 feet bgs. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Figure 1 shows the conceptual site model flow diagram for DSS Site 1009.

Pathway Identification

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

VI.4 Step 3. Background Screening Procedure

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

VI.4.1 Methodology

Maximum concentrations of nonradiological COCs were compared to the approved SNL/NM maximum screening 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 did not have either a quantifiable or calculated background screening level were considered in further risk assessment analyses.

For radiological COCs that exceed the SNL/NM background screening levels, background values were subtracted from the individual maximum radionuclide concentrations. Those that did not exceed these background levels were not carried any further in the risk assessment. This approach is consistent with DOE Order 5400.5, "Radiation Protection of the Public and the Environment" (DOE 1993). Radiological COCs that do not have a background value and were detected above the analytical minimum detectable activity (MDA) were carried through the risk assessment at 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 DSS Site 1009 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 did not have quantified background screening concentrations. Two constituents were organic compounds that do not have corresponding background screening values.

For the radiological COCs, one constituent (U-235) exhibited an MDA greater than its background screening value.

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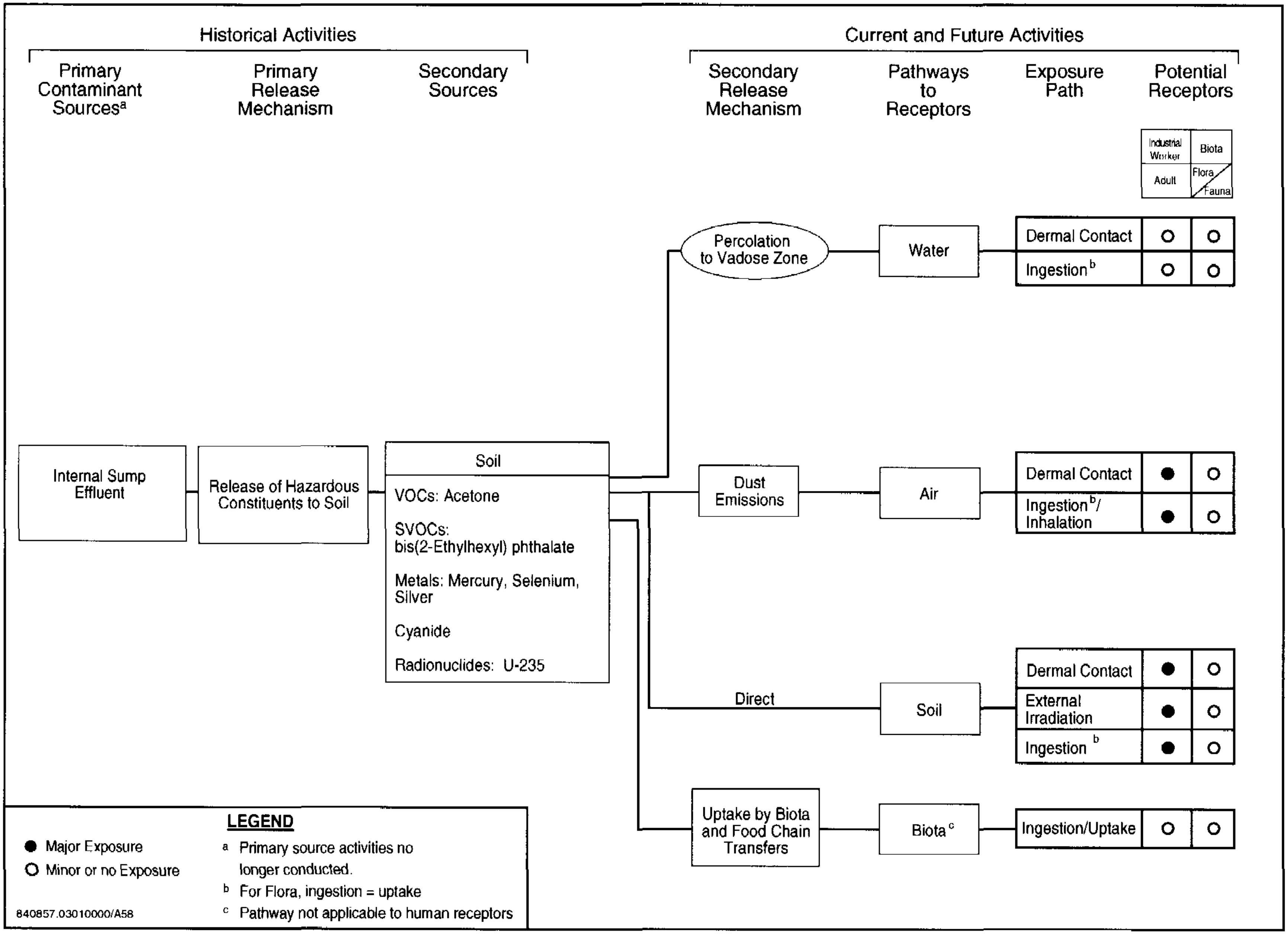

Figure 1

Conceptual Site Model Flow Diagram for DSS Site 1009, Building 6620 Internal Sump

VI.5 Step 4. Identification of Toxicological Parameters

Tables 7 (nonradiological) and 8 (radiological) 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 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. Dose conversion factors (DCFs) used in determining the excess TEDE values for radiological COCs for the individual pathways were the default values provided in the RESRAD computer code (Yu et al. 1993a) as developed in the following documents:

- DCFs for ingestion and inhalation were taken from "Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion" (EPA 1988).
- DCFs for surface contamination (contamination on the surface of the site) were taken from DOE/EH-0070, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public" (DOE 1988).
- DCFs for volume contamination (exposure to contamination deeper than the immediate surface of the site) were calculated using the methods discussed in "Dose-Rate Conversion Factors for External Exposure to Photon Emitters in Soil" (Kocher 1983) and in ANL/EAIS-8, "Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil" (Yu et al. 1993b).

VI.6 Step 5. Exposure Assessment and Risk Characterization

Section VI.6.1 describes the exposure assessment for this risk assessment. Section VI.6.2 provides the risk characterization, including the HI and excess cancer risk for both the potential nonradiological COCs and associated background for industrial and residential land-use scenarios. The incremental TEDE and incremental estimated cancer risk are provided for the background-adjusted radiological COCs for both 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).

Table 7
Toxicological Parameter Values for DSS Site 1009 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								
Acetone	1E-1[c]	L	1E-1[f]	–	–	–	D	0.01[g]
bis(2-Ethylhexyl) phthalate	2E-2[f]	–	2E-2[f]	–	1.4E-2[f]	1.4E-2[f]	–	0.01[g]

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

[b] EPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 2003):
D = Not classifiable as to human carcinogenicity.

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

[d] Toxicological parameter values from NMED December 2000.

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

[f] Toxicological parameter values from EPA Region 6 (EPA 2002a).

[g] Toxicological 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.
ORNL = Oak Ridge National Laboratory.
RfD$_{inh}$ = Inhalation chronic reference dose.
RfD$_o$ = Oral chronic reference dose.
SF$_{inh}$ = Inhalation slope factor.
SF$_o$ = Oral slope factor.
– = Information not available.

Table 8
Radiological Toxicological Parameter Values for DSS Site 1009 COCs Obtained from RESRAD Risk Coefficients[a]

COC	SF_o (1/pCi)	SF_{inh} (1/pCi)	SF_{ev} (g/pCi-yr)	Cancer Class[b]
U-235	4.70E-11	1.30E-08	2.70E-07	A

[a] Yu et al. 1993a.

[b] EPA weight-of-evidence classification system for carcinogenicity (EPA 1989): A = Human carcinogen for high dose and high dose rate (i.e., greater than 50 rem per year). For low-level environmental exposures, the carcinogenic effect has not been observed and documented.

1/pCi = One per picocurie.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
g/pCi-yr = Gram(s) per picocurie per year.
SF_{ev} = External volume exposure slope factor.
SF_{inh} = Inhalation slope factor.
SF_o = Oral (ingestion) slope factor.

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 9 shows an HI of 0.00 for the DSS Site 1009 nonradiological COCs and an estimated excess cancer risk of 3E-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 10 shows that for DSS Site 1009 associated background constituents neither a quantifiable HI nor an estimated excess cancer risk for the designated industrial land-use scenario.

For the radiological COCs, contribution from the direct gamma exposure pathway is included. For the industrial land-use scenario, a TEDE was calculated that resulted in an incremental TEDE of 2.9E-4 millirem (mrem)/year (yr). In accordance with EPA guidance found in Office of Solid Waste and Emergency Response (OSWER) Directive No. 9200.4-18 (EPA 1997b), an incremental TEDE of 15 mrem/yr is used for the probable land-use scenario (industrial in this case); the calculated dose value for DSS Site 1009 for the industrial land-use scenario is well below this guideline. The estimated excess cancer risk is 2.5E-9.

For the nonradiological COCs under the residential land-use scenario, the HI is 0.00 and the estimated excess cancer risk is 1E-9 (Table 9). 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, subsequently, for dust to be present in predominantly residential areas. Because of the nature of the local soil, other exposure pathways are not considered (see Appendix 1).

Table 9
Risk Assessment Values for DSS Site 1009 Nonradiological COCs

COC	Maximum Concentration (All Samples) (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Cyanide	0.0633 J	0.00	–	0.00	–
Mercury	0.00452 J	0.00	–	0.00	–
Selenium	0.0765[b]	0.00	–	0.00	–
Silver	0.04255[b]	0.00	–	0.00	–
Organic					
Acetone	0.00431 J	0.00	–	0.00	–
bis(2-Ethylhexyl) phthalate	0.0482 J	0.00	3E-10	0.00	1E-9
Total		**0.00**	**3E-10**	**0.00**	**1E-9**

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

Table 10
Risk Assessment Values for DSS Site 1009 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		–	–	–	–

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

Table 10 shows that for the DSS Site 1009 associated background constituents, there is no quantifiable HI or estimated excess cancer risk.

For the radiological COCs, the incremental TEDE for the residential land-use scenario is 7.4E-4 mrem/yr. The guideline being used is an excess TEDE of 75 mrem/yr (SNL/NM February 1998) for a complete loss of institutional controls (residential land use in this case); the calculated dose value for DSS Site 1009 for the residential land-use scenario is well below this guideline. Consequently, DSS Site 1009 is eligible for unrestricted radiological release as the residential land-use scenario resulted in an incremental TEDE of less than 75 mrem/yr to the on-site receptor. The estimated excess cancer risk is 7.5E-9. 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 OSWER Directive No. 9200.4-18 "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," (EPA 1997b). This summation is tabulated in Section VI.9, Summary.

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

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

For the nonradiological COCs under the industrial land-use scenario, the HI is 0.00 (lower than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). The estimated excess cancer risk is 3E-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, for nonradiological COCs there is neither a quantifiable HI nor an estimated excess cancer risk. 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 quantifiable background screening values are assumed to have a hazard quotient of 0.00. The incremental HI is 0.00 and the incremental estimated excess cancer risk is 2.51E-10 for the industrial land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs considering an industrial land-use scenario.

For radiological COCs under the industrial land-use scenario, the incremental TEDE is 2.9E-4 mrem/yr, which is significantly lower than EPA's numerical guideline of 15 mrem/yr. The incremental estimated excess cancer risk is 2.5E-9.

For the nonradiological COCs under the residential land-use scenario, the calculated HI is 0.00, which is below the numerical guidance. The estimated excess cancer risk is 1E-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. For background concentrations of the nonradiological COCs there is neither a quantifiable HI nor an estimated excess cancer risk. The incremental HI is 0.00 and the incremental estimated cancer risk is 1.09E-9 for the residential land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs considering a residential land-use scenario.

The incremental TEDE for a residential land-use scenario from the radiological component is 7.4E-4 mrem/yr, which is significantly lower than the numerical guideline of 75 mrem/yr suggested in the SNL/NM RESRAD Input Parameter Assumptions and Justification (SNL/NM February 1998). The estimated excess cancer risk is 7.5E-9.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1009 was based upon an initial conceptual model that was validated with baseline sampling conducted at the site. The baseline sampling was implemented in accordance with the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001), and the DQOs contained in these two documents are appropriate for use in risk assessments. The data from soil samples collected from beneath the potential effluent release point 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 quality of the data used to perform the risk assessment at DSS Site 1009.

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

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

Table 7 shows the uncertainties (confidence level) in nonradiological toxicological parameter values. There is a mixture of estimated values and values from the IRIS (EPA 2003), 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. Where values are not provided, information is not available from the HEAST (EPA 1997a), IRIS (EPA 2003), Technical Background Document for Development of Soil Screening Levels (NMED December 2000), the Risk Assessment Information System (ORNL 2003) or the EPA regions (EPA 2002a, 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 both the industrial and residential land-use scenarios compared to established numerical guidance.

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

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

VI.9 Summary

DSS Site 1009 contains identified COCs consisting of some inorganic, organic, and radiological compounds. Because of the location of the site, the designated industrial land-use scenario, and the nature of contamination, potential exposure pathways identified for this site included soil ingestion, dermal contact, and dust and volatile inhalation for chemical COCs and soil ingestion, dust inhalation, and direct gamma exposure for radionuclides. The same exposure pathways were applied to the residential land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for nonradiological COCs show that for the industrial land-use scenario the HI (0.00) is significantly lower than the accepted numerical guidance from the EPA. The estimated excess cancer risk is 3E-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 2.51E-10 for the industrial land-use scenario. The 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 also below the accepted numerical guidance from the EPA. The estimated excess cancer risk is 1E-9. Thus, excess cancer risk is also 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 1.09E-9 for the residential land-use scenario. The incremental risk calculations indicate insignificant risk to human health for the residential land-use scenario.

The incremental TEDE and corresponding estimated cancer risk from the radiological COC are much lower than EPA guidance values; the estimated TEDE is 2.9E-4 mrem/yr for the industrial land-use scenario, which is much lower than the EPA's numerical guidance of 15 mrem/yr (EPA 1997b). The corresponding incremental estimated cancer risk value is 2.5E-9 for the industrial land-use scenario. Furthermore, the incremental TEDE for the residential land-use scenario that results from a complete loss of institutional controls is 7.4E-4 mrem/yr with an associated risk of 7.5E-9. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS Site 1009 is eligible for unrestricted radiological release.

The summation of the nonradiological and radiological carcinogenic risks is tabulated in Table 11.

Table 11
Summation of Radiological and Nonradiological Risks from DSS Site 1009, Building 6620 Internal Sump Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	2.51E-10	2.5E-9	2.8E-9
Residential	1.09E-9	7.5E-9	8.5E-9

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 1009. 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 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 site to constituents associated with site activities. Included in this section are 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) involves summarizing the scoping results and determining whether further examination of potential ecological impacts is necessary.

VII.2.1 Data Assessment

As indicated in Section IV, all COCs at DSS Site 1009 are at depths greater than 5 feet bgs since the effluent release point at the bottom of the drywell started at approximately 9 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 COCs are also expected to be of low significance.

VII.2.4 Scoping Risk-Management Decision

Based upon information gathered through the scoping assessment, it was concluded that complete ecological pathways are not associated with COCs at this site. 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)

$$= C \times (CR \times EFD/BW/AT) \times \text{Toxicity Effect} \qquad (1)$$

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 [m^3]/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
VF = soil-to-air volatilization factor (m^3/kg)
PEF = particulate emission factor (m^3/kg)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Soil Dermal Contact

$$D_a = \frac{C_s * CF * SA * AF * ABS * EF * ED}{BW * AT}$$

where:

D_a = Absorbed dose (mg/kg-day)
C_s = Chemical concentration in soil (mg/kg)
CF = Conversion factor (1E-6 kg/mg)
SA = Skin surface area available for contact (cm^2/event)
AF = Soil to skin adherence factor (mg/cm^2)
ABS = Absorption factor (unitless)
EF = Exposure frequency (events/year)

ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Groundwater Ingestion

A receptor can ingest water by drinking it or through using household water for cooking. An estimate of intake from ingesting water will be calculated as follows (EPA August 1997):

$$I_w = \frac{C_w * IR * EF * ED}{BW * AT}$$

where:

I_w = Intake of contaminant from water ingestion (mg/kg/day)
C_w = Chemical concentration in water (mg/liter [L])
IR = Ingestion rate (L/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Groundwater Inhalation

The amount of a constituent taken into the body via exposure to volatilization from showering or other household water uses will be evaluated using the concentration of the constituent in the water source (EPA 1991 and 1992). An estimate of intake from volatile inhalation from groundwater will be calculated as follows (EPA 1991):

$$I_w = \frac{C_w * K * IR_i * EF * ED}{BW * AT}$$

where:

I_w = Intake of volatile in water from inhalation (mg/kg/day)
C_w = Chemical concentration in water (mg/L)
K = volatilization factor (0.5 L/m^3)
IR_i = Inhalation rate (m^3/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged—days)

For volatile compounds, volatilization from groundwater can be an important exposure pathway from showering and other household uses of groundwater. This exposure pathway will only be evaluated for organic chemicals with a Henry's Law constant greater than $1x10^{-5}$ and with a molecular weight of 200 grams/mole or less (EPA 1991).

Tables 2 and 3 show the default parameter values suggested for use by SNL/NM at SWMUs, based upon the selected land-use scenarios for nonradiological and radiological COCs, respectively. References are given at the end of the table indicating the source for the chosen parameter values. SNL/NM uses default values that are consistent with both regulatory guidance and the RME approach. Therefore, the values chosen will, in general, provide a conservative estimate of the actual risk parameter. These parameter values are suggested for use for the various exposure pathways, based upon the assumption that a particular site has no unusual characteristics that contradict the default assumptions. For sites for which the assumptions are not valid, the parameter values will be modified and documented.

Summary

SNL/NM will use the described default exposure routes and parameter values in risk assessments at sites that have an industrial, recreational, or residential future land-use scenario. There are no current residential land-use designations at SNL/NM ER sites, but NMED has requested this scenario to be considered to provide perspective of the risk under the more restrictive land-use scenario. For sites designated as industrial or recreational land use, SNL/NM will provide risk parameter values based upon a residential land-use scenario to indicate the effects of data uncertainty on risk value calculations or in order to potentially mitigate the need for institutional controls or restrictions on SNL/NM ER sites. The parameter values are based upon EPA guidance and supplemented by information from other government sources. If these exposure routes and parameters are acceptable, SNL/NM will use them in risk assessments for all sites where the assumptions are consistent with site-specific conditions. All deviations will be documented.

Table 2
Default Nonradiological Exposure Parameter Values for Various Land-Use Scenarios

Parameter	Industrial	Recreational	Residential
General Exposure Parameters			
Exposure Frequency (day/yr)	250[a,b]	8.7 (4 hr/wk for 52 wk/yr)[a,b]	350[a,b]
Exposure Duration (yr)	25[a,b,c]	30[a,b,c]	30[a,b,c]
Body Weight (kg)	70[a,b,c]	70 Adult[a,b,c] 15 Child[a,b,c]	70 Adult[a,b,c] 15 Child[a,b,c]
Averaging Time (days) for Carcinogenic Compounds (= 70 yr x 365 day/yr) for Noncarcinogenic Compounds (= ED x 365 day/yr)	25,550[a,b] 9,125 [a,b]	25,550[a,b] 10,950[a,b]	25,550 [a,b] 10,950 [a,b]
Soil Ingestion Pathway			
Ingestion Rate (mg/day)	100[a,b]	200 Child[a,b] 100 Adult[a,b]	200 Child [a,b] 100 Adult [a,b]
Inhalation Pathway			
Inhalation Rate (m^3/day)	20[a,b]	15 Child[a] 30 Adult[a]	10 Child[a] 20 Adult[a]
Volatilization Factor (m^3/kg)	Chemical Specific	Chemical Specific	Chemical Specific
Particulate Emission Factor (m^3/kg)	1.36E9[a]	1.36E9[a]	1.36E9[a]
Water Ingestion Pathway			
Ingestion Rate (liter/day)	2.4[a]	2.4[a]	2.4[a]
Dermal Pathway			
Skin Adherence Factor (mg/cm^2)	0.2[a]	0.2 Child[a] 0.07 Adult[a]	0.2 Child[a] 0.07 Adult[a]
Exposed Surface Area for Soil/Dust (cm^2/day)	3,300[a]	2,800 Child[a] 5,700 Adult[a]	2,800 Child[a] 5,700 Adult[a]
Skin Adsorption Factor	Chemical Specific	Chemical Specific	Chemical Specific

[a] Technical Background Document for Development of Soil Screening Levels (NMED December 2000).
[b] Risk Assessment Guidance for Superfund, Vol. 1, Part B (EPA 1991).
[c] Exposure Factors Handbook (EPA August 1997).

ED = Exposure duration.
EPA = U.S. Environmental Protection Agency.
hr = Hour(s).
kg = Kilogram(s).
m = Meter(s).
mg = Milligram(s).
NA = Not available.
wk = Week(s).
yr = Year(s).

Table 3
Default Radiological Exposure Parameter Values for Various Land-Use Scenarios

Parameter	Industrial	Recreational	Residential
General Exposure Parameters			
Exposure Frequency	8 hr/day for 250 day/yr	4 hr/wk for 52 wk/yr	365 day/yr
Exposure Duration (yr)	25[a,b]	30[a,b]	30[a,b]
Body Weight (kg)	70 Adult[a,b]	70 Adult[a,b]	70 Adult[a,b]
Soil Ingestion Pathway			
Ingestion Rate	100 mg/day[c]	100 mg/day[c]	100 mg/day[c]
Averaging Time (days) (= 30 yr x 365 day/yr)	10,950[d]	10,950[d]	10,950[d]
Inhalation Pathway			
Inhalation Rate (m^3/yr)	7,300[d,e]	10,950[e]	7,300[d,e]
Mass Loading for Inhalation g/m^3	1.36 E-5[d]	1.36 E-5 [d]	1.36 E-5 [d]
Food Ingestion Pathway			
Ingestion Rate, Leafy Vegetables (kg/yr)	NA	NA	16.5[c]
Ingestion Rate, Fruits, Non-Leafy Vegetables & Grain (kg/yr)	NA	NA	101.8[b]
Fraction Ingested	NA	NA	0.25[b,d]

[a] Risk Assessment Guidance for Superfund, Vol. 1, Part B (EPA 1991).
[b] Exposure Factors Handbook (EPA August 1997).
[c] EPA Region VI guidance (EPA 1996).
[d] For radionuclides, RESRAD (ANL 1993).
[e] SNL/NM (February 1998).

EPA = U.S. Environmental Protection Agency.
g = Gram(s)
hr = Hour(s).
kg = Kilogram(s).
m = Meter(s).
mg = Milligram(s).
NA = Not applicable.
wk = Week(s).
yr = Year(s).

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