

9-1-2005

Justification for Class III Permit Modification September 2005 DSS Site 1102 Operable Unit 1295 Former Building 889 Septic System at Technical Area I

Sandia National Laboratories/NM

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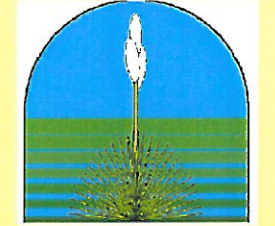


This work supported by the United States Department of Energy under contract DE-AC04-94185000.



Drain and Septic Systems - Areas of Concern (AOCs)

276, 1004, 1031, 1034, 1035, 1036, 1052, 1078, 1079, 1080, 1081, 1084, 1087, 1092, 1098, 1102, 1104, 1113, and 1120 (Poster 1/2)



Environmental Restoration Project

Site History

Drain and septic system site histories for the 19 AOCs are as follows:

AOC Number	Site Name	Location	Year Building and System Built	Year Drain or Septic System Abandoned	Years Septic Tank Effluent Sampled	Year Septic Tank Pumped For the last Time
276	Former Bldg 829X Silver Recovery Sump	TA-I	1948-1978	1994	No septic tank at this site	NA
1004	Bldg 6969 Septic System	Robotic Vehicle Range	1988	System is active	Periodically since 1992	Periodically
1031	Former Bldgs 6589 and 6600 Septic System	TA-III	1967	1991 (septic tank and seepage pit backfilled in 2002)	1990-1991, 1992, 1995	1996
1034	Bldg 6710 Septic System	TA-III	1958	Early 1990s	1990-1991, 1992, 1995	1996
1035	Bldg 6715 Septic System	TA-III	1962	Early 1990s	1990-1991, 1992, 1995	1996
1036	Bldg 6922 Septic System	TA-III	1955	1991	1990-1991, 1992, 1995, 2005	2005
1052	Bldg 803 Seepage Pit	TA-I	1957	Unknown	No septic tank at this site	NA
1078	Bldg 6640 Septic System	TA-III	1959	1991	1990-1991	Unknown (backfilled in 1991)
1079	Bldg 6643 Septic System	TA-III	1989	1991	1990-1991, 1992, 1995, 2005	2005
1080	Bldg 6644 Septic System	TA-III	1989	1991	1990-1991, 1992, 1995	1996
1081	Bldg 6650 Septic System	TA-III	1967 (southern system), Early 1960s (northern system)	1991	1990-1991, 1992, 1995	1996 (south septic tank), Unknown (north septic tank)
1084	Bldg 6505 Septic System	TA-III	1954	1991	1990-1991	Unknown (backfilled before 2002)
1087	Bldg 6743 Seepage Pit	TA-III	1967	2004-2005	No septic tank at this site	NA
1092	MO 228-230 Septic System	TA-III	1988	1991	1990-1991	Unknown (backfilled before 2002)
1098	TA-V Plenum Rooms Drywell	TA-V	1958	Late 1990s	No septic tank at this site	NA
1102	Former Bldg 889 Septic System	TA-I	Early 1950s	Early 1990s	1992-1995	Unknown (removed prior to 1999)
1104	Bldg 6595 Seepage Pit	TA-V	1966	Early 1990s	No septic tank at this site	NA
1113	Bldg 6597 Drywell	TA-V	1971	Prior to 2002	No septic tank at this site	NA
1120	Bldg 6643 Drywell	TA-III	1989	1991	No septic tank at this site	NA

Depth to Groundwater

Depth to groundwater at these 19 AOCs is as follows:

AOC Number	Site Name	Location	Groundwater Depth (ft bgs)
276	Former Bldg 829X Silver Recovery Sump	TA-I	555
1004	Bldg 6969 Septic System	Robotic Vehicle Range	548
1031	Former Bldgs. 6589 and 6600 Septic System	TA-III	486
1034	Bldg 6710 Septic System	TA-III	470
1035	Bldg 6715 Septic System	TA-III	470
1036	Bldg 6922 Septic System	TA-III	490
1052	Bldg 803 Seepage Pit	TA-I	552
1078	Bldg 6640 Septic System	TA-III	476
1079	Bldg 6643 Septic System	TA-III	487
1080	Bldg 6644 Septic System	TA-III	480
1081	Bldg 6650 Septic System	TA-III	480
1084	Bldg 6505 Septic System	TA-III	508
1087	Bldg 6743 Seepage Pit	TA-III	461
1092	MO 228-230 Septic System	TA-III	488
1098	TA-V Plenum Rooms Drywell	TA-V	509
1104	Bldg 6595 Seepage Pit	TA-V	507
1113	Bldg 6597 Drywell	TA-V	515
1120	Bldg 6643 Drywell	TA-III	483

Constituents of Concern

- VOCs
- SVOCs
- PCBs
- HE Compounds
- Metals
- Cyanide
- Radionuclides

Investigations

- A backhoe was used to positively locate buried components (drainfield drain lines, drywells) for placement of soil vapor samplers, and soil borings.
- Ten of the 19 AOCs were selected by NMED for passive soil-vapor sampling to screen for VOCs; no significant VOC contamination was identified at any of the ten sites.
- Soil samples were collected from directly beneath drainfield drain lines, seepage pits, and drywells to determine if COCs were released to the environment from drain systems.
- Four of the sites were selected by NMED for active soil vapor sampling to screen for VOCs. Each of the active soil-vapor monitoring wells was 150 ft deep with vapor sampling ports at 5, 20, 70, 100, and 150-ft bgs. The VOC concentrations were significantly lower than the 10 ppmv action level established by NMED.

The years that site-specific characterization activities were conducted and soil sampling depths at each of these 19 AOC sites are as follows:

AOC Number	Site Name	Buried Components (Drain Lines, Drywells) Located With a Backhoe	Soil Sampling Beneath Drainlines, Seepage Pits, Drywells	Type(s) of Drain System, and Soil Sampling Depths (ft bgs)	Passive Soil Vapor Sampling	Active Soil Vapor Monitor Well Installation and Sampling
276	Former Bldg 829X Silver Recovery Sump	None	1994, 2002	Silver Recovery Sump 8, 13	2002	None
1004	Bldg 6969 Septic System	2002	2002	Drainfield 8, 13	2002	2003
1031	Former Bldgs 6589 and 6600 Septic System	2002	2002	Seepage Pits 15, 20	2002	None
1034	Bldg 6710 Septic System	None	2002	Seepage Pit 14, 19	2002	None
1035	Bldg 6715 Septic System	None	2002	Seepage Pit 11, 16	2002	None
1036	Bldg 6922 Septic System	1997	1998, 1999	Drainfield 5, 10	None	None
1052	Bldg 803 Seepage Pit	None	2002	Seepage Pit 27, 27	2002	2003
1078	Bldg 6640 Septic System	2002	2002	Drainfield 5, 10	None	None
1079	Bldg 6643 Septic System	2002	2002	Drainfield 11, 16	None	None
1080	Bldg 6644 Septic System	2002	2002	Drainfield Borehole 1 & 2 5, 10 Borehole 3 6, 11	None	None
1081	Bldg 6650 Septic System	2003 (north septic tank)	2002	South seepage pit 10, 12, 15, 17 North seepage pit 10, 12, 15, 17, 20, 24, 25	2002	2003
1084	Bldg 6505 Septic System	2002	2002	Drainfield 3, 8	2002	None
1087	Bldg 6743 Seepage Pit	None	2002	Seepage Pit 8, 13	2002	None
1092	MO 228-230 Septic System	2002-2003	2002	Drainfield 6, 11	None	2003
1098	TA-V Plenum Rooms Drywell	None	2002	Drywell 10, 15	None	None
1102	Former Bldg 889 Septic System	1999-2002	2002	Seepage Pit 25, 30	None	None
1104	Bldg 6595 Seepage Pit	None	2002	Seepage Pit 11, 16	None	None
1113	Bldg 6597 Drywell	2002	2002	Drywell 5, 10	None	None
1120	Bldg 6643 Drywell	2002	2002	Drywell 8, 13	2002	None

For More Information Contact

U.S. Department of Energy
Sandia Site Office
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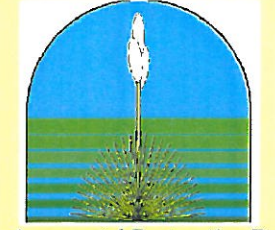
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This work supported by the United States Department of Energy under contract DE-AC04-94-185000.



Drain and Septic Systems - Areas of Concern (AOCs) 276, 1004, 1031, 1034, 1035, 1036, 1052, 1078, 1079, 1080, 1081, 1084, 1087, 1092, 1098, 1102, 1104, 1113, and 1120 (Poster 2/2)



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Summary of Data Used for NFA Justification

- Soil samples were analyzed at on- and off-site laboratories for VOCs, SVOCs, PCBs, HE compounds, metals, cyanide, gross alpha/beta activity, and radionuclides by gamma spectroscopy.
- There were VOCs detected at the 19 sites, SVOCs were detected at 15 of the sites, PCBs were detected at 9 sites, and cyanide was identified at 14 of the sites. HE compounds were detected at one of the sites (AOC 1113).
- Barium was detected at concentrations above the background value at six sites. Chromium and arsenic were detected at concentrations above background values at five sites. Silver was detected at concentrations above the background value at three sites, lead was detected above the background value at two sites, and mercury was detected above the background value at one site. No other metals were detected above background concentrations.
- Uranium-235 was detected at an activity slightly above the background activity at 5 of the 19 sites and, although not detected, the MDA for U-235 exceeded the background activity at 14 sites and the MDA for U-238 exceeded the background activity at one site. Gross alpha activity was slightly above background activity at five of the 19 sites, and gross beta activity was above the background activity at one site.
- All confirmatory soil sample analytical results for each site were used for characterizing that site, for performing the risk screening assessment, and as justification for the NFA proposal for the site.

Recommended Future Land Use

- Industrial land use was established for these 19 AOC sites.

Results of Risk Analysis

- Risk assessment results for industrial and residential land-use scenarios are calculated per NMED risk assessment guidance as presented in "Supplemental Risk Document Supporting Class 3 Permit Modification Process."
- Because COCs were present in concentrations greater than background-screening levels or because constituents were present that did not have background-screening numbers, it was necessary to perform risk assessments for these all of these AOCs. The risk assessment analysis evaluated the potential for adverse health effects for industrial and residential land-use scenarios.
- The maximum concentration value for lead was 22.2 mg/kg at AOC 1081 and 11.9 mg/kg at AOC 1087; these exceed the background value of 11.8 mg/kg. The EPA intentionally does not provide any human health toxicological data on lead; therefore, no risk parameter values could be calculated. The NMED guidance for lead screening concentrations for construction and industrial land-use scenarios are 750 and 1,500 mg/kg, respectively. The EPA screening guidance value for a residential land-use scenario is 400 mg/kg. The maximum concentration for lead at these two sites are less than all the screening values; therefore, lead was eliminated from further consideration in the human health risk assessment for each site.
- The non-radiological total human health HIs for 18 of the 19 AOCs are below NMED guidelines for a residential land-use scenario.
- For four sites, the total estimated excess cancer risks are at or slightly above the residential land-use scenario guideline. However, the incremental excess cancer risk values for these four sites are below the NMED residential land-use scenario guideline.
- For one of the 19 sites (AOC 1081), the total HI and the estimated excess cancer risk are above the NMED guidelines for the residential land-use scenario due to elevated levels of arsenic and silver. However, the total HI and estimated excess cancer risk values are below the NMED guidelines for the industrial land-use scenario.
- The total human health TEDEs for industrial land-use scenarios ranged from 0.001 to 0.46 mrem/yr, all of which are substantially below the EPA numerical guideline of 15 mrem/yr. The total human health TEDEs for residential land-use scenarios ranged from 0.0052 to 0.12 mrem/yr, all of which are substantially below the EPA numerical guideline of 75 mrem/yr. Therefore, these AOCs are eligible for unrestricted radiological release.
- Using the SNL predictive ecological risk and scoping assessment methodologies, it was concluded that a complete ecological pathway for each of 18 of the sites was not associated with the respective COPELs for that site. Thus, a more detailed ecological risk assessment to predict the level of risk was not deemed necessary for these sites.
- Ecological risks associated with AOC 1084 were predicted incorporating potential receptors and site-specific COPELs. The HQ values predicted were less than one, with the exception of barium. For barium, the contribution from background concentrations accounts for the majority (52%) of the HQ values. Therefore, ecological risks associated with this site are expected to be low.
- In conclusion, human health and ecological risks are acceptable for 18 sites for a residential land-use scenario and for all 19 for an industrial land-use scenario per NMED guidance. Thus, 18 of these sites are proposed for CAC without institutional controls, and one site (AOC 1081) is proposed for CAC with institutional controls.

The total HIs and excess cancer risk values for the nonradiological COCs at the 19 AOCs are as follows:

The total HIs and excess cancer risk values for the nonradiological COCs at the 19 AOCs are as follows:

AOC Number	Site Name	Residential Land-Use Scenario	
		Total Hazard Index	Excess Cancer Risk
276	Former Bldg 829X Silver Recovery Sump	0.27	2E-5 Total ^a 3.95E-6 Incremental
1004	Bldg 6969 Septic System	0.08	2E-6 Total
1031	Former Bldgs. 6589 and 6600 Septic System	0.25	1E-5 Total ^a 2.55E-6 Incremental
1034	Bldg 6710 Septic System	0.00	2E-9 Total
1035	Bldg 6715 Septic System	0.04	3E-9 Total
1036	Bldg 6922 Septic System	0.26	1E-5 Total ^a 8.35E-7 Incremental
1052	Bldg 803 Seepage Pit	0.00	2E-6 Total
1078	Bldg 6640 Septic System	0.27	1E-5 Total ^a 3.72E-7 Incremental
1079	Bldg 6643 Septic System	0.00	3E-8 Total
1080	Bldg 6644 Septic System	0.00	4E-8 Total
1084	Bldg 6505 Septic System	0.08	None
1087	Bldg 6743 Seepage Pit	0.00	4E-9 Total
1092	MO 228-230 Septic System	0.06	None
1098	TA-V Plenum Rooms Drywell	0.03	3E-7 Total
1102	Former Bldg 889 Septic System	0.00	1E-10 Total
1104	Bldg 6595 Seepage Pit	0.00	2E-6 Total
1113	Bldg 6597 Drywell	0.14	1E-7 Total
1120	Bldg 6643 Drywell	0.12	1E-6 Total
<i>NMED Guidance for Residential Land Use</i>		< 1	<1E-5
AOC Number	Site Name	Industrial Land-Use Scenario	
		Total Hazard Index	Excess Cancer Risk
1081	Bldg 6650 Septic System	0.39	5E-6 Total
<i>NMED Guidance for Industrial Land Use</i>		< 1	<1E-5

^aMaximum value exceeds NMED guidance for specified land-use scenario, therefore, incremental values are shown.

For More Information Contact

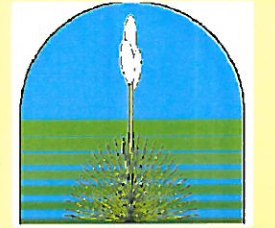
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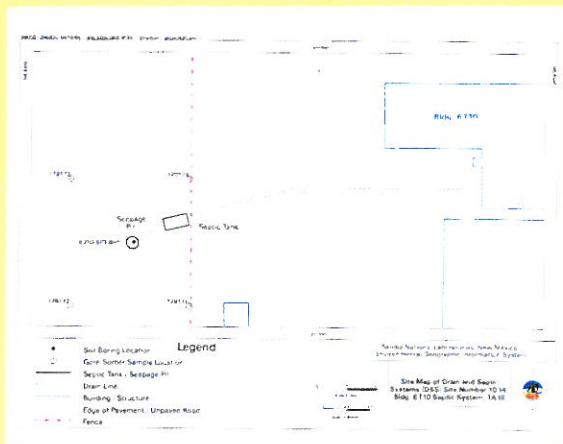
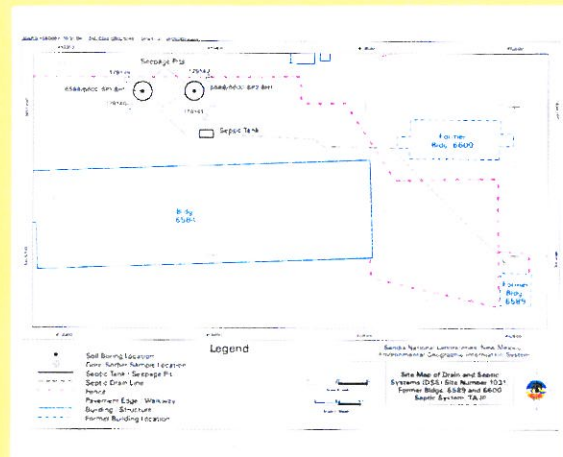
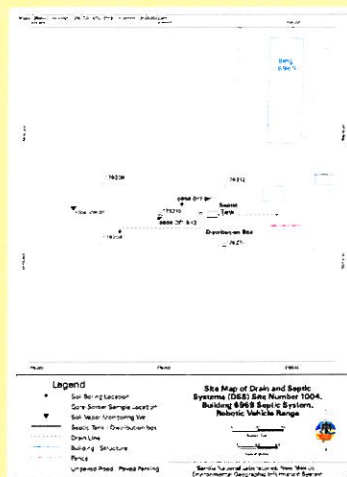
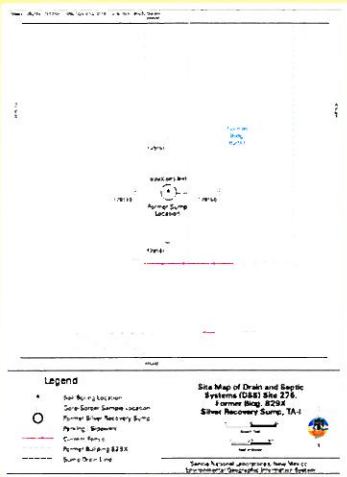


This work supported by the United States Department of Energy under contract DE-AC04-94185000.

Drain and Septic Systems (DSS) Areas of Concern (AOCs) 276, 1004, 1031, 1034, 1035 1036, 1052



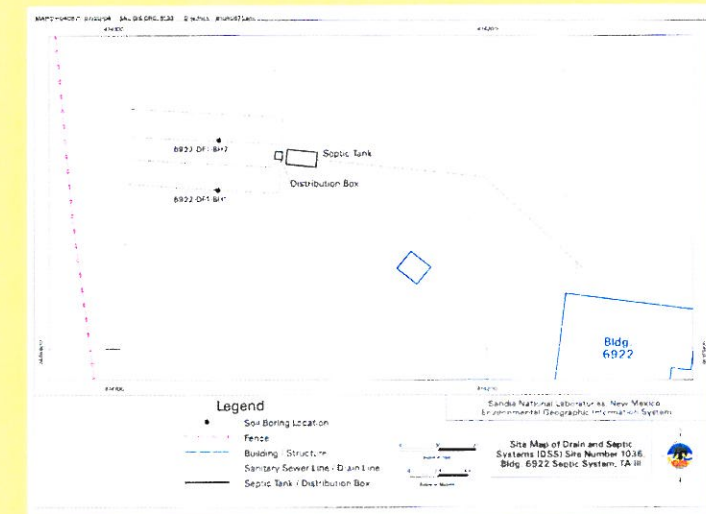
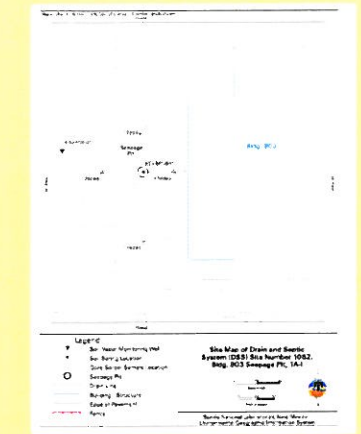
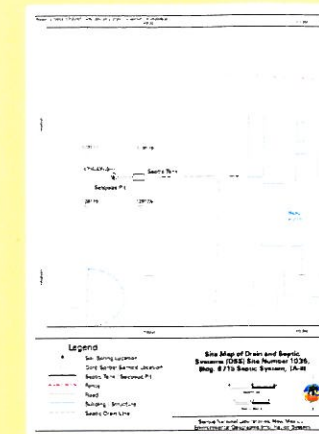
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Septic system demolition and backfilling.



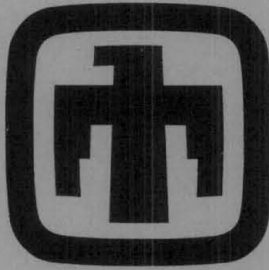
Three-foot long Geoprobe soil sampling device used to collect soil samples.



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Sandia National Laboratories

Justification for Class III Permit Modification

September 2005

DSS Site 1102

Operable Unit 1295

Former Building 889 Septic System at
Technical Area I

CAC (SWMU Assessment Report) Submitted December 2004

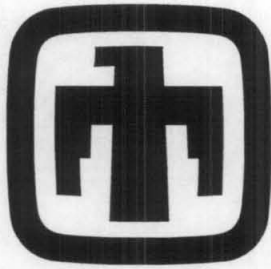
RSI Submitted March 2005

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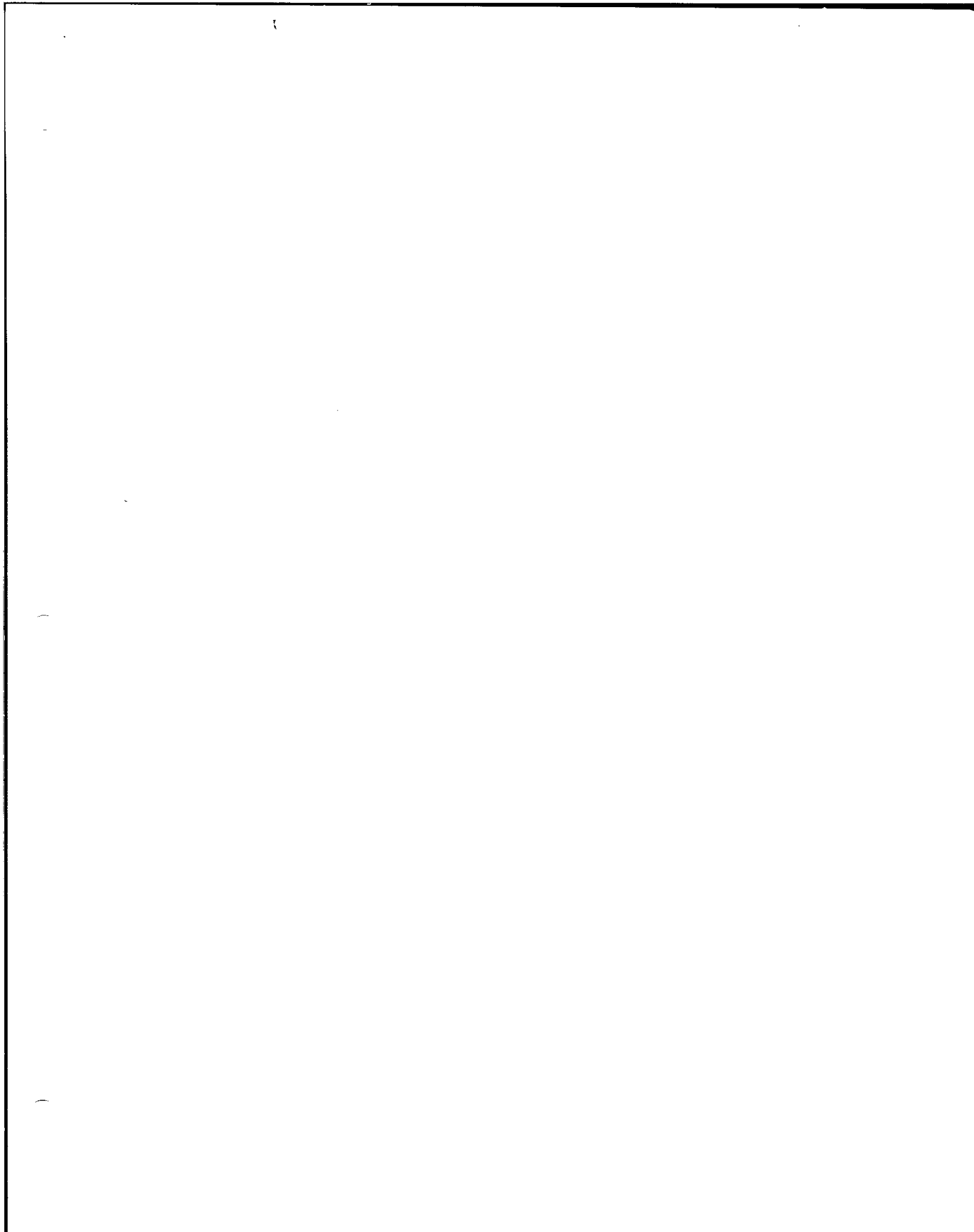
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RSI Submitted April 2005

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United States Department of Energy
Sandia Site Office



CAC



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DEC 1 6 2004

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

**Mr. James Bearzi, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Road East, Building 1
Santa Fe, NM 87505**

Dear Mr. Bearzi:

On behalf of the Department of Energy (DOE) and Sandia Corporation, DOE is submitting the enclosed Solid Waste Management Unit (SWMU) Assessment Reports and Proposals for Corrective Action Complete for Drain and Septic Systems (DSS) Sites 276, 1004, 1031, 1052, 1080, 1087, 1090, 1102, and 1113 at Sandia National Laboratories, New Mexico, EPA ID No. NM5890110518. These documents are compiled as DSS Round 7 and No Further Action (NFA) Batch 25.

This submittal includes descriptions of the site characterization work and risk assessments for the above referenced DSS Sites. The risk assessments conclude that for these sites: (1) there is no significant risk to human health under either the industrial or residential land-use scenarios; and (2) that there are no ecological risks associated with these sites.

Based on the information provided, DOE and Sandia are requesting a determination of Corrective Action Complete without controls for these DSS sites.

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

Sincerely,

**Patty Wagner
Manager**

Enclosure



Mr. J. Bearzi

(2)

DEC 1 6 2004

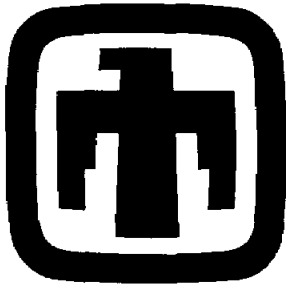
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Sandia National Laboratories/New Mexico
Environmental Restoration Project

**SWMU ASSESSMENT REPORT AND
PROPOSAL FOR
CORRECTIVE ACTION COMPLETE
DRAIN AND SEPTIC SYSTEMS SITE 1102,
FORMER BUILDING 889 SEPTIC SYSTEM**

December 2004



United States Department of Energy
Sandia Site Office

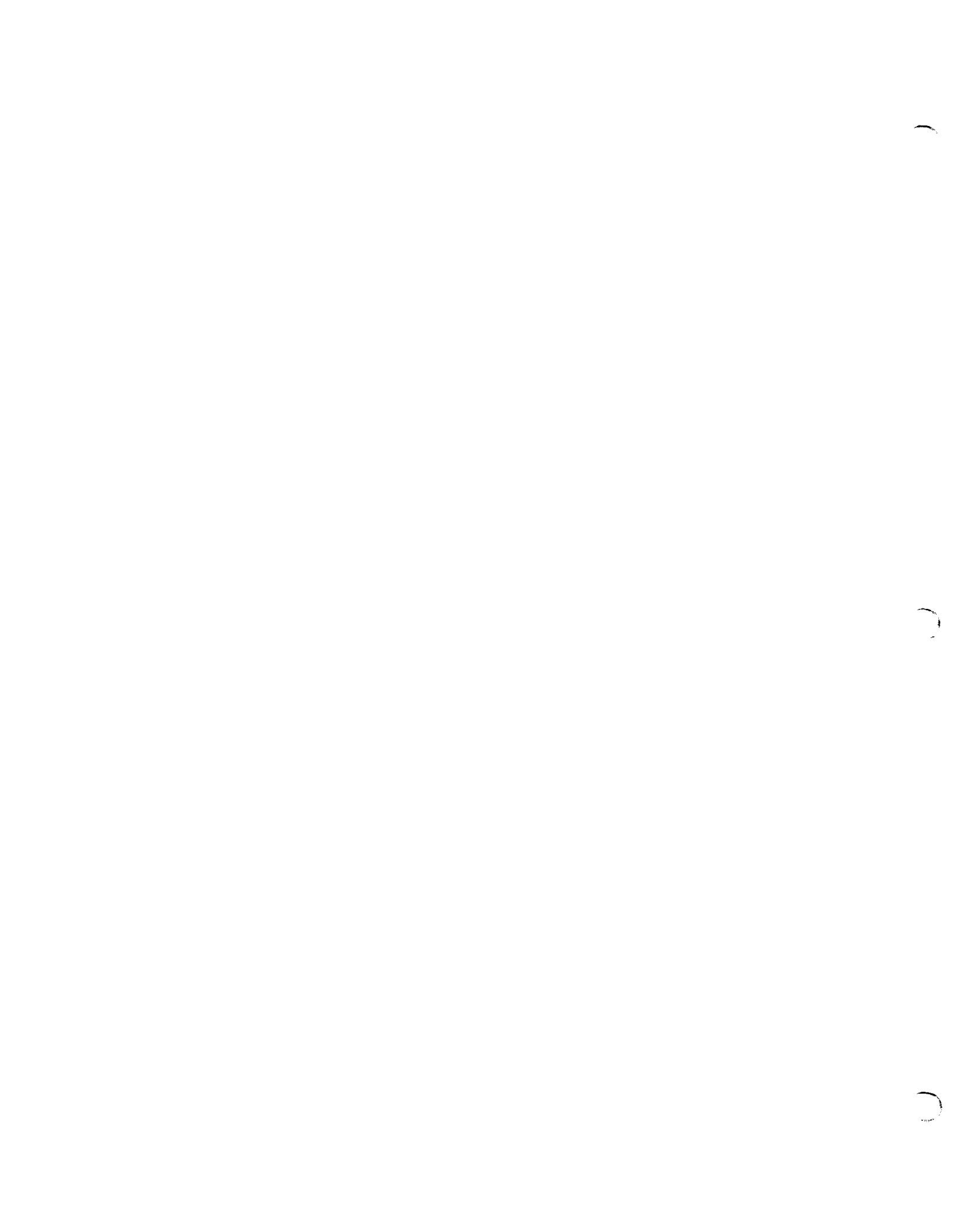


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LIST OF ANNEXES

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- A DSS Site 1102 Septic Tank Sampling Results
- B DSS Site 1102 Soil Sample Data Validation Results
- C DSS Site 1102 Risk Assessment

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ACRONYMS AND ABBREVIATIONS

AOP	Administrative Operating Procedure
BA	butyl acetate
bgs	below ground surface
CAC	Corrective Action Complete
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
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
TOP	Technical Operating Procedure
VOC	volatile organic compound
yr	year

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1.0 PROJECT BACKGROUND

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

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

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

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

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

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

2.0 DSS SITE 1102: FORMER BUILDING 889 SEPTIC SYSTEM

2.1 Summary

The SNL/NM ER Project conducted an assessment of DSS Site 1102, the Former Building 889 Septic System. There are no known or specific environmental concerns at this site. The assessment was conducted to determine whether environmental contamination was released to the environment via the septic system present at the site. This report provides documentation that the site was specifically characterized, that no significant releases of contaminants to the environment occurred via the Former Building 889 Septic System, and that it does not pose a threat to human health or the environment under either the industrial or residential land-use scenarios. Building 889 was demolished in the early 1990s, and it is assumed that the septic system was abandoned at that time.

Review and analysis of all relevant data for DSS Site 1102 indicate that concentrations of constituents of concern (COCs) at this site were found to be below applicable risk assessment action levels. Thus, a determination of Corrective Action Complete (CAC) without controls (NMED April 2004) is recommended for DSS Site 1102 based upon sampling data demonstrating that COCs released from the site into the environment pose an acceptable level of risk.

2.2 Site Description and Operational History

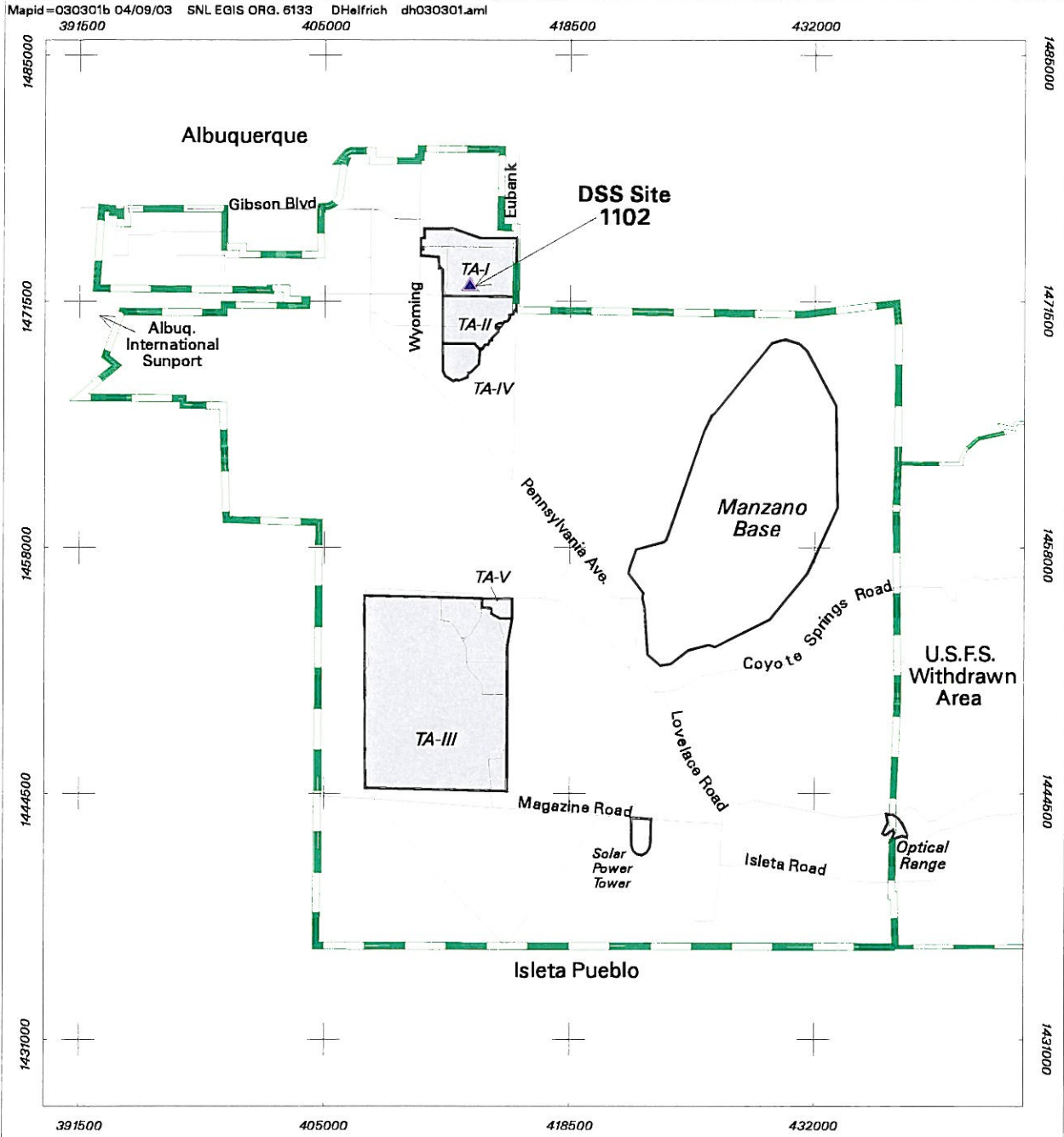
2.2.1 Site Description

DSS Site 1102 is located in SNL/NM Technical Area (TA)-I on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy. The site is located approximately 700 feet north of the Hardin and 14th Streets intersection (Figure 2.2.1-1). The septic tank and seepage pit are located approximately 20 and 40 feet south of the southwest corner of the former Building 889 (Figure 2.2.1-2). The abandoned septic system consisted of a 500-gallon septic tank connected to a single 8-foot diameter and 25-foot deep seepage pit (Figure 2.2.1-2). Construction details are based upon engineering drawings (SNL/NM December 1985), site inspections, and backhoe excavations of the system.

The surface geology at DSS Site 1102 is characterized by a veneer of aeolian sediments underlain by Upper Santa Fe Group alluvial fan deposits that interfinger with sediments of the ancestral Rio Grande west of the site. These deposits extend to, and probably far below, the water table at this site. The alluvial fan materials originated in the Manzanita Mountains east of DSS Site 1102, and typically consist of a mixture of silts, sands, and gravels that are poorly sorted, and exhibit moderately connected lenticular bedding. Individual beds range from 1 to 5 feet in thickness with a preferred east-west orientation and have moderate to low hydraulic conductivities (SNL/NM March 1996). Most of the area immediately surrounding the site is paved.

The ground surface in the vicinity of the site is flat to very slightly sloping to the northeast. The closest major drainage is Tijeras Arroyo located approximately 0.75 miles south of the site. No

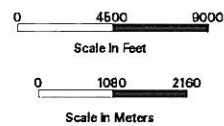
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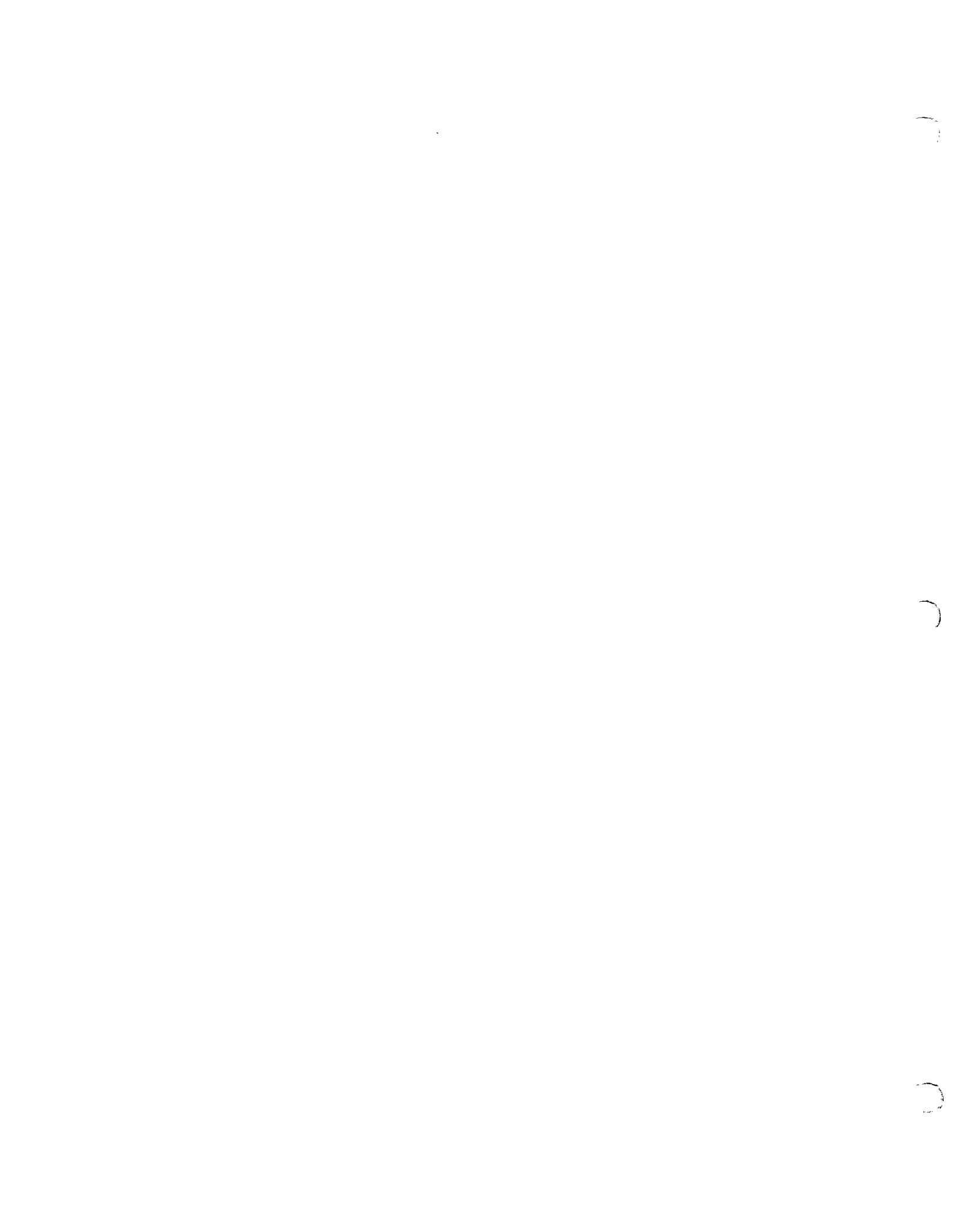
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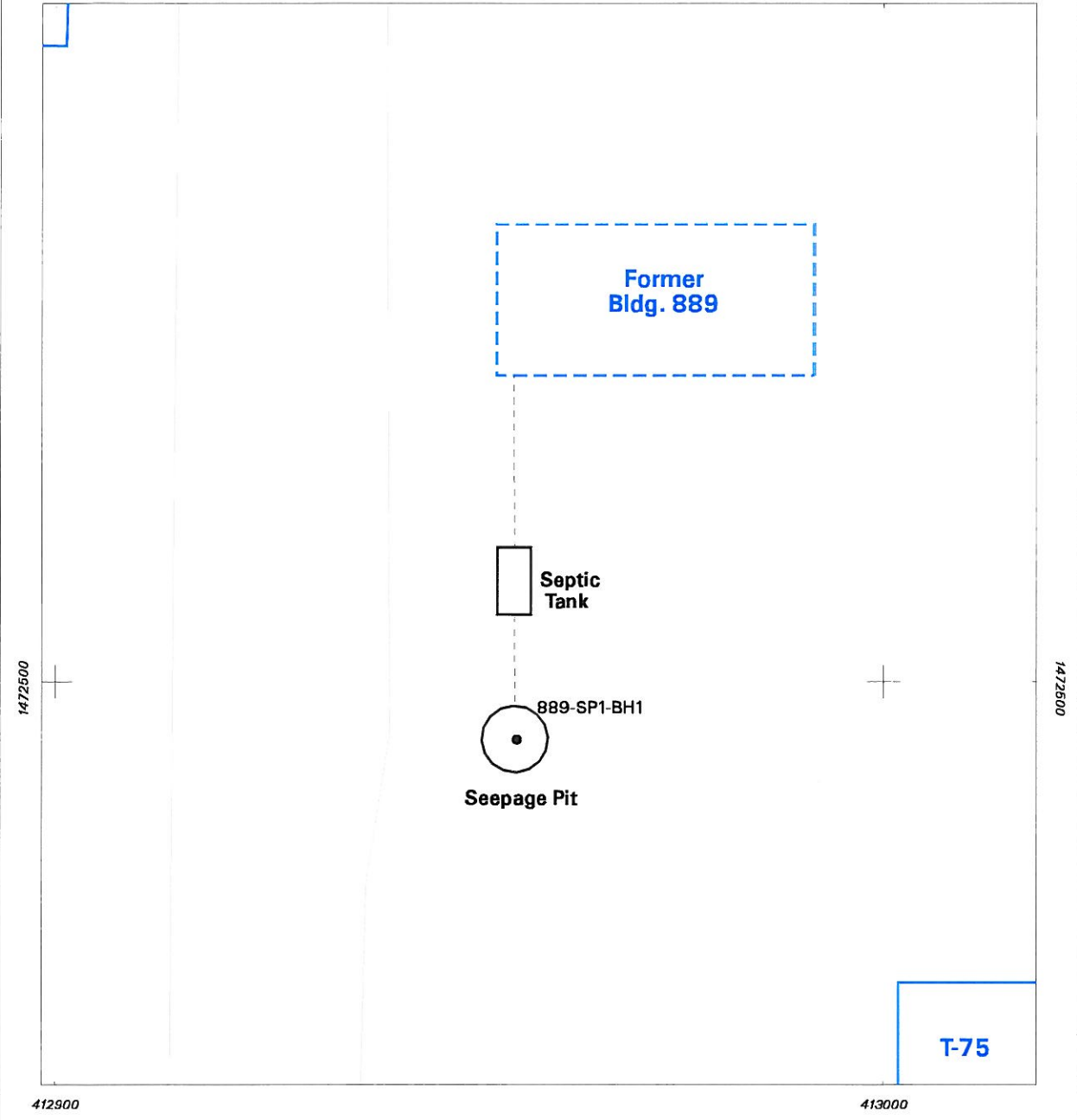
-  DSS Site 1102
-  Major Road
-  KAFB Boundary
-  USFS Withdrawn Area Boundary
-  SNL Technical Area

Figure 2.2.1-1
Location Map of Drain and Septic Systems (DSS) Site Number 1102, Former Bldg. 889 Septic System, TA-I



Sandia National Laboratories, New Mexico
 Environmental Geographic Information System





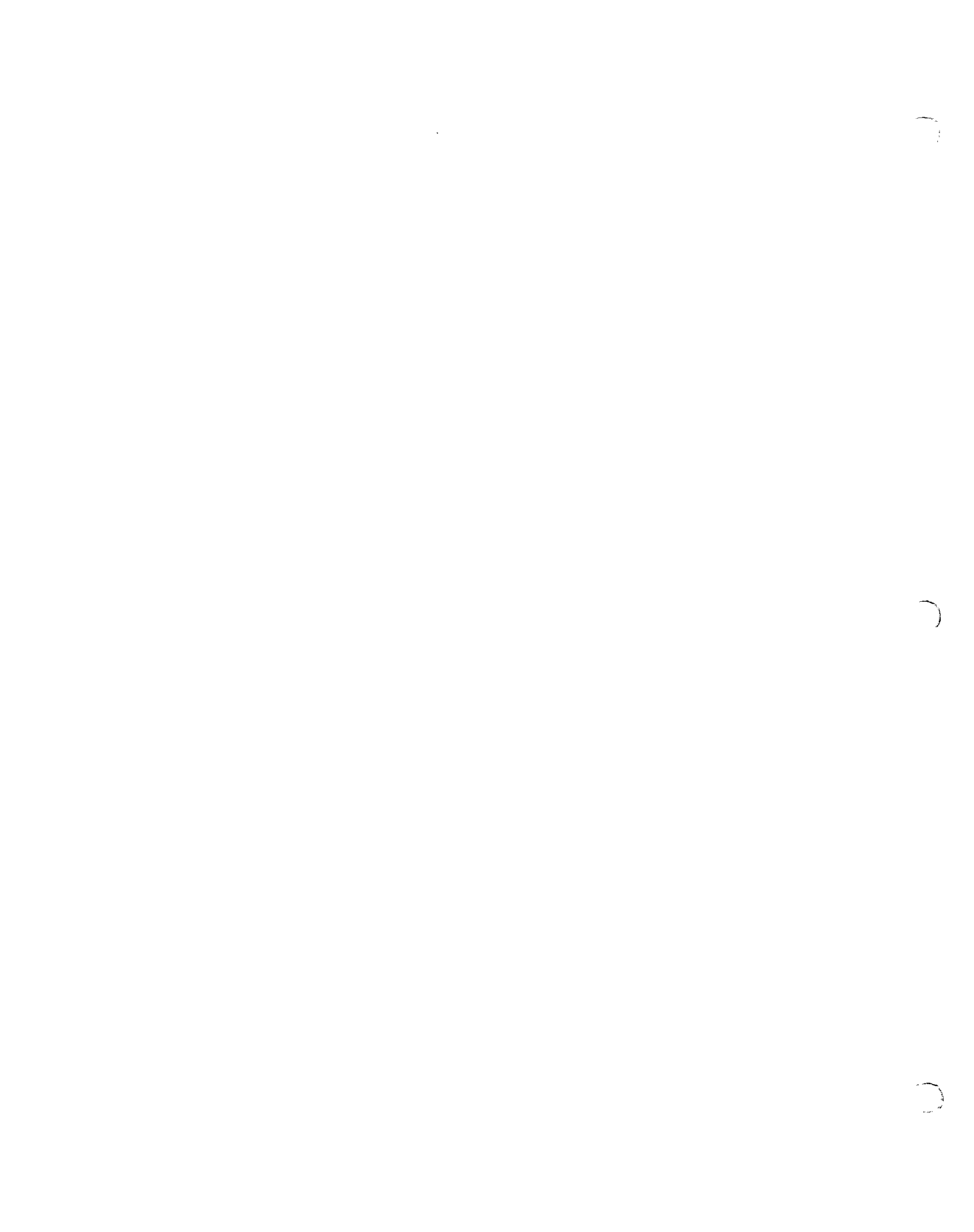
Legend

- Soil Boring Location
- Septic Tank / Seepage Pit
- - - Drain Line
- - - Former Building 889
- Paved Road
- Building / Structure

Figure 2.2.1-2
Site Map of Drain and Septic
Systems (DSS) Site Number 1102,
Former Building 889
Septic System, TA-I



Sandia National Laboratories, New Mexico
Environmental Geographic Information System



perennial surface-water bodies are present in the vicinity of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration rates for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996).

The site lies at an average elevation of approximately 5,425 feet above mean sea level (SNL/NM April 2003). Two water-bearing zones, a shallow groundwater system and the regional aquifer, underlie this site. Depth to the shallow groundwater system, which has a limited lateral extent and is present beneath the north-central part of KAFB, is approximately 310 feet below ground surface (bgs) at the site. The shallow groundwater system is not used as a water supply source. Depth to regional groundwater is approximately 535 feet bgs at the site. Both the City of Albuquerque and KAFB use the regional aquifer as a water supply source. Groundwater flow in the shallow system is to the southeast, while that in the regional aquifer is the northwest beneath DSS Site 1102 (SNL/NM May 2003). The nearest production wells to DSS Site 1102 are KAFB-1, approximately 1 mile to the west, and KAFB-11, approximately 1.1 miles to the southeast. The nearest groundwater monitoring wells are the TAI-W-02/TAI-W-06 well pair located, approximately 800 feet southwest of the site.

2.2.2 Operational History

Available information indicates that the former Building 889 was constructed in the early 1950s (SNL/NM January 1952), and it is assumed the septic system was constructed at the same time. The building was demolished in the early 1990s, and it is assumed that the septic system was abandoned at that time. Because operational records are not available, the site investigation was planned to be consistent with other DSS site investigations and to sample for possible COCs that may have been released during facility operations.

2.3 Land Use

2.3.1 Current Land Use

The current land use for DSS Site 1102 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1102 is industrial (DOE et al. September 1995).

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3.0 INVESTIGATORY ACTIVITIES

3.1 Summary

Three assessment investigations have been conducted at this site. In November 1992 and August 1995, waste characterization samples were collected from the septic tank (Investigation 1). In March 2002, a backhoe was used to physically locate the buried seepage pit at the site (Investigation 2). In September 2002, subsurface soil samples were collected from one boring drilled through the center of, and beneath, the seepage pit (Investigation 3). Investigations 2 and 3 were required by the NMED/HWB to adequately characterize the site and were conducted in accordance with procedures presented in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001) described in Chapter 1.0. These investigations are discussed in the following sections.

3.2 Investigation 1—Septic Tank Sampling

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

On November 10, 1992, and August 3, 1995, as part of the SNL/NM Septic System Monitoring Program, sludge samples were collected from the former Building 889 septic tank. The 1992 sludge samples were analyzed at an off-site laboratory for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), explosives, total metals, phenolic compounds, nitrates/nitrites, formaldehyde, fluoride, cyanide, oil and grease, radium, gross alpha/beta activity, and tritium (SNL/NM June 1993). The 1995 samples were also analyzed at an off-site laboratory for VOCs, SVOCs, pesticides, PCBs, metals, tritium, isotopic plutonium, strontium, thorium, and uranium, and radionuclides by gamma spectroscopy (SNL/NM December 1995). A fraction of each sample was also submitted to the SNL/NM Radiation Protection Sample Diagnostics (RPSD) Laboratory for gamma spectroscopy analysis prior to off-site release. The analytical results for the septic tank sampling are presented in Annex A.

3.3 Investigation 2—Backhoe Excavation

A field inspection was conducted at the site on October 29, 1999, and the location of the septic tank was marked by four protective posts, but no evidence of the tank itself was found. If the tank was still intact at the time, it was subsequently removed as part of the Microsystems and Engineering Science Applications (MESA) facility construction activities. The seepage pit was located and determined to be intact. However, the interior of the seepage pit had been backfilled with soil and the depth of the unit could not be determined. On March 26, 2002, a backhoe was used to excavate along the outside of the unit to determine the average depth of the DSS Site 1102 seepage pit. A hole was excavated to 13.5 feet bgs, the maximum excavation depth of the backhoe, but the base of the seepage pit was not reached. The total depth of the seepage pit was confirmed to be approximately 25 feet bgs during the subsequent soil sampling. No visible evidence of stained or discolored soil or odors indicating residual

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

3.4 Investigation 3—Soil Sampling

Soil sampling was conducted in accordance with the rationale and procedures in the SAP (SNL/NM October 1999) approved by the NMED. On September 6, 2002, soil samples were collected from one borehole drilled through the center of and beneath the seepage pit. The soil boring location is shown on Figure 2.2.1-2. A summary of the borehole, sample depths, sample analyses, analytical methods, laboratories, and sample date is presented in Table 3.4-1.

3.4.1 Soil Sampling Methodology

An auger drill rig was used to sample the borehole at two depth intervals. In the borehole drilled through the center of the seepage pit, the shallow sample interval started at the estimated base of the gravel aggregate in the seepage pit bottom, and the lower (deep) interval started at 5 feet below the top of the upper sample interval. Once the auger rig had reached the top of the sampling interval, a 3- or 4-foot-long by 1.5-inch inside diameter Geoprobe™ sampling tube lined with a butyl acetate (BA) sampling sleeve was inserted into the borehole and hydraulically driven downward 3 or 4 feet to fill the tube with soil.

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

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

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

3.4.2 Soil Sampling Results and Conclusions

Analytical results for the soil samples collected at DSS Site 1102 are presented and discussed in this section.

VOCs

VOC analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.4.2-1. Method detection limits (MDLs) for the VOC soil analyses are presented in Table 3.4.2-2. The VOC 2-butanone was detected in both samples collected from

Table 3.4-1
 Summary of Area Sampled, Analytical Methods, and Laboratories Used for
 DSS Site 1102, Former Building 889 Septic System Soil Samples

Sampling Area	Number of Borehole Locations	Top of Sampling Intervals in Each Borehole (ft.bgs)	Total Number of Soil Samples	Analytical Parameters and EPA Methods ^a	Analytical Laboratory	Date Samples Collected
Seepage Pit	1	25, 30	2	VOCs EPA Method 8260	GEL	09-06-02
	1	25, 30	2	SVOCs EPA Method 8270	GEL	09-06-02
	1	25, 30	2	PCBs EPA Method 8082	GEL	09-06-02
	1	25, 30	2	HE Compounds EPA Method 8330	GEL	09-06-02
	1	25, 30	2	RCRA Metals EPA Methods 6000/7000	GEL	09-06-02
	1	25, 30	2	Hexavalent Chromium EPA Method 7196A	GEL	09-06-02
	1	25, 30	2	Total Cyanide EPA Method 9012A	GEL	09-06-02
	1	25, 30	2	Gamma Spectroscopy EPA Method 901.1	RPSD	09-06-02
	1	25, 30	2	Gross Alpha/Beta Activity EPA Method 900.0	GEL	09-06-02

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

Table 3.4.2-1
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, VOC Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			VOCs (EPA Method 8260 ^a) ($\mu\text{g}/\text{kg}$)
Record Number ^b	ER Sample ID	Sample Depth (ft)	2-Butanone
605668	889-SP1-BH1-25-S	25	6.29
605668	889-SP1-BH1-30-S	30	20.7
Quality Assurance/Quality Control Sample ($\mu\text{g}/\text{L}$)			
605667	6589-6600-S2-TB ^c	NA	ND (2.31)

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

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

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

BH = Borehole.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

ER = Environmental Restoration.

ft = Foot (feet).

ID = Identification.

MDL = Method detection limit.

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

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

NA = Not applicable.

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

S = Soil sample.

SP = Seepage pit.

TB = Trip blank.

VOC = Volatile organic compound.

Table 3.4.2-2
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, VOC Analytical MDLs
 September 2002
 (Off-Site Laboratory)

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

^aEPA November 1986.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

MDL = Method detection limit.

µg/kg = Microgram(s) per kilogram.

VOC = Volatile organic compound.

the borehole. This compound was not detected in the associated trip blank (TB), and is a common contaminant and may not indicate soil contamination at this site.

SVOCs

SVOC analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.4.2-3. MDLs for the SVOC soil analyses are presented in Table 3.4.2-4. No SVOCs were detected in the samples collected at the site.

PCBs

PCB analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.4.2-5. MDLs for the PCB soil analyses are presented in Table 3.4.2-6. The PCB Aroclor-1260 was detected in both samples collected at the site, although the method holding time was exceeded for both samples.

HE Compounds

High explosive (HE) compound analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.4.2-7. MDLs for the HE soil analyses are presented in Table 3.4.2-8. No HE compounds were detected in the soil samples collected from the site.

RCRA Metals and Hexavalent Chromium

Resource Conservation and Recovery Act (RCRA) metals and hexavalent chromium analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.4.2-9. MDLs for the metals in soil analyses are presented in Table 3.4.2-10. None of the metal concentrations detected in the samples exceed the corresponding NMED-approved background concentrations.

Total Cyanide

Total cyanide analytical results for the two soil samples collected from the seepage pit borehole are summarized in Table 3.4.2-11. MDLs for the cyanide soil analyses are presented in Table 3.4.2-12. Cyanide was detected in both soil samples collected from the site.

Radionuclides

Analytical results for the gamma spectroscopy analysis of the two soil samples collected from the seepage pit borehole are summarized in Table 3.4.2-13. Uranium-235 was detected at an activity above the NMED-approved background in the 25-foot-bgs sample from the borehole. Also, although not detected, the minimum detectable activity (MDA) for the uranium-235 analysis in the 30-foot-bgs sample exceeded the background activity because the standard

Table 3.4.2-3
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, SVOC Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			SVOCs (EPA Method 8270 ^a) (µg/kg)
Record Number ^b	ER Sample ID	Sample Depth (ft)	
605668	889-SP1-BH1-25-S	25	ND
605668	889-SP1-BH1-30-S	30	ND

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

BH = Borehole.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

ER = Environmental Restoration.

ft = Foot (feet).

ID = Identification.

µg/kg = Microgram(s) per kilogram.

ND = Not detected.

S = Soil sample.

SP = Seepage pit.

SVOC = Semivolatile organic compound.

Table 3.4.2-4
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, SVOC Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 8270 ^a Detection Limit (µg/kg)
Acenaphthene	8
Acenaphthylene	16.7
Anthracene	16.7
Benzo(a)anthracene	16.7
Benzo(a)pyrene	16.7
Benzo(b)fluoranthene	16.7
Benzo(g,h,i)perylene	16.7
Benzo(k)fluoranthene	16.7
4-Bromophenyl phenyl ether	34
Butylbenzyl phthalate	28.7
Carbazole	16.7
4-Chlorobenzenamine	167
bis(2-Chloroethoxy)methane	12.3
bis(2-Chloroethyl)ether	37.3
bis-Chloroisopropyl ether	11
4-Chloro-3-methylphenol	167
2-Chloronaphthalene	13.7
2-Chlorophenol	15.3
4-Chlorophenyl phenyl ether	19.7
Chrysene	16.7
o-Cresol	26
Dibenz[a,h]anthracene	16.7
Dibenzofuran	17
1,2-Dichlorobenzene	10
1,3-Dichlorobenzene	11.3
1,4-Dichlorobenzene	15.7
3,3'-Dichlorobenzidine	167
2,4-Dichlorophenol	20.7
Diethylphthalate	17.7
2,4-Dimethylphenol	167
Dimethylphthalate	18.3
Di-n-butyl phthalate	24
Dinitro-o-cresol	167
2,4-Dinitrophenol	167
2,4-Dinitrotoluene	25.3
2,6-Dinitrotoluene	33.3
Di-n-octyl phthalate	30.3
Diphenyl amine	22.3
bis(2-Ethylhexyl) phthalate	30
Fluoranthene	16.7
Fluorene	4
Hexachlorobenzene	20

Refer to footnotes at end of table.

Table 3.4.2-4 (Concluded)
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, SVOC Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 8270 ^a Detection Limit ($\mu\text{g}/\text{kg}$)
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-Trichloropheno	17.3
2,4,6-Trichlorophenol	27.3

^aEPA November 1986.

- DSS = Drain and Septic Systems.
- EPA = U.S. Environmental Protection Agency.
- MDL = Method detection limit.
- $\mu\text{g}/\text{kg}$ = Microgram(s) per kilogram.
- SVOC = Semivolatile organic compound.

Table 3.4.2-5
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, PCB Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			PCBs (EPA Method 8082 ^a) ($\mu\text{g}/\text{kg}$)
Record Number ^b	ER Sample ID	Sample Depth (ft)	Aroclor-1260
605668	889-SP1-BH1-25-S	25	7 J (16.7) H
605668	889-SP1-BH1-30-S	30	5.1 J (16.7) H

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

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

BH = Borehole.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

ER = Environmental Restoration.

ft = Foot (feet).

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

ID = Identification.

J () = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.

MDL = Method detection limit.

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

PCB = Polychlorinated biphenyl.

S = Soil sample.

SP = Seepage pit.

Table 3.4.2-6
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, PCB Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 8082 ^a Detection Limit (µg/kg)
Aroclor-1016	5
Aroclor-1221	14.1
Aroclor-1232	8.33
Aroclor-1242	8.33
Aroclor-1248	5
Aroclor-1254	2.5
Aroclor-1260	5

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

Table 3.4.2-7
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, HE Compound Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			HE (EPA Method 8330 ^a) (µg/kg)
Record Number ^b	ER Sample ID	Sample Depth (ft)	
605668	889-SP1-BH1-25-S	25	ND
605668	889-SP1-BH1-30-S	30	ND

^aEPA November 1986.
^bAnalysis request/chain-of-custody record.
 BH = Borehole.
 DSS = Drain and Septic Systems.
 EPA = U.S. Environmental Protection Agency.
 ER = Environmental Restoration.
 ft = Foot (feet).
 HE = High explosive(s).
 ID = Identification.
 µg/kg = Microgram(s) per kilogram.
 ND = Not detected.
 S = Soil sample.
 SP = Seepage pit.

Table 3.4.2-8
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, HE Compound Analytical MDLs
 September 2002
 (Off-Site Laboratory)

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

^aEPA November 1986.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

HE = High Explosive(s).

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.

MDL = Method detection limit.

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

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

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

Table 3.4.2-9
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, Metals Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			Metals (EPA Method 6000/7000/7196A ^a) (mg/kg)									
Record Number ^b	ER Sample ID	Sample Depth (ft)	Arsenic	Barium	Cadmium	Chromium	Chromium (VI)	Lead	Mercury	Selenium	Silver	
605668	889-SP1-BH1-25-S	25	2.53	177 J	0.202 J (0.463)	8.84	ND (0.0523)	5.7	0.00787 J (0.01)	ND (0.15)	ND (0.0835)	
605668	889-SP1-BH1-30-S	30	2.78	182 J	0.271 J (0.472)	11.8	ND (0.0519)	6.84	0.00857 J (0.00992)	ND (0.153)	ND (0.0851)	
Background Concentration---North Area Supergroup ^c			4.4	200	0.9	12.8	NC	11.2	<0.1	<1	<1	

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

^cDinwiddie September 1997.

BH = Borehole.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

ER = Environmental Restoration.

ft = Foot (feet).

ID = Identification.

J = Analytical result was qualified as an estimated value.

J () = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.

MDL = Method detection limit.

mg/kg = Milligram(s) per kilogram.

NC = Not calculated.

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

S = Soil sample.

SP = Seepage pit.

Table 3.4.2-10
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, Metals Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 6000/7000/7196A ^a Detection Limit (mg/kg)
Arsenic	0.191-0.195
Barium	0.0618-0.0629
Cadmium	0.0443-0.0451
Chromium	0.149-0.152
Chromium (VI)	0.0519-0.0523
Lead	0.263-0.268
Mercury	0.000975-0.000983
Selenium	0.15-0.153
Silver	0.0835-0.0851

^aEPA November 1986.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

MDL = Method detection limit.

mg/kg = Milligram(s) per kilogram.

Table 3.4.2-11
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, Total Cyanide Analytical Results
 September 2002
 (Off-Site Laboratory)

Sample Attributes			Total Cyanide (EPA Method 9012A ^a) (mg/kg)
Record Number ^b	ER Sample ID	Sample Depth (ft)	
605668	889-SP1-BH1-25-S	25	0.0833 J (0.25)
605668	889-SP1-BH1-30-S	30	0.0525 J (0.208)

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

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

BH = Borehole.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

ER = Environmental Restoration.

ft = Foot (feet).

ID = Identification.

J () = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.

mg/kg = Milligram(s) per kilogram.

S = Soil sample.

SP = Seepage pit.

Table 3.4.2-12
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, Total Cyanide Analytical MDLs
 September 2002
 (Off-Site Laboratory)

Analyte	EPA Method 9012A ^a Detection Limit (mg/kg)
Total Cyanide	0.035-0.0419

^aEPA November 1986.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

MDL = Method detection limit.

mg/kg = Milligram(s) per kilogram.

Table 3.4.2-13
 Summary of DSS Site 1102, Former Building 889 Septic System
 Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
 September 2002
 (On-Site Laboratory)

Sample Attributes		Activity (EPA Method 901.1 ^a) (pCi/g)												
Record Number ^b	ER Sample ID	Sample Depth (ft)	Cesium-137			Thorium-232			Uranium-235			Uranium-238		
			Result	Error ^c		Result	Error ^c		Result	Error ^c	Result	Error ^c	Result	Error ^c
605747	889-SP1-BH1-25-S	25	ND (0.0362)	--	0.828	0.401	0.351	0.184	ND (0.555)	--	ND (0.532)	--		
605747	889-SP1-BH1-30-S	30	ND (0.0367)	--	0.797	0.375	ND (0.206)	--	ND (0.532)	--	ND (0.532)	--		
Background Activity—North Area Supergroup ^d			0.084	NA	1.54	NA	0.18	NA	1.3					

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

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

^cTwo standard deviations about the mean detected activity.

^dDinwiddle September 1997.

- BH = Borehole.
- DSS = Drain and Septic Systems.
- EPA = U.S. Environmental Protection Agency.
- ER = Environmental Restoration.
- ft = Foot (feet).
- ID = Identification.
- MDA = Minimum detectable activity.
- NA = Not applicable.
- ND () = Not detected above the MDA, shown in parentheses.
- ND () = Not detected, but the MDA (shown in parentheses) exceeds background activity.
- pCi/g = Picocurie(s) per gram.
- S = Soil sample.
- SP = Seepage pit.
- = Error not calculated for nondetect results.

gamma spectroscopy count time for soil samples (6,000 seconds) was not sufficient to reach the NMED-approved background activity established for SNL/NM soils. Even though the MDA may be slightly elevated, it is still very low, and the risk assessment outcome for the site is not significantly impacted by its use.

Gross Alpha/Beta Activity

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

Table 3.4.2-14
Summary of DSS Site 1102, Former Building 889 Septic System
Confirmatory Soil Sampling, Gross Alpha/Beta Activity Analytical Results
September 2002
(Off-Site Laboratory)

Sample Attributes			Activity (EPA Method 900.0 ^a) (pCi/g)			
Record Number ^b	ER Sample ID	Sample Depth (ft)	Gross Alpha		Gross Beta	
			Result	Error ^c	Result	Error ^c
605668	889-SP1-BH1-25-S	25	11.1	2.01	18.5	1.88
605668	889-SP1-BH1-30-S	30	11.9	2.03	20.1	2.16
Background Activity ^d			17.4	NA	35.4	NA

^aEPA November 1986.

^bAnalysis request/chain-of-custody record.

^cTwo standard deviations about the mean detected activity.

^dMiller September 2003.

BH = Borehole.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

ER = Environmental Restoration.

ft = Foot (feet).

ID = Identification.

NA = Not applicable.

pCi/g = Picocurie(s) per gram.

S = Soil sample.

SP = Seepage pit.

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

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

results for the EB samples appear only on the data tables for the site where they were collected. However, the results were used in the data validation process for all the samples in that batch.

Aqueous TB samples, for VOC analysis only, were included in every sample cooler containing VOC soil samples. The analytical results for the TB samples appear on the VOC data tables for the sites in that shipment. The results were used in the data validation process for all the samples in that batch. No VOCs were detected in the TB for DSS Site 1102 (Table 3.4.2-1).

No duplicate or EB samples were collected at this site.

All laboratory data were reviewed and verified/validated according to "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00-03 (SNL/NM December 1999). Annex B contains the data validation reports for the samples collected at this site. In addition, SNL/NM Department 7713 (RPSD Laboratory) reviewed all gamma spectroscopy results according to "Laboratory Data Review Guidelines," Procedure No. RPSD-02-11, Issue No. 2 (SNL/NM July 1996). The data are acceptable for use in this request for a determination of CAC without controls.

3.5 Site Sampling Data Gaps

Analytical data from the site assessment were sufficient for characterizing the nature and extent of possible COC releases. There are no further data gaps regarding characterization of DSS Site 1102.

4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS Site 1102, the Former Building 889 Septic System, is based upon the COCs identified in the soil samples collected from beneath the seepage pit at this site. This section summarizes the nature and extent of contamination and the environmental fate of the COCs.

4.1 Nature and Extent of Contamination

Potential COCs at DSS Site 1102 are VOCs, SVOCs, PCBs, HE compounds, cyanide, RCRA metals, hexavalent chromium, and radionuclides. No SVOCs or HE compounds were detected in any of the soil samples collected at this site. None of the eight RCRA metals were detected at concentrations above the approved maximum background concentrations for SNL/NM North Supergroup soils (Dinwiddie September 1997).

One VOC (2-butanone) and one PCB (Aroclor-1260) were detected in both samples collected from the site. Hexavalent chromium was not detected in either sample, and cyanide was detected in both samples, but because neither of these COCs have quantified background screening concentrations, it is unknown whether these COCs exceed background.

Uranium-235 exceeded the corresponding background activity in the 25-foot-bgs soil sample, and the MDA for the uranium-235 analysis in the 30-foot-bgs sample also exceeded the corresponding background activity. Finally, no gross alpha/beta activity was detected above the New Mexico-established background levels.

4.2 Environmental Fate

Potential COCs may have been released into the vadose zone via aqueous effluent discharged from the seepage pit. Possible secondary release mechanisms include the uptake of COCs that may have been released into the soil beneath the seepage pit (Figure 4.2-1). The depth to regional groundwater at the site (approximately 535 feet bgs) most likely precludes migration of potential COCs into the groundwater system. The potential pathways to receptors include soil ingestion, dermal contact, and inhalation, which could occur as a result of receptor exposure to contaminated subsurface soil at the site. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Annex C provides additional discussion on the fate and transport of COCs at DSS Site 1102.

Table 4.2-1 summarizes the potential COCs for DSS Site 1102. 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 1102 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;

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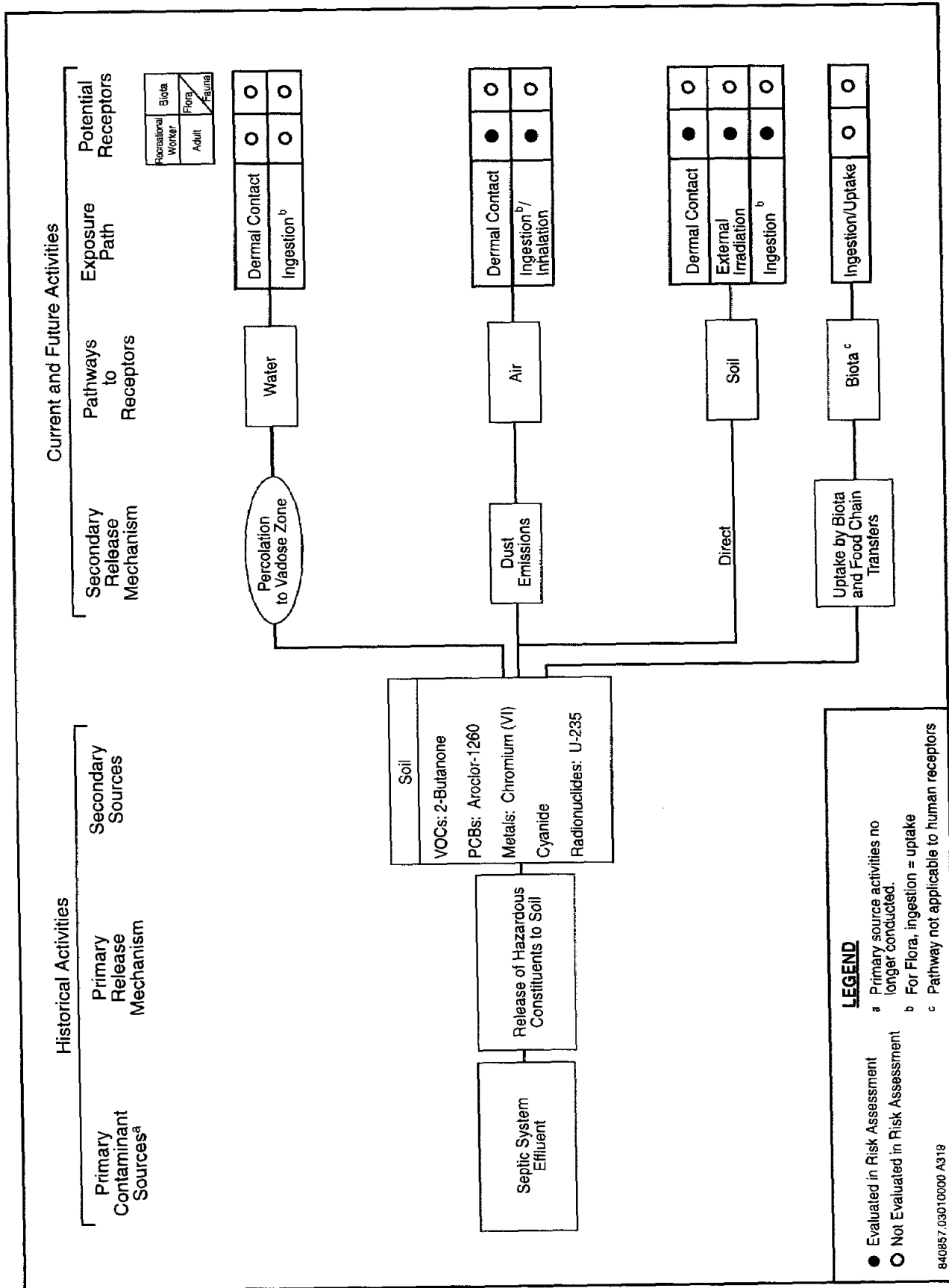


Figure 4.2-1
Conceptual Site Model Flow Diagram for DSS Site 1102, Former Building 889 Septic System

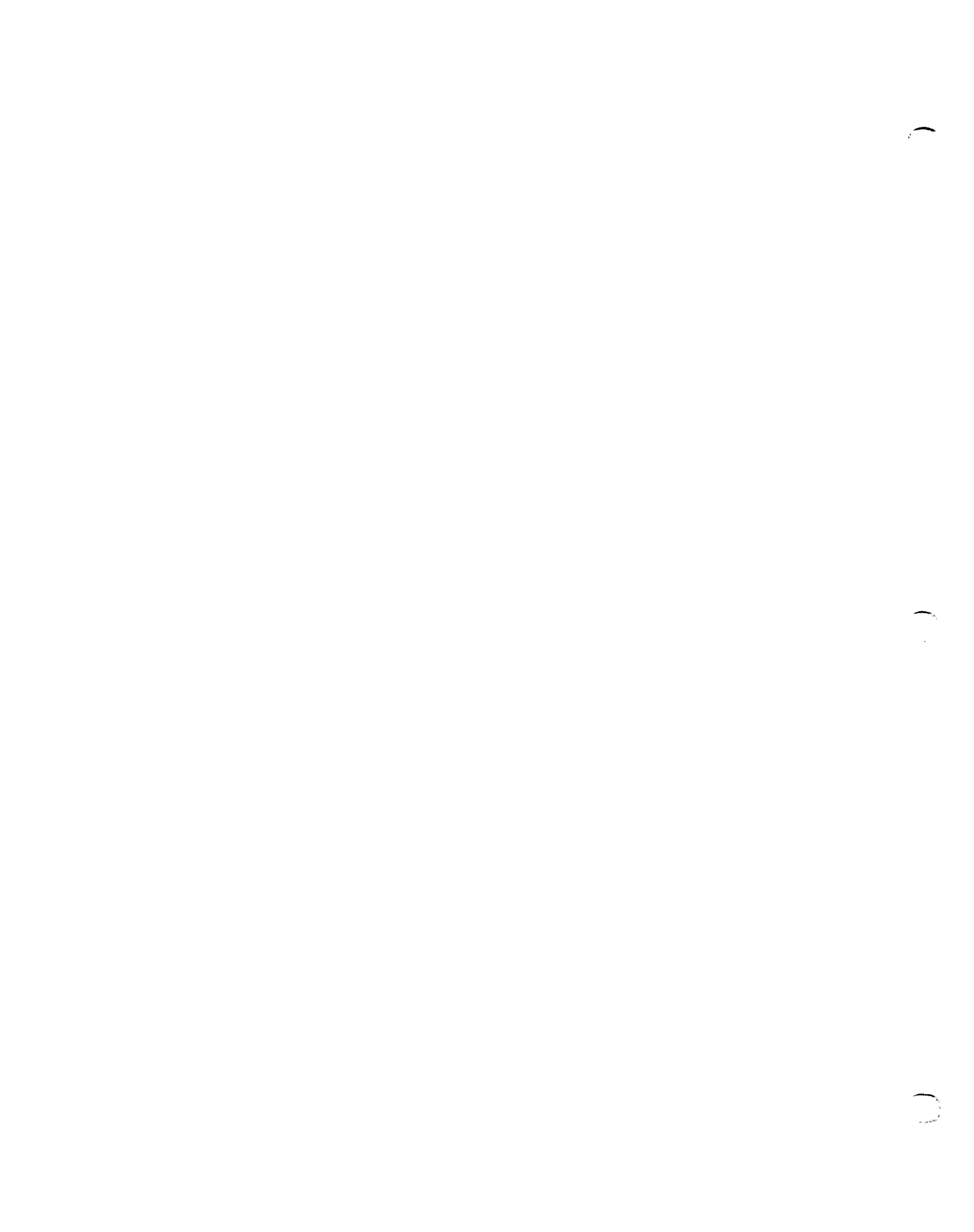


Table 4.2-1
Summary of Potential COCs for DSS Site 1102, Former Building 889 Septic System

COC Type	Number of Samples ^a	COCs Detected or with Concentrations Greater than Background or Nonquantified Background	Maximum Background Limit/Southwest Area Supergroup ^b (mg/kg)	Maximum Concentration ^c (All Samples) (mg/kg)	Average Concentration ^d (mg/kg)	Number of Samples Where COCs Detected or with Concentrations Greater than Background or Nonquantified Background ^e
VOCs	2	2-Butanone	NA	0.0207	0.0135	2
SVOCs	2	None	NA	NA	NA	None
PCBs	2	Aroclor-1260	NA	0.0070 J	0.0061	2
HE Compounds	2	None	NA	NA	NA	None
RCRA Metals	2	None	NA	NA	NA	None
Hexavalent Chromium	2	None	NC	NA	NA	None
Cyanide	2	Cyanide	NC	0.0633 J	0.0679	2
Radionuclides	2	Uranium-235	0.18	0.351	NC ^f	2
Gamma Spectroscopy	2	None	NA	NA	NA	None
Gross Alpha	2	None	NA	NA	NA	None
Gross Beta	2	None	NA	NA	NA	None

^aNumber of samples includes duplicates and splits.

^bIn middle September 1997.

^cMaximum concentration is either the maximum amount detected, or for radionuclides, the greater of either the maximum detection or the maximum MDA above background.

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

^eSee appropriate data table for sample locations.

^fAn average MDA is not calculated because of the variability in instrument counting error and the number of reported nondetect activities for gamma spectroscopy.

COC = Constituent of concern.

DSS = Drain and Septic Systems.

HE = High explosive(s).

J = Analytical result was qualified as an estimated value.

MDA = Minimum detectable activity.

MDL = Method detection limit.

mg/kg = Milligram(s) per kilogram.

NA = Not applicable.

NC = Not calculated.

PCB = Polychlorinated biphenyl.

pCi/g = Picocurie(s) per gram.

RCRA = Resource Conservation and Recovery Act.

SVOC = Semivolatile organic compound.

VOC = Volatile organic compound.

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

No pathways to groundwater and no intake routes through flora or fauna are considered appropriate for either the industrial or residential land-use scenarios. Annex C provides additional discussion of the exposure routes and receptors at DSS Site 1102.

4.3 Site Assessment

Site assessment at DSS Site 1102 included risk assessments for both human health and ecological risk. This section briefly summarizes the site assessment results, and Annex C discusses the risk assessment performed for DSS Site 1102 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1102 poses no significant threat to human health under either the industrial or residential land-use scenarios.

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

4.3.2 Risk Assessments

Risk assessments were performed for both human health and ecological risk at DSS Site 1102. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1102 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because 2-butanone, Aroclor-1260, hexavalent chromium, cyanide, and uranium-235 were detected, were present above background, have nonquantified background values, or had MDAs above background, it was necessary to perform a human health risk assessment analysis for the site, which included these COCs. Annex C provides a complete discussion of the risk assessment process, results, and uncertainties. The risk assessment process provides a quantitative evaluation of the potential adverse human health effects from constituents in the site's soil by calculating the hazard index (HI) and excess cancer risk for both industrial and residential land-use scenarios.

The HI calculated for the COCs at DSS Site 1102 is 0.00 for the industrial land-use scenario, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.00. The estimated excess cancer risk for DSS Site 1102 is 6E-11. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is

below the suggested acceptable risk value. The estimated incremental excess cancer risk is 5.66E-11. Both the incremental HI and excess cancer risk are below NMED guidelines.

The HI calculated for the COCs at DSS Site 1102 is 0.00 for the residential land-use scenario, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The incremental HI risk, determined by subtracting risk associated with background from potential nonradiological COC risk (without rounding), is 0.00. The estimated excess cancer risk for DSS Site 1102 COCs is 1E-10 for a residential land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. The estimated incremental excess cancer risk is 1.20E-10. Both the incremental HI and incremental excess cancer risk are below NMED guidelines.

For the radiological COCs, one of the constituents (uranium-235) had an activity value greater than the corresponding background values. The incremental total effective dose equivalent (TEDE) and corresponding estimated cancer risk from radiological COCs are much lower than the U.S. Environmental Protection Agency (EPA) guidance values; the estimated TEDE is 2.5E-2 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 estimated incremental estimated excess cancer risk value is 2.1E-7 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 6.3E-2 mrem/yr with an associated estimated incremental excess cancer risk of 6.1E-7. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS Site 1102 is eligible for unrestricted radiological release.

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

Table 4.3.2-1
Summation of Incremental Nonradiological and Radiological Risks from
DSS Site 1102, Former Building 889 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	5.66E-11	2.1E-7	2.1E-7
Residential	1.20E-10	6.1E-7	6.1E-7

DSS = Drain and Septic Systems.

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

4.3.2.2 *Ecological*

An ecological assessment that corresponds with the procedures in the EPA's Ecological Risk Assessment Guidance for Superfund (EPA 1997b) also was performed as set forth by the NMED Risk-Based Decision Tree in the "RPMP [RCRA Permits Management Program] Document Requirement Guide" (NMED March 1998). An early step in the evaluation compared

COC concentrations and identified potentially bioaccumulative constituents (see Annex C, Sections IV, VII.2, and VII.2.1). This methodology also required developing a site conceptual model and a food web model, as well as selecting ecological receptors, as presented in "Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratories, New Mexico" (IT July 1998). The risk assessment also includes the estimation of exposure and ecological risk.

All COCs at DSS Site 1102 are located at depths of 5 feet bgs or greater. 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 1102 poses insignificant risk to human health under both the industrial and residential land-use scenarios, a baseline human health risk assessment is not required for this site.

4.4.2 Ecological

Because the results of the ecological risk assessment summarized in Section 4.3.2.2 indicate that ecological risks at DSS Site 1102 are expected to be low, a baseline ecological risk assessment is not required for the site.

5.0 RECOMMENDATION FOR CORRECTIVE ACTION COMPLETE WITHOUT CONTROLS DETERMINATION

5.1 Rationale

Based upon field investigation data and the human health and ecological risk assessment analyses, a determination of CAC without controls is recommended for DSS Site 1102 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, a determination of CAC without controls (NMED April 2004) is recommended for DSS Site 1102. This is consistent with the NMED's NFA 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).

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6.0 REFERENCES

Bearzi, J. (New Mexico Environment Department/Hazardous Waste Bureau), January 2000. Letter to M.J. Zamorski (U.S. Department of Energy) and L. Shephard (Sandia National Laboratories/New Mexico) approving the "Sampling and Analysis Plan for Characterizing and Assessing Potential Releases to the Environment for Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico." January 28, 2000.

Bearzi, J.P. (New Mexico Environment Department), January 2001. Memorandum to RCRA-Regulated Facilities, "Risk-Based Screening Levels for RCRA Corrective Action Sites in New Mexico," Hazardous Waste Bureau, New Mexico Environment Department, Santa Fe, New Mexico. January 23, 2001.

Bleakly, D. (Sandia National Laboratories/New Mexico), July 1996. Memorandum, "List of Non-ER Septic/Drain Systems for the Sites Identified Through the Septic System Inventory Program." July 8, 1996.

Dinwiddie, R.S. (New Mexico Environment Department), September 1997. Letter to M.J. Zamorski (U.S. Department of Energy), Request for Supplemental Information: Background Concentrations Report, SNL/KAFB. September 24, 1997.

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

IT, see IT Corporation.

IT Corporation (IT), July 1998. "Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratories, New Mexico," IT Corporation, Albuquerque, New Mexico.

Miller, M. (Sandia National Laboratories/New Mexico), September 2003. Memorandum to F.B. Nimick (Sandia National Laboratories/New Mexico), regarding "State of New Mexico Background for Gross Alpha/Beta Assays in Soil Samples." September 12, 2003.

Moats, W. (New Mexico Environment Department/Hazardous Waste Bureau), February 2002. Letter to M.J. Zamorski (U.S. Department of Energy) and P. Davies (Sandia National Laboratories/New Mexico) approving the "Field Implementation Plan, Characterization of Non-Environmental Restoration Drain and Septic Systems." February 21, 2002.

National Oceanic and Atmospheric Administration (NOAA), 1990. "Local Climatological Data, Annual Summary with Comparative Data," Albuquerque, New Mexico.

New Mexico Environment Department (NMED) March 1998. "RPMP Document Requirement Guide," RCRA Permits Management Program, Hazardous and Radioactive Materials Bureau, New Mexico Environment Department, Santa Fe, New Mexico.

New Mexico Environment Department (NMED) April 2004. "Compliance Order on Consent Pursuant to New Mexico Hazardous Waste Act § 74-4-10," New Mexico Environment Department, Santa Fe, New Mexico. April 29, 2004.

NMED, see New Mexico Environment Department.

NOAA, see National Oceanic and Atmospheric Administration.

Sandia National Laboratories/New Mexico (SNL/NM), January 1952. SNL/NM Facilities Engineering Drawing 82783, Sheet 42, showing original design for Building 889, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), December 1985. SNL/NM Facilities Engineering Drawing 99576 showing the Building 889 Septic System, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), June 1993. "Sandia National Laboratories/New Mexico Septic Tank Monitoring Report, 1992 Report," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), July 1994. "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), December 1995. "Sandia National Laboratories Septic Tank Characterization Summary Tables of Analytical Reports, December 1995," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 1996. "Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), July 1996. "Laboratory Data Review Guidelines," Radiation Protection Diagnostics Procedure No. RPSD-02-11, Issue No. 2, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), February 1998. "RESRAD Input Parameter Assumptions and Justification," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), October 1999. "Sampling and Analysis Plan for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico," Sandia National Laboratories, Albuquerque, New Mexico. October 19, 1999.

Sandia National Laboratories/New Mexico (SNL/NM), December 1999. "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00-03, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), November 2001. "Field Implementation Plan, Characterization of Non-Environmental Restoration Drain and Septic Systems," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 2003. Database printout provided by SNL/NM Facilities Engineering showing the year that numerous SNL/NM buildings were constructed, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), April 2003. "DSS Sites Mean Elevation Report," GIS Group, Environmental Restoration Department, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), May 2003. "Tijeras Arroyo Groundwater Investigation Work Plan (Final Version)," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL/NM, see Sandia National Laboratories/New Mexico.

U.S. Department of Energy (DOE), U.S. Air Force, and U.S. Forest Service, September 1995. "Workbook: Future Use Management Area 2," prepared by Future Use Logistics and Support Working Group in cooperation with Department of Energy Affiliates, the U.S. Air Force, and the U.S. Forest Service.

U.S. Environmental Protection Agency (EPA), November 1986. "Test Methods for Evaluating Solid Waste," 3rd ed., Update 3, SW-846, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington D.C.

U.S. Environmental Protection Agency (EPA), 1989. "Risk Assessment Guidance for Superfund, Vol. 1: Human Health Evaluation Manual," EPA/540/1-89/002, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997a. "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," OSWER Directive No. 9200.4 18, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997b. "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risks," Interim Final, U.S. Environmental Protection Agency, Washington, D.C.

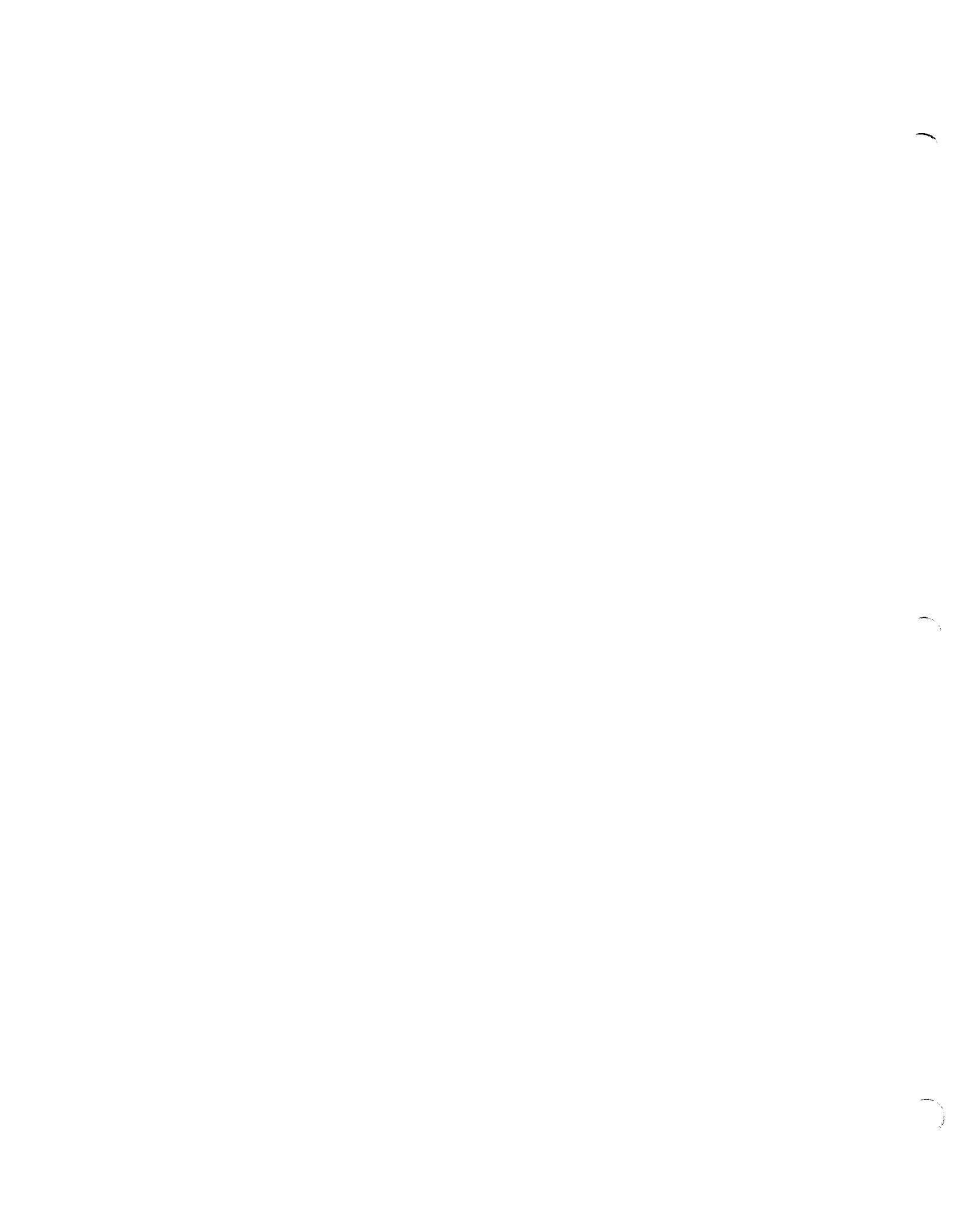
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ANNEX A
DSS Site 1102
Septic Tank Sampling Results



Building 897
Area ~~X~~ 1
Sample ID No. SNLA008560
Tank ID No. NRN

On November 10, 1992, a wet sludge sample was collected from the septic tank approximately 100 yards west of Building 897, on the east side of 14th Street. Because only a wet sludge fraction was available, a comprehensive suite of analyses were performed on the sludge rather than the metal and radionuclide suites. Results are reported as milligrams per kilogram (mg/kg). Analytical results worth noting are:

- The polychlorinated biphenyl Aroclor 1260 was measured at 0.310 mg/kg (ppm). This level does not exceed the SNL/NM limit of 2.0 ppm.
- The chlorinated pesticide 4,4'-DDE was measured at a level of 0.021 mg/kg.
- Formaldehyde was detected at 0.65 mg/kg.
- Oil and grease was measured at 313 mg/kg.

Several Resource Conservation and Recovery Act (RCRA) toxicity characteristic (TC) metals were detected in the sample. These elements are also regulated under the NMWQCC and the City of Albuquerque Wastewater Ordinance and include arsenic, barium, cadmium, copper, lead, mercury, and zinc.

The holding time for the SVOC analysis was exceeded by eight days, because the laboratory QC criteria were not met for the initial analysis. The sample was re-prepared and analyzed outside the holding time, and the reanalysis data are reported. An exceeded holding time qualifies the data by presenting the possibility that the data is biased low.

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

**Results of Septic Tank Analyses
(SLUDGE SAMPLE)**

Building No./Area: 887/A-1
Tank ID No.: NRN
Date Sampled: 11/10/92
Sample ID No.: SNLAC00560

Analytical Parameter	Measured Concentration	Comments
Volatile Organics (EPA 624)	(mg/l)	
No VOCs detected above laboratory reporting limit		
Semivolatile Organics (EPA 625)		
None detected above laboratory reporting limit		
Pesticides (EPA 606)		
None detected above laboratory reporting limit		
PCBs (EPA 606)	(mg/kg)	
Aroclor 1260	0.31	
4,4'-DDE	0.021	
Explosives (HPLC)	(mg/kg)	
None detected above laboratory reporting limit		
Metals	(mg/kg)	
Arsenic	3.1	
Barium	129	
Cadmium	1.7	
Chromium	26.1	
Copper	88.5	
Lead	20.0	
Manganese	221	
Mercury	0.32	
Nickel	NA	
Selenium	0.73	
Silver	1.0	
Thallium	ND (1.0)	
Zinc	253	
Uranium		
Miscellaneous Analytes	(mg/kg)	
Phenolic Compounds	ND (1.0)	
Nitrates/Nitrites	ND (0.50)	
Formaldehyde	0.85	
Fluoride	3.9	
Cyanide	ND (0.50)	
Oil and Grease	313	
Radiological Analyses	(pCi/l)	
Radium 226	ND (1.32)	
Radium 228	NA	
Gross Alpha	10 +/- 10	
Gross Beta	20 +/- 20	
Tritium	0.1 +/- 0.2	

NR = Not Regulated; ND = (#. #) = Not detected (Reporting Limit)
 Note: City and State Discharge Limits are for comparison purposes only. City limits apply to discharge of sanitary effluent and not septic tank waste, state limits apply to effluent discharge below the surface of the ground.
 References: City of Albuquerque NM Sewer Use and Wastewater Control Ordinance (1990), Section 8-9-2, and New Mexico Water Quality Control Commission Regulations (1988), Sec:



**RESULTS OF SEPTIC TANK SAMPLING
CHEMICAL ANALYSES OF SLUDGE SAMPLE**

Building ID: 889
 Sample ID Number: 024374
 Date Sampled: 8-03-95
 Percent Moisture: Various^a

Parameter (Method)	Result	Detection Limit (DL)	NM Discharge Limit ^b	COA Discharge Limit ^c	Comments
<i>Volatile Organics (8260)</i>	<i>(µg/kg)</i>	<i>(µg/kg)</i>	<i>(mg/L)</i>	<i>(mg/L)</i>	
Acetone	19	10	NR	NR	
Benzene	2BJ	10	0.01	TTO = 5.0	
<i>Semivolatile Organics (8270)</i>	<i>(µg/kg)</i>	<i>(µg/kg)</i>	<i>(mg/L)</i>	<i>(mg/L)</i>	
ButylBenzylPhthalate	57J	330	NR	TTO = 5.0	
bis(2-Ethylhexyl)Phthalate	120J	330	NR	TTO = 5.0	
<i>Pesticides/PCBs (8080)</i>	<i>(µg/kg)</i>	<i>(µg/kg)</i>	<i>(mg/L)</i>	<i>(mg/L)</i>	
Heptachlor Epoxide	4.4	1.7	NR	TTO = 5.0	
4,4'-DDT	3.5	3.3	NR	TTO = 5.0	
Endrin Aldehyde	3.8	3.3	NR	TTO = 5.0	
<i>Metals (6010/7470)</i>	<i>(mg/kg)</i>	<i>(mg/kg)</i>	<i>(mg/L)</i>	<i>(mg/L)</i>	
Arsenic	4.8	1.0	0.1	2.0	
Barium	210	20.0	1.0	20.0	
Cadmium	2.4	0.50	0.01	2.8	
Chromium	11.7	2.0	0.05	20.0	
Copper	66.3	2.5	1.0	16.5	
Lead	32.5	10.0	0.05	3.2	
Manganese	150	1.5	0.2	20.0	
Nickel	12.8	4.0	0.2	12.0	
Selenium	0.74	0.50	0.05	2.0	
Silver	3.2	1.0	0.05	5.0	
Thallium	0.91J	1.0	NR	NR	
Zinc	405	2.0	10.0	28.0	
Mercury	0.34	0.10	0.002	0.1	

Notes:

- ^a Percent moisture = 45.87 for VOCs; 48.28 for SVOCs, Pesticides and PCBs; and 45.16 for metals.
- ^b New Mexico Water Quality Control Commission Regulations (1990), Section 3-103.
- ^c City of Albuquerque Sewer Use and Wastewater Control Ordinance (1993), Section 8-9-3 M - maximum allowable concentration for grab sample.
- B = Analyte detected in method blank.
- DL = Detection limit indicated on laboratory report.
- IDL = Instrument detection limit.
- J = Estimated concentration of analyte, between DL and IDL.
- ND = Not detected above DL indicated.
- NR = Not regulated.

**RESULTS OF SEPTIC TANK SAMPLING
RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE**

Building ID: 889
 Sample ID Number: 024374
 Date Sampled: 8-03-95
 Percent Moisture: Not Reported

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit*	Comments
<i>Isotopic Analyses^b</i>	<i>(pCi/g ± 2-σ)</i>	<i>(pCi/g)</i>	<i>(pCi/g)</i>	<i>(pCi/g)</i>	
Tritium	-88 ± 67	116	57.2	NR	
Plutonium-239/240	0.002 ± 0.006	0.015	0.009	NR	
Plutonium-238	0.018 ± 0.012	0.013	0.009	NR	
Strontium-90	0.02 ± 0.00	0.55	0.26	NR	
Thorium-232	0.18 ± 0.06	0.016	0.012	NR	
Thorium-230	0.25 ± 0.07	0.022	0.015	NR	
Thorium-228	0.26 ± 0.07	0.038	0.023	NR	
Uranium-238	1.96 ± 0.35	0.018	0.013	NR	
Uranium-235/236	0.12 ± 0.05	0.018	0.015	NR	
Uranium-234	2.62 ± 0.46	0.019	0.014	NR	
<i>Gamma Spectroscopy^c</i>	<i>(pCi/g ± 2-σ)</i>	<i>(pCi/g)</i>	<i>(pCi/g)</i>	<i>(pCi/g)</i>	
Cesium-137	ND	0.22	0.10	NR	
Cesium-134	ND	0.16	0.074	NR	
Potassium-40	9.34 ± 2.72	1.20	0.48	NR	
Chromium-51	ND	1.80	0.87	NR	
Iron-59	ND	0.43	0.19	NR	
Cobalt-60	ND	0.18	0.077	NR	
Zirconium-95	ND	0.36	0.16	NR	
Ruthenium-103	ND	0.19	0.088	NR	
Ruthenium-106	ND	1.70	0.78	NR	
Cerium-144	ND	0.88	0.42	NR	
Thallium-208	0.29 ± 0.18	0.18	NL	NR	
Lead-212	0.95 ± 0.34	0.29	0.14	NR	
Lead-214	0.69 ± 0.29	0.33	0.16	NR	
Bismuth-214	0.66 ± 0.37	0.38	NL	NR	
Radium-226	0.66 ± 0.29	0.38	0.18	30.0 ^d	

Refer to footnotes at end of table.

**RESULTS OF SEPTIC TANK SAMPLING
RADIOLOGICAL ANALYSES OF SLUDGE SAMPLE**

Building ID: 889
 Sample ID Number: 024374
 Date Sampled: 8-03-95
 Percent Moisture: Not Reported

Parameter (Method)	Result	MDA	Critical Level	NM Discharge Limit ^a	Comments
<i>Gamma Spectroscopy^d</i>	<i>(pCi/g ± 2-σ)</i>	<i>(pCi/g)</i>	<i>(pCi/g)</i>	<i>(pCi/g)</i>	
Radium-226	ND	0.90	0.41	30.0 ^d	
Actinium-228	ND	0.90	0.41	NR	
Thorium-231	ND	4.40	2.10	NR	
Thorium-232	ND	0.90	0.41	NR	
Thorium-234	2.08 ± 1.99	2.30	1.10	NR	
Uranium-235	ND	0.88	0.43	NR	
Uranium-238	2.08 ± 1.99	2.30	1.10	NR	
Americium-241	ND	1.00	0.48	NR	

Notes:

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

^b Tritium analyzed by EMSL-LV-0539-17; isotopic uranium by NAS-NS-3050; plutonium by SL13028/SL13033; strontium by 7500-SR; thorium by NAS-NS-3004.

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

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

MDA = Minimum detectable activity.

ND = Not detected above MDA indicated.

NR = Not regulated.

NL = Not listed.





ANNEX B
DSS Site 1102
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/CF032-02
SMO PROJECT LEAD: Herrera SAMPLE SHIP DATE: 8/9/2002

ARCOC	LAB	LAB ID	PRELIM DATE	FINAL DATE	EDD		BY
					EDD	ON Q	
<u>605667</u>	<u>GEL</u>	<u>66780A</u>		<u>10/8/2002</u>	<u>X</u>	<u>X</u>	<u>JAC</u>
<u>605668</u>	<u>GEL</u>	<u>66780B</u>		<u>10/8/2002</u>	<u>X</u>	<u>X</u>	<u>JAC</u>

	NAME	DATE
REVIEW COMPLETED BY/DATE:	<u>L. Herrera</u>	<u>10-16-02</u>
CORRECTIONS REQUESTED/RECEIVED:	<u>requested: 10-16-02</u>	<u>rec'd 10-16-02</u>
PROBLEM #:	<u>5046</u>	
FINAL TRANSMITTED TO/DATE:	<u>Sanders</u>	<u>10-16-02</u>
SENT TO VALIDATION BY/DATE:	<u>CONRAD</u>	<u>10/21/02</u>
RUSH VALIDATION REQUIRED EST. TAT:	<input type="checkbox"/>	
VALIDATION COMPLETED BY/DATE:	<u>N</u>	<u>11-06-02</u>
COPY TO WM BY/DATE:		
TO ERDMS OR RECORDS CENTER BY/DATE:	<u>Conrad</u>	<u>11/14/02</u>

COMMENTS: _____

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Page 1 of 1

Internal Lab		Batch No.		5135/1089		Date Samples Shipped:		9-9-07		Project/Task No.:		1229 02.03.02		AR/COC		605668							
Dept. No./Mail Stop:		Mike Sanders		Carroll/Worksheet No.		SMO Authorization:		Edie Kahl 803-568-9171		Contract #:		PO 21671		Waste Characterization		Send preliminary/copy report to:							
Project Name:		DSS soil sampling		Lab Contact:		Lab Destination:		GEL		SMB Attached Bottle		Released by COC No.:		Validation Required		BNI TO: Sandia National Labs (Accounts Payable)							
Record Center Code:		EFV1256/DSS/DAT		ER 060		SMB Contact/Phone:		Pam Putassan/505-844-3185		P.O. Box 5800 MS 0154		Advisee, NM 87185-0154		Parameter & Method Requested		Lab Sample ID							
Service Order No.:		CF03-02		Send Report to SMO:		Wendy Patentes/505-844-3132																	
Location		Tech Area		Room		ER Site No.		Pump Depth (ft)		ER Sample ID or Sample Location Detail		Sample Matrix		Sample Volume		Preservative		Collection Method		Sample Type			
Building 8523-889																							
Sample No.-Fraction		5523/1086-SP1BH1-10-S		10'		1886		4oz		S		AS		4c		G		SA		VOC(8260B)		00%	
059793-001		5523/1086-SP1BH1-15-S		15'				4oz		S		AS		4c		G		SA		VOC(8260B)		00%	
059794-001		5523/1086-SP1BH1-10-S		10'				500ml		S		AG		4c		G		SA		see below for parameter		02%	
059793-002		5523/1086-SP1BH1-15-S		15'				500ml		S		AG		4c		G		SA		see below for parameter		01%	
059795-001		889/1102-SP1-BH1-25-S		25'		1103		4oz		S		AS		4c		G		SA		VOC(8260B)		01%	
059796-001		889/1102-SP1-BH1-30-S		30'				4oz		S		AS		4c		G		SA		see below for parameter		02%	
059795-002		889/1102-SP1-BH1-35-S		35'				500ml		S		AG		4c		G		SA		see below for parameter		02%	
059796-002		889/1102-SP1-BH1-30-S		30'				500ml		S		AG		4c		G		SA		see below for parameter		02%	
059796-004		889/1102-SP1-BH1-30-S		30'				500ml		S		AG		4c		G		SA		see below for parameter		02%	
RMMA		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		Return to Client <input type="checkbox"/> Disposal by lab <input type="checkbox"/>		Normal <input checked="" type="checkbox"/> Rush <input type="checkbox"/>		Level of Rush:		Signature		Name		J. Lee		W. Gibson		G. Quintana		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt	
Sample Disposal		Level of Rush:		Signature		Name		J. Lee		W. Gibson		G. Quintana		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt		Lab Use		Temp 4			
Turnaround Time		Signature		Name		J. Lee		W. Gibson		G. Quintana		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt		Lab Use		Temp 4					
Return Samples By:		Signature		Name		J. Lee		W. Gibson		G. Quintana		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt		Lab Use		Temp 4					
Sample Team Members		Signature		Name		J. Lee		W. Gibson		G. Quintana		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt		Lab Use		Temp 4					
1. Requisitioned by		Date		Time		1. Requisitioned by		Date		Time		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt		Lab Use		Temp 4					
1. Received by		Date		Time		1. Received by		Date		Time		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt		Lab Use		Temp 4					
2. Requisitioned by		Date		Time		2. Requisitioned by		Date		Time		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt		Lab Use		Temp 4					
2. Received by		Date		Time		2. Received by		Date		Time		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt		Lab Use		Temp 4					
3. Requisitioned by		Date		Time		3. Requisitioned by		Date		Time		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt		Lab Use		Temp 4					
3. Received by		Date		Time		3. Received by		Date		Time		Special Instructions/DOC Requirements		Abnormal Conditions on Receipt		Lab Use		Temp 4					

Analytical Quality Associates, Inc.



616 Maxine NE
Albuquerque, NM 87123
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MEMORANDUM

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

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

Summary

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

ICP-AES – Metals

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

Total Cyanide

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

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

Holding Times/Preservation

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

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

Calibration

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

Blanks

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

ICP-AES – Metals

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

Total Cyanide

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

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

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

Matrix Spike (MS) Analysis

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

ICP-AES

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

Hexavalent Chromium Batch # 200893

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

Replicate Analysis

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

ICP-AES

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

Hexavalent Chromium Batch # 200893

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

ICP Interference Check Sample (ICS)

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

All Other Analyses: No ICS required.

ICP Serial Dilution

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

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

All Other Analyses: No serial dilutions required.

Detection Limits/Dilutions

All Analyses: All detection limits were properly reported.

ICP-AES: All samples were diluted 2X.

All Other Analyses: No dilutions were performed.

Other QC

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

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

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

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

Analytical Quality Associates, Inc.



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MEMORANDUM

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

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

Summary

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

VOC - soil

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

SVOC - Batch 200259 and 200577

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

PCB

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

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

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

HE

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

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

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

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

Holding Times/Preservation

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

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

Calibration

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

VOC

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

SVOC – Batch 200259

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

PCB – Batch 200519

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

Blanks

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

Surrogates

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

Internal Standards (ISs)

All Analysis: All internal standard acceptance criteria were met.

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

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

VOC- water

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

SVOC – Batch 200259 and 200577

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

Laboratory Control Samples (LCS/LCSD) Analysis

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

VOC - soils

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

VOC – Soils and Waters

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

SVOC

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

HE – Batch 200966

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

Detection Limits/Dilutions

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

Confirmation Analyses

VOC and SVOC: No confirmation analyses required.

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

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

Other QC

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

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

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

Analytical Quality Associates, Inc.



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MEMORANDUM

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

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

Summary

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

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

Holding Times/Preservation

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

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

Calibration

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

Blanks

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

Matrix Spike (MS) Analysis

The MS/MSD analyses met all QC acceptance criteria.

Laboratory Control Sample (LCS) Analysis

The LCS analyses met all QC acceptance criteria.

Replicates

The replicate analyses met all QC acceptance criteria.

Tracer/Carrier Recoveries

No tracer/carrier required.

Negative Bias

All sample results met negative bias QC acceptance criteria.

Detection Limits/Dilutions

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

Other QC

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

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

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

Data Validation Summary

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

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

Check (✓) = Acceptable
 Shaded Cells = Not Applicable (also "NA")
 NP = Not Provided
 Other: * Congruation > 25% Reviewed By: Uhal Date: 11.06.04
value changed "J"
 - 0/3 received broken

Holding Time and Preservation

Site/Project: 055 Soil Sampling AR/COC #: 605667 - 68 Laboratory Sample IDs: 66780 - 001 thru - 002
 Laboratory: QEA Laboratory Report #: 605667 66780 - 82 66782 - 001
 # of Samples: 22 / Matrix: SOIL & TS

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

Reviewed By: Dhal Date: 11.06.02

Volatile Organics (SW 846 Method 8260)

Site/Project: DSS Soil Sampling/COC# 605667 - 68 # of Samples: 11 # / Matrix: Soil # 78
 Laboratory: GFA Laboratory Report #: 66780-001 thru -011 66782-001 (78)
 Methods: SW-846 6260A Batch #: 2007530 (Soil) 201028 (TR)

IS	CAS #	Name	T C L	Min. RF	Intercept	Calib. RF	Calib. R ²	CCV %D	Method Bks	LCS LCSB	LCS RPD	MS MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Trip Blanks
1	71-55-6	1,1,1-trichloroethane		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	79-34-5	1,1,2,2-tetrachloroethane		0.30	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	79-00-5	1,1,2-trichloroethane		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	75-34-3	1,1-dichloroethane		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	75-31-4	1,1-dichloroethane		0.20	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	107-06-2	1,2-dichloroethane		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	540-59-0	1,2-dichloroethane (total)		0.01	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	78-87-5	1,2-dichloropropane		0.01	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	78-93-3	2-butanone (MEK)		0.01	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	110-75-8	2-chloroethyl vinyl ether		0.01	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	591-78-6	2-benzonitrile (MBK)		0.01	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	108-10-1	4-methyl-2-pentanone (MIBK)		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	67-64-1	acetone (100% EtOH)		0.01	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	71-43-2	benzene		0.50	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	75-27-4	bromodichloromethane		0.20	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	75-25-2	bromoform		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	74-83-9	brnmonochloroethane		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	75-15-0	carbon disulfide		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	56-23-5	carbon tetrachloride		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	108-90-7	chlorobenzene		0.50	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	75-00-3	chloroethane		0.01	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	67-66-3	chloroform		0.20	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	74-87-3	chloromethane		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	10061-01-5	cis-1,3-dichloropropene		0.20	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	124-48-1	dibromodichloroethane		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	100-41-4	ethylbenzene		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	75-09-2	methylcyclohexane (100% EtOH)		0.01	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	100-42-5	styrene		0.30	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	127-18-4	tetrachloroethane		0.20	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	108-88-3	toluene (100% EtOH)		0.40	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	10061-02-6	trans-1,3-dichloropropene		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	79-01-6	trichloroethane		0.30	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	75-01-4	vinyl chloride		0.10	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	1330-20-7	xylene (total)		0.30	1.0E-2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Comments: Vinyl Acetate (soils) only
Trans 1,2-Dichloroethane
Trans 1,2-Dichloroethane
 Notes: Shaded rows are RCRA compounds.
 -32
 -30
 Reviewed By: Rahal Date: 11.05.02
 B-18

Volatile Organics

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

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

Sample	SMC 1	SMC 2	SMC 3	IS 1 Area	IS 1 RT	IS 2 area	IS 2 RT	IS 3 area	IS 3 RT
IN CRITERIA									

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

Comments: H2O batch: PS/PSD 66006 SNA 509
 Soils LCW & CCV same file (SA 2-thru 6) -ve.
 (SA 001 - 008) CCV 8.21 - 26hr - old
 009 - 011 CCV 2609

* Applies to samples 001 thru - 008
 1,7,8 NO NO &
 2,3,5 7 Rk All detect "J"
 4,6 704

WS #) of 1

Semivolatile Organics (SW 846 Method 8270)

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

Laboratory: GFK Laboratory Report #: 66780

Methods: SW-846 BJTDC

of Samples: 11 Matrix: Soil Batch #s: 200259 (Soil) 200577 (Soil) -013 only

IS	BNA	CAS #	NAME	T C L	Min. RF	Intercept	Calib. RF	Calib. RSD/ R ²	CCV %D	Method Blanks	LCS	LCSB	LCS RPD	MS	MSD	MS RPD	Field Dypr. RPD	Equip. Blanks	Field Blanks	Field Dup		
																					>05 183	<20% 100%
2	BN	120-82-1	1,2,4-Trichlorobenzene	✓	0.20		✓	✓	✓	✓	✓	✓	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	95-93-4	2,4,5-Trichlorophenol		0.20									72	✓	✓	✓	✓	✓	✓	✓	✓
3	A	88-06-2	2,4,6-Trichlorophenol		0.20									63	✓	✓	70	✓	✓	✓	✓	✓
2	A	120-83-2	2,4-Dichlorophenol		0.20																	
2	A	105-67-9	2,4-Dimethylphenol		0.20																	
3	A	51-28-5	2,4-dinitrophenol		0.01	✓	✓	✓	20%													
3	BN	121-14-2	2,4-Dinitrotoluene		0.20				70													
3	BN	606-20-2	2,6-Dinitrotoluene		0.20				✓													
3	BN	91-58-7	2-Chloroaniline		0.80																	
1	A	95-57-8	2-Chlorophenol		0.80																	
2	BN	91-57-6	2-Methylphenol		0.40																	
1	A	95-48-7	2-Methylphenol (o-cresol)		0.70																	
3	BN	88-74-4	2-Nitroaniline		0.01				25													
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																	

Notes: Shaded rows are RRA compounds. 63 at 69 ✓
 Reviewed By: d/hal Date: 11.01.02

Comments: m,p-cresol

Semivolatile Organics

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

Batch #s:

Matrix:

Laboratory: Laboratory Report #:

of Samples:

MSD

MSD

ID	BNA	CAS #	NAME	T C L	Min. RF	Intercept	Calib. RF	Calib. RSD/ R ²	CCV %D	Method Blanks	LCS	LCSB	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Field Blanks	Field Dup	
																					>0.5 0.05
3	BN	100-01-6	4-Nitroaniline	✓	0.01	1.82	✓	✓	✓	✓	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	Benzofluoranthene		0.80																
6	BN	50-32-8	Benzofluoranthene		0.70																
6	BN	205-99-2	Benzofluoranthene		0.70																
6	BN	191-24-2	Benzofluoranthene		0.50																
6	BN	207-08-9	Benzofluoranthene		0.70																
2	BN	111-91-1	1,2-Dichlorobenzene		0.30																
1	BN	111-44-4	1,2-Dichlorobenzene		0.70																
1	BN	108-60-1	1,2-Dichlorobenzene		0.01																
5	BN	117-81-7	1,2-Dichlorobenzene		0.01		✓	✓	✓	68 SJ 751											
5	BN	85-68-7	1,2-Dichlorobenzene		0.01		✓	✓	✓	✓											
4	BN	86-74-8	1,2-Dichlorobenzene		0.01																
5	BN	218-01-9	1,2-Dichlorobenzene		0.70																
6	BN	53-70-3	1,2-Dichlorobenzene		0.40																
3	BN	132-64-9	1,2-Dichlorobenzene		0.80																
3	BN	84-66-2	1,2-Dichlorobenzene		0.01																
3	BN	131-11-3	1,2-Dichlorobenzene		0.01																
4	BN	84-74-2	1,2-Dichlorobenzene		0.01																
6	BN	117-84-0	1,2-Dichlorobenzene		0.01		✓	✓	✓												
4	BN	206-44-0	1,2-Dichlorobenzene		0.60																
3	BN	86-73-7	1,2-Dichlorobenzene		0.90																
4	BN	118-74-1	1,2-Dichlorobenzene		0.10						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	BN	87-68-3	1,2-Dichlorobenzene		0.01						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	BN	77-47-4	1,2-Dichlorobenzene		0.01						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1	BN	67-72-1	1,2-Dichlorobenzene		0.30						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Comments:

Semivolatile Organics

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

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

Surrogate Recovery Outliers

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

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

Internal Standard Outliers

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

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

Comments: -013 received broken container
 Pyrene on QC summary not on TMA.
 # 22 > RA bis (2)
 # 12 → 21 70% " "

PCBs (SW 846 - Method 8082)

Site/Project: DSD Soil Sampling AR/COC #: 605667 Laboratory Sample IDs: 66780 - 012 thru -022
 Laboratory: QFL Laboratory Report #: 66780
 Methods: SW-846 8082 Matrix: Soils Batch #: 200578 XT 9/10
 # of Samples: 11 203079 XT 9/10
203080 (-012-014-012)

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

Sample	SMC % REC	SMC RT	Sample	SMC % REC	SMC RT
66780 - 021	None 26% (31-120%)				
← lower acceptance criteria > 10%					
All decs (1260) J, A1	NA	NA	US, A1		

Comments: SA-012, -014 thru -022
 all "07, HT" except
 19, 21, 22 1260 "JHT"

Confirmation

Sample	CAS #	RPD > 26%	Sample	CAS #	RPD > 26%
66780 - 019	1260	32%	Change to higher value		1.8

SA - 012, -014 thru -022
 Reextract out of HT
 only 1 set of data
 on lot A

SA - 021 & -022 5X
 (code name - 021 - done
 to sample viscosity)

No new data!
 Batch # 200255 XT 9/10
 200256
 MS not delivered with samples not on lot A
 not radiated

Reviewed By: A. Neal Date: 11.06.02

High Explosives (SW 846 Method 8330)

Site/Project: DSS Soil Sampling AR/COC #: 605667, - 68 Laboratory Sample IDs: 66780 - 01a thru - 02a

Laboratory: CEA Laboratory Report #: 66780

Methods: SW-846 8330

of Samples: 11 Matrix: Soil Batch #: 200966 retracted 203692

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

Comments: 203692 All 90 "UJ HT" - CE

200966 All Teryl 90 "UJ, A
ACU > 10% but < lower acceptance
criteria

Sample	SMC %REC	SMC RT	Sample	SMC %REC	SMC RT
<u>IN CHLOR</u>					

Confirmation

Sample	CAS #	RPD > 25%	Sample	CAS #	RPD > 25%
<u>NA</u>					

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: DWal Date: 11.06.02

Inorganic Metals

Site/Project: DJS Soil Sampling AR/COC #: 605667 Laboratory Report #: 66780 Laboratory Sample IDs: 66780 - 012 thru - 022

Laboratory: QEA Laboratory Report #: 66780

Methods: SW-846 6010 (ICP-AES) 7471 (Hg-CMA) Batch #: 200317 (Hg) 201371 (Metals)

of Samples: 11 Matrix: AQUEOUS

CAS # Analyte	QC Element																	
	TAL	ICV	CCY	ICB	OCB	Method Blanks	LCS	LCSD RPD	MS	MSD RPD	MSD RPD	Rep RPD	ICS AB	Serial Dilution	Field Deps. RPD	Equip. Blanks	Field Blanks	
7429-90-3 Al																		
7440-39-3 Ba	✓	✓	✓	✓	✓	✓	✓	747	NA	NA	✓	✓	✓	✓	✓	NA	NA	
7440-41-7 Be																		
7440-43-9 Cd	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓			
7440-70-2 Cr																		
7440-47-3 Cr	✓	✓	✓	✓	✓	✓	✓	NA			✓	✓	✓	✓	✓			
7440-48-4 Co																		
7440-50-8 Cu																		
7439-89-6 Fe																		
7439-95-4 Mg																		
7439-96-5 Mn																		
7440-02-0 Ni																		
7440-09-7 K																		
7440-22-4 Ag	✓	✓	✓	✓	✓	✓	✓	✓			NA	NA	✓	NA	✓			
7440-23-5 Ni																		
7440-62-2 V																		
7440-66-6 Zn																		
7439-92-1 Pb	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	NA	✓			SVB
7782-89-2 Bi	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	NA	✓			
7440-39-2 Ag	✓	✓	✓	3.50	2.41	✓	✓	✓			✓	✓	✓	✓	✓			AS 12.0
7440-36-0 Sb																		
7440-23-0 Tl																		
7439-97-6 Hg	✓	✓	✓	✓	✓	✓	✓	✓			NA	NA	✓	NA	✓			
Cyanide CN																		

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

Comments: ICP-AES 2X dil

NETS 66765 dup / M/S/D
SMX 504

All SA 75 ICB/CCS NO Q AS.
All SA > RL BA "J, A2"

Reviewed By: Nhal Date: 11-06-02

General Chemistry

Site/Project: DJS Soil Sampling AR/COC #: 605667, -68 Laboratory Sample IDs: 66780 - 012 thru -022
 Laboratory: G&K Laboratory Report #: 66780
 Methods: SW-846 9012A (TCV) 7196A (CEL) Batch #: 201253 (TCV) / 200895
 # of Samples: 11 Matrix: Soil

CAS #	Analyte	QC Element																
		T A L	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD RPD	MSD	MSD RPD	Rep. RPD	ICS AB	Serial Dilution	Field Dup. RPD	Equip. Blanks	Field Blanks	
595.70-0	Total Cr	✓	✓	✓	✓	[1.78]	0.129 J	✓	NA	NA	✓	NA	NA	✓	NA	All	CSX DL = J	
200893	Hexachlorobenzene								NA	NA		NA	NA		NA	MSXS	MSXS = 0.645 ug/g	
	Chromium	✓	✓	✓	✓	✓	✓	✓	NA	NA	✓	NA	NA	✓	NA	NA	NA	
200895	Hexachlorobenzene																	
	Chromium	✓	✓	✓	✓	✓	✓	✓	NA	NA	✓	NA	NA	✓	NA	NA	NA	

Comments: G-6 Barx 200893: MS/DUP 66MSH 5MAS 404. 66610

- MS 12. CSX MS J, B 13. 19. 20. 21. 22
- CSL 12. CSX DL J, B3 13. 16. 17. 19. 20. 21. 22
- MS 14. CSX MS NO Q. 15. 18.
- CSL 14. CSX DL 15. 17.

Date: 11.06.02

Reviewed By: Alwal

Radiochemistry

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

Laboratory: CEA Laboratory Report #: 66780

Methods: EPA 900.0

of Samples: 11 Matrix: Soils

Batch #: 20/305

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

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

Comments:

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

Reviewed By: Alhal Date: 11.06.02

Contract Verification Review (CVR)

Project Leader Collins Project Name DSS Soil Sampling Case No. 7223_02.03.02
 AR/COC No. 605667, 605668 Analytical Lab GEL SDG No. 66780A, 66780B

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

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

Line No.	Item	Complete?		If no, explain	Resolved?	
		Yes	No		Yes	No
1.1	All items on COC complete - data entry clerk initiated 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		059765-002 arrived broken		

2.0 Analytical Laboratory Report

Line No.	Item	Complete?		If no, explain	Resolved?	
		Yes	No		Yes	No
2.1	Data reviewed, signature	X				
2.2	Method reference number(s) complete and correct	X				
2.3	QC analysis and acceptance limits provided (MB, LCS, Replicate)	X				
2.4	Matrix spike/matrix spike duplicate data provided (if requested)	X				
2.5	Detection limits provided; PQL and MDL (or IDL), MDA and L _s	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				
2.13	Contractual qualifiers provided	X				
2.14	All requested result and TIC (if requested) data provided	X				

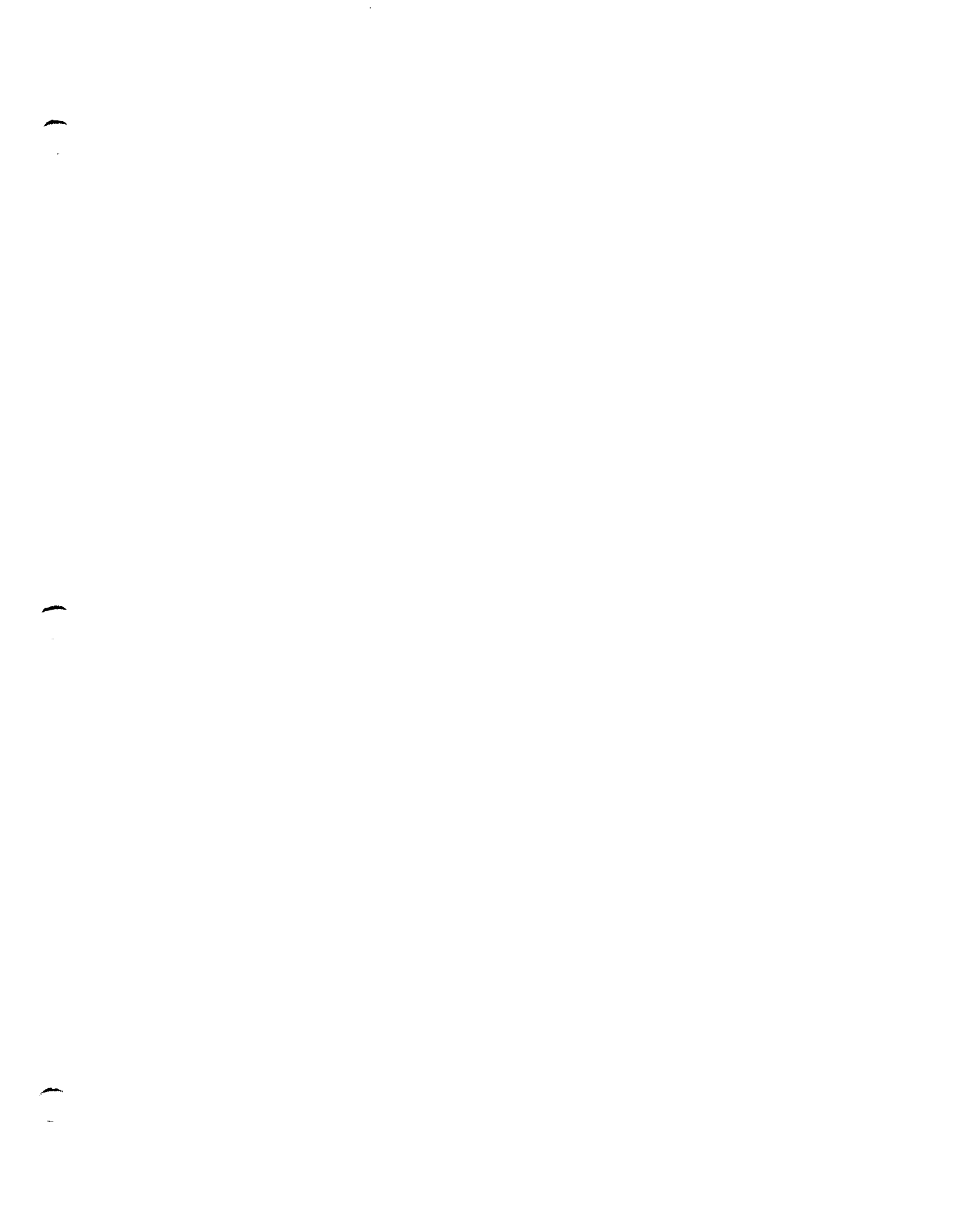
Contract Verification Review (Continued)

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		X	two HE LSC analytes not within acceptance limits with all re-extraction LSC analytes within acceptance limits (re-extracted out of holding)
	a) Laboratory control samples accuracy reported and met for all samples			
	b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique		X	PCB sample 058785-002RE re-extracted sample failed surrogate recovery
	c) Matrix spike recovery data reported and met		X	Barium not within inorganic acceptance limits
3.4	Precision	X		
	a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
	b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
3.5	Blank data		X	bis(2-Ethylhexyl)phthalate detected in SVOC method blank; cyanide detected in total cyanide method blank
	a) Method or reagent blank data reported and met for all samples			
	b) Sampling blank (e.g., field, trip, and equipment) data reported and met	X		
3.6	Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"- analyte undetected (results are below the MDL, IDL, or MDA (radiochemical)); "H"-analysis done beyond the holding time	X		
3.7	Narrative addresses planchet flaming for gross alpha/beta	X		
3.8	Narrative included, correct, and complete	X		
3.9	Second column confirmation data provided for methods 8330 (high explosives) and 8082 (pesticides/PCBs)	X		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

Item	Yes	No	Comments
4.1 GC/MS (8260, 8270, etc.)			
a) 12-hour tune check provided	X		
b) Initial calibration provided	X		
c) Continuing calibration provided	X		
d) Internal standard performance data provided	X		
e) Instrument run logs provided	X		
4.2 GC/HPLC (8330 and 8010 and 8062)			
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		



ANNEX C
DSS Site 1102
Risk Assessment



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DSS SITE 1102: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1102, the Former Building 889 Septic System, at Sandia National Laboratories/New Mexico (SNL/NM), is located in Technical Area-I on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (DOE). The abandoned system consisted of a 500-gallon septic tank connected to a single seepage pit located approximately 20 and 40 feet south, respectively, of the southwest corner of the former Building 889. Available information indicates that the building was constructed in the early 1950s (SNL/NM January 1952), and it is assumed that the septic system was also constructed at that time. Building 889 was demolished in the early 1990s, and it is assumed that the septic system was abandoned at that time.

Environmental concern about DSS Site 1102 is based upon the potential for the release of constituents of concern (COCs) in effluent discharged to the environment via the septic system at this site. Because operational records were not available, the investigation was planned to be consistent with other DSS site investigations and to sample for possible COCs that may have been released during facility operations.

The ground surface in the vicinity of the site is flat or slopes slightly to the northeast. The closest major drainage is Tijeras Arroyo, located approximately 0.75 miles southeast of the site. No springs or perennial surface-water bodies are located within 2 miles of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Surface-water runoff in the vicinity of the site is minor because the surface is flat or slopes slightly to the northeast. Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996). Most of the area immediately surrounding DSS Site 1102 is paved, and no storm sewers are used to direct surface water away from the site.

DSS Site 1102 lies at an average elevation of approximately 5,425 feet above mean sea level (SNL/NM April 2003). The regional groundwater beneath the site occurs in unconfined conditions in essentially unconsolidated silts, sands, and gravels. The depth to groundwater is approximately 535 feet below ground surface (bgs). Groundwater flow in the regional aquifer is thought to be to the northwest in this area (SNL/NM May 2003). The nearest groundwater monitoring wells are the TAI-W-02/TAI-W-06 well pair, approximately 800 feet southwest of the site. The nearest production wells include KAFB-1, approximately 1 mile to the west, and KAFB-11, approximately 1.1 miles to the southeast.

II. Data Quality Objectives

The Data Quality Objectives (DQOs) presented in the "Sampling and Analysis Plan [SAP] for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico" (SNL/NM October 1999) and "Field Implementation Plan [FIP], Characterization of Non-Environmental Restoration Drain and Septic Systems" (SNL/NM November 2001), identified the site-specific sample locations, sample depths, sampling procedures, and analytical requirements for this and many

other DSS sites. The DQOs outlined the quality assurance (QA)/quality control (QC) requirements necessary for producing defensible analytical data suitable for risk assessment purposes. The sampling conducted at this site was designed to:

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

Table 1 summarizes the rationale for determining the sampling locations at this site. The source of potential COCs at DSS Site 1102 was effluent discharged to the environment from the seepage pit at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1102 Sampling Area	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil beneath the septic system seepage pit	Effluent discharged to the environment from the seepage pit	1	NA	Evaluate potential COC releases to the environment from effluent discharged from the seepage pit

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

Using a Geoprobe™, the soil samples were collected from two 3- or 4-foot-long sampling intervals at one borehole location at DSS Site 1102. Sampling intervals started at 25 and 30 feet bgs in the single seepage pit boring. The soil samples were collected in accordance with the procedures described in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). Table 2 summarizes the types of confirmatory and QA/QC samples collected at the site and the laboratories that performed the analyses.

The 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 Radiation Protection Sample Diagnostics (RPSD) Laboratory. Table 3 summarizes the analytical methods and the data quality requirements from the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001).

Table 2
Number of Confirmatory Soil and QA/QC Samples Collected from DSS Site 1102

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 ^a	1	0	0	0	0	0	2	2	2
Total Samples	3	2	2	2	2	2	GEL	RPSD	GEL
Analytical Laboratory	GEL	GEL	GEL	GEL	GEL	GEL	GEL		

^aTBs for VOCs only.

DSS = Drain and Septic Systems.

EB = Equipment blank.

GEL = General Engineering Laboratories, Inc.

HE = High explosives(s).

PCB = Polychlorinated biphenyl.

QA/QC = Quality assurance/quality control.

RCRA = Resource Conservation and Recovery Act.

RPSD = Radiation Protection Sample Diagnostics Laboratory.

SVOC = Semivolatile organic compound.

TB = Trip blank.

VOC = Volatile organic compound.

Table 3
Summary of Data Quality Requirements for DSS Site 1102

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

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

^aEPA November 1986.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

GEL = General Engineering Laboratories, Inc.

HE = High explosive(s).

PCB = Polychlorinated biphenyl.

QA/QC = Quality assurance/quality control.

RCRA = Resource Conservation and Recovery Act.

RPSD = Radiation Protection Sample Diagnostics Laboratory.

SVOC = Semivolatile organic compound.

VOC = Volatile organic compound.

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

All of the soil sample results were verified/validated by SNL/NM according to "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure 94-03, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00-03 (SNL/NM December 1999). The data validation reports are presented in the associated DSS Site 1102 request for a determination of Corrective Action Complete (CAC) without controls. The gamma spectroscopy data from the RPSD Laboratory were reviewed according to "Laboratory Data Review Guidelines," Procedure No. RPSD-02-11, Issue No. 2 (SNL/NM July 1996). The gamma

spectroscopy results are presented in the CAC proposal. The reviews confirmed that the analytical data are defensible and therefore acceptable for use in the request for a determination of CAC without controls. 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 1102 is 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 site model for DSS Site 1102, which is presented in Section 4.0 of the associated request for a determination of CAC without controls. The quality of the data specifically used to determine the nature, migration rate, and extent of contamination is described in the following sections.

III.2 Nature of Contamination

Both the nature of contamination and the potential for the degradation of COCs at DSS Site 1102 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 1102.

III.3 Rate of Contaminant Migration

The septic system at DSS Site 1102 was abandoned in the early 1990s when Building 889 was demolished. The migration rate of COCs that may have been introduced into the subsurface via the septic system at this site was therefore dependent upon the volume of aqueous effluent discharged to the environment from this system when it was operational. Any migration of COCs from this site after use of the septic system was discontinued has been predominantly dependent upon precipitation. However, it is highly unlikely that sufficient precipitation has fallen on the site to reach the depth at which COCs may have been discharged to the subsurface from this system. Analytical data generated from the soil sampling conducted at the site are adequate to characterize the rate of COC migration at DSS Site 1102.

III.4 Extent of Contamination

Subsurface soil samples were collected from a single borehole drilled beneath the effluent release point (seepage pit) at the site to assess whether releases of effluent from the septic system caused any environmental contamination.

The soil samples were collected at sampling depths starting at 25 and 30 feet bgs beneath the seepage pit. Sampling intervals started at the depths at which effluent discharged from the seepage pit would have entered the subsurface environment at the site. This sampling procedure was required by New Mexico Environment Department (NMED) regulators and has been used at numerous DSS-type sites at SNL/NM. The 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 Levels

Site history and characterization activities are used to identify potential COCs. The DSS Site 1102 request for a determination of CAC without controls describes the identification of COCs and the sampling that was conducted in order to determine the concentration levels of those COCs across the site. Generally, COCs evaluated in this risk assessment include all detected organic and all inorganic and radiological COCs for which samples were analyzed. When the detection limit of an organic compound is too high (i.e., could possibly cause an adverse effect to human health or the environment), the compound is retained. Nondetected organic compounds not included in this assessment were determined to have detection limits low enough to ensure protection of human health and the environment. In order to provide conservatism in this risk assessment, the calculation uses only the maximum concentration value of each COC found for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 1997) was selected to provide the background screen listed in Tables 4 and 5.

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

Table 4 lists the nonradiological COCs and Table 5 lists the radiological COCs for the human health risk assessment at DSS Site 1102. All samples were collected from depths of 5 feet bgs or greater; therefore, evaluation of ecological risk was not performed. Both tables show the associated SNL/NM maximum background concentration values (Dinwiddie September 1997). Section VI.4 discusses the results presented in Tables 4 and 5.

V. Fate and Transport

The primary releases of COCs at DSS Site 1102 were to the subsurface soil resulting from the discharge of effluents from the former Building 889 septic system. Wind, water, and biota are natural mechanisms of COC transport from the primary release point; however, because the discharge was to subsurface soil, none of these mechanisms are considered to be of potential significance as transport mechanisms at this site. Because the seepage pit is no longer active, additional infiltration of water is not expected. Infiltration of precipitation is essentially nonexistent at DSS Site 1102, as virtually all of the moisture either drains away from the site or evaporates. Because groundwater at this site is approximately 535 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1102 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	2.78	4.4	Yes	44 ^c	-	Yes
Barium	182 J	200	Yes	170 ^d	-	Yes
Cadmium	0.271 J	0.9	Yes	64 ^c	-	Yes
Chromium, total	11.8	12.8	Yes	16 ^c	-	No
Chromium VI	0.0262 ^e	NC	Unknown	16 ^c	-	No
Cyanide	0.0833 J	NC	Unknown	NC	-	Unknown
Lead	6.84	11.2	Yes	49 ^c	-	Yes
Mercury	0.0086 J	<0.1	Yes	5,500 ^c	-	Yes
Selenium	0.0765 ^e	<1	Yes	800 ^f	-	Yes
Silver	0.0426 ^e	<1	Yes	0.5 ^c	-	No
Organic						
2-Butanone	0.0207	NA	NA	19	0.29 ^g	No
PCBs (Aroclor-1260)	0.007 J	NA	NA	31,200 ^c	6.72 ^c	Yes

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

^aDinwiddle September 1997, North Area Supergroup.

^bNMED March 1998.

^cYanicak March 1997.

^dNeumann 1976.

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

^fCallahan et al. 1979.

^gHoward 1990.

BCF = Bioconcentration factor.

COC = Constituent of concern.

DSS = Drain and Septic Systems.

J = Estimated concentration.

K_{ow} = Octanol-water partition coefficient.

Log = Logarithm (base 10).

mg/kg = Milligram(s) per kilogram.

NA = Not applicable.
 NC = Not calculated.
 NMED = New Mexico Environment Department.
 PCB = Polychlorinated biphenyl.
 SNL/NM = Sandia National Laboratories/New Mexico.
 - = Information not available.

Table 5
Radiological COCs for Human Health Risk Assessment at DSS Site 1102 with Comparison to the Associated SNL/NM Background Screening Value and BCF

COC	Maximum Activity (All Samples) (pCi/g) ^a	SNL/NM Background Activity (pCi/g) ^b	Is Maximum COC Activity Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (maximum aquatic)	Is COC a Bioaccumulator? ^c (BCF >40)
Cs-137	ND (0.0367)	0.084	Yes	3,000 ^d	Yes
Th-232	0.828	1.54	Yes	3,000 ^e	Yes
U-235	0.351	0.18	No	900 ^e	Yes
U-238	ND (0.555)	1.3	Yes	900 ^e	Yes

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

^aValue listed is the greater of either the maximum detection or the highest MDA.

^bDinwiddie September 1997, North Area Supergroup.

^cNMED March 1998.

^dWhicker and Schultz 1982.

^eBaker and Soldat 1992.

BCF = Bioconcentration factor.

COC = Constituent of concern.

DSS = Drain and Septic Systems.

MDA = Minimum detectable activity.

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

NMED = New Mexico Environment Department.

pCi/g = Picocurie(s) per gram.

SNL/NM = Sandia National Laboratories/New Mexico.

The COCs at DSS Site 1102 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 are not considered to be degradable. Transformations of these inorganic constituents could include changes in valence (oxidation/reduction reactions) or incorporation into organic forms (e.g., the conversion of selenite or selenate from soil to seleno-amino acids in plants). Cyanide can be metabolized by soil biota. 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 are expected to result in significant losses or transformations of the inorganic COCs.

The organic COCs at DSS Site 1102 are limited to VOCs and PCBs. Organic COCs may be degraded through photolysis, hydrolysis, and biotransformation. Photolysis requires light and therefore takes place in the air, at the ground surface, or in surface water. Hydrolysis includes chemical transformations in water and may occur in the soil solution. Biotransformation (i.e., transformation caused by plants, animals, and microorganisms) may occur; however, biological activity may be limited by the arid environment at this site. Because of the depth of the COCs in the soil, the loss of 2-butanone through volatilization is expected to be minimal.

Table 6 summarizes the fate and transport processes that can occur at DSS Site 1102. The COCs at this site include both radiological and nonradiological inorganic analytes as well as 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 1102

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

DSS = Drain and Septic Systems.

VI. Human Health Risk Assessment

VI.1 Introduction

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

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

VI.2 Step 1. Site Data

Section I of this risk assessment provides the site description and history for DSS Site 1102. 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 1102 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 1102 is approximately 535 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 1102.

Pathway Identification

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

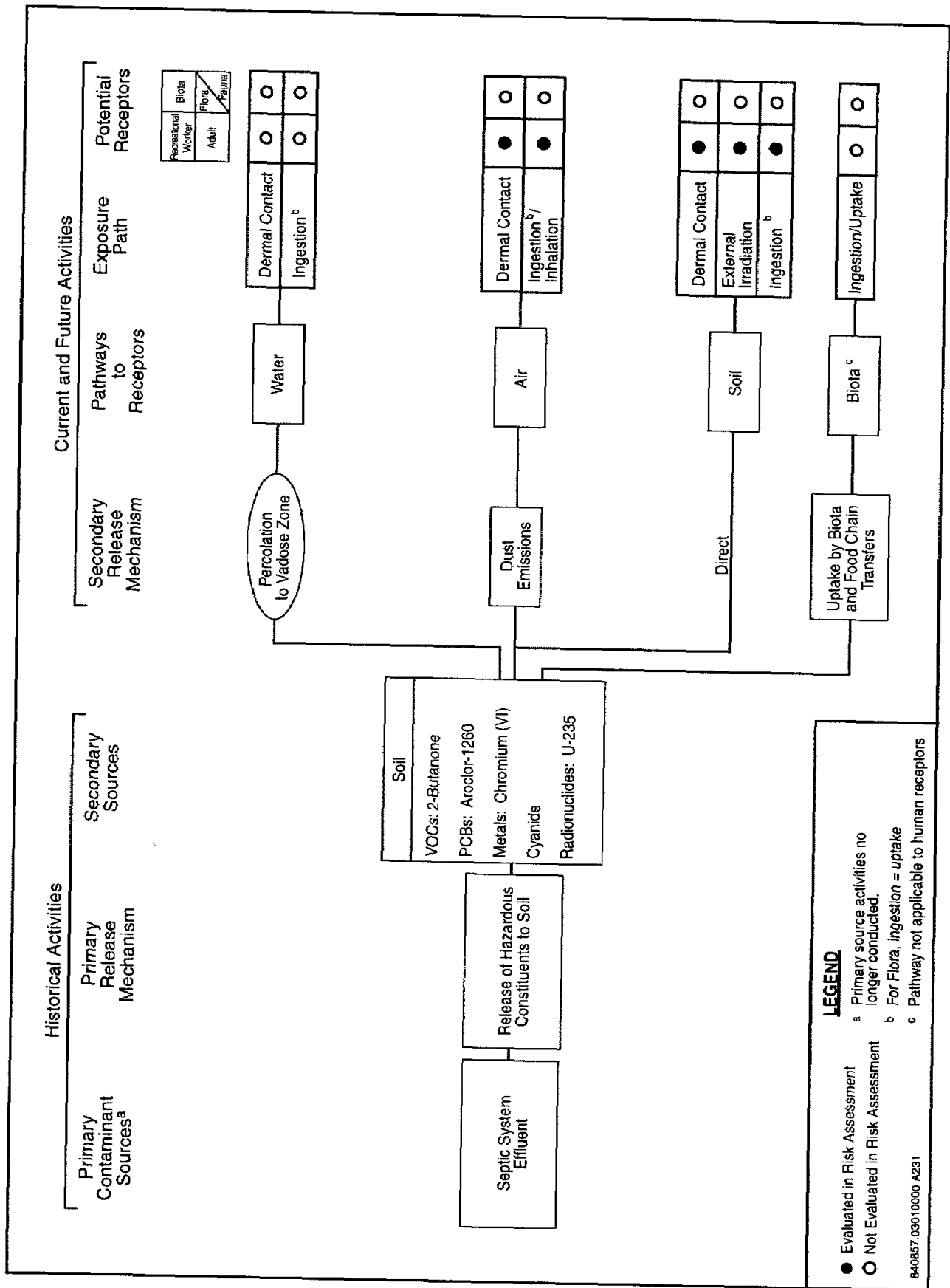
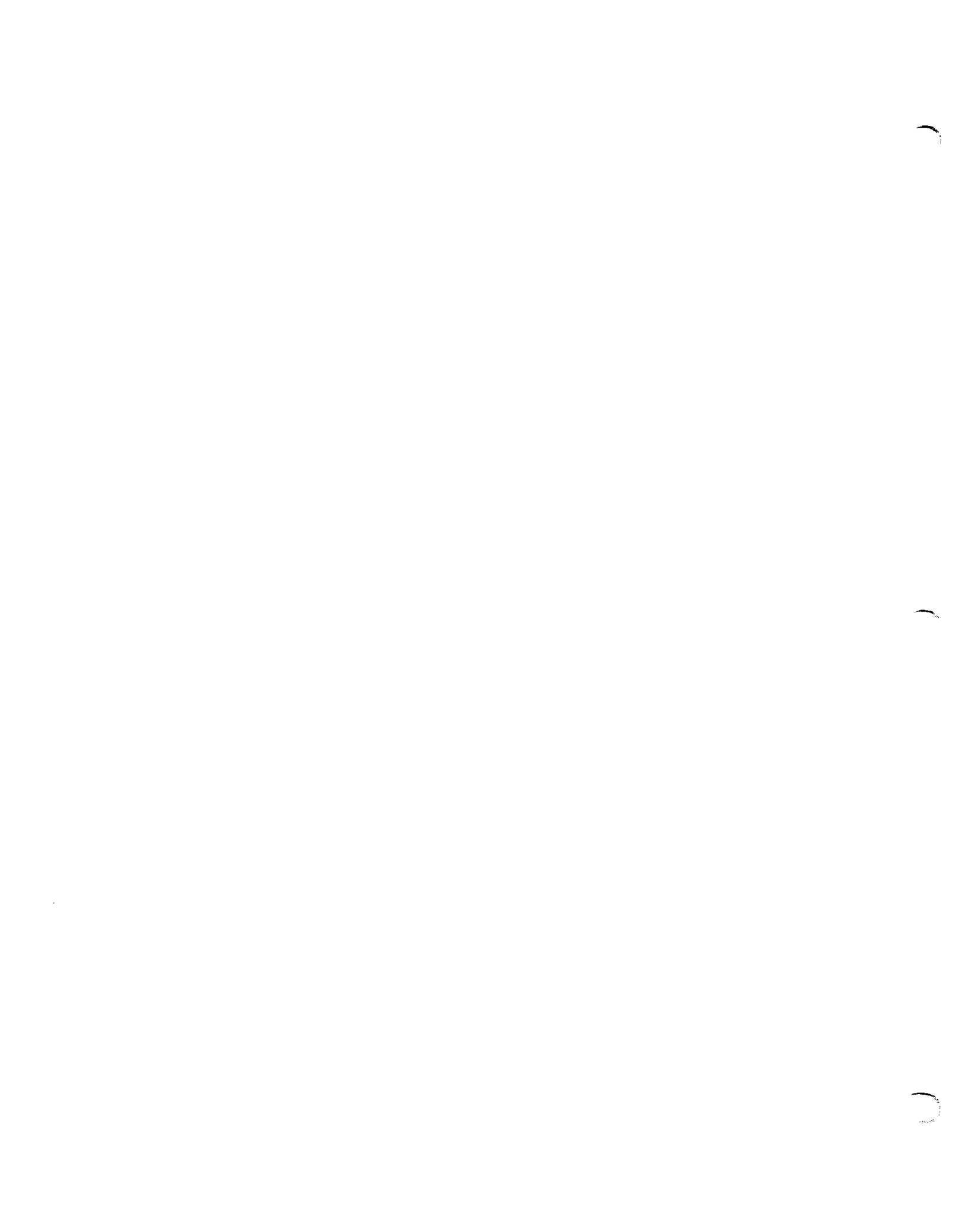


Figure 1
Conceptual Site Model Flow Diagram for DSS Site 1102, Former Building 889 Septic System



VI.4 Step 3. Background Screening Procedure

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

VI.4.1 Methodology

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

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

VI.4.2 Results

Tables 4 and 5 show the DSS Site 1102 maximum COC concentrations that were compared to the SNL/NM maximum background values (Dinwiddie September 1997) for the human health risk assessment. Two constituents do not have quantified background screening concentrations; therefore it is unknown whether these COCs exceed background. Two constituents are organic compounds that do not have corresponding background screening values.

The maximum concentration value for total PCBs is 0.007 J milligrams (mg)/kilogram (kg). This concentration is less than the EPA screening level of 1 mg/kg (Title 40, Code of Federal Regulations, Part 761). Because the maximum concentration for PCBs at this site is less than the screening value, PCBs are eliminated from further consideration in the human health risk assessment.

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

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

Table 7
Toxicological Parameter Values for DSS Site 1102 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								
Chromium VI	3E-3 ^c	L	2.3E-6 ^c	L	-	4.2E+1 ^c	A	0.01 ^d
Cyanide	2E-2 ^c	M	-	-	-	-	D	0.1 ^d
Organic								
2-Butanone	6E-1 ^c	L	2.9E-1 ^c	L	-	-	D	0.1 ^d

^aConfidence associated with IRIS (EPA 2004a) database values. Confidence: L = low, M = medium.
^bEPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 2004a):

A = Human carcinogen.
 D = Not classifiable as to human carcinogenicity.

^cToxicological parameter values from IRIS electronic database (EPA 2004a).

^dToxicological parameter values from NIMED (February 2004).

ABS = Gastrointestinal absorption coefficient.

COC = Constituent of concern.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

IRIS = Integrated Risk Information System.

mg/kg-d = Milligram(s) per kilogram-day.

(mg/kg-d)⁻¹ = Per milligram per kilogram-day.

NMED = New Mexico Environment Department.

RfD_{Inh} = Inhalation chronic reference dose.

RfD_o = Oral chronic reference dose.

SF_{Inh} = Inhalation slope factor.

SF_o = Oral slope factor.

- = Information not available.

Table 8
Radiological Toxicological Parameter Values for DSS Site 1102 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

^aYu et al. 1993a.

^bEPA 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-year.

SF_{ev} = External volume exposure slope factor.

SF_{inh} = Inhalation slope factor.

SF_o = Oral (ingestion) slope factor.

nonradiological COCs presented in Table 7 were obtained from the Integrated Risk Information System (IRIS) (EPA 2004a) and the Technical Background Document for Development of Soil Screening Levels (NMED February 2004). 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 the industrial and residential land-use scenarios. The incremental TEDE and incremental estimated cancer risk are provided for the background-adjusted radiological COC 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 February 2004), as well as other EPA and NMED guidance documents, and reflect the reasonable maximum exposure (RME) approach advocated by the RAGS (EPA 1989). For the radiological COC, the coded equation provided in RESRAD computer code is used to estimate the incremental TEDE and cancer risk for individual exposure pathways. Further discussion of this process is provided in the "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD" (Yu et al. 1993a).

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 1102 nonradiological COCs and an estimated excess cancer risk of $6E-11$ 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 an HI of 0.00 and no estimated excess cancer risk for the DSS Site 1102 associated background constituents under the designated industrial land-use scenario.

For the radiological COC, 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 $2.5E-2$ 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 1997a), 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 1102 for the industrial land-use scenario is well below this guideline. The estimated incremental excess cancer risk is $2.1E-7$.

For the nonradiological COCs under the residential land-use scenario, the HI is 0.00 with an estimated excess cancer risk of $1E-10$ (Table 9). The numbers in the table include exposure from soil ingestion, dermal contact, and dust and volatile inhalation. Although the EPA (1991) guidelines generally recommend that inhalation not be included in a residential land-use scenario, this pathway is included because of the potential for soil in Albuquerque, New Mexico, to be eroded and for dust to be present in predominantly residential areas. Because of the nature of the local soil, other exposure pathways are not considered (see Appendix 1). Table 10 shows an HI of 0.00 and no estimated excess cancer risk for the DSS Site 1102 associated background constituents under the residential land-use scenario.

Table 9
Risk Assessment Values for DSS Site 1102 Nonradiological COCs

COC	Maximum Concentration (mg/kg)	Industrial Land-Use Scenario ^a		Residential Land-Use Scenario ^a	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Chromium VI	0.0262 ^b	0.00	6E-11	0.00	1E-10
Cyanide	0.0833 J	0.00	–	0.00	–
Organic					
2-Butanone	0.0207	0.00	–	0.00	–
Total		0.00	6E-11	0.00	1E-10

^aEPA 1989.

^bConcentration is one-half the maximum 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 1102 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
Chromium VI	NC	–	–	–	–
Cyanide	NC	–	–	–	–
Total		0.00	–	0.00	–

^aDinwiddie September 1997, North Area Supergroup.

^bEPA 1989.

COC = Constituent of concern.

DSS = Drain and Septic Systems.

EPA = U.S. Environmental Protection Agency.

mg/kg = Milligram(s) per kilogram.

NC = Not calculated.

– = Information not available.

For the radiological COC, the incremental TEDE for the residential land-use scenario is $6.3E-2$ 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 1102 for the residential land-use scenario is well below this guideline. Consequently, DSS Site 1102 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 incremental excess cancer risk is $6.1E-7$. 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 [Comprehensive Environmental Response, Compensation, and Liability Act] Sites with Radioactive Contamination," (EPA 1997a). 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 evaluates the potential for adverse health effects for both the industrial (the designated land-use scenario for this site) and residential land-use scenarios.

For the nonradiological COCs under the industrial land-use scenario, the HI is 0.00 (less than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). The estimated excess cancer risk is $6E-11$. NMED guidance states that cumulative excess lifetime cancer risk must be less than $1E-5$ (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. This assessment also determined risks considering background concentrations of the potential nonradiological COCs for both the industrial and residential land-use scenarios. Assuming the industrial land-use scenario, there is neither a quantifiable HI nor an excess cancer risk for nonradiological COCs. The incremental risk is determined by subtracting risk associated with background from potential COC risk. These numbers are not rounded before the difference is determined and therefore may appear to be inconsistent with numbers presented in tables and within the text. For conservatism, the background constituents that do not have quantified background screening concentrations are assumed to have a hazard quotient of 0.00. The incremental HI is 0.00 and the incremental estimated excess cancer risk is $5.66E-11$ for the industrial land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under an industrial land-use scenario.

For the radiological COC under the industrial land-use scenario, the incremental TEDE is $2.5E-2$ mrem/yr, which is significantly lower than EPA's numerical guideline of 15 mrem/yr. The incremental estimated excess cancer risk is $2.1E-7$.

The calculated HI for the nonradiological COCs under the residential land-use scenario is 0.00, which is below numerical guidance. The estimated excess cancer risk is $1E-10$. 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. The incremental HI is 0.00 and the estimated incremental excess cancer risk is $1.20E-10$ for the residential land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under the residential land-use scenario.

The incremental TEDE for a residential land-use scenario from the radiological component is $6.3E-2$ mrem/yr, which is significantly less 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 incremental excess cancer risk is $6.1E-7$.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1102 is based upon an initial conceptual model that was validated with sampling conducted at the site. The sampling was implemented in accordance with the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). The DQOs contained in these two documents are appropriate for use in risk assessments. The data from soil samples collected at effluent release points are representative of potential COC releases to the site. The analytical requirements and results satisfy the DQOs, and data quality was verified/validated in accordance with SNL/NM procedures. Therefore, there is no uncertainty associated with the data quality used to perform the risk assessment at DSS Site 1102.

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

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

Table 7 shows the uncertainties (confidence levels) in nonradiological toxicological parameter values. There is a combination of estimated values and values from the IRIS (EPA 2004a) and the Technical Background Document for Development of Soil Screening Levels (NMED February 2004). Where values are not provided, information is not available from the Health Effects Assessment Summary Tables (EPA 1997b), IRIS (EPA 2004a), Technical Background Document for Development of Soil Screening Levels (NMED February 2004), Risk Assessment Information System (ORNL 2003), or the EPA regions (EPA 2004b, EPA 2002a, EPA 2002b). 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 the nonradiological COCs are within the acceptable range for human health under the residential and industrial land-use scenario compared to established numerical guidance.

For the radiological COC, the conclusion of the risk assessment is that potential effects on human health for both the industrial and residential land-use scenarios are below background and represent only a small fraction of the estimated 360 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 1102 contains identified COCs consisting of some inorganic, organic, and radiological compounds. Because of the location of the site, the designated industrial land-use scenario, and the nature of contamination, potential exposure pathways identified for this site include soil ingestion, dermal contact, and dust and volatile inhalation for chemical COCs, and soil ingestion, dust inhalation, and direct gamma exposure for radionuclides. The same exposure pathways are applied to the residential land-use scenario.

Using conservative assumptions and an RME approach to risk assessment, calculations for the 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 $6E-11$; 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 estimated incremental excess cancer risk is $5.66E-11$ 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 the nonradiological COCs show that for the residential land-use scenario the HI (0.00) is below the accepted numerical guidance from the EPA. The estimated excess cancer risk is $1E-10$. Thus, excess cancer risk is below the acceptable risk value provided by the NMED for a residential land-use scenario (Bearzi January 2001). The incremental HI is 0.00 and the estimated incremental excess cancer risk is $1.20E-10$ 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 $2.5E-2$ mrem/yr for the industrial land-use scenario, which is much less than the EPA's numerical guidance of 15 mrem/yr (EPA 1997a). The corresponding estimated incremental cancer risk value is $2.1E-7$ 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 $6.3E-2$ mrem/yr with an associated estimated incremental excess cancer risk of $6.1E-7$. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS Site 1102 is eligible for unrestricted radiological release.

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 (EPA 1997a). The summation of the nonradiological and radiological carcinogenic risks is tabulated in Table 11.

Table 11
Summation of Incremental Nonradiological and Radiological Risks from
DSS Site 1102, Building 889 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	$5.66E-11$	$2.1E-7$	$2.1E-7$
Residential	$1.20E-10$	$6.1E-7$	$6.1E-7$

DSS = Drain and Septic Systems.

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

VII. Ecological Risk Assessment

VII.1 Introduction

This section addresses the ecological risks associated with exposure to constituents of potential ecological concern (COPECs) in the soil at DSS Site 1102. 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) summarizes the scoping results and assesses the need for further examination of potential ecological impacts.

VII.2.1 Data Assessment

As indicated in Section IV, all COCs at DSS Site 1102 are at depths of 5 feet bgs or greater. 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 decay of the radiological COC also are expected to be of low significance.

VII.2.4 Scoping Risk-Management Decision

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

VIII. References

Baker, D.A., and J.K. Soldat, 1992. "Methods for Estimating Doses to Organisms from Radioactive Materials Released into the Aquatic Environment," PNL-8150, Pacific Northwest Laboratory, Richland, Washington.

Bearzi, J.P. (New Mexico Environment Department), January 2001. Memorandum to RCRA-Regulated Facilities, "Risk-Based Screening Levels for RCRA Corrective Action Sites in New Mexico," Hazardous Waste Bureau, New Mexico Environment Department, Santa Fe, New Mexico. January 23, 2001.

Callahan, M.A., M.W. Slimak, N.W. Gabel, I.P. May, C.F. Fowler, J.R. Freed, P. Jennings, R.L. Durfee, F.C. Whitmore, B. Maestri, W.R. Mabey, B.R. Holt, and C. Gould, 1979. "Water-Related Environmental Fate of 129 Priority Pollutants," EPA-440/4-79-029, Office of Water and Waste Management, Office of Water Planning and Standards, U.S. Environmental Protection Agency, Washington, D.C.

Dinwiddie, R.S. (New Mexico Environment Department), September 1997. Letter to M.J. Zamorski (U.S. Department of Energy), "Request for Supplemental Information: Background Concentrations Report, SNL/KAFB." September 24, 1997.

DOE, see U.S. Department of Energy.

EPA, see U.S. Environmental Protection Agency.

Howard, P.H., 1990. Volume II: "Solvents," *Handbook of Environmental Fate and Exposure Data for Organic Chemicals*, Lewis Publishers, Inc. Chelsea, Michigan.

Kocher, D.C. 1983. "Dose-Rate Conversion Factors for External Exposure to Photon Emitters in Soil," *Health Physics*, Vol. 28, pp. 193-205.

National Council on Radiation Protection and Measurements (NCRP), 1987. "Exposure of the Population in the United States and Canada from Natural Background Radiation," *NCRP Report No. 94*, National Council on Radiation Protection and Measurements, Bethesda, Maryland.

National Oceanic and Atmospheric Administration (NOAA), 1990. "Local Climatological Data, Annual Summary with Comparative Data," Albuquerque, New Mexico.

NCRP, see National Council on Radiation Protection and Measurements.

Neumann, G., 1976. "Concentration Factors for Stable Metals and Radionuclides in Fish, Mussels and Crustaceans—A Literature Survey," Report 85-04-24, National Swedish Environmental Protection Board.

New Mexico Environment Department (NMED), March 1998. "Risk-Based Decision Tree Description," *in* New Mexico Environment Department, "RPMP Document Requirement Guide," RCRA Permits Management Program, Hazardous and Radioactive Materials Bureau, New Mexico Environment Department, Santa Fe, New Mexico.

New Mexico Environment Department (NMED), February 2004. "Technical Background Document for Development of Soil Screening Levels Revision 2," Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, New Mexico Environment Department, Santa Fe, New Mexico.

NMED, see New Mexico Environment Department.

NOAA, see National Oceanographic and Atmospheric Administration.

Oak Ridge National Laboratory, 2003. "Risk Assessment Information System," electronic database maintained by Oak Ridge National Laboratory, Oak Ridge, Tennessee.

ORNL, see Oak Ridge National Laboratory.

Sandia National Laboratories/New Mexico (SNL/NM), January 1952. SNL/NM Facilities Engineering Drawing 82783, Sheet 42, showing original design for Building 889, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), July 1994. "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 1996. "Site-Wide Hydrogeologic Characterization Project, Calendar Year 1995 Annual Report," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), July 1996. "Laboratory Data Review Guidelines," Radiation Protection Diagnostics Procedure No. RPSD-02-11, Issue No. 2, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), February 1998. "RESRAD Input Parameter Assumptions and Justification," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), October 1999. "Sampling and Analysis Plan for Characterizing and Assessing Potential Releases to the Environment From Septic and Other Miscellaneous Drain Systems at Sandia National Laboratories/New Mexico," Sandia National Laboratories, Albuquerque, New Mexico. October 19, 1999.

Sandia National Laboratories/New Mexico (SNL/NM), December 1999. "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure

(AOP) 00-03, Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), November 2001. "Field Implementation Plan, Characterization of Non-Environmental Restoration Drain and Septic Systems," Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), March 2003. Database printout provided by SNL/NM Facilities Engineering showing the year that numerous SNL/NM buildings were constructed, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), April 2003. "DSS Sites Mean Elevation Report," GIS Group, Environmental Restoration Department, Sandia National Laboratories, Albuquerque, New Mexico.

Sandia National Laboratories/New Mexico (SNL/NM), May 2003. "Tijeras Arroyo Groundwater Investigation Work Plan (Final Version)," Environmental Restoration Project, Sandia National Laboratories, Albuquerque, New Mexico.

SNL/NM, see Sandia National Laboratories/New Mexico.

U.S. Department of Energy (DOE), 1988. "External Dose-Rate Conversion Factors for Calculation of Dose to the Public," DOE/EH-0070, Assistant Secretary for Environment, Safety and Health, U.S. Department of Energy, Washington, D.C.

U.S. Department of Energy (DOE), 1993. "Radiation Protection of the Public and the Environment," DOE Order 5400.5, U.S. Department of Energy, Washington, D.C.

U.S. Department of Energy (DOE), U.S. Air Force, and U.S. Forest Service, September 1995. "Workbook: Future Use Management Area 2," prepared by the Future Use Logistics and Support Working Group in cooperation with U.S. Department of Energy Affiliates, the U.S. Air Force, and the U.S. Forest Service.

U.S. Environmental Protection Agency (EPA), November 1986. "Test Methods for Evaluating Solid Waste," 3rd ed., Update 3, SW-846, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1988. "Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," Office of Radiation Programs, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1989. "Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual," EPA/540-1089/002, Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1991. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B)," Office of Emergency and Remedial Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997a. "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination," OSWER Directive No. 9200.4-18, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997b. "Health Effects Assessment Summary Tables (HEAST), FY 1997 Update," EPA-540-R-97-036, Office of Research and Development and Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997c. "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risks," Interim Final, U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 2002a. "Region 9 Preliminary Remediation Goals (PRGs) 2002," electronic database maintained by Region 9, U.S. Environmental Protection Agency, San Francisco, California.

U.S. Environmental Protection Agency (EPA), 2002b. "Risk-Based Concentration Table," electronic database maintained by Region 3, U.S. Environmental Protection Agency, Philadelphia, Pennsylvania.

U.S. Environmental Protection Agency (EPA), 2004a. Integrated Risk Information System (IRIS) electronic database, maintained by the U.S. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 2004b. "Region 6 Preliminary Remediation Goals (PRGs) 2004," electronic database maintained by Region 6, U.S. Environmental Protection Agency, Dallas, Texas.

Whicker, F.W., and V. Schultz, 1982. *Radioecology: Nuclear Energy and the Environment*, Volume II, CRC Press, Boca Raton, Florida.

Yanicak, S. (Oversight Bureau, Department of Energy, New Mexico Environment Department), March 1997. Letter to M. Johansen (DOE/AIP/POC Los Alamos National Laboratory), "(Tentative) list of constituents of potential ecological concern (COPECs) which are considered to be bioconcentrators and/or biomagnifiers." March 3, 1997.

Yu, C., A.J. Zielen, J.-J. Cheng, Y.C. Yuan, L.G. Jones, D.J. LePoire, Y.Y. Wang, C.O. Loureiro, E. Gnanapragasam, E. Faillace, A. Wallo III, W.A. Williams, and H. Peterson, 1993a. "Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD," Version 5.0. Environmental Assessment Division, Argonne National Laboratory, Argonne, Illinois.

Yu, C., C. Loureiro, J.-J. Cheng, L.G. Jones, Y.Y. Wang, Y.P. Chia, and E. Faillace, 1993b. "Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil," ANL/EAIS-8, Argonne National Laboratory, Argonne, Illinois.

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 five potential exposure routes from further risk assessment evaluations at any SNL/NM SWMU:

- Ingestion of contaminated fish and shellfish
- Ingestion of contaminated fruits and vegetables
- Ingestion of contaminated meat, eggs, and dairy products
- Ingestion of contaminated surface water while swimming
- Dermal contact with chemicals in water

That part of the exposure pathway for radionuclides related to immersion in contaminated air or water is also eliminated.

Based upon this evaluation, for future risk assessments the exposure routes that will be considered are shown in Table 1.

Table 1
Exposure Pathways Considered for Various Land-Use Scenarios

Industrial	Recreational	Residential
Ingestion of contaminated drinking water	Ingestion of contaminated drinking water	Ingestion of contaminated drinking water
Ingestion of contaminated soil	Ingestion of contaminated soil	Ingestion of contaminated soil
Inhalation of airborne compounds (vapor phase or particulate)	Inhalation of airborne compounds (vapor phase or particulate)	Inhalation of airborne compounds (vapor phase or particulate)
Dermal contact (nonradiological constituents only) soil only	Dermal contact (nonradiological constituents only) soil only	Dermal contact (nonradiological constituents only) soil only
External exposure to penetrating radiation from ground surfaces	External exposure to penetrating radiation from ground surfaces	External exposure to penetrating radiation from ground surfaces

Equations and Default Parameter Values for Identified Exposure Routes

In general, SNL/NM expects that ingestion of compounds in drinking water and soil will be the more significant exposure routes for chemicals; external exposure to radiation may also be significant for radionuclides. All of the above routes will, however, be considered for their appropriate land-use scenarios. The general equation for calculating potential intakes via these routes is shown below. The equations are taken from "Assessing Human Health Risks Posed by Chemicals: Screening-Level Risk Assessment" (NMED March 2000) and "Technical Background Document for Development of Soil Screening Levels" (NMED December 2000). Equations from both documents are based upon the "Risk Assessment Guidance for Superfund" (RAGS): Volume 1 (EPA 1989, 1991). These general equations also apply to calculating potential intakes for radionuclides. A more in-depth discussion of the equations used in performing radiological pathway analyses with the RESRAD code may be found in the RESRAD Manual (ANL 1993). RESRAD is the only code designated by the U.S. Department of Energy (DOE) in DOE Order 5400.5 for the evaluation of radioactively contaminated sites (DOE 1993). The Nuclear Regulatory Commission (NRC) has approved the use of RESRAD for dose evaluation by licensees involved in decommissioning, NRC staff evaluation of waste disposal requests, and dose evaluation of sites being reviewed by NRC staff. EPA Science Advisory Board reviewed the RESRAD model. EPA used RESRAD in their rulemaking on radiation site cleanup regulations. RESRAD code has been verified, undergone several benchmarking analyses, and been included in the International Atomic Energy Agency's VAMP and BIOMOVs II projects to compare environmental transport models.

Also shown are the default values SNL/NM ER will use in RME risk assessment calculations for industrial, recreational, and residential land-use scenarios, based upon EPA and other governmental agency guidance. The pathways and values for chemical contaminants are discussed first, followed by those for radionuclide contaminants. RESRAD input parameters that are left as the default values provided with the code are not discussed. Further information relating to these parameters may be found in the RESRAD Manual (ANL 1993) or by directly accessing the RESRAD websites at: <http://web.ead.anl.gov/resrad/home2/> or <http://web.ead.anl.gov/resrad/documents/>.

Generic Equation for Calculation of Risk Parameter Values

The equation used to calculate the risk parameter values (i.e., hazard quotients/HI, excess cancer risk, or radiation total effective dose equivalent [TEDE] [dose]) is similar for all exposure pathways and is given by:

Risk (or Dose) = Intake x Toxicity Effect (either carcinogenic, noncarcinogenic, or radiological)

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

where;

- C = contaminant concentration (site specific)
- CR = contact rate for the exposure pathway
- EFD = exposure frequency and duration
- BW = body weight of average exposure individual
- AT = time over which exposure is averaged.

For nonradiological constituents of concern (COCs), the total risk/dose (either cancer risk or HI) is the sum of the risks/doses for all of the site-specific exposure pathways and contaminants. For radionuclides, the calculated radiation exposure, expressed as TEDE is compared directly to the exposure guidelines of 15 millirem per year (mrem/year) for industrial and recreational future use and 75 mrem/year for the unlikely event that institutional control of the site is lost and the site is used for residential purposes (EPA 1997).

The evaluation of the carcinogenic health hazard produces a quantitative estimate for excess cancer risk resulting from the COCs present at the site. This estimate is evaluated for determination of further action by comparison of the quantitative estimate with the potentially acceptable risk of 1E-5 for nonradiological carcinogens. The evaluation of the noncarcinogenic health hazard produces a quantitative estimate (i.e., the HI) for the toxicity resulting from the COCs present at the site. This estimate is evaluated for determination of further action by comparison of this quantitative estimate with the EPA standard HI of unity (1). The evaluation of the health hazard from radioactive compounds produces a quantitative estimate of doses resulting from the COCs present at the site. This estimated dose is used to calculate an assumed risk. However, this calculated risk is presented for illustration purposes only, not to determine compliance with regulations.

The specific equations used for the individual exposure pathways can be found in RAGS (EPA 1989) and are outlined below. The RESRAD Manual (ANL 1993) describes similar equations for the calculation of radiological exposures.

Soil Ingestion

A receptor can ingest soil or dust directly by working in the contaminated soil. Indirect ingestion can occur from sources such as unwashed hands introducing contaminated soil to food that is then eaten. An estimate of intake from ingesting soil will be calculated as follows:

$$I_s = \frac{C_s * IR * CF * EF * ED}{BW * AT}$$

where:

- I_s = Intake of contaminant from soil ingestion (milligrams [mg]/kilogram [kg]-day)
- C_s = Chemical concentration in soil (mg/kg)
- IR = Ingestion rate (mg soil/day)
- CF = Conversion factor (1E-6 kg/mg)
- EF = Exposure frequency (days/year)
- ED = Exposure duration (years)
- BW = Body weight (kg)
- AT = Averaging time (period over which exposure is averaged) (days)

It should be noted that it is conservatively assumed that the receptor only ingests soil from the contaminated source.

Soil Inhalation

A receptor can inhale soil or dust directly by working in the contaminated soil. An estimate of intake from inhaling soil will be calculated as follows (EPA August 1997):

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

where:

- I_s = Intake of contaminant from soil inhalation (mg/kg-day)
- C_s = Chemical concentration in soil (mg/kg)
- IR = Inhalation rate (cubic meters [m³]/day)
- EF = Exposure frequency (days/year)
- ED = Exposure duration (years)
- VF = soil-to-air volatilization factor (m³/kg)
- PEF = particulate emission factor (m³/kg)
- BW = Body weight (kg)
- AT = Averaging time (period over which exposure is averaged) (days)

Soil Dermal Contact

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

where:

- D_a = Absorbed dose (mg/kg-day)
- C_s = Chemical concentration in soil (mg/kg)
- CF = Conversion factor (1E-6 kg/mg)
- SA = Skin surface area available for contact (cm²/event)
- AF = Soil to skin adherence factor (mg/cm²)
- ABS = Absorption factor (unitless)
- EF = Exposure frequency (events/year)

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

Groundwater Ingestion

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

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

where:

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

Groundwater Inhalation

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

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

where:

I_w = Intake of volatile in water from inhalation (mg/kg/day)
 C_w = Chemical concentration in water (mg/L)
 K = volatilization factor (0.5 L/m³)
 IR_i = Inhalation rate (m³/day)
 EF = Exposure frequency (days/year)
 ED = Exposure duration (years)
 BW = Body weight (kg)
 AT = Averaging time (period over which exposure is averaged—days)

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

Tables 2 and 3 show the default parameter values suggested for use by SNL/NM at SWMUs, based upon the selected land-use scenarios for nonradiological and radiological COCs,

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

Summary

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

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

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

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

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

^cExposure Factors Handbook (EPA August 1997).

ED = Exposure duration.

EPA = U.S. Environmental Protection Agency.

hr = Hour(s).

kg = Kilogram(s).

m = Meter(s).

mg = Milligram(s).

NA = Not available.

wk = Week(s).

yr = Year(s).

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

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

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

^bExposure Factors Handbook (EPA August 1997).

^cEPA Region VI guidance (EPA 1996).

^dFor radionuclides, RESRAD (ANL 1993).

^eSNL/NM (February 1998).

EPA = U.S. Environmental Protection Agency.

g = Gram(s)

hr = Hour(s).

kg = Kilogram(s).

m = Meter(s).

mg = Milligram(s).

NA = Not applicable.

wk = Week(s).

yr = Year(s).

References

ANL, see Argonne National Laboratory.

Argonne National Laboratory (ANL), 1993. *Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD*, Version 5.0, ANL/EAD/LD-2, Argonne National Laboratory, Argonne, IL.

DOE, see U.S. Department of Energy.

DOE and USAF, see U.S. Department of Energy and U.S. Air Force.

EPA, see U.S. Environmental Protection Agency.

New Mexico Environment Department (NMED), March 2000. "Assessing Human Health Risks Posed by Chemical: Screening-level Risk Assessment," Hazardous and Radioactive Materials Bureau, NMED, March 6, 2000.

New Mexico Environment Department (NMED), December 2000. "Technical Background Document for Development of Soil Screening Levels," Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, December 18, 2000.

Sandia National Laboratories/New Mexico (SNL/NM), February 1998. "RESRAD Input Parameter Assumptions and Justification," Sandia National Laboratories/New Mexico Environmental Restoration Project, Albuquerque, New Mexico.

U.S. Department of Energy (DOE), 1993. DOE Order 5400.5, "Radiation Protection of the Public and the Environment," U.S. Department of Energy, Washington, D.C.

U.S. Department of Energy (DOE), 1996. "Environmental Assessment of the Environmental Restoration Project at Sandia National Laboratories/New Mexico," U.S. Department of Energy, Kirtland Area Office.

U.S. Department of Energy, U.S. Air Force, and U.S. Forest Service, September 1995. "Workbook: Future Use Management Area 2," prepared by the Future Use Logistics and Support Working Group in cooperation with U.S. Department of Energy Affiliates, the U.S. Air Force, and the U.S. Forest Service.

U.S. Department of Energy, U.S. Air Force, and U.S. Forest Service, October 1995. "Workbook: Future Use Management Area 1," prepared by the Future Use Logistics and Support Working Group in cooperation with U.S. Department of Energy Affiliates, the U.S. Air Force, and the U.S. Forest Service.

U.S. Department of Energy and U.S. Air Force (DOE and USAF), January 1996. "Workbook: Future Use Management Areas 3,4,5,and 6," prepared by the Future Use Logistics and Support Working Group in cooperation with U.S. Department of Energy Affiliates, and the U.S. Air Force.

U.S. Department of Energy and U.S. Air Force (DOE and USAF), March 1996. "Workbook: Future Use Management Area 7," prepared by the Future Use Logistics and Support Working Group in cooperation with U.S. Department of Energy Affiliates and the U.S. Air Force.

U.S. Environmental Protection Agency (EPA), 1989. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual," EPA/540-1089/002, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1991. "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part B)," EPA/540/R-92/003, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1992. "Dermal Exposure Assessment: Principles and Applications," EPA/600/8-91/011B, Office of Research and Development, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1996. "Soil Screening Guidance: Technical Background Document," EPA/540/1295/128, Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. Environmental Protection Agency (EPA), August 1997. *Exposure Factors Handbook*, EPA/600/8-89/043, U.S. Environmental Protection Agency, Office of Health and Environmental Assessment, Washington, D.C.

U.S. Environmental Protection Agency (EPA), 1997. (OSWER No. 9200.4-18) *Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination*, U.S. EPA Office of Radiation and Indoor Air, Washington D.C, August 1997.



RSI



National Nuclear Security Administration

Sandia Site Office
P.O. Box 5400
Albuquerque, New Mexico 87185-5400

Brenda



MAR 22 2005

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Mr James Bearzi, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Road East, Building 1
Santa Fe, NM 87505

Dear Mr. Bearzi,

On behalf of the Department of Energy (DOE) and Sandia Corporation, DOE is submitting the enclosed responses to the New Mexico Environment Department Request for Supplemental Information, SWMU Assessment Reports and Proposals for Corrective Action Complete, Drain and Septic Systems (DSS) Sites 276, 1004, 1031, 1052, 1080, 1087, 1090, 1102, and 1113, DSS Round 7, Environmental Restoration Project at Sandia National Laboratories, New Mexico, EPA ID No. NM589011518, dated January 26, 2005.

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

Sincerely,

Patty Wagner
Manager

Enclosure

cc w/enclosure:

W. Moats, NMED-HWB (via Certified Mail)
L. King, EPA, Region 6 (Via Certified Mail)
M. Gardipe, NNSA/SC/ERD
D. Pepe, NMED-OB
J. Volkerding, DOE-NMED-OB

Mr. J. Bearzi

(2)

MAR 22 2005

cc w/o enclosure:

F. Nimick, SNL, MS 1089
R. E. Fate, SNL, MS 1089
M. J. Davis, SNL, MS 1089
D. Stockham, SNL, MS 1087
B. Langkopf, SNL, MS 1087
M. Sanders, SNL, MS 1087
A. Blumberg, SNL, MS 0141

**Sandia National Laboratories
Albuquerque, New Mexico
March 2005**

**Environmental Restoration Project
Responses to NMED Request for Supplemental Information
SWMU Assessment Reports and Proposals for Corrective Action Complete:
Drain and Septic Systems (DSS) Sites 276, 1004, 1031, 1052, 1080, 1087, 1090,
1102, AND 1113, DSS ROUND 7
Dated December 2004**

INTRODUCTION

This document responds to a January 26, 2005 Request for Supplemental Information (RSI) letter from William P. Moats of the State of New Mexico Environment Department (NMED) Hazardous Waste Bureau (HWB) to the U.S Department of Energy and Sandia National Laboratories/New Mexico (SNL/NM). A response to this RSI is due within sixty (60) days of receipt of the letter by SNL/NM, or by March 26, 2005.

In this document, the NMED comments (in bold font) are restated in the same order in which they were provided in the RSI. Following each comment, the word "Response" introduces the U.S. Department of Energy/SNL/NM reply (in normal font style).

GENERAL COMMENTS

- 1. Shallow ground water is present beneath several of the sites that are included in the subject document (SWMUs 276, 1102, and 1052). This fact is stated in the description of each of these sites. Clarify why this information is neither mentioned when describing the conceptual site model nor taken into account when identifying and evaluating the potential contaminant pathways in the risk assessment reports.**

Response: As noted in each of the three reports, the shallow groundwater aquifer is approximately 265, 267, and 310 feet below ground surface (bgs) at Sites 276 (Building 829X silver recovery sump), 1052 (Building 803 seepage pit), and 1102 (Building 889 septic system) respectively. The shallow groundwater aquifer is limited in extent beneath SNL/NM and Kirtland Air Force Base (KAFB) and is not used as a water supply source. The regional groundwater aquifer is approximately 555, 552, and 535 feet bgs beneath Sites 276, 1052, and 1102, respectively. In addition, infiltration of precipitation is almost nonexistent at these sites as virtually all moisture that falls or flows onto the site subsequently undergoes evapotranspiration.

No significant contaminant of concern (COC) concentrations were detected in soil samples collected in 2002 from beneath these three units. As described in the DSS Site 1052 SWMU Assessment Report (SAR), Site 1052 was one of seven DSS project sites selected by NMED for the installation of a deep soil-vapor monitoring well, to test for the presence of significant volatile organic compound (VOC) soil-vapor concentrations in the deep subsurface at selected DSS sites. Soil vapor samples were collected at depths of 5, 20, 70, 100, and 150 feet bgs in well 1052-VW-01, and total VOC vapor concentrations in all of the samples were much lower than the 10 parts per million by volume (ppmv) action level specified 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". Therefore, based on the sampling conducted at these three locations, it was considered unlikely that COCs have or will reach either the shallow or regional aquifers as a result of discharges from these sites. For these reasons, the groundwater pathway for these three sites was not evaluated as part of the risk assessments for these three sites.

- 2. The NMED is aware of the typical background levels for gross alpha/beta for the Sandia National Laboratories area. However, the term "New Mexico-established background levels" for gross alpha and gross beta is potentially misleading in that it implies that these levels have been officially approved by the New Mexico Environment Department (NMED), which is not true. In future reports, this phrase should be eliminated from similar discussions of gross alpha/beta activities.**

Response: SNL/NM acknowledges that there are no NMED-approved maximum background levels for gross alpha/beta activities in soil, and did not intend to imply that this was the case. The upper 95th percentile (mean plus 2 standard deviations above the mean) background activities for gross alpha/beta activities of 17.4 and 25.4 picocuries per gram (pCi/g), respectively, are based upon values derived from a gross alpha/beta soil sampling study conducted in November 1990 by the NMED in which soil samples were collected from 40 locations throughout the state. This is the most comprehensive study known to attempt to determine maximum background gross alpha and beta values in soil throughout the state. These background values were used in the DSS SARs to give the detected gross alpha/beta values meaning relative to background activities, instead of presenting the values without comparison. The language in future reports will be modified to remove the implication of official approval of the background values by the NMED.

- 3. Each drain and septic system report must include the date that the septic system was abandoned or otherwise inactivated and the date that the septic tank was pumped out and backfilled. If a tank has not been emptied and backfilled, state the date that these activities will occur.**

Response: The dates by which most of the septic systems in SNL/NM Technical Area (TA)-III and the Coyote Test Field (CTF) areas were "removed from service" are based upon two memos written by Mr. Joe Jones (SNL/NM), dated June 21, 1991, and July 26, 1993. In future SARs and RSI responses, for non-TA-III and CTF sites not listed in the Jones memos, additional research will be conducted as needed to determine the year in which a system was abandoned. Also, see the response to Specific Comment #7 below for additional historical information on the Building 803 seepage pit (DSS Site 1052), one of the sites included in DSS Round 7.

All known SNL/NM abandoned septic tanks were inspected in 2004 to determine if they were empty and ready to backfill, or if they contained effluent. Six tanks were found to still contain effluent. As a result, waste characterization samples were collected from these tanks in July 2004 and January 2005. SNL/NM plans to remove the waste in these six tanks and dispose of it according to SNL/NM policy in the spring of 2005. Once the waste has been removed, all of the remaining abandoned SNL/NM septic tanks and seepage pits will be backfilled in place with clean soil by mid-2005. It is anticipated that this backfilling work will commence in approximately mid-May 2005, and will be completed in approximately two months.

As of March 2005, there remain five SNL/NM-owned septic systems that are still in use. These include:

- Building 6020 septic system, 6000 Igloo area
- Building 6030 septic system, 6000 Igloo area
- Building 8895/MO-100 septic system, TA-I
- MO-14/MO-15 septic system, TA-I
- Robotic Vehicle Range septic system, east of TA-II

There are no current plans to close out these active septic systems, and the tanks will be periodically pumped out as required.

4. **Final decisions on the subject reports can not be made until the Quality Control and Gamma Spectrometry Reports addressed in NMED's January 14, 2005, Request for Supplemental Information have been received and approved by the NMED.**

Response: SNL/NM recognizes that final decisions for the proposals for Corrective Action Complete (CAC) for the DSS project sites cannot be made until the above-referenced report is completed. Work on this report is ongoing, and it is anticipated that it will be completed and delivered to the NMED by April 14, 2005, within the required 90-day time frame specified in the applicable Request for Supplemental Information letter.

SPECIFIC COMMENTS**5. Site 1087: Building 6743 Seepage Pit:**

The report states that the seepage pit at Site 1087 will be backfilled in late 2004 or early 2005, when all inflow plumbing will be disconnected. State whether the seepage pit has been backfilled and the date of this activity.

Response: The seepage pit at this site has not yet been backfilled. SNL/NM plans to backfill this seepage pit, and disconnect the piping from the Building 6743 floor drains to the seepage pit, in mid-2005.

6. Site 1090: Building 6721 Septic System:

The NMED does not believe that this site meets residential risk goals, as there are no data supporting an assertion that various semi-volatile organic compounds driving the risk assessment originate from drain field piping. Industrial land use controls will be required for Site 1090. Also, state the detection limits for all samples analyzed for Pyrene that have J-coded values in Table 3.4.2-3.

Response: SNL/NM believes that the most likely source of semivolatile organic compounds (SVOCs) detected in the shallow interval soil samples collected at this site are fragments of the disintegrated bituminous drainfield pipe. If this is the case, the source of the SVOC contamination (piping) still remains at the site, and SNL/NM accepts that the site will be designated Corrective Action Complete with Controls.

As shown on Table 3.4.2-4 of the DSS Site 1090 SAR (the SVOC analytical method detection limit [MDL] table), the MDL for pyrene is 16.7 micrograms per kilogram ($\mu\text{g}/\text{kg}$). The detections of pyrene on Table 3.4.2-3 (the SVOC data summary table) are estimated values that were J-coded during the data validation review process.

7. Site 1052: Building 803 Seepage Pit:

Provide the dates when the drainline was disconnected, the seepage pit was abandoned in place, and the discharges were routed to the City of Albuquerque sanitary sewer system.

It is not credible that SNL could not find any operational history for Site 1052. NMED currently has offices in Building 803 and at least some of the past uses of this building are known. Provide a description of the known historical operations at this site.

Response: The exact date that the Building 803 seepage pit was abandoned was unknown when the Site 1052 SAR was written in December 2004. However, a report titled "Storm Drain System Cross Connect Project" report produced by an SNL/NM Facilities Engineering group in August 1995 has since been located. This project was performed to investigate the storm and sanitary sewer line drain piping at SNL/NM, and to identify and correct any unauthorized cross connections (from the sanitary sewer system to the storm drain). Most of this work was done at TA-I facilities, and details, including test results for Building 803, are presented in the report. Specifically, the report states that an inspection of the Building 803 sanitary and storm drain systems was conducted on September 16, 1992, and included dye testing and inspections of interior drains. Part of the evaluation process included the introduction of fluorescent dye into various inspection ports (sinks, toilets, floor drains, etc.) in the building and observation for the presence of the dye at various downstream discharge points, to determine if there was a connection.

SNL/NM Facilities Engineering drawings show that a floor drain in the northwest part of Building 803 was connected to the seepage pit on the west side of the building. As part of the September 1992 inspection, it was determined that seepage pit floor drain was filled with concrete. The seepage pit was inspected after completion of the building dye testing, and no dye was observed to have entered the seepage pit. It was therefore concluded that the Building 803 seepage pit had been abandoned at sometime prior to September 16, 1992.

What is meant by the statement "because operational records were not available" (which appears in Section 2.2.2 of the DSS Site 1052 SAR) is that SNL/NM has, for the most part, not determined specifics on activities at this or any other DSS AOC site. It was recognized early in the DSS site investigation process that it would be very difficult, if not impossible to determine with a high degree of certainty complete site histories, and the types and quantities of COCs that may or may not have been discharged to the environment. Therefore, during the negotiation process being conducted with the NMED to determine a technical and decision-making approach to complete environmental investigations at the DSS sites, it was concluded that the most definitive way to determine if COCs are present at the sites would be to collect the same comprehensive set of characterization samples at each site. The "standard suite" of analyses was specified in the SAP, and included VOCs, SVOCs, polychlorinated biphenyls (PCBs), total cyanide, high explosive (HE) compounds, the eight Resource Conservation and Recovery Act (RCRA) metals, hexavalent chromium, radionuclides by gamma spectroscopy, and gross alpha/beta activity.

8. Site 276: Former Building 829 X Silver Recovery Sump:

The relationship between the silver sump and the sewer line on the east side of Building 829X is unclear. State whether there is any relationship between these two systems and whether the sewer line is part of SWMU 276.

Low levels of VOCs, SVOCs, and radionuclides were detected in the soil samples collected in 1994 along the sewer line. Describe any remedial activities that were conducted after the collection of these soil samples and whether the sewer line was removed. Data from the samples collected along the sewer line may need to be included in a revised risk assessment for the site.

Response: There is no known direct relationship or connection between the silver recovery sump (on the southwest side of the former Building 829X), and the sewer line on the east side of the building. SWMU 276 includes only the silver recovery sump, and does not include the sewer line. Portions of the August 1995 "Contamination Assessment Report for Soil Sampling at Building 829X" were included as Annex A of the SMWU 276 SAR for completeness, because it presents analytical results for samples collected from beneath the silver recovery sump, as well as other areas around Building 829X. Because the sewer line is not part of SWMU 276, the data from the samples collected along the sewer line is not relevant to the risk assessment for the site.

Available information (SNL/NM Facilities Engineering drawings and computer-aided design (CAD) system maps of sewer lines in TA-I) indicates that the portion of the sewer line in question was removed as part of the demolition activities for this and other nearby buildings. The area of the former Building 829X, and the sewer line and silver recovery sump are now covered by an asphalt parking lot.

9. **Site 1004: Building 6969 Septic System:**

This is an active site. The report does not state whether current operations comply with the applicable laws and regulations nor whether there are any institutional or other controls that will prevent the discharge of possible contaminants into the system in the future. Clarify how the current operations at Site 1004 are protective of the environment.

The risk assessment report for Site 1004 states that the analytical data adequately characterize the rate of contaminant migration up to the date of sampling in September 2002. State if there are any changes in the volumes or types of discharges to this system that may affect the rate of contaminant migration. Industrial land use controls may be required for Site 1004.

Response:

In the "Summary" Section 2.1 of the DSS Site 1004 SAR, the final sentence in the first paragraph states that "Current operations at the site are conducted in accordance with applicable laws and regulations that are protective of the environment."

SNL/NM has a septic system monitoring program that was established to sample all active septic tank systems at SNL/NM. The purpose of the program was to show that no contaminated material will be sent to the City of Albuquerque publically-owned treatment works (POTW) when tanks are pumped, and that no effluent contained within the tanks will contaminate the soil column. SNL/NM maintains five active septic tank systems in remote areas on KAFB that are not connected to the sanitary sewer system. These systems are used only for domestic sanitary sewage collection. Since these systems receive only domestic sewage and no industrial discharges, they do not require sampling prior to pumping and discharge to the public sewer system. However, since 1992 as a Best Management Practice (BMP), SNL/NM periodically samples these active systems prior to pumping and discharge by a certified pumping service. Environmental monitoring samples are also periodically collected from the KAFB sanitary sewer system at monitoring stations to verify and demonstrate that contaminants in waste streams exiting the facility do not exceed applicable wastewater discharge standards.

The SNL/NM Environment, Safety, and Health (ES&H) Manual describes numerous policies and procedures that are in place to ensure that operations at the site are conducted in a manner that are protective of the environment. SNL/NM department managers are directly responsible for ensuring that department activities are conducted in an environmentally responsible manner, and that department personnel are properly trained and educated about hazardous waste management practices. Also, annual audits and inspections are conducted at SNL/NM by NMED regulators to determine if the facility is in compliance with all pertinent environmental regulations.

Mr. Dan Puetz, the Robotics Vehicle Range facility representative, was contacted on March 4, 2005, and he stated that 16 to 18 permanent staff have typically worked at the facility, but that number has recently increased to approximately 35 personnel, and it could increase again to as many as 50 people approximately one year from now. The septic system at this remote facility currently receives only effluent from restrooms, and while the volume of effluent discharged to the system will increase in the future due to staff increases at the facility, the nature of the discharges will not change.

RSI



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



APR 7 2005

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Mr James Bearzi, Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Road East, Building 1
Santa Fe, NM 87505

Dear Mr. Bearzi,

On behalf of the Department of Energy (DOE) and Sandia Corporation, DOE is submitting the enclosed Quality Control (QC) Report, and copies of gamma spectroscopy analytical results for the entire Drain and Septic Systems (DSS) project, in response to the New Mexico Environment Department Request for Supplemental Information: Environmental Restoration Project SWMU Assessment Reports and Proposals for Corrective Action Complete: Drain and Septic Systems Sites 1034, 1035, 1036, 1078, 1079, 1084, 1098, 1104, and 1120, (DSS Round 6); September 2004, Environmental Restoration Project at Sandia National Laboratories, New Mexico, EPA ID No. NM589011518, dated January 14, 2005.

One hardcopy (consisting of seven volumes) will be delivered to Will Moats (NMED), and an electronic CD will be sent by certified mail to you and Laurie King (EPA).

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

Sincerely,

Patty Wagner
Manager

Enclosure

Mr. J. Bearzi

(2)

APR 7 2005

cc w/ enclosure:

W. Moats, NMED-HWB (via Certified Mail)

L. King, EPA, Region 6 (Via Certified Mail)

M. Gardipe, NNSA/SC/ERD

J. Volkerding, DOE-NMED-OB

cc w/o enclosure:

D. Pepe, NMED-OB

J. Estrada, NNSA/SSO, MS 0184

F. Nimick, SNL, MS 1089

R. E. Fate, SNL, MS 1089

M. J. Davis, SNL, MS 1089

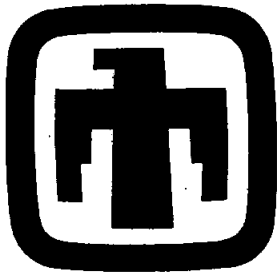
D. Stockham, SNL, MS 1087

~~B. Langkopf~~ SNL, MS 1087

P. Puissant, SNL, MS 1087

M. Sanders, SNL, MS 1087

A. Blumberg, SNL, MS 0141



Sandia National Laboratories

**Drain and Septic Systems Project
Quality Control (QC) Report**

April 2005

**Volume 1 of 7
Master Index**

and

Field Duplicate Relative Percent Difference Tables

**Environmental
Restoration
Project**



**United States Department of Energy
Sandia Site Office**

**Sandia National Laboratories/New Mexico
Drain and Septic Systems Project Quality Control Report
April 2005**

In response to the New Mexico Environmental Department (NMED) request for supplemental information dated January 14, 2005, the Sandia National Laboratories/New Mexico (SNL/NM) Environmental Restoration (ER) project is providing a complete set of laboratory analytical quality control (QC) documentation for approximately 1,200 soil and associated field blank and duplicate samples collected at the SNL/NM Drain and Septic System (DSS) sites from 1998 to 2002.

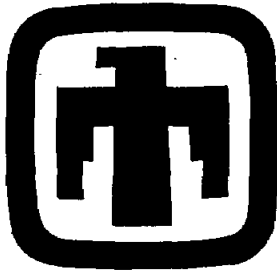
The documentation set is comprised of seven report binders. The first binder contains a master index sorted by DSS Site number, and then by analytical parameter. The master index also includes the site names, binder number in which the pertinent QC information can be found for any individual sample, Analytical Request/Chain of Custody (AR/COC) numbers, ER sample IDs, ER sample numbers, sample collection dates, sample matrix, analytical laboratory, and the laboratory analytical batch number for these DSS samples. The first binder also contains tables of calculated relative percent differences (RPDs) for primary and field duplicate sample pairs collected at the DSS sites from 1998 to 2002.

Binders 2 through 5 include the detailed QC information for General Engineering Laboratories (GEL). Binder 6 includes the same type of information for the ER Chemistry Laboratory (ERCL). Binders 2 through 6 include general narratives which address condition on receipt at the laboratory, and sample integrity issues (proper preservation, shipping, AR/COC, etc.). Technical narratives are also provided for each analytical method used. These narratives address holding time and any other specific QC method conformance issues. QC summaries are included for each QC batch. These include the result data and applicable calculations (percent recovery, RPD) for analytical blanks, spikes, and replicates. Finally, Binder 7 includes both complete gamma spectroscopy data documentation, and the associated batch QC from the SNL Radiation Protection Sample Diagnostic (RPSD) Laboratory. For each data set indicated by the AR/COC number, an individual cross reference summary sheet is provided.

DRAIN AND SEPTIC SYSTEMS PROJECT QC MASTER INDEX

Site #	Site Name	Binder #	COC#	ER Sample ID	Sample #	SAMPLE DATE	MATRIX	LAB TEST	Lab	BATCH #
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-25-S	060063-002	22-OCT-02	SOIL	BNA-8270	GEL	211309
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-30-S	060064-002	22-OCT-02	SOIL	BNA-8270	GEL	211309
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-30-S	060064-002	22-OCT-02	SOIL	BNA-8270	GEL	211309
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-25-S	060063-002	22-OCT-02	SOIL	GROSS-A/B	GEL	211317
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-25-S	060063-002	22-OCT-02	SOIL	GROSS-A/B	GEL	211317
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-30-S	060064-002	22-OCT-02	SOIL	GROSS-A/B	GEL	211317
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-30-S	060064-002	22-OCT-02	SOIL	GROSS-A/B	GEL	211317
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-25-S	060063-002	22-OCT-02	SOIL	TOTAL-CN	GEL	212382
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-25-S	060063-002	22-OCT-02	SOIL	TOTAL-CN	GEL	212382
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-30-S	060064-002	22-OCT-02	SOIL	TOTAL-CN	GEL	212382
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-30-S	060064-002	22-OCT-02	SOIL	TOTAL-CN	GEL	212382
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-25-S	060063-002	22-OCT-02	SOIL	Cr+6	GEL	213487
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-25-S	060063-002	22-OCT-02	SOIL	Cr+6	GEL	213487
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-30-S	060064-002	22-OCT-02	SOIL	Cr+6	GEL	213487
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-30-S	060064-002	22-OCT-02	SOIL	Cr+6	GEL	213487
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-25-S	060063-002	22-OCT-02	SOIL	RCRA METALS	GEL	210929, 211021
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-25-S	060063-002	22-OCT-02	SOIL	RCRA METALS	GEL	210929, 211021
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-30-S	060064-002	22-OCT-02	SOIL	RCRA METALS	GEL	210929, 211021
1101	Bldg. 885 SS	Volume 5	605786	885/1101-SP1-BH1-30-S	060064-002	22-OCT-02	SOIL	RCRA METALS	GEL	210929, 211021
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-25-S	059795-002	06-SEP-02	SOIL	BNA-8270	GEL	200259
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-30-S	059796-002	06-SEP-02	SOIL	BNA-8270	GEL	200259
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-25-S	059795-001	06-SEP-02	SOIL	VOA-8260	GEL	200753
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-30-S	059796-001	06-SEP-02	SOIL	VOA-8260	GEL	200753
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-25-S	059795-002	06-SEP-02	SOIL	Cr+6	GEL	200895
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-30-S	059796-002	06-SEP-02	SOIL	Cr+6	GEL	200895
1102	F. Bldg 889 SS	Volume 7	605747	889/1102-SP1-BH1-25-S	059795-003	06-SEP-02	SOIL	GAMMA SPEC	RPSD	201248
1102	F. Bldg 889 SS	Volume 7	605747	889/1102-SP1-BH1-30-S	059796-003	06-SEP-02	SOIL	GAMMA SPEC	RPSD	201248
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-25-S	059795-002	06-SEP-02	SOIL	TOTAL-CN	GEL	201253
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-30-S	059796-002	06-SEP-02	SOIL	TOTAL-CN	GEL	201253
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-25-S	059795-002	06-SEP-02	SOIL	GROSS-A/B	GEL	201305
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-30-S	059796-002	06-SEP-02	SOIL	GROSS-A/B	GEL	201305
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-25-S	059795-002	06-SEP-02	SOIL	PCB-8082	GEL	203080
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-30-S	059796-002	06-SEP-02	SOIL	PCB-8082	GEL	203080
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-25-S	059795-002	06-SEP-02	SOIL	HE-8330	GEL	200966, 203692
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-30-S	059796-002	06-SEP-02	SOIL	HE-8330	GEL	200966, 203692
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-25-S	059795-002	06-SEP-02	SOIL	RCRA METALS	GEL	201371, 200317
1102	F. Bldg 889 SS	Volume 4	605668	889/1102-SP1-BH1-30-S	059796-002	06-SEP-02	SOIL	RCRA METALS	GEL	201371, 200317
1104	Bldg. 6595 SP	Volume 7	605790	6595/1104-SP1-BH1-11-S	060059-003	01-OCT-02	SOIL	GAMMA SPEC	RPSD	201445
1104	Bldg. 6595 SP	Volume 7	605790	6595/1104-SP1-BH1-16-S	060060-003	01-OCT-02	SOIL	GAMMA SPEC	RPSD	201445
1104	Bldg. 6595 SP	Volume 5	605784	6595/1104-SP1-BH1-11-S	060059-002	01-OCT-02	SOIL	PCB-8082	GEL	206282
1104	Bldg. 6595 SP	Volume 5	605784	6595/1104-SP1-BH1-16-S	060060-002	01-OCT-02	SOIL	PCB-8082	GEL	206282
1104	Bldg. 6595 SP	Volume 5	605784	6595/1104-SP1-BH1-11-S	060059-002	01-OCT-02	SOIL	BNA-8270	GEL	206457

NOTE: Multiple batch numbers are listed for reanalysis and RCRA metals for the ICP run and the mercury CVAA run.



Sandia National Laboratories

**Drain and Septic Systems Project
Quality Control (QC) Report**

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General Engineering Laboratories, Inc. (GEL) QC Data

**Environmental
Restoration
Project**



**United States Department of Energy
Sandia Site Office**

GEL QC CROSS REFERENCE

COC 605668

Site #	Site Name	SAMPLE#	F#	DISP_ER_SAMP_LOC	SAMPLE DATE	MATRIX	LAB TEST	BATCH #
1086	Bldg. 6523 SS	059793	001	6523/1086-SP1BH1-10-S	06-SEP-02	SOIL	VOA-8260	200753
1086	Bldg. 6523 SS	059793	002	6523/1086-SP1BH1-10-S	06-SEP-02	SOIL	BNA-8270	200259, 200577
1086	Bldg. 6523 SS	059793	002	6523/1086-SP1BH1-10-S	06-SEP-02	SOIL	Cr+6	200893, 200895
1086	Bldg. 6523 SS	059793	002	6523/1086-SP1BH1-10-S	06-SEP-02	SOIL	GROSS-A/B	201305
1086	Bldg. 6523 SS	059793	002	6523/1086-SP1BH1-10-S	06-SEP-02	SOIL	HE-8330	200966, 203692
1086	Bldg. 6523 SS	059793	002	6523/1086-SP1BH1-10-S	06-SEP-02	SOIL	PCB-8082	200519, 203080
1086	Bldg. 6523 SS	059793	002	6523/1086-SP1BH1-10-S	06-SEP-02	SOIL	RCRA METALS	201371, 200317
1086	Bldg. 6523 SS	059793	002	6523/1086-SP1BH1-10-S	06-SEP-02	SOIL	TOTAL-CN	201253
1086	Bldg. 6523 SS	059794	001	6523/1086-SP1BH1-15-S	06-SEP-02	SOIL	VOA-8260	200753
1086	Bldg. 6523 SS	059794	002	6523/1086-SP1BH1-15-S	06-SEP-02	SOIL	BNA-8270	200259, 200577
1086	Bldg. 6523 SS	059794	002	6523/1086-SP1BH1-15-S	06-SEP-02	SOIL	Cr+6	200893, 200895
1086	Bldg. 6523 SS	059794	002	6523/1086-SP1BH1-15-S	06-SEP-02	SOIL	GROSS-A/B	201305
1086	Bldg. 6523 SS	059794	002	6523/1086-SP1BH1-15-S	06-SEP-02	SOIL	HE-8330	200966, 203692
1086	Bldg. 6523 SS	059794	002	6523/1086-SP1BH1-15-S	06-SEP-02	SOIL	PCB-8082	200519, 203080
1086	Bldg. 6523 SS	059794	002	6523/1086-SP1BH1-15-S	06-SEP-02	SOIL	RCRA METALS	201371, 200317
1086	Bldg. 6523 SS	059794	002	6523/1086-SP1BH1-15-S	06-SEP-02	SOIL	TOTAL-CN	201253
1102	F. Bldg 889 SS	059795	001	889/1102-SP1-BH1-25-S	06-SEP-02	SOIL	VOA-8260	200753
1102	F. Bldg 889 SS	059795	002	889/1102-SP1-BH1-25-S	06-SEP-02	SOIL	BNA-8270	200259, 200577
1102	F. Bldg 889 SS	059795	002	889/1102-SP1-BH1-25-S	06-SEP-02	SOIL	Cr+6	200893, 200895
1102	F. Bldg 889 SS	059795	002	889/1102-SP1-BH1-25-S	06-SEP-02	SOIL	GROSS-A/B	201305
1102	F. Bldg 889 SS	059795	002	889/1102-SP1-BH1-25-S	06-SEP-02	SOIL	HE-8330	200966, 203692
1102	F. Bldg 889 SS	059795	002	889/1102-SP1-BH1-25-S	06-SEP-02	SOIL	PCB-8082	200519, 203080
1102	F. Bldg 889 SS	059795	002	889/1102-SP1-BH1-25-S	06-SEP-02	SOIL	RCRA METALS	201371, 200317
1102	F. Bldg 889 SS	059795	002	889/1102-SP1-BH1-25-S	06-SEP-02	SOIL	TOTAL-CN	201253
1102	F. Bldg 889 SS	059796	001	889/1102-SP1-BH1-30-S	06-SEP-02	SOIL	VOA-8260	200753
1102	F. Bldg 889 SS	059796	002	889/1102-SP1-BH1-30-S	06-SEP-02	SOIL	BNA-8270	200259, 200577
1102	F. Bldg 889 SS	059796	002	889/1102-SP1-BH1-30-S	06-SEP-02	SOIL	Cr+6	200893, 200895
1102	F. Bldg 889 SS	059796	002	889/1102-SP1-BH1-30-S	06-SEP-02	SOIL	GROSS-A/B	201305
1102	F. Bldg 889 SS	059796	002	889/1102-SP1-BH1-30-S	06-SEP-02	SOIL	HE-8330	200966, 203692

SDG 86780B



Sandia National Laboratories

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Radiation Protection & Sample Diagnostics (RPSD)
Laboratory Data

Environmental
Restoration
Project



United States Department of Energy
Sandia Site Office

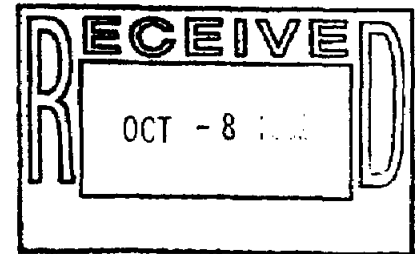
RPSD QC CROSS REFERENCE

COC 605747
BATCH NO. 201248

Site #	Site Name	SAMPLE#	F#	ER SAMPLE ID	SAMPLE DATE	MATRIX	LAB TEST
1081	Bldg. 6650 SS	059775	003	6650/1081-SP1-BH1-10-S	29-AUG-02	SOIL	GAMMA SPEC
1081	Bldg. 6650 SS	059776	003	6650/1081-SP1-BH1-15-S	29-AUG-02	SOIL	GAMMA SPEC
1081	Bldg. 6650 SS	059777	003	6650/1081-SP2-BH1-12-S	29-AUG-02	SOIL	GAMMA SPEC
1081	Bldg. 6650 SS	059778	003	6650/1081-SP2-BH1-17-S	29-AUG-02	SOIL	GAMMA SPEC
1081	Bldg. 6650 SS	059779	003	6650/1081-SP3-BH1-17-S	29-AUG-02	SOIL	GAMMA SPEC
1081	Bldg. 6650 SS	059780	003	6650/1081-SP3-BH1-24-S	29-AUG-02	SOIL	GAMMA SPEC
1081	Bldg. 6650 SS	059781	003	6650/1081-SP4-BH1-20-S	30-AUG-02	SOIL	GAMMA SPEC
1081	Bldg. 6650 SS	059782	003	6650/1081-SP4-BH1-25-S	30-AUG-02	SOIL	GAMMA SPEC
1083	Bldg. 6570 SS	059784	003	6570/1083-DW1-BH1-9-S	03-SEP-02	SOIL	GAMMA SPEC
1083	Bldg. 6570 SS	059785	003	6570/1083-DW1-BH1-14-S	03-SEP-02	SOIL	GAMMA SPEC
1031	Bldg. 6589/660 SS	059788	003	6589-6600/1031-SP1-BH1-15-S	05-SEP-02	SOIL	GAMMA SPEC
1031	Bldg. 6589/660 SS	059789	003	6589-6600/1031-SP1-BH1-20-S	05-SEP-02	SOIL	GAMMA SPEC
1031	Bldg. 6589/660 SS	059790	003	6589-6600/1031-SP2-BH1-10-S	05-SEP-02	SOIL	GAMMA SPEC
1031	Bldg. 6589/660 SS	059791	003	6589-6600/1031-SP2-BH1-15-S	05-SEP-02	SOIL	GAMMA SPEC
1086	Bldg. 6523 SS	059793	003	6523/1086-SP1-BH1-10-S	06-SEP-02	SOIL	GAMMA SPEC
1086	Bldg. 6523 SS	059794	003	6523/1086-SP1-BH1-15-S	06-SEP-02	SOIL	GAMMA SPEC
1102	F. Bldg 889 SS	059795	003	889/1102-SP1-BH1-25-S	06-SEP-02	SOIL	GAMMA SPEC
1102	F. Bldg 889 SS	059796	003	889/1102-SP1-BH1-30-S	06-SEP-02	SOIL	GAMMA SPEC
1083	Bldg. 6570 SS	059858	001	6570/1083-DW1-BH1-9-DU	03-SEP-02	SOIL	GAMMA SPEC

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ORIGINAL COPY

CASE NARRATIVE
for
Sandia National Laboratories
ARCOC-605667
SDG#66780A
ARCOC-605668
SDG#66780B
Case No. 7223.02.03.02



October 7, 2002

Laboratory Identification:

General Engineering Laboratories, Inc.

Mailing Address:

P.O. Box 30712
Charleston, South Carolina 29417

Express Mail Delivery and Shipping Address:

2040 Savage Road
Charleston, South Carolina 29407

Telephone Number:

(843) 556-8171

Summary:

Sample receipt

Sandia collected twenty-two soil samples and one aqueous sample on September 3, 5, and 6, 2002. The samples arrived at General Engineering Laboratories, Inc., (GEL) Charleston, South Carolina on September 10, 2002, for environmental analyses. Cooler clearance (screening, temperature check, etc.) was done upon login. The coolers arrived without any visible signs of tampering and with custody seals intact. The samples were delivered with chain of custody documentation and signatures. The temperature of the samples was 4.0°C, as measured from the temperature control bottles.

The soil sample with sample ID 059785-002 from ARCO-605667 was received broken, with the container still in the plastic bag. Client was contacted and instructed GEL to proceed with analysis.



The samples were screened according to GEL Standard Operating Procedures (SOP) EPI SOP S-007 rev. 2 "The Receiving of Radioactive Samples." The samples were stored properly according to SW-846 procedures and GEL SOP.

The samples were received and collected as listed in the table below:

ARCOC	SDG#	#of samples	Collection Date	Date Rec'd by Lab
605667	66780A	15	09/03/02,09/05/02	09/10/02
605668	66780B	8	09/06/02	09/10/02

The laboratory received the following samples:

Laboratory ID
ARCOC-605667:

Description

66780001	059784-001
66780002	059785-001
66780003	059786-001
66780004	059788-001
66780005	059789-001
66780006	059790-001
66780007	059791-001
66780012	059784-002
66780013	059785-002
66780014	059787-001
66780015	059788-002
66780016	059789-002
66780017	059790-002
66780018	059791-002
66782001	059792-001

ARCOC-605668:

66780008	059793-001
66780009	059794-001
66780010	059795-001
66780011	059796-001
66780019	059793-002
66780020	059794-002
66780021	059795-002
66780022	059796-002

Case Narrative

Sample analyses were conducted using methodology as outlined in General Engineering Laboratories (GEL) Standard Operating Procedures. Any technical or administrative problems during analysis, data review, and reduction are contained in the analytical case narratives in the enclosed data package.



Internal Chain of Custody:

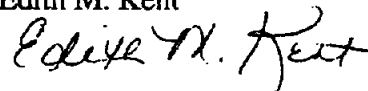
Custody was maintained for the samples.

Data Package:

The enclosed data package contains the following sections: Case Narrative, Chain of Custody, Cooler Receipt Checklist, Qualifier Flag and Data Package Definitions, Laboratory Certifications, Volatiles Data, Volatiles QC Summary, Semivolatiles Data, Semivolatiles QC Summary, PCB Data, PCB QC Summary, Explosives Data, Explosives QC Summary, Metals Data, Metals QC Summary, General Chemistry Data, General Chemistry QC Summary, Radiochemistry Data, Radiochemistry QC Summary, and Level C Data Package.

This data package, to the best of my knowledge, is in compliance with technical and administrative requirements.

Edith M. Kent



Project Manager



Date: 10/16/02

To: Edie Kent/Nicole McCleary From: Lorraine Herrera

Company: GEL Org: 6133

Phone: (843) 556-8171 Phone: (505) 844-3199

Fax: (843) 766-1178 Fax: (505) 844-3128

Correction Request

COC: 605867, 605868 SDG: 66780A, B Tracking No: 5046

NOTE: Edie,

Please make the following correction(s):

- GC/MS Volatile Organics narrative, pages 294-297, illegible due to incorrect word spacing

Thank you,
Lorraine



Sandia National Laboratories
Sample Management Office
P.O. Box 5800
Albuquerque, New Mexico 87185-1331

**GC/MS
VOLATILE
ANALYSIS**

REVISED

**GC/MS Volatile Organics
Sandia National Labs (SNLS)
SDG 66780**

Method/Analysis Information

Procedure: Volatile Organic Compounds (VOC) by Gas Chromatograph/Mass Spectrometer
Analytical Method: SW846 8260A
Prep Method: SW846 5030A
Analytical Batch Number: 200753
Prep Batch Number: 200751

Sample Analysis

The following client and quality control samples were analyzed to complete this sample delivery group/work order using the methods referenced in the Analysis Information section:

Sample ID	Client ID
66780001	059784-001
66780002	059785-001
66780003	059786-001
66780004	059788-001
66780005	059789-001
66780006	059790-001
66780007	059791-001
66780008	059793-001
66780009	059794-001
66780010	059795-001
66780011	059796-001
1200298583	VBLK01 (Blank)
1200298590	VBLK01LCS (Laboratory Control Sample)

SDG#66780-VOA

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REVISED

1200299181	VBLK02 (Blank)
1200299182	VBLK02LCS (Laboratory Control Sample)
1200298586	059784-001MS (Matrix Spike)
1200298589	059784-001MSD (Matrix Spike Duplicate)

Preparation/Analytical Method Verification

SOP Reference

Procedure(s) for preparation, analysis and reporting of analytical data are controlled by General Engineering Laboratories, Inc. as Standard Operating Procedure(s) (SOP). The data discussed in this narrative has been analyzed in accordance with GL-OA-E-026 REV.8.

Calibration Information

Due to software limitations, all the data files comprising the initial calibration curve may not be listed on the initial calibration summary form. All calibration files are listed in the calibration history report in the "Standard Data" section.

Initial Calibration

All the initial calibration requirements were met.

CCV Requirements

All the calibration verification standard (CCV) requirements were met.

Quality Control (QC) Information

Surrogate Recoveries

Surrogate recoveries, in all samples and quality control samples, were within the acceptance limits.

Blank Acceptance

Target analytes were not detected above the reporting limit in the blank.

LCS Recovery Statement

All the required analyte recoveries in the laboratory control sample were within the acceptance limits.

QC Sample Designation

The following sample was designated for matrix spike analysis:

66780001 059784-001

MS Recovery Statement

All the required matrix spike recoveries were within the acceptance limits.

MSD Recovery Statement

All the required matrix spike duplicate recoveries were within the acceptance limits.

MS/MSD RPD Statement

The relative percent differences (RPD) between the matrix spike and matrix spike duplicate recoveries were within the acceptance limits.

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Internal Standard (ISTD) Acceptance

The internal standard responses, in all samples and quality control samples, met the required acceptance criteria.

Technical Information**Holding Time Specifications**

All the samples were prepared and/or analyzed within the required holding time period.

Sample Preservation and Integrity

All samples met the sample preservation and integrity requirements.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

The samples in this sample delivery group/work order did not require dilutions.

Sample Re-prep/Re-analysis

Re-analyses were not required for samples in this sample group/work order.

Miscellaneous Information**Nonconformance (NCR) Documentation**

A nonconformance report was not required for this sample delivery group/work order.

Manual Integrations

Data files associated with the initial calibration, continuing calibration check, and samples did not require manual integrations.

Additional Comments

The following package was generated using an electronic data processing program, referred to as "virtual packaging". In an effort to increase quality and efficiency, the laboratory is developing systems to eventually generate all data packages electronically. The following change from "traditional" packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. An electronic signature page inserted after the case narrative of each electronic package will indicate the analyst, reviewer, and report specialist names associated with the generation of the data and package. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

TIC Comment

Tentatively identified compounds (TIC) were not required for this sample delivery group/work order.

System Configuration

The laboratory utilizes the following GC/MS configurations:

Chromatographic Columns

Chromatographic separation of volatile components is accomplished through analysis on one of the following columns:

Column ID	Column Description
-----------	--------------------

SDG#66780 -VOA

REVISED

J&W1 DB-624, 60m x 0.25mm, 1.4um
J&W2 DB-624, 75m x 0.53mm, 3.0um

Instrument Configuration

Instrument systems are reference in the raw data and individual form headers by the Instrument ID designations below:

Instrument ID	System Configuration	Chromatographic Column	P & T Trap
VOA1	HP6890/HP5973	J&W1	Trap C
VOA2	HP6890/HP5973	J&W1	Trap C
VOA4	HP5890/HP5972	J&W1	Trap K
VOA5	HP5890/HP5972	J&W1	Trap C
VOA7	HP5890/HP5972	J&W2	Trap K
VOA8	HP6890/HP5973	J&W1	Trap K
VOA9	HP6890/HP5973	J&W1	Trap C

Comments

* Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Review Validation:

GFI requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

The following data validator verified the information presented in this case narrative:

Reviewer: *Nicole McHenry* Date: *10/15/02*

REVISED

GC/MS Volatile Organics
Sandia National Labs (SNLS)
SDG 66780-1

Method/Analysis Information

Procedure: Volatile Organic Compounds (VOC) by Gas Chromatograph/Mass Spectrometer
Analytical Method: SW846 8260B
Prep Method: SW846 5030B
Analytical Batch Number: 201029

Sample Analysis

The following client and quality control samples were analyzed to complete this sample delivery group/work order using the methods referenced in the Analysis Information section:

Sample ID	Client ID
66782001	059792-001
1200300031	VBLK01 (Blank)
1200300032	VBLK01LCS (Laboratory Control Sample)

Preparation/Analytical Method Verification

SOP Reference

Procedure(s) for preparation, analysis and reporting of analytical data are controlled by General Engineering Laboratories, Inc. as Standard Operating Procedure(s) (SOP). The data discussed in this narrative has been analyzed in accordance with GL-OA-E-038 REV.6.

Calibration Information

Due to software limitations, all the data files comprising the initial calibration curve may not be listed on the initial calibration summary form. All calibration files are listed in the calibration history report in the "Standard Data" section.

Initial Calibration

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REVISED

All the initial calibration requirements were met.

CCV Requirements

All the calibration verification standard (CCV) requirements were met.

Quality Control (QC) Information

Surrogate Recoveries

Surrogate recoveries, in all samples and quality control samples, were within the acceptance limits.

Blank Acceptance

Target analytes were not detected above the reporting limit in the blank.

LCS Recovery Statement

All the required analyte recoveries in the laboratory control sample were within the acceptance limits.

QC Sample Designation

The matrix spikes were analyzed on a sample of similar matrix that was in another SNLS sample delivery group/work order (#66606).

MS Recovery Statement

All the required matrix spike recoveries were within the acceptance limits.

MSD Recovery Statement

All the required matrix spike duplicate recoveries were within the acceptance limits.

MS/MSD RPD Statement

The relative percent differences (RPD) between the matrix spike and matrix spike duplicate recoveries were within the acceptance limits.

Internal Standard (ISTD) Acceptance

The internal standard responses, in all samples and quality control samples, met the required acceptance criteria.

Technical Information

Holding Time Specifications

All the samples were prepared and/or analyzed within the required holding time period.

Sample Preservation and Integrity

All samples met the sample preservation and integrity requirements.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

The samples in this sample delivery group/work order did not require dilutions.

Sample Re-prep/Re-analysis

Re-analyses were not required for samples in this sample group/work order.

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Miscellaneous Information

Nonconformance (NCR) Documentation

A nonconformance report was not required for this sample delivery group/work order.

Manual Integrations

Data files associated with the initial calibration, continuing calibration check, and samples did not require manual integrations.

Additional Comments

The following package was generated using an electronic data processing program, referred to as "virtual packaging". In an effort to increase quality and efficiency, the laboratory is developing systems to eventually generate all data packages electronically. The following change from "traditional" packages should be noted:

Analyst/peer reviewer initials and dates are not present on the electronic data files. Presently, all initials and dates are present on the original raw data. These hard copies are temporarily stored in the laboratory. An electronic signature page inserted after the case narrative of each electronic package will indicate the analyst, reviewer, and report specialist names associated with the generation of the data and package. The data validator will always sign and date the case narrative. Data that are not generated electronically, such as hand written pages, will be scanned and inserted into the electronic package.

TIC Comment

Tentatively identified compounds (TIC) were not required for this sample delivery group/work order.

System Configuration

The laboratory utilizes the following GC/MS configurations:

Chromatographic Columns

Chromatographic separation of volatile components is accomplished through analysis on one of the following columns:

Column ID	Column Description
J&W1	DB-624, 60m x 0.25mm, 1.4um
J&W2	DB-624, 75m x 0.53mm, 3.0um

Instrument Configuration

Instrument systems are reference in the raw data and individual form headers by the Instrument ID designations below:

Instrument ID	System Configuration	Chromatographic Column	P & T Trap
VOA1	HP6890/HP5973	J&W1	Trap C
VOA2	HP6890/HP5973	J&W1	Trap C
VOA4	HP5890/HP5972	J&W1	Trap K

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REVISED

VOA5	HP5890/HP5972	J&W1	Trap C
VOA7	HP5890/HP5972	J&W2	Trap K
VOA8	HP6890/HP5973	J&W1	Trap K
VOA9	HP6890/HP5973	J&W1	Trap C

Certification Statement

* Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Review Validation:

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

The following data validator verified the information presented in this case narrative:

Reviewer: *Nicol Mulvaney* Date: *10/15/02*

**GC/MS VOLATILES
QUALITY
CONTROL
SUMMARY**

QC Summary

Report Date: September 19, 2002
Page 1 of 4

Client : Sandia National Laboratories
MS-0756
P.O. Box 5800
Albuquerque, New Mexico
Contact: Pamela M. Puissant
Workorder: 66780

Parma name	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Analst	Date Time
Volatile-GC/MS Federal									
Bach	200753								
QC1200298590	LCS								
1,1-Dichloroethylene	50.0		43.4	ug/kg		87	(75%-134%)	RMB	09/12/02 08:21
Benzene	50.0		47.9	ug/kg		96	(80%-120%)		
Chlorobenzene	50.0		51.0	ug/kg		102	(82%-118%)		
Toluene	50.0		51.0	ug/kg		102	(74%-115%)		
Trichloroethylene	50.0		47.4	ug/kg		95	(80%-119%)		
**Bromofluorobenzene	50.0		47.9	ug/kg		96	(69%-138%)		
**Dibromofluoromethane	50.0		48.0	ug/kg		96	(67%-137%)		
**Toluene-d8	50.0		46.4	ug/kg		93	(67%-139%)		
QC1200299182	LCS								
1,1-Dichloroethylene	50.0		43.3	ug/kg		87	(75%-134%)		09/12/02 20:09
Benzene	50.0		47.6	ug/kg		95	(80%-120%)		
Chlorobenzene	50.0		50.0	ug/kg		100	(82%-118%)		
Toluene	50.0		49.7	ug/kg		99	(74%-115%)		
Trichloroethylene	50.0		47.5	ug/kg		95	(80%-119%)		
**Bromofluorobenzene	50.0		47.7	ug/kg		96	(69%-138%)		
**Dibromofluoromethane	50.0		49.1	ug/kg		98	(67%-137%)		
**Toluene-d8	50.0		43.4	ug/kg		91	(67%-139%)		
QC1200298583	MB								
1,1,1-Trichloroethane		U	ND	ug/kg					09/12/02 10:26
1,1,2,2-Tetrachloroethane		U	ND	ug/kg					
1,1,2-Trichloroethane		U	ND	ug/kg					
1,1-Dichloroethane		U	ND	ug/kg					
1,1-Dichloroethylene		U	ND	ug/kg					
1,2-Dichloroethane		U	ND	ug/kg					
1,2-Dichloropropane		U	ND	ug/kg					
2-Butanone		U	ND	ug/kg					
2-Hexanone		U	ND	ug/kg					
4-Methyl-2-pentanone		U	ND	ug/kg					
Acetone		U	ND	ug/kg					
Benzene		U	ND	ug/kg					
Bromodichloromethane		U	ND	ug/kg					
Bromoform		U	ND	ug/kg					
Bromomethane		U	ND	ug/kg					
Carbon disulfide		U	ND	ug/kg					
Carbon tetrachloride		U	ND	ug/kg					
Chlorobenzene		U	ND	ug/kg					
Chloroethane		U	ND	ug/kg					
Chloroform		U	ND	ug/kg					
Chloromethane		U	ND	ug/kg					
Dibromochloromethane		U	ND	ug/kg					
Ethylbenzene		U	ND	ug/kg					
Methylene chloride		U	ND	ug/kg					

QC Summary

Workorder: 66780

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Volatile-GC/MS Federal										
Batch 200753										
Styrene			U	ND	ug/kg					
Tetrachloroethylene			U	ND	ug/kg					
Toluene			U	ND	ug/kg					
Trichloroethylene			U	ND	ug/kg					
Vinyl acetate			U	ND	ug/kg					
Vinyl chloride			U	ND	ug/kg					
Xylenes (total)			U	ND	ug/kg					
cis-1,2-Dichloroethylene			U	ND	ug/kg					
cis-1,3-Dichloropropylene			U	ND	ug/kg					
trans-1,2-Dichloroethylene			U	ND	ug/kg					
trans-1,3-Dichloropropylene			U	ND	ug/kg					
*Bromofluorobenzene	50.0			58.7	ug/kg		117	(69%-138%)		
*Dibromofluoromethane	50.0			47.9	ug/kg		96	(67%-137%)		
*Toluene-d8	50.0			46.5	ug/kg		93	(67%-139%)		
QC1200299180 MD										
1,1,1-Trichloroethane			U	ND	ug/kg					09/12/02 13:31
1,1,2,2-Tetrachloroethane			U	ND	ug/kg					
1,1,2-Trichloroethane			U	ND	ug/kg					
1,1-Dichloroethane			U	ND	ug/kg					
1,1-Dichloroethylene			U	ND	ug/kg					
1,2-Dichloroethane			U	ND	ug/kg					
1,2-Dichloropropane			U	ND	ug/kg					
2-Butanone			U	ND	ug/kg					
2-Hexanone			U	ND	ug/kg					
4-Methyl-2-pentanone			U	ND	ug/kg					
Acetone			U	ND	ug/kg					
Benzene			U	ND	ug/kg					
Bromodichloromethane			U	ND	ug/kg					
Bromoform			U	ND	ug/kg					
Bromomethane			U	ND	ug/kg					
Carbon disulfide			U	ND	ug/kg					
Carbon tetrachloride			U	ND	ug/kg					
Chlorobenzene			U	ND	ug/kg					
Chloroethane			U	ND	ug/kg					
Chloroform			U	ND	ug/kg					
Chloroethane			U	ND	ug/kg					
Dibromochloromethane			U	ND	ug/kg					
Ethylbenzene			U	ND	ug/kg					
Methylene chloride			U	ND	ug/kg					
Styrene			U	ND	ug/kg					
Tetrachloroethylene			U	ND	ug/kg					
Toluene			U	ND	ug/kg					
Trichloroethylene			U	ND	ug/kg					
Vinyl acetate			U	ND	ug/kg					
Vinyl chloride			U	ND	ug/kg					
Xylenes (total)			U	ND	ug/kg					
cis-1,2-Dichloroethylene			U	ND	ug/kg					
cis-1,3-Dichloropropylene			U	ND	ug/kg					

QC Summary

Workorder: 66780

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Parmsame	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Volatile-GC/MS Federal											
Batch 200753											
trans-1,2-Dichloroethylene			U	ND	ug/kg						
trans-1,3-Dichloropropylene			U	ND	ug/kg						
**Bromofluorobenzene	50.0			5240	ug/kg		105	(69%-138%)			
**Dibromofluoromethane	50.0			4550	ug/kg		91	(67%-137%)			
**Toluene-d8	50.0			4540	ug/kg		91	(67%-139%)			
QC1200299181 MB											
1,1,1-Trichloroethane			U	ND	ug/kg					09/12/02	21:54
1,1,2,2-Tetrachloroethane			U	ND	ug/kg						
1,1,2-Trichloroethane			U	ND	ug/kg						
1,1-Dichloroethane			U	ND	ug/kg						
1,1-Dichloroethylene			U	ND	ug/kg						
1,2-Dichloroethane			U	ND	ug/kg						
1,2-Dichloropropane			U	ND	ug/kg						
2-Butanone			U	ND	ug/kg						
2-Hexanone			U	ND	ug/kg						
4-Methyl-2-pentanone			U	ND	ug/kg						
Acetone			U	ND	ug/kg						
Benzene			U	ND	ug/kg						
Bromodichloromethane			U	ND	ug/kg						
Bromoform			U	ND	ug/kg						
Bromomethane			U	ND	ug/kg						
Carbon disulfide			U	ND	ug/kg						
Carbon tetrachloride			U	ND	ug/kg						
Chlorobenzene			U	ND	ug/kg						
Chloroethane			U	ND	ug/kg						
Chloroform			U	ND	ug/kg						
Chloromethane			U	ND	ug/kg						
Dibromochloromethane			U	ND	ug/kg						
Ethylbenzene			U	ND	ug/kg						
Methylene chloride			U	ND	ug/kg						
Styrene			U	ND	ug/kg						
Tetrachloroethylene			U	ND	ug/kg						
Toluene			U	ND	ug/kg						
Trichloroethylene			U	ND	ug/kg						
Vinyl acetate			U	ND	ug/kg						
Vinyl chloride			U	ND	ug/kg						
Xylenes (total)			U	ND	ug/kg						
cis-1,2-Dichloroethylene			U	ND	ug/kg						
cis-1,3-Dichloropropylene			U	ND	ug/kg						
trans-1,2-Dichloroethylene			U	ND	ug/kg						
trans-1,3-Dichloropropylene			U	ND	ug/kg						
**Bromofluorobenzene	50.0			55.3	ug/kg		111	(69%-138%)			
**Dibromofluoromethane	50.0			48.0	ug/kg		96	(67%-137%)			
**Toluene-d8	50.0			46.4	ug/kg		93	(67%-139%)			
QC1200298586 66780001 PS											
1,1-Dichloroethylene	50.0	U	ND	40.1	ug/L		80	(55%-128%)		09/13/02	00:31
Benzene	50.0	U	ND	44.6	ug/L		89	(53%-118%)			
Chlorobenzene	50.0	U	ND	46.2	ug/L		92	(53%-116%)			

QC Summary

Workorder: 66780

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Paramname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anist	Date	Time
Volatile-GC/MS Federal											
Batch 200753											
Toluene	50.0	U	ND	45.3	ug/L		91	(56%-113%)			
Trichloroethylene	50.0	U	ND	44.4	ug/L		89	(54%-119%)			
**Bromofluorobenzene	50.0		55.8	47.1	ug/L		94	(69%-138%)			
**Dibromofluoromethane	50.0		47.1	48.8	ug/L		98	(67%-137%)			
**Toluene-d8	50.0		46.5	45.1	ug/L		90	(67%-139%)			
QC1200298589 66790001 PSD											
1,1-Dichloroethylene	50.0	U	ND	40.1	ug/L	0	80	(0%-21%)		09/13/02	00:57
Benzene	50.0	U	ND	44.3	ug/L	0	89	(0%-17%)			
Chlorobenzene	50.0	U	ND	42.9	ug/L	7	86	(0%-21%)			
Toluene	50.0	U	ND	43.9	ug/L	3	88	(0%-25%)			
Trichloroethylene	50.0	U	ND	43.2	ug/L	3	86	(0%-25%)			
**Bromofluorobenzene	50.0		55.8	48.3	ug/L		97	(69%-138%)			
**Dibromofluoromethane	50.0		47.1	48.9	ug/L		98	(67%-137%)			
**Toluene-d8	50.0		46.5	45.4	ug/L		91	(67%-139%)			

Notes:

RER is calculated at the 95% confidence level (2-sigma).

The Qualifiers in this report are defined as follows:

- * Recovery or %RPD not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where d
- ** Indicates analyte is a surrogate compound.
- B The analyte was found in the blank above the effective MDL.
- H Holding time was exceeded
- J Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL
- P The response between the confirmation column and the primary column is >40%D
- U The analyte was analyzed for but not detected below this concentration. For Organic and Inorganic analytes the result is less than the effective MDL. I
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Uncertain identification for gamma spectroscopy.

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

For PS, PSD, and SOLT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

QC Summary

Report Date: September 27, 2002
Page 1 of 3

Client : Sandia National Laboratories
MS-0756
P.O. Box 5800
Albuquerque, New Mexico
Contact: Pamela M. Puiasant
Workorder: 66782

Parinname	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Analst	Date Time
Volatile-GC/MS Federal									
Batch: 201029									
QC1200299228 LCS									
1,1-Dichloroethylene	50.0		40.3	ug/L		81	(78%-140%)	CDS1	09/13/02 09:53
Benzene	50.0		45.4	ug/L		91	(78%-119%)		
Chlorobenzene	50.0		49.2	ug/L		98	(82%-120%)		
Toluene	50.0		47.8	ug/L		96	(68%-133%)		
Trichloroethylene	50.0		45.7	ug/L		91	(80%-123%)		
**Bromofluorobenzene	50.0		46.0	ug/L		92	(67%-136%)		
**Dibromofluoromethane	50.0		48.3	ug/L		97	(62%-148%)		
**Toluene-d8	50.0		45.6	ug/L		91	(58%-139%)		
QC1200300032 LCS									
1,1-Dichloroethylene	50.0		41.8	ug/L		84	(78%-140%)		09/13/02 21:59
Benzene	50.0		47.2	ug/L		94	(78%-119%)		
Chlorobenzene	50.0		49.2	ug/L		98	(82%-120%)		
Toluene	50.0		48.1	ug/L		96	(68%-133%)		
Trichloroethylene	50.0		47.1	ug/L		94	(80%-123%)		
**Bromofluorobenzene	50.0		46.9	ug/L		94	(67%-136%)		
**Dibromofluoromethane	50.0		49.0	ug/L		98	(62%-148%)		
**Toluene-d8	50.0		45.3	ug/L		91	(58%-139%)		
QC1200299225 MB									
1,1,1-Trichloroethane		U	ND	ug/L					09/13/02 11:12
1,1,2,2-Tetrachloroethane		U	ND	ug/L					
1,1,2-Trichloroethane		U	ND	ug/L					
1,1-Dichloroethane		U	ND	ug/L					
1,1-Dichloroethylene		U	ND	ug/L					
1,2-Dichloroethane		U	ND	ug/L					
1,2-Dichloropropane		U	ND	ug/L					
2-Butanone		U	ND	ug/L					
2-Hexanone		U	ND	ug/L					
4-Methyl-2-pentanone		U	ND	ug/L					
Acetone		U	ND	ug/L					
Benzene		U	ND	ug/L					
Bromodichloromethane		U	ND	ug/L					
Bromoform		U	ND	ug/L					
Bromomethane		U	ND	ug/L					
Carbon disulfide		U	ND	ug/L					
Carbon tetrachloride		U	ND	ug/L					
Chlorobenzene		U	ND	ug/L					
Chloroethane		U	ND	ug/L					
Chloroform		U	ND	ug/L					
Chloromethane		U	ND	ug/L					
Dibromochloromethane		U	ND	ug/L					
Ethylbenzene		U	ND	ug/L					
Methylene chloride		U	ND	ug/L					

QC Summary

Workorder: 66782

Page 2 of 3

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anist	Date	Time
Volatile-GC/MS Federal											
Batch 201029											
Styrene			U	ND	ug/L						
Tetrachloroethylene			U	ND	ug/L						
Toluene			U	ND	ug/L						
Trichloroethylene			U	ND	ug/L						
Vinyl chloride			U	ND	ug/L						
Xylenes (total)			U	ND	ug/L						
cis-1,2-Dichloroethylene			U	ND	ug/L						
cis-1,3-Dichloropropylene			U	ND	ug/L						
trans-1,2-Dichloroethylene			U	ND	ug/L						
trans-1,3-Dichloropropylene			U	ND	ug/L						
**Bromofluorobenzene	50.0			55.6	ug/L		111	(67%-136%)			
**Dibromofluoromethane	50.0			47.8	ug/L		96	(62%-148%)			
**Toluene-d8	50.0			46.5	ug/L		93	(58%-139%)			
(QC120030003) MB											
1,1,1-Trichloroethane			U	ND	ug/L						09/13/02 23:18
1,1,2,2-Tetrachloroethane			U	ND	ug/L						
1,1,2-Trichloroethane			U	ND	ug/L						
1,1-Dichloroethane			U	ND	ug/L						
1,1-Dichloroethylene			U	ND	ug/L						
1,2-Dichloroethane			U	ND	ug/L						
1,2-Dichloropropane			U	ND	ug/L						
2-Butanone			U	ND	ug/L						
2-Hexanone			U	ND	ug/L						
4-Methyl-2-pentanone			U	ND	ug/L						
Acetone			U	ND	ug/L						
Benzene			U	ND	ug/L						
Bromodichloromethane			U	ND	ug/L						
Bromoform			U	ND	ug/L						
Bromomethane			U	ND	ug/L						
Carbon disulfide			U	ND	ug/L						
Carbon tetrachloride			U	ND	ug/L						
Chlorobenzene			U	ND	ug/L						
Chloroethane			U	ND	ug/L						
Chloroform			U	ND	ug/L						
Chloromethane			U	ND	ug/L						
Dibromochloromethane			U	ND	ug/L						
Ethylbenzene			U	ND	ug/L						
Methylene chloride			U	ND	ug/L						
Styrene			U	ND	ug/L						
Tetrachloroethylene			U	ND	ug/L						
Toluene			U	ND	ug/L						
Trichloroethylene			U	ND	ug/L						
Vinyl chloride			U	ND	ug/L						
Xylenes (total)			U	ND	ug/L						
cis-1,2-Dichloroethylene			U	ND	ug/L						
cis-1,3-Dichloropropylene			U	ND	ug/L						
trans-1,2-Dichloroethylene			U	ND	ug/L						
trans-1,3-Dichloropropylene			U	ND	ug/L						

QC Summary

Workorder: 66782

Page 3 of 3

Paramname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Analst	Date	Time
Volatile-GC/MS Federal											
Batch 201029											
**Bromofluorobenzene	50.0			54.9	ug/L		110	(67%-136%)			
**Dibromofluoromethane	50.0			48.6	ug/L		97	(62%-148%)			
**Toluene-d8	50.0			46.0	ug/L		92	(58%-139%)			
QC1200299226 66606001 PSD											
1,1-Dichloroethylene	50.0	U	ND	39.8	ug/L		80	(67%-129%)		09/13/02	17:11
Benzene	50.0	U	ND	45.1	ug/L		90	(74%-112%)			
Chlorobenzene	50.0	U	ND	47.7	ug/L		95	(77%-113%)			
Toluene	50.0	U	ND	46.6	ug/L		93	(74%-109%)			
Trichloroethylene	50.0	U	ND	44.0	ug/L		88	(71%-118%)			
**Bromofluorobenzene	50.0		55.1	46.2	ug/L		92	(67%-136%)			
**Dibromofluoromethane	50.0		46.9	49.1	ug/L		98	(62%-148%)			
**Toluene-d8	50.0		46.2	45.1	ug/L		90	(58%-139%)			
QC1200299227 66606001 PSD											
1,1-Dichloroethylene	50.0	U	ND	38.9	ug/L	2	78	(0%-11%)		09/13/02	17:38
Benzene	50.0	U	ND	44.1	ug/L	2	88	(0%-8%)			
Chlorobenzene	50.0	U	ND	47.2	ug/L	1	94	(0%-11%)			
Toluene	50.0	U	ND	45.6	ug/L	2	91	(0%-12%)			
Trichloroethylene	50.0	U	ND	43.9	ug/L	0	88	(0%-9%)			
**Bromofluorobenzene	50.0		55.1	47.4	ug/L		95	(67%-136%)			
**Dibromofluoromethane	50.0		46.9	48.6	ug/L		97	(62%-148%)			
**Toluene-d8	50.0		46.2	45.8	ug/L		92	(58%-139%)			

Notes:

RER is calculated at the 95% confidence level (2-sigma).

The Qualifiers in this report are defined as follows:

- * Recovery or %RPD not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where it
- ** Indicates analyte is a surrogate compound.
- B The analyte was found in the blank above the effective MDL.
- H Holding time was exceeded
- J Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL
- P The response between the confirmation column and the primary column is >40% D
- U The analyte was analyzed for but not detected below this concentration. For Organic and Inorganic analytes the result is less than the effective MDL.
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Uncertain identification for gamma spectroscopy.

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

**GC/MS
SEMIVOLATILE
ANALYSIS**

**Semi-Volatile Case Narrative
Sandia National Labs (SNLS)
SDG 66780**

Method/Analysis Information

Procedure: Semivolatile Analysis by Gas Chromatograph/Mass Spectrometer
Analytical Method: SW846 8270C
Prep Method: SW846 3550B
Analytical Batch Number: 200259, 200577
Prep Batch Number: 200258, 200576

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 8270C:

Sample ID	Client ID
66780012	059784-002
66780013	059785-002
66780014	059787-001
66780015	059788-002
66780016	059789-002
66780017	059790-002
66780018	059791-002
66780019	059793-002
66780020	059794-002
66780021	059795-002
66780022	059796-002
1200297372	SBLK01 (Blank)
1200297373	SBLK01LCS (Laboratory Control Sample)

1200298116	SBLK02 (Blank)
1200298119	SBLK02LCS (Laboratory Control Sample)
1200298117	059785-002MS (Matrix Spike)
1200298118	059785-002MSD (Matrix Spike Duplicate)
1200297374	059787-001MS (Matrix Spike)
1200297375	059787-001MSD (Matrix Spike Duplicate)

Preparation/Analytical Method Verification

Procedures for preparation, analysis, and reporting of analytical data are documented by General Engineering Laboratories, Inc. (GEL) as Standard Operating Procedures (SOP).

Calibration Information

Due to the limited capacity of software we do not display all of the current initial calibration files here. If necessary, a calibration history will be inserted in the package prior to the appropriate Form 6.

Diphenylamine has now superseded N-Nitroso-diphenylamine as a CCC on Quantitation Reports, Initial Calibration Reports, Calibration Check Standard Reports, etc. Previous versions of EPA Method 8270 (prior to 8270C) listed N-Nitroso-diphenylamine as a CCC. However, as stated in EPA Method 8270C, Revision 3, December, 1996, Section 1.4.5, "N-Nitroso-diphenylamine decomposes in the gas chromatographic inlet and cannot be separated from Diphenylamine." Studies of these two compounds at GEL, both independent of each other and together, show that they not only coelute, but also have similar mass spectra. N-Nitroso-diphenylamine and Diphenylamine will be reported as Diphenylamine on all reports and forms.

When calibrations are performed for Appendix IX compounds some of the compounds may not be calibrated exactly according to the criteria in Method 8270C. If the %RSD is greater than 15% or the correlation coefficient is less than 0.99 then the analyte is quantitated using the response factor. If the analyte is detected then the sample is reanalyzed for that analyte on an instrument that is compliant with the criteria in the method.

Initial Calibration

All initial calibration requirements have been met for this SDG.

CCV Requirements

All calibration verification standard (CVS, ICV or CCV) requirements have been met for this SDG.

Quality Control (QC) Information

Surrogate Recoveries

All the surrogate recoveries were within the established acceptance criteria for this SDG.

Blank Acceptance

The target analyte, bis(2-Ethylhexyl)phthalate, was detected in method blanks 1200297372 and 1200298116 below the reporting limit.

LCS Recovery Statement

The laboratory control sample (LCS) spike recoveries for this SDG were within the established acceptance limits.

QC Sample Designation

The following samples analyzed with this SDG were chosen for matrix spike analysis:

66780012 059784-002
66780013 059785-002

MS Recovery Statement

The matrix spike recoveries for this SDG were within the established acceptance limits.

MSD Recovery Statement

The matrix spike duplicate (MSD) recoveries for this SDG were within the established acceptance limits.

MS/MSD RPD Statement

The relative percent differences (RPD) between each MS and MSD were within the required acceptance limits.

Internal Standard (ISTD) Acceptance

The internal standard responses were within the required acceptance criteria for all samples and QC.

Technical Information:**Holding Time Specifications**

All samples in this SDG met the specified holding time requirements. GEL assigns holding times based on the associated methodology that assigns the date and time from sample collection or sample receipt. Those holding times expressed in hours are calculated in the AlphaLIMS system. Those holding times expressed as days expire at midnight on the day of expiration.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

None of the samples analyzed in this SDG required dilution.

Miscellaneous Information:**Nonconformance (NCR) Documentation**

No nonconformance report (NCR) was generated for this SDG.

Manual Integrations

No manual integrations were required for any data file in this SDG.

Additional Comments

No additional comments were required for this SDG.

System Configuration

The laboratory utilizes a HP 6890 Series gas chromatograph and a HP 5973 Mass Selective Detector. The configuration is equipped with the electronic pressure control. All MS interfaces are capillary direct.

Chromatographic Columns

Chromatographic separation of semivolatile components is accomplished through analysis on one or more of the following columns (all with dimensions of 30 meters x 0.25 millimeters ID and 0.25 micron film except J&W DB-SMS2 which is 25 meters x 0.20 mm ID and 0.33 micron film):

Column ID	Column Description
J&W	DB-5.625(5% Phenyl)-methylpolysiloxane (identified by a DB-5.625 designation on quantitation reports and reconstructed ion chromatograms)
J&W DB-5MS	Similar to the J&W DB-5.625 with low bleed characteristics (identified by a DB-5MS designation)
Alltech	EC-5 (SE-54) 5% Phenyl, 95% Methylpolysiloxane (identified by a HP-5MS designation)
HP	HP-5MS 5% Phenylmethylsiloxane (identified by a HP-5MS designation)
Phenomenex	ZB-5 5% Phenyl Polysiloxane (identified by a ZB-5 designation)
J&W DB-5MS2	Similar to the J&W DB-5.625 with low bleed characteristics (identified by a DB-5MS2 designation)

Instrument Configuration

The samples reported in this SDG were analyzed on one or more of the following instrument systems. Instrument systems are referenced in the raw data and individual form headers by the Instrument ID designations listed below:

Instrument ID	System Configuration	Chromatographic Column
MSD2	HP6890/HP5973	DB-5MS2
MSD4	HP6890/HP5973	DB-5MS2
MSD5	HP6890/HP5973	DB-5MS2
MSD7	HP6890/HP5973	DB-5MS2
MSD8	HP6890/HP5973	DB-5MS2

Certification Statement

* Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Review Validation:

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

Reviewer: *[Signature]* Date: 10/4/02

**GC/MS
SEMI- VOLATILES
QUALITY CONTROL
SUMMARY**

QC Summary

Report Date: October 4, 2002
Page 1 of 7

Client : Sandia National Laboratories
MS-0756
P.O. Box 5800
Albuquerque, New Mexico
Contact: Pamela M. Puissant
Workorder: 66780

Parameter	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Analst	Date	Time
Semi-Volatiles-GC/MS Federal											
Batch 200259											
QC1200297373 LCS				1220	ug/kg		73	(27%-91%)	JWF	09/11/02	16:49
1,2,4-Trichlorobenzene	1670			1130	ug/kg		68	(25%-85%)			
1,4-Dichlorobenzene	1670			2800	ug/kg		84	(42%-96%)			
2,4,5-Trichlorophenol	3330			2540	ug/kg		76	(32%-91%)			
2,4,6-Trichlorophenol	3330			1020	ug/kg		61	(50%-105%)			
2,4-Dinitrotoluene	1670			2300	ug/kg		69	(31%-85%)			
2-Chlorophenol	3330			2660	ug/kg		80	(34%-97%)			
4-Chloro-3-methylphenol	3330			2750	ug/kg		83	(22%-128%)			
4-Nitrophenol	3330			1370	ug/kg		82	(39%-98%)			
Acenaphthene	1670			1380	ug/kg		83	(41%-105%)			
Hexachlorobenzene	1670			1230	ug/kg		74	(21%-94%)			
Hexachlorobutadiene	1670			1140	ug/kg		68	(25%-86%)			
Hexachloroethane	1670			1200	ug/kg		72	(34%-90%)			
N-Nitrosodipropylamine	1670			1200	ug/kg		72	(30%-84%)			
Nitrobenzene	1670			2630	ug/kg		79	(27%-109%)			
Pentachlorophenol	3330			2320	ug/kg		70	(31%-83%)			
Phenol	3330			1550	ug/kg		95	(37%-110%)			
Pyrene	1670			2450	ug/kg		73	(40%-83%)			
m,p-Cresols	3330			2400	ug/kg		72	(34%-86%)			
o-Cresol	3330			2730	ug/kg		82	(23%-111%)			
**2,4,6-Tribromophenol	3330			1200	ug/kg		72	(21%-104%)			
**2-Fluorobiphenyl	1670			2260	ug/kg		68	(22%-93%)			
**2-Fluorophenol	3330			1080	ug/kg		65	(24%-97%)			
**Nitrobenzene-d5	1670			2300	ug/kg		69	(22%-99%)			
**Phenol-d5	3330			1620	ug/kg		98	(30%-133%)			
**p-Terphenyl-d14	1670										
QC1200297372 MB											
1,2,4-Trichlorobenzene			U	ND	ug/kg						09/11/02 16:26
1,2-Dichlorobenzene			U	ND	ug/kg						
1,3-Dichlorobenzene			U	ND	ug/kg						
1,4-Dichlorobenzene			U	ND	ug/kg						
2,4,5-Trichlorophenol			U	ND	ug/kg						
2,4,6-Trichlorophenol			U	ND	ug/kg						
2,4-Dichlorophenol			U	ND	ug/kg						
2,4-Dimethylphenol			U	ND	ug/kg						
2,4-Dinitrophenol			U	ND	ug/kg						
2,4-Dinitrotoluene			U	ND	ug/kg						
2,6-Dinitrotoluene			U	ND	ug/kg						
2-Chloronaphthalene			U	ND	ug/kg						
2-Chlorophenol			U	ND	ug/kg						
2-Methyl-4,6-dinitrophenol			U	ND	ug/kg						
2-Methylnaphthalene			U	ND	ug/kg						
2-Nitrophenol			U	ND	ug/kg						

QC Summary

Workorder: 66780

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-GC/MS Federal											
Batch 200259											
3,3'-Dichlorobenzidine			U	ND	ug/kg						
4-Bromophenylphenylether			U	ND	ug/kg						
4-Chloro-3-methylphenol			U	ND	ug/kg						
4-Chloroaniline			U	ND	ug/kg						
4-Chlorophenylphenylether			U	ND	ug/kg						
4-Nitrophenol			U	ND	ug/kg						
Acenaphthene			U	ND	ug/kg						
Acenaphthylene			U	ND	ug/kg						
Anthracene			U	ND	ug/kg						
Benzo(a)anthracene			U	ND	ug/kg						
Benzo(a)pyrene			U	ND	ug/kg						
Benzo(b)fluoranthene			U	ND	ug/kg						
Benzo(ghi)perylene			U	ND	ug/kg						
Benzo(k)fluoranthene			U	ND	ug/kg						
Butylbenzylphthalate			U	ND	ug/kg						
Carbazole			U	ND	ug/kg						
Chrysene			U	ND	ug/kg						
Di-n-butylphthalate			U	ND	ug/kg						
Di-n-octylphthalate			U	ND	ug/kg						
Dibenzo(a,h)anthracene			U	ND	ug/kg						
Dibenzofuran			U	ND	ug/kg						
Diethylphthalate			U	ND	ug/kg						
Dimethylphthalate			U	ND	ug/kg						
Diphenylamine			U	ND	ug/kg						
Fluoranthene			U	ND	ug/kg						
Fluorene			U	ND	ug/kg						
Hexachlorobenzene			U	ND	ug/kg						
Hexachlorobutadiene			U	ND	ug/kg						
Hexachlorocyclopentadiene			U	ND	ug/kg						
Hexachloroethane			U	ND	ug/kg						
Indeno(1,2,3-cd)pyrene			U	ND	ug/kg						
Isophorone			U	ND	ug/kg						
N-Nitrosodipropylamine			U	ND	ug/kg						
Naphthalene			U	ND	ug/kg						
Nitrobenzene			U	ND	ug/kg						
Pentachlorophenol			U	ND	ug/kg						
Phenanthrene			U	ND	ug/kg						
Phenol			U	ND	ug/kg						
Pyrene			U	ND	ug/kg						
bis(2-Chloroethoxy)methane			U	ND	ug/kg						
bis(2-Chloroethyl) ether			U	ND	ug/kg						
bis(2-Chloroisopropyl) ether			U	ND	ug/kg						
bis(2-Ethylhexyl)phthalate			J	89.5	ug/kg						
m,p-Cresols			U	ND	ug/kg						
m-Nitroaniline			U	ND	ug/kg						
o-Cresol			U	ND	ug/kg						
o-Nitroaniline			U	ND	ug/kg						
p-Nitroaniline			U	ND	ug/kg						

Workorder: 66780

QC Summary

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Parmaame	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anist	Date	Time
Semi-Volatiles-GC/MS Federal											
Batch 200259											
**2,4,6-Tribromophenol	3330			1980	ug/kg		59	(23%-111%)			
**2-Fluorobiphenyl	1670			1300	ug/kg		78	(21%-104%)			
**2-Fluorophenol	3330			2530	ug/kg		76	(22%-93%)			
**Nitrobenzene-d5	1670			1290	ug/kg		77	(24%-97%)			
**Phenol-d5	3330			2550	ug/kg		77	(22%-99%)			
**p-Terphenyl-d14	1670			1600	ug/kg		96	(30%-133%)			
QC1200297314 66780014 MS											
1,2,4-Trichlorobenzene	1670	U	ND	1280	ug/kg		77	(15%-112%)		09/11/02	17:33
1,4-Dichlorobenzene	1670	U	ND	1240	ug/kg		75	(19%-89%)			
2,4,5-Trichlorophenol	3330	U	ND	2780	ug/kg		83				
2,4,6-Trichlorophenol	3330	U	ND	2510	ug/kg		75				
2,4-Dinitrotoluene	1670	U	ND	1010	ug/kg		60	(32%-117%)			
2-Chlorophenol	3330	U	ND	2500	ug/kg		75	(13%-101%)			
4-Chloro-3-methylphenol	3330	U	ND	2690	ug/kg		81	(23%-114%)			
4-Nitrophenol	3330	U	ND	2760	ug/kg		83	(20%-126%)			
Aconaphthene	1670	U	ND	1290	ug/kg		77	(15%-114%)			
Hexachlorobenzene	1670	U	ND	1360	ug/kg		82				
Hexachlorobutadiene	1670	U	ND	1310	ug/kg		79				
Hexachloroethane	1670	U	ND	1250	ug/kg		75				
N-Nitrosodipropylamine	1670	U	ND	1300	ug/kg		78	(18%-106%)			
Nitrobenzene	1670	U	ND	1260	ug/kg		75				
Pentachlorophenol	3330	U	ND	2410	ug/kg		72	(34%-110%)			
Phenol	3330	U	ND	2520	ug/kg		76	(17%-104%)			
Pyrene	1670	U	ND	1400	ug/kg		84	(26%-130%)			
m,p-Cresols	3330	U	ND	2590	ug/kg		78				
o-Cresol	3330	U	ND	2700	ug/kg		81				
**2,4,6-Tribromophenol	3330			2730	ug/kg		82	(23%-111%)			
**2-Fluorobiphenyl	1670			1200	ug/kg		72	(21%-104%)			
**2-Fluorophenol	3330			2520	ug/kg		76	(22%-93%)			
**Nitrobenzene-d5	1670			1130	ug/kg		68	(24%-97%)			
**Phenol-d5	3330			2310	ug/kg		75	(22%-99%)			
**p-Terphenyl-d14	1670			1470	ug/kg		88	(30%-133%)			
QC1200297315 66780014 MSD											
1,2,4-Trichlorobenzene	1670	U	ND	1050	ug/kg	20	63	(0%-31%)		09/11/02	17:55
1,4-Dichlorobenzene	1670	U	ND	989	ug/kg	23	59	(0%-36%)			
2,4,5-Trichlorophenol	3330	U	ND	2300	ug/kg	15	72				
2,4,6-Trichlorophenol	3330	U	ND	2100	ug/kg	18	63				
2,4-Dinitrotoluene	1670	U	ND	926	ug/kg	8	56	(0%-37%)			
2-Chlorophenol	3330	U	ND	1990	ug/kg	23	60	(0%-34%)			
4-Chloro-3-methylphenol	3330	U	ND	2280	ug/kg	17	68	(0%-34%)			
4-Nitrophenol	3330	U	ND	2810	ug/kg	2	84	(0%-35%)			
Aconaphthene	1670	U	ND	1080	ug/kg	17	65	(0%-33%)			
Hexachlorobenzene	1670	U	ND	1270	ug/kg	7	76				
Hexachlorobutadiene	1670	U	ND	1060	ug/kg	21	64				
Hexachloroethane	1670	U	ND	962	ug/kg	26	58				
N-Nitrosodipropylamine	1670	U	ND	1040	ug/kg	22	62	(0%-29%)			
Nitrobenzene	1670	U	ND	1040	ug/kg	19	62				
Pentachlorophenol	3330	U	ND	2220	ug/kg	8	67	(0%-40%)			

QC Summary

Workorder: 66780

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Parameter	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Semi-Volatiles-GC/MS Federal										
Batch	200259									
Phenol	3330	U	ND	2030	ug/kg	22	61	(0%-37%)		
Pyrene	1670	U	ND	1330	ug/kg	5	80	(0%-39%)		
m,p-Cresols	3330	U	ND	2090	ug/kg	21	63			
o-Cresol	3330	U	ND	2160	ug/kg	22	65			
**2,4,6-Tribromophenol	3330			2620	ug/kg		79	(23%-111%)		
**2-Fluorobiphenyl	1670			1000	ug/kg		60	(21%-104%)		
**2-Fluorophenol	3330			1990	ug/kg		60	(22%-93%)		
**Nitrobenzene-d5	1670			938	ug/kg		56	(24%-97%)		
**Phenol-d5	3330			2020	ug/kg		61	(22%-99%)		
**p-Terphenyl-d14	1670			1410	ug/kg		84	(30%-133%)		
Batch	300577									
QC: 200298119 LCS										
Pyridine	1670			643	ug/kg		39			JWF 09/16/02 12:38
1,2,4-Trichlorobenzene	1670			1080	ug/kg		65	(27%-91%)		
1,4-Dichlorobenzene	1670			1040	ug/kg		62	(25%-85%)		
2,4,5-Trichlorophenol	3330			2010	ug/kg		60	(42%-96%)		
2,4,6-Trichlorophenol	3330			1990	ug/kg		60	(32%-91%)		
2,4-Dinitrotoluene	1670			957	ug/kg		57	(50%-109%)		
2-Chlorophenol	3330			1910	ug/kg		57	(31%-85%)		
4-Chloro-3-methylphenol	3330			2020	ug/kg		61	(34%-97%)		
4-Nitrophenol	3330			1990	ug/kg		60	(22%-128%)		
Acenaphthene	1670			1040	ug/kg		62	(39%-98%)		
Hexachlorobenzene	1670			974	ug/kg		59	(41%-105%)		
Hexachlorobutadiene	1670			1110	ug/kg		66	(21%-94%)		
Hexachloroethane	1670			1010	ug/kg		61	(25%-86%)		
N-Nitrosodipropylamine	1670			1020	ug/kg		61	(34%-90%)		
Nitrobenzene	1670			1030	ug/kg		62	(30%-84%)		
Pentachlorophenol	3330			1820	ug/kg		55	(27%-109%)		
Phenol	3330			1870	ug/kg		56	(31%-83%)		
Pyrene	1670			902	ug/kg		54	(37%-110%)		
m,p-Cresols	3330			1940	ug/kg		58	(40%-83%)		
o-Cresol	3330			1960	ug/kg		59	(34%-86%)		
**2,4,6-Tribromophenol	3330			1950	ug/kg		58	(23%-111%)		
**2-Fluorobiphenyl	1670			953	ug/kg		57	(21%-104%)		
**2-Fluorophenol	3330			1960	ug/kg		59	(22%-93%)		
**Nitrobenzene-d5	1670			916	ug/kg		55	(24%-97%)		
**Phenol-d5	3330			1900	ug/kg		57	(22%-99%)		
**p-Terphenyl-d14	1670			954	ug/kg		57	(30%-133%)		
QC: 200298116 MB										
1,2,4-Trichlorobenzene			U	ND	ug/kg					09/16/02 12:14
1,2-Dichlorobenzene			U	ND	ug/kg					
1,3-Dichlorobenzene			U	ND	ug/kg					
1,4-Dichlorobenzene			U	ND	ug/kg					
2,4,5-Trichlorophenol			U	ND	ug/kg					
2,4,6-Trichlorophenol			U	ND	ug/kg					
2,4-Dichlorophenol			U	ND	ug/kg					
2,4-Dimethylphenol			U	ND	ug/kg					
2,4-Dinitrophenol			U	ND	ug/kg					

QC Summary

Workorder: 66780

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Analst	Date	Time
Semi-Volatiles-GC/MS Federal											
Batch 200577											
2,4-Dinitrotoluene			U	ND	ug/kg						
2,6-Dinitrotoluene			U	ND	ug/kg						
2-Chloronaphthalene			U	ND	ug/kg						
2-Chlorophenol			U	ND	ug/kg						
2-Methyl-4,6-dinitrophenol			U	ND	ug/kg						
2-Methylnaphthalene			U	ND	ug/kg						
2-Nitrophenol			U	ND	ug/kg						
3,3'-Dichlorobenzidine			U	ND	ug/kg						
4-Bromophenylphenylether			U	ND	ug/kg						
4-Chloro-3-methylphenol			U	ND	ug/kg						
4-Chloroaniline			U	ND	ug/kg						
4-Chlorophenylphenylether			U	ND	ug/kg						
4-Nitrophenol			U	ND	ug/kg						
Acenaphthene			U	ND	ug/kg						
Acenaphthylene			U	ND	ug/kg						
Anthracene			U	ND	ug/kg						
Benzo(a)anthracene			U	ND	ug/kg						
Benzo(a)pyrene			U	ND	ug/kg						
Benzo(b)fluoranthene			U	ND	ug/kg						
Benzo(ghi)perylene			U	ND	ug/kg						
Benzo(k)fluoranthene			U	ND	ug/kg						
Butylbenzylphthalate			U	ND	ug/kg						
Carbazole			U	ND	ug/kg						
Chrysene			U	ND	ug/kg						
Di-n-butylphthalate			U	ND	ug/kg						
Di-n-octylphthalate			U	ND	ug/kg						
Dibenzo(a,h)anthracene			U	ND	ug/kg						
Dibenzofuran			U	ND	ug/kg						
Diethylphthalate			U	ND	ug/kg						
Dimethylphthalate			U	ND	ug/kg						
Diphenylamine			U	ND	ug/kg						
Fluoranthene			U	ND	ug/kg						
Fluorene			U	ND	ug/kg						
Hexachlorobenzene			U	ND	ug/kg						
Hexachlorobutadiene			U	ND	ug/kg						
Hexachlorocyclopentadiene			U	ND	ug/kg						
Hexachloroethane			U	ND	ug/kg						
Indeno(1,2,3-cd)pyrene			U	ND	ug/kg						
Isophorone			U	ND	ug/kg						
N-Nitrosodipropylamine			U	ND	ug/kg						
Naphthalene			U	ND	ug/kg						
Nitrobenzene			U	ND	ug/kg						
Pentachlorophenol			U	ND	ug/kg						
Phenanthrene			U	ND	ug/kg						
Phenol			U	ND	ug/kg						
Pyrene			U	ND	ug/kg						
bis(2-Chloroethoxy)methane			U	ND	ug/kg						
bis(2-Chloroethyl) ether			U	ND	ug/kg						

QC Summary

Workorder: 66780

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Parmaigne	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-GC/MS Federal Batch 200577											
bis(2-Chloroisopropyl)ether			U	ND	ug/kg						
bis(2-Ethylhexyl)phthalate			J	75.2	ug/kg						
m,p-Cresols			U	ND	ug/kg						
m-Nitroaniline			U	ND	ug/kg						
o-Cresol			U	ND	ug/kg						
o-Nitroaniline			U	ND	ug/kg						
p-Nitroaniline			U	ND	ug/kg						
**2,4,6-Tribromophenol	3330			ND	ug/kg						
**2-Fluorobiphenyl	1670			1570	ug/kg		47	(23%-111%)			
**2-Fluorophenol	3330			985	ug/kg		59	(21%-104%)			
**Nitrobenzene-d5	1670			1890	ug/kg		57	(22%-93%)			
**Phenol-d5	3330			968	ug/kg		58	(24%-97%)			
**p-Terphenyl-d14	3330			1910	ug/kg		57	(22%-99%)			
QC1200298117 66780013 MS	1670			1010	ug/kg		61	(30%-133%)			
Pyridine	1670			0.00	ug/kg						
1,2,4-Trichlorobenzene	1670	U	ND	1160	ug/kg		70	(15%-112%)		09/16/02	13:26
1,4-Dichlorobenzene	1670	U	ND	1100	ug/kg		66	(19%-89%)			
2,4,5-Trichlorophenol	3330	U	ND	2510	ug/kg		75				
2,4,6-Trichlorophenol	3330	U	ND	2320	ug/kg		70				
2,4-Dinitrotoluene	1670	U	ND	1200	ug/kg		72	(32%-117%)			
2-Chlorophenol	3330	U	ND	2220	ug/kg		67	(13%-101%)			
4-Chloro-3-methylphenol	3330	U	ND	2450	ug/kg		73	(23%-114%)			
4-Nitrophenol	3330	U	ND	2480	ug/kg		75	(20%-126%)			
Acenaphthene	1670	U	ND	1210	ug/kg		73	(15%-114%)			
Hexachlorobenzene	1670	U	ND	1160	ug/kg		69				
Hexachlorobutadiene	1670	U	ND	1230	ug/kg		74				
Hexachloroethane	1670	U	ND	1100	ug/kg		66				
N-Nitrosodipropylamine	1670	U	ND	1180	ug/kg		71	(18%-106%)			
Nitrobenzene	1670	U	ND	1150	ug/kg		69				
Pentachlorophenol	3330	U	ND	2010	ug/kg		60	(34%-110%)			
Phenol	3330	U	ND	2210	ug/kg		66	(17%-104%)			
Pyrene	1670	U	ND	1050	ug/kg		63	(26%-130%)			
m,p-Cresols	3330	U	ND	2310	ug/kg		69				
o-Cresol	3330	U	ND	2290	ug/kg		69				
**2,4,6-Tribromophenol	3330			1890	ug/kg		73	(23%-111%)			
**2-Fluorobiphenyl	1670			1090	ug/kg		66	(21%-104%)			
**2-Fluorophenol	3330			2060	ug/kg		67	(22%-93%)			
**Nitrobenzene-d5	1670			1080	ug/kg		61	(24%-97%)			
**Phenol-d5	3330			2110	ug/kg		66	(22%-99%)			
**p-Terphenyl-d14	1670			1090	ug/kg		66	(30%-133%)			
QC1200298118 66780013 MSD											
Pyridine	1670			0.00	ug/kg						
1,2,4-Trichlorobenzene	1670	U	ND	1270	ug/kg	9	76	(0%-51%)		09/16/02	13:50
1,4-Dichlorobenzene	1670	U	ND	1220	ug/kg	10	73	(0%-36%)			
2,4,5-Trichlorophenol	3330	U	ND	2790	ug/kg	10	84				
2,4,6-Trichlorophenol	3330	U	ND	2510	ug/kg	8	75				
2,4-Dinitrotoluene	1670	U	ND	1350	ug/kg	12	81	(0%-37%)			
2-Chlorophenol	3330	U	ND	2380	ug/kg	7	71	(0%-34%)			

QC Summary

Workorder: 66780

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Parameter	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-GC/MS Federal											
Batch 200577											
4-Chloro-3-methylphenol	3330	U	ND	2640	ug/kg	8	79	(0%-34%)			
4-Nitrophenol	3330	U	ND	3070	ug/kg	21	92	(0%-35%)			
Acenaphthene	1670	U	ND	1300	ug/kg	7	78	(0%-33%)			
Hexachlorobenzene	1670	U	ND	1260	ug/kg	9	76				
Hexachlorobutadiene	1670	U	ND	1320	ug/kg	8	80				
Hexachloroethane	1670	U	ND	1180	ug/kg	7	71				
N-Nitrosodipropylamine	1670	U	ND	1290	ug/kg	9	78	(0%-29%)			
Nitrobenzene	1670	U	ND	1230	ug/kg	7	74				
Pentachlorophenol	3330	U	ND	2440	ug/kg	19	73	(0%-40%)			
Phenol	3330	U	ND	2420	ug/kg	9	73	(0%-37%)			
Pyrene	1670	U	ND	1060	ug/kg	1	64	(0%-39%)			
m,p-Cresols	3330	U	ND	2490	ug/kg	7	75				
o-Cresol	3330	U	ND	2530	ug/kg	10	76				
**2,4,6-Tribromophenol	3330		1890	2730	ug/kg		82	(23%-111%)			
**2-Fluorobiphenyl	1670		1090	1180	ug/kg		71	(21%-104%)			
**2-Fluorophenol	3330		2060	2410	ug/kg		72	(22%-93%)			
**Nitrobenzene-d5	1670		1080	1120	ug/kg		67	(24%-97%)			
**Phenol-d5	3330		2110	2400	ug/kg		72	(22%-99%)			
**p-Terphenyl-d14	1670		1070	1120	ug/kg		67	(30%-133%)			

Notes:

RER is calculated at the 95% confidence level (2-sigma).

The Qualifiers in this report are defined as follows:

- * Recovery or %RPD not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where it
- ** Indicates analyte is a surrogate compound.
- B The analyte was found in the blank above the effective MDL.
- H Holding time was exceeded
- J Estimated value, the analyte concentration (el) above the effective MDL and below the effective PQL
- P The response between the confirmation column and the primary column is >40%D
- U The analyte was analyzed for but not detected below this concentration. For Organic and Inorganic analytes the result is less than the effective MDL.
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Uncertain identification for gamma spectroscopy.

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

HPLC
EXPLOSIVES
ANALYSIS

**HPLC Narrative
Sandia National Labs (SNLS)
SDG 66780**

Method/Analysis Information

Procedure: Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)
Analytical Method: SW846 8330
Prep Method: SW846 8330 PREP
Analytical Batch Number: 200966
Prep Batch Number: 200965

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 8330:

Sample ID	Client ID
66780012	059784-002
66780013	059785-002
66780014	059787-001
66780015	059788-002
66780016	059789-002
66780017	059790-002
66780018	059791-002
66780019	059793-002

66780020	059794-002
66780021	059795-002
66780022	059796-002
1200299091	XBLK01 (Blank)
1200299092	XBLK01 LCS (Laboratory Control Sample)
1200299093	059784-002MS (Matrix Spike)
1200299094	059784-002MSD (Matrix Spike Duplicate)

System Configuration

The laboratory utilizes a high performance liquid chromatography (HPLC) instrument configuration for explosives analyses. The chromatographic hardware system consists of an HP Model 1050 HPLC or HP Model 1100 HPLC with programmable gradient pumping and a 100 ul loop injector for the primary system and a 100 ul loop injector for the confirmation system. The HPLC 1050 is coupled to a HP Model G1306A Diode Array UV detector, and the HPLC 1100 is coupled to a HP Model G1315A Diode Array UV detector which monitor absorbance at the following five wavelengths: 1) 214 nm; 2) 224 nm; 3) 235 nm; 4) 254 nm; 5) 264 nm.

The primary HPLC system is usually identified with either a designation of HPLC #2, or hplcb in the raw data printouts. The confirmation HPLC system is usually identified with a designation of HPLC #1, or hplca in the raw data printouts. The HP 1100 HPLC system is identified as HPLC #3, or hplcc in the raw data printouts. The HP 1100 HPLC has a Column Switching Valve which enables this system to be used for primary analysis or confirmation analysis.

Chromatographic Columns

Chromatographic separation of nitroaromatic and nitramine components is accomplished through analysis on the following reversed phase columns:

HP: Hypersil BDS-C18, 250 mm x 4 mm O.D. containing 5 um particle size.

Confirmation of nitroaromatic and nitramine components, initially identified on one of the above columns, is accomplished through analysis on the following column:

PH: Develosil CN-UG5-5, 250 mm x 4.6 mm I.D.

The primary column is used for quantitation while the confirmation column is for qualitative purposes only.

Preparation/Analytical Method Verification

Procedures for preparation, analysis, and reporting of analytical data are documented by General Engineering Laboratories, Inc. (GEL) as Standard Operating Procedures (SOP).

Calibration Information

Initial Calibration

All initial calibration requirements have been met for this SDG.

CCV Requirements

All calibration verification standard(s) (CVS, ICV or CCV) requirements have been met for this SDG.

Quality Control (QC) Information

Surrogate Recoveries

All the surrogate recoveries were within the established acceptance criteria for this SDG.

Blank Acceptance

The blank(s) analyzed with this SDG met the established acceptance criteria.

LCS Recovery Statement

One or more of the required spiking analytes were not within the acceptance limits in the laboratory control sample (LCS). Due to the failing QC the samples were reextracted out of holding. Please see nonconformance report 4094.

QC Sample Designation

The following sample analyzed with this SDG was chosen for matrix spike analysis: 66780012 (059784-002).

MS Recovery Statement

All the matrix spike recoveries were within the established acceptance limits.

MSD Recovery Statement

The matrix spike duplicate recoveries for this SDG were within the established acceptance limits.

MS/MSD RPD Statement

The relative percent differences (RPD) between the MS and MSD were within the required acceptance limits.

Technical Information

Holding Time Specifications

All samples in this analytical batch met the specified holding time requirements. GEL assigns holding times based on the associated methodology that assigns the date and time from sample collection or sample receipt. Those holding times expressed in hours are calculated in the AlphaLIMS system. Those holding times expressed as days expire at midnight on the day of expiration.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

None of the samples in this SDG required dilutions.

Sample Reextract/Reanalysis

One or more of the required spiking analytes were not within the acceptance limits in the laboratory control sample (LCS). Due to the failing QC the samples were reextracted out of holding. Please see nonconformance report 4094.

Miscellaneous Information

Nonconformance (NCR) Documentation

Nonconformance report 4094 was generated for this SDG.

One or more of the required spiking analytes were not within the acceptance limits in the laboratory control sample (LCS). Due to the failing QC the samples were reextracted out of holding. Please see nonconformance report 4094.

Manual Integration

Some initial calibration standards, continuing calibration standards, and/or samples required manual integrations due to software limitations.

Additional Comments

The Form 8 uses the retention time of the surrogate as a measure of how close the retention time of the samples and QC are to a standard component. The Instrument Blank does not contain the surrogate.

The following analytes coelute on the cyano column: a.) 2,4,6-Trinitrotoluene, 2,4-Dinitrotoluene, and 2,6-Dinitrotoluene b.) 1,3,5-Trinitrotoluene and 1,3-Dinitrobenzene c.) m-Nitrotoluene, p-Nitrotoluene and o-Nitrotoluene. As a result some of these analytes may be flagged with a P qualifier. The coelution from the cyano column should be considered and the values as suspect to the sample.

The samples were concentrated prior to analysis to achieve the required detection limit.

Confirmation analysis was performed on some of the samples in this batch. The values reported are from the primary analysis. The confirmation analysis is used for qualitative purposes only.

Method/Analysis Information

Procedure: Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC)
Analytical Method: SW846 8330
Prep Method: SW846 8330 PREP
Analytical Batch Number: 203692
Prep Batch Number: 203690

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 8330:

Sample ID	Client ID
66780012	059784-002RE
66780013	059785-002RE
66780014	059787-001RE
66780015	059788-002RE
66780016	059789-002RE
66780017	059790-002RE
66780018	059791-002RE
66780019	059793-002RE
66780020	059794-002RE
66780021	059795-002RE
66780022	059796-002RE

1200305791	XBLK01 (Blank)
1200305792	XBLK01 LCS (Laboratory Control Sample)
1200305793	059784-002MS (Matrix Spike)
1200305794	059784-002MSD (Matrix Spike Duplicate)

The primary column is used for quantitation while the confirmation column is for qualitative purposes only.

Preparation/Analytical Method Verification

Procedures for preparation, analysis, and reporting of analytical data are documented by General Engineering Laboratories, Inc. (GEL) as Standard Operating Procedures (SOP).

Calibration Information

Initial Calibration

All initial calibration requirements have been met for this SDG.

CCV Requirements

All calibration verification standard(s) (CVS, ICV or CCV) requirements have been met for this SDG.

Quality Control (QC) Information

Surrogate Recoveries

All the surrogate recoveries were within the established acceptance criteria for this SDG.

Blank Acceptance

The blank(s) analyzed with this SDG met the established acceptance criteria.

LCS Recovery Statement

All the LCS spike recoveries for this SDG were within the established acceptance limits.

QC Sample Designation

The following sample analyzed with this SDG was chosen for matrix spike analysis:
066780012 (59784-002)

MS Recovery Statement

All the matrix spike recoveries were within the established acceptance limits.

MSD Recovery Statement

The matrix spike duplicate recoveries were within the established acceptance limits.

MS/MSD RPD Statement

The relative percent differences (RPD) between the MS and MSD were within the required acceptance limits.

Technical Information**Holding Time Specifications**

One or more of the required spiking analytes were not within the acceptance limits in the laboratory control sample (LCS). Due to the failing QC the samples were reextracted out of holding. Please see nonconformance report 4094. GEL assigns holding times based on the associated methodology that assigns the date and time from sample collection or sample receipt. Those holding times expressed in hours are calculated in the AlphaLIMS system. Those holding times expressed as days expire at midnight on the day of expiration.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

None of the samples in this SDG required dilutions.

Miscellaneous Information**Nonconformance (NCR) Documentation**

Nonconformance report 4094 was generated for this SDG.

One or more of the required spiking analytes were not within the acceptance limits in the laboratory control sample (LCS). Due to the failing QC the samples were reextracted out of holding. Please see nonconformance report 4094.

Manual Integrations

Some initial calibration standards, continuing calibration standards, and/or samples required manual integrations due to software limitations.

Additional Comments

The following analytes coelute on the cyano column: a.) 2,4,6-Trinitrotoluene, 2,4-Dinitrotoluene, and 2,6-Dinitrotoluene b.) 1,3,5-Trinitrotoluene and 1,3-Dinitrobenzene c.) m-Nitrotoluene, p-Nitrotoluene and o-Nitrotoluene. As a result some of these analytes may be flagged with a P qualifier. The coelution from the cyano column should be considered and the values as suspect to the sample.

The samples were concentrated prior to analysis to achieve the required detection limit.

Confirmation analysis was performed on some of the samples in this batch. The values reported are from the primary analysis. The confirmation analysis is used for qualitative purposes only.

The Form 8 uses the retention time of the surrogate as a measure of how close the retention time of the samples and QC are to a standard component. The Instrument Blank does not contain the surrogate.

Certification Statement

* Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Review Validation:

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

Reviewer: Stephan Mauer Date: 10/07/02

HPLC
QUALITY
CONTROL
SUMMARY

QC Summary

Client : Sandia National Laboratories
 MS-0756
 P.O. Box 5800
 Albuquerque, New Mexico
 Contact: Pamela M. Puissant
 Workorder: 66780

Report Date: October 7, 2002
 Page 1 of 4

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anst	Date	Time
HPLC Explosives Federal											
Bach	200956										
QC1200299092	LCS										
1,3,5-Trinitrobenzene	800			737	ug/kg		92	(77%-124%)	JLW	09/16/02	20:15
2,4,6-Trinitrotoluene	800			860	ug/kg		110	(80%-120%)			
2,4-Dinitrotoluene	800			727	ug/kg		91	(77%-122%)			
2,6-Dinitrotoluene	800			756	ug/kg		95	(74%-121%)			
2-Amino-4,6-dinitrotoluene	800			740	ug/kg		93	(81%-125%)			
4-Amino-2,6-dinitrotoluene	800			597	ug/kg		75*	(79%-123%)			
HMX	800			749	ug/kg		94	(84%-131%)			
Nitrobenzene	800			702	ug/kg		88	(75%-125%)			
RDX	800			773	ug/kg		97	(80%-123%)			
Tetryl	800			84.9	ug/kg		11*	(65%-124%)			
m-Dinitrobenzene	800			744	ug/kg		93	(77%-124%)			
m-Nitrotoluene	800			710	ug/kg		89	(77%-117%)			
o-Nitrotoluene	800			702	ug/kg		88	(75%-119%)			
p-Nitrotoluene	800			706	ug/kg		88	(76%-121%)			
**1,2-dinitrobenzene	400			376	ug/kg		94	(71%-116%)			
QC1200299091	MB										
1,3,5-Trinitrobenzene			U	ND	ug/kg					09/16/02	19:33
2,4,6-Trinitrotoluene			U	ND	ug/kg						
2,4-Dinitrotoluene			U	ND	ug/kg						
2,6-Dinitrotoluene			U	ND	ug/kg						
2-Amino-4,6-dinitrotoluene			U	ND	ug/kg						
4-Amino-2,6-dinitrotoluene			U	ND	ug/kg						
HMX			U	ND	ug/kg						
Nitrobenzene			U	ND	ug/kg						
RDX			U	ND	ug/kg						
Tetryl			U	ND	ug/kg						
m-Dinitrobenzene			U	ND	ug/kg						
m-Nitrotoluene			U	ND	ug/kg						
o-Nitrotoluene			U	ND	ug/kg						
p-Nitrotoluene			U	ND	ug/kg						
**1,2-dinitrobenzene	400			384	ug/kg						
QC1200299093	66780012	MS					96	(71%-118%)			
1,3,5-Trinitrobenzene	800	U	ND	772	ug/kg		97	(66%-133%)		09/16/02	20:57
2,4,6-Trinitrotoluene	800	U	ND	776	ug/kg		97	(77%-132%)			
2,4-Dinitrotoluene	800	U	ND	778	ug/kg		97	(61%-134%)			
2,6-Dinitrotoluene	800	U	ND	852	ug/kg		107	(70%-121%)			
2-Amino-4,6-dinitrotoluene	800	U	ND	748	ug/kg		94	(79%-124%)			
4-Amino-2,6-dinitrotoluene	800	U	ND	609	ug/kg		76	(71%-120%)			
HMX	800	U	ND	780	ug/kg		98	(73%-138%)			
Nitrobenzene	800	U	ND	752	ug/kg		94	(72%-120%)			
RDX	800	U	ND	772	ug/kg		97	(61%-136%)			
Tetryl	800	U	ND	650	ug/kg		81	(65%-135%)			

QC Summary

Workorder: 66780

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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
HPLC Explosives Federal											
Batch 200966											
m-Dinitrobenzene	800	U	ND	792	ug/kg		99	(75%-125%)			
m-Nitrotoluene	800	U	ND	772	ug/kg		97	(73%-116%)			
o-Nitrotoluene	800	U	ND	758	ug/kg		95	(68%-122%)			
p-Nitrotoluene	800	U	ND	765	ug/kg		96	(67%-125%)			
**1,2-dinitrobenzene	400		409	412	ug/kg		103	(71%-118%)			
QC1200299094 66780012 MSD											
1,3,5-Trinitrobenzene	800	U	ND	823	ug/kg	6	103	(0%-20%)		09/16/02	21:39
2,4,6-Trinitrotoluene	800	U	ND	833	ug/kg	7	104	(0%-20%)			
2,4-Dinitrotoluene	800	U	ND	830	ug/kg	7	104	(0%-24%)			
2,6-Dinitrotoluene	800	U	ND	903	ug/kg	6	113	(0%-21%)			
2-Amino-4,6-dinitrotoluene	800	U	ND	796	ug/kg	6	99	(0%-20%)			
4-Amino-2,6-dinitrotoluene	800	U	ND	641	ug/kg	5	80	(0%-20%)			
HMX	800	U	ND	834	ug/kg	7	104	(0%-38%)			
Nitrobenzene	800	U	ND	783	ug/kg	4	98	(0%-21%)			
RDX	800	U	ND	821	ug/kg	6	103	(0%-35%)			
Tetryl	800	U	ND	661	ug/kg	2	83	(0%-30%)			
m-Dinitrobenzene	800	U	ND	846	ug/kg	7	106	(0%-23%)			
m-Nitrotoluene	800	U	ND	799	ug/kg	4	100	(0%-20%)			
o-Nitrotoluene	800	U	ND	786	ug/kg	4	98	(0%-23%)			
p-Nitrotoluene	800	U	ND	786	ug/kg	3	98	(0%-22%)			
**1,2-dinitrobenzene	400		409	421	ug/kg		105	(71%-118%)			
Batch 203692											
QC1200305792 LCS											
1,3,5-Trinitrobenzene	800			773	ug/kg		97	(77%-124%)	JLW	10/03/02	12:34
2,4,6-Trinitrotoluene	800			764	ug/kg		96	(80%-120%)			
2,4-Dinitrotoluene	800			722	ug/kg		90	(77%-122%)			
2,6-Dinitrotoluene	800			726	ug/kg		91	(74%-121%)			
2-Amino-4,6-dinitrotoluene	800			802	ug/kg		100	(81%-125%)			
4-Amino-2,6-dinitrotoluene	800			749	ug/kg		94	(79%-123%)			
HMX	800			803	ug/kg		100	(84%-131%)			
Nitrobenzene	800			689	ug/kg		86	(75%-125%)			
RDX	800			813	ug/kg		102	(80%-123%)			
Tetryl	800			698	ug/kg		87	(65%-124%)			
m-Dinitrobenzene	800			736	ug/kg		92	(77%-124%)			
m-Nitrotoluene	800			697	ug/kg		87	(77%-117%)			
o-Nitrotoluene	800			686	ug/kg		86	(75%-119%)			
p-Nitrotoluene	800			692	ug/kg		86	(76%-121%)			
**1,2-dinitrobenzene	400			350	ug/kg		87	(71%-118%)			
QC1200305791 MB											
1,3,5-Trinitrobenzene			U	ND	ug/kg					10/03/02	11:52
2,4,6-Trinitrotoluene			U	ND	ug/kg						
2,4-Dinitrotoluene			U	ND	ug/kg						
2,6-Dinitrotoluene			U	ND	ug/kg						
2-Amino-4,6-dinitrotoluene			U	ND	ug/kg						
4-Amino-2,6-dinitrotoluene			U	ND	ug/kg						
HMX			U	ND	ug/kg						
Nitrobenzene			U	ND	ug/kg						
RDX			U	ND	ug/kg						

QC Summary

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Parameter	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
IPLC Explosives Federal										
Bach	203692									
Tetryl			U	ND	ug/kg					
m-Dinitrobenzene			U	ND	ug/kg					
m-Nitrotoluene			U	ND	ug/kg					
o-Nitrotoluene			U	ND	ug/kg					
p-Nitrotoluene			U	ND	ug/kg					
**1,2-dinitrobenzene	400			345	ug/kg		86	(71%-118%)		
QC1200305793 66780012 MS										
1,3,5-Trinitrobenzene	800	U	ND	H	931	ug/kg	116	(66%-133%)		10/03/02 13:16
2,4,6-Trinitrotoluene	800	U	ND	H	916	ug/kg	114	(77%-132%)		
2,4-Dinitrotoluene	800	U	ND	H	917	ug/kg	115	(61%-134%)		
2,6-Dinitrotoluene	800	U	ND	H	929	ug/kg	116	(70%-121%)		
2-Amino-4,6-dinitrotoluene	800	U	ND	H	954	ug/kg	119	(79%-124%)		
4-Amino-2,6-dinitrotoluene	800	U	ND	H	916	ug/kg	114	(71%-120%)		
HMX	800	U	ND	H	936	ug/kg	117	(75%-138%)		
Nitrobenzene	800	U	ND	H	880	ug/kg	110	(72%-120%)		
RDX	800	U	ND	H	911	ug/kg	114	(61%-136%)		
Tetryl	800	U	ND	H	842	ug/kg	105	(65%-135%)		
m-Dinitrobenzene	800	U	ND	H	942	ug/kg	118	(75%-125%)		
m-Nitrotoluene	800	U	ND	H	890	ug/kg	111	(73%-116%)		
o-Nitrotoluene	800	U	ND	H	883	ug/kg	110	(68%-122%)		
p-Nitrotoluene	800	U	ND	H	892	ug/kg	111	(67%-125%)		
**1,2-dinitrobenzene	400		409	H	429	ug/kg	107	(71%-118%)		
QC1200305794 66780012 MSD										
1,3,5-Trinitrobenzene	800	U	ND	H	955	ug/kg	3	119	(0%-20%)	10/03/02 13:58
2,4,6-Trinitrotoluene	800	U	ND	H	948	ug/kg	3	118	(0%-20%)	
2,4-Dinitrotoluene	800	U	ND	H	928	ug/kg	1	116	(0%-24%)	
2,6-Dinitrotoluene	800	U	ND	H	934	ug/kg	0	117	(0%-21%)	
2-Amino-4,6-dinitrotoluene	800	U	ND	H	980	ug/kg	3	122	(0%-20%)	
4-Amino-2,6-dinitrotoluene	800	U	ND	H	944	ug/kg	3	118	(0%-20%)	
HMX	800	U	ND	H	971	ug/kg	4	121	(0%-38%)	
Nitrobenzene	800	U	ND	H	864	ug/kg	2	108	(0%-21%)	
RDX	800	U	ND	H	940	ug/kg	3	117	(0%-35%)	
Tetryl	800	U	ND	H	826	ug/kg	2	103	(0%-30%)	
m-Dinitrobenzene	800	U	ND	H	951	ug/kg	1	119	(0%-23%)	
m-Nitrotoluene	800	U	ND	H	886	ug/kg	0	111	(0%-20%)	
o-Nitrotoluene	800	U	ND	H	873	ug/kg	1	109	(0%-23%)	
p-Nitrotoluene	800	U	ND	H	887	ug/kg	1	111	(0%-22%)	
**1,2-dinitrobenzene	400		409	H	428	ug/kg	107	(71%-118%)		

Notes:

RER is calculated at the 95% confidence level (2-sigma).

The Qualifiers in this report are defined as follows:

- * Recovery or %RPD not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where 0
- ** Indicates analyte is a surrogate compound.
- B The analyte was found in the blank above the effective MDL.
- H Holding time was exceeded
- J Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL

QC Summary

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Parameter	NOM	Sample Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
P	The response between the confirmation column and the primary column is >40%D								
U	The analyte was analyzed for but not detected below this concentration. For Organic and Inorganic analytes the result is less than the effective MDL. 1								
X	Presumptive evidence that the analyte is not present. Please see narrative for further information.								
X	Presumptive evidence that the analyte is not present. Please see narrative for further information.								
X	Uncertain identification for gamma spectroscopy.								

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

**GC
SEMIVOLATILE
PCB
ANALYSIS**

**PCB Case Narrative
Sandia National Labs (SNLS)
SDG#66780**

Method/Analysis Information

Procedure: Polychlorinated Biphenyls by Method 8082
Analytical Method: SW846 8082
Prep Method: SW846 3550B
Analytical Batch Number: 200256, 200519, 203080
Prep Batch Number: 200255, 200518, 203079

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 8082:

Sample ID	Client ID
66780012	059784-002
66780013	059785-002
66780014	059787-001
66780015	059788-002
66780016	059789-002
66780017	059790-002
66780018	059791-002
66780019	059793-002
66780020	059794-002
66780021	059795-002
66780022	059796-002
1200298006	PBLK01 (Method Blank)
1200304225	PBLK03 (Method Blank)
1200298007	PBLK01LCS (Laboratory Control Sample)
1200297369	PBLK02LCS (Laboratory Control Sample)
1200304226	PBLK03LCS (Laboratory Control Sample)
1200297370	059784-002MS (Matrix Spike)
1200298008	059785-002MS (Matrix Spike)

1200304227	059796-002REMS (Matrix Spike)
1200297371	059784-002MSD (Matrix Spike Duplicate)
1200298009	059785-002MSD (Matrix Spike Duplicate)
1200304228	059796-002REMSD (Matrix Spike Duplicate)

System Configuration

Chromatographic Columns

Column ID	Column Description
J&W1	DB-5(5%-Phenyl)-methylsiloxane 30m x 0.53mm x 1.5um DB-608 Durabond stationary phase* 30m x 0.53mm x 0.5um
J&W2	DB-5(5%-Phenyl)-methylsiloxane 30m x 0.32mm x 1.0um DB-1701 Durabond stationary phase* 30m x 0.32mm x 0.5um
J&W3	DB-5(5%-Phenyl)-methylsiloxane 30m x 0.53mm x 1.5um DB-1701(14% Cyanopropylphenyl)-methylsiloxane 30m x 0.53mm x 0.5um
J&W4	DB-608 Durabond stationary phase* 30m x 0.53mm x .83um DB-XLB* 30m x 0.53mm x 1.5um
J&W5	DB-XLB* 30m x 0.25mm x 0.25um DB-17MS(50%-Phenyl)-methylsiloxane 30m x 0.25mm x 0.25um
J&W6	DB-5(5%-Phenyl)-methylsiloxane 30m x 0.25mm x 0.25um DB-17MS(50%-Phenyl)-methylsiloxane 30m x 0.25mm x 0.25um

* Durabond and DB-XLB are trademarks of J & W.

Instrument Configuration

The samples reported in this SDG were analyzed on one or more of the following instrument systems. Instrument systems are referenced in the raw data and individual form headers by the Instrument ID designations listed below.

Instrument ID	System Configuration	Chromatographic Column
ECD1	HP 6890 Series GC ECD/ECD	RESTEK*
ECD2	HP 6890 Series GC ECD/ECD	RESTEK*
ECD3	HP 6890 Series GC ECD/ECD	RESTEK*
ECD4	HP 5890 Series II Plus GC ECD/ECD	J&W5
ECD5	HP 6890 Series GC ECD/ECD	J&W5
ECD7	HP 6890 Series GC ECD/ECD	J&W5

*The columns were changed to RTX-CLPEST1 and RTX-CLPEST2.

Preparation/Analytical Method Verification

Procedures for preparation, analysis, and reporting of analytical data are documented by General Engineering Laboratories, Inc. (GEL) as Standard Operating Procedures (SOP).

Calibration Information

Initial Calibration

All initial calibration requirements have been met for this SDG.

CCV Requirements

All calibration verification standard(s) (CVS, ICV or CCV) requirements have not been met for this SDG.

Aroclor-1016 failed acceptance criteria with a positive bias on both analytical columns in the standards bracketing the samples in this SDG. The positive bias for the analytical data is the result of instrument response increasing after the initial calibration. The target analytes, identified positive in the samples, met the acceptance criteria in the standards bracketing the samples in this SDG. Therefore, the non-compliance has no adverse effects on the data.

Quality Control (QC) Information

Surrogate Recoveries

All the surrogate recoveries were within the established acceptance criteria for this SDG except for sample 66780021 (059795-002RE), which failed surrogate recovery due to dilution.

Blank Acceptance

The blank(s) analyzed with this SDG met the established acceptance criteria for QC samples 1200298006 (PBLK01) and 1200304225 (PBLK03). QC sample 1200297368, batch 200256, was not analyzed due to laboratory error. The entire batch, including all samples in this SDG except 66780013, was re-prepped. Both sets of data are reported in the package. The re-prepped data is reported on the Certificate of Analysis and QC Summary. See NCR.

LCS Recovery Statement

The Laboratory Control Sample (LCS) spike recoveries for this SDG were within the established acceptance limits.

QC Sample Designation

The following samples were selected for the PCB method QC:

<u>Client Sample ID#</u>	<u>Laboratory Sample ID#</u>
059785-002	66780013
059784-002	66780012
059796-002	66780022

The method QC included a Matrix Spike (MS) and Matrix Spike Duplicate (MSD).

MS Recovery Statement

The matrix spike recoveries for this SDG were within the established acceptance limits.

MSD Recovery Statement

The matrix spike duplicate recoveries for this SDG were within the established acceptance limits.

MS/MSD RPD Statement

The relative percent differences (RPD) between each MS and MSD were within the required acceptance limits.

Technical Information

Holding Time Specifications

GEL assigns holding times based on the associated methodology which assigns the date and time from sample collection or sample receipt. Those holding times expressed in hours are calculated in the AlphaLIMS system. Those holding times expressed as days expire at midnight on the day of expiration. All samples, except 66780013, were re-prepped out of holding.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

The following sample was diluted due to matrix viscosity:

Sample ID	Dilutions
66780021	5X

Sample Re-prep/Re-analysis

All samples in batch 200256 were re-prepped due to method blank, in the original batch, not being delivered with the samples. See NCR.

Miscellaneous Information

Nonconformance (NCR) Documentation

The following nonconformance report (NCRs) has been generated for this SDG: NCR#5094

Manual Integrations

No manual integrations were required for any data file in this SDG. Certain standards and QC samples may have required manual integrations to correctly position the baseline as set in the calibration standard injections. If manual integrations were performed, copies of all manual integration peak profiles are included in the raw data section of this PCB fraction.

Additional Comments

The additional comments field is used to address special issues associated with each analysis, clarify method/contractual issues pertaining to the analysis and to list any report documents generated as a result of sample analysis or review. The following additional comments were required for this sample set:

Aroclors quantitated on the raw data report by the Target data system do not necessarily represent a positive aroclor identification. In order for positive identification to be made, the aroclor must match in pattern and retention time; as well as quantitate relatively close between the primary and confirmation columns, as specified in SW846 method 8000. When these conditions are not met, the aroclor is reported as a non-detect on the data report. These situations will be noted on the raw data as DMP, representing "does not match pattern", or DNC "does not confirm".

Form Xs are included in this package for both original extracted samples and re-extracted samples to summarize the positive analytes in the samples and %D between two columns. It shows that the result is inconsistent between two extractions. This is probably due to non-homogeneous matrix.

Certification Statement

* Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Review Validation:

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

The following data validator verified the information presented in this case narrative:

Reviewer: Jimin Cao Date: 10/4/02

GC/ECD
PCB
QUALITY CONTROL
SUMMARY

QC Summary

Client : Sandia National Laboratories
 MS-0756
 P.O. Box 5800
 Albuquerque, New Mexico

Contact: Pamela M. Puissant

Workorder: 66780

Report Date: October 4, 2002
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Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-PCB											
Batch	200519										
QC1200298007	LCS										
Aroclor-1260	33.3										
**4cmx	6.67			29.5	ug/kg		89	(48%-116%)	MM	09/13/02	12:11
**Decachlorobiphenyl	6.67			5.75	ug/kg		86	(31%-120%)			
QC1200298006	MB			6.13	ug/kg		92	(34%-115%)			
Aroclor-1016				U	ND						
Aroclor-1221				U	ND					09/13/02	12:00
Aroclor-1232				U	ND						
Aroclor-1242				U	ND						
Aroclor-1248				U	ND						
Aroclor-1254				U	ND						
Aroclor-1260				U	ND						
**4cmx	6.67			5.81	ug/kg						
**Decachlorobiphenyl	6.67			6.11	ug/kg		87	(31%-120%)			
QC1200298008	66780013	MS					92	(34%-115%)			
Aroclor-1260	33.3			30.3	ug/kg		91	(36%-134%)		09/13/02	12:36
**4cmx	6.67			5.78	ug/kg		87	(31%-120%)			
**Decachlorobiphenyl	6.67			6.16	ug/kg		92	(34%-115%)			
QC1200298009	66780013	MSD									
Aroclor-1260	33.3			30.6	ug/kg	1	92	(0%-30%)		09/13/02	12:47
**4cmx	6.67			5.81	ug/kg		87	(31%-120%)			
**Decachlorobiphenyl	6.67			6.24	ug/kg		94	(34%-115%)			
Semi-Volatiles-PCB Federal											
Batch	203080										
QC1200304226	LCS										
Aroclor-1260	33.3			24.4	ug/kg		73	(48%-116%)	MM	09/26/02	11:18
**4cmx	6.67			4.58	ug/kg		69	(31%-120%)			
**Decachlorobiphenyl	6.67			4.62	ug/kg		69	(34%-115%)			
QC1200304225	MB										
Aroclor-1016				U	ND						
Aroclor-1221				U	ND					09/26/02	11:06
Aroclor-1232				U	ND						
Aroclor-1242				U	ND						
Aroclor-1248				U	ND						
Aroclor-1254				U	ND						
Aroclor-1260				U	ND						
**4cmx	6.67			4.54	ug/kg						
**Decachlorobiphenyl	6.67			4.55	ug/kg		68	(31%-120%)			
QC1200304227	66780022	MS					68	(34%-115%)			
Aroclor-1260	33.3	HJ	5.10	H	23.2	ug/kg	60	(36%-134%)		09/25/02	20:04
**4cmx	6.67	H		HU	ND	ug/kg	49	(31%-120%)			
**Decachlorobiphenyl	6.67	H		H	3.36	ug/kg	50	(34%-115%)			
QC1200304228	66780022	MSD									

QC Summary

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Paramname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-PCB Federal											
Batch 203080											
Aroclor-1260	33.3	HJ	5.10	H	25.9	ug/kg	3	62	(0%-30%)		
**4cmx	6.67	H		HU	ND	ug/kg		57	(31%-120%)		
**Decachlorobiphenyl	6.67	H		H	4.05	ug/kg		61	(34%-115%)		

Notes:

RER is calculated at the 95% confidence level (2-sigma).

The Qualifiers in this report are defined as follows:

- * Recovery or %RPD not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where t
- ** Indicates analyte is a surrogate compound.
- B The analyte was found in the blank above the effective MDL.
- H Holding time was exceeded
- J Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL
- P The response between the confirmation column and the primary column is >40%D
- U The analyte was analyzed for but not detected below this concentration. For Organic and Inorganic analytes the result is less than the effective MDL. I
- X Presumptive evidence that the analyte is not present. Please see narrative for further information
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Uncertain identification for gamma spectroscopy.

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

INORGANIC ANALYSIS

**Inorganic Case Narrative for
Sandia National Laboratory
SDG# 66780**

Sample Analysis:

The following samples were prepared and analyzed using the methods referenced in the "Method/Analysis Information" section of this narrative:

Sample ID	Client ID
66780012	059784-002
66780013	059785-002
66780014	059787-001
66780015	059788-002
66780016	059789-002
66780017	059790-002
66780018	059791-002
66780019	059793-002
66780020	059794-002
66780021	059795-002
66780022	059796-002
1200300057	Method Blank (MB) ICP-201371/201368
1200300061	Laboratory Control Sample (LCS)
1200297505	Method Blank (MB) CVAA-200317/200316
1200297508	Laboratory Control Sample (LCS)
1200297506	059784-002D (66780012) Sample Duplicate (DUP)
1200297507	059784-002S (66780012) Matrix Spike (MS)

Method/Analysis Information:

Analytical Batch #:	201371, 200317
Prep Batch #:	201368, 200316
Standard Operating Procedure:	GL-MA-E-013 REV.6; GL-MA-E-010 REV.10
Analytical Method:	SW846 6010B; SW846 7471A
Prep Method:	SW846 3050B; SW846 7471A

System Configuration

The ICP analysis was performed on a Thermo Jarrell Ash 61E Trace axial-viewing inductively coupled plasma atomic emission spectrometer. The instrument is equipped with a Meinhardt nebulizer, cyclonic spray chamber, and yttrium internal standard. Operating conditions for the Trace ICP are set at a power level of 950 watts. The instrument has a peristaltic pump flow rate of 140 RPM (2.0 mL/min sample uptake rate), argon gas flows of 15 L/min and 0.5 L/min for the torch and auxiliary gases, and a pressure setting of 26 PSI for the nebulizer.

Mercury analysis was performed on a Perkin-Elmer Flow Injection Mercury System (FIMS-400) automated mercury analyzer. The instrument consists of a cold vapor atomic absorption spectrometer set to detect mercury at a wavelength of 254 nm. Sample introduction through the flow injection system is performed via a peristaltic pump at 9 mL/min and nitrogen carrier gas rate of 5 L/min.

Sample Preparation

All samples were prepared in accordance with the referenced SW-846 procedures.

Calibration Information:

Initial Calibration

Instrument calibrations are conducted using method and instrument manufacturer's specifications. All initial calibration requirements have been met for this analysis.

CRDL Requirements

All CRDL standards met the referenced advisory control limits.

Continuing Calibration (CCV) Requirements

All CCV standards bracketing this SDG met the established recovery acceptance criteria.

Continuing Calibration Blanks (CCB) Requirements

All continuing calibration blanks (CCB) bracketing this SDG met the established acceptance criteria.

ICSA/ICSAB Requirements

All interference check standard (ICSA and ICSAB) elements associated with this SDG met the established acceptance criteria.

Quality Control (QC) Information:

Method Blank Acceptance

The preparation blanks analyzed with this SDG did not contain analytes of interest at concentrations greater than the required detection limits (RDL).

LCS Recovery Statement

All LCS spike recoveries for this SDG were within the established acceptance limits.

QC Sample Designation

Sample 059717-001(66765001) from SNLS SDG 66765 was designated as the quality control sample for the ICP batch. Sample 059784-002 (66780012) was designated as the quality control sample for the CVAA batch. Each batch included a sample duplicate (DUP) and a matrix spike (MS). The ICP batch included a serial dilution (SD).

MS Recovery Statement

The percent recoveries (%R) obtained from the MS analyses are evaluated when the sample concentration is less than four times (4X) the spike concentration added. All qualifying elements met the established acceptance limits for percent recovery except barium, as indicated by the "*" qualifier on the QC summary.

RPD Statement

The relative percent difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria of 20% when the sample is greater than five times (5X) the contract required detection limit (RDL). In cases where either the sample or duplicate value is less than 5X the RDL, a control limit of +/- the RDL is used to evaluate the DUP results. All applicable elements met the DUP acceptance criteria.

Serial Dilution % Difference Statement

The serial dilution is used to assess interference caused by matrix suppression or enhancement. Raw

element concentrations that are at least 50X the MDL for ICP analyses are applicable for serial dilution assessment. All applicable analytes met the acceptance criteria.

Technical Information:

Holding Time Specifications

All samples were analyzed within the specified holding times.

Sample Dilutions

Dilutions are performed to minimize matrix interference resulting from elevated mineral element concentrations and/or to bring over range target analyte concentrations into the linear calibration range of the instruments. The samples were diluted the standard 2x for soils on the ICP. No dilutions were required for the CVAA analysis.

Miscellaneous Information:

NCR Documentation

Nonconformance reports are generated to document procedural anomalies that may deviate from referenced SOP or contractual documents. No NCR's were issued for this SDG.

Additional Comments

The additional comments field is used to address special issues associated with each analysis, clarify method/contractual issues pertaining to the analysis and to list any report documents generated as a result of sample analysis or review. Additional comments were not required for this SDG.

Review/Validation:

GEL requires all analytical data to be verified by a qualified data validator.

The following data validator verified the data presented in this SDG:

Reviewer: Allison G.

Date: 10/7/12

INORGANICS
QUALITY
CONTROL
SUMMARY

QC Summary

Report Date: October 7, 2002

Page 1 of 2

Client: Sandia National Laboratories
 MS-0756
 P.O. Box 5800
 Albuquerque, New Mexico

Contact: Pamela M. Pulsant

Workorder: 66780

Partname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Metals Analysis-ICP Federal											
Batch 201371											
QC1200300058 66765001 DUP											
Arsenic		8.10		8.26	mg/kg	2		(0%-20%)	HSC	10/03/02	03:47
Barium		9.07		9.03	mg/kg	0		(0%-20%)			
Cadmium		0.597		0.589	mg/kg	1	^	(+/-0.467)			
Chromium		110		113	mg/kg	3		(0%-20%)			
Lead	J	0.481		0.533	mg/kg	10	^	(+/-0.467)			
Selenium	U	ND	U	ND	mg/kg	N/A		(+/-0.467)			
Silver	U	ND	U	ND	mg/kg	N/A		(+/-0.467)			
QC1200300061 LCS											
Arsenic	192			198	mg/kg		103	(79%-121%)		10/03/02	03:29
Barium	417			455	mg/kg		109	(80%-120%)			
Cadmium	125			131	mg/kg		105	(81%-119%)			
Chromium	133			143	mg/kg		108	(77%-123%)			
Lead	160			167	mg/kg		104	(78%-123%)			
Selenium	97.0			101	mg/kg		104	(72%-128%)			
Silver	115			126	mg/kg		110	(55%-145%)			
QC1200300057 MB											
Arsenic			U	ND	mg/kg					10/03/02	03:23
Barium			U	ND	mg/kg						
Cadmium			U	ND	mg/kg						
Chromium			U	ND	mg/kg						
Lead			U	ND	mg/kg						
Selenium			U	ND	mg/kg						
Silver			U	ND	mg/kg						
QC1200300060 66765001 MS											
Arsenic	23.6	8.10		31.2	mg/kg		98	(75%-125%)		10/03/02	03:53
Barium	23.6	9.07		39.0	mg/kg		127*	(75%-125%)			
Cadmium	23.6	0.597		21.8	mg/kg		90	(75%-125%)			
Chromium	23.6	110		137	mg/kg		N/A	(75%-125%)			
Lead	23.6	J 0.481		21.6	mg/kg		89	(75%-125%)			
Selenium	23.6	U ND		20.8	mg/kg		88	(75%-125%)			
Silver	23.6	U ND		24.5	mg/kg		104	(75%-125%)			
QC1200300059 66765001 SDILT											
Arsenic		82.7		16.6	ug/L	387				10/03/02	03:41
Barium		92.6		18.2	ug/L	1.56					
Cadmium		6.09	J	1.11	ug/L	8.89					
Chromium		1120		231	ug/L	3.36					
Lead	J	4.91	U	ND	ug/L	N/A					
Selenium	U	ND	U	ND	ug/L	N/A					
Silver	U	ND	U	ND	ug/L	N/A					

Metals Analysis-Mercury Federal
 Batch 200317

QC1200297506 66780012 DUP

QC Summary

Workorder: 66780

Page 2 of 2

Parname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Metals Analysis-Mercury Federal											
Batch 200317											
Mercury		0.0227	J	0.00621	mg/kg	N/A		(+/-0.00965) NOR1		09/30/02	10:38
QC1200297508	LCS										
Mercury	24.0			25.5	mg/kg		106	(66%-134%)		09/30/02	10:34
QC1200297505	MB										
Mercury			U	ND	mg/kg					09/30/02	10:32
QC1200297507	66780012 MS										
Mercury	0.0927	0.0227		0.105	mg/kg		89	(75%-125%)		09/30/02	10:40

Notes:

RER is calculated at the 95% confidence level (2-sigma).

The Qualifiers in this report are defined as follows:

- * Recovery or %RPD not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where it
- ** Indicates analyte is a surrogate compound.
- B The analyte was found in the blank above the effective MDL.
- H Holding time was exceeded
- J Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL
- P The response between the confirmation column and the primary column is >40%D
- U The analyte was analyzed for but not detected below this concentration. For Organic and Inorganic analytes the result is less than the effective MDL.]
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Uncertain identification for gamma spectroscopy.

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

**GENERAL
CHEMISTRY
ANALYSIS**

General Chemistry Narrative
Sandia National Labs (SNLS)
SDG 66780

Method/Analysis Information

Procedure:	Hexavalent Chromium
Analytical Method:	SW846 7196A
Prep Method:	SW846 3060A
Analytical Batch Number:	200893
Prep Batch Number:	200892

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 7196A:

Sample ID	Client ID
66780012	059784-002
66780013	059785-002
66780014	059787-001
66780015	059788-002
1200298925	MB for batch 200893
1200298926	DUP of 66454009
1200298927	DUP of 66610011
1200298928	MS of 66454009
1200298929	MS of 66610011
1200298930	LCS for batch 200893

SOP Reference

Procedure(s) for preparation, analysis and reporting of analytical data are controlled by General Engineering Laboratories, Inc. as Standard Operating Procedure(s) (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-044 REV.4.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by General Engineering Laboratories, Inc. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information:

The instrument used in this analysis was the following: Milton Roy Spectrophotometer 200

Initial Calibration

The instrument was properly calibrated.

Calibration Verification Information

All calibration verification standards were within the required limits.

Quality Control (QC) Information:

Blank Acceptance

The method and calibration blanks associated with this data were within the required acceptance limits.

Laboratory Control Sample Recovery

The recovery for the laboratory control sample was within the required acceptance limits.

Quality Control

The following SNLS samples were designated for Quality Control: 66454009 and 66610011.

Sample Spike Recovery

The spike recoveries for this sample set were within the required acceptance limits.

Sample Duplicate Acceptance

The Relative Percent Differences between the samples and duplicates for this SDG were within the required acceptance limits.

Technical Information:

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples from this sample group were analyzed within the required holding time for this method.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

No samples in this sample group required dilutions.

Miscellaneous Information:

Nonconformance Reports

No Nonconformance Reports (NCR) were required for any of the samples in this sample group for this analysis.

Method/Analysis Information

Procedure: **Hexavalent Chromium**
Analytical Method: SW846 7196A
Prep Method: SW846 3060A
Analytical Batch Number: 200895
Prep Batch Number: 200894

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 7196A:

Sample ID	Client ID
66780016	059789-002
66780017	059790-002
66780018	059791-002
66780019	059793-002
66780020	059794-002
66780021	059795-002
66780022	059796-002
1200298931	MB for batch 200895
1200298932	DUP of 66780016
1200298933	MS of 66780016
1200298934	LCS for batch 200895

SOP Reference

Procedure(s) for preparation, analysis and reporting of analytical data are controlled by General Engineering Laboratories, Inc. as Standard Operating Procedure(s) (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-044 REV.4.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by General Engineering Laboratories, Inc. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information:

The instrument used in this analysis was the following: Milton Roy Spectrophotometer 200

Initial Calibration

The instrument was properly calibrated.

Calibration Verification Information

All calibration verification standards were within the required limits.

Quality Control (QC) Information:

Blank Acceptance

The method and calibration blanks associated with this data were within the required acceptance limits.

Laboratory Control Sample Recovery

The recovery for the laboratory control sample was within the required acceptance limits.

Quality Control

The following sample was designated for Quality Control: 66780016.

Sample Spike Recovery

The spike recovery for this sample set was within the required acceptance limits.

Sample Duplicate Acceptance

The values for the sample and duplicate for this sample group are less than the Practical Quantitation Limit (PQL); therefore, the RPD is not applicable.

Technical Information:

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

All samples from this sample group were analyzed within the required holding time for this method.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

No samples in this sample group required dilutions.

Miscellaneous Information:

Nonconformance Reports

No Nonconformance Reports (NCR) were required for any of the samples in this sample group for this analysis.

Method/Analysis Information

Procedure: Total Cyanide
Analytical Method: SW846 9012A
Prep Method: SW846 9010B Prep
Analytical Batch Number: 201253
Prep Batch Number: 201252

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 9012A:

Sample ID	Client ID
66780012	059784-002
66780013	059785-002
66780014	059787-001
66780015	059788-002
66780016	059789-002
66780017	059790-002
66780018	059791-002
66780019	059793-002
66780020	059794-002
66780021	059795-002
66780022	059796-002
1200299791	MB for batch 201253
1200299792	DUP of 66780012
1200299793	DUP of 66780013
1200299794	MS of 66780012
1200299795	MS of 66780013

1200299796 LCS for batch 201252
1200299797 LCS for batch 201252

SOP Reference

Procedure(s) for preparation, analysis and reporting of analytical data are controlled by General Engineering Laboratories, Inc. as Standard Operating Procedure(s) (SOP). The data discussed in this narrative has been analyzed in accordance with GL-GC-E-095 Rev. 1.

Preparation/Analytical Method Verification

The SOP stated above has been prepared based on technical research and testing conducted by General Engineering Laboratories, Inc. and with guidance from the regulatory documents listed in this "Method/Analysis Information" section.

Calibration Information:

The instrument used in this analysis was the following: Lachat QuickChem FIA+

Initial Calibration

The instrument was properly calibrated.

Calibration Verification Information

All calibration verification standards were within the required limits.

Quality Control (QC) Information:

Blank Acceptance

The method and calibration blanks associated with this data were within the required acceptance limits.

Laboratory Control Sample Recovery

The recovery for the laboratory control sample was within the required acceptance limits.

Quality Control

Samples 66780012 and 66780013 were designated for Quality Control.

Sample Spike Recovery

The spike recoveries for this sample set were within the required acceptance limits.

Sample Duplicate Acceptance

The values for the samples and duplicates for this sample group are less than the Practical Quantitation Limit (PQL); therefore, the RPD is not applicable.

Technical Information:

GEL assigns holding times based on the date and time of sample collection. Those holding times expressed in hours are calculated in the AlphaLims system by hours. Those holding times expressed as days expire at midnight on the day of expiration.

Holding Times

The sample duplicate for 66780013 (1200299793) was repped and reanalyzed out of holding due to RPD failure. The sample was analyzed in the method specified hold time.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

No samples in this sample group required dilutions.

Sample Reanalysis

The following QC sample was repped and reanalyzed because of sample duplicate RPD failure in the original run: 1200299793.

Miscellaneous Information:

Nonconformance Reports

No Nonconformance Reports (NCR) were required for any of the samples in this sample group for this analysis.


Certification Statement

* Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Review Validation:

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

The following data validator verified the information presented in this case narrative:

Reviewer:  Date: 10/01/02

**GENERAL CHEMISTRY
QUALITY
CONTROL
SUMMARY**

QC Summary

Client : Sandia National Laboratories
 MS-0756
 P.O. Box 5800
 Albuquerque, New Mexico
 Contact: Pamela M. Puissant
 Workorder: 66780

Report Date: September 30, 2002
 Page 1 of 2

Paramname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rapid Flow Analysis Federal											
Batch 201253											
QC1200299792	66780012	DUP									
Cyanide, Total		BJ	0.0848	BU	ND	mg/kg	N/A ^	(+/-0.250)	ADF	09/17/02	13:33
QC1200299793	66780013	DUP									
Cyanide, Total		BJ	0.0509	BHU	ND	mg/kg	N/A ^	(+/-0.250)		09/18/02	14:15
QC1200299796	LCS										
Cyanide, Total	2.50			B	2.51	mg/kg		100	(81%-125%)	09/17/02	13:27
QC1200299797	LCS										
Cyanide, Total	277			B	294	mg/kg		106	(81%-125%)	09/17/02	13:32
QC1200299791	MB										
Cyanide, Total				J	0.129	mg/kg				09/17/02	13:26
QC1200299794	66780012	MS									
Cyanide, Total	5.56	BJ	0.0848	B	6.46	mg/kg		115	(55%-145%)	09/17/02	13:34
QC1200299795	66780013	MS									
Cyanide, Total	4.55	BJ	0.0509	B	5.22	mg/kg		114	(55%-145%)	09/17/02	13:36
Spectrometric Analysis Federal											
Batch 200893											
QC1200298926	66454009	DUP									
Hexavalent Chromium			0.454		0.412	mg/kg	10 ^	(+/-0.0959)	BEP2	09/21/02	07:00
QC1200298927	66610011	DUP									
Hexavalent Chromium		J	0.0704	J	0.0593	mg/kg	N/A ^	(+/-0.0988)			
QC1200298930	LCS										
Hexavalent Chromium	0.971				0.932	mg/kg		96	(72%-121%)		
QC1200298925	MB										
Hexavalent Chromium				U	ND	mg/kg					
QC1200298928	66454009	MS									
Hexavalent Chromium	1.01		0.454		1.54	mg/kg		108	(49%-130%)		
QC1200298929	66610011	MS									
Hexavalent Chromium	0.998	J	0.0704		0.928	mg/kg		86	(49%-130%)		
Batch 200895											
QC1200298932	66780016	DUP									
Hexavalent Chromium		U	ND	U	ND	mg/kg	N/A	(+/-0.0983)	BEP2	09/18/02	11:00
QC1200298934	LCS										
Hexavalent Chromium	1.01				0.985	mg/kg		98	(72%-121%)		
QC1200298931	MB										
Hexavalent Chromium				U	ND	mg/kg					
QC1200298933	66780016	MS									
Hexavalent Chromium	0.988	U	ND		0.800	mg/kg		77	(49%-130%)		

Notes:

RER is calculated at the 95% confidence level (2-sigma).

The Qualifiers in this report are defined as follows:

- * Recovery or %RPD not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where it
- ** Indicates analyte is a surrogate compound.
- B The analyte was found in the blank above the effective MDL.

QC Summary

Workorder: 66780

Page 2 of 2

<u>Parmname</u>	<u>NOM</u>	<u>Sample Qual</u>	<u>QC</u>	<u>Units</u>	<u>RPD%</u>	<u>REC%</u>	<u>Range</u>	<u>Anlst</u>	<u>Date</u>	<u>Time</u>
H	Holding time was exceeded									
J	Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL									
P	The response between the confirmation column and the primary column is >40%D									
U	The analyte was analyzed for but not detected below this concentration. For Organic and Inorganic analytes the result is less than the effective MDL.]									
X	Presumptive evidence that the analyte is not present. Please see narrative for further information.									
X	Presumptive evidence that the analyte is not present. Please see narrative for further information.									
X	Uncertain identification for gamma spectroscopy.									

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

RADIOLOGICAL ANALYSIS

**Radiochemistry Case Narrative
Sandia National Labs (SNLS)
Workorder 66780**

Method/Analysis Information

Batch Number: 201305
Procedure: Determination of Gross Alpha And Gross Non-Volatile Beta in Water
Analytical Method: EPA 900.0

Sample ID	Client ID
66780012	059784-002
66780013	059785-002
66780014	059787-001
66780015	059788-002
66780016	059789-002
66780017	059790-002
66780018	059791-002
66780019	059793-002
66780020	059794-002
66780021	059795-002
66780022	059796-002
1200299949	MB for batch 201305
1200299950	059784-002(66780012DUP)
1200299951	059784-002(66780012MS)
1200299953	LCS for batch 201305

SOP Reference

Procedure(s) for preparation, analysis and reporting of analytical data are controlled by General Engineering Laboratories, Inc. as Standard Operating Procedure(s) (SOP). The data discussed in this narrative has been analyzed in accordance with GL-RAD-A-001 REV.6.

Calibration Information:

Calibration Information

All initial and continuing calibration requirements have been met. The initial calibration was performed on June 13, 2002.

Standards Information

Standard solution(s) for these analyses are NIST traceable and used before the expiration date(s).

Sample Geometry

All counting sources were prepared in the same geometry as the calibration standards.

Quality Control (QC) Information:

Blank Information

The blank volume is representative of the sample volume(s) in this batch.

Designated QC

The following sample(s) was used for QC: 66780012.

QC Information

All of the QC samples met the required acceptance limits.

Technical Information:

Holding Time

All sample procedures for this sample set were performed within the required holding time.

Preparation Information

All preparation criteria have been met for these analyses.

Sample Re-prep/Re-analysis

None of the samples in this sample set required reprep or reanalysis.

Gross Alpha/Beta Preparation Information

High hygroscopic salt content in evaporated samples can cause the sample mass to fluctuate due to moisture absorption. To minimize this interference, the salts are converted to oxides by heating the sample under a flame until a dull red color is obtained. The conversion to oxides stabilizes the sample weight and ensures that proper alpha/beta efficiencies are assigned for each sample. Volatile radioisotopes of carbon, hydrogen, technetium, polonium and cesium may be lost during sample heating, especially to a dull red heat. For this sample set, the prepared planchet was counted for beta activity before being flamed. After flaming, the planchet was counted for alpha activity. This sequence causes the alpha count run data to record over the beta count run data in AlphaLims, therefore only the alpha count data will appear on the instrument runlog.

Miscellaneous Information:

NCR Documentation

No NCR were generated for the preparation or analysis of this sample set.

Qualifier information

Manual qualifiers were not required.

Certification Statement

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted in the analytical case narrative.

Review Validation:

GEL requires all analytical data to be verified by a qualified data validator. In addition, all data designated for CLP or CLP-like packaging will receive a third level validation upon completion of the data package.

The following data validator verified the information presented in this case narrative:

Reviewer: M. Mrome Date: 27 Sept 2012

**RADIOCHEMISTRY
QUALITY
CONTROL
SUMMARY**



GENERAL ENGINEERING LABORATORIES
Meeting today's needs with a vision for tomorrow.

QC Summary

Client: Sandia National Laboratories
 MS-9756
 P.O. Box 5800
 Albuquerque, New Mexico
 Contact: Pamela M. Paissant
 Workorder: 66780

Report Date: September 26, 2002
 Page 1 of 2

Parameter	NOM	Sample	Qual	QC	Units	RER	REC%	Range	Asht	Date	Time
Gravimetric Solids											
Batch	200253										
QC1200297367	66765001	DUP									
Moisture		1.12		0.907	percent	21		(0%-24%)	MLA	09/11/02	13:44
Batch	200644										
QC1200298308	66780013	DUP									
Moisture		2.31		2.59	percent	11		(0%-24%)	MLA	09/12/02	15:22
QC1200298739	66780013	DUP									
Moisture		2.31		0.866	percent	91*		(0%-24%)			
Rad. Gas Flow											
Batch	201305										
QC1200299950	66780012	DUP									
Alpha		12.3		11.3	pCi/g	0.217		(0%-20%)	OB1	09/21/02	22:05
		Uncert:	+/-1.66	+/-1.61							
		TPU:	1.99	2.73							
Beta		20.8		18.9	pCi/g	0.459		(0%-20%)			
		Uncert:	+/-1.94	+/-1.92							
		TPU:	2.14	2.08							
QC1200299953	LCS										
Alpha		9.89		11.4	pCi/g		115	(75%-125%)		09/23/02	09:04
		Uncert:		+/-1.68							
		TPU:		1.87							
Beta		39.7		45.6	pCi/g		115	(75%-125%)			
		Uncert:		+/-2.68							
		TPU:		5.19							
QC1200299949	MB										
Alpha		U		-0.0031	pCi/g					09/21/02	22:05
		Uncert:		+/-0.0596							
		TPU:		0.0596							
Beta		U		0.170	pCi/g						
		Uncert:		+/-0.333							
		TPU:		0.333							
QC1200299951	66780012	MS									
Alpha		90.7	12.3	110	pCi/g		108	(75%-125%)		09/23/02	09:04
		Uncert:	+/-1.66	+/-18.5							
		TPU:	1.99	20.3							
Beta		365	20.8	373	pCi/g		97	(75%-125%)			
		Uncert:	+/-1.94	+/-23.3							
		TPU:	2.14	29.0							

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GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

QC Summary

Workorder: 66780

Page 2 of 2

Paramname	NOM	Sample Qual	QC	Units	RER	REC%	Range	Asst	Date	Time
-----------	-----	-------------	----	-------	-----	------	-------	------	------	------

Notes:

The Qualifiers in this report are defined as follows:

- * Recovery or %RPD not within acceptance limits and/or spike amount not compatible with the sample or the duplicate RPD's are not applicable where the concentration falls below the effective PQL.
- ** Indicates analyte is a surrogate compound.
- B The analyte was found in the blank above the effective MDL.
- E Holding time was exceeded.
- J Estimated value, the analyte concentration fell above the effective MDL and below the effective PQL.
- P The response between the confirmation column and the primary column is >40% D
- U The analyte was analyzed for but not detected below this concentration. For Organic and Inorganic analytes the result is less than the effective MDL. For radiochemical analytes the result is less than the Decision Level.
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Presumptive evidence that the analyte is not present. Please see narrative for further information.
- X Uncertain identification for gamma spectroscopy.

N/A indicates that spike recovery limits do not apply when sample concentration exceeds spike conc. by a factor of 4 or more.

^ The Relative Percent Difference (RPD) obtained from the sample duplicate (DUP) is evaluated against the acceptance criteria when the sample is greater than five times (5X) the contract required detection limit (RL). In cases where either the sample or duplicate value is less than 5X the RL, a control limit of +/- the RL is used to evaluate the DUP result.

For PS, PSD, and SDILT results, the values listed are the measured amounts, not final concentrations.

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless qualified on the QC Summary.

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COC

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/11/02 4:25:38 PM *

* Analyzed by: *h 9/11/02* Reviewed by: *[Signature] 9/12/02*

Customer : SANDERS, M (6135)
 Customer Sample ID : 059775-003
 Lab Sample ID : 20124801

 Sample Description : 6650/1081-SP1-BH1-10-S
 Sample Quantity : 828.070 gram
 Sample Date/Time : 8/29/02 9:20:00 AM
 Acquire Start Date/Time : 9/09/02 1:17:02 PM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.90E-001
RA-226	1.43E+000	4.50E-001	6.07E-001
PB-214	5.59E-001	8.54E-002	5.32E-002
BI-214	4.78E-001	7.89E-002	4.32E-002
PB-210	Not Detected	-----	2.27E+001
TH-232	5.61E-001	2.74E-001	1.75E-001
RA-228	7.30E-001	1.32E-001	1.03E-001
AC-228	6.68E-001	1.26E-001	7.97E-002
TH-228	7.04E-001	3.77E-001	5.63E-001
RA-224	8.55E-001	1.86E-001	6.33E-002
PB-212	6.76E-001	9.87E-002	3.34E-002
BI-212	6.23E-001	2.42E-001	3.27E-001
TL-208	6.14E-001	1.02E-001	6.72E-002
U-235	Not Detected	-----	1.88E-001
TH-231	Not Detected	-----	9.18E+000
PA-231	Not Detected	-----	1.14E+000
TH-227	Not Detected	-----	2.90E-001
RA-223	Not Detected	-----	2.78E-001
RN-219	Not Detected	-----	2.94E-001
PB-211	Not Detected	-----	6.45E-001
TL-207	Not Detected	-----	1.04E+001
AM-241	Not Detected	-----	3.50E-001
PU-239	Not Detected	-----	3.49E+002
NP-237	Not Detected	-----	1.84E+000
PA-233	Not Detected	-----	4.41E-002
TH-229	Not Detected	-----	2.02E-001

[Summary Report] - Sample ID: : 20124801

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	2.88E-002
AG-110m	Not Detected	-----	2.20E-002
BA-133	Not Detected	-----	3.95E-002
BE-7	Not Detected	-----	2.16E-001
CD-115	Not Detected	-----	1.67E+000
CE-139	Not Detected	-----	2.43E-002
CE-141	Not Detected	-----	5.24E-002
CE-144	Not Detected	-----	1.92E-001
CM-243	Not Detected	-----	1.41E-001
CO-56	Not Detected	-----	2.75E-002
CO-57	Not Detected	-----	2.51E-002
CO-58	Not Detected	-----	2.70E-002
CO-60	Not Detected	-----	2.87E-002
CR-51	Not Detected	-----	2.39E-001
CS-134	Not Detected	-----	3.17E-002
CS-137	Not Detected	-----	2.38E-002
EU-152	Not Detected	-----	7.37E-002
EU-154	Not Detected	-----	1.33E-001
EU-155	Not Detected	-----	1.09E-001
FE-59	Not Detected	-----	6.65E-002
GD-153	Not Detected	-----	8.33E-002
HG-203	Not Detected	-----	2.99E-002
I-131	Not Detected	-----	5.77E-002
IR-192	Not Detected	-----	2.37E-002
K-40	1.55E+001	2.09E+000	2.48E-001
MN-52	Not Detected	-----	9.00E-002
MN-54	Not Detected	-----	2.61E-002
MO-99	Not Detected	-----	3.04E+000
NA-22	Not Detected	-----	3.11E-002
NA-24	Not Detected	-----	5.81E+003
ND-147	Not Detected	-----	3.06E-001
NI-57	Not Detected	-----	6.85E+000
RU-103	Not Detected	-----	2.51E-002
RU-106	Not Detected	-----	2.24E-001
SB-122	Not Detected	-----	5.13E-001
SB-124	Not Detected	-----	2.49E-002
SB-125	Not Detected	-----	6.46E-002
SN-113	Not Detected	-----	3.14E-002
SR-85	Not Detected	-----	3.08E-002
TA-182	Not Detected	-----	1.20E-001
TA-183	Not Detected	-----	1.37E+000
TL-201	Not Detected	-----	1.66E+000
Y-88	Not Detected	-----	2.12E-002
ZN-65	Not Detected	-----	7.68E-002
ZR-95	Not Detected	-----	4.69E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/11/02 4:26:52 PM *

* Analyzed by: *h* 9/11/02 Reviewed by: *K* 9/12/02 *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059776-003
 Lab Sample ID : 20124802

 Sample Description : 6650/1081-SP1-BH1-15-S
 Sample Quantity : 881.110 gram
 Sample Date/Time : 8/29/02 10:05:00 AM
 Acquire Start Date/Time : 9/09/02 2:59:06 PM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.74E-001
RA-226	1.64E+000	4.49E-001	5.73E-001
PB-214	6.09E-001	9.02E-002	5.08E-002
BI-214	5.04E-001	8.23E-002	4.50E-002
PB-210	Not Detected	-----	2.32E+001
TH-232	6.75E-001	3.20E-001	1.76E-001
RA-228	6.22E-001	1.16E-001	9.95E-002
AC-228	6.79E-001	1.30E-001	9.17E-002
TH-228	4.99E-001	3.63E-001	5.63E-001
RA-224	7.61E-001	1.67E-001	5.88E-002
PB-212	6.44E-001	9.40E-002	3.27E-002
BI-212	5.36E-001	2.22E-001	3.05E-001
TL-208	6.00E-001	9.99E-002	6.63E-002
U-235	Not Detected	-----	1.90E-001
TH-231	Not Detected	-----	9.29E+000
PA-231	Not Detected	-----	1.10E+000
TH-227	Not Detected	-----	2.80E-001
RA-223	Not Detected	-----	2.82E-001
RN-219	Not Detected	-----	2.85E-001
PB-211	Not Detected	-----	6.51E-001
TL-207	Not Detected	-----	1.03E+001
AM-241	Not Detected	-----	3.48E-001
PU-239	Not Detected	-----	3.38E+002
NP-237	Not Detected	-----	1.86E+000
PA-233	Not Detected	-----	4.37E-002
TH-229	Not Detected	-----	1.99E-001

[Summary Report] - Sample ID: : 20124802

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	2.73E-002
AG-110m	Not Detected	-----	2.19E-002
BA-133	Not Detected	-----	3.88E-002
BE-7	Not Detected	-----	2.07E-001
CD-115	Not Detected	-----	1.71E+000
CE-139	Not Detected	-----	2.39E-002
CE-141	Not Detected	-----	5.26E-002
CE-144	Not Detected	-----	1.88E-001
CM-243	Not Detected	-----	1.34E-001
CO-56	Not Detected	-----	2.78E-002
CO-57	Not Detected	-----	2.56E-002
CO-58	Not Detected	-----	2.68E-002
CO-60	Not Detected	-----	2.94E-002
CR-51	Not Detected	-----	2.27E-001
CS-134	Not Detected	-----	3.08E-002
CS-137	Not Detected	-----	2.37E-002
EU-152	Not Detected	-----	7.53E-002
EU-154	Not Detected	-----	1.26E-001
EU-155	Not Detected	-----	1.10E-001
FE-59	Not Detected	-----	6.52E-002
GD-153	Not Detected	-----	8.32E-002
HG-203	Not Detected	-----	2.85E-002
I-131	Not Detected	-----	5.62E-002
IR-192	Not Detected	-----	2.25E-002
K-40	1.81E+001	2.41E+000	2.21E-001
MN-52	Not Detected	-----	8.37E-002
MN-54	Not Detected	-----	1.39E-002
MO-99	Not Detected	-----	2.95E+000
NA-22	Not Detected	-----	3.34E-002
NA-24	Not Detected	-----	6.53E+003
ND-147	Not Detected	-----	2.89E-001
NI-57	Not Detected	-----	7.48E+000
RU-103	Not Detected	-----	2.40E-002
RU-106	Not Detected	-----	2.12E-001
SB-122	Not Detected	-----	5.11E-001
SB-124	Not Detected	-----	2.42E-002
SB-125	Not Detected	-----	6.53E-002
SN-113	Not Detected	-----	3.02E-002
SR-85	Not Detected	-----	2.99E-002
TA-182	Not Detected	-----	1.24E-001
TA-183	Not Detected	-----	1.37E+000
TL-201	Not Detected	-----	1.67E+000
Y-88	Not Detected	-----	2.27E-002
ZN-65	Not Detected	-----	8.07E-002
ZR-95	Not Detected	-----	4.49E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/09/02 6:21:42 PM *

* Analyzed by: *[Signature]* 9/10/02 Reviewed by: *[Signature]* 9/11/02

Customer : SANDERS, M (6135)
 Customer Sample ID : 059777-003
 Lab Sample ID : 20124803

 Sample Description : 6650/1081-SP2-BH1-12-S
 Sample Quantity : 791.740 gram
 Sample Date/Time : 8/29/02 11:00:00 AM
 Acquire Start Date/Time : 9/09/02 4:41:14 PM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	6.07E-001
RA-226	1.03E+000	4.48E-001	6.55E-001
PB-214	5.90E-001	9.00E-002	5.59E-002
BI-214	4.97E-001	8.29E-002	4.79E-002
PB-210	Not Detected	-----	2.37E+001
TH-232	5.52E-001	2.73E-001	1.87E-001
RA-228	6.35E-001	1.24E-001	1.19E-001
AC-228	5.80E-001	1.19E-001	9.51E-002
TH-228	4.98E-001	3.67E-001	5.69E-001
RA-224	5.42E-001	1.34E-001	7.60E-002
PB-212	6.10E-001	8.99E-002	3.34E-002
BI-212	7.08E-001	2.34E-001	2.92E-001
TL-208	5.20E-001	9.26E-002	7.06E-002
U-235	Not Detected	-----	1.92E-001
TH-231	Not Detected	-----	9.55E+000
PA-231	Not Detected	-----	1.12E+000
TH-227	Not Detected	-----	2.90E-001
RA-223	Not Detected	-----	2.89E-001
RN-219	Not Detected	-----	3.07E-001
PB-211	Not Detected	-----	6.93E-001
TL-207	Not Detected	-----	1.09E+001
AM-241	Not Detected	-----	3.55E-001
PU-239	Not Detected	-----	3.53E+002
NP-237	Not Detected	-----	1.88E+000
PA-233	Not Detected	-----	4.77E-002
TH-229	Not Detected	-----	2.03E-001

[Summary Report] - Sample ID: : 20124803

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	3.14E-002
AG-110m	Not Detected	-----	2.36E-002
BA-133	Not Detected	-----	4.07E-002
BE-7	Not Detected	-----	2.20E-001
CD-115	Not Detected	-----	1.76E+000
CE-139	Not Detected	-----	2.50E-002
CE-141	Not Detected	-----	5.23E-002
CE-144	Not Detected	-----	2.02E-001
CM-243	Not Detected	-----	1.40E-001
CO-56	Not Detected	-----	2.92E-002
CO-57	Not Detected	-----	2.57E-002
CO-58	Not Detected	-----	2.85E-002
CO-60	Not Detected	-----	3.15E-002
CR-51	Not Detected	-----	2.45E-001
CS-134	Not Detected	-----	3.27E-002
CS-137	Not Detected	-----	2.52E-002
EU-152	Not Detected	-----	7.49E-002
EU-154	Not Detected	-----	1.45E-001
EU-155	Not Detected	-----	1.11E-001
FE-59	Not Detected	-----	6.97E-002
GD-153	Not Detected	-----	8.53E-002
HG-203	Not Detected	-----	2.95E-002
I-131	Not Detected	-----	6.02E-002
IR-192	Not Detected	-----	2.44E-002
K-40	1.86E+001	2.49E+000	2.79E-001
MN-52	Not Detected	-----	9.70E-002
MN-54	Not Detected	-----	2.84E-002
MO-99	Not Detected	-----	3.09E+000
NA-22	Not Detected	-----	3.48E-002
NA-24	Not Detected	-----	6.92E+003
ND-147	Not Detected	-----	3.05E-001
NI-57	Not Detected	-----	7.65E+000
RU-103	Not Detected	-----	2.71E-002
RU-106	Not Detected	-----	2.20E-001
SB-122	Not Detected	-----	5.86E-001
SB-124	Not Detected	-----	2.59E-002
SB-125	Not Detected	-----	6.83E-002
SN-113	Not Detected	-----	3.20E-002
SR-85	Not Detected	-----	3.26E-002
TA-182	Not Detected	-----	1.34E-001
TA-183	Not Detected	-----	1.41E+000
TL-201	Not Detected	-----	1.70E+000
Y-88	Not Detected	-----	2.11E-002
ZN-65	Not Detected	-----	8.40E-002
ZR-95	Not Detected	-----	4.52E-002

Sandia National Laboratories
 Radiation Protection Sample Diagnostics Program
 9/09/02 8:03:50 PM

* Analyzed by: *de* 9/10/02 Reviewed by: *[Signature]* 9/11/02

Customer : SANDERS, M (6135)
 Customer Sample ID : 059778-003
 Lab Sample ID : 20124804

Sample Description : 6650/1081-SP2-BH1-17-S
 Sample Quantity : 772.690 gram
 Sample Date/Time : 8/29/02 11:55:00 AM
 Acquire Start Date/Time : 9/09/02 6:23:32 PM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.72E-001
RA-226	1.44E+000	4.28E-001	5.60E-001
PB-214	4.66E-001	7.57E-002	5.52E-002
BI-214	4.36E-001	7.40E-002	4.30E-002
PB-210	Not Detected	-----	2.25E+001
TH-232	5.89E-001	2.81E-001	1.57E-001
RA-228	5.32E-001	1.09E-001	1.07E-001
AC-228	4.74E-001	1.01E-001	8.20E-002
TH-228	3.60E-001	3.65E-001	5.81E-001
RA-224	6.04E-001	1.44E-001	6.82E-002
PB-212	5.41E-001	8.07E-002	3.04E-002
BI-212	5.78E-001	1.94E-001	2.34E-001
TL-208	4.71E-001	8.62E-002	6.75E-002
U-235	Not Detected	-----	1.90E-001
TH-231	Not Detected	-----	9.08E+000
PA-231	Not Detected	-----	1.10E+000
TH-227	Not Detected	-----	2.73E-001
RA-223	Not Detected	-----	2.83E-001
RN-219	Not Detected	-----	2.82E-001
PB-211	Not Detected	-----	6.35E-001
TL-207	Not Detected	-----	1.10E+001
AM-241	Not Detected	-----	3.51E-001
PU-239	Not Detected	-----	3.35E+002
NP-237	Not Detected	-----	1.84E+000
PA-233	Not Detected	-----	4.42E-002
TH-229	Not Detected	-----	1.90E-001

[Summary Report] - Sample ID: : 20124804

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	2.83E-002
AG-110m	Not Detected	-----	2.28E-002
BA-133	Not Detected	-----	3.85E-002
BE-7	Not Detected	-----	2.05E-001
CD-115	Not Detected	-----	1.68E+000
CE-139	Not Detected	-----	2.42E-002
CE-141	Not Detected	-----	5.25E-002
CE-144	Not Detected	-----	1.91E-001
CM-243	Not Detected	-----	1.32E-001
CO-56	Not Detected	-----	2.75E-002
CO-57	Not Detected	-----	2.44E-002
CO-58	Not Detected	-----	2.78E-002
CO-60	Not Detected	-----	2.78E-002
CR-51	Not Detected	-----	2.29E-001
CS-134	Not Detected	-----	3.10E-002
CS-137	Not Detected	-----	2.35E-002
EU-152	Not Detected	-----	7.13E-002
EU-154	Not Detected	-----	1.30E-001
EU-155	Not Detected	-----	1.10E-001
FE-59	Not Detected	-----	6.51E-002
GD-153	Not Detected	-----	8.09E-002
HG-203	Not Detected	-----	2.83E-002
I-131	Not Detected	-----	5.61E-002
IR-192	Not Detected	-----	2.27E-002
K-40	1.57E+001	2.12E+000	2.44E-001
MN-52	Not Detected	-----	9.98E-002
MN-54	Not Detected	-----	2.64E-002
MO-99	Not Detected	-----	2.94E+000
NA-22	Not Detected	-----	3.27E-002
NA-24	Not Detected	-----	7.02E+003
ND-147	Not Detected	-----	2.97E-001
NI-57	Not Detected	-----	7.76E+000
RU-103	Not Detected	-----	2.74E-002
RU-106	Not Detected	-----	2.11E-001
SB-122	Not Detected	-----	5.43E-001
SB-124	Not Detected	-----	2.46E-002
SB-125	Not Detected	-----	6.39E-002
SN-113	Not Detected	-----	2.92E-002
SR-85	Not Detected	-----	3.00E-002
TA-182	Not Detected	-----	1.21E-001
TA-183	Not Detected	-----	1.40E+000
TL-201	Not Detected	-----	1.66E+000
Y-88	Not Detected	-----	1.99E-002
ZN-65	Not Detected	-----	7.81E-002
ZR-95	Not Detected	-----	4.72E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/09/02 9:45:54 PM *

* Analyzed by: *h 2/19/02* Reviewed by: *[Signature]* *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059779-003
 Lab Sample ID : 20124805

 Sample Description : 6650/1081-SP3-BH1-17-S
 Sample Quantity : 703.790 gram
 Sample Date/Time : 8/29/02 2:55:00 PM
 Acquire Start Date/Time : 9/09/02 8:05:35 PM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	6.11E-001
RA-226	1.08E+000	4.35E-001	6.22E-001
PB-214	5.14E-001	8.19E-002	5.56E-002
BI-214	4.90E-001	8.21E-002	4.50E-002
PB-210	Not Detected	-----	2.50E+001
TH-232	5.57E-001	2.75E-001	1.82E-001
RA-228	5.33E-001	1.13E-001	1.15E-001
AC-228	5.38E-001	1.10E-001	7.76E-002
TH-228	3.16E-001	3.42E-001	5.46E-001
RA-224	6.41E-001	1.57E-001	8.84E-002
PB-212	5.59E-001	8.40E-002	3.40E-002
BI-212	4.58E-001	2.26E-001	3.21E-001
TL-208	4.84E-001	8.89E-002	6.79E-002
U-235	Not Detected	-----	1.94E-001
TH-231	Not Detected	-----	9.61E+000
PA-231	Not Detected	-----	1.14E+000
TH-227	Not Detected	-----	2.90E-001
RA-223	Not Detected	-----	3.01E-001
RN-219	Not Detected	-----	3.15E-001
PB-211	Not Detected	-----	6.90E-001
TL-207	Not Detected	-----	1.08E+001
AM-241	Not Detected	-----	3.74E-001
PU-239	Not Detected	-----	3.59E+002
NP-237	Not Detected	-----	1.97E+000
PA-233	Not Detected	-----	4.71E-002
TH-229	Not Detected	-----	2.10E-001

[Summary Report] - Sample ID: : 20124805

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	2.91E-002
AG-110m	Not Detected	-----	2.38E-002
BA-133	Not Detected	-----	4.16E-002
BE-7	Not Detected	-----	2.25E-001
CD-115	Not Detected	-----	1.77E+000
CE-139	Not Detected	-----	2.55E-002
CE-141	Not Detected	-----	5.48E-002
CE-144	Not Detected	-----	1.96E-001
CM-243	Not Detected	-----	1.43E-001
CO-56	Not Detected	-----	2.85E-002
CO-57	Not Detected	-----	2.60E-002
CO-58	Not Detected	-----	2.91E-002
CO-60	Not Detected	-----	2.69E-002
CR-51	Not Detected	-----	2.52E-001
CS-134	Not Detected	-----	3.43E-002
CS-137	Not Detected	-----	2.47E-002
EU-152	Not Detected	-----	7.65E-002
EU-154	Not Detected	-----	1.34E-001
EU-155	Not Detected	-----	1.14E-001
FE-59	Not Detected	-----	6.67E-002
GD-153	Not Detected	-----	8.80E-002
HG-203	Not Detected	-----	2.99E-002
I-131	Not Detected	-----	6.08E-002
IR-192	Not Detected	-----	2.47E-002
K-40	1.50E+001	2.03E+000	2.72E-001
MN-52	Not Detected	-----	1.03E-001
MN-54	Not Detected	-----	2.91E-002
MO-99	Not Detected	-----	3.02E+000
NA-22	Not Detected	-----	3.59E-002
NA-24	Not Detected	-----	6.74E+003
ND-147	Not Detected	-----	3.10E-001
NI-57	Not Detected	-----	7.82E+000
RU-103	Not Detected	-----	2.78E-002
RU-106	Not Detected	-----	2.18E-001
SB-122	Not Detected	-----	5.61E-001
SB-124	Not Detected	-----	2.65E-002
SB-125	Not Detected	-----	6.81E-002
SN-113	Not Detected	-----	3.16E-002
SR-85	Not Detected	-----	3.32E-002
TA-182	Not Detected	-----	1.29E-001
TA-183	Not Detected	-----	1.48E+000
TL-201	Not Detected	-----	1.69E+000
Y-88	Not Detected	-----	1.89E-002
ZN-65	Not Detected	-----	8.25E-002
ZR-95	Not Detected	-----	5.04E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/09/02 11:27:58 PM *

* Analyzed by: *hr 9/10/02* Reviewed by: *[Signature]* *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059780-003
 Lab Sample ID : 20124806

 Sample Description : 6650/1081-SP3-BH1-24-S
 Sample Quantity : 901.820 gram
 Sample Date/Time : 8/29/02 3:35:00 PM
 Acquire Start Date/Time : 9/09/02 9:47:39 PM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.49E-001
RA-226	1.08E+000	3.95E-001	5.56E-001
PB-214	5.17E-001	7.93E-002	5.06E-002
BI-214	4.55E-001	7.52E-002	4.19E-002
PB-210	Not Detected	-----	2.13E+001
TH-232	5.10E-001	2.48E-001	1.56E-001
RA-228	4.39E-001	9.30E-002	1.05E-001
AC-228	4.39E-001	9.14E-002	7.09E-002
TH-228	3.67E-001	3.29E-001	5.19E-001
RA-224	4.59E-001	1.13E-001	6.09E-002
PB-212	4.82E-001	7.17E-002	2.98E-002
BI-212	5.41E-001	2.07E-001	2.76E-001
TL-208	4.51E-001	7.99E-002	5.92E-002
U-235	Not Detected	-----	1.75E-001
TH-231	Not Detected	-----	8.46E+000
PA-231	Not Detected	-----	1.04E+000
TH-227	Not Detected	-----	2.48E-001
RA-223	Not Detected	-----	2.65E-001
RN-219	Not Detected	-----	2.60E-001
PB-211	Not Detected	-----	5.95E-001
TL-207	Not Detected	-----	9.96E+000
AM-241	Not Detected	-----	3.09E-001
PU-239	Not Detected	-----	3.16E+002
NP-237	Not Detected	-----	1.66E+000
PA-233	Not Detected	-----	4.25E-002
TH-229	Not Detected	-----	1.71E-001

[Summary Report] - Sample ID: : 20124806

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	2.59E-002
AG-110m	Not Detected	-----	2.03E-002
BA-133	Not Detected	-----	3.68E-002
BE-7	Not Detected	-----	1.99E-001
CD-115	Not Detected	-----	1.53E+000
CE-139	Not Detected	-----	2.20E-002
CE-141	Not Detected	-----	4.76E-002
CE-144	Not Detected	-----	1.76E-001
CM-243	Not Detected	-----	1.27E-001
CO-56	Not Detected	-----	2.51E-002
CO-57	Not Detected	-----	2.33E-002
CO-58	Not Detected	-----	2.43E-002
CO-60	Not Detected	-----	2.62E-002
CR-51	Not Detected	-----	2.14E-001
CS-134	Not Detected	-----	2.96E-002
CS-137	Not Detected	-----	2.25E-002
EU-152	Not Detected	-----	6.83E-002
EU-154	Not Detected	-----	1.19E-001
EU-155	Not Detected	-----	1.03E-001
FE-59	Not Detected	-----	6.16E-002
GD-153	Not Detected	-----	7.40E-002
HG-203	Not Detected	-----	2.69E-002
I-131	Not Detected	-----	5.24E-002
IR-192	Not Detected	-----	2.19E-002
K-40	1.76E+001	2.36E+000	2.47E-001
MN-52	Not Detected	-----	9.13E-002
MN-54	Not Detected	-----	1.36E-002
MO-99	Not Detected	-----	2.66E+000
NA-22	Not Detected	-----	3.20E-002
NA-24	Not Detected	-----	6.17E+003
ND-147	Not Detected	-----	2.57E-001
NI-57	Not Detected	-----	6.79E+000
RU-103	Not Detected	-----	2.28E-002
RU-106	Not Detected	-----	2.06E-001
SB-122	Not Detected	-----	5.04E-001
SB-124	Not Detected	-----	2.32E-002
SB-125	Not Detected	-----	6.02E-002
SN-113	Not Detected	-----	2.75E-002
SR-85	Not Detected	-----	2.86E-002
TA-182	Not Detected	-----	1.17E-001
TA-183	Not Detected	-----	1.23E+000
TL-201	Not Detected	-----	1.50E+000
Y-88	Not Detected	-----	2.01E-002
ZN-65	Not Detected	-----	7.44E-002
ZR-95	Not Detected	-----	4.34E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/10/02 7:52:53 AM *

* Analyzed by: *h* 9/10/02 Reviewed by: *[Signature]* *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059781-003
 Lab Sample ID : 20124807

 Sample Description : 6650/1081-SP4-BH1-20-S
 Sample Quantity : 834.540 gram
 Sample Date/Time : 8/30/02 9:10:00 AM
 Acquire Start Date/Time : 9/09/02 11:29:43 PM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.89E-001
RA-226	1.82E+000	4.63E-001	5.68E-001
PB-214	5.61E-001	8.50E-002	5.11E-002
BI-214	5.11E-001	8.34E-002	4.39E-002
PB-210	Not Detected	-----	2.25E+001
TH-232	6.58E-001	3.11E-001	1.65E-001
RA-228	6.12E-001	1.16E-001	9.81E-002
AC-228	6.00E-001	1.16E-001	7.89E-002
TH-228	6.31E-001	3.69E-001	5.58E-001
RA-224	5.61E-001	1.37E-001	8.00E-002
PB-212	6.13E-001	9.01E-002	3.31E-002
BI-212	6.21E-001	2.34E-001	3.12E-001
TL-208	5.24E-001	9.13E-002	6.63E-002
U-235	8.58E-002	1.50E-001	1.92E-001
TH-231	Not Detected	-----	9.17E+000
PA-231	Not Detected	-----	1.11E+000
TH-227	Not Detected	-----	2.79E-001
RA-223	Not Detected	-----	2.68E-001
RN-219	Not Detected	-----	2.98E-001
PB-211	Not Detected	-----	6.75E-001
TL-207	Not Detected	-----	9.80E+000
AM-241	Not Detected	-----	3.40E-001
PU-239	Not Detected	-----	3.37E+002
NP-237	Not Detected	-----	1.74E+000
PA-233	Not Detected	-----	4.45E-002
TH-229	Not Detected	-----	1.97E-001

[Summary Report] - Sample ID: : 20124807

nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	2.66E-002
AG-110m	Not Detected	-----	2.19E-002
BA-133	Not Detected	-----	3.93E-002
BE-7	Not Detected	-----	2.17E-001
CD-115	Not Detected	-----	1.37E+000
CE-139	Not Detected	-----	2.43E-002
CE-141	Not Detected	-----	5.11E-002
CE-144	Not Detected	-----	1.91E-001
CM-243	Not Detected	-----	1.37E-001
CO-56	Not Detected	-----	2.78E-002
CO-57	Not Detected	-----	2.54E-002
CO-58	Not Detected	-----	2.60E-002
CO-60	Not Detected	-----	3.03E-002
CR-51	Not Detected	-----	2.31E-001
CS-134	Not Detected	-----	3.12E-002
CS-137	Not Detected	-----	2.37E-002
EU-152	Not Detected	-----	7.41E-002
EU-154	Not Detected	-----	1.22E-001
EU-155	Not Detected	-----	1.08E-001
FE-59	Not Detected	-----	6.52E-002
GD-153	Not Detected	-----	8.09E-002
HG-203	Not Detected	-----	2.88E-002
I-131	Not Detected	-----	5.53E-002
IR-192	Not Detected	-----	2.32E-002
K-40	1.67E+001	2.24E+000	2.39E-001
MN-52	Not Detected	-----	8.06E-002
MN-54	Not Detected	-----	2.68E-002
MO-99	Not Detected	-----	2.54E+000
NA-22	Not Detected	-----	3.08E-002
NA-24	Not Detected	-----	3.29E+003
ND-147	Not Detected	-----	2.90E-001
NI-57	Not Detected	-----	5.39E+000
RU-103	Not Detected	-----	2.53E-002
RU-106	Not Detected	-----	2.15E-001
SB-122	Not Detected	-----	4.58E-001
SB-124	Not Detected	-----	2.30E-002
SB-125	Not Detected	-----	6.48E-002
SN-113	Not Detected	-----	3.02E-002
SR-85	Not Detected	-----	3.02E-002
TA-182	Not Detected	-----	1.30E-001
TA-183	Not Detected	-----	1.23E+000
TL-201	Not Detected	-----	1.39E+000
Y-88	Not Detected	-----	2.26E-002
ZN-65	Not Detected	-----	7.94E-002
ZR-95	Not Detected	-----	4.75E-002

Sandia National Laboratories
 Radiation Protection Sample Diagnostics Program
 9/10/02 2:52:11 AM

* Analyzed by: *[Signature]* 9/10/02 Reviewed by: *[Signature]* 9/12/02

Customer : SANDERS, M (6135)
 Customer Sample ID : 059782-003
 Lab Sample ID : 20124808

Sample Description : 6650/1081-SP4-BH1-25-S
 Sample Quantity : 679.100 gram
 Sample Date/Time : 8/30/02 9:55:00 AM
 Acquire Start Date/Time : 9/10/02 1:11:56 AM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	6.52E-001
RA-226	1.07E+000	4.69E-001	6.84E-001
PB-214	5.30E-001	8.58E-002	6.16E-002
BI-214	4.84E-001	8.35E-002	5.23E-002
PB-210	Not Detected	-----	2.58E+001
TH-232	6.37E-001	3.10E-001	1.92E-001
RA-228	5.69E-001	1.19E-001	1.18E-001
AC-228	5.76E-001	1.25E-001	1.08E-001
TH-228	6.28E-001	3.99E-001	6.07E-001
RA-224	7.42E-001	1.72E-001	6.67E-002
PB-212	6.04E-001	9.04E-002	3.75E-002
BI-212	8.05E-001	2.79E-001	3.58E-001
TL-208	5.15E-001	9.31E-002	6.89E-002
U-235	Not Detected	-----	2.09E-001
TH-231	Not Detected	-----	9.80E+000
PA-231	Not Detected	-----	1.20E+000
TH-227	Not Detected	-----	3.10E-001
RA-223	Not Detected	-----	2.96E-001
RN-219	Not Detected	-----	3.18E-001
PB-211	Not Detected	-----	6.97E-001
TL-207	Not Detected	-----	1.11E+001
AM-241	Not Detected	-----	3.74E-001
PU-239	Not Detected	-----	3.70E+002
NP-237	Not Detected	-----	2.04E+000
PA-233	Not Detected	-----	4.99E-002
TH-229	Not Detected	-----	2.09E-001

[Summary Report] - Sample ID: : 20124808

Isotope Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	2.95E-002
AG-110m	Not Detected	-----	2.48E-002
BA-133	Not Detected	-----	4.48E-002
BE-7	Not Detected	-----	2.33E-001
CD-115	Not Detected	-----	1.58E+000
CE-139	Not Detected	-----	2.70E-002
CE-141	Not Detected	-----	5.61E-002
CE-144	Not Detected	-----	2.04E-001
CM-243	Not Detected	-----	1.49E-001
CO-56	Not Detected	-----	3.17E-002
CO-57	Not Detected	-----	2.76E-002
CO-58	Not Detected	-----	2.90E-002
CO-60	Not Detected	-----	3.46E-002
CR-51	Not Detected	-----	2.63E-001
CS-134	Not Detected	-----	3.55E-002
CS-137	Not Detected	-----	2.75E-002
EU-152	Not Detected	-----	8.08E-002
EU-154	Not Detected	-----	1.36E-001
EU-155	Not Detected	-----	1.22E-001
FE-59	Not Detected	-----	6.80E-002
GD-153	Not Detected	-----	8.60E-002
HG-203	Not Detected	-----	3.10E-002
I-131	Not Detected	-----	6.05E-002
IR-192	Not Detected	-----	2.58E-002
K-40	1.59E+001	2.16E+000	2.66E-001
MN-52	Not Detected	-----	8.73E-002
MN-54	Not Detected	-----	2.79E-002
MO-99	Not Detected	-----	2.78E+000
NA-22	Not Detected	-----	3.49E-002
NA-24	Not Detected	-----	3.96E+003
ND-147	Not Detected	-----	3.10E-001
NI-57	Not Detected	-----	5.73E+000
RU-103	Not Detected	-----	2.80E-002
RU-106	Not Detected	-----	2.44E-001
SB-122	Not Detected	-----	4.81E-001
SB-124	Not Detected	-----	2.74E-002
SB-125	Not Detected	-----	6.94E-002
SN-113	Not Detected	-----	3.20E-002
SR-85	Not Detected	-----	3.50E-002
TA-182	Not Detected	-----	1.35E-001
TA-183	Not Detected	-----	1.37E+000
TL-201	Not Detected	-----	1.58E+000
Y-88	Not Detected	-----	2.48E-002
ZN-65	Not Detected	-----	8.76E-002
ZR-95	Not Detected	-----	4.99E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/10/02 4:34:09 AM *

* Analyzed by: *[Signature]* 9/10/02 Reviewed by: *[Signature]* *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059784-003
 Lab Sample ID : 20124809
 Sample Description : 6570/1083-DW1-BH1-9-S
 Sample Quantity : 615.440 gram
 Sample Date/Time : 9/03/02 8:55:00 AM
 Acquire Start Date/Time : 9/10/02 2:53:54 AM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	7.83E-001
RA-226	Not Detected	-----	7.63E-001
PB-214	8.27E-001	1.23E-001	6.90E-002
BI-214	7.84E-001	1.24E-001	5.45E-002
PB-210	Not Detected	-----	3.08E+001
TH-232	7.86E-001	3.82E-001	2.42E-001
RA-228	8.37E-001	1.60E-001	1.43E-001
AC-228	9.47E-001	1.75E-001	1.01E-001
TH-228	5.66E-001	3.81E-001	5.83E-001
RA-224	9.90E-001	2.21E-001	7.83E-002
PB-212	8.71E-001	1.27E-001	4.17E-002
BI-212	8.19E-001	3.06E-001	4.05E-001
TL-208	7.78E-001	1.31E-001	8.51E-002
U-235	2.11E-001	1.95E-001	2.50E-001
TH-231	Not Detected	-----	1.22E+001
PA-231	Not Detected	-----	1.43E+000
TH-227	Not Detected	-----	3.81E-001
RA-223	Not Detected	-----	2.85E-001
RN-219	Not Detected	-----	3.85E-001
PB-211	Not Detected	-----	8.69E-001
TL-207	Not Detected	-----	1.30E+001
AM-241	Not Detected	-----	4.60E-001
PU-239	Not Detected	-----	4.29E+002
NP-237	Not Detected	-----	2.38E+000
PA-233	Not Detected	-----	5.86E-002
TH-229	Not Detected	-----	2.54E-001

[Summary Report] - Sample ID: . : 20124809

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	3.83E-002
AG-110m	Not Detected	-----	2.91E-002
BA-133	Not Detected	-----	5.52E-002
BE-7	Not Detected	-----	2.50E-001
CD-115	Not Detected	-----	5.64E-001
CE-139	Not Detected	-----	3.08E-002
CE-141	Not Detected	-----	6.14E-002
CE-144	Not Detected	-----	2.43E-001
CM-243	Not Detected	-----	1.80E-001
CO-56	Not Detected	-----	3.57E-002
CO-57	Not Detected	-----	3.15E-002
CO-58	Not Detected	-----	3.30E-002
CO-60	Not Detected	-----	3.35E-002
CR-51	Not Detected	-----	2.68E-001
CS-134	Not Detected	-----	4.26E-002
CS-137	Not Detected	-----	3.00E-002
EU-152	Not Detected	-----	9.29E-002
EU-154	Not Detected	-----	1.76E-001
EU-155	Not Detected	-----	1.40E-001
FE-59	Not Detected	-----	7.13E-002
GD-153	Not Detected	-----	1.02E-001
HG-203	Not Detected	-----	3.56E-002
I-131	Not Detected	-----	5.17E-002
IR-192	Not Detected	-----	2.88E-002
K-40	1.64E+001	2.24E+000	3.34E-001
MN-52	Not Detected	-----	6.34E-002
MN-54	Not Detected	-----	2.17E-002
MO-99	Not Detected	-----	1.21E+000
NA-22	Not Detected	-----	3.98E-002
NA-24	Not Detected	-----	6.00E+001
ND-147	Not Detected	-----	2.76E-001
NI-57	Not Detected	-----	1.11E+000
RU-103	Not Detected	-----	2.88E-002
RU-106	Not Detected	-----	2.81E-001
SB-122	Not Detected	-----	2.19E-001
SB-124	Not Detected	-----	3.01E-002
SB-125	Not Detected	-----	8.47E-002
SN-113	Not Detected	-----	3.83E-002
SR-85	Not Detected	-----	3.88E-002
TA-182	Not Detected	-----	1.59E-001
TA-183	Not Detected	-----	9.89E-001
TL-201	Not Detected	-----	7.94E-001
Y-88	Not Detected	-----	2.42E-002
ZN-65	Not Detected	-----	1.02E-001
ZR-95	Not Detected	-----	5.68E-002

 * Sandia National Laboratories *
 Radiation Protection Sample Diagnostics Program *
 9/10/02 6:16:08 AM *

* Analyzed by:

Reviewed by: *[Signature]*
 9/10/02

Customer : SANDERS, M (6135)
 Customer Sample ID : 059785-003
 Lab Sample ID : 20124810

Sample Description : 6570/1083-DW1-BH1-14-S
 Sample Quantity : 1002.730 gram ✓
 Sample Date/Time : 9/03/02 9:25:00 AM
 Acquire Start Date/Time : 9/10/02 4:35:53 AM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.29E-001
RA-226	9.41E-001	3.74E-001	5.38E-001
PB-214	4.89E-001	7.42E-002	4.60E-002
BI-214	4.65E-001	7.53E-002	4.03E-002
PB-210	Not Detected	-----	1.93E+001
TH-232	4.87E-001	2.48E-001	1.94E-001
RA-228	4.81E-001	9.57E-002	9.56E-002
AC-228	5.06E-001	1.01E-001	7.76E-002
TH-228	2.97E-001	3.13E-001	5.00E-001
RA-224	6.20E-001	1.39E-001	5.71E-002
PB-212	5.23E-001	7.67E-002	2.82E-002
BI-212	4.58E-001	1.77E-001	2.37E-001
TL-208	4.42E-001	7.48E-002	4.82E-002
U-235	1.28E-001	1.36E-001	1.73E-001
TH-231	Not Detected	-----	8.27E+000
PA-231	Not Detected	-----	9.78E-001
TH-227	Not Detected	-----	2.42E-001
RA-223	Not Detected	-----	1.95E-001
RN-219	Not Detected	-----	2.54E-001
PB-211	Not Detected	-----	5.85E-001
TL-207	Not Detected	-----	8.87E+000
AM-241	Not Detected	-----	3.08E-001
PU-239	Not Detected	-----	3.08E+002
NP-237	Not Detected	-----	1.63E+000
FA-233	Not Detected	-----	3.99E-002
TH-229	Not Detected	-----	1.75E-001

[Summary Report] - Sample ID: : 20124810

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	2.29E-002
AG-110m	Not Detected	-----	1.93E-002
BA-133	Not Detected	-----	3.46E-002
BE-7	Not Detected	-----	1.85E-001
CD-115	Not Detected	-----	3.73E-001
CE-139	Not Detected	-----	2.10E-002
CE-141	Not Detected	-----	4.35E-002
CE-144	Not Detected	-----	1.67E-001
CM-243	Not Detected	-----	1.26E-001
CO-56	Not Detected	-----	2.24E-002
CO-57	Not Detected	-----	2.18E-002
CO-58	Not Detected	-----	2.27E-002
CO-60	Not Detected	-----	2.53E-002
CR-51	Not Detected	-----	1.84E-001
CS-134	Not Detected	-----	2.82E-002
CS-137	Not Detected	-----	2.17E-002
EU-152	Not Detected	-----	6.43E-002
EU-154	Not Detected	-----	1.06E-001
EU-155	Not Detected	-----	9.76E-002
FE-59	Not Detected	-----	5.44E-002
GD-153	Not Detected	-----	7.19E-002
HG-203	Not Detected	-----	2.45E-002
I-131	Not Detected	-----	3.51E-002
IR-192	Not Detected	-----	1.93E-002
K-40	1.75E+001	2.33E+000	1.97E-001
MN-52	Not Detected	-----	4.73E-002
MN-54	Not Detected	-----	2.28E-002
MO-99	Not Detected	-----	8.07E-001
NA-22	Not Detected	-----	2.84E-002
NA-24	Not Detected	-----	4.59E+001
ND-147	Not Detected	-----	1.93E-001
NI-57	Not Detected	-----	8.04E-001
RU-103	Not Detected	-----	2.00E-002
RU-106	Not Detected	-----	1.83E-001
SB-122	Not Detected	-----	1.51E-001
SB-124	Not Detected	-----	2.19E-002
SB-125	Not Detected	-----	5.78E-002
SN-113	Not Detected	-----	2.63E-002
SR-85	Not Detected	-----	2.46E-002
TA-182	Not Detected	-----	1.08E-001
TA-183	Not Detected	-----	6.67E-001
TL-201	Not Detected	-----	5.30E-001
Y-88	Not Detected	-----	1.70E-002
ZN-65	Not Detected	-----	6.59E-002
ZR-95	Not Detected	-----	3.74E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/10/02 9:40:19 AM *

* Analyzed by: *fu* 9/10/02 Reviewed by: *Ratillo* *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059788-003
 Lab Sample ID : 20124812

Sample Description : 6589/6600-1031-SP1-BH1-15-S
 Sample Quantity : 761.010 gram
 Sample Date/Time : 9/05/02 10:50:00 AM
 Acquire Start Date/Time : 9/10/02 7:59:57 AM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	6.79E-001
RA-226	1.74E+000	5.11E-001	6.74E-001
PB-214	6.96E-001	1.04E-001	5.96E-002
BI-214	6.85E-001	1.08E-001	5.13E-002
PB-210	Not Detected	-----	2.59E+001
TH-232	8.72E-001	4.06E-001	1.91E-001
RA-228	7.81E-001	1.44E-001	1.24E-001
AC-228	7.94E-001	1.49E-001	9.61E-002
TH-228	1.03E+000	4.15E-001	5.83E-001
RA-224	9.21E-001	2.01E-001	7.10E-002
PB-212	7.99E-001	1.16E-001	3.65E-002
BI-212	5.83E-001	2.86E-001	4.14E-001
TL-208	6.91E-001	1.14E-001	7.36E-002
U-235	Not Detected	-----	2.05E-001
TH-231	Not Detected	-----	1.06E+001
PA-231	Not Detected	-----	1.26E+000
TH-227	Not Detected	-----	3.29E-001
RA-223	Not Detected	-----	2.22E-001
RN-219	Not Detected	-----	3.15E-001
PB-211	Not Detected	-----	7.32E-001
TL-207	Not Detected	-----	1.11E+001
AM-241	Not Detected	-----	3.85E-001
PU-239	Not Detected	-----	3.87E+002
NP-237	Not Detected	-----	2.05E+000
PA-233	Not Detected	-----	5.13E-002
TH-229	Not Detected	-----	2.24E-001

[Summary Report] - Sample ID: : 20124812

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	3.17E-002
AG-110m	Not Detected	-----	2.40E-002
BA-133	Not Detected	-----	4.55E-002
BE-7	Not Detected	-----	2.16E-001
CD-115	Not Detected	-----	2.76E-001
CE-139	Not Detected	-----	2.67E-002
CE-141	Not Detected	-----	4.92E-002
CE-144	Not Detected	-----	2.13E-001
CM-243	Not Detected	-----	1.53E-001
CO-56	Not Detected	-----	2.82E-002
CO-57	Not Detected	-----	2.74E-002
CO-58	Not Detected	-----	2.79E-002
CO-60	Not Detected	-----	2.93E-002
CR-51	Not Detected	-----	2.23E-001
CS-134	Not Detected	-----	3.65E-002
CS-137	Not Detected	-----	2.73E-002
EU-152	Not Detected	-----	8.20E-002
EU-154	Not Detected	-----	1.46E-001
EU-155	Not Detected	-----	1.21E-001
FE-59	Not Detected	-----	5.94E-002
GD-153	Not Detected	-----	9.05E-002
HG-203	Not Detected	-----	2.99E-002
I-131	Not Detected	-----	3.66E-002
IR-192	Not Detected	-----	2.45E-002
K-40	1.53E+001	2.06E+000	2.67E-001
MN-52	Not Detected	-----	4.87E-002
MN-54	Not Detected	-----	3.01E-002
MO-99	Not Detected	-----	6.43E-001
NA-22	Not Detected	-----	3.48E-002
NA-24	Not Detected	-----	6.06E+000
ND-147	Not Detected	-----	2.18E-001
NI-57	Not Detected	-----	2.78E-001
RU-103	Not Detected	-----	2.73E-002
RU-106	Not Detected	-----	2.28E-001
SB-122	Not Detected	-----	1.22E-001
SB-124	Not Detected	-----	2.49E-002
SB-125	Not Detected	-----	7.00E-002
SN-113	Not Detected	-----	3.30E-002
SR-85	Not Detected	-----	3.31E-002
TA-182	Not Detected	-----	1.36E-001
TA-183	Not Detected	-----	6.43E-001
TL-201	Not Detected	-----	4.28E-001
Y-88	Not Detected	-----	2.29E-002
ZN-65	Not Detected	-----	8.65E-002
ZR-95	Not Detected	-----	4.87E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/9/02 3:05:14 PM *

* Analyzed by: *h 9/10/02* Reviewed by: *[Signature] 9/11/02*

Customer : SANDERS, M (6135)
 Customer Sample ID : 059789-003
 Lab Sample ID : 20124813

Sample Description : 6589-6600-1031-SP1-BH1-20-S
 Sample Quantity : 694.690 gram
 Sample Date/Time : 9/5/02 11:10:00 AM
 Acquire Start Date/Time : 9/9/02 1:24:59 PM
 Detector Name : LAB01
 Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.46E-001
RA-226	1.47E+000	5.49E-001	7.71E-001
PB-214	7.73E-001	1.17E-001	6.26E-002
BI-214	6.49E-001	1.09E-001	5.62E-002
PB-210	Not Detected	-----	8.91E+000
TH-232	7.45E-001	3.44E-001	1.41E-001
RA-228	7.32E-001	1.59E-001	1.63E-001
AC-228	7.72E-001	1.59E-001	1.11E-001
TH-228	6.30E-001	2.32E-001	5.06E-001
RA-224	8.46E-001	2.10E-001	8.09E-002
PB-212	7.30E-001	1.10E-001	4.38E-002
BI-212	5.55E-001	2.80E-001	3.95E-001
TL-208	7.37E-001	1.31E-001	9.21E-002
U-235	Not Detected	-----	2.14E-001
TH-231	Not Detected	-----	6.81E+000
PA-231	Not Detected	-----	1.51E+000
TH-227	Not Detected	-----	3.33E-001
RA-223	Not Detected	-----	1.48E-001
RN-219	Not Detected	-----	4.01E-001
PB-211	Not Detected	-----	9.48E-001
TL-207	Not Detected	-----	1.59E+001
AM-241	Not Detected	-----	1.82E-001
PU-239	Not Detected	-----	3.71E+002
NP-237	Not Detected	-----	2.04E+000
PA-233	Not Detected	-----	6.21E-002
TH-229	Not Detected	-----	1.98E-001

[Summary Report] - Sample ID: : 20124813

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	4.45E-002
AG-110m	Not Detected	-----	3.29E-002
BA-133	Not Detected	-----	4.70E-002
BE-7	Not Detected	-----	2.69E-001
CD-115	Not Detected	-----	2.56E-001
CE-139	Not Detected	-----	2.69E-002
CE-141	Not Detected	-----	5.04E-002
CE-144	Not Detected	-----	2.12E-001
CM-243	Not Detected	-----	1.88E-001
CO-56	Not Detected	-----	3.60E-002
CO-57	Not Detected	-----	2.54E-002
CO-58	Not Detected	-----	3.61E-002
CO-60	Not Detected	-----	4.21E-002
CR-51	Not Detected	-----	2.67E-001
CS-134	Not Detected	-----	4.68E-002
CS-137	Not Detected	-----	3.55E-002
EU-152	Not Detected	-----	7.57E-002
EU-154	Not Detected	-----	2.06E-001
EU-155	Not Detected	-----	1.18E-001
FE-59	Not Detected	-----	8.75E-002
GD-153	Not Detected	-----	6.82E-002
HG-203	Not Detected	-----	3.62E-002
I-131	Not Detected	-----	4.13E-002
IR-192	Not Detected	-----	2.90E-002
K-40	1.57E+001	2.19E+000	3.24E-001
MN-52	Not Detected	-----	6.46E-002
MN-54	Not Detected	-----	3.92E-002
MO-99	Not Detected	-----	7.78E-001
NA-22	Not Detected	-----	5.32E-002
NA-24	Not Detected	-----	3.96E+000
ND-147	Not Detected	-----	2.62E-001
NI-57	Not Detected	-----	3.92E-001
RU-103	Not Detected	-----	3.38E-002
RU-106	Not Detected	-----	3.02E-001
SB-122	Not Detected	-----	1.25E-001
SB-124	Not Detected	-----	3.45E-002
SB-125	Not Detected	-----	8.63E-002
SN-113	Not Detected	-----	4.01E-002
SR-85	Not Detected	-----	4.09E-002
TA-182	Not Detected	-----	1.84E-001
TA-183	Not Detected	-----	2.69E-001
TL-201	Not Detected	-----	2.06E-001
Y-88	Not Detected	-----	3.38E-002
ZN-65	Not Detected	-----	1.22E-001
ZR-95	Not Detected	-----	6.74E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/9/02 4:47:42 PM *

* Analyzed by: *Am 9/10/02* Reviewed by: *[Signature] 9/11/02*

Customer : SANDERS, M (6135)
 Customer Sample ID : 059790-003
 Lab Sample ID : 20124814

Sample Description : 6589-6600-1031-SP2-BH1-10-S
 Sample Quantity : 682.150 gram
 Sample Date/Time : 9/5/02 11:40:00 AM
 Acquire Start Date/Time : 9/9/02 3:07:20 PM
 Detector Name : LAB01
 Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.45E-001
RA-226	2.03E+000	5.96E-001	7.76E-001
PB-214	7.06E-001	1.11E-001	6.78E-002
BI-214	6.56E-001	1.14E-001	7.01E-002
PB-210	Not Detected	-----	9.34E+000
TH-232	6.47E-001	3.23E-001	2.23E-001
RA-228	7.87E-001	1.64E-001	1.41E-001
AC-228	7.00E-001	1.49E-001	1.12E-001
TH-228	6.97E-001	2.44E-001	5.11E-001
RA-224	7.95E-001	2.03E-001	9.10E-002
PB-212	7.61E-001	1.14E-001	3.75E-002
BI-212	4.82E-001	2.72E-001	3.92E-001
TL-208	6.62E-001	1.23E-001	9.32E-002
U-235	Not Detected	-----	2.09E-001
TH-231	Not Detected	-----	6.96E+000
PA-231	Not Detected	-----	1.45E+000
TH-227	Not Detected	-----	3.46E-001
RA-223	Not Detected	-----	1.54E-001
RN-219	Not Detected	-----	4.13E-001
PB-211	Not Detected	-----	9.11E-001
TL-207	Not Detected	-----	1.64E+001
AM-241	Not Detected	-----	1.82E-001
PU-239	Not Detected	-----	3.70E+002
NP-237	Not Detected	-----	2.02E+000
PA-233	Not Detected	-----	6.12E-002
TH-229	Not Detected	-----	2.08E-001

[Summary Report] - Sample ID: : 20124814

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	4.40E-002
AG-110m	Not Detected	-----	3.26E-002
BA-133	Not Detected	-----	4.75E-002
BE-7	Not Detected	-----	2.76E-001
CD-115	Not Detected	-----	2.64E-001
CE-139	Not Detected	-----	2.65E-002
CE-141	Not Detected	-----	4.92E-002
CE-144	Not Detected	-----	2.11E-001
CM-243	Not Detected	-----	1.86E-001
CO-56	Not Detected	-----	3.96E-002
CO-57	Not Detected	-----	2.62E-002
CO-58	Not Detected	-----	3.62E-002
CO-60	Not Detected	-----	4.25E-002
CR-51	Not Detected	-----	2.89E-001
CS-134	Not Detected	-----	4.65E-002
CS-137	Not Detected	-----	3.55E-002
EU-152	Not Detected	-----	7.82E-002
EU-154	Not Detected	-----	2.07E-001
EU-155	Not Detected	-----	1.21E-001
FE-59	Not Detected	-----	9.45E-002
GD-153	Not Detected	-----	7.13E-002
HG-203	Not Detected	-----	3.53E-002
I-131	Not Detected	-----	4.39E-002
IR-192	Not Detected	-----	3.06E-002
K-40	1.64E+001	2.27E+000	3.27E-001
MN-52	Not Detected	-----	6.02E-002
MN-54	Not Detected	-----	4.01E-002
MO-99	Not Detected	-----	8.13E-001
NA-22	Not Detected	-----	5.16E-002
NA-24	Not Detected	-----	4.09E+000
ND-147	Not Detected	-----	3.00E-001
NI-57	Not Detected	-----	4.14E-001
RU-103	Not Detected	-----	3.44E-002
RU-106	Not Detected	-----	3.17E-001
SB-122	Not Detected	-----	1.26E-001
SB-124	Not Detected	-----	3.35E-002
SB-125	Not Detected	-----	9.16E-002
SN-113	Not Detected	-----	4.17E-002
SR-85	Not Detected	-----	4.08E-002
TA-182	Not Detected	-----	1.91E-001
TA-183	Not Detected	-----	2.71E-001
TL-201	Not Detected	-----	2.21E-001
Y-88	Not Detected	-----	3.44E-002
ZN-65	Not Detected	-----	1.29E-001
ZR-95	Not Detected	-----	6.96E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/9/02 6:30:11 PM *

* Analyzed by:

Reviewed by:

Handwritten signatures and dates: 9/10/02 and 9/11/02

Customer : SANDERS, M (6135)
 Customer Sample ID : 059791-003
 Lab Sample ID : 20124815 ✓

Sample Description : 6589-6600-1031-SP2-BH1-15-S
 Sample Quantity : 670.400 gram
 Sample Date/Time : 9/5/02 12:10:00 PM
 Acquire Start Date/Time : 9/9/02 4:49:50 PM
 Detector Name : LAB01
 Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:

U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.55E-001
RA-226	1.69E+000	5.46E-001	7.32E-001
PB-214	8.06E-001	1.24E-001	7.26E-002
BI-214	7.70E-001	1.27E-001	6.30E-002
PB-210	Not Detected	-----	9.74E+000
TH-232	7.27E-001	3.56E-001	2.24E-001
RA-228	7.88E-001	1.66E-001	1.52E-001
AC-228	7.51E-001	1.58E-001	1.18E-001
TH-228	9.14E-001	2.76E-001	5.28E-001
RA-224	8.99E-001	2.26E-001	1.10E-001
PB-212	7.66E-001	1.15E-001	4.10E-002
BI-212	7.47E-001	2.99E-001	3.89E-001
TL-208	7.59E-001	1.38E-001	1.05E-001
U-235	Not Detected	-----	2.16E-001
TH-231	Not Detected	-----	7.15E+000
PA-231	Not Detected	-----	1.55E+000
TH-227	Not Detected	-----	3.53E-001
RA-223	Not Detected	-----	1.57E-001
RN-219	Not Detected	-----	4.25E-001
PB-211	Not Detected	-----	9.74E-001
TL-207	Not Detected	-----	1.56E+001
AM-241	Not Detected	-----	1.83E-001
PU-239	Not Detected	-----	3.87E+002
NP-237	Not Detected	-----	2.00E+000
PA-233	Not Detected	-----	6.20E-002
TH-229	Not Detected	-----	2.04E-001

[Summary Report] - Sample ID: : 20124815

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	4.63E-002
AG-110m	Not Detected	-----	3.40E-002
BA-133	Not Detected	-----	5.24E-002
BE-7	Not Detected	-----	2.85E-001
CD-115	Not Detected	-----	2.76E-001
CE-139	Not Detected	-----	2.70E-002
CE-141	Not Detected	-----	5.11E-002
CE-144	Not Detected	-----	2.10E-001
CM-243	Not Detected	-----	1.97E-001
CO-56	Not Detected	-----	3.79E-002
CO-57	Not Detected	-----	2.69E-002
CO-58	Not Detected	-----	3.89E-002
CO-60	Not Detected	-----	4.20E-002
CR-51	Not Detected	-----	2.80E-001
CS-134	Not Detected	-----	4.95E-002
CS-137	Not Detected	-----	3.78E-002
EU-152	Not Detected	-----	8.01E-002
EU-154	Not Detected	-----	2.17E-001
EU-155	Not Detected	-----	1.19E-001
FE-59	Not Detected	-----	9.31E-002
GD-153	Not Detected	-----	6.87E-002
HG-203	Not Detected	-----	3.68E-002
I-131	Not Detected	-----	4.31E-002
IR-192	Not Detected	-----	3.02E-002
K-40	1.56E+001	2.18E+000	3.60E-001
MN-52	Not Detected	-----	6.65E-002
MN-54	Not Detected	-----	4.06E-002
MO-99	Not Detected	-----	7.80E-001
NA-22	Not Detected	-----	5.33E-002
NA-24	Not Detected	-----	4.54E+000
ND-147	Not Detected	-----	2.85E-001
NI-57	Not Detected	-----	4.59E-001
RU-103	Not Detected	-----	3.51E-002
RU-106	Not Detected	-----	3.31E-001
SB-122	Not Detected	-----	1.30E-001
SB-124	Not Detected	-----	3.42E-002
SB-125	Not Detected	-----	9.62E-002
SN-113	Not Detected	-----	4.42E-002
SR-85	Not Detected	-----	4.22E-002
TA-182	Not Detected	-----	1.94E-001
TA-183	Not Detected	-----	2.75E-001
TL-201	Not Detected	-----	2.28E-001
Y-88	Not Detected	-----	2.92E-002
ZN-65	Not Detected	-----	1.27E-001
ZR-95	Not Detected	-----	6.55E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/9/02 8:12:40 PM *

* Analyzed by: *by 9/10/02* Reviewed by: *[Signature]* *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059793-003
 Lab Sample ID : 20124816

 Sample Description : 6523-1086-SP1-BH1-10-S
 Sample Quantity : 691.450 gram
 Sample Date/Time : 9/6/02 9:20:00 AM
 Acquire Start Date/Time : 9/9/02 6:32:19 PM
 Detector Name : LAB01
 Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.41E-001
RA-226	1.52E+000	5.91E-001	8.42E-001
PB-214	7.89E-001	1.20E-001	6.74E-002
BI-214	6.88E-001	1.17E-001	6.95E-002
PB-210	Not Detected	-----	9.69E+000
TH-232	6.19E-001	3.17E-001	2.40E-001
RA-228	7.93E-001	1.64E-001	1.50E-001
AC-228	7.78E-001	1.59E-001	1.09E-001
TH-228	5.96E-001	2.36E-001	5.31E-001
RA-224	8.11E-001	2.02E-001	7.02E-002
PB-212	8.46E-001	1.25E-001	4.23E-002
BI-212	1.24E+000	3.96E-001	4.87E-001
TL-208	7.66E-001	1.34E-001	8.86E-002
U-235	9.12E-002	1.78E-001	2.09E-001
TH-231	Not Detected	-----	7.06E+000
PA-231	Not Detected	-----	1.57E+000
TH-227	Not Detected	-----	3.50E-001
RA-223	Not Detected	-----	1.42E-001
RN-219	Not Detected	-----	4.11E-001
PB-211	Not Detected	-----	9.48E-001
TL-207	Not Detected	-----	1.61E+001
AM-241	Not Detected	-----	1.83E-001
PU-239	Not Detected	-----	3.81E+002
NP-237	Not Detected	-----	2.02E+000
PA-233	Not Detected	-----	6.24E-002
TH-229	Not Detected	-----	1.99E-001

[Summary Report] - Sample ID: : 20124816

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	4.71E-002
AG-110m	Not Detected	-----	3.05E-002
BA-133	Not Detected	-----	5.05E-002
BE-7	Not Detected	-----	2.80E-001
CD-115	Not Detected	-----	2.14E-001
CE-139	Not Detected	-----	2.72E-002
CE-141	Not Detected	-----	4.88E-002
CE-144	Not Detected	-----	2.05E-001
CM-243	Not Detected	-----	1.87E-001
CO-56	Not Detected	-----	3.90E-002
CO-57	Not Detected	-----	2.61E-002
CO-58	Not Detected	-----	3.79E-002
CO-60	Not Detected	-----	4.59E-002
CR-51	Not Detected	-----	2.47E-001
CS-134	Not Detected	-----	4.82E-002
CS-137	Not Detected	-----	3.53E-002
EU-152	Not Detected	-----	7.79E-002
EU-154	Not Detected	-----	2.21E-001
EU-155	Not Detected	-----	1.19E-001
FE-59	Not Detected	-----	9.19E-002
GD-153	Not Detected	-----	6.77E-002
HG-203	Not Detected	-----	3.59E-002
I-131	Not Detected	-----	3.96E-002
IR-192	Not Detected	-----	2.93E-002
K-40	1.60E+001	2.22E+000	2.99E-001
MN-52	Not Detected	-----	5.72E-002
MN-54	Not Detected	-----	4.15E-002
MO-99	Not Detected	-----	6.31E-001
NA-22	Not Detected	-----	5.18E-002
NA-24	Not Detected	-----	1.71E+000
ND-147	Not Detected	-----	2.70E-001
NI-57	Not Detected	-----	2.97E-001
RU-103	Not Detected	-----	3.33E-002
RU-106	Not Detected	-----	3.01E-001
SB-122	Not Detected	-----	1.06E-001
SB-124	Not Detected	-----	3.39E-002
SB-125	Not Detected	-----	9.20E-002
SN-113	Not Detected	-----	3.91E-002
SR-85	Not Detected	-----	4.14E-002
TA-182	Not Detected	-----	1.90E-001
TA-183	Not Detected	-----	2.50E-001
TL-201	Not Detected	-----	1.90E-001
Y-88	Not Detected	-----	3.11E-002
ZN-65	Not Detected	-----	1.27E-001
ZR-95	Not Detected	-----	6.69E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/9/02 9:55:08 PM *

* Analyzed by: *[Signature]* 9/9/02 Reviewed by: *[Signature]* 9/11/02 *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059794-003
 Lab Sample ID : 20124817

Sample Description : 6523-1086-SP1-BH1-15-S
 Sample Quantity : 676.410 gram
 Sample Date/Time : 9/6/02 9:40:00 AM
 Acquire Start Date/Time : 9/9/02 8:14:48 PM
 Detector Name : LAB01
 Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.22E-001
RA-226	1.78E+000	5.83E-001	7.90E-001
PE-214	7.05E-001	1.10E-001	6.76E-002
BI-214	6.44E-001	1.11E-001	6.49E-002
PB-210	Not Detected	-----	9.63E+000
TH-232	6.63E-001	3.33E-001	2.37E-001
RA-228	6.69E-001	1.51E-001	1.53E-001
AC-228	7.78E-001	1.60E-001	1.09E-001
TH-228	8.06E-001	2.46E-001	4.56E-001
RA-224	8.44E-001	2.16E-001	1.14E-001
PB-212	7.86E-001	1.17E-001	4.21E-002
BI-212	9.32E-001	3.43E-001	4.42E-001
TL-208	6.66E-001	1.24E-001	9.62E-002
U-235	1.34E-001	1.86E-001	2.19E-001
TH-231	Not Detected	-----	6.81E+000
PA-231	Not Detected	-----	1.56E+000
TH-227	Not Detected	-----	3.44E-001
RA-223	Not Detected	-----	1.35E-001
RN-219	Not Detected	-----	4.12E-001
PB-211	Not Detected	-----	9.20E-001
TL-207	Not Detected	-----	1.66E+001
AM-241	Not Detected	-----	1.74E-001
PU-239	Not Detected	-----	3.89E+002
NP-237	Not Detected	-----	2.01E+000
PA-233	Not Detected	-----	6.09E-002
TH-229	Not Detected	-----	2.12E-001

[Summary Report] - Sample ID: : 20124817

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	4.48E-002
AG-110m	Not Detected	-----	3.42E-002
BA-133	Not Detected	-----	4.93E-002
BE-7	Not Detected	-----	2.79E-001
CD-115	Not Detected	-----	2.09E-001
CE-139	Not Detected	-----	2.63E-002
CE-141	Not Detected	-----	5.03E-002
CE-144	Not Detected	-----	2.06E-001
CM-243	Not Detected	-----	1.85E-001
CO-56	Not Detected	-----	3.81E-002
CO-57	Not Detected	-----	2.64E-002
CO-58	Not Detected	-----	3.60E-002
CO-60	Not Detected	-----	4.82E-002
CR-51	Not Detected	-----	2.52E-001
CS-134	Not Detected	-----	4.57E-002
CS-137	Not Detected	-----	3.60E-002
EU-152	Not Detected	-----	7.87E-002
EU-154	Not Detected	-----	2.11E-001
EU-155	Not Detected	-----	1.20E-001
FE-59	Not Detected	-----	9.05E-002
GD-153	Not Detected	-----	6.96E-002
HG-203	Not Detected	-----	3.47E-002
I-131	Not Detected	-----	3.95E-002
IR-192	Not Detected	-----	2.88E-002
K-40	1.63E+001	2.27E+000	3.18E-001
MN-52	Not Detected	-----	5.56E-002
MN-54	Not Detected	-----	4.04E-002
MO-99	Not Detected	-----	6.21E-001
NA-22	Not Detected	-----	4.98E-002
NA-24	Not Detected	-----	1.65E+000
ND-147	Not Detected	-----	2.83E-001
NI-57	Not Detected	-----	3.03E-001
RU-103	Not Detected	-----	3.29E-002
RU-106	Not Detected	-----	3.31E-001
SB-122	Not Detected	-----	1.06E-001
SB-124	Not Detected	-----	3.23E-002
SB-125	Not Detected	-----	8.62E-002
SN-113	Not Detected	-----	4.15E-002
SR-85	Not Detected	-----	4.02E-002
TA-182	Not Detected	-----	1.81E-001
TA-183	Not Detected	-----	2.37E-001
TL-201	Not Detected	-----	1.93E-001
Y-88	Not Detected	-----	3.71E-002
ZN-65	Not Detected	-----	1.27E-001
ZR-95	Not Detected	-----	6.62E-002

 * Sandia National Laboratories *
 Radiation Protection Sample Diagnostics Program *
 9/9/02 11:37:37 PM *

* Analyzed by: *[Signature]* 9/10/02 Reviewed by: *[Signature]* 9/11/02 *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059795-003
 Lab Sample ID : 20124818

Sample Description : 889/1102-SP1-BH1-25-S
 Sample Quantity : 776.900 gram
 Sample Date/Time : 9/6/02 1:50:00 PM
 Acquire Start Date/Time : 9/9/02 9:57:15 PM
 Detector Name : LAB01
 Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.55E-001
RA-226	1.72E+000	5.94E-001	8.24E-001
PB-214	8.45E-001	1.25E-001	6.62E-002
BI-214	7.68E-001	1.25E-001	6.09E-002
PB-210	Not Detected	-----	9.49E+000
TH-232	8.28E-001	4.01E-001	2.48E-001
RA-228	9.70E-001	1.87E-001	1.70E-001
AC-228	9.93E-001	1.87E-001	1.09E-001
TH-228	9.25E-001	2.58E-001	4.55E-001
RA-224	1.07E+000	2.46E-001	7.97E-002
PB-212	1.01E+000	1.47E-001	4.33E-002
BI-212	8.67E-001	2.87E-001	3.47E-001
TL-208	9.05E-001	1.50E-001	9.25E-002
U-235	3.51E-001	1.84E-001	2.17E-001
TH-231	Not Detected	-----	7.24E+000
PA-231	Not Detected	-----	1.50E+000
TH-227	Not Detected	-----	3.53E-001
RA-223	Not Detected	-----	1.50E-001
RN-219	Not Detected	-----	4.10E-001
PB-211	Not Detected	-----	9.29E-001
TL-207	Not Detected	-----	1.56E+001
AM-241	Not Detected	-----	1.83E-001
PU-239	Not Detected	-----	3.83E+002
NP-237	Not Detected	-----	2.05E+000
PA-233	Not Detected	-----	6.04E-002
TH-229	Not Detected	-----	2.11E-001

[Summary Report] - Sample ID: : 20124818

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	4.55E-002
AG-110m	Not Detected	-----	3.46E-002
BA-133	Not Detected	-----	5.02E-002
BE-7	Not Detected	-----	2.68E-001
CD-115	Not Detected	-----	2.14E-001
CE-139	Not Detected	-----	2.80E-002
CE-141	Not Detected	-----	4.90E-002
CE-144	Not Detected	-----	2.11E-001
CM-243	Not Detected	-----	1.85E-001
CO-56	Not Detected	-----	3.76E-002
CO-57	Not Detected	-----	2.61E-002
CO-58	Not Detected	-----	3.55E-002
CO-60	Not Detected	-----	4.10E-002
CR-51	Not Detected	-----	2.63E-001
CS-134	Not Detected	-----	4.61E-002
CS-137	Not Detected	-----	3.62E-002
EU-152	Not Detected	-----	7.79E-002
EU-154	Not Detected	-----	2.15E-001
EU-155	Not Detected	-----	1.19E-001
FE-59	Not Detected	-----	8.77E-002
GD-153	Not Detected	-----	6.82E-002
HG-203	Not Detected	-----	3.50E-002
I-131	Not Detected	-----	3.92E-002
IR-192	Not Detected	-----	3.02E-002
K-40	1.63E+001	2.25E+000	3.00E-001
MN-52	Not Detected	-----	5.61E-002
MN-54	Not Detected	-----	4.00E-002
MO-99	Not Detected	-----	6.42E-001
NA-22	Not Detected	-----	4.82E-002
NA-24	Not Detected	-----	1.49E+000
ND-147	Not Detected	-----	2.72E-001
NI-57	Not Detected	-----	2.82E-001
RU-103	Not Detected	-----	3.10E-002
RU-106	Not Detected	-----	3.06E-001
SB-122	Not Detected	-----	1.03E-001
SB-124	Not Detected	-----	3.22E-002
SB-125	Not Detected	-----	9.58E-002
SN-113	Not Detected	-----	3.85E-002
SR-85	Not Detected	-----	3.91E-002
TA-182	Not Detected	-----	1.81E-001
TA-183	Not Detected	-----	2.45E-001
TL-201	Not Detected	-----	1.85E-001
Y-88	Not Detected	-----	3.47E-002
ZN-65	Not Detected	-----	1.25E-001
ZR-95	Not Detected	-----	6.21E-002

 * Sandia National Laboratories *
 * Radiation Protection Sample Diagnostics Program *
 * 9/10/02 1:19:58 AM *

*
 * Analyzed by: *h* 9/10/02 Reviewed by: *R. Atwood* *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059796-003
 Lab Sample ID : 20124819

Sample Description : 889/1102-SP1-BH1-30-S
 Sample Quantity : 761.200 gram
 Sample Date/Time : 9/6/02 2:35:00 PM
 Acquire Start Date/Time : 9/9/02 11:39:44 PM
 Detector Name : LAB01
 Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	5.32E-001
RA-226	1.84E+000	5.32E-001	6.86E-001
PB-214	7.05E-001	1.09E-001	6.55E-002
BI-214	7.07E-001	1.15E-001	5.39E-002
PB-210	Not Detected	-----	9.13E+000
TH-232	7.97E-001	3.75E-001	1.82E-001
RA-228	8.86E-001	1.77E-001	1.64E-001
AC-228	8.15E-001	1.63E-001	1.12E-001
TH-228	7.03E-001	2.26E-001	4.43E-001
RA-224	9.33E-001	2.27E-001	1.15E-001
PB-212	8.70E-001	1.28E-001	3.90E-002
BI-212	1.11E+000	3.55E-001	4.35E-001
TL-208	8.32E-001	1.40E-001	8.83E-002
U-235	Not Detected	-----	2.06E-001
TH-231	Not Detected	-----	6.80E+000
PA-231	Not Detected	-----	1.45E+000
TH-227	Not Detected	-----	3.32E-001
RA-223	Not Detected	-----	1.39E-001
RN-219	Not Detected	-----	3.89E-001
PB-211	Not Detected	-----	8.75E-001
TL-207	Not Detected	-----	1.58E+001
AM-241	Not Detected	-----	1.82E-001
PU-239	Not Detected	-----	3.72E+002
NP-237	Not Detected	-----	1.97E+000
PA-233	Not Detected	-----	5.95E-002
TH-229	Not Detected	-----	1.98E-001

[Summary Report] - Sample ID: : 20124819

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	4.55E-002
AG-110m	Not Detected	-----	3.30E-002
BA-133	Not Detected	-----	4.58E-002
BE-7	Not Detected	-----	2.74E-001
CD-115	Not Detected	-----	2.00E-001
CE-139	Not Detected	-----	2.58E-002
CE-141	Not Detected	-----	4.83E-002
CE-144	Not Detected	-----	2.03E-001
CM-243	Not Detected	-----	1.78E-001
CO-56	Not Detected	-----	3.61E-002
CO-57	Not Detected	-----	2.63E-002
CO-58	Not Detected	-----	3.67E-002
CO-60	Not Detected	-----	3.97E-002
CR-51	Not Detected	-----	2.54E-001
CS-134	Not Detected	-----	4.41E-002
CS-137	Not Detected	-----	3.67E-002
EU-152	Not Detected	-----	7.87E-002
EU-154	Not Detected	-----	2.13E-001
EU-155	Not Detected	-----	1.18E-001
FE-59	Not Detected	-----	8.59E-002
GD-153	Not Detected	-----	6.92E-002
HG-203	Not Detected	-----	3.39E-002
I-131	Not Detected	-----	3.66E-002
IR-192	Not Detected	-----	2.84E-002
K-40	1.61E+001	2.22E+000	2.93E-001
MN-52	Not Detected	-----	5.30E-002
MN-54	Not Detected	-----	3.77E-002
MO-99	Not Detected	-----	6.66E-001
NA-22	Not Detected	-----	4.95E-002
NA-24	Not Detected	-----	1.65E+000
ND-147	Not Detected	-----	2.67E-001
NI-57	Not Detected	-----	2.85E-001
RU-103	Not Detected	-----	3.10E-002
RU-106	Not Detected	-----	3.07E-001
SB-122	Not Detected	-----	1.03E-001
SB-124	Not Detected	-----	3.09E-002
SB-125	Not Detected	-----	8.86E-002
SN-113	Not Detected	-----	4.02E-002
SR-85	Not Detected	-----	4.01E-002
TA-182	Not Detected	-----	1.82E-001
TA-183	Not Detected	-----	2.47E-001
TL-201	Not Detected	-----	1.82E-001
Y-88	Not Detected	-----	3.42E-002
ZN-65	Not Detected	-----	1.27E-001
ZR-95	Not Detected	-----	6.51E-002

 Sandia National Laboratories *
 Radiation Protection Sample Diagnostics Program *
 9/10/02 7:58:13 AM *

* Analyzed by: *[Signature]* 9/10/02 Reviewed by: *[Signature]* 9/11/02 *

Customer : SANDERS, M (6135)
 Customer Sample ID : 059858-001
 Lab Sample ID : 20124811

Sample Description : 6570/1083-DW1-BH1-9-DU
 Sample Quantity : 704.530 gram
 Sample Date/Time : 9/03/02 9:10:00 AM
 Acquire Start Date/Time : 9/10/02 6:17:52 AM
 Detector Name : LAB02
 Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
 U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	-----	6.93E-001
RA-226	2.11E+000	5.51E-001	6.87E-001
PB-214	9.65E-001	1.36E-001	5.96E-002
BI-214	8.12E-001	1.26E-001	4.87E-002
PB-210	Not Detected	-----	2.60E+001
TH-232	7.27E-001	3.43E-001	1.79E-001
RA-228	6.42E-001	1.28E-001	1.18E-001
AC-228	6.05E-001	1.25E-001	9.76E-002
TH-228	4.17E-001	3.36E-001	5.24E-001
RA-224	6.32E-001	1.54E-001	8.51E-002
PB-212	6.34E-001	9.41E-002	3.65E-002
BI-212	7.47E-001	2.61E-001	3.35E-001
TL-208	4.75E-001	9.26E-002	8.28E-002
U-235	Not Detected	-----	2.13E-001
TH-231	Not Detected	-----	1.03E+001
PA-231	Not Detected	-----	1.29E+000
TH-227	Not Detected	-----	3.13E-001
RA-223	Not Detected	-----	2.47E-001
RN-219	Not Detected	-----	3.26E-001
PB-211	Not Detected	-----	7.17E-001
TL-207	Not Detected	-----	1.11E+001
AM-241	Not Detected	-----	3.88E-001
PU-239	Not Detected	-----	3.87E+002
NP-237	Not Detected	-----	2.05E+000
PA-233	Not Detected	-----	5.15E-002
TH-229	Not Detected	-----	2.12E-001

[Summary Report] - Sample ID: : 20124811

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	-----	3.10E-002
AG-110m	Not Detected	-----	2.60E-002
BA-133	Not Detected	-----	5.06E-002
BE-7	Not Detected	-----	2.19E-001
CD-115	Not Detected	-----	4.92E-001
CE-139	Not Detected	-----	2.68E-002
CE-141	Not Detected	-----	5.29E-002
CE-144	Not Detected	-----	2.12E-001
CM-243	Not Detected	-----	1.54E-001
CO-56	Not Detected	-----	2.86E-002
CO-57	Not Detected	-----	2.84E-002
CO-58	Not Detected	-----	2.89E-002
CO-60	Not Detected	-----	3.01E-002
CR-51	Not Detected	-----	2.41E-001
CS-134	Not Detected	-----	3.98E-002
CS-137	Not Detected	-----	2.72E-002
EU-152	Not Detected	-----	8.44E-002
EU-154	Not Detected	-----	1.42E-001
EU-155	Not Detected	-----	1.25E-001
FE-59	Not Detected	-----	6.52E-002
GD-153	Not Detected	-----	9.16E-002
HG-203	Not Detected	-----	3.08E-002
I-131	Not Detected	-----	4.42E-002
IR-192	Not Detected	-----	2.52E-002
K-40	1.25E+001	1.72E+000	2.55E-001
MN-52	Not Detected	-----	5.91E-002
MN-54	Not Detected	-----	2.90E-002
MO-99	Not Detected	-----	1.09E+000
NA-22	Not Detected	-----	3.36E-002
NA-24	Not Detected	-----	5.78E+001
ND-147	Not Detected	-----	2.53E-001
NI-57	Not Detected	-----	1.08E+000
RU-103	Not Detected	-----	2.50E-002
RU-106	Not Detected	-----	2.28E-001
SB-122	Not Detected	-----	1.96E-001
SB-124	Not Detected	-----	2.63E-002
SB-125	Not Detected	-----	7.40E-002
SN-113	Not Detected	-----	3.40E-002
SR-85	Not Detected	-----	3.27E-002
TA-182	Not Detected	-----	1.45E-001
TA-183	Not Detected	-----	8.49E-001
TL-201	Not Detected	-----	6.78E-001
Y-88	Not Detected	-----	2.56E-002
ZN-65	Not Detected	-----	9.17E-002
ZR-95	Not Detected	-----	4.76E-002

 Sandia National Laboratories *
 Radiation Protection Sample Diagnostics Program *
 9/10/02 7:58:01 AM *

 * Analyzed by: *[Signature]* 9/10/02 Reviewed by: *[Signature]* *

Customer : SANDERS M (6135)
 Customer Sample ID : LAB_CONTROL_SAMPLE_USING_CG-134
 Lab Sample ID : 20124820

Sample Description : MIXED_GAMMA_STANDARD_CG-134
 Sample Quantity : 1.000 Each
 Sample Date/Time : 11/1/90 12:00:00 PM
 Acquire Start Date/Time : 9/10/02 7:47:41 AM
 Detector Name : LAB01
 Elapsed Live/Real Time : 600 / 604 seconds

Comments:

Nuclide Name	Activity (pCi/Each)	2-sigma Error	MDA (pCi/Each)
U-238	Not Detected	-----	2.57E+003
RA-226	Not Detected	-----	5.69E+003
PB-214	Not Detected	-----	6.61E+002
BI-214	Not Detected	-----	5.81E+002
PB-210	Not Detected	-----	9.56E+004
TH-232	Not Detected	-----	2.08E+003
RA-228	Not Detected	-----	2.49E+003
AC-228	Not Detected	-----	1.44E+003
TH-228	Not Detected	-----	4.90E+005
RA-224	Not Detected	-----	6.73E+003
PB-212	Not Detected	-----	3.41E+004
BI-212	Not Detected	-----	3.03E+005
TL-208	Not Detected	-----	6.40E+004
U-235	Not Detected	-----	1.39E+003
TH-231	Not Detected	-----	4.03E+004
PA-231	Not Detected	-----	1.38E+004
TH-227	Not Detected	-----	2.69E+003
RA-223	Not Detected	-----	1.00E+026
RN-219	Not Detected	-----	6.60E+003
PB-211	Not Detected	-----	1.50E+004
TL-207	Not Detected	-----	2.33E+005
AM-241	8.90E+004	1.28E+004	1.87E+003
PU-239	Not Detected	-----	2.32E+006
NP-237	Not Detected	-----	1.24E+004
PA-233	Not Detected	-----	5.98E+002
TH-229	Not Detected	-----	1.28E+003

[Summary Report] - Sample ID: : 20124820

Nuclide Name	Activity (pCi/Each)	2-sigma Error	MDA (pCi/Each)
AG-108m	Not Detected	-----	3.23E+002
AG-110m	Not Detected	-----	2.51E+008
BA-133	Not Detected	-----	9.30E+002
BE-7	Not Detected	-----	1.00E+026
CD-115	Not Detected	-----	1.00E+026
CE-139	Not Detected	-----	5.30E+011
CE-141	Not Detected	-----	1.00E+026
CE-144	Not Detected	-----	5.04E+007
CM-243	Not Detected	-----	2.17E+003
CO-56	Not Detected	-----	2.70E+019
CO-57	Not Detected	-----	1.06E+007
CO-58	Not Detected	-----	7.54E+020
CO-60	7.90E+004	1.05E+004	9.60E+002
CR-51	Not Detected	-----	1.00E+026
CS-134	Not Detected	-----	1.50E+004
CS-137	6.76E+004	8.58E+003	4.27E+002
EU-152	Not Detected	-----	9.40E+002
EU-154	Not Detected	-----	3.62E+003
EU-155	Not Detected	-----	4.30E+003
FE-59	Not Detected	-----	1.00E+026
GD-153	Not Detected	-----	1.07E+008
HG-203	Not Detected	-----	1.00E+026
I-131	Not Detected	-----	1.00E+026
IR-192	Not Detected	-----	1.25E+020
K-40	Not Detected	-----	1.57E+003
MN-52	Not Detected	-----	1.00E+026
MN-54	Not Detected	-----	4.89E+006
MO-99	Not Detected	-----	1.00E+026
NA-22	Not Detected	-----	4.20E+003
NA-24	Not Detected	-----	1.00E+026
ND-147	Not Detected	-----	1.00E+026
NI-57	Not Detected	-----	1.00E+026
RU-103	Not Detected	-----	1.00E+026
RU-106	Not Detected	-----	9.40E+006
SB-122	Not Detected	-----	1.00E+026
SB-124	Not Detected	-----	1.00E+026
SB-125	Not Detected	-----	2.30E+004
SN-113	Not Detected	-----	9.64E+013
SR-85	Not Detected	-----	1.00E+026
TA-182	Not Detected	-----	2.32E+014
TA-183	Not Detected	-----	1.00E+026
TL-201	Not Detected	-----	1.00E+026
Y-88	Not Detected	-----	2.57E+014
ZN-65	Not Detected	-----	1.75E+008
ZR-95	Not Detected	-----	1.00E+026

