9-1-2005

Justification for Class III Permit Modification September 2005, DSS Site 1084, Operable Unit 1295, Building 6505 Septic System at Technical Area III

Sandia National Laboratories/NM

This work supported by the United States Department of Energy under contract DE-AC04-94I85000.

Sandia National Laboratories

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)

Environmental Restoration Project

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 J 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 COPECs. 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
NMED Guidance for Residential Land Use		< 1	<1E-5

AOC Number	Site Name	Industrial Land-Use Scenario	
			Excess Cancer Risk
1081	Bldg 6650 Septic System	0.39	5E-6 Total
NMED Guidance for Industrial Land Use		< 1	<1E-5

[a]Maximum value exceeds NMED guidance for specified land-use scenario, therefore, incremental values are shown.

For More Information Contact

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

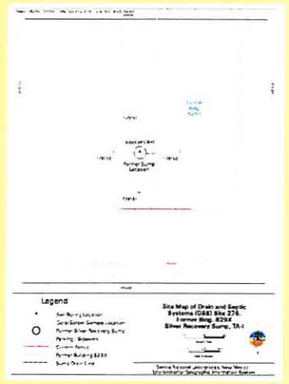
Sandia National Laboratories
Environmental Restoration Project
Task Leader: Mike Sanders
Telephone (505) 284-2478

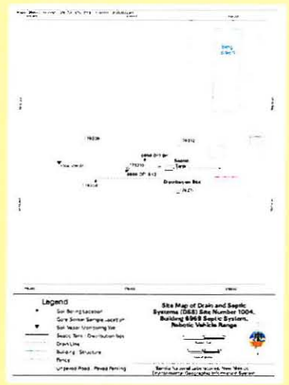
This work supported by the
United States Department of Energy
under contract DE-AC04-94185000.

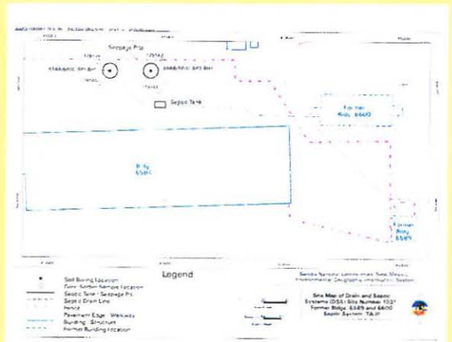
Sandia National Laboratories

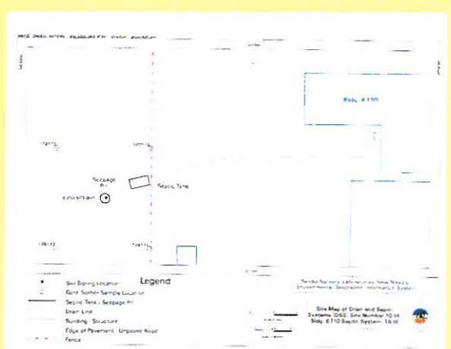
Drain and Septic Systems (DSS) Areas of Concern (AOCs)
276, 1004, 1031, 1034, 1035
1036, 1052

Environmental Restoration Project



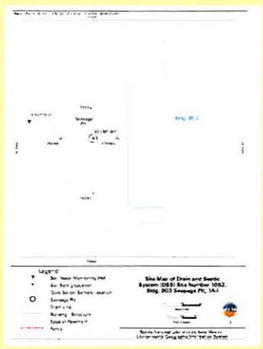


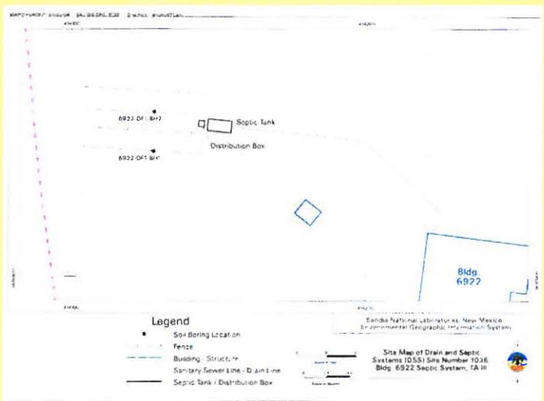




Septic system demolition and backfilling.

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





For More Information Contact

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

Sandia National Laboratories
Environmental Restoration Project
Task Leader: Mike Sanders
Telephone (505) 284-2478

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)

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

Sandia National Laboratories

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	Year(s) 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	1958	System is active	Periodically since 1992	Periodically
1031	Former Bldgs 6589 and 6600 Septic System	TA-III	1967	1991 (septic tank and seepage pits 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 systems) Early 1980s (northern systems)	1991	1992-1995 (south septic tank) 2004 (north septic tank)	1996 (south septic tank) Unknown (north septic tank)
1084	Bldg 6505 Septic System	TA-III	1954	1991	1990-1991	Unknown (backfilled before 2003)
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 2003)
1098	TA-V Plenum Rooms Drywell	TA-X	1958	Early 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
1102	Former Bldg 889 Septic System	TA-I	535
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 22, 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 Septic System	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 2003	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
Environmental Restoration
Mr. John Gould
Telephone (505) 845-6089

Sandia National Laboratories
Environmental Restoration Project
Task Leader: Mike Sanders
Telephone (505) 284-2478

Sandia National Laboratories

Justification for Class III Permit Modification

September 2005

DSS Site 1084
Operable Unit 1295
Building 6505 Septic System at Technical Area III

CAC (SWMU Assessment Report) Submitted September 2004
RSI Submitted April 2005

Environmental
Restoration
Project

United States Department of Energy
Sandia Site Office

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

CAC

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

SEP 1 7 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 1034, 1035, 1036, 1078, 1079, 1084, 1098, 1104, and 1120 at Sandia National Laboratories, New Mexico, EPA ID No. NM5890110518. These documents are compiled as DSS Round 6 and No Further Action (NFA) Batch 24.

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

SEP 17 2004

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

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

Sandia National Laboratories/New Mexico
Environmental Restoration Project

SWMU ASSESSMENT REPORT AND PROPOSAL FOR CORRECTIVE ACTION COMPLETE DRAIN AND SEPTIC SYSTEMS SITE 1084, BUILDING 6505 SEPTIC SYSTEM

September 2004

United States Department of Energy
Sandia Site Office

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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
GS	Gore-Sorber™
HE	high explosive
HI	hazard index
HQ	hazard quotient
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(s)

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1.0 INTRODUCTION

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 1084: BUILDING 6505 SEPTIC SYSTEM

2.1 Summary

The SNL/NM ER Project conducted an assessment of DSS Site 1084, the Building 6505 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 Building 6505 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. Current operations at the site are conducted in accordance with applicable laws and regulations that are protective of the environment, and septic system discharges are now directed to the City of Albuquerque sewer system.

Review and analysis of all relevant data for DSS Site 1084 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 1084 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 1084 is located in SNL/NM Technical Area (TA)-III on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (Figure 2.2.1-1). The site is located approximately 3,400 feet southeast of the entrance to TA-III and is about 80 feet west of the corner of Building 6505 (Figure 2.2.1-2). The abandoned septic system consisted of a 325-gallon septic tank and distribution box that emptied to a 30-foot-long drain line with four branching laterals, each 60 feet long (Figure 2.2.1-2). Construction details are based upon engineering drawings (SNL/NM April 1955), site inspections, backhoe excavations, and Geoprobe™ exploration of the system. The system received discharges from Building 6505, approximately 80 feet to the east.

The surface geology at DSS Site 1084 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 1084, 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). Site vegetation primarily consists of desert grasses, shrubs, and cacti.

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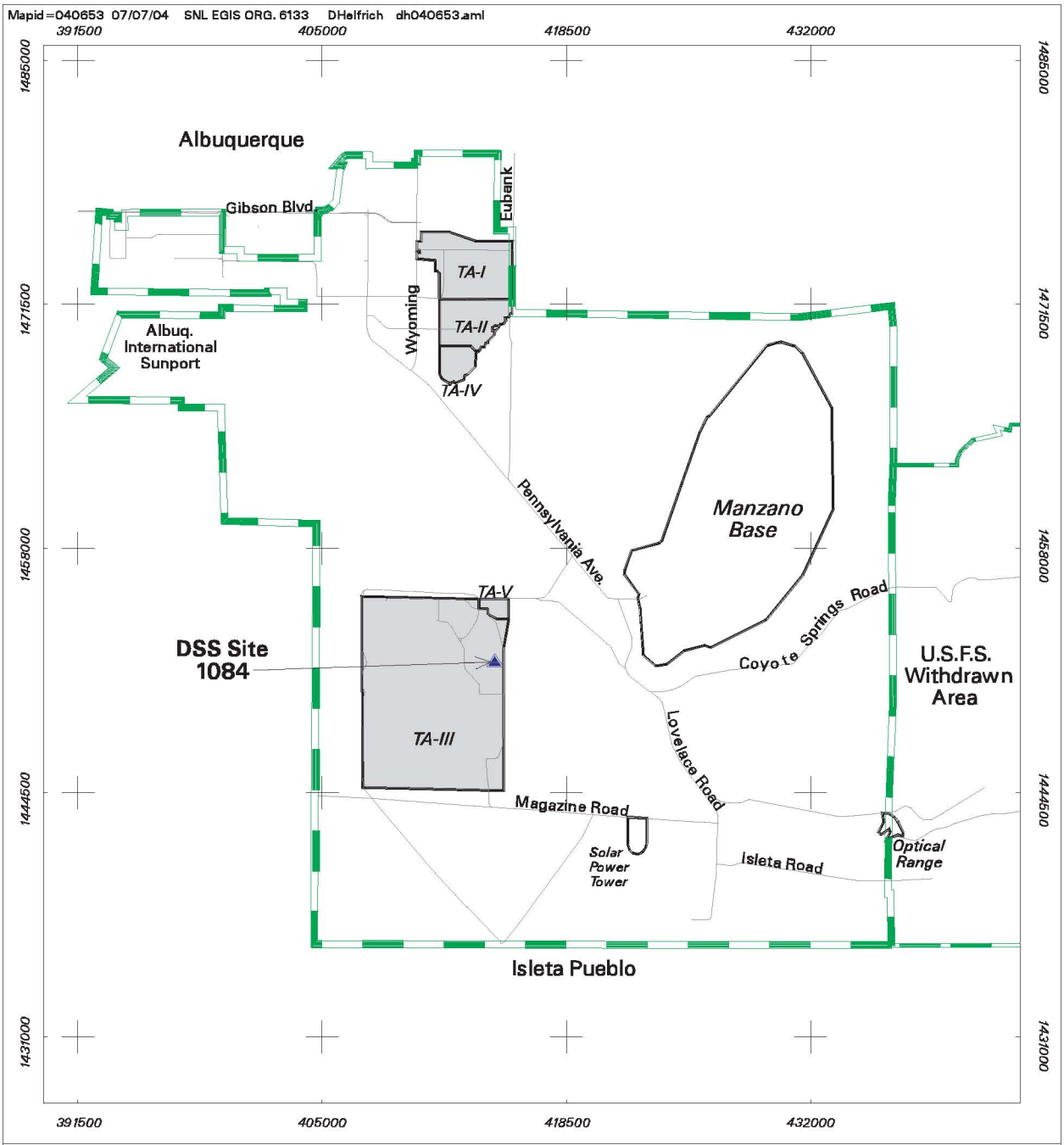

Legend

- DSS Site 1084
- 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 1084, Bldg. 6505 Septic System, TA-III

0 4500 9000
Scale in Feet

0 1080 2160
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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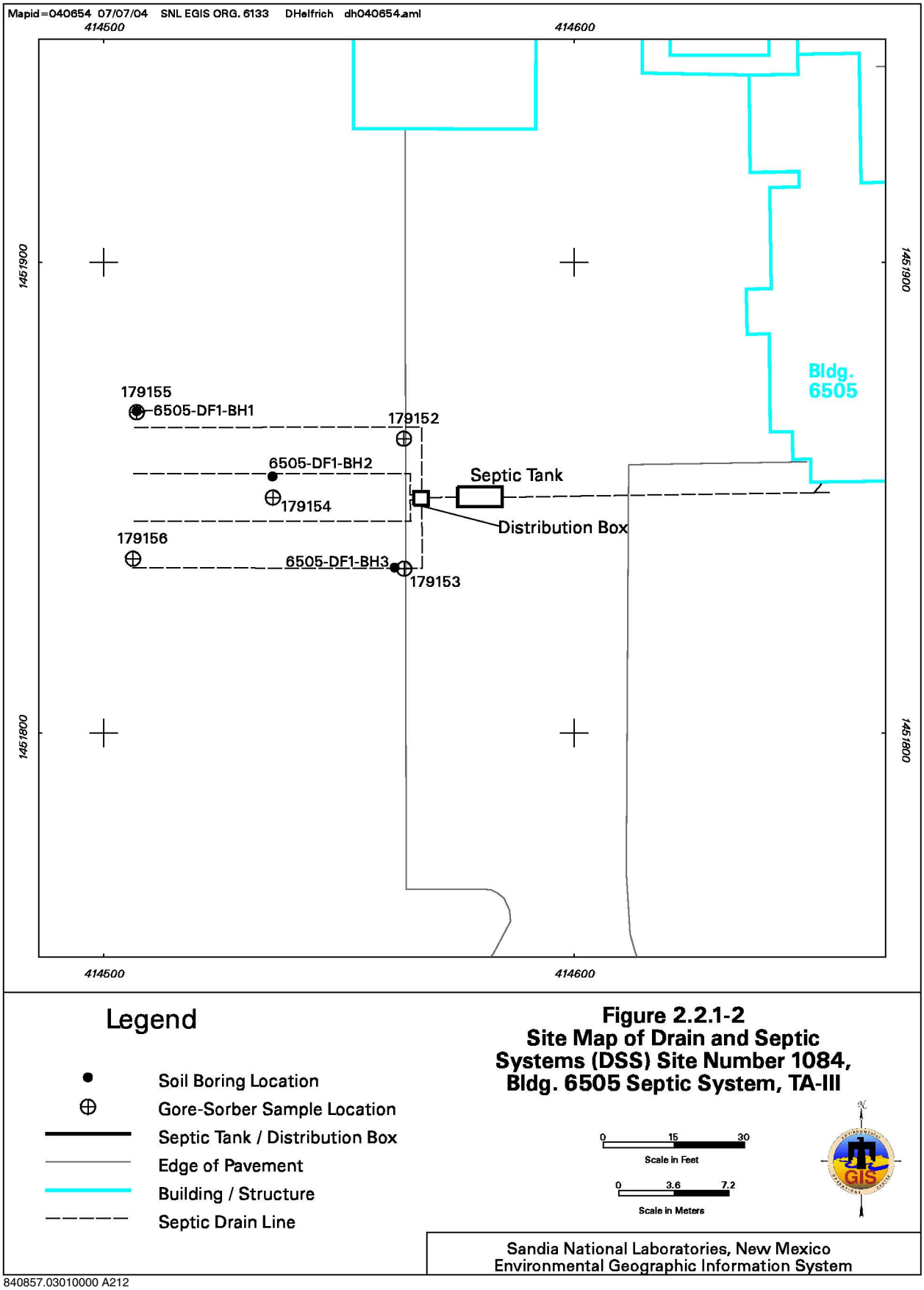

Figure 2.2.1-2
Site Map of Drain and Septic Systems (DSS) Site Number 1084, Bldg. 6505 Septic System, TA-III

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

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The ground surface in the vicinity of the site is flat to very slightly sloping to the west. The closest drainage lies approximately 0.9 miles south of the site and terminates in a playa just west of KAFB. No perennial surface-water bodies are present in the vicinity of the site. Average annual rainfall in the SNL/NM and KAFB area, as measured at Albuquerque International Sunport, is 8.1 inches (NOAA 1990). Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration rates for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996).

The site lies at an average elevation of approximately 5,433 feet above mean sea level (SNL/NM April 2003). Depth to groundwater is approximately 508 feet below ground surface (bgs) at the site. Groundwater flow is thought to be generally to the west in this area (SNL/NM March 2002). The nearest production wells to DSS Site 1084 are KAFB-4, approximately 3.4 miles to the northwest, and KAFB-11, approximately 3.6 miles to the northeast. The nearest groundwater monitoring well is the Mixed Waste Landfill Well MWL-BW1, approximately 3,000 feet west of the site.

2.2.2 Operational History

Available information indicates that Building 6505, currently known as the Thermal Spray Research Lab, was constructed in 1954 (SNL/NM March 2003), and it is assumed the septic system was constructed at the same time. Because operational records are not available, the site investigation was planned to be consistent with other DSS site investigations and to sample for possible COCs that may have been released during facility operations.

In June 1991, Building 6505 was connected to an extension of the City of Albuquerque sanitary sewer system (Jones June 1991). The old septic system line was disconnected and capped, and the system was abandoned in place concurrent with this change (Romero September 2003).

2.3 Land Use

2.3.1 Current Land Use

The current land use for DSS Site 1084 is industrial.

2.3.2 Future/Proposed Land Use

The projected future land use for DSS Site 1084 is industrial (DOE et al. September 1995).

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3.0 INVESTIGATORY ACTIVITIES

3.1 Summary

Five assessment investigations have been conducted at this site. In late 1990 or early 1991, waste characterization samples were collected from the septic tank (Investigation 1). In March 2002, a backhoe was used to physically locate the buried drainfield drain lines (Investigation 2). In April 2002, a passive soil-vapor survey was conducted to determine whether areas of significant volatile organic compound (VOC) contamination were present in the soil around the drainfield) (Investigation 3). In August 2002, six subsurface soil samples were collected from three borings in the drainfield area (Investigation 4). In December 2003, a Geoprobe™ was used to locate the septic tank and determine the contents of the tank (Investigation 5). Investigations 2, 3, 4, and 5 were required by the NMED/HWB to adequately characterize the site and were conducted in accordance with procedures presented in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001) described in Chapter 1.0. These investigations are discussed in the following sections.

3.2 Investigation 1—Septic Tank Sampling

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

In late 1990 or early 1991, as part of the SNL/NM Septic System Monitoring Program, an aqueous sample was collected from the Building 6505 septic tank (SNL/NM April 1991). The aqueous samples were analyzed at an off-site laboratory for semivolatile organic compounds (SVOCs), oil and grease, phenolic compounds, metals, gross beta activity, and uranium-238. The analytical results are presented in Annex A. A fraction of each sample was also submitted to the SNL/NM Radiation Protection Sample Diagnostics (RPSD) Laboratory for gamma spectroscopy analysis prior to off-site release.

3.3 Investigation 2—Backhoe Excavation

On March 11, 2002, a backhoe was used to determine the location, dimensions, and average depth of the DSS Site 1084 drainfield system. Excavation began in the vicinity of the drainfield drain lines. The drainfield was found to have four laterals, arranged as shown on Figure 2.2.1-2, with an average drain line trench depth of 3 feet bgs. The north drain line was followed east to the point where it continued under the paved asphalt area (Figure 2.2.1-2). The backhoe work was stopped at this point in order to prevent damage to the asphalt pavement. 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—Passive Soil-Vapor Sampling

In late April 2002 and early May 2002, a passive soil-vapor survey was conducted in the Building 6505 Septic System area. This survey was required at this site by NMED/HWB regulators and was conducted to determine whether significant VOC contamination was present in the soil at the site.

3.4.1 Passive Soil-Vapor Sampling Methodology

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

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

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

3.4.2 Soil-Vapor Survey Results and Conclusions

A total of five GS passive soil-vapor samplers were placed in the drainfield area of the site (Figure 2.2.1-2). Samplers were installed at the site on April 29, 2002, and were retrieved on May 14, 2002. Sample locations are designated by the same six-digit sample number both on Figure 2.2.1-2 and in the analytical results tables presented in Annex B.

As shown in the analytical results tables in Annex B, the GS samplers were analyzed for a total of 30 individual or groups of VOCs, including trichloroethene, tetrachloroethene, cis- and trans-dichloroethene, and benzene/toluene/ethylbenzene/xylene. Low to trace-level (but quantifiable) amounts of 17 individual or groups of VOCs were detected in the GS samplers installed at this site. The analytical results indicated there were no areas of significant VOC contamination at the site that would require additional characterization.

3.5 Investigation 4—Soil Sampling

Once the system drain lines were located, soil sampling was conducted in accordance with the rationale and procedures in the SAP (SNL/NM October 1999) approved by the NMED. On August 20, 2002, soil samples were collected from three drainfield boreholes. Soil boring locations are shown on Figure 2.2.1-2. Figure 3.5-1 shows soil samples being collected at DSS Site 1084. A summary of the boreholes, sample depths, sample analyses, analytical methods, laboratories, and sample date is presented in Table 3.5-1.

3.5.1 Soil Sampling Methodology

An auger drill rig was used to sample all boreholes at two depth intervals. In drainfields, the top of the shallow interval started at the bottom of the drain line trenches, as determined by the backhoe excavation, and the lower (deep) interval started at 5 feet beneath the top of the upper 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.

3.5.2 Soil Sampling Results and Conclusions

Analytical results for the soil samples collected at DSS Site 1084 are presented and discussed in this section.

VOCs

VOC analytical results for the six soil samples and one duplicate soil sample collected from the three drainfield boreholes are summarized in Table 3.5.2-1. Method detection limits (MDLs) for the VOC soil analyses are presented in Table 3.5.2-2. One VOC, 2-butanone, was detected in the 3-foot-bgs sample and the duplicate sample from BH2 and in the 8-foot-bgs samples from

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Figure 3.5-1
Collecting soil samples with the Geoprobe™ from beneath DSS Site 1084,
Building 6505 Septic System drainfield. View to the northeast. August 20, 2002

Table 3.5-1
Summary of Areas Sampled, Analytical Methods, and Laboratories Used for
DSS Site 1084, Building 6505 Septic System Soil Samples

Sampling Area	Number of Borehole Locations	Top of Sampling Intervals in Each Borehole (ft bgs)	Total Number of Soil Samples	Analytical Parameters and EPA Methods[a]	Analytical Laboratory	Date Samples Collected
Drainfield	3	3, 8	6 +1 Duplicate	VOCs EPA Method 8260	GEL	08-20-02
	3	3, 8	6 +1 Duplicate	SVOCs EPA Method 8270	GEL	08-20-02
	3	3, 8	6 +1 Duplicate	PCBs EPA Method 8082	GEL	08-20-02
	3	3, 8	6 +1 Duplicate	HE Compounds EPA Method 8330	GEL	08-20-02
	3	3, 8	6 +1 Duplicate	RCRA Metals EPA Methods 6000/7000	GEL	08-20-02
	3	3, 8	6 +1 Duplicate	Hexavalent Chromium EPA Method 7196A	GEL	08-20-02
	3	3, 8	6 +1 Duplicate	Total Cyanide EPA Method 9012A	GEL	08-20-02
	3	3, 8	6 +1 Duplicate	Gamma Spectroscopy EPA Method 901.1	RPSD	08-20-02
	3	3, 8	6 +1 Duplicate	Gross Alpha/Beta Activity EPA Method 900.0	GEL	08-20-02

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

Table 3.5.2-1
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, VOC Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			VOCs (EPA Method 8260[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	2-Butanone
605649	6505-DF1-BH1-3-S	3	ND (3.74)
605649	6505-DF1-BH1-8-S	8	ND (3.74)
605649	6505-DF1-BH2-3-S	3	**25.5**
605649	6505-DF1-BH2-3-DU	3	**9.98**
605649	6505-DF1-BH2-8-S	8	**12.7**
605649	6505-DF1-BH3-3-S	3	ND (3.74)
605649	6505-DF1-BH3-8-S	8	**9.35**
Quality Assurance/Quality Control Sample (µg/L)			
605649	6505-DF1-TB[c]	NA	ND (2.31)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]ER sample ID reflects the final site for VOC samples included in this shipment.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.
TB = Trip blank.
VOC = Volatile organic compound.

Table 3.5.2-2
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, VOC Analytical MDLs
August 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

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

BH2 and BH3. This compound was not detected in the associated trip blanks (TBs). It is a common laboratory contaminant and may not indicate soil contamination at this site.

SVOCs

SVOC analytical results for the six soil samples and one duplicate soil sample collected from the drainfield boreholes are summarized in Table 3.5.2-3. MDLs for the SVOC soil analyses are presented in Table 3.5.2-4. No SVOCs were detected in any of the soil samples collected from the site.

PCBs

Polychlorinated biphenyl (PCB) analytical results for the six soil samples and one duplicate soil sample collected from the drainfield boreholes are summarized in Table 3.5.2-5. MDLs for the PCB soil analyses are presented in Table 3.5.2-6. One PCB, Aroclor-1260 was detected in the 8-foot-bgs sample from borehole BH2.

HE Compounds

High explosive (HE) compound analytical results for the six soil samples and one duplicate soil sample collected from the drainfield boreholes are summarized in Table 3.5.2-7. MDLs for the HE soil analyses are presented in Table 3.5.2-8. 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 six soil samples and one duplicate soil sample collected from the drainfield boreholes are summarized in Table 3.5.2-9. MDLs for the metals in soil analyses are presented in Table 3.5.2-10. Barium and chromium were detected above the NMED-approved background in the 3-foot-bgs and the 8-foot-bgs samples, respectively, from borehole BH3.

Total Cyanide

Total cyanide analytical results for the six soil samples and one duplicate soil sample collected from the drainfield boreholes are summarized in Table 3.5.2-11. MDLs for the cyanide soil analyses are presented in Table 3.5.2-12. Cyanide was detected in the 3-foot-bgs samples from boreholes BH2 and BH3 and in the 8-foot-bgs samples from boreholes BH1, BH2, and BH3.

Radionuclides

Analytical results for the gamma spectroscopy analysis of the six soil samples and one duplicate soil sample collected from the drainfield boreholes are summarized in Table 3.5.2-13. No

Table 3.5.2-3
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, SVOC Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			SVOCs (EPA Method 8270[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
605649	6505-DF1-BH1-3-S	3	ND
605649	6505-DF1-BH1-8-S	8	ND
605649	6505-DF1-BH2-3-S	3	ND
605649	6505-DF1-BH2-3-DU	3	ND
605649	6505-DF1-BH2-8-S	8	ND
605649	6505-DF1-BH3-3-S	3	ND
605649	6505-DF1-BH3-8-S	8	ND

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

Table 3.5.2-4
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, SVOC Analytical MDLs
August 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 3.5.2-4 (Concluded)
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, SVOC Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 8270[a] Detection Limit (µg/kg)
Hexachlorobutadiene	12.7
Hexachlorocyclopentadiene	167
Hexachloroethane	22
Indeno(1,2,3-cd)pyrene	16.7
Isophorone	16
2-Methylnaphthalene	16.7
4-Methylphenol	33.3
Naphthalene	16.7
2-Nitroaniline	167
3-Nitroaniline	167
4-Nitroaniline	37
Nitrobenzene	20.3
2-Nitrophenol	17
4-Nitrophenol	167
n-Nitrosodipropylamine	22.7
Pentachlorophenol	167
Phenanthrene	16.7
Phenol	12.7
Pyrene	16.7
1,2,4-Trichlorobenzene	12.7
2,4,5-Trichloropheno	17.3
2,4,6-Trichlorophenol	27.3

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

Table 3.5.2-5
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, PCB Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			PCB (EPA Method 8082[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	Aroclor-1260
605649	6505-DF1-BH1-3-S	3	ND (1)
605649	6505-DF1-BH1-8-S	8	ND (1)
605649	6505-DF1-BH2-3-S	3	ND (1)
605649	6505-DF1-BH2-3-DU	3	ND (1)
605649	6505-DF1-BH2-8-S	8	**1.8 J (3.33)**
605649	6505-DF1-BH3-3-S	3	ND (1)
605649	6505-DF1-BH3-8-S	8	ND (1)

Note: Values in **bold** represent detected analytes.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
ND ( ) = Not detected above the MDL, shown in parentheses.
PCB = Polychlorinated biphenyl.
S = Soil sample.

Table 3.5.2-6
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, PCB Analytical MDLs
August 2002
(Off-Site Laboratory)

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

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

Table 3.5.2-7
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, HE Compound Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			HE (EPA Method 8330[a]) (µg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
605649	6505-DF1-BH1-3-S	3	ND H
605649	6505-DF1-BH1-8-S	8	ND H
605649	6505-DF1-BH2-3-S	3	ND H
605649	6505-DF1-BH2-3-DU	3	ND H
605649	6505-DF1-BH2-8-S	8	ND H
605649	6505-DF1-BH3-3-S	3	ND H
605649	6505-DF1-BH3-8-S	8	ND H

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
H = The holding time was exceeded for the associated sample analysis.
HE = High explosive(s).
ID = Identification.
µg/kg = Microgram(s) per kilogram.
ND = Not detected.
S = Soil sample.

Table 3.5.2-8
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, HE Compound Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 8330[a] Detection Limit (µg/kg)
2-Amino-4,6-dinitrotoluene	18.1
4-Amino-2,6-dinitrotoluene	34.1
1,3-Dinitrobenzene	34.1
2,4-Dinitrotoluene	55
2,6-Dinitrotoluene	48
HMX	48
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

[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
HE = High explosive(s).
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
MDL = Method detection limit.
µg/kg = Microgram(s) per kilogram.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
Tetryl = Methyl-2,4,6-trinitrophenylnitramine.

Table 3.5.2-9
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, Metals Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			Metals (EPA Method 6000/7000/7471A[a]) (mg/kg)								
Record Number[b]	ER Sample ID	Sample Depth (ft)	Arsenic	Barium	Cadmium	Chromium	Chromium (VI)	Lead	Mercury	Selenium	Silver
605649	6505-DF1-BH1-3-S	3	2.84	82.3 J	0.145 J (0.485)	12.8 J	ND (0.0533)	3.99	0.00331 J (0.00951)	ND (0.393 J)	ND (0.0876)
605649	6505-DF1-BH1-8-S	8	3.36	96.5 J	0.19 J (0.463)	10.4 J	0.0578 J (0.0963)	5.13	0.00253 J (0.0086)	ND (0.15 J)	ND (0.0835)
605649	6505-DF1-BH2-3-S	3	3.15	103 J	0.208 J (0.495)	10.1 J	ND (0.0517)	5.75	0.00416 J (0.00929)	ND (0.401 J)	ND (0.0893)
605649	6505-DF1-BH2-3-DU	3	3.17	137 J	0.197 J (0.472)	9.17 J	ND (0.0536)	4.86	0.00928	ND (0.153 J)	ND (0.0851)
605649	6505-DF1-BH2-8-S	8	3.16	63.3 J	0.223 J (0.472)	10.8 J	ND (0.0519)	6.31	0.0164	0.315 J (0.472)	0.35 J (0.472)
605649	6505-DF1-BH3-3-S	3	3.88	**411 J**	0.199 J (0.45)	9.02 J	ND (0.0533)	4.79	0.00752 J (0.00972)	ND (0.146 J)	ND (0.0813)
605649	6505-DF1-BH3-8-S	8	3.11	73.8 J	0.222 J (0.467)	**20.2 J**	ND (0.0522)	5.76	0.00415 J (0.00858)	ND (0.151 J)	ND (0.0843)
Background Concentration—Southwest Area Supergroup[c]			4.4	214	0.9	15.9	1	11.8	<0.1	<1	<1

Note: Values in **bold** exceed background soil concentrations.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]Dinwiddie September 1997.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J = Analytical result was qualified as an estimated value.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
ND ( ) = Not detected above the MDL, shown in parentheses.
S = Soil sample.

Table 3.5.2-10
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, Metals Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 6000/7000/7471A[a] Detection Limit (mg/kg)
Arsenic	0.186–0.204
Barium	0.0601–0.066
Cadmium	0.0431–0.0473
Chromium	0.145–0.16
Chromium (VI)	0.0517–0.0536
Lead	0.256–0.281
Mercury	0.000844–0.000956
Selenium	0.146–0.401
Silver	0.0813–0.0893

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

Table 3.5.2-11
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, Total Cyanide Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			Total Cyanide (EPA Method 9012A[a]) (mg/kg)
Record Number[b]	ER Sample ID	Sample Depth (ft)	
605649	6505-DF1-BH1-3-S	3	ND
605649	6505-DF1-BH1-8-S	8	**0.0782 J (0.278)**
605649	6505-DF1-BH2-3-S	3	**0.0725 J (0.25)**
605649	6505-DF1-BH2-3-DU	3	ND
605649	6505-DF1-BH2-8-S	8	**0.0718 J (0.227)**
605649	6505-DF1-BH3-3-S	3	**0.102 J (0.227)**
605649	6505-DF1-BH3-8-S	8	**0.125 J (0.25)**

Note: Values in ***bold*** *exceed background soil concentrations.*
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J ( ) = The reported value is greater than or equal to the MDL but is less than the practical quantitation limit, shown in parentheses.
MDL = Method detection limit.
mg/kg = Milligram(s) per kilogram.
ND = Not detected.
S = Soil sample.

Table 3.5.2-12
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, Total Cyanide Analytical MDLs
August 2002
(Off-Site Laboratory)

Analyte	EPA Method 9012A[a] Detection Limit (mg/kg)
Total Cyanide	0.0381–0.0466

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

Table 3.5.2-13
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, Gamma Spectroscopy Analytical Results
August 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]
605640	6505-DF1-BH1-3-S	3	ND (0.0265)	--	0.488	0.246	**ND (0.198)**	--	ND (0.625)	--
605640	6505-DF1-BH1-8-S	8	ND (0.0268)	--	0.661	0.319	**ND (0.207)**	--	ND (0.654)	--
605640	6505-DF1-BH2-3-S	3	ND (0.0318)	--	0.734	0.353	**ND (0.243)**	--	ND (0.747)	--
605640	6505-DF1-BH2-3-DU	3	ND (0.0298)	--	0.719	0.347	**ND (0.228)**	--	ND (0.718)	--
605640	6505-DF1-BH2-8-S	8	ND (0.0302)	--	0.757	0.362	0.101	0.182	ND (0.715)	--
605640	6505-DF1-BH3-3-S	3	ND (0.0269)	--	0.526	0.266	**ND (0.204)**	--	ND (0.67)	--
605640	6505-DF1-BH3-8-S	8	ND (0.0339)	--	0.694	0.337	**ND (0.196)**	--	ND (0.5)	--
Background Activity—Southwest Area Supergroup[d]			0.079	NA	1.01	NA	0.16	NA	1.4	NA

Note: Values in **bold** exceed background soil activities.
[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]Two standard deviations about the mean detected activity.
[d]Dinwiddie September 1997.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
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.
-- = Error not calculated for nondetect results.

activities above NMED-approved background levels were detected in any sample analyzed. However, although not detected, the minimum detectable activity (MDA) for most of the uranium-235 analyses exceeded the respective background activity because the standard gamma spectroscopy count time for soil samples (6,000 seconds) was not sufficient to reach the NMED-approved background activity established for SNL/NM soil. Even though the MDA values may be slightly elevated, they are still very low, and the risk assessment outcome for the site is not significantly impacted by their use.

Gross Alpha/Beta Activity

Gross alpha/beta activity analytical results for the six soil samples and one duplicate soil sample collected from the drainfield boreholes are summarized in Table 3.5.2-14. No gross alpha or beta activity was detected above the New Mexico-established background levels (Miller September 2003) in any of the samples. These results indicate no significant levels of radioactive material are present in the soil at the site.

3.5.3 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. No EB samples were collected at this site.

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 1084 (Table 3.5.2-1).

As shown in Tables 3.5.2-1, 3.5.2-3, 3.5.2-5, 3.5.2-7, 3.5.2-9, 3.5.2-11, 3.5.2-13, and 3.5.2-14, to assess the precision and repeatability of sampling and analytical procedures, duplicate soil samples (designated 'DU') were collected and analyzed at the on- and off-site laboratories for VOCs, SVOCs, PCBs, HE compounds, metals, total cyanide, radionuclides by gamma spectroscopy, and gross alpha/beta activity.

As shown in Tables 3.5.2-3, 3.5.2-5, 3.5.2-7, 3.5.2-9 and 3.5.2-13, no SVOCs, PCBs, HE compounds, hexavalent chromium, or elevated radionuclides were detected in the primary or the duplicate samples from the 3-foot-bgs interval in borehole BH2.

As shown in Table 3.5.2-1, the 2-butanone concentration in the primary sample was 2.5 times that in the duplicate sample from the 3-foot-bgs interval in borehole BH2.

Table 3.5.2-14
Summary of DSS Site 1084, Building 6505 Septic System
Confirmatory Soil Sampling, Gross Alpha/Beta Activity Analytical Results
August 2002
(Off-Site Laboratory)

Sample Attributes			Activity (EPA Method 900.0[a]) (pCi/g)			
			Gross Alpha		Gross Beta	
Record Number[b]	ER Sample ID	Sample Depth (ft)	Result	Error[c]	Result	Error[c]
605649	6505-DF1-BH1-3-S	3	5.5 J	1.74	17.8	1.87
605649	6505-DF1-BH1-8-S	8	14.6 J	4.57	20.8	1.81
605649	6505-DF1-BH2-3-S	3	8.29 J	2.02	19.4	1.88
605649	6505-DF1-BH2-3-DU	3	6.83 J	2.21	17.9	1.95
605649	6505-DF1-BH2-8-S	8	9.49 J	2.3	20.5	2.04
605649	6505-DF1-BH3-3-S	3	10.5 J	2.33	17.2	1.7
605649	6505-DF1-BH3-8-S	8	11.9 J	2.28	17.5	1.78
Background Activity[d]			17.4	NA	35.4	NA

[a]EPA November 1986.
[b]Analysis request/chain-of-custody record.
[c]Two standard deviations about the mean detected activity.
[d]Miller September 2003.
BH = Borehole.
DF = Drainfield.
DSS = Drain and Septic Systems.
DU = Duplicate sample.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
ID = Identification.
J = Analytical result was qualified as an estimated value.
NA = Not applicable.
pCi/g = Picocurie(s) per gram.
S = Soil sample.

As shown in Table 3.5.2-9, metals concentrations in the primary and duplicate samples from the 3-foot-bgs interval in borehole BH2 compared as follows:

- Arsenic, barium, cadmium, chromium, and lead concentrations were comparable.
- The mercury concentration in the duplicate sample was 2.25 times the concentration in the primary sample.
- Hexavalent chromium, selenium, and silver were not detected in either the primary or the duplicate samples.

As shown in Table 3.5.2-11, cyanide was detected in the primary sample but not in the duplicate sample.

As shown in Table 3.5.2-13, detected activities of the radionuclides by gamma spectroscopy were comparable in the primary and duplicate samples.

As shown in Table 3.5.2-14 gross alpha/beta activity results for the primary and duplicate samples are comparable.

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

3.6 Investigation 5—Geoprobe™ Exploration

On December 4, 2003, a Geoprobe™ was used to locate the septic tank beneath the asphalt pavement west of Building 6505 (Figure 3.6-1). Eleven boreholes were drilled within the assumed vicinity of the septic tank as shown on engineering drawings. The septic tank was located and it was determined that the tank had been abandoned and backfilled with dirt at some point after the samples were collected from the tank in late 1990 or early 1991 (Figure 3.6-2).

3.7 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 1084.

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Figure 3.6-1
Using the Geoprobe™ to determine the location of the DSS Site 1084 septic tank, which was located beneath the asphalt pavement. View to the northeast. December 4, 2003

Figure 3.6-2
Location of the DSS Site 1084 septic tank under the asphalt parking lot, as determined by Geoprobe™ borings. The tank was found filled with dirt. View to the east. December 4, 2003

4.0 CONCEPTUAL SITE MODEL

The conceptual site model for DSS Site 1084, the Building 6505 Septic System, is based upon the COCs identified in the soil samples collected from beneath the drainfield at this site. This section summarizes the nature and extent of contamination and the environmental fate of the COCs.

4.1 Nature and Extent of Contamination

Potential COCs at DSS Site 1084 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. The VOC, 2-butanone, was detected in four of the seven samples collected from the site. PCBs were detected in one sample, and cyanide was detected in five samples collected from the site. Barium and chromium were each detected in one sample above the NMED-approved maximum background concentrations for SNL/NM Southwest Area Supergroup soils (Dinwiddie September 1997). Hexavalent chromium was detected in one sample but not above the NMED-approved maximum background concentration. When a metal concentration exceeded its maximum background screening value, it was considered further in the risk assessment process.

None of the four representative gamma spectroscopy radionuclides were detected at activities exceeding the corresponding background levels. However, the MDA values for most of the uranium-235 analyses 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 septic system and drainfield. Possible secondary release mechanisms include the uptake of COCs that may have been released into the soil beneath the drainfield (Figure 4.2-1). The depth to groundwater at the site (approximately 508 feet bgs) most likely precludes migration of potential COCs into the groundwater system. The potential pathways to receptors include soil ingestion, dermal contact, and inhalation, which could occur as a result of receptor exposure to contaminated subsurface soil at the site. No intake routes through plant, meat, or milk ingestion are considered appropriate for either the industrial or residential land-use scenarios. Annex D provides additional discussion on the fate and transport of COCs at DSS Site 1084.

Table 4.2-1 summarizes the potential COCs for DSS Site 1084. 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 1084 is industrial (DOE et al. September 1995).

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

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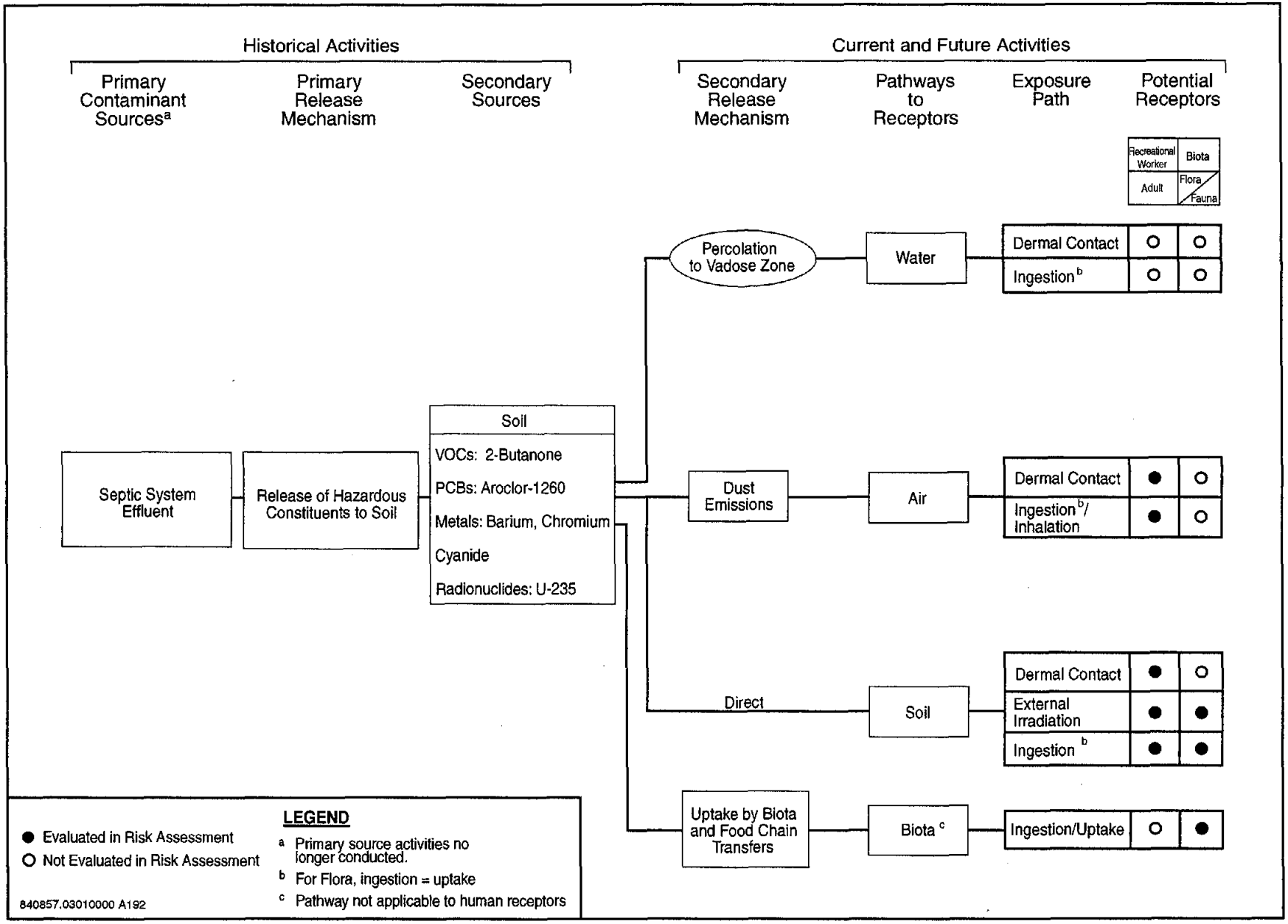

Figure 4.2-1

Conceptual Site Model Flow Diagram for DSS Site 1084, Building 6505 Septic System

Table 4.2-1
Summary of Potential COCs for DSS Site 1084, Building 6505 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 with Concentrations Greater than Background or Nonquantified Background[e]
VOCs		7	2-Butanone	NA	0.0255	0.0090	4
SVOCs		7	None	NA	NA	NA	None
PCBs		7	Aroclor-1260	NA	0.0018 J	0.0007	1
HE Compounds		7	None	NA	NA	NA	None
RCRA Metals		7	Barium	214	411 J	138.1	1
		7	Chromium	15.9	20.2 J	11.8	1
Hexavalent Chromium		7	None	NA	NA	NA	None
Cyanide		7	Cyanide	NC	0.125 J	0.0697	5
Radionuclides (pCi/g)	Gamma Spectroscopy	7	U-235	0.16	ND (0.243)	NC[f]	6
	Gross Alpha	7	None	NA	NA	NA	None
	Gross Beta	7	None	NA	NA	NA	None

[a]Number of samples includes duplicates and splits.
[b]Dinwiddie September 1997.
[c]Maximum concentration is either the maximum amount detected, or for radionuclides, the greater of either the maximum detection or the maximum MDA above background.
[d]Average concentration includes all samples except blanks. The average is calculated as the sum of detected amounts and one-half of the MDLs for nondetect results, divided by the number of samples.
[e]See appropriate data table for sample locations.
[f]An average MDA is not calculated because of the variability in instrument counting error and the number of reported 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.
ND ( ) = Not detected above the MDA shown in parentheses.
PCB = Polychlorinated biphenyl.
pCi/g = Picocurie(s) per gram.
RCRA = Resource Conservation and Recovery Act.
SVOC = Semivolatile organic compound.
VOC = Volatile organic compound.

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.

Potential biota receptors include flora and fauna at the site. Major exposure routes for biota include direct soil ingestion, ingesting COCs through food chain transfers, and direct contact with COCs in soil. Annex D provides additional discussion of the exposure routes and receptors at DSS Site 1084.

4.3 Site Assessment

Site assessment at DSS Site 1084 included risk assessments for both human health and ecological risk. This section briefly summarizes the site assessment results, and Annex D discusses the risk assessment performed for DSS Site 1084 in more detail.

4.3.1 Summary

The site assessment concluded that DSS Site 1084 poses no significant threat to human health under either the industrial or residential land-use scenarios. Ecological risks are expected to be very low.

4.3.2 Risk Assessments

Risk assessments were performed for both human health and ecological risk at DSS Site 1084. This section summarizes the results.

4.3.2.1 Human Health

DSS Site 1084 has been recommended for an industrial land-use scenario (DOE et al. September 1995). Because 2-butanone, PCBs (Aroclor-1260), barium, chromium, cyanide, and uranium-235 are present above background levels, have nonquantified background levels, or have MDA values above background levels, it was necessary to perform a human health risk assessment analysis for the site, which included these COCs. Annex D provides a complete discussion of the risk assessment process, results, and uncertainties. The risk assessment process provides a quantitative evaluation of the potential adverse human health effects from constituents in the site's soil by calculating the hazard index (HI) and excess cancer risk for both industrial and residential land-use scenarios.

The HI calculated for the COCs at DSS Site 1084 is 0.01 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 0.01. There is no quantifiable excess cancer risk for DSS Site 1084 COCs for an industrial land-use scenario. NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5 (Bearzi January 2001); thus the excess cancer risk for this site is below the suggested acceptable risk value. There is no

estimated incremental excess cancer risk for DSS Site 1084. Both the incremental HI and excess cancer risk are below NMED guidelines.

The HI calculated for the COCs at DSS Site 1084 is 0.08 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 0.04. There is no excess cancer risk for DSS Site 1084. 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. There is no incremental excess cancer risk for DSS Site 1084. Both the incremental HI and incremental excess cancer risk are below NMED guidelines.

For the radiological COCs, one of the constituents, uranium-235, had MDA values 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 EPA guidance values; the estimated TEDE is 1.2E-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 incremental estimated cancer risk value is 1.4E-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 3.1E-2 mrem/yr with an associated estimated excess cancer risk of 4.0E-7. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS Site 1084 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 Radiological and Nonradiological Risks from DSS Site 1084, Building 6505 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	0.00E+0	1.4E-7	1.4E-7
Residential	0.00E+0	4.0E-7	4.0E-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 D, Sections IV, VII.2, and VII.3). This methodology also required developing a site conceptual

model and a food web model, as well as selecting ecological receptors, as presented in "Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratories, New Mexico" (IT July 1998). The risk assessment also includes the estimation of exposure and ecological risk.

Table 18 of Annex D presents the results of the ecological risk assessment. Ecological risks associated with DSS Site 1084 were estimated through a risk assessment that incorporates site-specific information when available. All hazard quotient (HQ) values predicted at this site were less than 1 with the exception of barium. For barium, the contribution from background concentrations accounts for the majority (52 percent) of the HQ values. Therefore, ecological risks associated with this site are expected to be low.

4.4 Baseline Risk Assessments

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

4.4.1 Human Health

Because the results of the human health risk assessment summarized in Section 4.3.2.1 indicate that DSS Site 1084 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 1084 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 1084 for the following reasons:

- The soil has been sampled for all potential COCs.
- No COCs are present in the soil at levels considered hazardous to human health for either an industrial or residential land-use scenario.
- None of the COCs warrant ecological concern after conservative exposure assumptions are analyzed.

5.2 Criterion

Based upon the evidence provided in Section 5.1, a determination of CAC without controls (NMED April 2004) is recommended for DSS Site 1084. 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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ANNEX A
DSS Site 1084
Septic Tank Sampling Results

4-17-91

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

DB Dionne

4-17-91

Nick Durand,

For your information.

David Dionne

TABLE 2

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

BUILDING 6505

SAMPLE NUMBERS SNLA004839, SNLA004840

Parameters	Results	Units
SEMIVOLATILE ORGANICS		
4-Methylphenol*	67	µg/l
INORGANICS		
Oil and Grease	1.6	mg/l
Phenolics	0.38	mg/l
METALS		
Barium	0.32	mg/l
Cadmium	0.014	mg/l
Chromium	0.014	mg/l
Copper	1.4	mg/l
Lead	0.14	mg/l
Manganese	0.16	mg/l
Mercury	0.0016	mg/l
Selenium	0.0057	mg/l
Silver	0.021	mg/l
Zinc	4.2	mg/l
RADIOLOGICAL		
Gross Beta	25	pCi/l
Uranium 238	1.1	pCi/l

*Not on total toxic organic list

ANNEX B
DSS Site 1084
Gore-Sorber™ Passive Soil-Vapor Survey Analytical Results

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

GORE-SORBER® Screening Survey
Final Report

Non-ER Drain & Septic
Kirtland AFB, NM

June 6, 2002

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

W.L. Gore & Associates, Inc.

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

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

Analytical Data Reviewed by:
Jim E. Whetzel, Chemist

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

GORE-SORBER® Screening Survey
Final Report

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

SITE INFORMATION

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

FIELD PROCEDURES

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

Retrieval date(s): 5/8,9,10,14,15,16,21/2002
 # Modules Retrieved: 131
 # Modules Lost in Field: 4
 # Modules Not Returned: 1

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

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

GORE-SORBER® Screening Survey
Final Report

ANALYTICAL PROCEDURES

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

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

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

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

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

GORE-SORBER® Screening Survey
Final Report

DATA TABULATION

 # CONTOUR MAPS ENCLOSED: No contour maps were generated.

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

General Comments:

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

GORE-SORBER® Screening Survey
Final Report

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

Project Specific Comments:

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

GORE-SORBER® Screening Survey
Final Report

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

UNITS

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

ANALYTES

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

BLANKS

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

APPENDIX A:

1. CHAIN OF CUSTODY
2. DATA TABLE

GORE-SORBER® Screening Survey Chain of Custody

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

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

nstructions: Customer must complete ALL shaded cells

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

Serial # of Modules Shipped			# of Modules for Installation 135 # of Trip Blanks 7		
# 179087 - # 179144	# 179087 - # 179134	Total Modules Shipped: 142 Pieces			
# 179150 - # 179233	# 179135 - # 179136	Total Modules Received: 142 Pieces			
# - #	# 179139 - #	Total Modules Installed: 135 Pieces			
# - #	# 179142 - # 179144	Serial # of Trip Blanks (*Client Decides*)	#	#	
- #	# 179150 - # 179151	# 179227	#	#	
- #	# - #	#	#	#	
# - #	# - #	#	#	#	
# - #	# - #	#	#	#	
# - #	# - #	#	#	#	
# - #	# - #	#	#	#	
Prepared By: Maryanne Mayhi		#	#	#	
Verified By: MaryAnne Mayhi		#	#	#	

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

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

Installation Start Date and Time: 4/23/02 10815T : (AM) PM
Installation Complete Date and Time: 5/6/02 10940 1 : (AM) PM

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

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

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

	Date	Time		Date	Time
Relinquished By: [signature] Affiliation: W.L. Gore & Associates, Inc.	3-4-02	12:00	Received By: Mike Sander Affiliation: Sandia / ER	3-6-02	
Relinquished By: William J Kelly Affiliation: 6135	5-14-02	12:58	Received By: Affiliation:	Date	Time
Relinquished By: Affiliation	Date	Time	Received By: MaryAnne Mayhi Affiliation: W.L. Gore & Associates, Inc.	5/7/02	14:00

GORE-SORBER® Screening Survey Chain of Custody

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

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

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

Instructions: Customer must complete ALL shaded cells

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

Serial # of Modules Shipped			# of Modules for Installation 135 # of Trip Blanks 7		
# 179087 - # 179144	#179152 - #179187	Total Modules Shipped: 142 Pieces			
# 179150 - # 179233	#179188 - #179226	Total Modules Received: 142 Pieces			
# - #	# - #	Total Modules Installed: 135 Pieces			
# - #	# - #	Serial # of Trip Blanks (*Client Decides*)	#	#	
- #	# - #	#179228	#	#	
- #	# - #	#179229	#	#	
# - #	# - #	#	#	#	
# - #	# - #	#	#	#	
# - #	# - #	#	#	#	
# - #	# - #	#	#	#	
Prepared By: Clarence Vigil		#	#	#	
Verified By: Mary Anne Waight		#	#	#	

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

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

Installation Start Date and Time: 4/23/02 1081ST : (AM) PM
Installation Complete Date and Time: 5/6/02 1094O1 : (AM) PM

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

Total Modules Retrieved: 74 Pieces
Total Modules Lost in Field: 4 Pieces
Total Unused Modules Returned: 3 Pieces

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

	Date	Time		Date	Time
Relinquished By: [signature] Affiliation: W.L. Gore & Associates, Inc.	5-4-02	12:00	Received By: Mike Sanders Affiliation: Sandia ; 6133	5-7-02	
Relinquished By: William J Riley Affiliation: Sandia N.L. 6135	5-21-02	0935	Received By: Affiliation:	Date	Time
Relinquished By: Affiliation:	Date	Time	Received By: Mary Anne Waight Affiliation: W.L. Gore & Associates, Inc.	5-24-02	13:30

;ORE-SORBER® Screening Survey
nstallation and Retrieval Log

of 4

SITE NAME & LOCATION

LINE #	MODULE #	INSTALLATION DATE/TIME	RETRIEVAL DATE/TIME	EVIDENCE OF LIQUID HYDROCARBONS (LPH) or HYDROCARBON ODOR (Check as appropriate)			MODULE IN WATER (check one)		COMMENTS	
				LPH	ODOR	NONE	YES	NO		
13.	179129	4/25/02, 1428	5-10-02, 1047						1026/6501-65-	3
14.	179130	1437	5-10-02, 1051						↓	1
15.	179131	1442	5-10-02, 1053						1025/6501-	1
16.	179132	1446	↓						↓	2
17.	179133	↓ 1504	5-10-02, 11:06						↓	3
18.	179134	4/26/02, 0905	5-10-02 1247						1093/6584-	1
19.	179135	0914	↓ 1254						↓	4
50.	179136	0930	5-10-02, 1305							2
51.	179137	0938	Lost							3
52.	179138	0948	Lost						↓	5
53.	179139	1018	5-10-02, 1322						1031/6600-	2
54.	179140	1026	Lost							3
55.	179141	1030	Lost							4
56.	179142	1038	5-10-02, 1343						↓	1
57.	179143	1136	5-10-02, 11:36						276/829X-	2
[illegible]	179144	1142	↓						↓	3
[illegible]	179150	1150	↓						↓	4
60.	179151	↓ 1155	5-10-02, 11:54						↓	1
61.	179152	4/29/02, 0814	5-14-02, 09:42						1084/6505-	1
62.	179153	0822	↓						↓	5
63.	179154	0829	↓						↓	3
64.	179155	0903	↓						↓	2
65.	179156	0845	5-14-02 ↓ 1021						↓	4
66.	179157	0930	05-14-02 0919						1083/6570-	4
67.	179158	0934	↓						↓	1
68.	179159	0940	↓						↓	2
69.	179160	0948	↓ 0940						↓	3
70.	179161	1050	05-14-02, 1025						1032/6610-	1
71.	179162	1100	↓						↓	2
72.	179163	1110	↓						↓	4
73.	179164	1114	↓						↓	3
74.	179165	1120	↓						↓	5
75.	179166	1126	05-14-02, 11:03						↓	6
76.	179167	1222	05-14-02, 11:06						1120/6643-	2
77.	179168	1230	↓						↓	3
78.	179169	1237	↓						↓	4
79.	179170	1242	05-14-02 ↓ 11:32						↓	1
80.	179171	1320	5-14-02 - 0844						1034/6710-	4
[illegible]	179172	1325	↓ 0917						↓	3
[illegible]	179173	1332	↓ 0851						↓	2
[illegible]	179174	1340	↓ 0855						↓	1
84.	179175	↓ 1423	5-14-02, 0814						1035/6715- ↓	

D55 1085

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

DATE ANALYZED	SAMPLE NAME	BTEX, ug	BENZ, ug	TOL, ug	EtBENZ, ug	mpXYL, ug	oXYL, ug	C11, C13, &C15, ug	UNDEC, ug	TRIDEC, ug	PENTADEC, ug	TMBs, ug
	MDL=		0.03	0.02	0.01	0.01	0.01		0.02	0.01	0.02	
5/21/2002	179125	0.10	nd	0.08	nd	0.02	nd	0.05	0.04	0.01	bdl	0.00
5/21/2002	179126	0.00	nd	nd	nd	bdl	nd	0.04	0.03	0.02	bdl	0.00
5/21/2002	179127	0.09	nd	0.05	nd	0.02	0.01	0.04	0.04	bdl	bdl	0.00
5/21/2002	179128	0.07	nd	0.05	nd	0.02	nd	0.08	0.04	0.01	0.03	0.00
5/21/2002	179129	0.02	nd	nd	nd	0.02	nd	0.06	0.03	0.03	bdl	0.00
5/21/2002	179130	0.21	nd	0.15	nd	0.04	0.02	0.15	0.07	0.03	0.05	0.00
5/21/2002	179131	nd	nd	nd	nd	nd	nd	0.07	0.04	0.01	0.02	nd
5/21/2002	179132	nd	nd	nd	nd	nd	nd	0.05	bdl	0.02	0.02	0.00
5/21/2002	179133	0.08	nd	0.08	nd	nd	nd	0.19	0.04	0.09	0.05	nd
5/21/2002	179134	nd	nd	nd	nd	nd	nd	0.05	0.03	0.02	bdl	0.00
5/21/2002	179135	0.11	nd	0.10	nd	0.01	nd	0.16	0.04	0.04	0.08	0.00
5/21/2002	179136	0.09	nd	0.09	nd	nd	nd	0.04	0.02	0.01	bdl	0.00
5/21/2002	179139	nd	nd	nd	nd	nd	nd	0.68	0.07	0.10	0.51	0.00
5/21/2002	179142	0.11	nd	0.07	nd	0.03	0.01	0.25	0.12	0.07	0.06	0.00
5/21/2002	179143	nd	nd	nd	nd	nd	nd	0.07	0.03	0.02	0.03	nd
5/21/2002	179144	0.17	nd	0.09	0.02	0.05	0.01	0.08	0.04	0.01	0.02	0.00
5/21/2002	179150	0.40	nd	0.19	0.04	0.13	0.04	0.07	0.05	0.02	bdl	0.00
5/21/2002	179151	nd	nd	nd	nd	nd	nd	0.03	0.03	bdl	bdl	0.00
5/28/2002	179152	0.09	nd	0.05	nd	0.03	0.02	0.19	0.06	0.02	0.11	0.08
5/28/2002	179153	0.13	nd	0.08	nd	0.04	0.02	0.13	0.03	0.02	0.08	0.13
5/28/2002	179154	nd	nd	nd	nd	nd	nd	0.11	0.02	0.01	0.07	0.00
5/28/2002	179155	nd	nd	nd	nd	nd	nd	0.06	bdl	0.02	0.04	0.00
5/28/2002	179156	nd	nd	nd	nd	nd	nd	0.22	0.15	0.01	0.06	0.00
5/28/2002	179157	nd	nd	nd	nd	nd	nd	0.12	0.04	0.02	0.06	0.00
5/28/2002	179158	0.01	nd	nd	nd	0.01	nd	0.11	0.05	0.01	0.05	0.00
5/28/2002	179159	0.00	nd	nd	nd	bdl	nd	0.07	0.03	0.01	0.03	0.00
5/28/2002	179160	nd	nd	nd	nd	nd	nd	0.02	bdl	0.02	bdl	0.00
5/28/2002	179161	0.00	nd	nd	nd	bdl	nd	0.08	0.03	0.02	0.03	0.00
5/28/2002	179162	0.01	nd	nd	nd	0.01	nd	0.10	0.03	0.03	0.04	0.00
5/28/2002	179163	0.01	nd	nd	nd	0.01	nd	0.07	0.02	0.02	0.03	0.00
5/28/2002	179164	0.02	nd	nd	nd	0.02	bdl	0.14	0.06	0.02	0.06	0.00
5/28/2002	179165	nd	nd	nd	nd	nd	nd	0.08	0.03	bdl	0.05	0.00
5/28/2002	179166	0.00	nd	bdl	nd	nd	nd	0.05	0.03	0.01	bdl	0.00
5/28/2002	179167	nd	nd	nd	nd	nd	nd	0.02	0.02	bdl	bdl	0.00
5/28/2002	179168	0.04	nd	0.03	nd	0.01	nd	0.09	0.04	0.02	0.03	0.00
5/28/2002	179169	nd	nd	nd	nd	nd	nd	0.06	0.03	0.01	0.02	nd
5/28/2002	179170	0.03	nd	nd	nd	0.03	nd	0.06	0.04	0.02	bdl	0.00
5/28/2002	179171	nd	nd	nd	nd	nd	nd	0.04	0.03	0.02	bdl	0.00

DSS 1084

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

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

SAMPLE NAME	124TMB, ug	135TMB, ug	ct12DCE, ug	t12DCE, ug	c12DCE, ug	NAPH&2-MN, ug	NAPH, ug	2MeNAPH, ug	MTBE, ug	11DCA, ug	111TCA, ug	12DCA, ug
MDL=	0.03	0.02		0.14	0.03		0.01	0.02	0.04	0.04	0.02	0.02
179125	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179126	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179127	nd	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179128	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179129	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179130	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179131	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179132	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	bdl	nd
179133	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
179134	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179135	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179136	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179139	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179142	bdl	bdl	nd	nd	nd	0.01	0.01	bdl	nd	nd	nd	nd
179143	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179144	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179150	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	bdl	nd
179151	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd	bdl	nd
179152	0.06	0.03	nd	nd	nd	0.11	0.05	0.06	nd	nd	nd	nd
179153	0.09	0.03	nd	nd	nd	0.16	0.09	0.07	nd	nd	nd	nd
179154	bdl	bdl	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179155	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179156	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179157	bdl	bdl	nd	nd	nd	0.03	nd	0.03	nd	nd	nd	nd
179158	bdl	bdl	nd	nd	nd	0.04	0.02	0.03	nd	nd	nd	nd
179159	bdl	bdl	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179160	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179161	nd	bdl	nd	nd	nd	0.11	0.05	0.06	nd	nd	nd	nd
179162	bdl	nd	nd	nd	nd	0.05	0.02	0.03	nd	nd	nd	nd
179163	bdl	bdl	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179164	bdl	bdl	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179165	bdl	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179166	bdl	nd	nd	nd	nd	0.04	0.02	0.02	nd	nd	nd	nd
179167	bdl	nd	nd	nd	nd	0.04	nd	0.04	nd	nd	nd	nd
179168	bdl	bdl	nd	nd	nd	0.07	0.02	0.04	nd	nd	nd	nd
179169	nd	nd	nd	nd	nd	0.00	nd	bdl	nd	nd	nd	nd
179170	bdl	nd	nd	nd	nd	0.02	0.02	bdl	nd	nd	nd	nd
179171	bdl	bdl	nd	nd	nd	0.08	0.03	0.05	nd	nd	nd	nd

No mdl is available for summed combinations of analytes. In summed columns (eg., BTEX), the repo[redacted]values should be considered ESTIMATED if any of the individu[redacted]mpounds were reported as bdl.

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

SAMPLE NAME	TCE, ug	OCT, ug	PCE, ug	14DCB, ug	CHCl3, ug	CCl4, ug	ClBENZ, ug
MDL=	0.02	0.02	0.01	0.01	0.03	0.03	0.01
179125	0.03	nd	1.24	nd	nd	nd	nd
179126	nd	nd	0.52	nd	nd	nd	nd
179127	nd	nd	0.55	nd	nd	nd	nd
179128	nd	nd	nd	nd	nd	nd	nd
179129	nd	nd	0.01	nd	nd	nd	nd
179130	nd	0.12	0.02	nd	nd	nd	nd
179131	nd	nd	nd	nd	nd	nd	nd
179132	nd	nd	0.75	nd	nd	nd	nd
179133	nd	nd	0.18	nd	nd	nd	nd
179134	nd	nd	0.33	nd	nd	nd	nd
179135	nd	nd	0.38	bdl	nd	nd	nd
179136	nd	nd	0.65	nd	0.05	nd	nd
179139	nd	nd	0.14	nd	nd	nd	nd
179142	nd	0.12	0.42	nd	nd	nd	nd
179143	0.41	nd	0.25	nd	nd	nd	nd
179144	0.84	0.13	0.21	nd	nd	nd	nd
179150	2.50	0.14	0.18	bdl	nd	nd	nd
179151	0.71	nd	0.32	nd	nd	nd	nd
179152	nd	nd	0.06	0.02	nd	nd	nd
179153	nd	nd	0.03	nd	0.08	nd	nd
179154	nd	nd	nd	nd	nd	nd	nd
179155	nd	nd	nd	nd	nd	bdl	nd
179156	nd	nd	nd	nd	nd	nd	nd
179157	nd	nd	0.38	nd	nd	nd	nd
179158	nd	nd	0.56	nd	nd	nd	nd
179159	nd	nd	0.60	nd	nd	nd	nd
179160	nd	nd	0.37	nd	nd	nd	nd
179161	nd	nd	nd	nd	nd	nd	nd
179162	nd	nd	bdl	nd	nd	nd	nd
179163	nd	nd	nd	nd	nd	nd	nd
179164	nd	nd	0.01	nd	nd	nd	nd
179165	nd	nd	nd	nd	nd	nd	nd
179166	nd	nd	nd	nd	nd	nd	nd
179167	nd	nd	nd	nd	nd	nd	nd
179168	nd	nd	nd	nd	nd	bdl	nd
179169	nd	nd	nd	nd	nd	nd	nd
179170	nd	nd	nd	nd	nd	nd	nd
179171	nd	nd	nd	nd	nd	nd	nd

USS 108K

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

ANNEX C
DSS Site 1084
Soil Sample Data Validation Results

CONTRACT LABORATORY
ANALYSIS REQUEST AND CHAIN OF CUSTODY

Internal Lab

Batch No. | SMO Use | AR/COC 605649

Dept. No./Mail Stop:	6135/1089	Date Samples Shipped:	8/22/02	Project/Task No.:	7223.02.03.02
Project/Task Manager:	~~Mike Sanders~~ Collins	Carrier/Waybill No.	11714	SMO Authorization:	Pam Puissant
Project Name:	DSS soil sampling	Lab Contact:	Edie Kent 803-556-8171	Contract #:	PO 21671
Record Center Code:	ER/1295/DSS/DAT	Lab Destination:	GEL		See attached Cotell order
Logbook Ref. No.:	ER 090	SMO Contact/Phone:	Pam Puissant/505-844-3185		
Service Order No.	CF032-02	Send Report to SMO:	Wendy Palencia/505-844-3132		
Location	Tech Area				
Building 6505	Room				

~~Waste Characterization~~ AR
-Send preliminary/copy report to:

☐ ~~Released~~ by COC No.:
☑ Validation Required

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

Reference LOV(available at SMO)

Sample No.-Fraction	ER Sample ID or Sample Location Detail	Pump Depth (ft)	ER Site No.	Date/Time(hr) Collected	Sample Matrix	Container Type	Container Volume	Preserv-ative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
059673-001	6505/1084-DF1-BH1-3-S	3'		8-20-02/0830	S	AS	4oz	4c	G	SA	VOC (8260B)	
059674-001	6505/1084-DF1-BH1-8-S	8'		0845	S	AS	4oz	4c	G	SA	VOC (8260B)	
059673-002	6505/1084-DF1-BH1-3-S	3'		0835	S	G	500ml	4c	G	SA	see below for parameter #	
059674-002	6505/1084-DF1-BH1-8-S	8'		0850	S	G	500ml	4c	G	SA	see below for parameter	
059675-001	6505/1084-DF1-BH2-3-DU	3'		0935	S	AS	4oz	4c	G	SA	VOC (8260B)	
059675-002	6505/1084-DF1-BH2-3-DU	3'		0940 ~~0945~~	S	G	500ml	4c	G	SA	see below for parameter	
059676-001	6505/1084-DF1-BH2-3-S	3'		0935	S	AS	4oz	4c	G	SA	VOC (8260B)	
059677-001	6505/1084-DF1-BH2-8-S	8'		0950	S	AS	4oz	4c	G	SA	VOC (8260B)	
059676-002	6505/1084-DF1-BH2-3-S	3'		0940	S	G	500ml	4c	G	SA	see below for parameter	
059677-002	6505/1084-DF1-BH2-8-S	8'		0955	S	G	500ml	4c	G	SA	see below for parameter	

RMMA ☐ Yes ☑ No Ref. No.
Sample Disposal ☐ Return to Client ☑ Disposal by lab
Turnaround Time ☑ Normal ☐ Rush
Return Samples By:

Sample Tracking | Smo Use
Date Entered(mm/dd/yy): 08/29/02
Entered by: JAC
Level of Rush:
QC Inits.: RK

Special Instructions/QC Requirements
EDD ☑ Yes ☐ No
Level C Package ☑ Yes ☐ No
*Send report to: Mike Sanders
Dept6135/MS/1089
Phone/505-284/2478
*Please list as separate report.

- ☒ SVOC (8270C)
- PCBs(8082)Cr6+(7197)
- HE(8330
- Total Cyanide(9010)
- RCRA Metals(6020,7000, 7471)
- Gross alpha/beta (900)

Abnormal Conditions on Receipt

Lab Use

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

1.Relinquished by		Org. 6135	Date 8-22-02	Time 10:20	4.Relinquished by	Org.	Date	Time
1. Received by		Org. 3125	Date 8/22/02	Time 1020	4. Received by	Org.	Date	Time
2.Relinquished by		Org. 3125	Date 8/22/02	Time 1050	5.Relinquished by	Org.	Date	Time
2. Received by		Org.	Date	Time	5. Received by	Org.	Date	Time
3.Relinquished by		Org.	Date	Time	6.Relinquished by	Org.	Date	Time
3. Received by		Org.	Date	Time	6. Received by	Org.	Date	Time

OFF-SITE LABORATORY
Analysis Request And Chain Of Custody (Continuation)

AR/COC- 605649

Project Name:		Project/Task Manger:				Project/Task No.: 7220.02.03.02						
Location	Tech Area											
Building	Room	Reference LOV (available at SMO)										Lab use
Sample No-Fraction	ER Sample ID or Sample Location detail	Beginning Depth (ft)	ER Site No.	Date/Time (hr) Collected	Sample Matrix	Container Type	Container Volume	Preserv-ative	Collection Method	Sample Type	Parameter & Method Requested	Lab Sample ID
059678-001	6505/1084-DF1-BH3-3-S	3'		8-20-03/1005	S	AS	4oz	4c	G	SA	VOC (8260B)	
059679-001	6505/1084-DF1-BH3-8-S	8'		1020	S	AS	4oz	4c	G	SA	VOC (8260B)	
059678-002	6505/1084-DF1-BH3-3-S	3'		1010	S	G	500ml	4c	G	SA	see below for parameter	
059679-002	6505/1084-DF1-BH3-8-S	8'		1025	S	G	500ml	4c	G	SA	see below for parameter	
059680-001	6505/1084-DF1-BH3-TB			1030	DIW	G	3x40ml	HCL	G	TB	VOC (8260B)	

Abnormal Conditions on Receipt: LAB USE

Recipient Initials

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:
SAMPLE SHIP DATE: 8/22/02

ARCOC	LAB	LAB ID	PRELIM DATE	FINAL DATE	EDD	EDD ON Q	BY
605649	GEL	65936A		9/27/2002	X	X	JAC
605650		65936B		9/27/2002	X	X	JAC
605651		65936C		9/27/2002	X	X	JAC
605655		65936D		9/27/2002	X	X	JAC

	NAME	DATE
CORRECTIONS REQUESTED/RECEIVED:	requested 10.07.02	rec'd 10.09.02
PROBLEM #:	4886	
REVIEW COMPLETED BY/DATE:	[signature]	10.07.02
FINAL TRANSMITTED TO/DATE:	[signature]	10.07.02
SENT TO VALIDATION BY/DATE:	[signature]	10/14/02
RUSH VALIDATION REQUIRED EST. TAT:		
VALIDATION COMPLETED BY/DATE:	NJ	10.28.02
TO ERDMS OR RECORDS CENTER BY/DATE:	R. Kavanaugh	11/4/02

COMMENTS:

NOV 25 2002

Sample Findings Summary

Site: DSS soil sampling — ARCDC: 605649, -50, -51, -56 — Data: Organic, Inorganic and Radiochemistry

Sample ID	All VOC (8260) compounds	BVOC	117-81-7 (bis(2-ethylhexyl)phthalate)	PCB	11097-69-1 (aroclor-1254)	ME	479-45-8 (tetryl)	Metals	7440-39-3 (barium)	7440-43-9 (cadmium)	7440-47-3 (chromium)	7782-49-2 (selenium)	7440-22-4 (silver)	7439-97-6 (mercury)	General Chemistry	5995-70-0 (total cyanide)	18540-29-9 (hexavalent chromium)	Radiochemistry	70543-80-0 (gross alpha)	All ME (8330) compounds
059660-001 6605/1084-DF1-BH3-TB	P2																			
059666-001 6610/1032-SP1-BH1-TB	P2																			
059660-001 6560/1028-SP2-BH1-TB	P2																			
059639-001 6560/1028-SP2-EB	P2																			
059639-003 6560/1028-SP2-TB	P2																			
059639-002 6560/1028-SP2-EB			9.65U,B																	
059639-005 6560/1028-SP2-EB																	UJ,HT			
059639-007 6560/1028-SP2-EB									J,B		J,B,BS		UJ,BS	UJ,BS						
059673-002 6605/1084-DF1-BH1-3-S							UJ, A		J, A2	J, BS	J	UJ,BS							J,A2	
059674-002 6605/1084-DF1-BH1-6-S							UJ, A		J, A2	J, BS	J	UJ,BS				J,B			J,A2	
059675-002 6605/1084-DF1-BH2-3-DU							UJ, A		J, A2	J, BS	J	UJ,BS							J,A2	
059676-002 6605/1084-DF1-BH2-3-S							UJ, A		J, A2	J, BS	J	UJ,BS				J,B			J,A2	
059677-002 6605/1084-DF1-BH2-6-S							UJ, A		J, A2	J, BS	J	J, BS				J,B			J,A2	
059678-002 6605/1084-DF1-BH3-3-S							UJ, A		J, A2	J, BS	J	UJ,BS				J,B			J,A2	
059679-002 6605/1084-DF1-BH3-6-S							UJ, A		J, A2	J, BS	J	UJ,BS				J,B			J,A2	
059661-002 6610/1032-DF1-BH1-2-S							UJ, A		J, A2	J, BS	J	UJ,BS							J,A2	
059662-002 6610/1032-DF1-BH1-7-S							UJ, A		J, A2		J	UJ,BS							J,A2	
059663-002 6610/1032-SP1-BH1-12-S							UJ, A		J, A2	J, BS	J	J, BS							J,A2	
059664-002 6610/1032-SP1-BH1-17-S							UJ, A		J, A2	J, BS	J	UJ,BS							J,A2	
059665-002 6610/1028-SP1-BH1-14-S							UJ, A		J, A2	J, BS	J	J, BS							J,A2	
059667-002 6560/1028-SP1-BH1-19-S					J		UJ, A		J, A2	J, BS	J	J, BS							J,A2	
059665-002 6560/1028-SP2-BH1-7-S							UJ, A		J, A2		J	UJ,BS							J,A2	
059669-002 6560/1028-SP2-BH1-12-S							UJ, A		J, A2	J, BS	J	J, BS							J,A2	

Sample ID	All ME (8330) compounds
059673-002 6605/1084-DF1-BH1-3-S-RE	UJ, HT
059674-002 6605/1084-DF1-BH1-6-S-RE	UJ, HT
059675-002 6605/1084-DF1-BH2-3-DU-RE	UJ, HT
059676-002 6605/1084-DF1-BH2-3-S-RE	UJ, HT
059677-002 6605/1084-DF1-BH2-6-S-RE	UJ, HT
059678-002 6605/1084-DF1-BH3-3-S-RE	UJ, HT
059679-002 6605/1084-DF1-BH3-6-S-RE	UJ, HT
059661-002 6610/1032-DF1-BH1-2-S-RE	UJ, HT
059662-002 6610/1032-DF1-BH1-7-S-RE	UJ, HT
059663-002 6610/1032-SP1-BH1-12-S-RE	UJ, HT
059664-002 6610/1032-SP1-BH1-17-S-RE	UJ, HT
059665-002 6610/1028-SP1-BH1-14-S-RE	UJ, HT
059667-002 6560/1028-SP1-BH1-19-S-RE	UJ, HT
059665-002 6560/1028-SP2-BH1-7-S-RE	UJ, HT
059669-002 6560/1028-SP2-BH1-12-S-RE	UJ, HT
059639-004 6560/1028-SP2-EB-RE	UJ, HT

Validated By: K Mal

Date: 10/23/02

Analytical Quality Associates, Inc.
616 Maxine NE
Albuquerque, NM 87123
Phone: 505-299-5201
Fax: 505-299-6744
Email: minteer@aol.com

MEMORANDUM

DATE: October 23, 2002

TO: File

FROM: Linda Thal

SUBJECT: Radiochemical Data Review and Validation - SNL
Site: DSS soil sampling
ARCOC 605649 605650 605651 605655
GEL SDG # 65936 and 65944 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 (Gross Alpha/Beta). Problems were identified with the data package that resulted in the qualification of data.

Batch 198983 soils
The MS/MSD %R for gross alpha (73/68%) was < QC acceptance criteria (75–125%). All associated sample results were > MDA and will be qualified "J, A2".

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.

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. The equipment blank (65944-012) had a nonvolatile beta value > MDA. However, all associated sample results were > 5X the EB value; thus no data will be qualified.

Matrix Spike (MS) Analysis

The MS/MSD analyses met all QC acceptance criteria except as mentioned above in the summary section and as follows:

Batch 198970 water
The MS/MSD was performed on a sample of similar matrix from another SNL SDG. No data will be qualified as a result.

Laboratory Control Sample (LCS) Analysis

The LCS analyses met all QC acceptance criteria.

Replicates

The replicate analyses met all QC acceptance criteria.

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 and equipment blank (EB) was submitted on the ARCOC. There are no "required" validation procedures for assessing a file duplicate.
No 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.
616 Maxine NE
Albuquerque, NM 87123
Phone: 505-299-5201
Fax: 505-299-6744
Email: minteer@aol.com

MEMORANDUM

DATE: 10/18/02

TO: File

FROM: Linda Thal

SUBJECT: Organic Data Review and Validation - SNL
Site: DSS soil sampling
ARCOC # 605649, 605650, 605651, 605655
GEL SDG # 65936 and 65944
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 – Batch 197301 water
No MS/MSD or replicate sample was performed for the batch. All associated sample results will have the "P2" descriptor added due to lack of precision information.

SVOC – Batch 196776 water
Bis (2-ethylhexyl) phthalate was detected in the method blank (MB) at a value > DL but < RL. Sample 65944-006 (equipment blank) had a bis(2-ethylhexyl) phthalate value > DL, < RL and < 10X the MB value and will be qualified "U, B" at the RL.

PCB – Batch196833 soil
Sample 65936-028 had an aroclor 1254 value > DL but < RL. The RPD (34%) between the primary and confirmation column was > QC acceptance criteria (25%). The highest detected result is reported and will be qualified "J".

HE – Batch 196863 soil
The LCS %R for tetryl (51%) was < QC acceptance criteria (65-124%). All associated samples were non-detect for tetryl and will be qualified "UJ, A".

HE – Batch 201462 soil
Samples 65936 –016 thru -030 required reanalysis due to a QC failure. Both sets of data are on the Certificate of Analysis and both sets of data will be validated. The reanalysis was out of holding time. The reanalysis calibration, sample and QC data are provided. All associated sample results were non-detect and will be qualified "UJ, HT".

HE – Batch 201060 water
Sample 65944-008 (equipment blank) was reanalyzed at more than 2X the method specified holding time. Both sets of data are on the Certificate of Analysis and both sets of data will be validated. The reanalysis calibration, sample and QC data are provided. The associated 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.

VOC – Batch 197301 water: It should be noted that, according to the sample receipt and review form, sample 65944-001 was received with a little headspace. It is not known what affect this will have on the data; thus no data will be qualified.

Calibration

All Analysis: All initial and continuing calibration acceptance criteria were met with the exception of the following:

VOC-Batch 196955 soil
The CCV had a %D >20% but < 40% with a positive bias for dibromochloromethane (23%). The associated sample results were non-detect for dibromochloromethane and are therefore unaffected by a positive bias. No data will be qualified.

VOC-Batch 197301 water
The CCV had a %D >20% but < 40% with a negative bias for cis-1,3-dichloropropene (24%) and trans-1,3-dichlorpropene (25%).The associated sample results were non-detect for cis-1,3-dichloropropene and trans-1,3-dichloropropene and no data will be qualified.

SVOC – Batch 196839 soil
The initial calibration had a correlation coefficient >0.9 but <0.99 for 2-nitrophenol and 4-chlorophenyl-phenylether. The associated sample results were non-detect and no data will be qualified.
The CCV had a %D > 20% but < 40% with a negative bias for 3,3'-dichlorobenzidine (23%) and 4-chloroaniline (26%). The associated sample results were non-detect and no data will be qualified.
The CCV had a %D > 20% but < 40% with a positive bias for several compounds (see DV worksheet). The associated sample results were non-detect and therefore unaffected by a positive bias; thus no data will be qualified.

SVOC – Batch 196776 water
The CCV had a %D > 20% but < 40% with a negative bias for 2,4-dimethylphenol (25%). The associated sample results were non-detect and no data will be qualified.

Blanks

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

VOC
Trip blanks 65944-003 and –005 had toluene values > DL but < RL. The associated sample results were non-detect and no data will be qualified.

Surrogates

All Analysis: All surrogate acceptance criteria were met.

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 mentioned above in the summary section and as follows:

VOC-Soils

It should be noted that the sample used for the MS/MSD was of similar matrix from SNL SDG 65745. No data will be qualified as a result.

SVOC – Batch 196839 soil and 196776 water
Several compounds (see DV worksheet) had %R < QC acceptance criteria (75 – 125%). Using professional judgment, no data will be qualified.
Several compounds (soils only - see DV worksheet) had RPDs > QC acceptance criteria (20%). Using professional judgment, no data will be qualified.

HE – Batch 201462 soil
It should be noted that the sample used for the MS/MSD was of similar matrix from SNL SDG 65475. No data will be qualified as a result.

HE – Batch 196860 and 201060 water
No MS/MSD was extracted with these batches. An LCS/LCSD was extracted and passed all QC acceptance criteria for accuracy and precision.

Laboratory Control Samples (LCS/LCSD) Analysis

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

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.

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

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

HE – Batch 201462 soil
The %R for 4-amino-2,6-dinitrotoluene (74%) was < QC acceptance recovery (79 – 130%). The MS/MSD %R for 4-amino-2,6-dinitrotoluene was in criteria, and using professional judgment no data will be qualified.

HE – Batch 196860 and 201060 water
An LCS/LCSD was extracted and passed all QC acceptance criteria for accuracy and precision

Detection Limits/Dilutions

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

SVOC – Batch 196776 water
It should be noted that 500ml was used for the MS/MSD extraction (DF=2X).

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, equipment blank and a field duplicate were submitted on the ARCOC. There are no "required" validation procedures for a field duplicate.

SVOC, PCB and HE: An equipment blank and field duplicate was submitted on the ARCOC. There are no "required" validation procedures for a field duplicate. No 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.
616 Maxine NE
Albuquerque, NM 87123
Phone: 505-299-5201
Fax: 505-299-6744
Email: minteer@aol.com

MEMORANDUM

DATE: 10/23/02

TO: File

FROM: Linda Thal

SUBJECT: Inorganic Data Review and Validation - SNL
Site: DSS soil sampling
ARCOC # 605649, 605650, 505651, 605655
GEL SDG # 65936 and 65944
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 7470/1 (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 soils
Cadmium was detected in the continuing calibration blank (CCB) at a value > DL but < RL. All associated sample results for cadmium (excluding sample 65936-024 and –029) had cadmium values < 5X the CCB value and will be qualified "J, B3".

Selenium was detected in the CCB at a negative value, with an absolute value > DL but < RL. Sample 65936-020, -25, -27, -28 and –30 had selenium values > DL but < 5X the CCB value and will be qualified "J, B3". All remaining samples had selenium values that were non-detect and will be qualified "UJ, B3"

The MS %R for barium (134%) was > QC acceptance criteria (75-125%). All associated sample results were > RL and will be qualified "J, A2".

The replicate RPD for chromium (46%) was > QC acceptance criteria (20%). All associated sample values for chromium were > 5X RL and will be qualified "J".

ICP-AES – Metals water
Barium was detected in the method blank (MB), and chromium in the MB and CCB at values greater than the DL but < RL. The sample results were < 5X the blank values and will be qualified "J, B" for barium and "J, B, B3" for chromium.

Silver was detected in the initial calibration blank (ICB) at a negative value, with an absolute value > DL but < RL. The sample result was non-detect and will be qualified "UJ, B3".

HG – water
Mercury was detected in the CCB at a negative value, with an absolute value > DL but < RL. The sample result was non-detect and will be qualified "UJ, B3".

Total Cyanide - soil
The MB had a value > DL but < RL. Samples 65936-017, -019, -020, -021 and –022 results were > DL but < 5X the MB value and will be qualified "J, B".

Hexavalent Chromium – water
Sample 65944-010 (equipment blank) was run after the method specified hold time had expired but within 2X the method specified hold time. The sample result was non-detect and will be qualified "UJ, HT".

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

Holding Times/Preservation

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

Calibration

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

Blanks

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

ICP-AES – Metals soils
Chromium and barium were detected in the EB (65944-011) at a value > DL but < RL. All associated sample results were > 5X the EB value and will not be qualified.

Cadmium was detected in the CCB at a value > DL but < RL. Sample 65936-024 and –029 had cadmium values > 5X the CCB value and will not be qualified.

ICP-AES – Metals water
Lead, silver and selenium were detected in one or more of the blanks at values > DL but < RL. The sample results for lead and selenium were non-detect and will not be qualified. The sample result for silver was non-detect and is qualified due to a negative value observed in the ICB. The silver result will not be further qualified.

Total Cyanide - soil
The MB had a value > DL but < RL. Samples 65936-016, -018, -023 through -030 results were non-detect 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 – Metals water
The sample used for the MS was of similar matrix from SNL SDG 66619. No data will be qualified as a result.

HG – soils
The sample used for the MS was of similar matrix from SNL SDG 65745. No data will be qualified as a result.

HG – water
The sample used for the MS was of similar matrix from SNL SDG 65748. No data will be qualified as a result.

Total Cyanide - water
The sample used for the MS was of similar matrix from SNL SDG 66197. No data will be qualified as a result.

Replicate Analysis

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

ICP-AES – Metals water
The sample used for the replicate was of similar matrix from SNL SDG 66619. No data will be qualified as a result.

HG – soils
The sample used for the replicate was of similar matrix from SNL SDG 65745. No data will be qualified as a result.

HG – water
The sample used for the replicate was of similar matrix from SNL SDG 65748. No data will be qualified as a result.

Total Cyanide - water
The sample used for the replicate was of similar matrix from SNL SDG 66197. No data will be qualified as a result.

ICP Interference Check Sample (ICS)

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

All Other Analyses: No ICS required.

ICP Serial Dilution

ICP-AES soils and water: The serial dilutions met QC acceptance criteria except as follows:

ICP-AES – Metals water
The sample used for the serial dilution was of similar matrix from SNL SDG 66619. 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 soils: All samples were diluted 2X. Sample 65936-016 and –019 were diluted 5X for selenium.

All Other Analyses: No dilutions were performed.

Other QC

All Analyses: A field duplicate and equipment blank was submitted on the ARCOC. No field blank was submitted on the ARCOC.

The ARCOC requests metals analysis by method SW-846 6020 (ICP-MS).

No raw data was submitted with the package.

No other specific issues were identified which affect data quality.

Data Validation Summary

Site/Project: DJS Soil Sampling Project/Task #: 7223.02.03.02 # of Samples: 30/12 Matrix: Soils / Aqueous

AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936-001 thru -030

Laboratory: GEL 65944-001 thru 012

Laboratory Report #: 65936

QC Element	Analysis										
	Organics				Inorganics				RAD	Hexavalent Chromium / Other	
	VOC	SVOC	Pesticide/ PCB	HPLC (HE)	ICP/AES	GFAA/ AA	CVAA (Hg)	CN			
1. Holding Times/Preservation	✓	✓	✓	✓ / UJ, HT	✓		✓	✓	✓	✓ / UJ HT	
2. Calibrations	✓	✓	✓	✓	✓		✓	✓	✓	✓	
3. Method Blanks	✓	✓ / U, B	✓	✓	J, UJ, B3 / J, UJ, B, B3		✓ / UJ B3	J, B / ✓	✓	✓	
4. MS/MSD	✓ / P2	✓	✓	✓	J, A2 / ✓		✓	✓	J, A2 / ✓	✓	
5. Laboratory Control Samples	✓	✓	✓	UJ, A / ✓	✓		✓	✓	✓	✓	
6. Replicates					J / ✓		✓	✓	✓	✓	
7. Surrogates	✓	✓	✓	✓						NA	
8. Internal Standards	✓	✓									
9. TCL Compound Identification	✓	✓									
10. ICP Interference Check Sample					✓						
11. ICP Serial Dilution					✓						
12. Carrier/Chemical Tracer Recoveries									NA		
13. Other QC	TB DUP EB	EB DUP	* EB DUP	EB DUP	EB DUP		DUP EB	DUP EB	DUP EB	DUP EB	

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

Check (√) = Acceptable
Shaded Cells = Not Applicable (also "NA")
NP = Not Provided
Other: *PCB confirmation "J"

Reviewed By: [signature] Date: 10.23.02

Holding Time and Preservation

Site/Project: DSS Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936-001 thru -030

Laboratory: GEL Laboratory Report #: 65936/-944 65944-001 thru -012

# of Samples: 42 Matrix: Soil & H_2O

Sample ID	Analytical Method	Holding Time Criteria	Days Holding Time was Exceeded	Preservation Criteria	Preservation Deficiency	Comments
65936-001 thru -030 -RE	SW-846-8330	14 days	14 ~~28~~ days	NA	NA	All results qualified
65944-008-RE	SW846-8330	7 days	15 LT ~~7~~ days	NA	NA	UJ, HT
65944-010	SW-846-7196A	24 hours	7 hrs 50 min	NA	NA	UJ, HT

Reviewed By: [signature] Date: 10.23.02

Semivolatile Organics

Site/Project: _____ AR/COC #: 605649, -50, -51, -55 Batch #s: _____

Laboratory: _____ Laboratory Report #: _____ # of Samples: _____ Matrix: _____

IS	BNA	CAS #	NAME	TCL	Min. RF	Intercept	Calib. RF	Calib. RSD/ R^2	CCV %D	Method Blanks	LCS	LCSD	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Field Blanks	
						1 2	>.05 2	<20%/ 0.99 2	20% 2	1 2	1 2			1 2	1 2	1 2				
3	BN	100-01-6	4-Nitroaniline		0.01		✓	✓	✓	✓	✓	NA					NA	✓	NA	
3	A	100-02-7	4-Nitrophenol		0.01				+23.5		✓✓			✓✓	✓✓	✓✓				
3	BN	83-32-9	Acenaphthene		0.90				✓		✓✓			✓✓	✓✓	✓✓				
3	BN	208-96-8	Acenaphthylene		0.90															
4	BN	120-12-7	Anthracene		0.70															
5	BN	56-55-3	Benzo(a)anthracene		0.80															
6	BN	50-32-8	Benzo(a)pyrene		0.70	✓	✓	✓												
6	BN	205-99-2	Benzo(b)fluoranthene		0.70															
6	BN	191-24-2	Benzo(g,h,i)perylene		0.50	✓	✓	✓	+57											
6	BN	207-08-9	Benzo(k)fluoranthene		0.70				✓											
2	BN	111-91-1	bis(2-Chloroethoxy)methane		0.30				✓											
1	BN	111-44-4	bis(2-Chloroethyl)ether		0.70				+54											
1	BN	108-60-1	bis(2-chloroisopropyl)ether		0.01				+23											
5	BN	117-81-7	bis(2-Ethylhexyl)phthalate		0.01	✓	✓	✓	✓	2.23								2.58J	→ U,B at RL (9.66)	
5	BN	85-68-7	Butylbenzylphthalate		0.01													✓		
4	BN	86-74-8	Carbazole		0.01															
5	BN	218-01-9	Chrysene		0.70															
6	BN	53-70-3	Dibenz(a,h)anthracene		0.40	✓	✓	✓	+48											
3	BN	132-64-9	Dibenzofuran		0.80				✓											
3	BN	84-66-2	Diethylphthalate		0.01															
3	BN	131-11-3	Dimethylphthalate		0.01															
4	BN	84-74-2	Di-n-butylphthalate		0.01															
6	BN	117-84-0	Di-n-octylphthalate		0.01	✓	✓	✓												
4	BN	206-44-0	Fluoranthene		0.60															
3	BN	86-73-7	Fluorene		0.90	✓	✓	✓												
4	BN	118-74-1	Hexachlorobenzene		0.10						✓✓			50 ✓	43 ✓	✓✓				
2	BN	87-68-3	Hexachlorobutadiene		0.01	✓	✓	✓			✓✓			41 ✓	35 ✓	✓✓				
3	BN	77-47-4	Hexachlorocyclopentadiene		0.01															
1	BN	67-72-1	Hexachloroethane		0.30						✓✓			40/66	37/70	✓✓				

Comments:

Semivolatile Organics

Site/Project: _____ AR/COC #: 605649, -50, -51, -55 Batch #s: _____

Laboratory: _____ Laboratory Report #: _____ # of Samples: _____ Matrix: _____

IS	BNA	CAS #	NAME	TCL	Min. RF	Intercept	Calib. RF	Calib. RSD/ R^2	CCV %D	Method Blanks	LCS	LCS D	LCS RPD	MS	MSD	MS RPD	Field Dup. RPD	Equip. Blanks	Field Blanks		
							>.05	<20%/ 0.99	20%	1 2	1 2			1 2	1 2	1 2					
6	BN	193-39-5	Indeno(1,2,3-cd)pyrene	✓	0.50	✓ ✓	✓ ✓	✓ ✓	245 ✓	✓ ✓		NA					NA	✓	NA		
2	BN	78-59-1	Isophorone		0.40				✓												
2	BN	91-20-3	Naphthalene		0.70																
2	BN	98-95-3	Nitrobenzene		0.20						✓ ✓			82 74	54 ✓	✓ ✓					
4	BN	86-30-6	N-Nitrosodiphenylamine (1)		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
IN CRITERIA								

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

Comments: Pyride on H2O QC not TAL not validated

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
IN CRITERIA												

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

PCBs (SW 846 - Method 8082)

Site/Project: DJJ Soil Sampling AR/COC #: 605649 - 50, -51, -55 Laboratory Sample IDs: 65936 - 016 thru - 030
659HH - 007 (EB)

Laboratory: GEL Laboratory Report #: 65936, 659HH

Methods: SW - 846 8082

# of Samples: 15 & 1 Matrix: Soil & EB Batch #s: 196833 (1) (Soil) 196769 (2) (H2O)

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

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

Confirmation

Sample	CAS #	RPD > 25%	Sample	CAS #	RPD > 25%
65936 - 028	125H	34 %			
The highest	detected	result	reported.	will be	qualified "J"

Comments: 196769 The confirmation column had a 1016 CCV 720%. As the sample was ND, this would have no impact on the data and confirmation is not necessary.

NO RAW DATA !

Reviewed By: [signature] Date: 10.21.02

WS 1

High Explosives (SW 846 Method 8330)

Site/Project: DJJ Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936 - 016 thru - 030

Laboratory: CAL Laboratory Report #: 65936

Methods: SW- 846 8330 ① ②

# of Samples: 15 Matrix: Soils Batch #s: 196863 Re 201462 (Soils)

CAS #	NAME	I / L	Intercept	Curve R^2 .99	CCV %D 20%	Method Blanks U	LCS	LCSD	LCS RPD 20%	MS	MSD	MS RPD 120%	Field. Dup. RPD	Equip. Blanks U	Field Blanks U		
				1 2	1 2	1 2	1	2		1 2	1 2	1 2					
2691-41-0	HMX		NA	✓ ✓	✓ ✓	✓ ✓	✓	✓	NA	✓ ✓	✓ ✓	✓ ✓	✓	✓	NA		
121-82-4	RDX																
99-35-49	1,3,5-Trinitrobenzene																
99-65-0	1,3-dinitrobenzene																
98-95-3	Nitrobenzene						(65-124%)										
479-45-8	Tetryl						51	S									
118-96-7	2,4,6-trinitrotoluene						✓										
35572-78-2	2-amino-4,6-dinitrotoluene							(79-123%)									
19406-51-0	4-amino-2,6-dinitrotoluene							74									
121-14-2	2,4-dinitrotoluene							✓									
606-20-2	2,6-dinitrotoluene																
88-72-2	2-nitrotoluene																
99-99-0	4-nitrotoluene																
99-08-1	3-nitrotoluene																
78-11-5	PETN																

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

Confirmation

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

Comments: 201462 MS/MSD 65~~475~~ HT ONLY SOIL

All samples
196863 - Tetryl UJ, A

201462 - All compounds UJ, HT

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: [signature] Date: 10.21.02

WS 2 of 2

High Explosives (SW 846 Method 8330)

Site/Project: DSS Soil Sampling AR/COC #: 605649 LT 55 Laboratory Sample IDs: 65944 - 008

Laboratory: GEL Laboratory Report #:

Methods: SW-846 8330

# of Samples: 1 Matrix: Aqueous Batch #s: 196860 re 201060

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

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

Confirmation

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

Comments: 201060 196860 NO MS/MSD. MS/MSD used for accuracy & precision.

Requested XT sheet for 196859 & CCVs for 196860.

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: [signature] Date: 10.21.02

WS ● 2

Inorganic Metals

Site/Project: DSS Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936-016 thru -030

Laboratory: GEL Laboratory Report #: 65936

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

# of Samples: ~~16~~ 15 LT Matrix: Soils Batch #s: 197745 (Hg) 196732 (Metals)

CAS # / Analyte	QC Element (ug/l)																			
	TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS ②	MSD	MSD RPD	① Rep. RPD	ICS AB	Serial Dilution	~~Field~~ LT Dup. RPD	65944 Equip. Blanks 011	Field Blanks	Field Dup RPD
7429-90-5 Al								NA			NA							NA	
7440-39-3 Ba	✓	✓	✓	✓	✓	✓	✓			13%			✓	✓	✓	.000329 mg/l			✓
7440-41-7 Be																			
7440-43-9 Cd	✓	✓	✓	✓	0.517	✓	✓			✓			NA	✓	NA		✓		✓
7440-70-2 Ca																			
7440-47-3 Cr	✓	✓	✓	✓	✓	✓	✓			✓			46%	✓	✓	.00062 mg/l			✓
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	✓	✓	✓	✓	✓④	✓	✓			✓			NA	✓	NA		✓		✓
7440-23-5 Na																			
7440-62-2 V																			
7440-66-6 Zn																			
7439-92-1 Pb	✓	✓	✓	✓	✓	✓	✓			✓			✓	✓	✓		✓		✓
7782-49-2 Se	✓	✓	✓	✓	③④	✓	✓			✓			NA	✓	NA		✓		✓
7440-38-2 As	✓	✓	✓	✓	✓	✓	✓			✓			✓	✓	NA		✓		✓
7440-36-0 Sb																			
7440-28-0 Tl																			
7439-97-6 Hg	✓	✓	✓	✓	✓	✓	✓			✓			NA				✓		✓
Cyanide CN																			

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

Comments: Hg Dup/MS SDG 65745

ASI soils 2x SA 16 & 19 CR SE 5X

① SA 75% RPD CC.

Reviewed By: [signature] Date: 10.21.02

③ ~~SE~~ SA 20 CCB -2.0 ug/l 9/17

B-14 SA 17 & 18 -2.88 ug/l 9/10

SA 16 & 19 -1.66 ug/l 9/10

④ SE & Ag - NO

SA 21 → 30 9/11

SE -2.52 ug

Inorganic Metals

Site/Project: DSS Soil Sampling AR/COC #: 605655 Laboratory Sample IDs: 65944-011 (CB)

Laboratory: GEL Laboratory Report #: 65944

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

# of Samples: 1 Matrix: Aqueous Batch #s: 19721 (Hg) 19996 9 (Metals)

CAS #/ Analyte	QC Element																				
				ug/L	ug/L														ug/L	
	TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD	ICS AB	Serial Dilution	Field Dup. RPD	Equip. Blanks	Field Blanks	5X DL	5X B
7429-90-5 Al																				
7440-39-3 Ba	✓	✓	✓	✓		.00025	✓	NA		✓	NA		✓	✓	✓	NA	NA	NA		.00125
7440-41-7 Be																				5X J, B
7440-43-9 Cd	✓	✓	✓	✓		✓	✓			✓			NA	✓	NA					
7440-70-2 Ca																				
7440-47-3 Cr	✓	✓	✓	✓	.00104	.00867	✓			✓			NA	✓	NA					J, B, B3
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																			ND =	
7440-22-4 Ag	✓	✓	✓	[-.00108]	.0026	.00085	✓			✓			NA	✓	NA				UJ, B3	
7440-23-5 Na																				
7440-62-2 V																				
7440-66-6 Zn																				
7439-92-1 Pb	✓	✓	✓	✓	.00195	.00259	✓			✓			NA	✓	NA					ND NOQ
7782-49-2 Se	✓	✓	✓	✓	.00317	✓	✓			✓			NA	✓	NA					ND NOQ
7440-38-2 As	✓	✓	✓	✓		✓	✓			✓			✓	✓	NA					
7440-36-0 Sb																				
7440-28-0 Tl																				
7439-97-6 Hg	✓	✓	✓	✓	[.0000458]	✓	✓			✓✓			NA						ND =	
																			UJ, B3	
Cyanide CN																				

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

Comments: Metals DUP MS SO 66619 SNAS SO4

Hg Dup MS 65748 SNAS SO4
65920

Reviewed By: [signature] Date: 10.22.02.

General Chemistry

Site/Project: DSJ Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936 - 016 thru - 030 (Soils)
65944 - 010, - 009 (EB)

Laboratory: GEL Laboratory Report #: 65936

Methods: SW-846 9012A (TCN) 7196A (Hex Cr) 197510 (prep - 8/29) 196887 (prep 8/29)

# of Samples: 15 1 Matrix: Soils EB Batch #s: 197511 (soil TCN) 196888 (soil Cr⁶)

CAS #	Analyte	TAL	ICV	CCV	ICB	CCB	Method Blanks	LCS	LCSD	LCSD RPD	MS	MSD	MSD RPD	Rep. RPD	ICS AB	Serial Dilution	Field Dup. RPD	Equip. Blanks	Field Blanks	MB x 5
	Soils						ug/kg										QC Element			
	Total CN		✓	✓	✓	✓	0.0869 J	✓✓	NA	NA	✓✓	NA	NA	NA	NA	NA	✓	NO	NA	0.4345 mg/kg (1)
	Hex avalent Cromium		✓	✓	✓	✓	✓	✓	NA	NA	✓✓	NA	NA	NA	NA	NA	✓	NO	NA	
*	H2O (EB)																			
	Total CN		✓	✓	✓	✓	✓	✓	NA	NA	✓	NA	—	NA	→	→	→	→	→	
	Hexavalent Chromium		✓	✓	✓	✓	✓	✓	NA	NA	✓ 7/6	NA	—	NA	→	→	→	→	→	
											(80 - 122% QC Criteria) (75 - 125% QC Criteria)									

Comments:

* EB = 659HH - 009 (Total CN) Method 9010B (prep) 9012A (A) 199200 prep 9/04 (13 days) 199201 Anal 9/05

659HH - 010 (Cr⁶) Method 7196A 196733 (Anal 8/23 16.15) Cell on 8/22 @ 8.25 # UJ, (2) HT > 7 hours.

TCN - H2O — DUP/MS 66197

Reviewed By: [signature] Date: 10.23.02

SB (1) 017, -019, -020, -021, -022, < 5X MB value

Radiochemistry

Site/Project: DSS Soil Sampling AR/COC #: 605649, -50, -51, -55 Laboratory Sample IDs: 65936 -016 thru - 030 soils

Laboratory: GEL Laboratory Report #: 65936 65944 - 012 (EB)

Methods: EPA 900 (Gross A/B)

# of Samples: 15 & 1 Matrix: Soils & Aqueous (EB) Batch #s: 198983 (soils) 198970 (H2O)

Analyte	QC Element												
	Method Blanks	LCS	MS/msd	Rep RER	Equip. Blanks	Field Dup. RER	Field Blanks	Sample ID	Isotope	IS/Trace	Sample ID	Isotope	IS/Trace
Criteria	U	20%	25%	<1.0	U	<1.0	U	NA		50-105			50-105
H3													
U-238													
U-234													
U-235/-236													
Th-232													
Th-228													
Th-230			(75-125%)										
Pu-239/-240													
Soils Gross Alpha ✓	✓	✓	✓	73/68	✓	ND	✓	NA					
Nonvolatile Beta ✓	✓	✓	✓ ✓	✓	0.448	✓	NA						
Ra-226					> MDA								
Ra-228													
Ni-63					5X = 2.24								
Gamma Spec. Am-241													
Gamma Spec. Cs-137													
Gamma Spec. Co-60													
EB Gross Alpha	✓	✓	✓ ✓	✓	NA	NA	NA						
Nonvolatile Beta	✓	✓	✓ ✓	✓	1	1	1						

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

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

Comments: H2O - 65919 - Dup/MS

Gross α All detects J, A2

All SA > 5X EB. Nonvolatile β

Reviewed By: [signature] Date: 10.23.02

Contract Verification Review (CVR)

Project Leader Collins | Project Name DSS Soil Sampling | Case No. 7223_02.03.02

AR/COC No. 605649, 650, 651, 655 | Analytical Lab GEL | SDG No. 65936A, B, C, D

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

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

Line No.	Item	Complete? Yes	Complete? No	If no, explain	Resolved? Yes	Resolved? No
1.1	All items on COC complete - data entry clerk initialed and dated	X				
1.2	Container type(s) correct for analyses requested	X				
1.3	Sample volume adequate for # and types of analyses requested	X				
1.4	Preservative correct for analyses requested	X				
1.5	Custody records continuous and complete	X				
1.6	Lab sample number(s) provided and SNL sample number(s) cross referenced and correct	X				
1.7	Date samples received	X				
1.8	Condition upon receipt information provided	X		605649-one vial received w/ headspace, was not used for analyses		

2.0 Analytical Laboratory Report

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

3.0 Data Quality Evaluation

Item	Yes	No	If no, Sample ID No./Fraction(s) and Analysis
3.1 Are reporting units appropriate for the matrix and meet contract specified or project-specific requirements? Inorganics and metals reported as ppm (mg/liter or mg/Kg)? Tritium reported in picocuries per liter with percent moisture for soil samples? Units consistent between QC samples and sample data	X		
3.2 Quantitation limit met for all samples	X		
3.3 Accuracy a) Laboratory control samples accuracy reported and met for all samples		X	tetryl re-extracted and analyzed out of holding time for HE analysis
b) Surrogate data reported and met for all organic samples analyzed by a gas chromatography technique	X		
c) Matrix spike recovery data reported and met		X	HE MS recovery data not within SNL contractual limits but within GEL acceptance limits; NPN MS not within SNL limits but within GEL acceptance limits; barium not within acceptance limits; alpha MS recovery failed low
3.4 Precision a) Replicate sample precision reported and met for all inorganic and radiochemistry samples	X		
b) Matrix spike duplicate RPD data reported and met for all organic samples	X		
3.5 Blank data a) Method or reagent blank data reported and met for all samples		X	bis(2-Ethylhexyl)phthalate detected in SVOC method blank; barium, chromium, lead, silver detected in RCRA metals DI water method blank; cyanide detected in method blank
b) Sampling blank (e.g., field, trip, and equipment) data reported and met		X	toluene detected in VOC trip blank; barium, detected in RCRA metals DI water equipment blank
3.6 Contractual qualifiers provided: "J"- estimated quantity; "B"-analyte found in method blank above the MDL for organic or above the PQL for inorganic; "U"- analyte undetected (results are below the MDL, IDL, or MDA (radiochemical); "H"-analysis done beyond the holding time	X		
3.7 Narrative addresses planchet flaming for gross alpha/beta	X		
3.8 Narrative included, correct, and complete	X		
3.9 Second column confirmation data provided for methods 8330 (high explosives) and 8082 (pesticides/PCBs)	X		

Contract Verification Review (Continued)

4.0 Calibration and Validation Documentation

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

Contract Verification Review (Concluded)

5.0 Problem Resolution

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

Sample/Fraction No.	Analysis	Problems/Comments/Resolutions
059687-001	VOC	incorrect sample ID/Client Description (page 51): correct ID is 6560/1028-SP1-BH1-19S
059639-007	RCRA Metals	missing reviewed by signature (page 242)

Were deficiencies unresolved? (Yes) No

Based on the review, this data package is complete. Yes (No)

If no, provide: nonconformance report or correction request number 4886 and date correction request was submitted: 10/07/02

Reviewed by: [signature] Date: 10/07/02 Closed by: [signature] Date: 10-09-02

ANNEX D
DSS Site 1084
Risk Assessment

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DSS SITE 1084: RISK ASSESSMENT REPORT

I. Site Description and History

Drain and Septic Systems (DSS) Site 1084, the Building 6505 Septic System, at Sandia National Laboratories/New Mexico (SNL/NM), is located in Technical Area-III on federally owned land controlled by Kirtland Air Force Base (KAFB) and permitted to the U.S. Department of Energy (DOE). The septic system consisted of a 325-gallon septic tank connected to a drainfield consisting of four 60-foot-long drain lines. Available information indicates that Building 6505 was constructed in 1954 (SNL/NM March 2003), and it is assumed that the septic system was also constructed at that time. By June 1991, the septic system discharges were routed to the City of Albuquerque sanitary sewer system (Jones June 1991). The old septic system line was disconnected and capped, and the system was abandoned in place concurrent with this change (Romero September 2003).

Environmental concern about DSS Site 1084 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 the 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 west. The closest drainage lies south of the site and terminates in the playa just west of KAFB. No springs or perennial surface-water bodies are located within the near 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). Surface-water runoff in the vicinity of the site is minor because the surface is flat or slopes gently to the west. Infiltration of precipitation is almost nonexistent as virtually all of the moisture subsequently undergoes evapotranspiration. The estimates of evapotranspiration for the KAFB area range from 95 to 99 percent of the annual rainfall (SNL/NM March 1996). Most of the area immediately surrounding DSS Site 1084 is unpaved with some native vegetation, and no storm sewers are used to direct surface water away from the site.

DSS Site 1084 lies at an average elevation of approximately 5,433 feet above mean sea level. The groundwater beneath the site occurs in unconfined conditions in essentially unconsolidated silts, sands, and gravels. The depth to groundwater is approximately 508 feet below ground surface (bgs). Groundwater flow is thought to be west in this area (SNL/NM March 2002). The nearest groundwater monitoring well is approximately 3,000 feet west of the site. The nearest production wells are northwest and northeast of the site and include KAFB-4 and KAFB-11, which are approximately 3.4 and 3.6 miles away, respectively.

II. Data Quality Objectives

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

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

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

Table 1 summarizes the rationale for determining the sampling locations at this site. The source of potential COCs at DSS Site 1084 was effluent discharged to the environment from the drainfield at this site.

Table 1
Summary of Sampling Performed to Meet DQOs

DSS Site 1084 Sampling Area	Potential COC Source	Number of Sampling Locations	Sample Density (samples/acre)	Sampling Location Rationale
Soil beneath the septic system drainfield	Effluent discharged to the environment from the drainfield	3	NA	Evaluate potential COC releases to the environment from effluent discharged from the drainfield

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

The soil samples were collected at three locations across DSS Site 1084 with a Geoprobe™ from two 3- or 4-foot-long sampling intervals at each boring location. Drainfield sampling intervals started at 3 and 8 feet bgs in each of the three drainfield borings. The soil samples were collected in accordance with the procedures described in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001). Table 2 summarizes the types of confirmatory and QA/QC samples collected at the site and the laboratories that performed the analyses.

The soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, polychlorinated biphenyls (PCBs), Resource Conservation and Recovery Act (RCRA) metals, hexavalent chromium, cyanide, radionuclides, and gross alpha/beta activity. The samples were analyzed by an off-site laboratory (General Engineering Laboratories, Inc.) and the on-site SNL/NM Radiation Protection Sample Diagnostic (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 1084

Sample Type	VOCs	SVOCs	PCBs	HE	RCRA Metals	Hexavalent Chromium	Cyanide	Gamma Spectroscopy Radionuclides	Gross Alpha/Beta
Confirmatory	3	3	3	3	3	3	3	3	3
Duplicates	1	1	1	1	1	1	1	1	1
EBs and TBs[a]	1	0	0	0	0	0	0	0	0
Total Samples	5	4	4	4	4	4	4	4	4
Analytical Laboratory	GEL	GEL	GEL	GEL	GEL	GEL	GEL	RPSD	GEL

[a]TBs for VOCs only.
DSS = Drain and Septic Systems.
EB = Equipment blank.
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.
TB = Trip blank.
VOC = Volatile organic compound.

Table 3
Summary of Data Quality Requirements for DSS Site 1084

Analytical Method[a]	Data Quality Level	GEL	RPSD
VOCs EPA Method 8260	Defensible	3	None
SVOCs EPA Method 8270	Defensible	3	None
PCBs EPA Method 8082	Defensible	3	None
HE Compounds EPA Method 8330	Defensible	3	None
RCRA Metals EPA Method 6000/7000	Defensible	3	None
Hexavalent Chromium EPA Method 7196A	Defensible	3	None
Total Cyanide EPA Method 9012A	Defensible	3	None
Gamma Spectroscopy Radionuclides EPA Method 901.1	Defensible	None	3
Gross Alpha/Beta Activity EPA Method 900.0	Defensible	3	None

Note: The number of samples does not include QA/QC samples such as duplicates, trip blanks, and equipment blanks.
[a]EPA November 1986.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
GEL = General Engineering Laboratories, Inc.
HE = High explosive(s).
PCB = Polychlorinated biphenyl.
QA/QC = Quality assurance/quality control.
RCRA = Resource Conversation 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) and one set of field duplicate samples. No significant QA/QC problems were identified in the QA/QC samples.

All of the soil sample results were verified/validated by SNL/NM according to "Verification and Validation of Chemical and Radiochemical Data," Technical Operating Procedure (TOP) 94-03, Rev. 0 (SNL/NM July 1994) or SNL/NM ER Project "Data Validation Procedure for Chemical and Radiochemical Data," Administrative Operating Procedure (AOP) 00-03 (SNL/NM December 1999). The data validation reports are presented in the associated DSS Site 1084 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 1084 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, soil sampling, and passive soil-vapor sampling. The DQOs contained in the SAP (SNL/NM October 1999) and FIP (SNL/NM November 2001) identified the sample locations, sample density, sample depth, and analytical requirements. The sample data were subsequently used to develop the final conceptual model for DSS Site 1084, 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 1084 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 1084.

III.3 Rate of Contaminant Migration

The septic system at DSS Site 1084 was deactivated in 1991 when Building 6505 was connected to an extension of the City of Albuquerque sanitary sewer system. The migration rate of COCs that may have been introduced into the subsurface via the septic system at this site was therefore dependent upon the volume of aqueous effluent discharged to the environment from this system when it was operational. Any migration of COCs from this site after use of the septic system was discontinued has been predominantly dependent upon precipitation. However, it is highly unlikely that sufficient precipitation has fallen on the site to reach the depth at which COCs may have been discharged to the subsurface from this system. Analytical data generated from the soil sampling conducted at the site are adequate to characterize the rate of COC migration at DSS Site 1084.

III.4 Extent of Contamination

Subsurface soil samples were collected from boreholes drilled at three locations beneath the effluent release area (the drainfield) 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 3 and 8 feet bgs in the drainfield area. Sampling intervals started at the depths at which effluent discharged from the drainfield drain lines would have entered the subsurface environment at the site. This sampling procedure was required by New Mexico Environment Department (NMED) regulators and has been used at numerous DSS-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 Screening Levels

Site history and characterization activities are used to identify potential COCs. The DSS Site 1084 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, 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 through 7.

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 the risk assessment consist of both inorganic and organic compounds.

Tables 4 and 5 list the nonradiological COCs for the human health and ecological risk assessments at DSS Site 1084, respectively. Tables 6 and 7 list the radiological COCs for the human health and ecological risk assessments, respectively. All tables show the associated SNL/NM maximum background concentration values (Dinwiddie September 1997). Section VI.4 discusses the results presented in Tables 4 and 6; Sections VII.2 and VII.3 discuss the results presented in Tables 5 and 7.

V. Fate and Transport

The primary releases of COCs at DSS Site 1084 were to the subsurface soil resulting from the discharge of effluent from the Building 6505 septic system. Wind, water, and biota are natural mechanisms of COC transport from the primary release point; however, because the discharge was to subsurface soil, none of these are considered to be of potential

Table 4
Nonradiological COCs for Human Health Risk Assessment at DSS Site 1084 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (All Samples) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (Maximum Aquatic)	Log K_{ow} (for Organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Arsenic	3.88	4.4	Yes	44[c]	–	**Yes**
Barium	411 J	214	**No**	170[d]	–	**Yes**
Cadmium	0.223 J	0.9	Yes	64[c]	–	**Yes**
Chromium, total	20.2 J	15.9	**No**	16[c]	–	No
Chromium VI	0.0578 J	1	Yes	16[c]	–	No
Cyanide	0.125 J	NC	**Unknown**	NC	–	**Unknown**
Lead	6.31	11.8	Yes	49[c]	–	**Yes**
Mercury	0.0164	<0.1	Yes	5,500[c]	–	**Yes**
Selenium	0.315 J	<1	Yes	800[e]	–	**Yes**
Silver	0.35 J	<1	Yes	0.5[c]	–	No
Organic						
2-Butanone	0.0255	NA	**NA**	1[f]	0.29[f]	No
PCBs, total	0.0018 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.
[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]NMED March 1998.
[c]Yanicak March 1997.
[d]Neumann 1976.
[e]Callahan et al. 1979.
[f]Howard 1990.

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

Table 5
Nonradiological COCs for Ecological Risk Assessment at DSS Site 1084 with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC	Maximum Concentration (Samples < 5 ft bgs) (mg/kg)	SNL/NM Background Concentration (mg/kg)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background Screening Value?	BCF (Maximum Aquatic)	Log K_{ow} (for Organic COCs)	Bioaccumulator?[b] (BCF>40, Log K_{ow}>4)
Inorganic						
Arsenic	3.88	4.4	Yes	44[c]	–	**Yes**
Barium	411 J	214	**No**	170[d]	–	**Yes**
Cadmium	0.208 J	0.9	Yes	64[c]	–	**Yes**
Chromium, total	12.8 J	15.9	Yes	16[c]	–	No
Chromium VI	0.0268[e]	1	Yes	16[c]	–	No
Cyanide	0.102 J	NC	**Unknown**	NC	–	**Unknown**
Lead	5.75	11.8	Yes	49[c]	–	**Yes**
Mercury	0.0093	<0.1	Yes	5,500[c]	–	**Yes**
Selenium	0.201[e]	<1	Yes	800[f]	–	**Yes**
Silver	0.0447[e]	<1	Yes	0.5[c]	–	No
Organic						
2-Butanone	0.0255	NA	**NA**	1[g]	0.29[g]	No

Note: **Bold** indicates the COCs that exceed the background screening values and/or are bioaccumulators.
[a]Dinwiddie September 1997, Southwest Area Supergroup.
[b]NMED March 1998.
[c]Yanicak March 1997.
[d]Neumann 1976.
[e]Value is the greater of either the maximum detection or one-half of the highest detection limit.
[f]Callahan et al. 1979.
[g]Howard 1990.

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

Table 6
Radiological COCs for Human Health Risk Assessment at DSS Site 1084 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 (0.034)	0.079	Yes	3,000[d]	**Yes**
Th-232	0.757	1.01	Yes	3,000[e]	**Yes**
U-235	**ND (0.243)**	0.16	**No**	900[e]	**Yes**
U-238	ND (0.747)	1.4	Yes	900[e]	**Yes**

Note: **Bold** indicates COCs that exceed background screening values and/or are bioaccumulators.
[a]Value is the greater of either the maximum detection or the highest MDA.
[b]Dinwiddie September 1997, Southwest Area Supergroup.
[c]NMED March 1998.
[d]Whicker and Schultz 1982.
[e]Baker and Soldat 1992.
BCF = Bioconcentration factor.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected above the MDA, shown in parentheses.
ND ( ) = Not detected but the MDA (shown in parentheses) exceeds background activity.
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.

Table 7
Radiological COCs for Ecological Risk Assessment at DSS Site 1084 with Comparison to the Associated SNL/NM Background Screening Value and BCF

COC	Maximum Activity (Samples < 5 ft bgs) (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 (0.032)	0.079	Yes	3000[d]	**Yes**
Th-232	0.734	1.01	Yes	3000[e]	**Yes**
U-235	**ND (0.243)**	0.16	**No**	900[e]	**Yes**
U-238	ND (0.747)	1.4	Yes	900[e]	**Yes**

Note: **Bold** indicates COCs that exceed background screening values and/or are bioaccumulators.
[a]Value is the greater of either the maximum detection or the highest MDA.
[b]Dinwiddie September 1997, Southwest Area Supergroup.
[c]NMED March 1998.
[d]Whicker and Schultz 1982.
[e]Baker and Soldat 1992.
BCF = Bioconcentration factor.
bgs = Below ground surface.
ft = Foot (feet).
COC = Constituent of concern.
DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected, above the MDA, shown in parentheses.
ND ( ) = Not detected but the MDA (shown in parentheses) exceeds background activity.
NMED = New Mexico Environment Department.
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.

significance as transport mechanisms at this site. Because the septic system is no longer active, additional water infiltration is not expected. Infiltration of precipitation is essentially nonexistent at DSS Site 1084, as virtually all of the moisture either drains away from the site or evaporates. Because groundwater at this site is approximately 508 feet bgs, the potential for COCs to reach groundwater through the unsaturated zone above the water table is extremely low.

The COCs at DSS Site 1084 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 1084 are limited to 2-butanone and PCBs. Organic constituents 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 8 summarizes the fate and transport processes that can occur at DSS Site 1084. COCs at this site include organic analytes as well as radiological and nonradiological inorganic 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 8
Summary of Fate and Transport at DSS Site 1084

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

DSS = Drain and Septic Systems.

VI. Human Health Risk Assessment

VI.1 Introduction

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

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

VI.2 Step 1. Site Data

Section I of this risk assessment provides the site description and history for DSS Site 1084. 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 1084 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. 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 1084 is approximately 508 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 1084.

Pathway Identification

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

VI.4 Step 3. Background Screening Procedure

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

VI.4.1 Methodology

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

For the radiological COCs that exceed the SNL/NM background screening levels, background values were 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 background screening values and were detected above the analytical minimum detectable activity (MDA) 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 6 show DSS Site 1084 maximum COC concentrations that were compared to the SNL/NM maximum background values (Dinwiddie September 1997) for the human health risk assessment. For the nonradiological COCs, two constituents were measured at a concentration greater than their background screening values. One constituent does not have a quantified background screening concentration; therefore, it is unknown whether this COC exceeds the background value. Two constituents are organic compounds that do not have corresponding background screening values.

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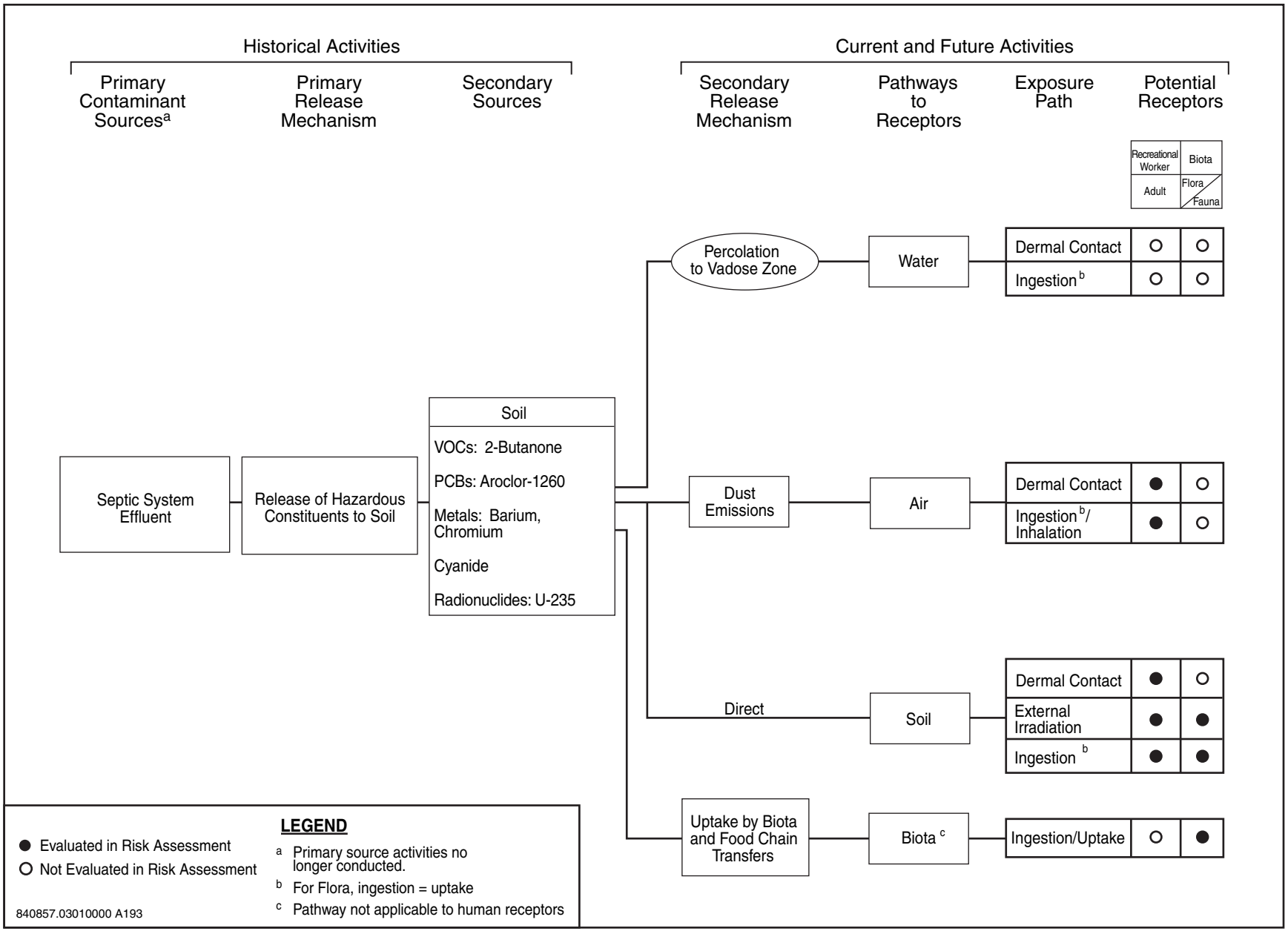

Figure 1

Conceptual Site Model Flow Diagram for DSS Site 1084, Building 6505 Septic System

The maximum concentration value used for total PCBs is the greater of either the maximum detection or one-half of the highest detection limit, which is 0.0018 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 used 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) had an MDA value greater than the background screening level. The greater of either the maximum detection or the highest MDA is conservatively used in the risk assessment.

VI.5 Step 4. Identification of Toxicological Parameters

Tables 9 and 10 list the COCs retained in the risk assessment and provide the values for the available toxicological information. The toxicological values for the nonradiological COCs presented in Table 9 were obtained from the Integrated Risk Information System (IRIS) (EPA 2003), the Health Effects Assessment Summary Tables (HEAST) (EPA 1997a), and the Technical Background Document for Development of Soil Screening Levels (NMED December 2000). Dose conversion factors (DCFs) used in determining the excess TEDE values for radiological COCs for the individual pathways are 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 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 COCs for both industrial and residential land-use scenarios.

Table 9
Toxicological Parameter Values for DSS Site 1084 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								
Barium	7E-02[c]	M	1.4E-4[d]	–	–	–	D	0.01[e]
Chromium	1.5E+0[c]	L	–	–	–	–	D	0.01[e]
Cyanide	2E-2[c]	M	–	–	–	–	D	0.1[e]
Organic								
2-Butanone	6E-1[c]	L	2.9E-1[c]	L	–	–	D	0.1[e]

[a]Confidence associated with IRIS (EPA 2003) database values. Confidence: L = low, M = medium.
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 2003):
D = Not classifiable as to human carcinogenicity.
[c]Toxicological parameter values from IRIS electronic database (EPA 2003).
[d]Toxicological parameter values from HEAST (EPA 1997a).
[e]Toxicological parameter values from NMED (December 2000).

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

Table 10
Toxicological Parameter Values for DSS Site 1084 Radiological 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-8	2.70E-7	A

[a]Yu et al. 1993a.
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989): A = Human carcinogen for high dose and high dose rate (i.e., greater than 50 rem per year). For low-level environmental exposures, the carcinogenic effect has not been observed and documented.
1/pCi = One per picocurie.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
g/pCi-yr = Gram(s) per picocurie-year.
SF_{ev} = External volume exposure slope factor.
SF_{inh} = Inhalation slope factor.
SF_o = Oral (ingestion) slope factor.

VI.6.1 Exposure Assessment

Appendix 1 provides the equations and parameter input values used to calculate intake values and subsequent HI and excess cancer risk values for the individual exposure pathways. The appendix shows parameters for both industrial and residential land-use scenarios. The equations for nonradiological COCs are based upon the Risk Assessment Guidance for Superfund (RAGS) (EPA 1989). Parameters are based upon information from the RAGS (EPA 1989), the Technical Background Document for Development of Soil Screening Levels (NMED December 2000), as well as other EPA and NMED guidance documents. The parameters reflect the reasonable maximum exposure (RME) approach advocated by the RAGS (EPA 1989). For the radiological COCs, the coded equations provided in RESRAD computer code are 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 11 shows an HI of 0.01 for the DSS Site 1084 nonradiological COCs and no estimated excess cancer risk. The numbers presented include exposure from soil ingestion, dermal contact, and dust and volatile inhalation for nonradiological COCs. Table 12 shows an HI of 0.00 and no estimated excess cancer risk for the DSS Site 1084 associated background constituents under the designated industrial land-use scenario.

Table 11
Risk Assessment Values for DSS Site 1084 Nonradiological COCs

COC	Maximum Concentration (All Samples) (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Barium	411 J	0.01	–	0.08	–
Chromium	20.2 J	0.00	–	0.00	–
Cyanide	0.125 J	0.00	–	0.00	–
Organic					
2-Butanone	0.0255	0.00	–	0.00	–
Total		0.01	–	0.08	–

[a]EPA 1989.
COC = Constituent of concern.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
J = Concentration was qualified as an estimated value.
mg/kg = Milligram(s) per kilogram.
– = Information not available.

Table 12
Risk Assessment Values for DSS Site 1084 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
Barium	214	0.00	–	0.04	–
Chromium	15.9	0.00	–	0.00	–
Cyanide	NC	–	–	–	–
Total		0.00	–	0.04	–

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

For the radiological COC, contribution from the direct gamma exposure pathway is included. For the industrial land-use scenario, a TEDE is calculated for an individual on the site, which results in an incremental TEDE of 1.2E-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 1997b), an incremental TEDE of 15 mrem/yr is used for the probable land-use scenario (industrial in this case); the calculated dose value for DSS Site 1084 for the industrial land-use scenario is well below this guideline. The estimated excess cancer risk is 1.4E-7.

The HI is 0.08 with no estimated excess cancer risk for the nonradiological COCs under the residential land-use scenario (Table 11). The numbers in the table include exposure from soil ingestion, dermal contact, and dust 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. Based upon the nature of the local soil, other exposure pathways are not evaluated (see Appendix 1). Table 12 shows an HI of 0.04 and no estimated excess cancer risk for the associated background constituents at DSS Site 1084 under the residential land-use scenario.

For the radiological COC, the incremental TEDE for the residential land-use scenario is 3.1E-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 1084 for the residential land-use scenario is well below this guideline. Consequently, DSS Site 1084 is eligible for unrestricted radiological release as the residential land-use scenario resulted in an incremental TEDE of less than 75 mrem/yr to the on-site receptor. The estimated excess cancer risk is 4.0E-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 1997b). This summation is tabulated in Section VI.9, "Summary."

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

The human health risk assessment analysis 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 0.01 (lower than the numerical guideline of 1 suggested in the RAGS [EPA 1989]). There is no excess cancer risk. 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 determines risks by evaluating background concentrations of the potential nonradiological COCs for both the industrial and residential land-use scenarios. The incremental risk is determined by subtracting risk associated with background from potential COC risk. These numbers are not rounded before the difference is determined and therefore may appear to be inconsistent with numbers presented in tables and within the text. For conservatism, the background constituents that do not have quantified background concentrations are assumed to have a hazard quotient (HQ) of 0.00. The incremental HI is 0.01 and there is no estimated incremental cancer risk for the industrial land-

use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs considering an industrial land-use scenario.

For the radiological COC under the industrial land-use scenario, the incremental TEDE is 1.2E-2 mrem/yr, which is significantly lower than EPA's numerical guideline of 15 mrem/yr (EPA 1997b). The incremental estimated excess cancer risk is 1.4E-7.

For the nonradiological COCs under the residential land-use scenario, the calculated HI is 0.08, which is below the numerical guidance. There is no excess cancer risk. 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 0.04 and there is no estimated incremental cancer risk for the residential land-use scenario. These incremental risk calculations indicate insignificant risk to human health from nonradiological COCs under a residential land-use scenario.

The incremental TEDE for a residential land-use scenario from the radiological component is 3.1E-2 mrem/yr, which is significantly lower than the numerical guideline of 75 mrem/yr suggested in the SNL/NM "RESRAD Input Parameter Assumptions and Justification" (SNL/NM February 1998). The estimated excess cancer risk is 4.0E-7.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at DSS Site 1084 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 screening assessments. The data from soil samples collected at effluent release points are representative of potential COC releases to the site. The analytical requirements and results satisfy the DQOs, and data quality was verified/validated in accordance with SNL/NM procedures. Therefore, there is no uncertainty associated with the data quality used to perform the risk screening assessment at DSS Site 1084.

Because of the location, history, and future land use, 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 near-surface soil and the location and physical characteristics of the site, there is low 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 may be overestimated. Maximum measured values of COC concentrations are used to provide conservative results.

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

Because of the conservative nature of the RME approach, uncertainties in toxicological values are not expected to change the conclusion from the risk assessment analysis.

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

For the radiological COCs, the conclusion of the risk assessment is that potential effects on human health for both industrial and residential land-use scenarios are within guidelines and represent only a small fraction of the estimated 360 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 1084 contains identified COCs consisting of some inorganic 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 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 (0.01) is significantly lower than the accepted numerical guidance from the EPA. There is no estimated excess cancer. 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 0.01, and there is no incremental excess cancer risk 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 (0.08) is also below the accepted numerical guidance from the EPA. There is no estimated excess cancer risk. 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 0.04 and there is no incremental excess cancer risk 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 1.2E-2 mrem/yr for the industrial land-use scenario, which is much lower than the EPA's numerical guidance of 15 mrem/yr (EPA 1997b). The corresponding incremental estimated cancer risk value is 1.4E-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 3.1E-2 mrem/yr with an associated risk of 4.0E-7. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore, DSS Site 1084 is eligible for unrestricted radiological release.

The summation of the nonradiological and radiological carcinogenic risks is tabulated in Table 13.

Table 13
Summation of Incremental Radiological and Nonradiological Risks from DSS Site 1084, Building 6505 Septic System Carcinogens

Scenario	Nonradiological Risk	Radiological Risk	Total Risk
Industrial	0.00E+0	1.4E-7	1.4E-7
Residential	0.00E+0	4.0E-7	4.0E-7

DSS = Drain and Septic Systems.

Uncertainties associated with the calculations are considered small relative to the conservatism of this 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 1084. A component of the NMED Risk-Based Decision Tree (NMED March 1998) is to conduct an ecological assessment that corresponds with that presented in EPA's Ecological RAGS (EPA 1997c). The current methodology is tiered and contains an initial scoping assessment followed by a more detailed risk assessment. Initial components of NMED's decision tree (a discussion of DQOs, data assessment, and evaluations of both bioaccumulation and fate and transport potential) are addressed in previous sections of this report. Following the completion of the scoping assessment, a determination is made as to whether a more detailed examination of potential ecological risk is necessary. If deemed necessary, the scoping assessment proceeds to a risk assessment whereby a more quantitative estimate of ecological risk is conducted. Although this assessment is conservative in the estimation of ecological risks, ecological relevance and professional judgment are also used as recommended by the EPA (1998) to ensure that predicted exposures of selected ecological receptors reflect those reasonably expected to occur at the site.

VII.2 Scoping Assessment

The scoping assessment focuses primarily on the likelihood of exposure of biota at, or adjacent to, the site to constituents associated with site activities. Included in this section are an evaluation of existing data and a comparison of maximum detected concentrations to background concentrations, examination of bioaccumulation potential, and fate and transport potential. The 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 (Tables 5 and 7), constituents in the soil within the 0- to 5-foot depth interval that are identified as COPECs for this site include the following:

- Barium
- Cyanide
- 2-Butanone
- U-235

VII.2.2 Bioaccumulation

Among the COPECs listed in Section VII.2.1, the following are considered to have bioaccumulation potential in aquatic environments (Section IV, Tables 5 and 7):

- Barium
- U-235

However, as directed by the NMED (March 1998), bioaccumulation for inorganic constituents is assessed exclusively based upon maximum reported bioconcentration factors (BCFs) for aquatic species. Because only aquatic BCFs are used to evaluate the bioaccumulation potential for metals, bioaccumulation in terrestrial species is likely to be overpredicted.

VII.2.3 Fate and Transport Potential

The potential for the COPECs to migrate from the source of contamination to other media or biota is discussed in Section V. As noted in Table 8 (Section V), wind, surface water, and biota (food chain uptake) are expected to be of low significance as transport mechanisms for COPECs at this site. Degradation, transformation, and radiological decay of the COPECs are also 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 may be associated with this site and that COPECs also exist at the site. As a consequence, a detailed ecological risk assessment is deemed necessary to predict the potential level of ecological risk associated with the site.

VII.3 Risk Assessment

As concluded in Section VII.2.4, both complete ecological pathways and COPECs are associated with this site. The ecological risk assessment performed for the site involves a quantitative estimate of current ecological risks using exposure models in association with exposure parameters and toxicity information obtained from the literature. The estimation of potential ecological risks is conservative to ensure that ecological risks are not underpredicted.

Components within the risk assessment include the following:

- Problem Formulation—sets the stage for the evaluation of potential exposure and risk.
- Exposure Estimation—provides a quantitative estimate of potential exposure.
- Ecological Effects Evaluation—presents benchmarks used to gauge the toxicity of COPECs to specific receptors.
- Risk Characterization—characterizes the ecological risk associated with exposure of the receptors to environmental media at the site.
- Uncertainty Assessment—discusses uncertainties associated with the estimation of exposure and risk.
- Risk Interpretation—evaluates ecological risk in terms of HQs and ecological significance.
- Risk Assessment Scientific/Management Decision Point—presents the decision to risk managers based upon the results of the risk assessment.

VII.3.1 Problem Formulation

Problem formulation is the initial stage of the risk assessment that provides the introduction to the risk evaluation process. Components that are addressed in this section include a discussion of ecological pathways and the ecological setting, identification of COPECs, and selection of ecological receptors. The conceptual model, ecological food webs, and ecological endpoints (other components commonly addressed in an ecological risk assessment) are presented in "Predictive Ecological Risk Assessment Methodology, Environmental Restoration Program, Sandia National Laboratories, New Mexico" (IT July 1998) and are not duplicated here.

VII.3.1.1 Ecological Pathways and Setting

DSS Site 1084 is less than 1 acre in size. The site is located in an area dominated by grassland habitat. The site is unpaved and open to use by wildlife. No threatened or endangered species exist at this site (IT February 1995), and no surface-water bodies, seeps, or springs are associated with the site.

Complete ecological pathways may exist at this site through the exposure of plants and wildlife to COPECs in the soil. It is assumed that direct uptake of COPECs from soil is the major route of exposure for plants and that exposure of plants to wind-blown soil is minor. Exposure modeling for the wildlife receptors is limited to the food and soil ingestion pathways and external radiation. Because of the lack of surface water at this site, exposure to COPECs through the ingestion of surface water is considered insignificant. Inhalation and dermal contact also are considered insignificant pathways with respect to ingestion (Sample and Suter 1994). Groundwater is not expected to be affected by COCs at this site.

VII.3.1.2 COPECs

Discharge of waste water from the septic system of Building 6505 is the primary source of COPECs at DSS Site 1084. All COPECs identified for this site are listed in Section VII.2. The COPECs include both radiological and nonradiological analytes. The analytes were screened against background concentrations and those that exceeded the approved SNL/NM background screening levels (Dinwiddie September 1997) for the area are considered to be COPECs. All organic analytes detected in the soil and inorganic analytes with uncertain background levels are retained as COPECs. Nonradiological inorganic constituents that are essential nutrients, such as iron, magnesium, calcium, potassium, and sodium, are not included in this risk assessment as set forth by the EPA (1989). In order to provide conservatism, this ecological risk assessment is based upon the maximum soil concentrations of the COPECs measured in the upper 5 feet of soil at this site. Tables 5 and 7 present the maximum concentrations and activities for the COPECs.

VII.3.1.3 Ecological Receptors

A nonspecific perennial plant is selected as the receptor to represent plant species at the site (IT July 1998). Vascular plants are the principal primary producers at the site and are key to the diversity and productivity of the wildlife community associated with the site. The deer mouse (*Peromyscus maniculatus*) and the burrowing owl (*Speotyto cunicularia*) are used to represent wildlife use. Because of its opportunistic food habits, the deer mouse is used to represent a mammalian herbivore, omnivore, and insectivore. The burrowing owl represents a top predator at this site. The burrowing owl is present at SNL/NM and is designated a species of management concern by the U.S. Fish and Wildlife Service in Region 2, which includes the state of New Mexico (USFWS September 1995).

VII.3.2 Exposure Estimation

For the nonradiological COPECs, direct uptake from the soil is considered the only significant route of exposure for terrestrial plants. Exposure modeling for the wildlife receptors is limited to food and soil ingestion pathways. Inhalation and dermal contact are considered insignificant pathways with respect to ingestion (Sample and Suter 1994). Drinking water is also considered an insignificant pathway because of the lack of surface water at this site. The deer mouse is modeled under three dietary regimes: as an herbivore (100 percent of its diet as plant material), as an omnivore (50 percent of its diet as plants and 50 percent as soil invertebrates), and as an insectivore (100 percent of its diet as soil invertebrates). The burrowing owl is modeled as a strict predator on small mammals (100 percent of its diet as deer mice). Because the exposure in the burrowing owl from a diet consisting of equal parts of herbivorous, omnivorous, and

insectivorous deer mice would be equivalent to the exposure consisting of only omnivorous deer mice, the diet of the burrowing owl is modeled with intake of omnivorous mice only. Both species are modeled with soil ingestion comprising 2 percent of the total dietary intake. Table 14 presents the species-specific factors used in modeling exposures in the wildlife receptors. Justification for use of the factors presented in this table is described in the ecological risk assessment methodology document (IT July 1998).

Although home range is also included in this table, exposures for this risk assessment are modeled using an area use factor of 1.0, implying that all food items and soil ingested come from the site being investigated. The maximum COPEC concentrations measured in the upper 5 feet of soil are used to conservatively estimate potential exposures and risks to plants and wildlife at this site.

For the radiological dose-rate calculations, the deer mouse is modeled as an herbivore (100 percent of its diet as plants), and the burrowing owl is modeled as a strict predator on small mammals (100 percent of its diet as deer mice). Both are modeled with soil ingestion comprising 2 percent of the total dietary intake. Receptors are exposed to radiation both internally and externally from U-235. Internal and external dose rates to the deer mouse and the burrowing owl are approximated using modified dose-rate models from the DOE (1995) as presented in the ecological risk assessment methodology document for the SNL/NM ER Project (IT July 1998). Radionuclide-dependent data for the dose-rate calculations were obtained from Baker and Soldat (1992). The external dose-rate model examines the total-body dose rate to a receptor residing in soil exposed to radionuclides. The soil surrounding the receptor is assumed to be an infinite medium uniformly contaminated with gamma-emitting radionuclides. The external dose-rate model is the same for both the deer mouse and the burrowing owl. The internal total-body dose-rate model assumes that a fraction of the radionuclide concentration ingested by a receptor is absorbed by the body and concentrated at the center of a spherical body shape. This provides for a conservative estimate for absorbed dose. This concentrated radiation source at the center of the body of the receptor is assumed to be a "point" source. Radiation emitted from this point source is absorbed by the body tissues to contribute to the absorbed dose. Alpha and beta emitters are assumed to transfer 100 percent of their energy to the receptor as they pass through tissues. Gamma-emitting radionuclides transfer only a fraction of their energy to the tissues because gamma rays interact less with matter than do beta or alpha emitters. The external and internal dose-rate results are summed to calculate a total dose rate from exposure to U-235 in soil.

Table 15 provides the transfer factors used in modeling the concentrations of COPECs through the food chain. Table 16 presents maximum concentrations in soil and derived concentrations in tissues of the various food chain elements that are used to model dietary exposures for each of the wildlife receptors.

VII.3.3 Ecological Effects Evaluation

Table 17 shows benchmark toxicity values for the plant and wildlife receptors. For plants, the benchmark soil concentrations are based upon the lowest-observed-adverse-effect level (LOAEL). For wildlife, the toxicity benchmarks are based upon the no-observed-adverse-effect level (NOAEL) for chronic oral exposure in a taxonomically similar test species. Sufficient toxicity information was not available to estimate the LOAELs or NOAELs for some COPECs.

Table 14
Exposure Factors for Ecological Receptors at DSS Site 1084

Receptor Species	Class/Order	Trophic Level	Body Weight (kg)[a]	Food Intake Rate (kg/day)[b]	Dietary Composition[c]	Home Range (acres)
Deer Mouse (*Peromyscus maniculatus*)	Mammalia/ Rodentia	Herbivore	2.39E-2[d]	3.72E-3	Plants: 100% (+ Soil at 2% of intake)	2.7E-1[e]
Deer Mouse (*Peromyscus maniculatus*)	Mammalia/ Rodentia	Omnivore	2.39E-2[d]	3.72E-3	Plants: 50% Invertebrates: 50% (+ Soil at 2% of intake)	2.7E-1[e]
Deer Mouse (*Peromyscus maniculatus*)	Mammalia/ Rodentia	Insectivore	2.39E-2[d]	3.72E-3	Invertebrates: 100% (+ Soil at 2% of intake)	2.7E-1[e]
Burrowing owl (*Speotyto cunicularia*)	Aves/ Strigiformes	Carnivore	1.55E-1[f]	1.73E-2	Rodents: 100% (+ Soil at 2% of intake)	3.5E+1[g]

[a]Body weights are in kg wet weight.
[b]Food intake rates are estimated from the allometric equations presented in Nagy (1987). Units are kg dry weight per day.
[c]Dietary compositions are generalized for modeling purposes. Default soil intake value of 2 percent of food intake.
[d]Silva and Downing 1995.
[e]EPA (1993), based upon the average home range measured in semiarid shrubland in Idaho.
[f]Dunning 1993.
[g]Haug et al. 1993.
DSS = Drain and Septic Systems.
EPA = U.S. Environmental Protection Agency.
kg = Kilogram(s).

Table 15
Transfer Factors Used in Exposure Models for COPECs at DSS Site 1084

COPEC	Soil-to-Plant Transfer Factor	Soil-to-Invertebrate Transfer Factor	Food-to-Muscle Transfer Factor
Inorganic			
Barium	1.5E-1[a]	1.0E+0[b]	2.0E-4[c]
Cyanide	0.0E+0[c]	0.0E+0[c]	0.0E+0[c]
Organic[d]			
2-Butanone	2.6E+1	1.4E+1	3.7E-8

[a]Baes et al. 1984.
[b]Default value.
[c]No data found for food chain transfers of cyanide; however, because of its high metabolic activity, cyanide is assumed not to transfer in the food chain.
[d]Soil-to-plant and food-to-muscle transfer factors from equations developed in Travis and Arms (1988). Soil-to-invertebrate transfer factors from equations developed in Connell and Markwell (1990). All three equations based upon relationship of the transfer factor to the Log K_{ow} value of compound.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).

Table 16
Media Concentrations[a] for COPECs at DSS Site 1084

COPEC	Soil (Maximum)[a]	Plant Foliage[b]	Soil Invertebrate[b]	Deer Mouse Tissues[c]
Inorganic				
Barium	4.1E+2[d]	6.2E+1	4.1E+2	1.5E-1
Cyanide	1.0E-1[d]	0.0E+0	0.0E+0	0.0E+0
Organic				
2-Butanone	2.6E-2	6.7E-1	3.5E-1	5.8E-8

[a]In milligrams per kilogram. All biotic media are based upon dry weight of the media. Soil concentration measurements are assumed to have been based upon dry weight. Values have been rounded to two significant digits after calculation.
[b]Product of the soil concentration and the corresponding transfer factor.
[c]Based upon the deer mouse with an omnivorous diet. Product of the average concentration ingested in food and soil times the food-to-muscle transfer factor times a wet weight-dry weight conversion factor of 3.125 (EPA 1993).
[d]Estimated value.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.

Table 17
Toxicity Benchmarks for Ecological Receptors at DSS Site 1084

COPEC	Plant Benchmark[a,b]	Mammalian NOAELs			Avian NOAELs		
		Mammalian Test Species[c,d]	Test Species NOAEL[d,e]	Deer Mouse NOAEL[e,f]	Avian Test Species[d]	Test Species NOAEL[d,e]	Burrowing Owl NOAEL[e,g]
Inorganic							
Barium	500	rat[h]	5.1	10.5	chicken	20.8	20.8
Cyanide	–	rat[i]	68.7	126	–	–	–
Organic							
2-Butanone	–	rat	1771	3464	–	–	–

[a]In mg/kg soil dry weight.
[b]Efroymson et al. 1997.
[c]Body weights (in kg) for the NOAEL conversion are as follows: lab mouse, 0.030; lab rat, 0.350; oldfield mouse, 0.014 (except where noted).
[d]Sample et al. (1996), except where noted.
[e]In mg/kg body weight per day.
[f]Based upon NOAEL conversion methodology presented in Sample et al. (1996), using a deer mouse body weight of 0.0239 kg and a mammalian scaling factor of 0.25.
[g]Based upon NOAEL conversion methodology presented in Sample et al. (1996). The avian scaling factor of 0.0 was used, making the NOAEL independent of body weight.
[h]Body weight: 0.435 kg.
[i]Body weight: 0.273 kg.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
kg = Kilogram(s).
mg/kg = Milligram(s) per kilogram.
NOAEL = No-observed-adverse-effect level.
– = Insufficient toxicity data.

The benchmark used for exposure of terrestrial receptors to radiation is 0.1 rad/day. This value has been recommended by the International Atomic Energy Agency (IAEA 1992) for the protection of terrestrial populations. Because plants and insects are less sensitive to radiation than vertebrates (Whicker and Schultz 1982), the dose of 0.1 rad/day should also protect other groups within the terrestrial habitat of DSS Site 1084.

VII.3.4 Risk Characterization

Maximum concentrations in soil and estimated dietary exposures are compared to plant and wildlife benchmark values, respectively. Table 18 presents the results of these comparisons. HQs are used to quantify the comparison with benchmarks for plant and wildlife exposure.

The only HQs that exceed unity are associated with barium for the deer mice. Because of a lack of sufficient toxicity information, the HQ for plants could not be determined for cyanide and 2-butanone. Similarly for the burrowing owl, HQs could not be determined for cyanide and 2-butanone. As directed by the NMED, HIs are calculated for each of the receptors (the HI is the sum of chemical-specific HQs for all pathways for a given receptor). Total HIs are greater than unity for both the omnivorous and insectivorous deer mice, with a maximum HI of 6.2 for the insectivorous deer mouse.

Tables 19 and 20 summarize the internal and external dose-rate model results for U-235 for the deer mouse and burrowing owl, respectively. The total radiation dose rate to the deer mouse is predicted to be 6.6E-6 rad/day and that for the burrowing owl is 5.0E-6 rad/day. These dose rates for the deer mouse and the burrowing owl are lower than the benchmark of 0.1 rad/day.

VII.3.5 Uncertainty Assessment

Many uncertainties are associated with the characterization of ecological risks at DSS Site 1084. These uncertainties result from assumptions used in calculating risk that may overestimate or underestimate true risk presented at the site. For this risk assessment, assumptions are made that are more likely to overestimate exposures and risk rather than to underestimate them. These conservative assumptions are used to be more protective of the ecological resources potentially affected by the site. Conservatisms incorporated into this risk assessment include the use of maximum analyte concentrations measured in soil samples to evaluate risk, the use of wildlife toxicity benchmarks based upon NOAEL values, and the incorporation of strict herbivorous and strict insectivorous diets for predicting the extreme HQ values for the deer mouse. Each of these uncertainties, which are consistent among each of the site-specific ecological risk assessments, is discussed in greater detail in the uncertainty section of the ecological risk assessment methodology document for the SNL/NM ER Program (IT July 1998). It should be noted that of the three COPECs, the maximum concentrations of cyanide and barium are estimated values.

Uncertainties associated with the estimation of risk to ecological receptors following exposure to U-235 are primarily related to those inherent in the radionuclide-specific data. Radionuclide-dependent data are measured values that have their associated errors. The dose-rate models used for these calculations are based upon conservative estimates of receptor shape, radiation absorption by body tissues, and intake parameters. The goal is to provide a realistic

Table 18
HQs for Ecological Receptors at DSS Site 1084

COPEC	Plant HQ	Deer Mouse HQ (Herbivorous)	Deer Mouse HQ (Omnivorous)[a]	Deer Mouse HQ (Insectivorous)[a]	Burrowing Owl HQ
Inorganic					
Barium	8.2E-01	1.0E+0	**3.6E+0**	**6.2E+0**	4.5E-2
Cyanide	–	2.5E-6	2.5E-6	2.5E-6	–
Organic					
2-Butanone	–	3.0E-5	2.3E-5	1.6E-5	–
HI[b]	8.2E-01	1.0E+0	**3.6E+0**	**6.2E+0**	4.5E-2

[a]**Bold** values indicate the HQ or HI exceeds unity.
[b]The HI is the sum of individual HQs.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
HI = Hazard index.
HQ = Hazard quotient.
– = Insufficient toxicity data available for risk estimation purposes.

Table 19
Total Dose Rates for Deer Mice
Exposed to Radionuclides at DSS Site 1084

Radionuclide	Maximum Activity (pCi/g)	Total Dose (rad/day)
U-235	ND (0.243)	6.6E-6
Total Dose		6.6E-6

DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected above the MDA, shown in parentheses.
pCi/g = Picocurie(s) per gram.

Table 20
Total Dose Rates for Burrowing Owls
Exposed to Radionuclides at DSS Site 1084

Radionuclide	Maximum Activity (pCi/g)	Total Dose (rad/day)
U-235	ND (0.243)	5.0E-6
Total Dose		5.0E-6

DSS = Drain and Septic Systems.
MDA = Minimum detectable activity.
ND ( ) = Not detected above the MDA, shown in parentheses.
pCi/g = Picocurie(s) per gram.

but conservative estimate of a receptor's internal and external exposure to radionuclides in soil. The dose estimates are conservatively based upon the MDA of U-235, which was not detected at the site.

In the estimation of ecological risk, background concentrations are included as a component of maximum on-site concentrations. Conservatisms in the modeling of exposure and risk can result in the prediction of risk to ecological receptors when exposed at background concentrations. As shown in Table 21, HQs associated with exposures to background are greater than 1.0 for barium. It is therefore likely that the actual risks from barium at DSS Site 1084 are overestimated by the HQs calculated in this assessment because of conservatisms incorporated into the exposure assessment and in the toxicity benchmarks for this COPEC. In the case of barium, exposure to background concentrations may account for the majority (52 percent) of the HQ values shown in Table 18.

Table 21
HQs for Ecological Receptors Exposed to Background Concentrations at DSS Site 1084

COPEC	Plant HQ	Deer Mouse HQ (Herbivorous)	Deer Mouse HQ (Omnivorous)[a]	Deer Mouse HQ (Insectivorous)[a]	Burrowing Owl HQ
Barium	4.3E-1	5.4E-1	**1.9E+0**	**3.2E+0**	2.3E-2

[a]**Bold** values indicate the HQ exceeds unity.
COPEC = Constituent of potential ecological concern.
DSS = Drain and Septic Systems.
HQ = Hazard quotient.

VII.3.6 Risk Interpretation

Ecological risks associated with DSS Site 1084 are estimated through a risk assessment that incorporates site-specific information when available. All HQ values predicted for the COPECs at this site are found to be less than unity with the exception of barium. For barium, the contribution from background concentrations accounts for the majority (52 percent) of the HQ values.

Analysis of the uncertainties associated with these predicted values indicate that they are more likely to overestimate actual risk rather than underestimate it. Based upon this final analysis, the potential for ecological risks associated with DSS Site 1084 is expected to be very low.

VII.3.7 Risk Assessment Scientific/Management Decision Point

After potential ecological risks associated with the site have been assessed, a decision is made as to whether the site should be recommended for CAC without controls or whether additional data should be collected to more thoroughly assess actual ecological risk at the site. With respect to this site, ecological risks are predicted to be very low. The scientific/management decision is to recommend this site for CAC without controls.

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APPENDIX 1
EXPOSURE PATHWAY DISCUSSION FOR CHEMICAL AND RADIONUCLIDE CONTAMINATION

Introduction

Sandia National Laboratories/New Mexico (SNL/NM) uses a default set of exposure routes and associated default parameter values developed for each future land-use designation being considered for SNL/NM Environmental Restoration (ER) Project sites. This default set of exposure scenarios and parameter values are invoked for risk assessments unless site-specific information suggests other parameter values. Because many SNL/NM solid waste management units (SWMUs) have similar types of contamination and physical settings, SNL/NM believes that the risk assessment analyses at these sites can be similar. A default set of exposure scenarios and parameter values facilitates the risk assessments and subsequent review.

The default exposure routes and parameter values used are those that SNL/NM views as resulting in a Reasonable Maximum Exposure (RME) value. Subject to comments and recommendations by the U.S. Environmental Protection Agency (EPA) Region VI and New Mexico Environment Department (NMED), SNL/NM will use these default exposure routes and parameter values in future risk assessments.

At SNL/NM, all SWMUs exist within the boundaries of the Kirtland Air Force Base. Approximately 240 potential waste and release sites have been identified where hazardous, radiological, or mixed materials may have been released to the environment. Evaluation and characterization activities have occurred at all of these sites to varying degrees. Among other documents, the SNL/NM ER draft Environmental Assessment (DOE 1996) presents a summary of the hydrogeology of the sites and the biological resources present. When evaluating potential human health risk the current or reasonably foreseeable land use negotiated and approved for the specific SWMU/AOC, aggregate, or watershed will be used. The following references generally document these land uses: *Workbook: Future Use Management Area 2 (DOE et al. September 1995); Workbook: Future Use Management Area 1 (DOE et al. October 1995); Workbook: Future Use Management Areas 3, 4, 5, and 6 (DOE and USAF January 1996); Workbook: Future Use Management Area 7 (DOE and USAF March 1996)*. At this time, all SNL/NM SWMUs have been tentatively designated for either industrial or recreational future land use. The NMED has also requested that risk calculations be performed based upon a residential land-use scenario. Therefore, all three land-use scenarios will be addressed in this document.

The SNL/NM ER Project has screened the potential exposure routes and identified default parameter values to be used for calculating potential intake and subsequent hazard index (HI), excess cancer risk and dose values. The EPA (EPA 1989) provides a summary of exposure routes that could potentially be of significance at a specific waste site. These potential exposure routes consist of:

- Ingestion of contaminated drinking water
- Ingestion of contaminated soil

- Ingestion of contaminated fish and shellfish
- Ingestion of contaminated fruits and vegetables
- Ingestion of contaminated meat, eggs, and dairy products
- Ingestion of contaminated surface water while swimming
- Dermal contact with chemicals in water
- Dermal contact with chemicals in soil
- Inhalation of airborne compounds (vapor phase or particulate)
- External exposure to penetrating radiation (immersion in contaminated air; immersion in contaminated water; and exposure from ground surfaces with photon-emitting radionuclides)

Based upon the location of the SNL/NM SWMUs and the characteristics of the surface and subsurface at the sites, we have evaluated these potential exposure routes for different land-use scenarios to determine which should be considered in risk assessment analyses (the last exposure route is pertinent to radionuclides only). At SNL/NM SWMUs, there is currently no consumption of fish, shellfish, fruits, vegetables, meat, eggs, or dairy products that originate on site. Additionally, no potential for swimming in surface water is present due to the high-desert environmental conditions. As documented in the RESRAD computer code manual (ANL 1993), risks resulting from immersion in contaminated air or water are not significant compared to risks from other radiation exposure routes.

For the industrial and recreational land-use scenarios, SNL/NM ER has, therefore, excluded the following 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):

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

where:

I_s = Intake of contaminant from soil inhalation (mg/kg-day)
C_s = Chemical concentration in soil (mg/kg)
IR = Inhalation rate (cubic meters [m^3]/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
VF = soil-to-air volatilization factor (m^3/kg)
PEF = particulate emission factor (m^3/kg)
BW = Body weight (kg)
AT = Averaging time (period over which exposure is averaged) (days)

Soil Dermal Contact

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

where:

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

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

Groundwater Ingestion

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

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

where:

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

Groundwater Inhalation

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

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

where:

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

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

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

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

Summary

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

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

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

[a]Technical Background Document for Development of Soil Screening Levels (NMED 2000).
[b]Risk Assessment Guidance for Superfund, Vol. 1, Part B (EPA 1991).
[c]Exposure Factors Handbook (EPA August 1997).
ED = Exposure duration.
EPA = U.S. Environmental Protection Agency.
hr = Hour(s).
kg = Kilogram(s).
m = Meter(s).
mg = Milligram(s).
NA = Not available.
wk = Week(s).
yr = Year(s).

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

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

[a]Risk Assessment Guidance for Superfund, Vol. 1, Part B (EPA 1991).
[b]Exposure Factors Handbook (EPA August 1997).
[c]EPA Region VI guidance (EPA 1996).
[d]For radionuclides, RESRAD (ANL 1993).
[e]SNL/NM (February 1998).
EPA = U.S. Environmental Protection Agency.
g = Gram(s)
hr = Hour(s).
kg = Kilogram(s).
m = Meter(s).
mg = Milligram(s).
NA = Not applicable.
wk = Week(s).
yr = Year(s).

References

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

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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

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 #
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-14-S	059785-001	03-SEP-02	SOIL	VOA-8260	GEL	200753
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-DU	059786-001	03-SEP-02	SOIL	VOA-8260	GEL	200753
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-S	059784-001	03-SEP-02	SOIL	VOA-8260	GEL	200753
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-14-S	059785-002	03-SEP-02	SOIL	Cr+6	GEL	200893
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-DU	059787-001	03-SEP-02	SOIL	Cr+6	GEL	200893
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-S	059784-002	03-SEP-02	SOIL	Cr+6	GEL	200893
1083	Bldg. 6570 SS	Volume 7	605747	6570/1083-DW1-BH1-14-S	059785-003	03-SEP-02	SOIL	GAMMA SPEC	RPSD	201248
1083	Bldg. 6570 SS	Volume 7	605747	6570/1083-DW1-BH1-9-DU	059858-001	03-SEP-02	SOIL	GAMMA SPEC	RPSD	201248
1083	Bldg. 6570 SS	Volume 7	605747	6570/1083-DW1-BH1-9-S	059784-003	03-SEP-02	SOIL	GAMMA SPEC	RPSD	201248
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-14-S	059785-002	03-SEP-02	SOIL	TOTAL-CN	GEL	201253
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-DU	059787-001	03-SEP-02	SOIL	TOTAL-CN	GEL	201253
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-S	059784-002	03-SEP-02	SOIL	TOTAL-CN	GEL	201253
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-14-S	059785-002	03-SEP-02	SOIL	GROSS-A/B	GEL	201305
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-DU	059787-001	03-SEP-02	SOIL	GROSS-A/B	GEL	201305
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-S	059784-002	03-SEP-02	SOIL	GROSS-A/B	GEL	201305
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-DU	059787-001	03-SEP-02	SOIL	PCB-8082	GEL	203080
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-S	059784-002	03-SEP-02	SOIL	PCB-8082	GEL	203080
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-14-S	059785-002	03-SEP-02	SOIL	HE-8330	GEL	200966, 203692
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-DU	059787-001	03-SEP-02	SOIL	HE-8330	GEL	200966, 203692
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-S	059784-002	03-SEP-02	SOIL	HE-8330	GEL	200966, 203692
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-14-S	059785-002	03-SEP-02	SOIL	RCRA METALS	GEL	201371, 200317
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-DU	059787-001	03-SEP-02	SOIL	RCRA METALS	GEL	201371, 200317
1083	Bldg. 6570 SS	Volume 4	605667	6570/1083-DW1-BH1-9-S	059784-002	03-SEP-02	SOIL	RCRA METALS	GEL	201371, 200317
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-3-S	059673-002	20-AUG-02	SOIL	PCB-8082	GEL	196833
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-8-S	059674-002	20-AUG-02	SOIL	PCB-8082	GEL	196833
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-DU	059675-002	20-AUG-02	SOIL	PCB-8082	GEL	196833
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-S	059676-002	20-AUG-02	SOIL	PCB-8082	GEL	196833
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-8-S	059677-002	20-AUG-02	SOIL	PCB-8082	GEL	196833
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-3-S	059678-002	20-AUG-02	SOIL	PCB-8082	GEL	196833
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-8-S	059679-002	20-AUG-02	SOIL	PCB-8082	GEL	196833
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-3-S	059673-002	20-AUG-02	SOIL	BNA-8270	GEL	196839
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-8-S	059674-002	20-AUG-02	SOIL	BNA-8270	GEL	196839
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-DU	059675-002	20-AUG-02	SOIL	BNA-8270	GEL	196839
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-S	059676-002	20-AUG-02	SOIL	BNA-8270	GEL	196839
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-8-S	059677-002	20-AUG-02	SOIL	BNA-8270	GEL	196839
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-3-S	059678-002	20-AUG-02	SOIL	BNA-8270	GEL	196839
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-8-S	059679-002	20-AUG-02	SOIL	BNA-8270	GEL	196839
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-3-S	059673-002	20-AUG-02	SOIL	HE-8330	GEL	196863
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-8-S	059674-002	20-AUG-02	SOIL	HE-8330	GEL	196863
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-DU	059675-002	20-AUG-02	SOIL	HE-8330	GEL	196863
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-S	059676-002	20-AUG-02	SOIL	HE-8330	GEL	196863
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-8-S	059677-002	20-AUG-02	SOIL	HE-8330	GEL	196863

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

DRAIN AND SEPTIC SYSTEMS PROJECT QC MASTER INDEX

Site #	Site Name	Binder #	COC#	ER Sample ID	Sample #	SAMPLE DATE	MATRIX	LAB TEST	Lab	BATCH #
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-3-S	059678-002	20-AUG-02	SOIL	HE-8330	GEL	196863
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-8-S	059679-002	20-AUG-02	SOIL	HE-8330	GEL	196863
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-3-S	059673-002	20-AUG-02	SOIL	Cr+6	GEL	196888
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-8-S	059674-002	20-AUG-02	SOIL	Cr+6	GEL	196888
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-DU	059675-002	20-AUG-02	SOIL	Cr+6	GEL	196888
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-S	059676-002	20-AUG-02	SOIL	Cr+6	GEL	196888
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-8-S	059677-002	20-AUG-02	SOIL	Cr+6	GEL	196888
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-3-S	059678-002	20-AUG-02	SOIL	Cr+6	GEL	196888
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-8-S	059679-002	20-AUG-02	SOIL	Cr+6	GEL	196888
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-3-S	059673-001	20-AUG-02	SOIL	VOA-8260	GEL	196955
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-8-S	059674-001	20-AUG-02	SOIL	VOA-8260	GEL	196955
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-DU	059675-001	20-AUG-02	SOIL	VOA-8260	GEL	196955
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-S	059676-001	20-AUG-02	SOIL	VOA-8260	GEL	196955
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-8-S	059677-001	20-AUG-02	SOIL	VOA-8260	GEL	196955
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-3-S	059678-001	20-AUG-02	SOIL	VOA-8260	GEL	196955
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-8-S	059679-001	20-AUG-02	SOIL	VOA-8260	GEL	196955
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-TB	059680-001	20-AUG-02	AQUEOUS	VOA-8260	GEL	197301
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-3-S	059673-002	20-AUG-02	SOIL	TOTAL-CN	GEL	197511
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-8-S	059674-002	20-AUG-02	SOIL	TOTAL-CN	GEL	197511
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-DU	059675-002	20-AUG-02	SOIL	TOTAL-CN	GEL	197511
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-S	059676-002	20-AUG-02	SOIL	TOTAL-CN	GEL	197511
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-8-S	059677-002	20-AUG-02	SOIL	TOTAL-CN	GEL	197511
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-3-S	059678-002	20-AUG-02	SOIL	TOTAL-CN	GEL	197511
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-8-S	059679-002	20-AUG-02	SOIL	TOTAL-CN	GEL	197511
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-3-S	059673-002	20-AUG-02	SOIL	GROSS-A/B	GEL	198983
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-8-S	059674-002	20-AUG-02	SOIL	GROSS-A/B	GEL	198983
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-DU	059675-002	20-AUG-02	SOIL	GROSS-A/B	GEL	198983
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-S	059676-002	20-AUG-02	SOIL	GROSS-A/B	GEL	198983
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-8-S	059677-002	20-AUG-02	SOIL	GROSS-A/B	GEL	198983
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-3-S	059678-002	20-AUG-02	SOIL	GROSS-A/B	GEL	198983
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-8-S	059679-002	20-AUG-02	SOIL	GROSS-A/B	GEL	198983
1084	Bldg. 6505 SS	Volume 7	605640	6505/1084-DF1-BH1-3-S	059673-003	20-AUG-02	SOIL	GAMMA SPEC	RPSD	201181
1084	Bldg. 6505 SS	Volume 7	605640	6505/1084-DF1-BH1-8-S	059674-003	20-AUG-02	SOIL	GAMMA SPEC	RPSD	201181
1084	Bldg. 6505 SS	Volume 7	605640	6505/1084-DF1-BH2-3-DU	059675-003	20-AUG-02	SOIL	GAMMA SPEC	RPSD	201181
1084	Bldg. 6505 SS	Volume 7	605640	6505/1084-DF1-BH2-3-S	059676-003	20-AUG-02	SOIL	GAMMA SPEC	RPSD	201181
1084	Bldg. 6505 SS	Volume 7	605640	6505/1084-DF1-BH2-8-S	059677-003	20-AUG-02	SOIL	GAMMA SPEC	RPSD	201181
1084	Bldg. 6505 SS	Volume 7	605640	6505/1084-DF1-BH3-3-S	059678-003	20-AUG-02	SOIL	GAMMA SPEC	RPSD	201181
1084	Bldg. 6505 SS	Volume 7	605640	6505/1084-DF1-BH3-8-S	059679-003	20-AUG-02	SOIL	GAMMA SPEC	RPSD	201181
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-3-S	059673-002	20-AUG-02	SOIL	RCRA METALS	GEL	196732, 197745
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH1-8-S	059674-002	20-AUG-02	SOIL	RCRA METALS	GEL	196732, 197745
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-DU	059675-002	20-AUG-02	SOIL	RCRA METALS	GEL	196732, 197745
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-3-S	059676-002	20-AUG-02	SOIL	RCRA METALS	GEL	196732, 197745

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

DRAIN AND SEPTIC SYSTEMS PROJECT QC MASTER INDEX

Site #	Site Name	Binder #	COC#	ER Sample ID	Sample #	SAMPLE DATE	MATRIX	LAB TEST	Lab	BATCH #
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH2-8-S	059677-002	20-AUG-02	SOIL	RCRA METALS	GEL	196732, 197745
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-3-S	059678-002	20-AUG-02	SOIL	RCRA METALS	GEL	196732, 197745
1084	Bldg. 6505 SS	Volume 3	605649	6505/1084-DF1-BH3-8-S	059679-002	20-AUG-02	SOIL	RCRA METALS	GEL	196732, 197745
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-10-S	059793-002	06-SEP-02	SOIL	BNA-8270	GEL	200259
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-15-S	059794-002	06-SEP-02	SOIL	BNA-8270	GEL	200259
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-10-S	059793-001	06-SEP-02	SOIL	VOA-8260	GEL	200753
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-15-S	059794-001	06-SEP-02	SOIL	VOA-8260	GEL	200753
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-10-S	059793-002	06-SEP-02	SOIL	Cr+6	GEL	200895
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-15-S	059794-002	06-SEP-02	SOIL	Cr+6	GEL	200895
1086	Bldg. 6523 SS	Volume 7	605747	6523/1086-SP1-BH1-10-S	059793-003	06-SEP-02	SOIL	GAMMA SPEC	RPSD	201248
1086	Bldg. 6523 SS	Volume 7	605747	6523/1086-SP1-BH1-15-S	059794-003	06-SEP-02	SOIL	GAMMA SPEC	RPSD	201248
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-10-S	059793-002	06-SEP-02	SOIL	TOTAL-CN	GEL	201253
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-15-S	059794-002	06-SEP-02	SOIL	TOTAL-CN	GEL	201253
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-10-S	059793-002	06-SEP-02	SOIL	GROSS-A/B	GEL	201305
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-15-S	059794-002	06-SEP-02	SOIL	GROSS-A/B	GEL	201305
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-10-S	059793-002	06-SEP-02	SOIL	PCB-8082	GEL	203080
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-15-S	059794-002	06-SEP-02	SOIL	PCB-8082	GEL	203080
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-10-S	059793-002	06-SEP-02	SOIL	HE-8330	GEL	200966, 203692
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-15-S	059794-002	06-SEP-02	SOIL	HE-8330	GEL	200966, 203692
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-10-S	059793-002	06-SEP-02	SOIL	RCRA METALS	GEL	201371, 200317
1086	Bldg. 6523 SS	Volume 4	605668	6523/1086-SP1BH1-15-S	059794-002	06-SEP-02	SOIL	RCRA METALS	GEL	201371, 200317
1087	Bldg. 6743 SP	Volume 7	605732	6743/1087-SP1-BH1-13-S	059853-003	17-SEP-02	SOIL	GAMMA SPEC	RPSD	201315
1087	Bldg. 6743 SP	Volume 7	605732	6743/1087-SP1-BH1-8-S	059852-003	17-SEP-02	SOIL	GAMMA SPEC	RPSD	201315
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-13-S	059853-002	17-SEP-02	SOIL	PCB-8082	GEL	203015
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-8-S	059852-002	17-SEP-02	SOIL	PCB-8082	GEL	203015
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-13-S	059853-002	17-SEP-02	SOIL	BNA-8270	GEL	203051
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-8-S	059852-002	17-SEP-02	SOIL	BNA-8270	GEL	203051
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-13-S	059853-002	17-SEP-02	SOIL	GROSS-A/B	GEL	203332
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-8-S	059852-002	17-SEP-02	SOIL	GROSS-A/B	GEL	203332
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-13-S	059853-002	17-SEP-02	SOIL	Cr+6	GEL	203665
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-8-S	059852-002	17-SEP-02	SOIL	Cr+6	GEL	203665
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-13-S	059853-001	17-SEP-02	SOIL	VOA-8260	GEL	203934
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-8-S	059852-001	17-SEP-02	SOIL	VOA-8260	GEL	203934
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-13-S	059853-002	17-SEP-02	SOIL	HE-8330	GEL	204142
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-8-S	059852-002	17-SEP-02	SOIL	HE-8330	GEL	204142
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-13-S	059853-002	17-SEP-02	SOIL	TOTAL-CN	GEL	204703
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-8-S	059852-002	17-SEP-02	SOIL	TOTAL-CN	GEL	204703
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-13-S	059853-002	17-SEP-02	SOIL	RCRA METALS	GEL	203818, 203489
1087	Bldg. 6743 SP	Volume 4	605674	6743/1087-SP1-BH1-8-S	059852-002	17-SEP-02	SOIL	RCRA METALS	GEL	203818, 203489
1089	Bldg. 6734 SP	Volume 7	605732	6734/1089-SP1-BH1-14-S	059855-003	17-SEP-02	SOIL	GAMMA SPEC	RPSD	201315
1089	Bldg. 6734 SP	Volume 7	605732	6734/1089-SP1-BH1-9-S	059854-003	17-SEP-02	SOIL	GAMMA SPEC	RPSD	201315
1089	Bldg. 6734 SP	Volume 4	605674	6734/1089-SP1-BH1-14-S	059855-002	17-SEP-02	SOIL	PCB-8082	GEL	203015

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

Acronym List

GEL	= General Engineering Laboratory.
ERCL	= Environmental Restoration Chemistry Laboratory.
mg/kg	= milligram per kilogram.
NC	= Not calculated for nondetected results.
ND	= Not detected.
PCB	= Polychlorinated biphenyls.
pCi/g	= picocurie(s) per gram.
RPD	= Relative percent difference and is calculated as: (|x1 - x2| / ((x1 + x2)/2)) x 100. Where: x1 = concentration detected in the primary sample x2 = concentration detected in the duplicate environmental sample.
RPSD	= Radiation Protection and Sample Diagnostics Laboratory
SVOC	= Semivolatile organic compounds.
µg/kg	= microgram per kilogram.
VOC	= Volatile Organic Compounds.

DSS Site 1084, Bldg. 6505 Septic System
RPD's Calculated for VOC Soil Samples
Collected in August 2002

Parameter	6505-DF1-BH2-3-S Primary Sample (GEL)	6505-DF1-BH2-3-DU Duplicate Sample (GEL)	
	µg/kg		
Acetone	ND	ND	NC
Benzene	ND	ND	NC
Bromodichloromethane	ND	ND	NC
Bromoform	ND	ND	NC
Bromomethane	ND	ND	NC
2-Butanone	25.5	9.98	87.49
Carbon disulfide	ND	ND	NC
Carbon tetrachloride	ND	ND	NC
Chlorobenzene	ND	ND	NC
Chloroethane	ND	ND	NC
Chloroform	ND	ND	NC
Chloromethane	ND	ND	NC
Dibromochloromethane	ND	ND	NC
1,1-Dichloroethane	ND	ND	NC
1,2-Dichloroethane	ND	ND	NC
1,1-Dichloroethene	ND	ND	NC
cis-1,2-Dichloroethene	ND	ND	NC
trans-1,2-Dichloroethene	ND	ND	NC
1,2-Dichloropropane	ND	ND	NC
cis-1,3-Dichloropropene	ND	ND	NC
trans-1,3-Dichloropropene	ND	ND	NC
Ethyl benzene	ND	ND	NC
2-Hexanone	ND	ND	NC
Methylene chloride	ND	ND	NC
4-methyl-, 2-Pentanone	ND	ND	NC
Styrene	ND	ND	NC
1,1,2,2-Tetrachloroethane	ND	ND	NC
Tetrachloroethene	ND	ND	NC
Toluene	ND	ND	NC
1,1,1-Trichloroethane	ND	ND	NC
1,1,2-Trichloroethane	ND	ND	NC
Trichloroethene	ND	ND	NC
Vinyl acetate	ND	ND	NC
Vinyl chloride	ND	ND	NC
Xylene	ND	ND	NC

DSS Site 1084, Bldg. 6505 Septic System
RPD's Calculated for SVOC Soil Samples
Collected in August 2002

Parameter	6505-DF1-BH2-3-S Primary Sample (GEL)	6505-DF1-BH2-3-DU Duplicate Sample (GEL)	RPD
	µg/kg		
Acenaphthene	ND	ND	NC
Acenaphthylene	ND	ND	NC
Anthracene	ND	ND	NC
Benzo(a)anthracene	ND	ND	NC
Benzo(a)pyrene	ND	ND	NC
Benzo(b)fluoranthene	ND	ND	NC
Benzo(ghi)perylene	ND	ND	NC
Benzo(k)fluoranthene	ND	ND	NC
4-Bromophenyl phenyl ether	ND	ND	NC
Butylbenzyl phthalate	ND	ND	NC
Carbazole	ND	ND	NC
4-Chloro-3-methylphenol	ND	ND	NC
4-Chlorobenzenamine	ND	ND	NC
bis(2-Chloroethoxy)methane	ND	ND	NC
bis(2-Chloroethyl)ether	ND	ND	NC
bis-Chloroisopropyl ether	ND	ND	NC
2-Chloronaphthalene	ND	ND	NC
2-Chlorophenol	ND	ND	NC
4-Chlorophenyl phenyl ether	ND	ND	NC
Chrysene	ND	ND	NC
m-,p-Cresol	ND	ND	NC
o-Cresol	ND	ND	NC
Di-n-butyl phthalate	ND	ND	NC
Di-n-octyl phthalate	ND	ND	NC
Dibenz[a,h]anthracene	ND	ND	NC
Dibenzofuran	ND	ND	NC
1,2-Dichlorobenzene	ND	ND	NC
1,3-Dichlorobenzene	ND	ND	NC
1,4-Dichlorobenzene	ND	ND	NC
3,3'-Dichlorobenzidine	ND	ND	NC
2,4-Dichlorophenol	ND	ND	NC
Diethylphthalate	ND	ND	NC
2,4-Dimethylphenol	ND	ND	NC
Dimethylphthalate	ND	ND	NC
Dinitro-o-cresol	ND	ND	NC
2,4-Dinitrophenol	ND	ND	NC
2,4-Dinitrotoluene	ND	ND	NC
2,6-Dinitrotoluene	ND	ND	NC
1,2-Diphenylhydrazine	ND	ND	NC
bis(2-Ethylhexyl)phthalate	ND	ND	NC
Fluoranthene	ND	ND	NC
Fluorene	ND	ND	NC
Hexachlorobenzene	ND	ND	NC
Hexachlorobutadiene	ND	ND	NC

DSS Site 1084, Bldg. 6505 Septic System
RPD's Calculated for SVOC Soil Samples
Collected in August 2002

Parameter	6505-DF1-BH2-3-S Primary Sample (GEL)	6505-DF1-BH2-3-DUP Duplicate Sample (GEL)	RPD
	µg/kg		
Hexachlorocyclopentadiene	ND	ND	NC
Hexachloroethane	ND	ND	NC
Indeno(1,2,3-c,d)pyrene	ND	ND	NC
Isophorone	ND	ND	NC
2-Methylnaphthalene	ND	ND	NC
Naphthalene	ND	ND	NC
Nitro-benzene	ND	ND	NC
2-Nitroaniline	ND	ND	NC
3-Nitroaniline	ND	ND	NC
4-Nitroaniline	ND	ND	NC
2-Nitrophenol	ND	ND	NC
4-Nitrophenol	ND	ND	NC
n-Nitrosodiphenylamine	ND	ND	NC
Pentachlorophenol	ND	ND	NC
Phenanthrene	ND	ND	NC
Phenol	ND	ND	NC
Pyrene	ND	ND	NC
1,2,4-Trichlorobenzene	ND	ND	NC
2,4,5-Trichlorophenol	ND	ND	NC
2,4,6-Trichlorophenol	ND	ND	NC

DSS Site 1084, Bldg. 6505 Septic System
RPD's Calculated for PCB Soil Samples
Collected in August 2002

Parameter	6505-DF1-BH2-3-S Primary Sample (GEL)	6505-DF1-BH2-3-DUP Duplicate Sample (GEL)	RPD
	µg/kg		
Aroclor 1016	ND	ND	NC
Aroclor 1221	ND	ND	NC
Aroclor 1232	ND	ND	NC
Aroclor 1242	ND	ND	NC
Aroclor 1248	ND	ND	NC
Aroclor 1254	ND	ND	NC
Aroclor 1260	ND	ND	NC

DSS Site 1084, Bldg. 6505 Septic System
RPD's Calculated for High Explosives Soil Samples
Collected in August 2002

Parameter	6505-DF1-BH2-3-S Primary Sample (GEL)	6505-DF1-BH2-3-DU Duplicate Sample (GEL)	RPD
	µg/kg		
4-Amino-2,6-dinitrotoluene	ND	ND	NC
2-Amino-4,6-dinitrotoluene	ND	ND	NC
1,3-Dinitrobenzene	ND	ND	NC
2,4-Dinitrotoluene	ND	ND	NC
2,6-Dinitrotoluene	ND	ND	NC
HMX	ND	ND	NC
Nitro-benzene	ND	ND	NC
2-Nitrotoluene	ND	ND	NC
3-Nitrotoluene	ND	ND	NC
4-Nitrotoluene	ND	ND	NC
RDX	ND	ND	NC
Tetryl	ND	ND	NC
1,3,5-Trinitrobenzene	ND	ND	NC
2,4,6-Trinitrotoluene	ND	ND	NC

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DSS Site 1084, Bldg. 6505 Septic System
RPD's Calculated for Metals Soil Samples
Collected in August 2002

Parameter	6505-DF1-BH2-3-S Primary Sample (GEL)	6505-DF1-BH2-3-DU Duplicate Sample (GEL)	RPD
	mg/kg		
Arsenic	3.15	3.17	0.63
Barium	103	137	28.33
Cadmium	0.208	0.197	5.43
Chromium	10.1	9.17	9.65
Lead	5.75	4.86	16.78
Mercury	0.00416	0.00928	76.19
Selenium	ND	ND	NC
Silver	ND	ND	NC

DSS Site 1084, Bldg. 6505 Septic System
RPD's Calculated for Chromium VI Soil Samples
Collected in August 2002

Parameter	6505-DF1-BH2-3-S Primary Sample (GEL)	6505-DF1-BH2-3-DU Duplicate Sample (GEL)	RPD
	mg/kg		
Chromium (VI)	ND	ND	NC

DSS Site 1084, Bldg. 6505 Septic System
RPD's Calculated for Cyanide Soil Samples
Collected in August 2002

Parameter	6505-DF1-BH2-3-S Primary Sample (GEL)	6505-DF1-BH2-3-DU Duplicate Sample (GEL)	RPD
	mg/kg		
Cyanide, total	0.0725	ND	NC

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DSS Site 1084, Bldg. 6505 Septic System
RPD's Calculated for Gamma Spectroscopy Soil Samples
Collected in August 2002

Parameter	6505-DF1-BH2-3-S Primary Sample (RPSD)	6505-DF1-BH2-3-DU Duplicate Sample (RPSD)	RPD
	pCi/g		
Cesium-137	ND	ND	NC
Thorium-232	0.734	0.719	2.06
Uranium-235	ND	ND	NC
Uranium-238	ND	ND	NC

DSS Site 1084, Bldg. 6505 Septic System
RPD's Calculated for Gross Alpha/Beta Soil Samples
Collected in August 2002

Parameter	6505-DF1-BH2-3-S Primary Sample (GEL)	6505-DF1-BH2-3-DU Duplicate Sample (GEL)	RPD
	pCi/g		
Gross Alpha	8.29	6.83	19.31
Gross Beta	19.4	17.9	8.04

Sandia National Laboratories

Drain and Septic Systems Project Quality Control (QC) Report

April 2005

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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 605649

Site #	Site Name	SAMPLE#	F#	DISP_ER_SAMP_LOC	SAMPLE DATE	MATRIX	LAB TEST	BATCH #
1084	Bldg. 6505 SS	059673	001	6505/1084-DF1-BH1-3-S	20-AUG-02	SOIL	VOA-8260	196955
1084	Bldg. 6505 SS	059673	002	6505/1084-DF1-BH1-3-S	20-AUG-02	SOIL	BNA-8270	196839
1084	Bldg. 6505 SS	059673	002	6505/1084-DF1-BH1-3-S	20-AUG-02	SOIL	Cr+6	196888
1084	Bldg. 6505 SS	059673	002	6505/1084-DF1-BH1-3-S	20-AUG-02	SOIL	GROSS-A/B	198983
1084	Bldg. 6505 SS	059673	002	6505/1084-DF1-BH1-3-S	20-AUG-02	SOIL	HE-8330	196863
1084	Bldg. 6505 SS	059673	002	6505/1084-DF1-BH1-3-S	20-AUG-02	SOIL	PCB-8082	196833
1084	Bldg. 6505 SS	059673	002	6505/1084-DF1-BH1-3-S	20-AUG-02	SOIL	RCRA METALS	196732, 197745
1084	Bldg. 6505 SS	059673	002	6505/1084-DF1-BH1-3-S	20-AUG-02	SOIL	TOTAL-CN	197511
1084	Bldg. 6505 SS	059674	001	6505/1084-DF1-BH1-8-S	20-AUG-02	SOIL	VOA-8260	196955
1084	Bldg. 6505 SS	059674	002	6505/1084-DF1-BH1-8-S	20-AUG-02	SOIL	BNA-8270	196839
1084	Bldg. 6505 SS	059674	002	6505/1084-DF1-BH1-8-S	20-AUG-02	SOIL	Cr+6	196888
1084	Bldg. 6505 SS	059674	002	6505/1084-DF1-BH1-8-S	20-AUG-02	SOIL	GROSS-A/B	198983
1084	Bldg. 6505 SS	059674	002	6505/1084-DF1-BH1-8-S	20-AUG-02	SOIL	HE-8330	196863
1084	Bldg. 6505 SS	059674	002	6505/1084-DF1-BH1-8-S	20-AUG-02	SOIL	PCB-8082	196833
1084	Bldg. 6505 SS	059674	002	6505/1084-DF1-BH1-8-S	20-AUG-02	SOIL	RCRA METALS	196732, 197745
1084	Bldg. 6505 SS	059674	002	6505/1084-DF1-BH1-8-S	20-AUG-02	SOIL	TOTAL-CN	197511
1084	Bldg. 6505 SS	059675	001	6505/1084-DF1-BH2-3-DU	20-AUG-02	SOIL	VOA-8260	196955
1084	Bldg. 6505 SS	059675	002	6505/1084-DF1-BH2-3-DU	20-AUG-02	SOIL	BNA-8270	196839
1084	Bldg. 6505 SS	059675	002	6505/1084-DF1-BH2-3-DU	20-AUG-02	SOIL	Cr+6	196888
1084	Bldg. 6505 SS	059675	002	6505/1084-DF1-BH2-3-DU	20-AUG-02	SOIL	GROSS-A/B	198983
1084	Bldg. 6505 SS	059675	002	6505/1084-DF1-BH2-3-DU	20-AUG-02	SOIL	HE-8330	196863
1084	Bldg. 6505 SS	059675	002	6505/1084-DF1-BH2-3-DU	20-AUG-02	SOIL	PCB-8082	196833
1084	Bldg. 6505 SS	059675	002	6505/1084-DF1-BH2-3-DU	20-AUG-02	SOIL	RCRA METALS	196732, 197745
1084	Bldg. 6505 SS	059675	002	6505/1084-DF1-BH2-3-DU	20-AUG-02	SOIL	TOTAL-CN	197511
1084	Bldg. 6505 SS	059676	001	6505/1084-DF1-BH2-3-S	20-AUG-02	SOIL	VOA-8260	196955
1084	Bldg. 6505 SS	059676	002	6505/1084-DF1-BH2-3-S	20-AUG-02	SOIL	BNA-8270	196839
1084	Bldg. 6505 SS	059676	002	6505/1084-DF1-BH2-3-S	20-AUG-02	SOIL	Cr+6	196888
1084	Bldg. 6505 SS	059676	002	6505/1084-DF1-BH2-3-S	20-AUG-02	SOIL	GROSS-A/B	198983
1084	Bldg. 6505 SS	059676	002	6505/1084-DF1-BH2-3-S	20-AUG-02	SOIL	HE-8330	196863

GEL QC CROSS REFERENCE

COC 605649

Site #	Site Name	SAMPLE#	F#	DISP_ER_SAMP_LOC	SAMPLE DATE	MATRIX	LAB TEST	BATCH #
1084	Bldg. 6505 SS	059676	002	6505/1084-DF1-BH2-3-S	20-AUG-02	SOIL	PCB-8082	196833
1084	Bldg. 6505 SS	059676	002	6505/1084-DF1-BH2-3-S	20-AUG-02	SOIL	RCRA METALS	196732, 197745
1084	Bldg. 6505 SS	059676	002	6505/1084-DF1-BH2-3-S	20-AUG-02	SOIL	TOTAL-CN	197511
1084	Bldg. 6505 SS	059677	001	6505/1084-DF1-BH2-8-S	20-AUG-02	SOIL	VOA-8260	196955
1084	Bldg. 6505 SS	059677	002	6505/1084-DF1-BH2-8-S	20-AUG-02	SOIL	BNA-8270	196839
1084	Bldg. 6505 SS	059677	002	6505/1084-DF1-BH2-8-S	20-AUG-02	SOIL	Cr+6	196888
1084	Bldg. 6505 SS	059677	002	6505/1084-DF1-BH2-8-S	20-AUG-02	SOIL	GROSS-A/B	198983
1084	Bldg. 6505 SS	059677	002	6505/1084-DF1-BH2-8-S	20-AUG-02	SOIL	HE-8330	196863
1084	Bldg. 6505 SS	059677	002	6505/1084-DF1-BH2-8-S	20-AUG-02	SOIL	PCB-8082	196833
1084	Bldg. 6505 SS	059677	002	6505/1084-DF1-BH2-8-S	20-AUG-02	SOIL	RCRA METALS	196732, 197745
1084	Bldg. 6505 SS	059677	002	6505/1084-DF1-BH2-8-S	20-AUG-02	SOIL	TOTAL-CN	197511
1084	Bldg. 6505 SS	059678	001	6505/1084-DF1-BH3-3-S	20-AUG-02	SOIL	VOA-8260	196955
1084	Bldg. 6505 SS	059678	002	6505/1084-DF1-BH3-3-S	20-AUG-02	SOIL	BNA-8270	196839
1084	Bldg. 6505 SS	059678	002	6505/1084-DF1-BH3-3-S	20-AUG-02	SOIL	Cr+6	196888
1084	Bldg. 6505 SS	059678	002	6505/1084-DF1-BH3-3-S	20-AUG-02	SOIL	GROSS-A/B	198983
1084	Bldg. 6505 SS	059678	002	6505/1084-DF1-BH3-3-S	20-AUG-02	SOIL	HE-8330	196863
1084	Bldg. 6505 SS	059678	002	6505/1084-DF1-BH3-3-S	20-AUG-02	SOIL	PCB-8082	196833
1084	Bldg. 6505 SS	059678	002	6505/1084-DF1-BH3-3-S	20-AUG-02	SOIL	RCRA METALS	196732, 197745
1084	Bldg. 6505 SS	059678	002	6505/1084-DF1-BH3-3-S	20-AUG-02	SOIL	TOTAL-CN	197511
1084	Bldg. 6505 SS	059679	001	6505/1084-DF1-BH3-8-S	20-AUG-02	SOIL	VOA-8260	196955
1084	Bldg. 6505 SS	059679	002	6505/1084-DF1-BH3-8-S	20-AUG-02	SOIL	BNA-8270	196839
1084	Bldg. 6505 SS	059679	002	6505/1084-DF1-BH3-8-S	20-AUG-02	SOIL	Cr+6	196888
1084	Bldg. 6505 SS	059679	002	6505/1084-DF1-BH3-8-S	20-AUG-02	SOIL	GROSS-A/B	198983
1084	Bldg. 6505 SS	059679	002	6505/1084-DF1-BH3-8-S	20-AUG-02	SOIL	HE-8330	196863
1084	Bldg. 6505 SS	059679	002	6505/1084-DF1-BH3-8-S	20-AUG-02	SOIL	PCB-8082	196833
1084	Bldg. 6505 SS	059679	002	6505/1084-DF1-BH3-8-S	20-AUG-02	SOIL	RCRA METALS	196732, 197745
1084	Bldg. 6505 SS	059679	002	6505/1084-DF1-BH3-8-S	20-AUG-02	SOIL	TOTAL-CN	197511
1084	Bldg. 6505 SS	059680	001	6505/1084-DF1-BH3-TB	20-AUG-02	AQUEOUS	VOA-8260	197301

Sandia National Laboratories

Drain and Septic Systems Project Quality Control (QC) Report

April 2005

Volume 7 of 7
Radiation Protection & Sample Diagnostics (RPSD)
Laboratory Data

Environmental
Restoration
Project

United States Department of Energy
Sandia Site Office

RPSD QC CROSS REFERENCE

COC 605640
BATCH NO. 201181

Site #	Site Name	SAMPLE#	F#	ER SAMPLE ID	SAMPLE DATE	MATRIX	LAB TEST
1025	Bldg. 6501 E. SS	059668	003	6501E/1025-SP1-BH1-11-S	19-AUG-02	SOIL	GAMMA SPEC
1025	Bldg. 6501 E. SS	059669	003	6501E/1025-SP1-BH1-16-S	19-AUG-02	SOIL	GAMMA SPEC
1026	Bldg. 6501 W. SS	059670	003	6501W/1026-SP1-BH1-12.5-S	19-AUG-02	SOIL	GAMMA SPEC
1026	Bldg. 6501 W. SS	059671	003	6501W/1026-SP1-BH1-17-S	19-AUG-02	SOIL	GAMMA SPEC
1084	Bldg. 6505 SS	059673	003	6505/1084-DF1-BH1-3-S	20-AUG-02	SOIL	GAMMA SPEC
1084	Bldg. 6505 SS	059674	003	6505/1084-DF1-BH1-8-S	20-AUG-02	SOIL	GAMMA SPEC
1084	Bldg. 6505 SS	059675	003	6505/1084-DF1-BH2-3-DU	20-AUG-02	SOIL	GAMMA SPEC
1084	Bldg. 6505 SS	059676	003	6505/1084-DF1-BH2-3-S	20-AUG-02	SOIL	GAMMA SPEC
1084	Bldg. 6505 SS	059677	003	6505/1084-DF1-BH2-8-S	20-AUG-02	SOIL	GAMMA SPEC
1084	Bldg. 6505 SS	059678	003	6505/1084-DF1-BH3-3-S	20-AUG-02	SOIL	GAMMA SPEC
1084	Bldg. 6505 SS	059679	003	6505/1084-DF1-BH3-8-S	20-AUG-02	SOIL	GAMMA SPEC
1032	Bldg. 6610 SS	059681	003	6610/1032-OF1-BH1-2-S	20-AUG-02	SOIL	GAMMA SPEC
1032	Bldg. 6610 SS	059682	003	6610/1032-OF1-BH1-7-S	20-AUG-02	SOIL	GAMMA SPEC
1032	Bldg. 6610 SS	059683	003	6610/1032-SP1-BH1-12-S	21-AUG-02	SOIL	GAMMA SPEC
1032	Bldg. 6610 SS	059684	003	6610/1032-SP1-BH1-17-S	21-AUG-02	SOIL	GAMMA SPEC
1028	Bldg. 6560 SS	059686	003	6560/1028-SP1-BH1-14-S	21-AUG-02	SOIL	GAMMA SPEC
1028	Bldg. 6560 SS	059687	003	6560/1028-SP1-BH1-19-S	21-AUG-02	SOIL	GAMMA SPEC
1028	Bldg. 6560 SS	059688	003	6560/1028-SP2-BH1-7-S	22-AUG-02	SOIL	GAMMA SPEC
1028	Bldg. 6560 SS	059689	003	6560/1028-SP2-BH1-12-S	22-AUG-02	SOIL	GAMMA SPEC

[redacted] COC# 605649 [redacted]

CASE NARRATIVE
for
Sandia National Laboratories
ARCOC-605649
SDG#65936A
ARCOC-605650
SDG#65936B
ARCOC-605651
SDG#65936C
ARCOC-605655
SDG#65936D
Case No. 7223.02.03.02

September 19, 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 thirty soil samples and twelve aqueous samples on August 20th, 21st, and 22nd, 2002. The samples arrived at General Engineering Laboratories, Inc., (GEL) Charleston, South Carolina on August 23rd, 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 2.0, 3.0, and 4.0°C, as measured from the temperature control bottles.

One of the vials for the trip blank was received with headspace. There was sufficient sample from the remaining vials to perform the analysis. Sandia was notified. On ARCOC-605649, 605650, and 605651, the metals method listed for soils was 6020. On the equipment blanks on ARCOC-605655, metals method 6010 was listed. Sandia was notified. Client instructed GEL to use the 6010 analysis for both soils and water samples.

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
605649	65936A	15	08/20/02	08/23/02
605650	65936B	9	08/20/02,08/21/02	08/23/02
605651	65936C	9	08/21/02,08/22/02	08/23/02
605655	65936D	9	08/22/02	08/23/02

The laboratory received the following samples:

Laboratory ID	Description
ARCOC-605649:	
65936001	059673-001
65936002	059674-001
65936003	059675-001
65936004	059676-001
65936005	059677-001
65936006	059678-001
65936007	059679-001
65936016	059673-002
65936017	059674-002
65936018	059675-002
65936019	059676-002
65936020	059677-002
65936021	059678-002
65936022	059679-002
65944001	059680-001

ARCOC-605650:

65936008	059681-001
65936009	059682-001
65936010	059683-001
65936011	059684-001
65936023	059681-002
65936024	059682-002
65936025	059683-002
65936026	059684-002
65944002	059685-001

ARCOC-605651:

65936012	059686-001
65936013	059687-001
65936014	059688-001
65936015	059689-001
65936027	059686-002
65936028	059687-002
65936029	059688-002
65936030	059689-002
65944003	059690-001

ARCOC-605655:

65944004	059639-001
65944005	059639-009
65944006	059639-002
65944007	059639-003
65944008	059639-004
65944009	059639-005
65944010	059639-006
65944011	059639-007
65944012	059639-008

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

GENERAL ENGINEERING LABORATORIES
P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29407
(843) 556-8171 • Fax (843) 766-1178

GC/MS Volatile Organics
Sandia National Labs (SNLS)
SDG# 65936

Method/Analysis Information

Procedure:	Volatile Organic Compounds (VOC) by Gas Chromatograph/Mass Spectrometer
Analytical Method:	SW846 8260A
Prep Method:	SW846 5030A
Analytical Batch Number:	196955
Prep Batch Number:	196953

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
65936001	059673-001
65936002	059674-001
65936003	059675-001
65936004	059676-001
65936005	059677-001
65936006	059678-001
65936007	059679-001
65936008	059681-001
65936009	059682-001
65936010	059683-001
65936011	059684-001
65936012	059686-001
65936013	059687-001
65936014	059688-001
65936015	059689-001
1200290123	VBLK01 (Blank)

1200290126 VBLK01LCS (Laboratory Control Sample)

Preparation/Analytical Method Verification

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

QC Sample Designation
Matrix spikes were analyzed on a sample of similar matrix that was in SNLS sample delivery group/work order, # 65745.

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.

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

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
Sample re-analysis was not required for this sample delivery 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 on the original raw data. These hard copies are temporary 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 package. The data validator will always sign and date the case narrative. Data that are not generated electronically, and such as hand written pages, will be scanned and inserted into the electronic package.

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
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

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: Pat Steele **Date:** 09-13-02

QC Summary

Report Date: September 13, 2002

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

Workorder: 65936

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Volatile-GC/MS Federal											
Batch 196955											
QC1200290126 LCS											
1,1-Dichloroethylene	50.0			44.0	ug/kg		88	(75%-134%)	SHJ	08/27/02	11:51
Benzene	50.0			49.2	ug/kg		98	(80%-120%)			
Chlorobenzene	50.0			48.7	ug/kg		98	(82%-118%)			
Toluene	50.0			48.0	ug/kg		96	(74%-115%)			
Trichloroethylene	50.0			48.0	ug/kg		96	(80%-119%)			
**Bromofluorobenzene	50.0			47.6	ug/kg		95	(69%-138%)			
**Dibromofluoromethane	50.0			48.6	ug/kg		97	(67%-137%)			
**Toluene-d8	50.0			47.4	ug/kg		95	(67%-139%)			
QC1200290123 MB											
1,1,1-Trichloroethane			U	ND	ug/kg					08/27/02	13:14
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						

QC Summary

Workorder: 65936

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Volatile-GC/MS Federal										
Batch 196955										
trans-1,2-Dichloroethylene			U	ND	ug/kg					
trans-1,3-Dichloropropylene			U	ND	ug/kg					
**Bromofluorobenzene	50.0			48.7	ug/kg		98	(69%-138%)		
**Dibromofluoromethane	50.0			48.5	ug/kg		97	(67%-137%)		
**Toluene-d8	50.0			47.6	ug/kg		95	(67%-139%)		
QC1200290124 65745001 PS										
1,1-Dichloroethylene	50.0	U	ND	46.8	ug/L		94	(55%-128%)		08/30/02 00:47
Benzene	50.0	U	ND	51.3	ug/L		103	(53%-118%)		
Chlorobenzene	50.0	U	ND	50.4	ug/L		101	(53%-116%)		
Toluene	50.0	U	ND	50.5	ug/L		101	(56%-113%)		
Trichloroethylene	50.0	U	ND	50.2	ug/L		100	(54%-119%)		
**Bromofluorobenzene	50.0		48.5	47.8	ug/L		96	(69%-138%)		
**Dibromofluoromethane	50.0		48.1	47.0	ug/L		94	(67%-137%)		
**Toluene-d8	50.0		47.6	47.5	ug/L		95	(67%-139%)		
QC1200290125 65745001 PSD										
1,1-Dichloroethylene	50.0	U	ND	43.3	ug/L	8	87	(0%-21%)		08/30/02 01:11
Benzene	50.0	U	ND	47.8	ug/L	7	96	(0%-17%)		
Chlorobenzene	50.0	U	ND	46.7	ug/L	8	93	(0%-21%)		
Toluene	50.0	U	ND	47.7	ug/L	6	95	(0%-25%)		
Trichloroethylene	50.0	U	ND	46.4	ug/L	8	93	(0%-25%)		
**Bromofluorobenzene	50.0		48.5	48.1	ug/L		96	(69%-138%)		
**Dibromofluoromethane	50.0		48.1	47.7	ug/L		95	(67%-137%)		
**Toluene-d8	50.0		47.6	47.4	ug/L		95	(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 th
- ** 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. T
- 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 infromation.
- X Uncertain identification for gamma spectroscopy.

QC Summary

Workorder: 65936

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

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 acceptence 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 Volatile Organics
Sandia National Labs (SNLS)
SDG 65936-1

Method/Analysis Information

Procedure:	Volatile Organic Compounds (VOC) by GC/MS by Methods 8260B/5030B
Analytical Method:	SW846 8260B DOE-AL
Analytical Batch Number:	197301

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
65944001	059680-001
65944002	059685-001
65944003	059690-001
65944004	059639-001
65944005	059639-009
1200290971	VBLK01 (Method Blank)
1200290979	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

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
Matrix spike analyses were not required for this sample delivery group/work order.

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
Reanalyses 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
Sulfur dioxide was found in these samples when a TIC search report was generated. It is believed that the sulfur dioxide should not be present in these samples, and its presence is believed to be the result of system contamination from the analysis of a sample that contained a high concentration of this compound.

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.

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
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
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: Pat Stute **Date:** 09-16-02

QC Summary

Report Date: September 16, 2002

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

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Volatile-GC/MS Federal											
Batch 197301											
QC1200290979 LCS											
1,1-Dichloroethylene	50.0			45.3	ug/L		91	(78%-140%)	RMB	08/27/02	08:40
Benzene	50.0			48.5	ug/L		97	(78%-119%)			
Chlorobenzene	50.0			50.0	ug/L		100	(82%-120%)			
Toluene	50.0			50.8	ug/L		102	(68%-133%)			
Trichloroethylene	50.0			47.2	ug/L		94	(80%-123%)			
**Bromofluorobenzene	50.0			45.4	ug/L		91	(67%-136%)			
**Dibromofluoromethane	50.0			50.9	ug/L		102	(62%-148%)			
**Toluene-d8	50.0			48.3	ug/L		97	(58%-139%)			
QC1200290971 MB											
1,1,1-Trichloroethane			U	ND	ug/L					08/27/02	10:18
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						

QC Summary

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Volatile-GC/MS Federal											
Batch 197301											
trans-1,3-Dichloropropylene			U	ND	ug/L						
**Bromofluorobenzene	50.0			59.9	ug/L		120	(67%-136%)			
**Dibromofluoromethane	50.0			51.9	ug/L		104	(62%-148%)			
**Toluene-d8	50.0			49.7	ug/L		100	(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 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 infromation.
- 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 acceptence 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.

Semi-Volatile Case Narrative
Sandia National Labs (SNLS)
SDG 65936

Method/Analysis Information

Procedure:	**Semivolatile Analysis by Gas Chromatograph/Mass Spectrometer**
Analytical Method:	SW846 8270C
Prep Method:	SW846 3550B
Analytical Batch Number:	196839
Prep Batch Number:	196838

Sample Analysis

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

Sample ID	Client ID
65936016	059673-002
65936017	059674-002
65936018	059675-002
65936019	059676-002
65936020	059677-002
65936021	059678-002
65936022	059679-002
65936023	059681-002
65936024	059682-002
65936025	059683-002
65936026	059684-002

65936027	059686-002
65936028	059687-002
65936029	059688-002
65936030	059689-002
1200289823	SBLK01 (Blank)
1200289824	SBLK01LCS (Laboratory Control Sample)
1200289825	059679-002MS (Matrix Spike)
1200289826	059679-002MSD (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 that 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 blank(s) analyzed with this SDG met the established acceptance criteria.

LCS Recovery Statement
The laboratory control sample (LCS) spike recoveries were within the established acceptance limits.

QC Sample Designation
The following sample analyzed with this SDG was chosen for matrix spike analysis: *65936022*(059679-002).

MS Recovery Statement
The matrix spike (MS) recoveries were within the established acceptance limits.

MSD Recovery Statement
The matrix spike duplicate (MSD) recoveries 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 are needed 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-5MS2 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

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:

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: Herbert R Mauer **Date:** 09/12/02

QC Summary

Report Date: September 12, 2002

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

Workorder: 65936

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-GC/MS Federal											
Batch 196839											
QC1200289824 LCS											
1,2,4-Trichlorobenzene	1670			631	ug/kg		38	(27%-91%)	EH1	08/28/02	10:57
1,4-Dichlorobenzene	1670			568	ug/kg		34	(25%-85%)			
2,4,5-Trichlorophenol	3330			1960	ug/kg		59	(42%-96%)			
2,4,6-Trichlorophenol	3330			1630	ug/kg		49	(32%-91%)			
2,4-Dinitrotoluene	1670			1150	ug/kg		69	(50%-109%)			
2-Chlorophenol	3330			1360	ug/kg		41	(31%-85%)			
4-Chloro-3-methylphenol	3330			1870	ug/kg		56	(34%-97%)			
4-Nitrophenol	3330			3130	ug/kg		94	(22%-128%)			
Acenaphthene	1670			814	ug/kg		49	(39%-98%)			
Hexachlorobenzene	1670			904	ug/kg		54	(41%-105%)			
Hexachlorobutadiene	1670			534	ug/kg		32	(21%-94%)			
Hexachloroethane	1670			526	ug/kg		32	(25%-86%)			
N-Nitrosodipropylamine	1670			709	ug/kg		43	(34%-90%)			
Nitrobenzene	1670			730	ug/kg		44	(30%-84%)			
Pentachlorophenol	3330			1790	ug/kg		54	(27%-109%)			
Phenol	3330			1680	ug/kg		50	(31%-83%)			
Pyrene	1670			886	ug/kg		53	(37%-110%)			
m,p-Cresols	3330			1510	ug/kg		45	(40%-83%)			
o-Cresol	3330			1560	ug/kg		47	(34%-86%)			
**2,4,6-Tribromophenol	3330			1820	ug/kg		55	(23%-111%)			
**2-Fluorobiphenyl	1670			743	ug/kg		45	(21%-104%)			
**2-Fluorophenol	3330			1360	ug/kg		41	(22%-93%)			
**Nitrobenzene-d5	1670			678	ug/kg		41	(24%-97%)			
**Phenol-d5	3330			1690	ug/kg		51	(22%-99%)			
**p-Terphenyl-d14	1670			961	ug/kg		58	(30%-133%)			
QC1200289823 MB											
1,2,4-Trichlorobenzene			U	ND	ug/kg					08/28/02	10:36
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: 65936

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Semi-Volatiles-GC/MS Federal										
Batch 196839										
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			U	ND	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					

QC Summary

Workorder: 65936

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Semi-Volatiles-GC/MS Federal Batch 196839											
**2,4,6-Tribromophenol	3330				1750	ug/kg		53	(23%-111%)		
**2-Fluorobiphenyl	1670				843	ug/kg		51	(21%-104%)		
**2-Fluorophenol	3330				1950	ug/kg		58	(22%-93%)		
**Nitrobenzene-d5	1670				959	ug/kg		58	(24%-97%)		
**Phenol-d5	3330				2260	ug/kg		68	(22%-99%)		
**p-Terphenyl-d14	1670				1200	ug/kg		72	(30%-133%)		
QC1200289825 65936022 MS											
1,2,4-Trichlorobenzene	1670	U	ND		835	ug/kg		50	(15%-112%)		08/28/02 13:41
1,4-Dichlorobenzene	1670	U	ND		739	ug/kg		44	(19%-89%)		
2,4,5-Trichlorophenol	3330	U	ND		2090	ug/kg		63			
2,4,6-Trichlorophenol	3330	U	ND		1790	ug/kg		54			
2,4-Dinitrotoluene	1670	U	ND		1170	ug/kg		70	(32%-117%)		
2-Chlorophenol	3330	U	ND		1880	ug/kg		56	(13%-101%)		
4-Chloro-3-methylphenol	3330	U	ND		2450	ug/kg		74	(23%-114%)		
4-Nitrophenol	3330	U	ND		1710	ug/kg		51	(20%-126%)		
Acenaphthene	1670	U	ND		927	ug/kg		56	(15%-114%)		
Hexachlorobenzene	1670	U	ND		829	ug/kg		50			
Hexachlorobutadiene	1670	U	ND		680	ug/kg		41			
Hexachloroethane	1670	U	ND		673	ug/kg		40			
N-Nitrosodipropylamine	1670	U	ND		995	ug/kg		60	(18%-106%)		
Nitrobenzene	1670	U	ND		1050	ug/kg		63			
Pentachlorophenol	3330	U	ND		1740	ug/kg		52	(34%-110%)		
Phenol	3330	U	ND		2120	ug/kg		64	(17%-104%)		
Pyrene	1670	U	ND		897	ug/kg		54	(26%-130%)		
m,p-Cresols	3330	U	ND		2210	ug/kg		66			
o-Cresol	3330	U	ND		2170	ug/kg		65			
**2,4,6-Tribromophenol	3330		1980		1850	ug/kg		56	(23%-111%)		
**2-Fluorobiphenyl	1670		806		894	ug/kg		54	(21%-104%)		
**2-Fluorophenol	3330		1750		1850	ug/kg		56	(22%-93%)		
**Nitrobenzene-d5	1670		868		947	ug/kg		57	(24%-97%)		
**Phenol-d5	3330		1800		2110	ug/kg		63	(22%-99%)		
**p-Terphenyl-d14	1670		1090		942	ug/kg		57	(30%-133%)		
QC1200289826 65936022 MSD											
1,2,4-Trichlorobenzene	1670	U	ND		719	ug/kg	15	43	(0%-31%)		08/28/02 14:02
1,4-Dichlorobenzene	1670	U	ND		639	ug/kg	15	38	(0%-36%)		
2,4,5-Trichlorophenol	3330	U	ND		2030	ug/kg	3	61			
2,4,6-Trichlorophenol	3330	U	ND		1380	ug/kg	26	42			
2,4-Dinitrotoluene	1670	U	ND		1060	ug/kg	10	64	(0%-37%)		
2-Chlorophenol	3330	U	ND		1540	ug/kg	20	46	(0%-34%)		
4-Chloro-3-methylphenol	3330	U	ND		2050	ug/kg	18	62	(0%-34%)		
4-Nitrophenol	3330	U	ND		1580	ug/kg	8	48	(0%-35%)		
Acenaphthene	1670	U	ND		745	ug/kg	22	45	(0%-33%)		
Hexachlorobenzene	1670	U	ND		708	ug/kg	16	43			
Hexachlorobutadiene	1670	U	ND		590	ug/kg	14	35			
Hexachloroethane	1670	U	ND		608	ug/kg	10	37			
N-Nitrosodipropylamine	1670	U	ND		784	ug/kg	24	47	(0%-29%)		
Nitrobenzene	1670	U	ND		891	ug/kg	16	54			
Pentachlorophenol	3330	U	ND		1550	ug/kg	12	46	(0%-40%)		

QC Summary

Workorder: 65936

Parmname	NOM	Qual	Sample	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Semi-Volatiles-GC/MS Federal										
Batch 196839										
Phenol	3330	U	ND	1620	ug/kg	27	49	(0%-37%)		
Pyrene	1670	U	ND	821	ug/kg	9	49	(0%-39%)		
m,p-Cresols	3330	U	ND	1640	ug/kg	30	49			
o-Cresol	3330	U	ND	1750	ug/kg	21	53			
**2,4,6-Tribromophenol	3330		1980	1580	ug/kg		47	(23%-111%)		
**2-Fluorobiphenyl	1670		806	684	ug/kg		41	(21%-104%)		
**2-Fluorophenol	3330		1750	1590	ug/kg		48	(22%-93%)		
**Nitrobenzene-d5	1670		868	796	ug/kg		48	(24%-97%)		
**Phenol-d5	3330		1800	1640	ug/kg		49	(22%-99%)		
**p-Terphenyl-d14	1670		1090	884	ug/kg		53	(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 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 infromation.
- 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 acceptence criteria when the sample is greator 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.

Semi-Volatile Case Narrative
Sandia National Labs (SNLS)
SDG 65936-1

Method/Analysis Information

Procedure:	**Semivolatile Analysis by Gas Chromatograph/Mass Spectrometer**
Analytical Method:	SW846 8270C
Prep Method:	SW846 3510C
Analytical Batch Number:	196776
Prep Batch Number:	196775

Sample Analysis

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

Sample ID	Client ID
65944006	059639-002
1200289659	SBLK01 (Blank)
1200289660	SBLK01LCS (Laboratory Control Sample)
1200289661	059639-002MS (Matrix Spike)
1200289662	059639-002MSD (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 that 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
Target analytes were detected in the blank 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 sample analyzed with this SDG was chosen for matrix spike analysis: *65944006*(059639-002).

MS Recovery Statement
The matrix spike (MS) recoveries were within the established acceptance limits.

MSD Recovery Statement
The matrix spike duplicate (MSD) recoveries 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.

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 are needed 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-5MS2 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

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:

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: Herbert N Mauk **Date:** 09/12/02

QC Summary

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-GC/MS Federal											
Batch 196776											
2-Nitrophenol			U	ND	ug/L						
3,3'-Dichlorobenzidine			U	ND	ug/L						
4-Bromophenylphenylether			U	ND	ug/L						
4-Chloro-3-methylphenol			U	ND	ug/L						
4-Chloroaniline			U	ND	ug/L						
4-Chlorophenylphenylether			U	ND	ug/L						
4-Nitrophenol			U	ND	ug/L						
Acenaphthene			U	ND	ug/L						
Acenaphthylene			U	ND	ug/L						
Anthracene			U	ND	ug/L						
Benzo(a)anthracene			U	ND	ug/L						
Benzo(a)pyrene			U	ND	ug/L						
Benzo(b)fluoranthene			U	ND	ug/L						
Benzo(ghi)perylene			U	ND	ug/L						
Benzo(k)fluoranthene			U	ND	ug/L						
Butylbenzylphthalate			U	ND	ug/L						
Carbazole			U	ND	ug/L						
Chrysene			U	ND	ug/L						
Di-n-butylphthalate			U	ND	ug/L						
Di-n-octylphthalate			U	ND	ug/L						
Dibenzo(a,h)anthracene			U	ND	ug/L						
Dibenzofuran			U	ND	ug/L						
Diethylphthalate			U	ND	ug/L						
Dimethylphthalate			U	ND	ug/L						
Diphenylamine			U	ND	ug/L						
Fluoranthene			U	ND	ug/L						
Fluorene			U	ND	ug/L						
Hexachlorobenzene			U	ND	ug/L						
Hexachlorobutadiene			U	ND	ug/L						
Hexachlorocyclopentadiene			U	ND	ug/L						
Hexachloroethane			U	ND	ug/L						
Indeno(1,2,3-cd)pyrene			U	ND	ug/L						
Isophorone			U	ND	ug/L						
N-Nitrosodipropylamine			U	ND	ug/L						
Naphthalene			U	ND	ug/L						
Nitrobenzene			U	ND	ug/L						
Pentachlorophenol			U	ND	ug/L						
Phenanthrene			U	ND	ug/L						
Phenol			U	ND	ug/L						
Pyrene			U	ND	ug/L						
bis(2-Chloroethoxy)methane			U	ND	ug/L						
bis(2-Chloroethyl) ether			U	ND	ug/L						
bis(2-Chloroisopropyl)ether			U	ND	ug/L						
bis(2-Ethylhexyl)phthalate			J	2.20	ug/L						
m,p-Cresols			U	ND	ug/L						
m-Nitroaniline			U	ND	ug/L						
o-Cresol			U	ND	ug/L						
o-Nitroaniline			U	ND	ug/L						

QC Summary

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Semi-Volatiles-GC/MS Federal										
Batch 196776										
p-Nitroaniline			U	ND	ug/L					
**2,4,6-Tribromophenol	100			102	ug/L		102	(27%-126%)		
**2-Fluorobiphenyl	50.0			42.2	ug/L		85	(32%-109%)		
**2-Fluorophenol	100			54.1	ug/L		54	(13%-73%)		
**Nitrobenzene-d5	50.0			42.4	ug/L		85	(33%-107%)		
**Phenol-d5	100			33.5	ug/L		34	(14%-66%)		
**p-Terphenyl-d14	50.0			49.6	ug/L		99	(36%-130%)		
QC1200289661 65944006 MS										
Pyridine	100			0.00	ug/L					08/27/02 17:37
1,2,4-Trichlorobenzene	100	U	ND	78.3	ug/L		78	(44%-102%)		
1,4-Dichlorobenzene	100	U	ND	69.3	ug/L		69	(48%-95%)		
2,4,5-Trichlorophenol	200	U	ND	166	ug/L		83			
2,4,6-Trichlorophenol	200	U	ND	159	ug/L		79			
2,4-Dinitrotoluene	100	U	ND	82.3	ug/L		82	(48%-120%)		
2-Chlorophenol	200	U	ND	142	ug/L		71	(32%-98%)		
4-Chloro-3-methylphenol	200	U	ND	170	ug/L		85	(40%-107%)		
4-Nitrophenol	200	U	ND	93.2	ug/L		47	(16%-78%)		
Acenaphthene	100	U	ND	83.1	ug/L		83	(32%-127%)		
Hexachlorobenzene	100	U	ND	93.9	ug/L		94			
Hexachlorobutadiene	100	U	ND	75.9	ug/L		76			
Hexachloroethane	100	U	ND	66.1	ug/L		66			
N-Nitrosodipropylamine	100	U	ND	79.6	ug/L		80	(44%-119%)		
Nitrobenzene	100	U	ND	74.1	ug/L		74			
Pentachlorophenol	200	U	ND	185	ug/L		92	(44%-104%)		
Phenol	200	U	ND	89.6	ug/L		45	(15%-70%)		
Pyrene	100	U	ND	86.0	ug/L		86	(29%-142%)		
m,p-Cresols	200	U	ND	138	ug/L		69			
o-Cresol	200	U	ND	145	ug/L		73			
**2,4,6-Tribromophenol	200			183	ug/L		92	(27%-126%)		
**2-Fluorobiphenyl	100			70.1	ug/L		70	(32%-109%)		
**2-Fluorophenol	200			117	ug/L		59	(13%-73%)		
**Nitrobenzene-d5	100			68.5	ug/L		69	(33%-107%)		
**Phenol-d5	200			88.1	ug/L		44	(14%-66%)		
**p-Terphenyl-d14	100			83.1	ug/L		83	(36%-130%)		
QC1200289662 65944006 MSD										
Pyridine	100			0.00	ug/L					08/27/02 20:51
1,2,4-Trichlorobenzene	100	U	ND	83.3	ug/L	6	83	(0%-20%)		
1,4-Dichlorobenzene	100	U	ND	73.7	ug/L	6	74	(0%-20%)		
2,4,5-Trichlorophenol	200	U	ND	176	ug/L	5	88			
2,4,6-Trichlorophenol	200	U	ND	166	ug/L	4	83			
2,4-Dinitrotoluene	100	U	ND	88.4	ug/L	7	88	(0%-16%)		
2-Chlorophenol	200	U	ND	151	ug/L	6	76	(0%-25%)		
4-Chloro-3-methylphenol	200	U	ND	173	ug/L	2	87	(0%-25%)		
4-Nitrophenol	200	U	ND	110	ug/L	17	55	(0%-25%)		
Acenaphthene	100	U	ND	88.4	ug/L	6	88	(0%-24%)		
Hexachlorobenzene	100	U	ND	97.9	ug/L	4	98			
Hexachlorobutadiene	100	U	ND	79.0	ug/L	4	79			
Hexachloroethane	100	U	ND	69.6	ug/L	5	70			

QC Summary

Workorder: 65944

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Semi-Volatiles-GC/MS Federal												
Batch 196776												
N-Nitrosodipropylamine	100	U	ND		83.2	ug/L	4	83	(0%-20%)			
Nitrobenzene	100	U	ND		78.1	ug/L	5	78				
Pentachlorophenol	200	U	ND		197	ug/L	7	99	(0%-17%)			
Phenol	200	U	ND		93.7	ug/L	4	47	(0%-29%)			
Pyrene	100	U	ND		91.0	ug/L	6	91	(0%-30%)			
m,p-Cresols	200	U	ND		147	ug/L	6	73				
o-Cresol	200	U	ND		157	ug/L	8	79				
**2,4,6-Tribromophenol	200				194	ug/L		97	(27%-126%)			
**2-Fluorobiphenyl	100				74.7	ug/L		75	(32%-109%)			
**2-Fluorophenol	200				126	ug/L		63	(13%-73%)			
**Nitrobenzene-d5	100				72.8	ug/L		73	(33%-107%)			
**Phenol-d5	200				96.0	ug/L		48	(14%-66%)			
**p-Terphenyl-d14	100				91.0	ug/L		91	(36%-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 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 infromation.
- 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 acceptence 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 Narrative
Sandia National Labs (SNLS)
SDG 65936

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:	196863
Prep Batch Number:	196862

Sample Analysis

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

Sample ID	Client ID
65936016	059673-002
65936017	059674-002
65936018	059675-002
65936019	059676-002
65936020	059677-002
65936021	059678-002
65936022	059679-002
65936023	059681-002
65936024	059682-002
65936025	059683-002
65936026	059684-002
65936027	059686-002

65936028	059687-002
65936029	059688-002
65936030	059689-002
1200289876	XBLK01 (Blank)
1200289877	XBLK01LCS (Laboratory Control Sample)
1200289878	059673-002MS (Matrix Spike)
1200289879	059673-002MSD (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
Tetryl was not within the acceptance limits in the laboratory control sample (LCS). As a result the samples were reextracted out of holding for Tetryl only. The reextracted analysis passed for Tetryl. Both analyses are reported. Please see nonconformance report 4126. Please see the emails in the Miscellaneous Section.

QC Sample Designation
The following sample analyzed with this SDG was chosen for matrix spike analysis: *65936016* (059673-002).

MS Recovery Statement
The matrix spike recoveries were not within the SNLS static limits. The spike recoveries were within the GEL SPC established acceptance limits. The GEL SPC limits are in the QC Summary. Please see the emails in the Miscellaneous Section.

MSD Recovery Statement
The matrix spike duplicate (MSD) 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
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
Tetryl was not within the acceptance limits in the laboratory control sample (LCS). As a result the samples were reextracted out of holding for Tetryl only. The reextracted analysis passed for Tetryl. Both analyses are reported. Please see nonconformance report 4126. Please see the emails in the Miscellaneous Section.

Miscellaneous Information

Nonconformance (NCR) Documentation
Nonconformance report 4126 has been generated for this SDG.

Tetryl was not within the acceptance limits in the laboratory control sample (LCS). As a result the samples were reextracted out of holding for Tetryl only. The reextracted analysis passed for Tetryl. Both analyses are reported. Please see nonconformance report 4126. Please see the emails in the Miscellaneous Section.

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

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 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 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.

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:	201462
Prep Batch Number:	201460

Sample Analysis

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

Sample ID	Client ID
65936016	059673-002
65936017	059674-002
65936018	059675-002
65936019	059676-002
65936020	059677-002
65936021	059678-002
65936022	059679-002
65936023	059681-002
65936024	059682-002
65936025	059683-002
65936026	059684-002
65936027	059686-002

65936028	059687-002
65936029	059688-002
65936030	059689-002
1200300280	XBLK02 (Blank)
1200300281	XBLK02LCS (Laboratory Control Sample)

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
Tetryl was not within the acceptance limits in the laboratory control sample (LCS). As a result the samples were reextracted out of holding for Tetryl only. The reextracted analysis passed for Tetryl. Both analyses are reported. Please see nonconformance report 4126. Please see the emails in the Miscellaneous Section.

QC Sample Designation
A matrix spike was performed on a client sample of similar matrix in SDG 65475.

MS Recovery Statement
The matrix spike recoveries were not within the SNLS static limits. The spike recoveries were within the GEL SPC established acceptance limits. The GEL SPC limits are in the QC Summary. Please see the emails in the Miscellaneous Section.

MSD Recovery Statement
The matrix spike duplicate (MSD) 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
Tetryl was not within the acceptance limits in the laboratory control sample (LCS). As a result the samples were reextracted out of holding for Tetryl only. The reextracted analysis passed for Tetryl. Both analyses are reported. Please see nonconformance report 4126. Please see the emails in the Miscellaneous Section. 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 4126 has been generated for this SDG.

Tetryl was not within the acceptance limits in the laboratory control sample (LCS). As a result the samples were reextracted out of holding for Tetryl only. The reextracted analysis passed for Tetryl. Both analyses are reported. Please see nonconformance report 4126. Please see the emails in the Miscellaneous Section.

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

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

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.

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 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.

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: Robert K Mace **Date:** 09/25/07

QC Summary

Report Date: September 25, 2002

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

Workorder: 65936

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
HPLC Explosives Federal											
Batch 196863											
QC1200289877 LCS											
1,3,5-Trinitrobenzene	800				736	ug/kg		92	(77%-124%)	JLW	08/28/02 19:44
2,4,6-Trinitrotoluene	800				802	ug/kg		100	(80%-120%)		
2,4-Dinitrotoluene	800				730	ug/kg		91	(77%-122%)		
2,6-Dinitrotoluene	800				768	ug/kg		96	(74%-121%)		
2-Amino-4,6-dinitrotoluene	800				770	ug/kg		96	(81%-125%)		
4-Amino-2,6-dinitrotoluene	800				699	ug/kg		87	(79%-123%)		
HMX	800				796	ug/kg		100	(84%-131%)		
Nitrobenzene	800				728	ug/kg		91	(75%-125%)		
RDX	800				807	ug/kg		101	(80%-123%)		
Tetryl	800				411	ug/kg		51*	(65%-124%)		
m-Dinitrobenzene	800				752	ug/kg		94	(77%-124%)		
m-Nitrotoluene	800				738	ug/kg		92	(77%-117%)		
o-Nitrotoluene	800				732	ug/kg		92	(75%-119%)		
p-Nitrotoluene	800				748	ug/kg		94	(76%-121%)		
**1,2-dinitrobenzene	400				378	ug/kg		94	(71%-118%)		
QC1200289876 MB											
1,3,5-Trinitrobenzene				U	ND	ug/kg					08/28/02 19:02
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				364	ug/kg		91	(71%-118%)		
QC1200289878 65936016 MS											
1,3,5-Trinitrobenzene	800	U	ND		732	ug/kg		92	(66%-133%)		08/28/02 20:26
2,4,6-Trinitrotoluene	800	U	ND		753	ug/kg		94	(77%-132%)		
2,4-Dinitrotoluene	800	U	ND		731	ug/kg		91	(61%-134%)		
2,6-Dinitrotoluene	800	U	ND		787	ug/kg		98	(70%-121%)		
2-Amino-4,6-dinitrotoluene	800	U	ND		713	ug/kg		89	(79%-124%)		
4-Amino-2,6-dinitrotoluene	800	U	ND		585	ug/kg		73	(71%-120%)		
HMX	800	U	ND		773	ug/kg		97	(75%-138%)		
Nitrobenzene	800	U	ND		739	ug/kg		92	(72%-120%)		
RDX	800	U	ND		736	ug/kg		92	(61%-136%)		
Tetryl	800	U	ND		632	ug/kg		79	(65%-135%)		

QC Summary

Workorder: 65936

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
HPLC Explosives Federal											
Batch 196863											
m-Dinitrobenzene	800	U	ND		759	ug/kg		95	(75%-125%)		
m-Nitrotoluene	800	U	ND		730	ug/kg		91	(73%-116%)		
o-Nitrotoluene	800	U	ND		736	ug/kg		92	(68%-122%)		
p-Nitrotoluene	800	U	ND		753	ug/kg		94	(67%-125%)		
**1,2-dinitrobenzene	400		373		377	ug/kg		94	(71%-118%)		
QC1200289879 65936016 MSD											
1,3,5-Trinitrobenzene	800	U	ND		843	ug/kg	14	105	(0%-20%)		08/28/02 21:07
2,4,6-Trinitrotoluene	800	U	ND		846	ug/kg	12	106	(0%-20%)		
2,4-Dinitrotoluene	800	U	ND		836	ug/kg	13	104	(0%-24%)		
2,6-Dinitrotoluene	800	U	ND		892	ug/kg	13	111	(0%-21%)		
2-Amino-4,6-dinitrotoluene	800	U	ND		798	ug/kg	11	100	(0%-20%)		
4-Amino-2,6-dinitrotoluene	800	U	ND		627	ug/kg	7	78	(0%-20%)		
HMX	800	U	ND		889	ug/kg	14	111	(0%-38%)		
Nitrobenzene	800	U	ND		844	ug/kg	13	106	(0%-21%)		
RDX	800	U	ND		844	ug/kg	14	105	(0%-35%)		
Tetryl	800	U	ND		727	ug/kg	14	91	(0%-30%)		
m-Dinitrobenzene	800	U	ND		853	ug/kg	12	107	(0%-23%)		
m-Nitrotoluene	800	U	ND		845	ug/kg	15	106	(0%-20%)		
o-Nitrotoluene	800	U	ND		845	ug/kg	14	106	(0%-23%)		
p-Nitrotoluene	800	U	ND		863	ug/kg	14	108	(0%-22%)		
**1,2-dinitrobenzene	400		373		393	ug/kg		98	(71%-118%)		
Batch 201462											
QC1200300281 LCS											
1,3,5-Trinitrobenzene	800				691	ug/kg		86	(77%-124%)	JLW	09/17/02 21:02
2,4,6-Trinitrotoluene	800				693	ug/kg		87	(80%-120%)		
2,4-Dinitrotoluene	800				641	ug/kg		80	(77%-122%)		
2,6-Dinitrotoluene	800				679	ug/kg		85	(74%-121%)		
2-Amino-4,6-dinitrotoluene	800				683	ug/kg		85	(81%-125%)		
4-Amino-2,6-dinitrotoluene	800				595	ug/kg		74*	(79%-123%)		
HMX	800				723	ug/kg		90	(84%-131%)		
Nitrobenzene	800				627	ug/kg		78	(75%-125%)		
RDX	800				713	ug/kg		89	(80%-123%)		
Tetryl	800				603	ug/kg		75	(65%-124%)		
m-Dinitrobenzene	800				664	ug/kg		83	(77%-124%)		
m-Nitrotoluene	800				632	ug/kg		79	(77%-117%)		
o-Nitrotoluene	800				632	ug/kg		79	(75%-119%)		
p-Nitrotoluene	800				640	ug/kg		80	(76%-121%)		
**1,2-dinitrobenzene	400				346	ug/kg		86	(71%-118%)		
QC1200300280 MB											
1,3,5-Trinitrobenzene				U	ND	ug/kg					09/17/02 20:19
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

Workorder: 65936

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
HPLC Explosives Federal											
Batch 201462											
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				354	ug/kg		88	(71%-118%)		
QC1200300293 65745005 MS											
1,3,5-Trinitrobenzene	800	U	ND	H	760	ug/kg		95	(66%-133%)		09/17/02 21:44
2,4,6-Trinitrotoluene	800	U	ND	H	767	ug/kg		96	(77%-132%)		
2,4-Dinitrotoluene	800	U	ND	H	754	ug/kg		94	(61%-134%)		
2,6-Dinitrotoluene	800	U	ND	H	807	ug/kg		101	(70%-121%)		
2-Amino-4,6-dinitrotoluene	800	U	ND	H	761	ug/kg		95	(79%-124%)		
4-Amino-2,6-dinitrotoluene	800	U	ND	H	701	ug/kg		88	(71%-120%)		
HMX	800	U	ND	H	797	ug/kg		100	(75%-138%)		
Nitrobenzene	800	U	ND	H	737	ug/kg		92	(72%-120%)		
RDX	800	U	ND	H	750	ug/kg		94	(61%-136%)		
Tetryl	800	U	ND	H	671	ug/kg		84	(65%-135%)		
m-Dinitrobenzene	800	U	ND	H	778	ug/kg		97	(75%-125%)		
m-Nitrotoluene	800	U	ND	H	742	ug/kg		93	(73%-116%)		
o-Nitrotoluene	800	U	ND	H	737	ug/kg		92	(68%-122%)		
p-Nitrotoluene	800	U	ND	H	753	ug/kg		94	(67%-125%)		
**1,2-dinitrobenzene	400		370	H	401	ug/kg		100	(71%-118%)		
QC1200300294 65745005 MSD											
1,3,5-Trinitrobenzene	800	U	ND	H	761	ug/kg	0	95	(0%-20%)		09/17/02 22:27
2,4,6-Trinitrotoluene	800	U	ND	H	767	ug/kg	0	96	(0%-20%)		
2,4-Dinitrotoluene	800	U	ND	H	755	ug/kg	0	94	(0%-24%)		
2,6-Dinitrotoluene	800	U	ND	H	804	ug/kg	0	100	(0%-21%)		
2-Amino-4,6-dinitrotoluene	800	U	ND	H	752	ug/kg	1	94	(0%-20%)		
4-Amino-2,6-dinitrotoluene	800	U	ND	H	650	ug/kg	8	81	(0%-20%)		
HMX	800	U	ND	H	794	ug/kg	0	99	(0%-38%)		
Nitrobenzene	800	U	ND	H	733	ug/kg	1	92	(0%-21%)		
RDX	800	U	ND	H	747	ug/kg	0	93	(0%-35%)		
Tetryl	800	U	ND	H	667	ug/kg	1	83	(0%-30%)		
m-Dinitrobenzene	800	U	ND	H	778	ug/kg	0	97	(0%-23%)		
m-Nitrotoluene	800	U	ND	H	743	ug/kg	0	93	(0%-20%)		
o-Nitrotoluene	800	U	ND	H	738	ug/kg	0	92	(0%-23%)		
p-Nitrotoluene	800	U	ND	H	751	ug/kg	0	94	(0%-22%)		
**1,2-dinitrobenzene	400		370	H	402	ug/kg		101	(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 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.

QC Summary

Workorder: 65936

Parmname	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. 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 infromation.

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 acceptence 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 Narrative
Sandia National Labs (SNLS)
SDG 65936-1

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:	196860
Prep Batch Number:	196859

Sample Analysis

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

Sample ID	Client ID
65944008	059639-004
1200289873	XBLK01 (Blank)
1200289874	XBLK01LCS (Laboratory Control Sample)
1200289875	XBLK01LCSD (Laboratory Control Sample 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
The LCS failed spike recoveries when evaluated versus the SNLS static limits. The LCS passed spike recoveries when evaluated versus the GEL SPC limits. The GEL SPC limits are on the QC Summary. Please see the emails in the Miscellaneous Section. The associated sample was reextracted out of holding. Both sets of data are reported. Please see nonconformance report 4305.

LCSD Recovery Statement
All the LCSD spike recoveries for this SDG were within the established acceptance limits.

LCS/LCSD RPD Statement
All the relative percent differences (RPD) between the LCS and LCSD were within the required acceptance limits.

QC Sample Designation
A matrix spike/matrix spike duplicate was not performed with this batch.

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.

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
The LCS failed spike recoveries when evaluated versus the SNLS static limits. The LCS passed spike recoveries when evaluated versus the GEL SPC limits. The GEL SPC limits are on the QC Summary. Please see the emails in the Miscellaneous Section. The associated sample was reextracted out of holding. Both sets of data are reported. Please see nonconformance report 4305.

Miscellaneous Information

Nonconformance (NCR) Documentation
Nonconformance report 4305 was generated for this SDG.

The LCS failed spike recoveries when evaluated versus the SNLS static limits. The LCS passed spike recoveries when evaluated versus the GEL SPC limits. The GEL SPC limits are on the QC Summary. Please see the emails in the Miscellaneous Section. The associated sample was reextracted out of holding. Both sets of data are reported. Please see nonconformance report 4305.

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

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 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 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.

Target analytes were detected on the primary column for the indicated samples; they were not detected on the confirmation column.
1200289873, 65944008

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:	201060
Prep Batch Number:	201058

Sample Analysis

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

Sample ID	Client ID
65944008	059639-004RE
1200299291	XBLK02 (Blank)
1200299292	XBLK02LCS (Laboratory Control Sample)
1200299293	XBLK02LCSD (Laboratory Control Sample 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
The LCS failed spike recoveries when evaluated versus the SNLS static limits. The LCS passed spike recoveries when evaluated versus the GEL SPC limits. The GEL SPC limits are on the QC Summary. Please see the emails in the Miscellaneous Section. The associated sample was reextracted out of holding. Both sets of data are reported. Please see nonconformance report 4305.

LCSD Recovery Statement
The LCSD failed spike recoveries when evaluated versus the SNLS static limits. The LCSD passed spike recoveries when evaluated versus the GEL SPC limits. The GEL SPC limits are on the QC Summary. Please see the emails in the Miscellaneous Section. The associated sample was reextracted out of holding. Both sets of data are reported. Please see nonconformance report 4305.

LCS/LCSD RPD Statement
All the relative percent differences (RPD) between each LCS and LCSD were within the required acceptance limits.

QC Sample Designation
A matrix spike/matrix spike was not performed with this batch.

Technical Information

Holding Time Specifications
The LCS and LCSD failed spike recoveries when evaluated versus the SNLS static limits. The LCS and LCSD passed spike recoveries when evaluated versus the GEL SPC limits. The GEL SPC limits are on the QC Summary. Please see the emails in the Miscellaneous Section. The associated sample was reextracted out of holding. Both sets of data are reported. Please see nonconformance report 4305. GEL assigns holding times based on the associated methodology that assigns the date and time from sample collection or sample receipt.

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 4305 was generated for this SDG.

The LCS and LCSD failed spike recoveries when evaluated versus the SNLS static limits. The LCS and LCSD passed spike recoveries when evaluated versus the GEL SPC limits. The GEL SPC limits are on the QC Summary. Please see the emails in the Miscellaneous Section. The associated sample was reextracted out of holding. Both sets of data are reported. Please see nonconformance report 4305.

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

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 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 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.

Target analytes were detected on the primary column for the indicated samples; they were not detected on the confirmation column.
1200299291

Comment

* 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: Deborah M Maier **Date:** 09/25/02

QC Summary

Report Date: September 24, 2002

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

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
HPLC Explosives Federal										
Batch 196860										
QC1200289874 LCS										
1,3,5-Trinitrobenzene	1.04			0.946	ug/L		91	(84%-110%)	JLW	08/27/02 22:26
2,4,6-Trinitrotoluene	1.04			0.998	ug/L		96	(85%-110%)		
2,4-Dinitrotoluene	1.04			0.913	ug/L		88	(78%-110%)		
2,6-Dinitrotoluene	1.04			0.964	ug/L		93	(79%-110%)		
2-Amino-4,6-dinitrotoluene	1.04			0.996	ug/L		96	(77%-110%)		
4-Amino-2,6-dinitrotoluene	1.04			0.925	ug/L		89	(59%-110%)		
HMX	1.04			0.994	ug/L		96	(86%-110%)		
Nitrobenzene	1.04			0.797	ug/L		77	(68%-110%)		
RDX	1.04			0.954	ug/L		92	(76%-110%)		
Tetryl	1.04			0.838	ug/L		81	(73%-110%)		
m-Dinitrobenzene	1.04			0.883	ug/L		85	(76%-110%)		
m-Nitrotoluene	1.04			0.870	ug/L		84	(73%-110%)		
o-Nitrotoluene	1.04			0.854	ug/L		82	(69%-110%)		
p-Nitrotoluene	1.04			0.870	ug/L		84	(73%-110%)		
**1,2-dinitrobenzene	0.519			0.453	ug/L		87	(59%-118%)		
QC1200289875 LCSD										
1,3,5-Trinitrobenzene	1.04			0.956	ug/L	1	92	(0%-20%)		08/27/02 23:08
2,4,6-Trinitrotoluene	1.04			1.01	ug/L	1	97	(0%-20%)		
2,4-Dinitrotoluene	1.04			0.955	ug/L	4	92	(0%-20%)		
2,6-Dinitrotoluene	1.04			1.03	ug/L	7	100	(0%-20%)		
2-Amino-4,6-dinitrotoluene	1.04			0.994	ug/L	0	96	(0%-20%)		
4-Amino-2,6-dinitrotoluene	1.04			0.937	ug/L	1	90	(0%-24%)		
HMX	1.04			0.996	ug/L	0	96	(0%-20%)		
Nitrobenzene	1.04			0.872	ug/L	9	84	(0%-20%)		
RDX	1.04			0.940	ug/L	2	91	(0%-20%)		
Tetryl	1.04			0.917	ug/L	9	88	(0%-20%)		
m-Dinitrobenzene	1.04			0.935	ug/L	6	90	(0%-20%)		
m-Nitrotoluene	1.04			0.951	ug/L	9	92	(0%-20%)		
o-Nitrotoluene	1.04			0.941	ug/L	10	91	(0%-23%)		
p-Nitrotoluene	1.04			0.958	ug/L	10	92	(0%-20%)		
**1,2-dinitrobenzene	0.519			0.477	ug/L		92	(59%-118%)		
QC1200289873 MB										
1,3,5-Trinitrobenzene			U	ND	ug/L					08/27/02 21:44
2,4,6-Trinitrotoluene			U	ND	ug/L					
2,4-Dinitrotoluene			U	ND	ug/L					
2,6-Dinitrotoluene			U	ND	ug/L					
2-Amino-4,6-dinitrotoluene			U	ND	ug/L					
4-Amino-2,6-dinitrotoluene			U	ND	ug/L					
HMX			U	ND	ug/L					
Nitrobenzene			U	ND	ug/L					
RDX			U	ND	ug/L					
Tetryl			U	ND	ug/L					

QC Summary

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
HPLC Explosives Federal										
Batch 196860										
m-Dinitrobenzene			U	ND	ug/L					
m-Nitrotoluene			U	ND	ug/L					
o-Nitrotoluene			U	ND	ug/L					
p-Nitrotoluene			U	ND	ug/L					
**1,2-dinitrobenzene	0.519			0.467	ug/L		90	(59%-118%)		
Batch 201060										
QC1200299292 LCS										
1,3,5-Trinitrobenzene	1.04			0.982	ug/L		95	(84%-110%)	JLW	09/14/02 16:22
2,4,6-Trinitrotoluene	1.04			1.02	ug/L		99	(85%-110%)		
2,4-Dinitrotoluene	1.04			0.919	ug/L		89	(78%-110%)		
2,6-Dinitrotoluene	1.04			0.962	ug/L		93	(79%-110%)		
2-Amino-4,6-dinitrotoluene	1.04			1.04	ug/L		101	(77%-110%)		
4-Amino-2,6-dinitrotoluene	1.04			0.968	ug/L		93	(59%-110%)		
HMX	1.04			1.04	ug/L		100	(86%-110%)		
Nitrobenzene	1.04			0.814	ug/L		78	(68%-110%)		
RDX	1.04			1.04	ug/L		100	(76%-110%)		
Tetryl	1.04			0.983	ug/L		95	(73%-110%)		
m-Dinitrobenzene	1.04			0.904	ug/L		87	(76%-110%)		
m-Nitrotoluene	1.04			0.879	ug/L		85	(73%-110%)		
o-Nitrotoluene	1.04			0.851	ug/L		82	(69%-110%)		
p-Nitrotoluene	1.04			0.892	ug/L		86	(73%-110%)		
**1,2-dinitrobenzene	0.519			0.449	ug/L		86	(59%-118%)		
QC1200299293 LCSD										
1,3,5-Trinitrobenzene	1.04			0.936	ug/L	5	90	(0%-20%)		09/14/02 17:04
2,4,6-Trinitrotoluene	1.04			1.05	ug/L	2	101	(0%-20%)		
2,4-Dinitrotoluene	1.04			0.911	ug/L	1	88	(0%-20%)		
2,6-Dinitrotoluene	1.04			0.939	ug/L	2	90	(0%-20%)		
2-Amino-4,6-dinitrotoluene	1.04			1.05	ug/L	0	101	(0%-20%)		
4-Amino-2,6-dinitrotoluene	1.04			0.968	ug/L	0	93	(0%-24%)		
HMX	1.04			1.05	ug/L	1	101	(0%-20%)		
Nitrobenzene	1.04			0.824	ug/L	1	79	(0%-20%)		
RDX	1.04			1.07	ug/L	3	103	(0%-20%)		
Tetryl	1.04			0.873	ug/L	12	84	(0%-20%)		
m-Dinitrobenzene	1.04			0.882	ug/L	2	85	(0%-20%)		
m-Nitrotoluene	1.04			0.849	ug/L	4	82	(0%-20%)		
o-Nitrotoluene	1.04			0.826	ug/L	3	80	(0%-23%)		
p-Nitrotoluene	1.04			0.858	ug/L	4	83	(0%-20%)		
**1,2-dinitrobenzene	0.519			0.444	ug/L		85	(59%-118%)		
QC1200299291 MB										
1,3,5-Trinitrobenzene			U	ND	ug/L					09/14/02 15:40
2,4,6-Trinitrotoluene			U	ND	ug/L					
2,4-Dinitrotoluene			U	ND	ug/L					
2,6-Dinitrotoluene			U	ND	ug/L					
2-Amino-4,6-dinitrotoluene			U	ND	ug/L					
4-Amino-2,6-dinitrotoluene			U	ND	ug/L					
HMX			U	ND	ug/L					
Nitrobenzene			U	ND	ug/L					
RDX			U	ND	ug/L					

QC Summary

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
HPLC Explosives Federal											
Batch 201060											
Tetryl			U	ND	ug/L						
m-Dinitrobenzene			U	ND	ug/L						
m-Nitrotoluene			U	ND	ug/L						
o-Nitrotoluene			U	ND	ug/L						
p-Nitrotoluene			U	ND	ug/L						
**1,2-dinitrobenzene	0.519			0.394	ug/L		76	(59%-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 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 infromation.
- 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 acceptence 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.

PCB Case Narrative
Sandia National Labs (SNLS)
SDG#65936

Method/Analysis Information

Procedure:	**Polychlorinated Biphenyls by Method 8082**
Analytical Method:	SW846 8082
Prep Method:	SW846 3550B
Analytical Batch Number:	196833
Prep Batch Number:	196832

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 8082:

Sample ID	Client ID
65936016	059673-002
65936017	059674-002
65936018	059675-002
65936019	059676-002
65936020	059677-002
65936021	059678-002
65936022	059679-002
65936023	059681-002
65936024	059682-002
65936025	059683-002
65936026	059684-002
65936027	059686-002
65936028	059687-002
65936029	059688-002
65936030	059689-002
1200289815	PBLK01 (Method Blank)
1200289816	PBLK01LCS (Laboratory Control Sample)
1200289817	059673-002MS (Matrix Spike)
1200289818	059673-002MSD (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
ECD8	HP 6890 Series GC ECD/ECD	RESTEK*

*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. All target analytes, identified positive in the samples, met the acceptance criteria in the standards bracketing the sample 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.

Blank Acceptance

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

LCS Recovery Statement

The Laboratory Control Sample (LCS) spike recoveries for this SDG were within the established acceptance limits.

QC Sample Designation

The following sample was selected for the PCB method QC:

Client Sample ID#	Laboratory Sample ID#
059673-002	65936016

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 in this SDG met the

specified holding time requirements.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

None of the samples in this SDG required any dilutions.

Sample Re-prep/Re-analysis

None of the samples in this sample group were reprepped or reanalyzed.

Miscellaneous Information

Nonconformance (NCR) Documentation

No nonconformance reports (NCRs) have been generated for this SDG.

Manual Integrations

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 SDG:

Aroclors quantitated on the raw data report by the Target data system do not necessarily represent 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". For the samples containing more than one PCB, the quantitation of PCB may be elevated due to overlapping PCB patterns.

* 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: Jimi Cao Date: 4/19/02

QC Summary

Report Date: September 19, 2002

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

Workorder: 65936

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Semi-Volatiles-PCB Federal										
Batch 196833										
QC1200289816 LCS										
Aroclor-1260	33.3			27.4	ug/kg		82	(48%-116%)	MM	09/09/02 15:17
**4cmx	6.67			5.17	ug/kg		78	(31%-120%)		
**Decachlorobiphenyl	6.67			5.43	ug/kg		81	(34%-115%)		
QC1200289815 MB										
Aroclor-1016			U	ND	ug/kg					09/09/02 15:05
Aroclor-1221			U	ND	ug/kg					
Aroclor-1232			U	ND	ug/kg					
Aroclor-1242			U	ND	ug/kg					
Aroclor-1248			U	ND	ug/kg					
Aroclor-1254			U	ND	ug/kg					
Aroclor-1260			U	ND	ug/kg					
**4cmx	6.67			5.05	ug/kg		76	(31%-120%)		
**Decachlorobiphenyl	6.67			5.30	ug/kg		80	(34%-115%)		
QC1200289817 65936016 MS										
Aroclor-1260	33.3	U	ND	27.4	ug/kg		82	(36%-134%)		09/09/02 15:28
**4cmx	6.67			5.19	ug/kg		78	(31%-120%)		
**Decachlorobiphenyl	6.67			5.39	ug/kg		81	(34%-115%)		
QC1200289818 65936016 MSD										
Aroclor-1260	33.3	U	ND	24.3	ug/kg	12	73	(0%-30%)		09/09/02 15:40
**4cmx	6.67			3.98	ug/kg		60	(31%-120%)		
**Decachlorobiphenyl	6.67			4.78	ug/kg		72	(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 infromation.
- X Uncertain identification for gamma spectroscopy.

QC Summary

Workorder: 65936

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

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.

PCB Case Narrative
Sandia National Labs (SNLS)
SDG 65936-1

Method/Analysis Information

Procedure:	**Polychlorinated Biphenyls by Method 8082**
Analytical Method:	SW846 8082
Prep Method:	SW846 3510C
Analytical Batch Number:	196769
Prep Batch Number:	196768

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 8082:

Sample ID	Client ID
65944007	059639-003
1200289639	PBLK01(Method Blank)
1200289640	PBLK01LCS(Laboratory Control Sample)
1200289641	059639-003MS(Matrix Spike)
1200289642	059639-003MSD(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	
RESTEK	Rtx-CLPesticides Rtx-CLPesticides II	30m x 0.25mm x 0.25um 30m x 0.25mm x 0.20um

* 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
ECD8	HP 6890 Series GC ECD/ECD	RESTEK

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) requirements have not been met for this SDG. Aroclor 1260 failed acceptance criteria with a positive bias on non-primary analytical column 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. There were no target analytes detected in any associated samples. 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.

Blank Acceptance

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

LCS Recovery Statement

The Laboratory Control Sample (LCS) spike recoveries for this SDG were within the established acceptance limits.

QC Sample Designation

The following sample was selected for the PCB method QC:

Client Sample ID#	Laboratory Sample ID#
059639-003	65944007

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 in this SDG met the specified holding time requirements.

Preparation/Analytical Method Verification

All procedures were performed as stated in the SOP.

Sample Dilutions

None of the samples in this SDG were required dilutions.

Sample Re-prep/Re-analysis

None of the samples in this sample group were reprepped or reanalyzed.

Miscellaneous Information

Nonconformance (NCR) Documentation

No nonconformance reports (NCRs) have been generated for this SDG.

Manual Integrations

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 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".

* 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: Jim Cea **Date:** 9/16/05

QC Summary

Report Date: September 16, 2002

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

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Semi-Volatiles-PCB										
Batch 196769										
QC1200289640 LCS										
Aroclor-1260	1.00			0.680	ug/L		68	(47%-131%)	MM	08/29/02 00:23
**4cmx	0.200			0.120	ug/L		60	(34%-116%)		
**Decachlorobiphenyl	0.200			0.135	ug/L		68	(21%-122%)		
QC1200289639 MB										
Aroclor-1016			U	ND	ug/L					08/29/02 00:11
Aroclor-1221			U	ND	ug/L					
Aroclor-1232			U	ND	ug/L					
Aroclor-1242			U	ND	ug/L					
Aroclor-1248			U	ND	ug/L					
Aroclor-1254			U	ND	ug/L					
Aroclor-1260			U	ND	ug/L					
**4cmx	0.200			0.119	ug/L		60	(34%-116%)		
**Decachlorobiphenyl	0.200			0.108	ug/L		54	(21%-122%)		
QC1200289641 65944007 MS										
Aroclor-1260	1.00			0.600	ug/L		60	(21%-113%)		08/28/02 22:33
**4cmx	0.200			0.132	ug/L		66	(34%-116%)		
**Decachlorobiphenyl	0.200			0.0587	ug/L		29	(21%-122%)		
QC1200289642 65944007 MSD										
Aroclor-1260	1.00			0.640	ug/L	6	64	(0%-30%)		08/28/02 22:46
**4cmx	0.200			0.135	ug/L		68	(34%-116%)		
**Decachlorobiphenyl	0.200			0.068	ug/L		34	(21%-122%)		

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. 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

QC Summary

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

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 acceptence 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 Case Narrative for
Sandia National Laboratory
SDG# 65936

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
65936016	059673-002
65936017	059674-002
65936018	059675-002
65936019	059676-002
65936020	059677-002
65936021	059678-002
65936022	059679-002
65936023	059681-002
65936024	059682-002
65936025	059683-002
65936026	059684-002
65936027	059686-002
65936028	059687-002
65936029	059688-002
65936030	059689-002
1200289542	Method Blank (MB) **ICP-196732/196730**
1200289546	Laboratory Control Sample (LCS)
1200289544	059673-002L (65936016) Serial Dilution (SD)
1200289543	059673-002D (65936016) Sample Duplicate (DUP)
1200289545	059673-002S (65936016) Matrix Spike (MS)
1200292059	Method Blank (MB) **CVAA-197745/197744**
1200292062	Laboratory Control Sample (LCS)

Method/Analysis Information:

Analytical Batch #:	196732, 197745
Prep Batch #:	196730, 197744
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 samples from this SDG met the established recovery acceptance criteria, with the exception o silver in CCV11 and CCV12. Samples bracketed by CCV11 and CCV12 were rerun for silver. CCV15 and CCV16 recovered high for lead, but did not bracket reported lead results from this SDG.

Continuing Calibration Blanks (CCB) Requirements
All continuing calibration blanks (CCB) bracketing samples from 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/LCSD Recovery Statement
All LCS spike recoveries for this SDG were within the established acceptance limits.

QC Sample Designation
Sample 059673-002 (65936016) was designated as the quality control sample for ICP batch. Sample 059668-002 (65745005) from SNLS SDG 65745 was designated as the quality control sample for 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, with the exception of 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 instrument detection limit (IDL) 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. Samples in this SDG required further dilution for selenium in order to minimize suppression due to matrix effects. No dilutions were required for the CVAA analysis other than the 5x dilution for the LCS.

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: _____

Date: 9/19/2

QC Summary

Report Date: September 19, 2002

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

Workorder: 65936

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Metals Analysis-ICP Federal										
Batch 196732										
QC1200289543 65936016 DUP										
Arsenic		2.84		2.50	mg/kg	13		(0%-20%)	RMJ	09/10/02 19:21
Barium		82.3		89.7	mg/kg	9		(0%-20%)		
Cadmium	J	0.145	J	0.122	mg/kg	N/A ^		(+/-0.476)		
Chromium		12.8		7.99	mg/kg	46*		(0%-20%)		
Lead		3.99		4.10	mg/kg	3		(0%-20%)		
Selenium	U	ND	U	ND	mg/kg	N/A		(+/-1.19)	BAS	09/10/02 22:50
Silver	U	ND	U	ND	mg/kg	N/A		(+/-0.476)	RMJ	09/10/02 19:21
QC1200289546 LCS										
Arsenic	132			133	mg/kg		101	(74%-126%)		09/10/02 19:03
Barium	781			804	mg/kg		103	(77%-123%)		
Cadmium	51.5			56.5	mg/kg		110	(77%-123%)		
Chromium	142			151	mg/kg		106	(80%-120%)		
Lead	52.9			52.6	mg/kg		99	(75%-125%)		
Selenium	60.9			67.3	mg/kg		111	(71%-129%)		
Silver	125			136	mg/kg		109	(52%-148%)		
QC1200289542 MB										
Arsenic			U	ND	mg/kg					09/10/02 18:57
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					
QC1200289545 65936016 MS										
Arsenic	23.1	2.84		25.3	mg/kg		97	(75%-125%)		09/10/02 19:27
Barium	23.1	82.3		113	mg/kg		134*	(75%-125%)		
Cadmium	23.1	J 0.145		23.2	mg/kg		100	(75%-125%)		
Chromium	23.1	12.8		31.1	mg/kg		79	(75%-125%)		
Lead	23.1	3.99		27.2	mg/kg		100	(75%-125%)		
Selenium	23.1	U ND		23.4	mg/kg		101	(75%-125%)	BAS	09/10/02 22:56
Silver	23.1	U ND		22.5	mg/kg		97	(75%-125%)	RMJ	09/10/02 19:27
QC1200289544 65936016 SDILT										
Arsenic		29.2		6.79	ug/L	16.2				09/10/02 19:15
Barium		847		177	ug/L	4.58				
Cadmium	J	1.49	U	ND	ug/L	N/A				
Chromium		132		27.8	ug/L	5.36				
Lead		41.1		7.88	ug/L	4.03				
Selenium	U	ND	U	ND	ug/L	N/A			BAS	09/10/02 22:44
Silver	U	ND	U	ND	ug/L	N/A			RMJ	09/10/02 19:15
Metals Analysis-Mercury Federal										
Batch 197745										
QC1200292060 65745005 DUP										

QC Summary

Workorder: 65936

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Metals Analysis-Mercury Federal										
Batch 197745										
Mercury		J 0.00353	J	0.00352	mg/kg	N/A		(+/-0.00998)	NOR1	09/03/02 14:15
QC1200292062 LCS										
Mercury	4.50			4.24	mg/kg		94	(68%-132%)		09/03/02 14:11
QC1200292059 MB										
Mercury			U	ND	mg/kg					09/03/02 14:09
QC1200292061 65745005 MS										
Mercury	0.0902	J 0.00353		0.0969	mg/kg		103	(75%-125%)		09/03/02 14:22

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 infocmation.
- X Presumptive evidence that the analyte is not present. Please see narrative for further infromation.
- 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 acceptence 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.

Metals Case Narrative for
Sandia National Labs (SNLS)
SDG# 65936-1

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
65944011	059639-007
1200296652	Method Blank (MB) ICP-199969/199968
1200296656	Laboratory Control Sample (LCS)
1200290416	Method Blank (MB) CVAA-197121/197117
1200290421	Laboratory Control Sample (LCS)

Method/Analysis Information:

Analytical Batch #:	199969, 197121
Prep Batch #:	199968, 197117
Analytical Method:	SW846 6010B, SW846 7470A
Prep Method:	SW846 3005B, SW846 7470A
Standard Operating Procedure:	GL-MA-E-013 REV.6, GL-MA-E-010 REV.10

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 the analyses.

CRDL Requirements
All element recoveries in the CRDL standards met the advisory control limits (70% - 130).

ICSA/ICSAB Requirements
All interference check standard (ICSA and ICSAB) elements associated with this SDG met the established acceptance criteria.

Continuing Calibration (CCV) Requirements
All CCV standards bracketing samples from this SDG met the established recovery acceptance criteria.

Continuing Calibration Blanks (CCB) Requirements
All continuing calibration blanks (CCB) bracketing samples from 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 client required detection limits (CRDL).

LCS Recovery Statement
All LCS spike recoveries for this SDG were within the required acceptance limits.

QC Sample Statement
Sample 059772-005 (66619010) from SNLS SDG 66619 was designated as the quality control sample for the ICP batch. Sample 059555-009 (65920004) from SNLS SDG 65920 was designated as the QC sample for the CVAA batch. A matrix spike (MS) and a sample duplicate (DUP) were analyzed in each batch. A serial dilution (SD) was analyzed in the ICP batch.

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. The MS analyses met the recommended quality control acceptance criteria for percent recovery (75%-125%) for all applicable analytes.

DUP 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 IDL for ICP analyses are applicable for serial dilution assessment. All applicable analytes met the acceptance criteria.

Technical Information:
Holding Time Specifications
All samples in this SDG met the specified holding time requirements.

Sample Dilutions
Dilutions are performed to minimize matrix interferences (e.g., those resulting from elevated mineral element concentrations) present in the sample and/or to bring over range target analyte concentrations into the linear calibration range of the instruments. No dilutions were necessary.

Miscellaneous Information:
NCR Documentation
Nonconformance reports (NCR) are generated to document procedural anomalies that may deviate from referenced SOP or contractual documents. No NCR was generated with 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: QQE's a/k/a. C

Date: 9/19/02

QC Summary

Report Date: September 19, 2002

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

Workorder: 65944

Parmname	NOM		Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Metals Analysis-ICP Federal											
Batch 199969											
QC1200296653 66619010 DUP											
Arsenic			0.00712		0.00723	mg/L	1 ^		(+/-0.005)	RMJ	09/16/02 18:34
Barium		B	0.0102	B	0.00987	mg/L	3 ^		(+/-0.005)		
Cadmium		J	0.000843	J	0.000846	mg/L	N/A ^		(+/-0.005)		
Chromium		BJ	0.00353	BJ	0.00398	mg/L	N/A ^		(+/-0.005)		
Lead		BJ	0.00272	BJ	0.0019	mg/L	N/A ^		(+/-0.005)		
Selenium		U	ND	U	ND	mg/L	N/A		(+/-0.005)		
Silver		BU	ND	BU	ND	mg/L	N/A		(+/-0.005)		
QC1200296656 LCS											
Arsenic	0.500				0.529	mg/L		106	(80%-120%)		09/16/02 17:58
Barium	0.500			B	0.522	mg/L		104	(80%-120%)		
Cadmium	0.500				0.529	mg/L		106	(80%-120%)		
Chromium	0.500			B	0.525	mg/L		105	(80%-120%)		
Lead	0.500			B	0.532	mg/L		106	(80%-120%)		
Selenium	0.500				0.527	mg/L		105	(80%-120%)		
Silver	0.500			B	0.521	mg/L		104	(80%-120%)		
QC1200296652 MB											
Arsenic				U	ND	mg/L					09/16/02 17:52
Barium				J	0.00025	mg/L					
Cadmium				U	ND	mg/L					
Chromium				J	0.000867	mg/L					
Lead				J	0.00259	mg/L					
Selenium				U	ND	mg/L					
Silver				J	0.00085	mg/L					
QC1200296655 66619010 MS											
Arsenic	0.500		0.00712		0.524	mg/L		103	(75%-125%)		09/16/02 18:40
Barium	0.500	B	0.0102	B	0.524	mg/L		103	(75%-125%)		
Cadmium	0.500	J	0.000843		0.512	mg/L		102	(75%-125%)		
Chromium	0.500	BJ	0.00353	B	0.518	mg/L		103	(75%-125%)		
Lead	0.500	BJ	0.00272	B	0.515	mg/L		102	(75%-125%)		
Selenium	0.500	U	ND		0.511	mg/L		102	(75%-125%)		
Silver	0.500	BU	ND	B	0.512	mg/L		102	(75%-125%)		
QC1200296654 66619010 SDILT											
Arsenic			7.12	U	ND	ug/L	N/A				09/16/02 18:28
Barium		B	10.2	BJ	1.87	ug/L	8.17				
Cadmium		J	0.843	U	ND	ug/L	N/A				
Chromium		BJ	3.53	BJ	1.14	ug/L	61.1				
Lead		BJ	2.72	BJ	2.69	ug/L	395				
Selenium		U	ND	U	ND	ug/L	N/A				
Silver		BU	ND	BU	ND	ug/L	N/A				
Metals Analysis-Mercury Federal											
Batch 197121											
QC1200290417 65748010 DUP											

QC Summary

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Metals Analysis-Mercury Federal										
Batch 197121										
Mercury		U	ND	U ND	mg/L	N/A		(+/-0.0002)	NOR1	08/29/02 10:42
QC1200290418 65920004 DUP										
Mercury		U	ND	U ND	mg/L	N/A		(+/-0.0002)		08/29/02 11:04
QC1200290421 LCS										
Mercury	0.002			0.00197	mg/L		99	(80%-120%)		08/29/02 10:38
QC1200290416 MB										
Mercury			U	ND	mg/L					08/29/02 10:36
QC1200290419 65748010 MS										
Mercury	0.002	U	ND	0.00199	mg/L		99	(75%-125%)		08/29/02 10:48
QC1200290420 65920004 MS										
Mercury	0.002	U	ND	0.00192	mg/L		96	(75%-125%)		08/29/02 11:06

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. T
- 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 infromation.
- 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 acceptence 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.

Method/Analysis Information

Procedure:	**Total Cyanide**
Analytical Method:	SW846 9012A
Prep Method:	SW846 9010B Prep
Analytical Batch Number:	197511
Prep Batch Number:	197510

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 9012A:

Sample ID	Client ID
65936016	059673-002
65936017	059674-002
65936018	059675-002
65936019	059676-002
65936020	059677-002
65936021	059678-002
65936022	059679-002
65936023	059681-002
65936024	059682-002
65936025	059683-002
65936026	059684-002
65936027	059686-002
65936028	059687-002
65936029	059688-002
65936030	059689-002
1200291427	MB for batch 197511
1200291428	DUP of 65745005

1200291429	DUP of 65936016
1200291430	MS of 65745005
1200291431	MS of 65936016
1200291432	LCS for batch 197511
1200291433	LCS for batch 197511

SOP Reference

Procedures for preparation, analysis and reporting of analytical data are controlled by General Engineering Laboratories, Inc. as Standard Operating Procedures (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
The following SNLS samples were designated for Quality Control: *65745005, 65936016.*

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
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
The following QC sample in this sample group was diluted 1:50 due to high concentration for this analysis: *1200291433.*

Miscellaneous Information:

Nonconformance Reports
No Nonconformance Reports (NCR) were required for any of the samples in this sample group for this analysis.

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:

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:** 9/11/02

General Chemistry Narrative
Sandia National Labs (SNLS)
SDG 65936

Method/Analysis Information

Procedure:	**Hexavalent Chromium**
Analytical Method:	SW846 7196A
Prep Method:	SW846 3060A
Analytical Batch Number:	196888
Prep Batch Number:	196887

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 7196A:

Sample ID	Client ID
65936016	059673-002
65936017	059674-002
65936018	059675-002
65936019	059676-002
65936020	059677-002
65936021	059678-002
65936022	059679-002
65936023	059681-002
65936024	059682-002
65936025	059683-002
65936026	059684-002
65936027	059686-002
65936028	059687-002

65936029	059688-002
65936030	059689-002
1200289940	MB for batch 196887
1200289941	DUP of 65745005
1200289942	DUP of 65936021
1200289943	MS of 65745005
1200289944	MS of 65936021
1200289945	LCS for batch 196887

SOP Reference

Procedures for preparation, analysis and reporting of analytical data are controlled by General Engineering Laboratories, Inc. as Standard Operating Procedures (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: *65745005, 65936021.*

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
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.

QC Summary

Report Date: September 10, 2002

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

Workorder: 65936

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date Time
Rapid Flow Analysis Federal										
Batch 197511										
QC1200291428 65745005 DUP										
Cyanide, Total	BJ	0.0706	BU	ND	mg/kg	N/A ^		(+/-0.227)	ADF	08/30/02 11:15
QC1200291429 65936016 DUP										
Cyanide, Total	BU	ND	BJ	0.275	mg/kg	N/A		(+/-0.278)		08/30/02 11:22
QC1200291432 LCS										
Cyanide, Total	2.50		B	2.53	mg/kg		101	(81%-125%)		08/30/02 11:09
QC1200291433 LCS										
Cyanide, Total	277		B	340	mg/kg		123	(81%-125%)		08/30/02 11:13
QC1200291427 MB										
Cyanide, Total			J	0.0869	mg/kg					08/30/02 11:08
QC1200291430 65745005 MS										
Cyanide, Total	5.56	BJ	0.0706	B	6.11	mg/kg		109 (55%-145%)		08/30/02 11:15
QC1200291431 65936016 MS										
Cyanide, Total	4.55	BU	ND	B	4.57	mg/kg		100 (55%-145%)		08/30/02 11:22
Spectrometric Analysis Federal										
Batch 196888										
QC1200289941 65745005 DUP										
Hexavalent Chromium	U	ND	U	ND	mg/kg	N/A		(+/-0.0965)	BEP1	08/30/02 10:00
QC1200289942 65936021 DUP										
Hexavalent Chromium	U	ND	U	ND	mg/kg	N/A		(+/-0.0961)		
QC1200289945 LCS										
Hexavalent Chromium	0.997			0.927	mg/kg		93	(72%-121%)		
QC1200289940 MB										
Hexavalent Chromium			U	ND	mg/kg					
QC1200289943 65745005 MS										
Hexavalent Chromium	0.991	U	ND	0.565	mg/kg		56	(49%-130%)		
QC1200289944 65936021 MS										
Hexavalent Chromium	0.973	U	ND	0.779	mg/kg		80	(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 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.

QC Summary

Workorder: 65936

Parmname			NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

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 acceptence 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.

Method/Analysis Information

Procedure:	**Total Cyanide**
Analytical Method:	SW846 9012A
Prep Method:	SW846 9010B Prep
Analytical Batch Number:	199201
Prep Batch Number:	199200

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 9012A:

Sample ID	Client ID
65944009	059639-005
1200294945	MB for batch 199201
1200294946	LCS for batch 199201
1200294947	DUP of 66197009
1200294948	MS of 66197009

SOP Reference

Procedures for preparation, analysis and reporting of analytical data are controlled by General Engineering Laboratories, Inc. as Standard Operating Procedures (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
The following sample was designated for Quality Control: *66197009*.

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.

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:

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:** 9/11/02

General Chemistry Narrative
Sandia National Labs (SNLS)
SDG 65936-1

Method/Analysis Information

Procedure: **Hexavalent Chromium**

Analytical Method: SW846 7196A

Analytical Batch Number: 196733

Sample Analysis

The following samples were analyzed using the analytical protocol as established in SW846 7196A:

Sample ID	Client ID
65944010	059639-006
1200289550	MB for batch 196733
1200289551	DUP of 65944010
1200289552	PS of 65944010
1200289553	LCS for batch 196733

SOP Reference

Procedures for preparation, analysis and reporting of analytical data are controlled by General Engineering Laboratories, Inc. as Standard Operating Procedures (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: *65944010.*

Sample Spike Recovery
The matrix spike was outside of the laboratory internal SPC limits but within the client required limits of 75%-125%.

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
Sample 65944010 was received with insufficient time to prep/analyze the sample in the remaining method-specified holding time. The following sample was run as soon as possible by the analyst.

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.

QC Summary

Report Date: September 10, 2002

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

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time
Rapid Flow Analysis Federal											
Batch 199201											
QC1200294947 66197009 DUP											
Cyanide, Total	U	ND	U	ND	mg/L	N/A		(+/-0.005)	ADF	09/05/02	14:21
QC1200294946 LCS											
Cyanide, Total	0.050			0.0526	mg/L		105	(90%-110%)		09/05/02	14:19
QC1200294945 MB											
Cyanide, Total			U	ND	mg/L					09/05/02	14:18
QC1200294948 66197009 MS											
Cyanide, Total	0.100	U	ND	0.0947	mg/L		95	(72%-133%)		09/05/02	14:22
Spectrometric Analysis Federal											
Batch 196733											
QC1200289551 65944010 DUP											
Hexavalent Chromium	HU	ND	HU	ND	mg/L	N/A		(+/-0.010)	VH1	08/23/02	16:15
QC1200289553 LCS											
Hexavalent Chromium	0.100			0.095	mg/L		95	(89%-110%)			
QC1200289550 MB											
Hexavalent Chromium			U	ND	mg/L						
QC1200289552 65944010 PS											
Hexavalent Chromium	0.100	HU	ND	H	0.077	mg/L		76*	(80%-122%)		

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 th
- ** 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. T
- 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 infromation.
- X Uncertain identification for gamma spectroscopy.

QC Summary

Workorder: 65944

Parmname	NOM	Sample	Qual	QC	Units	RPD%	REC%	Range	Anlst	Date	Time

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 acceptence 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.

Radiochemistry Case Narrative
Sandia National Labs (SNLS)
Workorder 65936

Method/Analysis Information

Batch Number: 198983
Procedure: Determination of Gross Alpha And Gross Non-Volatile Beta in Water
Analytical Method: EPA 900.0

Sample ID	Client ID
65936016	059673-002
65936017	059674-002
65936018	059675-002
65936019	059676-002
65936020	059677-002
65936021	059678-002
65936022	059679-002
65936023	059681-002
65936024	059682-002
65936025	059683-002
65936026	059684-002
65936027	059686-002
65936028	059687-002
65936029	059688-002
65936030	059689-002
1200294338	MB for batch 198983
1200294339	059673-002(65936016DUP)
1200294340	059673-002(65936016MS)
1200294341	059673-002(65936016MSD)
1200294342	LCS for batch 198983

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: *65936016*.

QC Information
The alpha matrix spike and matrix spike duplicate failed due to the matrix of the sample. The recoveries were similar in results.

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.

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:
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. Morris **Date:** 13 Sep 2002

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow

QC Summary

Report Date: September 13, 2002

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

Workorder: 65936

Parameter	NOM	Sample	Qual	QC	Units	RER	REC%	Range	Anlst	Date Time
Gravimetric Solids										
Batch 197078										
QC1200290381 65936016 DUP										
Moisture		4.93		4.91	percent	0		(0%-24%)	MLA	08/27/02 18:16
Rad Gas Flow										
Batch 198983										
QC1200294339 65936016 DUP										
Alpha		5.50		6.31	pCi/g	0.209		(0%-20%)	JS1	09/07/02 19:15
	Uncert:	+/-1.65		+/-2.05						
	TPU:	1.74		2.12						
Beta		17.8		18.6	pCi/g	0.182		(0%-20%)		
	Uncert:	+/-1.73		+/-1.62						
	TPU:	1.87		2.46						
QC1200294342 LCS										
Alpha	9.89			9.58	pCi/g		97	(75%-125%)		09/09/02 07:58
	Uncert:			+/-1.55						
	TPU:			1.75						
Beta	39.8			46.6	pCi/g		117	(75%-125%)		
	Uncert:			+/-2.66						
	TPU:			3.28						
QC1200294338 MB										
Alpha			U	0.0271	pCi/g					09/07/02 19:15
	Uncert:			+/-0.0682						
	TPU:			0.0682						
Beta			U	0.0895	pCi/g					
	Uncert:			+/-0.123						
	TPU:			0.123						
QC1200294340 65936016 MS										
Alpha	89.9	5.50		70.7	pCi/g		73*	(75%-125%)		09/09/02 07:58
	Uncert:	+/-1.65		+/-15.0						
	TPU:	1.74		16.6						
Beta	362	17.8		363	pCi/g		96	(75%-125%)		
	Uncert:	+/-1.73		+/-22.6						
	TPU:	1.87		26.8						
QC1200294341 65936016 MSD										
Alpha	97.9	5.50		72.0	pCi/g		68			
	Uncert:	+/-1.65		+/-15.6						
	TPU:	1.74		16.7						
Beta	394	17.8		375	pCi/g		91			
	Uncert:	+/-1.73		+/-24.0						
	TPU:	1.87		26.1						

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29407
(843) 556-8171 • Fax (843) 766-1178

QC Summary

Workorder: 65936

Parameter	NOM	Sample	Qual	QC	Units	RER	REC%	Range	Anlst	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.
- 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. 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 infromation.
- 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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Radiochemistry Case Narrative
Sandia National Labs (SNLS)
SDG 65936-1

Method/Analysis Information

Batch Number: 198970
Procedure: Determination of Gross Alpha And Gross Non-Volatile Beta in Water
Analytical Method: EPA 900.0

Sample ID	Client ID
65944012	059639-008
1200294292	MB for batch 198970
1200294293	059540-008(65919003DUP)
1200294294	059540-008(65919003MS)
1200294295	059540-008(65919003MSD)
1200294296	LCS for batch 198970

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 October 11, 2001.

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: *65919003*.

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
Samples 1200294294, 1200294295 and 1200294296 were recounted due to high alpha recovery.

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.

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:
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: Valerie Drum **Date:** 9/16/02

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

QC Summary

Report Date: September 16, 2002

Client : Sandia National Laboratories
MS-0756
P.O. Box 5800
Albuquerque, New Mexico

Contact: Pamela M. Puissant

Workorder: 65944

Parameter	NOM	Sample	Qual	QC	Units	RER	REC%	Range	Anlst	Date Time
Rad Gas Flow										
Batch 198970										
QC1200294293 65919003 DUP										
Alpha		100		137	pCi/L	0.562		(0%-20%)	HOB1	09/10/02 01:17
Uncert:		+/-27.9		+/-31.1						
TPU:		29.9		35.5						
Beta		106		109	pCi/L	0.0835		(0%-20%)		
Uncert:		+/-19.9		+/-20.0						
TPU:		19.9		20.0						
QC1200294296 LCS										
Alpha	9.89			9.16	pCi/L		93	(75%-125%)		09/10/02 07:17
Uncert:				+/-1.68						
TPU:				1.92						
Beta	39.7			42.3	pCi/L		106	(75%-125%)		
Uncert:				+/-2.37						
TPU:				2.40						
QC1200294292 MB										
Alpha			U	0.0348	pCi/L					09/10/02 01:17
Uncert:				+/-0.0704						
TPU:				0.0705						
Beta			U	0.0992	pCi/L					
Uncert:				+/-0.0774						
TPU:				0.0774						
QC1200294294 65919003 MS										
Alpha	1980	100		2460	pCi/L		120	(75%-125%)		09/10/02 07:17
Uncert:		+/-27.9		+/-410						
TPU:		29.9		473						
Beta	7950	106		9230	pCi/L		115	(75%-125%)		
Uncert:		+/-19.9		+/-495						
TPU:		19.9		499						
QC1200294295 65919003 MSD										
Alpha	1980	100		2550	pCi/L		124	(75%-125%)		
Uncert:		+/-27.9		+/-427						
TPU:		29.9		475						
Beta	7950	106		8560	pCi/L		106	(75%-125%)		
Uncert:		+/-19.9		+/-480						
TPU:		19.9		489						

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.

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GENERAL ENGINEERING LABORATORIES

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QC Summary

Workorder: 65944

Parameter	NOM	Sample	Qual	QC	Units	RER	REC%	Range	Anlst	Date	Time

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. 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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[redacted]

COC# 605640

Radiation Protection Sample Diagnostics

DOCUMENTATION OF CORRECTED RESULTS

Original Sample(s)

Sample ID(s): 20118101/059668-003

Sample Information: Soil Marinelli 6501E/1025-SPI-BM-11-5

Reason(s) for Correcting Results

☒ Transcription error ☐ Analytical Error

☐ Other (describe): Sample date entered as 8-19-92; correct date 8-19-02.

This report supersedes reported dated 8/26/02.

Corrected Results

Sample ID	Isotope	Result	Error	MDA

Prepared by: [signature] Date: 10-15-02

Approved by: [signature] Date: 10-15-02.

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program *
* 10/15/02 9:55:08 AM *
****
*
* Analyzed by: Beverly Key 10-15-02 Reviewed by: 10/15/02 *
****

Customer : SANDERS (6135)
Customer Sample ID : 059668-003
Lab Sample ID : 20118101

Sample Description : 6501E/1025-SP1-BH1-11-S
Sample Quantity : 707.300 gram
Sample Date/Time : 8/19/02 9:45:00 AM
Acquire Start Date/Time : 8/26/02 11:25:00 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	---	7.03E-001
RA-226	1.98E+000	5.21E-001	6.49E-001
PB-214	7.92E-001	1.15E-001	5.65E-002
BI-214	6.77E-001	1.08E-001	5.11E-002
PB-210	Not Detected	---	2.77E+001
TH-232	8.88E-001	4.11E-001	1.81E-001
RA-228	8.02E-001	1.50E-001	1.27E-001
AC-228	7.73E-001	1.48E-001	9.75E-002
TH-228	6.58E-001	4.33E-001	6.64E-001
RA-224	8.38E-001	1.92E-001	9.19E-002
PB-212	7.87E-001	1.15E-001	3.93E-002
BI-212	8.03E-001	2.50E-001	2.99E-001
TL-208	7.45E-001	1.16E-001	5.41E-002
U-235	Not Detected	---	2.26E-001
TH-231	Not Detected	---	1.09E+001
PA-231	Not Detected	---	1.31E+000
TH-227	Not Detected	---	3.52E-001
RA-223	Not Detected	---	2.65E-001
RN-219	Not Detected	---	3.23E-001
PB-211	Not Detected	---	7.13E-001
TL-207	Not Detected	---	1.18E+001
AM-241	Not Detected	---	4.07E-001
PU-239	Not Detected	---	4.03E+002
NP-237	Not Detected	---	2.16E+000
PA-233	Not Detected	---	5.49E-002
TH-229	Not Detected	---	2.29E-001

[Summary Report] - Sample ID: : 20118101

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.43E-002
AG-110m	Not Detected	---------	2.68E-002
BA-133	Not Detected	---------	4.34E-002
BE-7	Not Detected	---------	2.26E-001
CD-115	Not Detected	---------	5.63E-001
CE-139	Not Detected	---------	2.71E-002
CE-141	Not Detected	---------	5.73E-002
CE-144	Not Detected	---------	2.23E-001
CM-243	Not Detected	---------	1.62E-001
CO-56	Not Detected	---------	3.00E-002
CO-57	Not Detected	---------	2.88E-002
CO-58	Not Detected	---------	2.80E-002
CO-60	Not Detected	---------	3.10E-002
CR-51	Not Detected	---------	2.56E-001
CS-134	Not Detected	---------	4.28E-002
CS-137	Not Detected	---------	3.00E-002
EU-152	Not Detected	---------	8.54E-002
EU-154	Not Detected	---------	1.58E-001
EU-155	Not Detected	---------	1.32E-001
FE-59	Not Detected	---------	6.90E-002
GD-153	Not Detected	---------	9.80E-002
HG-203	Not Detected	---------	3.26E-002
I-131	Not Detected	---------	4.73E-002
IR-192	Not Detected	---------	2.75E-002
K-40	1.72E+001	2.32E+000	2.70E-001
MN-52	Not Detected	---------	6.14E-002
MN-54	Not Detected	---------	3.19E-002
MO-99	Not Detected	---------	1.17E+000
NA-22	Not Detected	---------	3.60E-002
NA-24	Not Detected	---------	7.00E+001
ND-147	Not Detected	---------	2.76E-001
NI-57	Not Detected	---------	1.18E+000
RU-103	Not Detected	---------	2.78E-002
RU-106	Not Detected	---------	2.50E-001
SB-122	Not Detected	---------	2.16E-001
SB-124	Not Detected	---------	2.77E-002
SB-125	Not Detected	---------	7.93E-002
SN-113	Not Detected	---------	3.33E-002
SR-85	Not Detected	---------	3.45E-002
TA-182	Not Detected	---------	1.43E-001
TA-183	Not Detected	---------	9.13E-001
TL-201	Not Detected	---------	7.60E-001
Y-88	Not Detected	---------	2.73E-002
ZN-65	Not Detected	---------	9.60E-002
ZR-95	Not Detected	---------	4.76E-002

Effective Date: 10/09/02

IMPORTANT NOTICE: A printed copy of this document may not be the document currently in effect. The official version is located on the Sandia Restricted Network (SRN), RPLS home page.

Radiation Protection Sample Diagnostics

DOCUMENTATION OF CORRECTED RESULTS

Sample ID(s): 20118103 / 059670-003

Sample Information: Soil Marinelli 6501W/1026-SP1-BH12.5-S

☑ Transcription error ☐ Analytical Error

☐ Other (describe): Sample date entered as 8-19-92; correct sample date 8-19-02.

This report supercedes report dated 8-26-02.

Sample ID	Isotope	Result	Error	MDA

Prepared by: [signature] Date: 11/12/02

Approved by: [signature] Date: 11/12/02

RPSD-0212-01.3

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program
11/12/02 2:24:43 PM

Analyzed by: Beverly Ray 11-12-02 Reviewed by: [illegible] 11/13/02

Customer : SANDERS (6135)
Customer Sample ID : 059670-003
Lab Sample ID : 20118103

Sample Description : 6501W/1026-SP1-BH12.5-S
Sample Quantity : 653.600 gram
Sample Date/Time : 8/19/02 2:05:00 PM
Acquire Start Date/Time : 8/26/02 2:48:58 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	---	7.08E-001
RA-226	1.79E+000	5.26E-001	6.87E-001
PB-214	6.89E-001	1.03E-001	5.72E-002
BI-214	5.89E-001	9.70E-002	5.08E-002
PB-210	Not Detected	---	2.78E+001
TH-232	7.38E-001	3.51E-001	1.91E-001
RA-228	7.34E-001	1.42E-001	1.23E-001
AC-228	6.98E-001	1.42E-001	1.09E-001
TH-228	8.62E-001	4.04E-001	5.83E-001
RA-224	8.57E-001	1.95E-001	7.49E-002
PB-212	7.25E-001	1.07E-001	3.93E-002
BI-212	6.79E-001	2.90E-001	4.03E-001
TL-208	6.57E-001	1.14E-001	8.05E-002
U-235	Not Detected	---	2.20E-001
TH-231	Not Detected	---	1.10E+001
PA-231	Not Detected	---	1.37E+000
TH-227	Not Detected	---	3.50E-001
RA-223	Not Detected	---	2.69E-001
RN-219	Not Detected	---	3.37E-001
PB-211	Not Detected	---	7.70E-001
TL-207	Not Detected	---	1.27E+001
AM-241	Not Detected	---	4.24E-001
PU-239	Not Detected	---	3.96E+002
NP-237	Not Detected	---	2.19E+000
PA-233	Not Detected	---	5.54E-002
TH-229	Not Detected	---	2.34E-001

[Summary Report] - Sample ID: : 20118103

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.35E-002
AG-110m	Not Detected	---------	2.72E-002
BA-133	Not Detected	---------	4.44E-002
BE-7	Not Detected	---------	2.58E-001
CD-115	Not Detected	---------	5.62E-001
CE-139	Not Detected	---------	2.87E-002
CE-141	Not Detected	---------	5.51E-002
CE-144	Not Detected	---------	2.25E-001
CM-243	Not Detected	---------	1.63E-001
CO-56	Not Detected	---------	2.87E-002
CO-57	Not Detected	---------	2.90E-002
CO-58	Not Detected	---------	3.10E-002
CO-60	Not Detected	---------	3.35E-002
CR-51	Not Detected	---------	2.55E-001
CS-134	Not Detected	---------	4.21E-002
CS-137	Not Detected	---------	3.01E-002
EU-152	Not Detected	---------	8.66E-002
EU-154	Not Detected	---------	1.54E-001
EU-155	Not Detected	---------	1.29E-001
FE-59	Not Detected	---------	7.16E-002
GD-153	Not Detected	---------	9.76E-002
HG-203	Not Detected	---------	3.26E-002
I-131	Not Detected	---------	4.92E-002
IR-192	Not Detected	---------	2.73E-002
K-40	1.81E+001	2.45E+000	2.70E-001
MN-52	Not Detected	---------	7.01E-002
MN-54	Not Detected	---------	3.29E-002
MO-99	Not Detected	---------	1.18E+000
NA-22	Not Detected	---------	3.73E-002
NA-24	Not Detected	---------	6.87E+001
ND-147	Not Detected	---------	2.64E-001
NI-57	Not Detected	---------	1.20E+000
RU-103	Not Detected	---------	2.91E-002
RU-106	Not Detected	---------	2.68E-001
SB-122	Not Detected	---------	2.15E-001
SB-124	Not Detected	---------	2.92E-002
SB-125	Not Detected	---------	7.90E-002
SN-113	Not Detected	---------	3.69E-002
SR-85	Not Detected	---------	3.45E-002
TA-182	Not Detected	---------	1.52E-001
TA-183	Not Detected	---------	9.46E-001
TL-201	Not Detected	---------	7.68E-001
Y-88	Not Detected	---------	2.70E-002
ZN-65	Not Detected	---------	9.75E-002
ZR-95	Not Detected	---------	5.34E-002

****

Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/26/02 1:05:15 PM

****

Analyzed by: Beverly Ley 8/27/02 Reviewed by: [illegible] 8/26/02

****

Customer : SANDERS (6135)
Customer Sample ID : 059668-003
Lab Sample ID : 20118101

Sample Description : 6501E/1025-SP1-BH1-11-S
Sample Quantity : 707.300 gram
Sample Date/Time : 8/19/92 9:45:00 AM
Acquire Start Date/Time : 8/26/02 11:25:00 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	---	7.03E-001
RA-226	1.99E+000	5.23E-001	6.52E-001
PB-214	7.96E-001	1.15E-001	5.68E-002
BI-214	6.80E-001	1.09E-001	5.14E-002
PB-210	Not Detected	---	3.78E+001
TH-232	8.88E-001	4.11E-001	1.81E-001
RA-228	8.02E-001	1.50E-001	1.27E-001
AC-228	7.73E-001	1.48E-001	9.75E-002
TH-228	2.46E+001	1.62E+001	2.49E+001
RA-224	3.14E+001	7.18E+000	3.44E+000
PB-212	2.95E+001	4.31E+000	1.47E+000
BI-212	3.01E+001	9.36E+000	1.12E+001
TL-208	2.79E+001	4.33E+000	2.03E+000
U-235	Not Detected	---	2.26E-001
TH-231	Not Detected	---	1.09E+001
PA-231	Not Detected	---	1.31E+000
TH-227	Not Detected	---	4.86E-001
RA-223	Not Detected	---	1.00E+026
RN-219	Not Detected	---	4.45E-001
PB-211	Not Detected	---	9.83E-001
TL-207	Not Detected	---	1.63E+001
AM-241	Not Detected	---	4.13E-001
PU-239	Not Detected	---	4.03E+002
NP-237	Not Detected	---	2.16E+000
PA-233	Not Detected	---	5.49E-002
TH-229	Not Detected	---	2.29E-001

[Summary Report] - Sample ID: : 20118101

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.62E-002
AG-110m	Not Detected	---------	6.76E+002
BA-133	Not Detected	---------	8.39E-002
BE-7	Not Detected	---------	1.00E+026
CD-115	Not Detected	---------	1.00E+026
CE-139	Not Detected	---------	2.63E+006
CE-141	Not Detected	---------	1.00E+026
CE-144	Not Detected	---------	1.61E+003
CM-243	Not Detected	---------	2.07E-001
CO-56	Not Detected	---------	5.41E+012
CO-57	Not Detected	---------	3.19E+002
CO-58	Not Detected	---------	8.89E+013
CO-60	Not Detected	---------	1.15E-001
CR-51	Not Detected	---------	1.00E+026
CS-134	Not Detected	---------	1.23E+000
CS-137	Not Detected	---------	3.77E-002
EU-152	Not Detected	---------	1.42E-001
EU-154	Not Detected	---------	3.54E-001
EU-155	Not Detected	---------	5.78E-001
FE-59	Not Detected	---------	1.00E+026
GD-153	Not Detected	---------	3.48E+003
HG-203	Not Detected	---------	1.00E+026
I-131	Not Detected	---------	1.00E+026
IR-192	Not Detected	---------	2.14E+013
K-40	1.72E+001	2.32E+000	2.70E-001
MN-52	Not Detected	---------	1.00E+026
MN-54	Not Detected	---------	1.06E+002
MO-99	Not Detected	---------	1.00E+026
NA-22	Not Detected	---------	5.16E-001
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	---------	2.40E+002
SB-122	Not Detected	---------	1.00E+026
SB-124	Not Detected	---------	5.06E+016
SB-125	Not Detected	---------	1.00E+000
SN-113	Not Detected	---------	1.19E+008
SR-85	Not Detected	---------	3.82E+015
TA-182	Not Detected	---------	5.10E+008
TA-183	Not Detected	---------	1.00E+026
TL-201	Not Detected	---------	1.00E+026
Y-88	Not Detected	---------	5.56E+008
ZN-65	Not Detected	---------	3.09E+003
ZR-95	Not Detected	---------	7.08E+015

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program
8/27/02 8:48:31 AM

Analyzed by: Beverly Key 8/27/02 Reviewed by: [illegible] 8/27/02

Customer : SANDERS (6135)
Customer Sample ID : 059669-003
Lab Sample ID : 20118102

Sample Description : 6501E/1025-SP1-BH1-16-S
Sample Quantity : 811.500 gram
Sample Date/Time : 8/19/02 10:25:00 AM
Acquire Start Date/Time : 8/26/02 1:06:59 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	---	5.96E-001
RA-226	1.49E+000	4.30E-001	5.58E-001
PB-214	5.87E-001	8.76E-002	4.85E-002
BI-214	5.28E-001	8.57E-002	4.30E-002
PB-210	Not Detected	---	2.30E+001
TH-232	5.34E-001	2.60E-001	1.62E-001
RA-228	5.74E-001	1.14E-001	1.05E-001
AC-228	5.44E-001	1.13E-001	9.21E-002
TH-228	7.27E-001	3.94E-001	5.90E-001
RA-224	6.93E-001	1.57E-001	5.89E-002
PB-212	5.95E-001	8.79E-002	3.45E-002
BI-212	5.96E-001	2.45E-001	3.37E-001
TL-208	5.15E-001	8.82E-002	5.81E-002
U-235	Not Detected	---	1.89E-001
TH-231	Not Detected	---	9.21E+000
PA-231	Not Detected	---	1.12E+000
TH-227	Not Detected	---	2.91E-001
RA-223	Not Detected	---	2.19E-001
RN-219	Not Detected	---	2.94E-001
PB-211	Not Detected	---	6.74E-001
TL-207	Not Detected	---	1.11E+001
AM-241	Not Detected	---	3.49E-001
PU-239	Not Detected	---	3.40E+002
NP-237	Not Detected	---	1.84E+000
PA-233	Not Detected	---	4.52E-002
TH-229	Not Detected	---	1.97E-001

[Summary Report] - Sample ID: : 20118102

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	2.85E-002
AG-110m	Not Detected	---------	2.25E-002
BA-133	Not Detected	---------	3.78E-002
BE-7	Not Detected	---------	2.12E-001
CD-115	Not Detected	---------	4.60E-001
CE-139	Not Detected	---------	2.43E-002
CE-141	Not Detected	---------	4.80E-002
CE-144	Not Detected	---------	1.95E-001
CM-243	Not Detected	---------	1.40E-001
CO-56	Not Detected	---------	2.84E-002
CO-57	Not Detected	---------	2.45E-002
CO-58	Not Detected	---------	2.66E-002
CO-60	Not Detected	---------	2.91E-002
CR-51	Not Detected	---------	2.09E-001
CS-134	Not Detected	---------	3.53E-002
CS-137	Not Detected	---------	2.48E-002
EU-152	Not Detected	---------	7.27E-002
EU-154	Not Detected	---------	1.31E-001
EU-155	Not Detected	---------	1.11E-001
FE-59	Not Detected	---------	6.09E-002
GD-153	Not Detected	---------	8.09E-002
HG-203	Not Detected	---------	2.80E-002
I-131	Not Detected	---------	4.17E-002
IR-192	Not Detected	---------	2.27E-002
K-40	1.67E+001	2.24E+000	2.40E-001
MN-52	Not Detected	---------	6.18E-002
MN-54	Not Detected	---------	2.61E-002
MO-99	Not Detected	---------	1.03E+000
NA-22	Not Detected	---------	3.29E-002
NA-24	Not Detected	---------	6.78E+001
ND-147	Not Detected	---------	2.31E-001
NI-57	Not Detected	---------	1.03E+000
RU-103	Not Detected	---------	2.39E-002
RU-106	Not Detected	---------	2.20E-001
SB-122	Not Detected	---------	1.84E-001
SB-124	Not Detected	---------	2.36E-002
SB-125	Not Detected	---------	6.45E-002
SN-113	Not Detected	---------	3.04E-002
SR-85	Not Detected	---------	2.86E-002
TA-182	Not Detected	---------	1.31E-001
TA-183	Not Detected	---------	7.88E-001
TL-201	Not Detected	---------	6.70E-001
Y-88	Not Detected	---------	2.18E-002
ZN-65	Not Detected	---------	8.51E-002
ZR-95	Not Detected	---------	4.50E-002

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*
Sandia National Laboratories
Radiation Protection Sample Diagnostics Program
8/26/02 4:29:13 PM
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* Analyzed by: Beverly Key 8/27/02 Reviewed by: [illegible] 8/27/02

Customer : SANDERS (6135)
Customer Sample ID : 059670-003
Lab Sample ID : 20118103

Sample Description : 6501W/1026-SP1-BH12.5-S
Sample Quantity : 653.600 gram
Sample Date/Time : 8/19/92 2:05:00 PM
Acquire Start Date/Time : 8/26/02 2:48:58 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	---	7.08E-001
RA-226	1.80E+000	5.29E-001	6.90E-001
PB-214	6.92E-001	1.04E-001	5.74E-002
BI-214	5.91E-001	9.74E-002	5.10E-002
PB-210	Not Detected	---	3.79E+001
TH-232	7.38E-001	3.51E-001	1.91E-001
RA-228	7.34E-001	1.42E-001	1.23E-001
AC-228	6.98E-001	1.42E-001	1.09E-001
TH-228	3.23E+001	1.51E+001	2.18E+001
RA-224	3.21E+001	7.30E+000	2.80E+000
PB-212	2.72E+001	4.01E+000	1.47E+000
BI-212	2.54E+001	1.09E+001	1.51E+001
TL-208	2.46E+001	4.27E+000	3.01E+000
U-235	Not Detected	---	2.20E-001
TH-231	Not Detected	---	1.10E+001
PA-231	Not Detected	---	1.37E+000
TH-227	Not Detected	---	4.83E-001
RA-223	Not Detected	---	1.00E+026
RN-219	Not Detected	---	4.65E-001
PB-211	Not Detected	---	1.06E+000
TL-207	Not Detected	---	1.75E+001
AM-241	Not Detected	---	4.30E-001
PU-239	Not Detected	---	3.96E+002
NP-237	Not Detected	---	2.19E+000
PA-233	Not Detected	---	5.54E-002
TH-229	Not Detected	---	2.34E-001

[Summary Report] - Sample ID: : 20118103

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.53E-002
AG-110m	Not Detected	---------	6.86E+002
BA-133	Not Detected	---------	8.58E-002
BE-7	Not Detected	---------	1.00E+026
CD-115	Not Detected	---------	1.00E+026
CE-139	Not Detected	---------	2.79E+006
CE-141	Not Detected	---------	1.00E+026
CE-144	Not Detected	---------	1.62E+003
CM-243	Not Detected	---------	2.08E-001
CO-56	Not Detected	---------	5.16E+012
CO-57	Not Detected	---------	3.22E+002
CO-58	Not Detected	---------	9.84E+013
CO-60	Not Detected	---------	1.25E-001
CR-51	Not Detected	---------	1.00E+026
CS-134	Not Detected	---------	1.21E+000
CS-137	Not Detected	---------	3.79E-002
EU-152	Not Detected	---------	1.44E-001
EU-154	Not Detected	---------	3.45E-001
EU-155	Not Detected	---------	5.65E-001
FE-59	Not Detected	---------	1.00E+026
GD-153	Not Detected	---------	3.46E+003
HG-203	Not Detected	---------	1.00E+026
I-131	Not Detected	---------	1.00E+026
IR-192	Not Detected	---------	2.12E+013
K-40	1.81E+001	2.45E+000	2.70E-001
MN-52	Not Detected	---------	1.00E+026
MN-54	Not Detected	---------	1.10E+002
MO-99	Not Detected	---------	1.00E+026
NA-22	Not Detected	---------	5.35E-001
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	---------	2.58E+002
SB-122	Not Detected	---------	1.00E+026
SB-124	Not Detected	---------	5.33E+016
SB-125	Not Detected	---------	1.00E+000
SN-113	Not Detected	---------	1.32E+008
SR-85	Not Detected	---------	3.82E+015
TA-182	Not Detected	---------	5.42E+008
TA-183	Not Detected	---------	1.00E+026
TL-201	Not Detected	---------	1.00E+026
Y-88	Not Detected	---------	5.50E+008
ZN-65	Not Detected	---------	3.14E+003
ZR-95	Not Detected	---------	7.94E+015

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Sandia National Laboratories
Radiation Protection Sample Diagnostics Program
8/27/02 8:44:47 AM
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* Analyzed by: Beverly Key 8/27/02 Reviewed by: 8/27/02

Customer : SANDERS (6135)
Customer Sample ID : 059671-003
Lab Sample ID : 20118104

Sample Description : 6501W/1026-SP1-BH1-17-S
Sample Quantity : 740.800 gram
Sample Date/Time : 8/19/02 2:55:00 PM
Acquire Start Date/Time : 8/26/02 4:30:56 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	---	6.24E-001
RA-226	1.28E+000	4.09E-001	5.47E-001
PB-214	6.24E-001	9.37E-002	5.29E-002
BI-214	5.32E-001	8.84E-002	5.03E-002
PB-210	Not Detected	---	2.34E+001
TH-232	6.11E-001	2.93E-001	1.66E-001
RA-228	5.87E-001	1.20E-001	1.19E-001
AC-228	5.90E-001	1.22E-001	9.65E-002
TH-228	5.70E-001	3.78E-001	5.80E-001
RA-224	6.68E-001	1.59E-001	8.04E-002
PB-212	5.77E-001	8.60E-002	3.58E-002
BI-212	4.80E-001	2.51E-001	3.67E-001
TL-208	4.84E-001	9.13E-002	7.75E-002
U-235	Not Detected	---	2.01E-001
TH-231	Not Detected	---	9.86E+000
PA-231	Not Detected	---	1.23E+000
TH-227	Not Detected	---	3.01E-001
RA-223	Not Detected	---	2.31E-001
RN-219	Not Detected	---	3.03E-001
PB-211	Not Detected	---	6.90E-001
TL-207	Not Detected	---	1.09E+001
AM-241	Not Detected	---	3.72E-001
PU-239	Not Detected	---	3.57E+002
NP-237	Not Detected	---	1.96E+000
PA-233	Not Detected	---	4.91E-002
TH-229	Not Detected	---	2.09E-001

[Summary Report] - Sample ID: : 20118104

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.10E-002
AG-110m	Not Detected	---------	2.45E-002
BA-133	Not Detected	---------	3.95E-002
BE-7	Not Detected	---------	2.09E-001
CD-115	Not Detected	---------	4.90E-001
CE-139	Not Detected	---------	2.54E-002
CE-141	Not Detected	---------	5.05E-002
CE-144	Not Detected	---------	2.02E-001
CM-243	Not Detected	---------	1.48E-001
CO-56	Not Detected	---------	2.87E-002
CO-57	Not Detected	---------	2.67E-002
CO-58	Not Detected	---------	2.72E-002
CO-60	Not Detected	---------	3.08E-002
CR-51	Not Detected	---------	2.34E-001
CS-134	Not Detected	---------	3.81E-002
CS-137	Not Detected	---------	2.54E-002
EU-152	Not Detected	---------	7.82E-002
EU-154	Not Detected	---------	1.43E-001
EU-155	Not Detected	---------	1.14E-001
FE-59	Not Detected	---------	6.74E-002
GD-153	Not Detected	---------	8.80E-002
HG-203	Not Detected	---------	2.92E-002
I-131	Not Detected	---------	4.36E-002
IR-192	Not Detected	---------	2.47E-002
K-40	1.92E+001	2.57E+000	2.73E-001
MN-52	Not Detected	---------	6.22E-002
MN-54	Not Detected	---------	2.83E-002
MO-99	Not Detected	---------	1.15E+000
NA-22	Not Detected	---------	3.37E-002
NA-24	Not Detected	---------	7.00E+001
ND-147	Not Detected	---------	2.49E-001
NI-57	Not Detected	---------	1.14E+000
RU-103	Not Detected	---------	2.45E-002
RU-106	Not Detected	---------	2.35E-001
SB-122	Not Detected	---------	1.95E-001
SB-124	Not Detected	---------	2.45E-002
SB-125	Not Detected	---------	7.18E-002
SN-113	Not Detected	---------	3.23E-002
SR-85	Not Detected	---------	3.01E-002
TA-182	Not Detected	---------	1.33E-001
TA-183	Not Detected	---------	8.35E-001
TL-201	Not Detected	---------	6.84E-001
Y-88	Not Detected	---------	2.14E-002
ZN-65	Not Detected	---------	8.91E-002
ZR-95	Not Detected	---------	4.75E-002

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* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program *
* 8/27/02 8:53:47 AM *
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* Analyzed by: Beverly Key 8/27/02 Reviewed by: [illegible] 8/27/02 *

Customer : SANDERS (6135)
Customer Sample ID : 059673-003
Lab Sample ID : 20118105

Sample Description : 6505/1084-DF1-BH1-3-S
Sample Quantity : 700.100 gram
Sample Date/Time : 8/20/02 8:40:00 AM
Acquire Start Date/Time : 8/26/02 6:12:55 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	---	6.25E-001
RA-226	9.49E-001	4.46E-001	6.58E-001
PB-214	5.37E-001	8.50E-002	5.68E-002
BI-214	4.93E-001	8.31E-002	4.72E-002
PB-210	Not Detected	---	2.41E+001
TH-232	4.88E-001	2.46E-001	1.79E-001
RA-228	4.83E-001	1.07E-001	1.16E-001
AC-228	5.70E-001	1.20E-001	9.63E-002
TH-228	7.86E-001	4.07E-001	6.03E-001
RA-224	6.48E-001	1.57E-001	8.11E-002
PB-212	5.73E-001	8.59E-002	3.84E-002
BI-212	5.67E-001	2.70E-001	3.86E-001
TL-208	5.30E-001	9.20E-002	5.96E-002
U-235	Not Detected	---	1.98E-001
TH-231	Not Detected	---	9.50E+000
PA-231	Not Detected	---	1.23E+000
TH-227	Not Detected	---	3.10E-001
RA-223	Not Detected	---	2.17E-001
RN-219	Not Detected	---	3.18E-001
PB-211	Not Detected	---	6.91E-001
TL-207	Not Detected	---	1.03E+001
AM-241	Not Detected	---	3.55E-001
PU-239	Not Detected	---	3.70E+002
NP-237	Not Detected	---	1.99E+000
PA-233	Not Detected	---	4.79E-002
TH-229	Not Detected	---	2.02E-001

[Summary Report] - Sample ID: : 20118105

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.19E-002
AG-110m	Not Detected	---------	2.40E-002
BA-133	Not Detected	---------	3.91E-002
BE-7	Not Detected	---------	2.11E-001
CD-115	Not Detected	---------	3.95E-001
CE-139	Not Detected	---------	2.44E-002
CE-141	Not Detected	---------	4.88E-002
CE-144	Not Detected	---------	2.00E-001
CM-243	Not Detected	---------	1.44E-001
CO-56	Not Detected	---------	2.92E-002
CO-57	Not Detected	---------	2.59E-002
CO-58	Not Detected	---------	2.64E-002
CO-60	Not Detected	---------	2.95E-002
CR-51	Not Detected	---------	2.29E-001
CS-134	Not Detected	---------	3.75E-002
CS-137	Not Detected	---------	2.65E-002
EU-152	Not Detected	---------	7.72E-002
EU-154	Not Detected	---------	1.47E-001
EU-155	Not Detected	---------	1.19E-001
FE-59	Not Detected	---------	6.65E-002
GD-153	Not Detected	---------	8.70E-002
HG-203	Not Detected	---------	2.83E-002
I-131	Not Detected	---------	3.96E-002
IR-192	Not Detected	---------	2.42E-002
K-40	1.48E+001	2.02E+000	2.81E-001
MN-52	Not Detected	---------	5.67E-002
MN-54	Not Detected	---------	2.83E-002
MO-99	Not Detected	---------	9.05E-001
NA-22	Not Detected	---------	3.44E-002
NA-24	Not Detected	---------	3.47E+001
ND-147	Not Detected	---------	2.34E-001
NI-57	Not Detected	---------	8.19E-001
RU-103	Not Detected	---------	2.40E-002
RU-106	Not Detected	---------	2.16E-001
SB-122	Not Detected	---------	1.65E-001
SB-124	Not Detected	---------	2.56E-002
SB-125	Not Detected	---------	7.09E-002
SN-113	Not Detected	---------	3.05E-002
SR-85	Not Detected	---------	3.25E-002
TA-182	Not Detected	---------	1.28E-001
TA-183	Not Detected	---------	7.28E-001
TL-201	Not Detected	---------	5.86E-001
Y-88	Not Detected	---------	2.12E-002
ZN-65	Not Detected	---------	8.74E-002
ZR-95	Not Detected	---------	4.70E-002

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/27/02 8:59:55 AM

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* Analyzed by: Beverly Key 8/27/02 Reviewed by: [illegible] 8/27/02 *

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Customer : SANDERS (6135)
Customer Sample ID : 059674-003
Lab Sample ID : 20118106

Sample Description : 6505/1084-DF1-BH1-8-S
Sample Quantity : 707.500 gram
Sample Date/Time : 8/20/02 8:55:00 AM
Acquire Start Date/Time : 8/26/02 7:54:53 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---	6.54E-001
RA-226	1.40E+000	4.84E-001	6.70E-001
PB-214	6.43E-001	9.67E-002	5.43E-002
BI-214	5.55E-001	9.18E-002	5.04E-002
PB-210	Not Detected	---	2.57E+001
TH-232	6.61E-001	3.19E-001	1.91E-001
RA-228	7.61E-001	1.44E-001	1.30E-001
AC-228	6.93E-001	1.35E-001	9.22E-002
TH-228	4.87E-001	4.25E-001	6.69E-001
RA-224	8.26E-001	1.85E-001	6.18E-002
PB-212	7.00E-001	1.03E-001	3.73E-002
BI-212	9.62E-001	2.77E-001	3.22E-001
TL-208	6.11E-001	1.06E-001	7.69E-002
U-235	Not Detected	---	2.07E-001
TH-231	Not Detected	---	1.00E+001
PA-231	Not Detected	---	1.22E+000
TH-227	Not Detected	---	3.26E-001
RA-223	Not Detected	---	2.31E-001
RN-219	Not Detected	---	3.09E-001
PB-211	Not Detected	---	6.94E-001
TL-207	Not Detected	---	1.13E+001
AM-241	Not Detected	---	3.84E-001
PU-239	Not Detected	---	3.80E+002
NP-237	Not Detected	---	2.05E+000
PA-233	Not Detected	---	4.99E-002
TH-229	Not Detected	---	2.18E-001

[Summary Report] - Sample ID: : 20118106

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.26E-002
AG-110m	Not Detected	---------	2.41E-002
BA-133	Not Detected	---------	4.13E-002
BE-7	Not Detected	---------	2.24E-001
CD-115	Not Detected	---------	4.41E-001
CE-139	Not Detected	---------	2.62E-002
CE-141	Not Detected	---------	5.12E-002
CE-144	Not Detected	---------	2.09E-001
CM-243	Not Detected	---------	1.52E-001
CO-56	Not Detected	---------	2.77E-002
CO-57	Not Detected	---------	2.69E-002
CO-58	Not Detected	---------	2.87E-002
CO-60	Not Detected	---------	3.18E-002
CR-51	Not Detected	---------	2.37E-001
CS-134	Not Detected	---------	3.93E-002
CS-137	Not Detected	---------	2.68E-002
EU-152	Not Detected	---------	8.06E-002
EU-154	Not Detected	---------	1.50E-001
EU-155	Not Detected	---------	1.24E-001
FE-59	Not Detected	---------	6.44E-002
GD-153	Not Detected	---------	9.01E-002
HG-203	Not Detected	---------	2.99E-002
I-131	Not Detected	---------	4.36E-002
IR-192	Not Detected	---------	2.49E-002
K-40	1.52E+001	2.06E+000	2.56E-001
MN-52	Not Detected	---------	5.49E-002
MN-54	Not Detected	---------	2.98E-002
MO-99	Not Detected	---------	9.64E-001
NA-22	Not Detected	---------	3.47E-002
NA-24	Not Detected	---------	3.57E+001
ND-147	Not Detected	---------	2.34E-001
NI-57	Not Detected	---------	8.39E-001
RU-103	Not Detected	---------	2.60E-002
RU-106	Not Detected	---------	2.20E-001
SB-122	Not Detected	---------	1.70E-001
SB-124	Not Detected	---------	2.41E-002
SB-125	Not Detected	---------	7.25E-002
SN-113	Not Detected	---------	3.34E-002
SR-85	Not Detected	---------	3.21E-002
TA-182	Not Detected	---------	1.36E-001
TA-183	Not Detected	---------	7.95E-001
TL-201	Not Detected	---------	6.21E-001
Y-88	Not Detected	---------	2.00E-002
ZN-65	Not Detected	---------	9.15E-002
ZR-95	Not Detected	---------	5.06E-002

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/27/02 9:04:09 AM

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* Analyzed by: Beverly Key 8/27/02 Reviewed by: [illegible] 8/27/02

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Customer : SANDERS (6135)
Customer Sample ID : 059675-003
Lab Sample ID : 20118107

Sample Description : 6505/1084-DF1-BH2-3-DU
Sample Quantity : 613.500 gram
Sample Date/Time : 8/20/02 9:45:00 AM
Acquire Start Date/Time : 8/26/02 9:36:51 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	---	7.18E-001
RA-226	1.47E+000	5.29E-001	7.37E-001
PB-214	6.91E-001	1.05E-001	6.03E-002
BI-214	6.34E-001	1.05E-001	5.69E-002
PB-210	Not Detected	---	2.74E+001
TH-232	7.19E-001	3.47E-001	2.06E-001
RA-228	8.08E-001	1.53E-001	1.17E-001
AC-228	6.38E-001	1.36E-001	1.14E-001
TH-228	8.81E-001	4.01E-001	5.73E-001
RA-224	8.53E-001	2.00E-001	1.02E-001
PB-212	7.80E-001	1.15E-001	4.02E-002
BI-212	7.27E-001	2.59E-001	3.27E-001
TL-208	6.71E-001	1.16E-001	7.87E-002
U-235	Not Detected	---	2.28E-001
TH-231	Not Detected	---	1.12E+001
PA-231	Not Detected	---	1.42E+000
TH-227	Not Detected	---	3.65E-001
RA-223	Not Detected	---	2.51E-001
RN-219	Not Detected	---	3.65E-001
PB-211	Not Detected	---	8.59E-001
TL-207	Not Detected	---	1.21E+001
AM-241	Not Detected	---	4.23E-001
PU-239	Not Detected	---	4.17E+002
NP-237	Not Detected	---	2.24E+000
PA-233	Not Detected	---	5.63E-002
TH-229	Not Detected	---	2.34E-001

[Summary Report] - Sample ID: : 20118107

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.57E-002
AG-110m	Not Detected	---------	2.63E-002
BA-133	Not Detected	---------	4.64E-002
BE-7	Not Detected	---------	2.47E-001
CD-115	Not Detected	---------	4.93E-001
CE-139	Not Detected	---------	2.83E-002
CE-141	Not Detected	---------	5.65E-002
CE-144	Not Detected	---------	2.27E-001
CM-243	Not Detected	---------	1.67E-001
CO-56	Not Detected	---------	3.17E-002
CO-57	Not Detected	---------	3.02E-002
CO-58	Not Detected	---------	3.10E-002
CO-60	Not Detected	---------	3.50E-002
CR-51	Not Detected	---------	2.56E-001
CS-134	Not Detected	---------	4.58E-002
CS-137	Not Detected	---------	2.98E-002
EU-152	Not Detected	---------	8.96E-002
EU-154	Not Detected	---------	1.64E-001
EU-155	Not Detected	---------	1.36E-001
FE-59	Not Detected	---------	7.61E-002
GD-153	Not Detected	---------	9.58E-002
HG-203	Not Detected	---------	3.29E-002
I-131	Not Detected	---------	4.63E-002
IR-192	Not Detected	---------	2.80E-002
K-40	1.63E+001	2.23E+000	3.06E-001
MN-52	Not Detected	---------	6.40E-002
MN-54	Not Detected	---------	2.30E-002
MO-99	Not Detected	---------	1.13E+000
NA-22	Not Detected	---------	3.93E-002
NA-24	Not Detected	---------	4.14E+001
ND-147	Not Detected	---------	2.67E-001
NI-57	Not Detected	---------	9.95E-001
RU-103	Not Detected	---------	3.04E-002
RU-106	Not Detected	---------	2.64E-001
SB-122	Not Detected	---------	2.00E-001
SB-124	Not Detected	---------	2.88E-002
SB-125	Not Detected	---------	8.09E-002
SN-113	Not Detected	---------	3.61E-002
SR-85	Not Detected	---------	3.69E-002
TA-182	Not Detected	---------	1.44E-001
TA-183	Not Detected	---------	8.79E-001
TL-201	Not Detected	---------	6.77E-001
Y-88	Not Detected	---------	2.67E-002
ZN-65	Not Detected	---------	9.67E-002
ZR-95	Not Detected	---------	5.37E-002

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program
8/27/02 9:08:15 AM

Analyzed by: Beverly Kay 8/27/02 Reviewed by: 8/27/02

Customer : SANDERS (6135)
Customer Sample ID : 059676-003
Lab Sample ID : 20118108

Sample Description : 6505/1084-DF1-BH2-3-S
Sample Quantity : 563.900 gram
Sample Date/Time : 8/20/02 9:45:00 AM
Acquire Start Date/Time : 8/26/02 11:18:49 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	---	7.47E-001
RA-226	1.80E+000	5.74E-001	7.71E-001
PB-214	7.27E-001	1.13E-001	7.19E-002
BI-214	6.37E-001	1.07E-001	6.06E-002
PB-210	Not Detected	---	2.98E+001
TH-232	7.34E-001	3.53E-001	2.05E-001
RA-228	7.24E-001	1.46E-001	1.23E-001
AC-228	Not Detected	---	2.01E-001
TH-228	6.82E-001	3.94E-001	5.87E-001
RA-224	8.96E-001	2.07E-001	7.52E-002
PB-212	7.24E-001	1.08E-001	4.23E-002
BI-212	6.92E-001	2.81E-001	3.76E-001
TL-208	6.06E-001	1.12E-001	8.89E-002
U-235	Not Detected	---	2.43E-001
TH-231	Not Detected	---	1.19E+001
PA-231	Not Detected	---	1.50E+000
TH-227	Not Detected	---	3.78E-001
RA-223	Not Detected	---	2.75E-001
RN-219	Not Detected	---	3.91E-001
PB-211	Not Detected	---	8.80E-001
TL-207	Not Detected	---	1.27E+001
AM-241	Not Detected	---	4.42E-001
PU-239	Not Detected	---	4.37E+002
NP-237	Not Detected	---	2.21E+000
PA-233	Not Detected	---	5.89E-002
TH-229	Not Detected	---	2.55E-001

[Summary Report] - Sample ID: : 20118108

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.79E-002
AG-110m	Not Detected	---------	3.02E-002
BA-133	Not Detected	---------	4.99E-002
BE-7	Not Detected	---------	2.64E-001
CD-115	Not Detected	---------	5.11E-001
CE-139	Not Detected	---------	2.92E-002
CE-141	Not Detected	---------	6.05E-002
CE-144	Not Detected	---------	2.43E-001
CM-243	Not Detected	---------	1.76E-001
CO-56	Not Detected	---------	3.47E-002
CO-57	Not Detected	---------	3.14E-002
CO-58	Not Detected	---------	3.37E-002
CO-60	Not Detected	---------	3.64E-002
CR-51	Not Detected	---------	2.86E-001
CS-134	Not Detected	---------	4.71E-002
CS-137	Not Detected	---------	3.18E-002
EU-152	Not Detected	---------	9.40E-002
EU-154	Not Detected	---------	1.75E-001
EU-155	Not Detected	---------	1.35E-001
FE-59	Not Detected	---------	8.19E-002
GD-153	Not Detected	---------	1.03E-001
HG-203	Not Detected	---------	3.55E-002
I-131	Not Detected	---------	5.04E-002
IR-192	Not Detected	---------	2.94E-002
K-40	1.64E+001	2.25E+000	3.28E-001
MN-52	Not Detected	---------	6.53E-002
MN-54	Not Detected	---------	3.47E-002
MO-99	Not Detected	---------	1.20E+000
NA-22	Not Detected	---------	4.04E-002
NA-24	Not Detected	---------	4.75E+001
ND-147	Not Detected	---------	2.81E-001
NI-57	Not Detected	---------	1.17E+000
RU-103	Not Detected	---------	3.02E-002
RU-106	Not Detected	---------	2.76E-001
SB-122	Not Detected	---------	2.12E-001
SB-124	Not Detected	---------	2.99E-002
SB-125	Not Detected	---------	8.63E-002
SN-113	Not Detected	---------	4.03E-002
SR-85	Not Detected	---------	3.97E-002
TA-182	Not Detected	---------	1.60E-001
TA-183	Not Detected	---------	9.28E-001
TL-201	Not Detected	---------	7.35E-001
Y-88	Not Detected	---------	2.33E-002
ZN-65	Not Detected	---------	1.05E-001
ZR-95	Not Detected	---------	5.71E-002

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/27/02 9:17:33 AM

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Analyzed by: Beverly Key 8/27/02 Reviewed by: 8/27/02

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Customer : SANDERS (6135)
Customer Sample ID : 059677-003
Lab Sample ID : 20118109

Sample Description : 6505/1084-DF1-BH2-8-S
Sample Quantity : 636.800 gram
Sample Date/Time : 8/20/02 10:00:00 AM
Acquire Start Date/Time : 8/27/02 1:00:55 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---	7.15E-001
RA-226	1.33E+000	5.11E-001	7.25E-001
PB-214	7.49E-001	1.11E-001	6.04E-002
BI-214	6.65E-001	1.08E-001	5.31E-002
PB-210	Not Detected	---	2.84E+001
TH-232	7.57E-001	3.62E-001	2.06E-001
RA-228	7.43E-001	1.46E-001	1.36E-001
AC-228	7.48E-001	1.47E-001	1.03E-001
TH-228	9.28E-001	4.67E-001	6.89E-001
RA-224	7.81E-001	1.87E-001	1.02E-001
PB-212	7.82E-001	1.15E-001	4.23E-002
BI-212	8.11E-001	2.77E-001	3.48E-001
TL-208	6.84E-001	1.18E-001	8.21E-002
U-235	1.01E-001	1.82E-001	2.32E-001
TH-231	Not Detected	---	1.13E+001
PA-231	Not Detected	---	1.33E+000
TH-227	Not Detected	---	3.63E-001
RA-223	Not Detected	---	2.60E-001
RN-219	Not Detected	---	3.63E-001
PB-211	Not Detected	---	7.99E-001
TL-207	Not Detected	---	1.29E+001
AM-241	Not Detected	---	4.18E-001
PU-239	Not Detected	---	4.17E+002
NP-237	Not Detected	---	2.23E+000
PA-233	Not Detected	---	5.46E-002
TH-229	Not Detected	---	2.36E-001

[Summary Report] - Sample ID: : 20118109

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.67E-002
AG-110m	Not Detected	---------	2.96E-002
BA-133	Not Detected	---------	4.62E-002
BE-7	Not Detected	---------	2.43E-001
CD-115	Not Detected	---------	5.18E-001
CE-139	Not Detected	---------	2.91E-002
CE-141	Not Detected	---------	5.78E-002
CE-144	Not Detected	---------	2.27E-001
CM-243	Not Detected	---------	1.64E-001
CO-56	Not Detected	---------	3.23E-002
CO-57	Not Detected	---------	3.04E-002
CO-58	Not Detected	---------	3.21E-002
CO-60	Not Detected	---------	3.46E-002
CR-51	Not Detected	---------	2.49E-001
CS-134	Not Detected	---------	4.55E-002
CS-137	Not Detected	---------	3.02E-002
EU-152	Not Detected	---------	9.06E-002
EU-154	Not Detected	---------	1.69E-001
EU-155	Not Detected	---------	1.37E-001
FE-59	Not Detected	---------	7.44E-002
GD-153	Not Detected	---------	9.67E-002
HG-203	Not Detected	---------	3.24E-002
I-131	Not Detected	---------	5.08E-002
IR-192	Not Detected	---------	2.65E-002
K-40	1.83E+001	2.47E+000	2.86E-001
MN-52	Not Detected	---------	6.71E-002
MN-54	Not Detected	---------	1.86E-002
MO-99	Not Detected	---------	1.11E+000
NA-22	Not Detected	---------	3.91E-002
NA-24	Not Detected	---------	4.93E+001
ND-147	Not Detected	---------	2.71E-001
NI-57	Not Detected	---------	9.91E-001
RU-103	Not Detected	---------	2.86E-002
RU-106	Not Detected	---------	2.60E-001
SB-122	Not Detected	---------	2.00E-001
SB-124	Not Detected	---------	2.97E-002
SB-125	Not Detected	---------	8.10E-002
SN-113	Not Detected	---------	3.62E-002
SR-85	Not Detected	---------	3.63E-002
TA-182	Not Detected	---------	1.54E-001
TA-183	Not Detected	---------	8.85E-001
TL-201	Not Detected	---------	7.20E-001
Y-88	Not Detected	---------	2.55E-002
ZN-65	Not Detected	---------	1.00E-001
ZR-95	Not Detected	---------	5.62E-002

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/27/02 9:16:00 AM

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Analyzed by: Beverly Key 8/27/02 Reviewed by: 8/27/02

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Customer : SANDERS (6135)
Customer Sample ID : 059678-003
Lab Sample ID : 20118110

Sample Description : 6505/1084-DF1-BH3-3-S
Sample Quantity : 651.000 gram
Sample Date/Time : 8/20/02 10:15:00 AM
Acquire Start Date/Time : 8/27/02 2:42:53 AM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	6.70E-001
RA-226	1.33E+000	4.55E-001	6.22E-001
PB-214	6.14E-001	9.39E-002	5.44E-002
BI-214	5.25E-001	8.74E-002	4.48E-002
PB-210	Not Detected	---------	2.60E+001
TH-232	5.26E-001	2.66E-001	1.96E-001
RA-228	6.24E-001	1.28E-001	1.17E-001
AC-228	6.52E-001	1.28E-001	8.35E-002
TH-228	3.90E-001	3.90E-001	6.21E-001
RA-224	6.24E-001	1.53E-001	7.34E-002
PB-212	6.08E-001	9.08E-002	3.60E-002
BI-212	6.70E-001	2.68E-001	3.60E-001
TL-208	5.15E-001	9.78E-002	8.21E-002
U-235	Not Detected	---------	2.04E-001
TH-231	Not Detected	---------	1.00E+001
PA-231	Not Detected	---------	1.26E+000
TH-227	Not Detected	---------	3.22E-001
RA-223	Not Detected	---------	2.41E-001
RN-219	Not Detected	---------	3.16E-001
PB-211	Not Detected	---------	6.79E-001
TL-207	Not Detected	---------	1.09E+001
AM-241	Not Detected	---------	3.91E-001
PU-239	Not Detected	---------	3.81E+002
NP-237	Not Detected	---------	2.10E+000
PA-233	Not Detected	---------	5.00E-002
TH-229	Not Detected	---------	2.14E-001

[Summary Report] - Sample ID: : 20118110

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---	3.16E-002
AG-110m	Not Detected	---	2.35E-002
BA-133	Not Detected	---	4.17E-002
BE-7	Not Detected	---	2.42E-001
CD-115	Not Detected	---	4.58E-001
CE-139	Not Detected	---	2.61E-002
CE-141	Not Detected	---	5.14E-002
CE-144	Not Detected	---	2.13E-001
CM-243	Not Detected	---	1.59E-001
CO-56	Not Detected	---	3.16E-002
CO-57	Not Detected	---	2.74E-002
CO-58	Not Detected	---	2.82E-002
CO-60	Not Detected	---	3.23E-002
CR-51	Not Detected	---	2.37E-001
CS-134	Not Detected	---	3.98E-002
CS-137	Not Detected	---	2.69E-002
EU-152	Not Detected	---	8.04E-002
EU-154	Not Detected	---	1.45E-001
EU-155	Not Detected	---	1.24E-001
FE-59	Not Detected	---	6.84E-002
GD-153	Not Detected	---	9.12E-002
HG-203	Not Detected	---	3.10E-002
I-131	Not Detected	---	4.26E-002
IR-192	Not Detected	---	2.39E-002
K-40	1.30E+001	1.79E+000	2.66E-001
MN-52	Not Detected	---	5.54E-002
MN-54	Not Detected	---	3.10E-002
MO-99	Not Detected	---	1.03E+000
NA-22	Not Detected	---	3.62E-002
NA-24	Not Detected	---	4.95E+001
ND-147	Not Detected	---	2.58E-001
NI-57	Not Detected	---	9.24E-001
RU-103	Not Detected	---	2.44E-002
RU-106	Not Detected	---	2.50E-001
SB-122	Not Detected	---	1.80E-001
SB-124	Not Detected	---	2.74E-002
SB-125	Not Detected	---	7.29E-002
SN-113	Not Detected	---	3.32E-002
SR-85	Not Detected	---	3.48E-002
TA-182	Not Detected	---	1.35E-001
TA-183	Not Detected	---	8.34E-001
TL-201	Not Detected	---	6.60E-001
Y-88	Not Detected	---	2.36E-002
ZN-65	Not Detected	---	9.18E-002
ZR-95	Not Detected	---	4.90E-002

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Sandia National Laboratories
Radiation Protection Sample Diagnostics Program
8/26/02 12:57:16 PM
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* Analyzed by: 8/26/02 Reviewed by: Beverly Key 8/27/02 *

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Customer : SANDERS M (6135)
Customer Sample ID : 059679-003
Lab Sample ID : 20118111

Sample Description : 6505/1084-DF1-BH3-8-S
Sample Quantity : 766.200 gram
Sample Date/Time : 8/20/02 10:30:00 AM
Acquire Start Date/Time : 8/26/02 11:17:00 AM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---	5.00E-001
RA-226	1.39E+000	5.44E-001	7.77E-001
PB-214	7.64E-001	1.15E-001	6.13E-002
BI-214	6.12E-001	1.02E-001	5.04E-002
PB-210	Not Detected	---	8.36E+000
TH-232	6.94E-001	3.37E-001	2.07E-001
RA-228	6.43E-001	1.43E-001	1.57E-001
AC-228	7.39E-001	1.48E-001	9.53E-002
TH-228	7.65E-001	2.29E-001	4.26E-001
RA-224	7.97E-001	2.00E-001	1.03E-001
PB-212	7.14E-001	1.07E-001	3.88E-002
BI-212	6.63E-001	2.91E-001	3.99E-001
TL-208	6.69E-001	1.16E-001	7.25E-002
U-235	Not Detected	---	1.96E-001
TH-231	Not Detected	---	6.60E+000
PA-231	Not Detected	---	1.35E+000
TH-227	Not Detected	---	3.26E-001
RA-223	Not Detected	---	1.54E-001
RN-219	Not Detected	---	3.85E-001
PB-211	Not Detected	---	8.50E-001
TL-207	Not Detected	---	1.51E+001
AM-241	Not Detected	---	1.72E-001
PU-239	Not Detected	---	3.49E+002
NP-237	Not Detected	---	1.89E+000
PA-233	Not Detected	---	5.61E-002
TH-229	Not Detected	---	1.94E-001

[Summary Report] - Sample ID: : 20118111

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.22E-002
AG-110m	Not Detected	---------	3.13E-002
BA-133	Not Detected	---------	4.24E-002
BE-7	Not Detected	---------	2.61E-001
CD-115	Not Detected	---------	4.28E-001
CE-139	Not Detected	---------	2.49E-002
CE-141	Not Detected	---------	4.89E-002
CE-144	Not Detected	---------	1.94E-001
CM-243	Not Detected	---------	1.69E-001
CO-56	Not Detected	---------	3.63E-002
CO-57	Not Detected	---------	2.47E-002
CO-58	Not Detected	---------	3.31E-002
CO-60	Not Detected	---------	3.87E-002
CR-51	Not Detected	---------	2.58E-001
CS-134	Not Detected	---------	4.60E-002
CS-137	Not Detected	---------	3.39E-002
EU-152	Not Detected	---------	7.32E-002
EU-154	Not Detected	---------	1.95E-001
EU-155	Not Detected	---------	1.11E-001
FE-59	Not Detected	---------	8.57E-002
GD-153	Not Detected	---------	6.55E-002
HG-203	Not Detected	---------	3.33E-002
I-131	Not Detected	---------	4.38E-002
IR-192	Not Detected	---------	2.80E-002
K-40	1.47E+001	2.04E+000	3.29E-001
MN-52	Not Detected	---------	7.36E-002
MN-54	Not Detected	---------	3.43E-002
MO-99	Not Detected	---------	1.09E+000
NA-22	Not Detected	---------	4.66E-002
NA-24	Not Detected	---------	3.15E+001
ND-147	Not Detected	---------	3.02E-001
NI-57	Not Detected	---------	9.41E-001
RU-103	Not Detected	---------	3.08E-002
RU-106	Not Detected	---------	2.89E-001
SB-122	Not Detected	---------	1.88E-001
SB-124	Not Detected	---------	3.05E-002
SB-125	Not Detected	---------	8.67E-002
SN-113	Not Detected	---------	3.76E-002
SR-85	Not Detected	---------	3.68E-002
TA-182	Not Detected	---------	1.79E-001
TA-183	Not Detected	---------	3.36E-001
TL-201	Not Detected	---------	3.23E-001
Y-88	Not Detected	---------	2.64E-002
ZN-65	Not Detected	---------	1.21E-001
ZR-95	Not Detected	---------	6.55E-002

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program
8/26/02 2:38:34 PM

Analyzed by: [signature] 8/27/02 Reviewed by: Beverly Kay 8/27/02

Customer : SANDERS M (6135)
Customer Sample ID : 059681-003
Lab Sample ID : 20118112

Sample Description : 6610/1032-OF1-BH1-2-S
Sample Quantity : 668.800 gram
Sample Date/Time : 8/20/02 11:30:00 AM
Acquire Start Date/Time : 8/26/02 12:59:22 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	---	5.05E-001
RA-226	1.47E+000	4.77E-001	6.32E-001
PB-214	5.80E-001	9.51E-002	6.44E-002
BI-214	4.44E-001	8.40E-002	6.05E-002
PB-210	Not Detected	---	8.61E+000
TH-232	7.06E-001	3.40E-001	1.94E-001
RA-228	6.42E-001	1.47E-001	1.53E-001
AC-228	5.49E-001	1.29E-001	1.10E-001
TH-228	6.40E-001	2.27E-001	4.59E-001
RA-224	5.71E-001	1.66E-001	1.08E-001
PB-212	6.54E-001	9.92E-002	3.71E-002
BI-212	7.59E-001	2.79E-001	3.43E-001
TL-208	5.32E-001	1.05E-001	8.66E-002
U-235	Not Detected	---	1.97E-001
TH-231	Not Detected	---	6.42E+000
PA-231	Not Detected	---	1.40E+000
TH-227	Not Detected	---	3.32E-001
RA-223	Not Detected	---	1.55E-001
RN-219	Not Detected	---	3.87E-001
PB-211	Not Detected	---	8.81E-001
TL-207	Not Detected	---	1.54E+001
AM-241	Not Detected	---	1.68E-001
PU-239	Not Detected	---	3.51E+002
NP-237	Not Detected	---	1.87E+000
PA-233	Not Detected	---	5.99E-002
TH-229	Not Detected	---	1.90E-001

[Summary Report] - Sample ID: : 20118112

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---	4.26E-002
AG-110m	Not Detected	---	3.16E-002
BA-133	Not Detected	---	4.17E-002
BE-7	Not Detected	---	2.58E-001
CD-115	Not Detected	---	4.35E-001
CE-139	Not Detected	---	2.52E-002
CE-141	Not Detected	---	4.80E-002
CE-144	Not Detected	---	1.93E-001
CM-243	Not Detected	---	1.71E-001
CO-56	Not Detected	---	3.72E-002
CO-57	Not Detected	---	2.41E-002
CO-58	Not Detected	---	3.38E-002
CO-60	Not Detected	---	4.39E-002
CR-51	Not Detected	---	2.65E-001
CS-134	Not Detected	---	4.47E-002
CS-137	Not Detected	---	3.38E-002
EU-152	Not Detected	---	7.16E-002
EU-154	Not Detected	---	1.98E-001
EU-155	Not Detected	---	1.08E-001
FE-59	Not Detected	---	9.15E-002
GD-153	Not Detected	---	6.46E-002
HG-203	Not Detected	---	3.35E-002
I-131	Not Detected	---	4.72E-002
IR-192	Not Detected	---	2.87E-002
K-40	1.44E+001	2.03E+000	4.06E-001
MN-52	Not Detected	---	7.79E-002
MN-54	Not Detected	---	3.76E-002
MO-99	Not Detected	---	1.24E+000
NA-22	Not Detected	---	5.00E-002
NA-24	Not Detected	---	3.67E+001
ND-147	Not Detected	---	2.87E-001
NI-57	Not Detected	---	9.34E-001
RU-103	Not Detected	---	3.30E-002
RU-106	Not Detected	---	2.85E-001
SB-122	Not Detected	---	1.95E-001
SB-124	Not Detected	---	3.26E-002
SB-125	Not Detected	---	8.67E-002
SN-113	Not Detected	---	4.03E-002
SR-85	Not Detected	---	3.94E-002
TA-182	Not Detected	---	1.80E-001
TA-183	Not Detected	---	3.24E-001
TL-201	Not Detected	---	3.12E-001
Y-88	Not Detected	---	3.22E-002
ZN-65	Not Detected	---	1.20E-001
ZR-95	Not Detected	---	6.17E-002

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/26/02 4:20:53 PM

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* Analyzed by: 8/27/02 Reviewed by: Beverly Key 8/27/02

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Customer : SANDERS M (6135)
Customer Sample ID : 059682-003
Lab Sample ID : 20118113

Sample Description : 6610/1032-OF1-BH1-7-S
Sample Quantity : 649.800 gram
Sample Date/Time : 8/20/02 2:35:00 PM
Acquire Start Date/Time : 8/26/02 2:40:39 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---	5.16E-001
RA-226	1.48E+000	5.76E-001	8.18E-001
PB-214	6.40E-001	1.03E-001	6.72E-002
BI-214	5.95E-001	1.06E-001	6.74E-002
PB-210	Not Detected	---	8.94E+000
TH-232	6.19E-001	3.12E-001	2.21E-001
RA-228	6.41E-001	1.51E-001	1.70E-001
AC-228	5.36E-001	1.30E-001	1.17E-001
TH-228	4.62E-001	2.19E-001	4.75E-001
RA-224	6.58E-001	1.83E-001	1.10E-001
PB-212	6.13E-001	9.43E-002	4.00E-002
BI-212	7.78E-001	2.77E-001	3.31E-001
TL-208	5.85E-001	1.10E-001	7.93E-002
U-235	Not Detected	---	2.06E-001
TH-231	Not Detected	---	7.09E+000
PA-231	Not Detected	---	1.45E+000
TH-227	Not Detected	---	3.36E-001
RA-223	Not Detected	---	1.62E-001
RN-219	Not Detected	---	4.02E-001
PB-211	Not Detected	---	9.33E-001
TL-207	Not Detected	---	1.60E+001
AM-241	Not Detected	---	1.75E-001
PU-239	Not Detected	---	3.67E+002
NP-237	Not Detected	---	1.88E+000
PA-233	Not Detected	---	6.12E-002
TH-229	Not Detected	---	1.96E-001

[Summary Report] - Sample ID: : 20118113

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.24E-002
AG-110m	Not Detected	---------	3.22E-002
BA-133	Not Detected	---------	4.45E-002
BE-7	Not Detected	---------	2.70E-001
CD-115	Not Detected	---------	4.36E-001
CE-139	Not Detected	---------	2.73E-002
CE-141	Not Detected	---------	5.16E-002
CE-144	Not Detected	---------	2.03E-001
CM-243	Not Detected	---------	1.80E-001
CO-56	Not Detected	---------	3.97E-002
CO-57	Not Detected	---------	2.52E-002
CO-58	Not Detected	---------	3.89E-002
CO-60	Not Detected	---------	4.31E-002
CR-51	Not Detected	---------	2.66E-001
CS-134	Not Detected	---------	4.99E-002
CS-137	Not Detected	---------	3.56E-002
EU-152	Not Detected	---------	7.50E-002
EU-154	Not Detected	---------	2.01E-001
EU-155	Not Detected	---------	1.14E-001
FE-59	Not Detected	---------	8.67E-002
GD-153	Not Detected	---------	6.90E-002
HG-203	Not Detected	---------	3.62E-002
I-131	Not Detected	---------	4.87E-002
IR-192	Not Detected	---------	2.94E-002
K-40	1.66E+001	2.31E+000	2.83E-001
MN-52	Not Detected	---------	7.46E-002
MN-54	Not Detected	---------	3.99E-002
MO-99	Not Detected	---------	1.28E+000
NA-22	Not Detected	---------	5.34E-002
NA-24	Not Detected	---------	3.23E+001
ND-147	Not Detected	---------	3.35E-001
NI-57	Not Detected	---------	1.01E+000
RU-103	Not Detected	---------	3.59E-002
RU-106	Not Detected	---------	3.25E-001
SB-122	Not Detected	---------	2.09E-001
SB-124	Not Detected	---------	3.40E-002
SB-125	Not Detected	---------	9.39E-002
SN-113	Not Detected	---------	4.22E-002
SR-85	Not Detected	---------	4.00E-002
TA-182	Not Detected	---------	1.91E-001
TA-183	Not Detected	---------	3.37E-001
TL-201	Not Detected	---------	3.36E-001
Y-88	Not Detected	---------	3.05E-002
ZN-65	Not Detected	---------	1.24E-001
ZR-95	Not Detected	---------	6.83E-002

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Radiation Protection Sample Diagnostics Program

8/26/02 6:03:11 PM

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Analyzed by: [illegible] 8/27/02 Reviewed by: Beverly Key 8/27/02

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Customer : SANDERS M (6135)
Customer Sample ID : 059683-003
Lab Sample ID : 20118114

Sample Description : 6610/1032-SP1-BH1-12-S
Sample Quantity : 701.100 gram
Sample Date/Time : 8/21/02 10:35:00 AM
Acquire Start Date/Time : 8/26/02 4:22:57 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	5.01E-001
RA-226	1.60E+000	5.35E-001	7.27E-001
PB-214	6.26E-001	9.92E-002	6.16E-002
BI-214	4.98E-001	9.04E-002	6.00E-002
PB-210	Not Detected	---------	8.58E+000
TH-232	5.54E-001	2.84E-001	2.15E-001
RA-228	4.99E-001	1.48E-001	1.63E-001
AC-228	5.61E-001	1.35E-001	1.25E-001
TH-228	5.40E-001	2.11E-001	4.46E-001
RA-224	6.25E-001	1.70E-001	8.85E-002
PB-212	6.17E-001	9.37E-002	3.68E-002
BI-212	7.02E-001	3.01E-001	4.06E-001
TL-208	5.18E-001	1.02E-001	8.22E-002
U-235	Not Detected	---------	1.95E-001
TH-231	Not Detected	---------	6.27E+000
PA-231	Not Detected	---------	1.37E+000
TH-227	Not Detected	---------	3.21E-001
RA-223	Not Detected	---------	1.43E-001
RN-219	Not Detected	---------	3.66E-001
PB-211	Not Detected	---------	8.29E-001
TL-207	Not Detected	---------	1.50E+001
AM-241	Not Detected	---------	1.66E-001
PU-239	Not Detected	---------	3.42E+002
NP-237	Not Detected	---------	1.87E+000
PA-233	Not Detected	---------	5.60E-002
TH-229	Not Detected	---------	1.86E-001

[Summary Report] - Sample ID: : 20118114

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.18E-002
AG-110m	Not Detected	---------	3.05E-002
BA-133	Not Detected	---------	4.04E-002
BE-7	Not Detected	---------	2.53E-001
CD-115	Not Detected	---------	3.46E-001
CE-139	Not Detected	---------	2.40E-002
CE-141	Not Detected	---------	4.81E-002
CE-144	Not Detected	---------	1.88E-001
CM-243	Not Detected	---------	1.69E-001
CO-56	Not Detected	---------	3.83E-002
CO-57	Not Detected	---------	2.42E-002
CO-58	Not Detected	---------	3.37E-002
CO-60	Not Detected	---------	4.21E-002
CR-51	Not Detected	---------	2.55E-001
CS-134	Not Detected	---------	4.64E-002
CS-137	Not Detected	---------	3.15E-002
EU-152	Not Detected	---------	7.18E-002
EU-154	Not Detected	---------	1.94E-001
EU-155	Not Detected	---------	1.05E-001
FE-59	Not Detected	---------	8.57E-002
GD-153	Not Detected	---------	6.14E-002
HG-203	Not Detected	---------	3.28E-002
I-131	Not Detected	---------	4.10E-002
IR-192	Not Detected	---------	2.75E-002
K-40	1.40E+001	1.96E+000	2.71E-001
MN-52	Not Detected	---------	6.13E-002
MN-54	Not Detected	---------	3.74E-002
MO-99	Not Detected	---------	9.49E-001
NA-22	Not Detected	---------	4.67E-002
NA-24	Not Detected	---------	1.24E+001
ND-147	Not Detected	---------	2.92E-001
NI-57	Not Detected	---------	6.26E-001
RU-103	Not Detected	---------	3.02E-002
RU-106	Not Detected	---------	2.79E-001
SB-122	Not Detected	---------	1.54E-001
SB-124	Not Detected	---------	3.14E-002
SB-125	Not Detected	---------	8.40E-002
SN-113	Not Detected	---------	4.01E-002
SR-85	Not Detected	---------	3.80E-002
TA-182	Not Detected	---------	1.71E-001
TA-183	Not Detected	---------	2.91E-001
TL-201	Not Detected	---------	2.53E-001
Y-88	Not Detected	---------	2.93E-002
ZN-65	Not Detected	---------	1.19E-001
ZR-95	Not Detected	---------	6.06E-002

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/26/02 7:45:30 PM

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Analyzed by: 8/27/02 Reviewed by: Beverly Key 8/27/02

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Customer : SANDERS M (6135)
Customer Sample ID : 059684-003
Lab Sample ID : 20118115

Sample Description : 6610/1032-SP1-BH1-17-S
Sample Quantity : 774.300 gram
Sample Date/Time : 8/21/02 11:15:00 AM
Acquire Start Date/Time : 8/26/02 6:05:17 PM
Detector Name : LAB01
Elapsed Live/Real Time : 6000 / 6002 seconds

Comments:
U-235/Ra-226 peaks not resolved. Either isotope may be overestimated.

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Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	5.03E-001	2.37E-001	3.87E-001
RA-226	1.40E+000	5.21E-001	7.34E-001
PB-214	6.15E-001	9.63E-002	5.92E-002
BI-214	5.27E-001	9.12E-002	5.28E-002
PB-210	Not Detected	---	8.24E+000
TH-232	5.58E-001	2.89E-001	2.29E-001
RA-228	6.17E-001	1.38E-001	1.50E-001
AC-228	5.51E-001	1.25E-001	1.05E-001
TH-228	7.51E-001	2.31E-001	4.42E-001
RA-224	6.23E-001	1.64E-001	7.82E-002
PB-212	6.56E-001	9.82E-002	3.42E-002
BI-212	5.19E-001	2.80E-001	4.04E-001
TL-208	5.57E-001	1.06E-001	8.47E-002
U-235	1.30E-001	1.66E-001	1.95E-001
TH-231	Not Detected	---	6.31E+000
PA-231	Not Detected	---	1.29E+000
TH-227	Not Detected	---	3.05E-001
RA-223	Not Detected	---	1.45E-001
RN-219	Not Detected	---	3.58E-001
PB-211	Not Detected	---	7.75E-001
TL-207	Not Detected	---	1.42E+001
AM-241	Not Detected	---	1.60E-001
PU-239	Not Detected	---	3.34E+002
NP-237	Not Detected	---	1.74E+000
PA-233	Not Detected	---	5.45E-002
TH-229	Not Detected	---	1.81E-001

[Summary Report] - Sample ID: : 20118115

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---	4.09E-002
AG-110m	Not Detected	---	2.98E-002
BA-133	Not Detected	---	3.98E-002
BE-7	Not Detected	---	2.50E-001
CD-115	Not Detected	---	3.33E-001
CE-139	Not Detected	---	2.42E-002
CE-141	Not Detected	---	4.67E-002
CE-144	Not Detected	---	1.88E-001
CM-243	Not Detected	---	1.57E-001
CO-56	Not Detected	---	3.34E-002
CO-57	Not Detected	---	2.35E-002
CO-58	Not Detected	---	3.37E-002
CO-60	Not Detected	---	4.13E-002
CR-51	Not Detected	---	2.44E-001
CS-134	Not Detected	---	4.36E-002
CS-137	Not Detected	---	3.37E-002
EU-152	Not Detected	---	7.00E-002
EU-154	Not Detected	---	1.89E-001
EU-155	Not Detected	---	1.03E-001
FE-59	Not Detected	---	8.65E-002
GD-153	Not Detected	---	6.07E-002
HG-203	Not Detected	---	3.03E-002
I-131	Not Detected	---	4.12E-002
IR-192	Not Detected	---	2.64E-002
K-40	1.51E+001	2.09E+000	3.05E-001
MN-52	Not Detected	---	6.38E-002
MN-54	Not Detected	---	1.79E-002
MO-99	Not Detected	---	9.66E-001
NA-22	Not Detected	---	4.36E-002
NA-24	Not Detected	---	1.23E+001
ND-147	Not Detected	---	2.75E-001
NI-57	Not Detected	---	6.37E-001
RU-103	Not Detected	---	2.96E-002
RU-106	Not Detected	---	2.88E-001
SB-122	Not Detected	---	1.52E-001
SB-124	Not Detected	---	2.93E-002
SB-125	Not Detected	---	8.19E-002
SN-113	Not Detected	---	3.66E-002
SR-85	Not Detected	---	3.57E-002
TA-182	Not Detected	---	1.63E-001
TA-183	Not Detected	---	2.84E-001
TL-201	Not Detected	---	2.47E-001
Y-88	Not Detected	---	2.81E-002
ZN-65	Not Detected	---	1.10E-001
ZR-95	Not Detected	---	6.44E-002

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program
8/26/02 9:27:49 PM

Analyzed by: 8/27/02 Reviewed by: Beverly Key 8/27/02

Customer : SANDERS M (6135)
Customer Sample ID : 059686-003
Lab Sample ID : 20118116

Sample Description : 6560/1028-SP1-BH1-14-S
Sample Quantity : 515.500 gram
Sample Date/Time : 8/21/02 2:25:00 PM
Acquire Start Date/Time : 8/26/02 7:47:35 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	---	6.44E-001
RA-226	1.88E+000	6.87E-001	9.56E-001
PB-214	7.66E-001	1.24E-001	7.88E-002
BI-214	7.34E-001	1.30E-001	8.08E-002
PB-210	Not Detected	---	1.08E+001
TH-232	8.55E-001	4.22E-001	2.76E-001
RA-228	8.63E-001	1.92E-001	1.73E-001
AC-228	8.25E-001	1.83E-001	1.46E-001
TH-228	7.73E-001	2.95E-001	6.25E-001
RA-224	9.17E-001	2.42E-001	1.14E-001
PB-212	7.71E-001	1.18E-001	4.71E-002
BI-212	5.62E-001	3.42E-001	5.01E-001
TL-208	6.82E-001	1.37E-001	1.15E-001
U-235	Not Detected	---	2.51E-001
TH-231	Not Detected	---	8.33E+000
PA-231	Not Detected	---	1.74E+000
TH-227	Not Detected	---	4.20E-001
RA-223	Not Detected	---	1.87E-001
RN-219	Not Detected	---	4.86E-001
PB-211	Not Detected	---	1.10E+000
TL-207	Not Detected	---	2.08E+001
AM-241	Not Detected	---	2.16E-001
PU-239	Not Detected	---	4.55E+002
NP-237	Not Detected	---	2.37E+000
PA-233	Not Detected	---	7.49E-002
TH-229	Not Detected	---	2.34E-001

[Summary Report] - Sample ID: : 20118116

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	5.18E-002
AG-110m	Not Detected	---------	3.83E-002
BA-133	Not Detected	---------	5.27E-002
BE-7	Not Detected	---------	3.30E-001
CD-115	Not Detected	---------	4.36E-001
CE-139	Not Detected	---------	3.14E-002
CE-141	Not Detected	---------	6.09E-002
CE-144	Not Detected	---------	2.42E-001
CM-243	Not Detected	---------	2.22E-001
CO-56	Not Detected	---------	4.96E-002
CO-57	Not Detected	---------	3.06E-002
CO-58	Not Detected	---------	4.70E-002
CO-60	Not Detected	---------	5.27E-002
CR-51	Not Detected	---------	3.38E-001
CS-134	Not Detected	---------	5.98E-002
CS-137	Not Detected	---------	4.31E-002
EU-152	Not Detected	---------	9.09E-002
EU-154	Not Detected	---------	2.39E-001
EU-155	Not Detected	---------	1.39E-001
FE-59	Not Detected	---------	1.11E-001
GD-153	Not Detected	---------	7.94E-002
HG-203	Not Detected	---------	4.36E-002
I-131	Not Detected	---------	5.58E-002
IR-192	Not Detected	---------	3.74E-002
K-40	1.88E+001	2.65E+000	4.34E-001
MN-52	Not Detected	---------	8.47E-002
MN-54	Not Detected	---------	4.70E-002
MO-99	Not Detected	---------	1.24E+000
NA-22	Not Detected	---------	7.01E-002
NA-24	Not Detected	---------	1.71E+001
ND-147	Not Detected	---------	3.79E-001
NI-57	Not Detected	---------	7.94E-001
RU-103	Not Detected	---------	4.09E-002
RU-106	Not Detected	---------	3.79E-001
SB-122	Not Detected	---------	2.07E-001
SB-124	Not Detected	---------	3.84E-002
SB-125	Not Detected	---------	1.16E-001
SN-113	Not Detected	---------	4.79E-002
SR-85	Not Detected	---------	5.28E-002
TA-182	Not Detected	---------	2.34E-001
TA-183	Not Detected	---------	3.75E-001
TL-201	Not Detected	---------	3.36E-001
Y-88	Not Detected	---------	3.91E-002
ZN-65	Not Detected	---------	1.55E-001
ZR-95	Not Detected	---------	8.24E-002

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/26/02 11:10:08 PM

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* Analyzed by: 8/27/02 Reviewed by: Beverly Key 8/27/02 *

****

Customer : SANDERS M (6135)
Customer Sample ID : 059687-003
Lab Sample ID : 20118117

Sample Description : 6560/1028-SP1-BH1-19-S
Sample Quantity : 727.600 gram
Sample Date/Time : 8/21/02 2:45:00 PM
Acquire Start Date/Time : 8/26/02 9:29:54 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	---	4.85E-001
RA-226	1.48E+000	4.82E-001	6.45E-001
PB-214	6.17E-001	9.74E-002	6.02E-002
BI-214	5.38E-001	9.51E-002	6.00E-002
PB-210	Not Detected	---	8.17E+000
TH-232	6.05E-001	2.94E-001	1.73E-001
RA-228	4.26E-001	1.60E-001	2.09E-001
AC-228	6.07E-001	1.34E-001	1.08E-001
TH-228	3.08E-001	1.74E-001	4.39E-001
RA-224	5.87E-001	1.61E-001	8.53E-002
PB-212	5.87E-001	8.94E-002	3.48E-002
BI-212	4.78E-001	2.57E-001	3.68E-001
TL-208	5.53E-001	1.06E-001	8.59E-002
U-235	Not Detected	---	1.89E-001
TH-231	Not Detected	---	6.10E+000
PA-231	Not Detected	---	1.32E+000
TH-227	Not Detected	---	3.04E-001
RA-223	Not Detected	---	1.44E-001
RN-219	Not Detected	---	3.57E-001
PB-211	Not Detected	---	8.18E-001
TL-207	Not Detected	---	1.47E+001
AM-241	Not Detected	---	1.67E-001
PU-239	Not Detected	---	3.42E+002
NP-237	Not Detected	---	1.85E+000
PA-233	Not Detected	---	5.39E-002
TH-229	Not Detected	---	1.83E-001

[Summary Report] - Sample ID: : 20118117

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---	4.12E-002
AG-110m	Not Detected	---	3.01E-002
BA-133	Not Detected	---	4.05E-002
BE-7	Not Detected	---	2.55E-001
CD-115	Not Detected	---	3.30E-001
CE-139	Not Detected	---	2.42E-002
CE-141	Not Detected	---	4.65E-002
CE-144	Not Detected	---	1.90E-001
CM-243	Not Detected	---	1.60E-001
CO-56	Not Detected	---	3.71E-002
CO-57	Not Detected	---	2.38E-002
CO-58	Not Detected	---	3.27E-002
CO-60	Not Detected	---	3.93E-002
CR-51	Not Detected	---	2.47E-001
CS-134	Not Detected	---	4.47E-002
CS-137	Not Detected	---	3.41E-002
EU-152	Not Detected	---	7.07E-002
EU-154	Not Detected	---	1.90E-001
EU-155	Not Detected	---	1.06E-001
FE-59	Not Detected	---	8.15E-002
GD-153	Not Detected	---	6.23E-002
HG-203	Not Detected	---	3.14E-002
I-131	Not Detected	---	4.13E-002
IR-192	Not Detected	---	2.59E-002
K-40	1.49E+001	2.08E+000	3.06E-001
MN-52	Not Detected	---	6.20E-002
MN-54	Not Detected	---	3.70E-002
MO-99	Not Detected	---	1.01E+000
NA-22	Not Detected	---	4.76E-002
NA-24	Not Detected	---	1.36E+001
ND-147	Not Detected	---	2.87E-001
NI-57	Not Detected	---	6.29E-001
RU-103	Not Detected	---	3.13E-002
RU-106	Not Detected	---	2.78E-001
SB-122	Not Detected	---	1.52E-001
SB-124	Not Detected	---	3.12E-002
SB-125	Not Detected	---	8.53E-002
SN-113	Not Detected	---	3.68E-002
SR-85	Not Detected	---	3.59E-002
TA-182	Not Detected	---	1.75E-001
TA-183	Not Detected	---	2.95E-001
TL-201	Not Detected	---	2.55E-001
Y-88	Not Detected	---	3.66E-002
ZN-65	Not Detected	---	1.19E-001
ZR-95	Not Detected	---	6.28E-002

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/27/02 12:52:27 AM

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Analyzed by: 8/27/02 Reviewed by: Beverly Kay 8/27/02

****

Customer : SANDERS M (6135)
Customer Sample ID : 059688-003
Lab Sample ID : 20118118

Sample Description : 6560/1028-SP2-BH1-7-S
Sample Quantity : 698.200 gram
Sample Date/Time : 8/22/02 9:15:00 AM
Acquire Start Date/Time : 8/26/02 11:12:13 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	---	5.38E-001
RA-226	1.67E+000	6.05E-001	8.48E-001
PB-214	7.86E-001	1.21E-001	7.16E-002
BI-214	7.06E-001	1.18E-001	6.10E-002
PB-210	Not Detected	---	9.33E+000
TH-232	7.50E-001	3.67E-001	2.35E-001
RA-228	6.96E-001	2.03E-001	2.40E-001
AC-228	7.92E-001	1.60E-001	1.07E-001
TH-228	8.51E-001	2.56E-001	4.74E-001
RA-224	8.70E-001	2.17E-001	1.02E-001
PB-212	8.02E-001	1.19E-001	3.93E-002
BI-212	7.98E-001	3.34E-001	4.53E-001
TL-208	7.09E-001	1.29E-001	9.62E-002
U-235	1.03E-001	1.84E-001	2.15E-001
TH-231	Not Detected	---	7.03E+000
PA-231	Not Detected	---	1.51E+000
TH-227	Not Detected	---	3.51E-001
RA-223	Not Detected	---	1.55E-001
RN-219	Not Detected	---	3.94E-001
PB-211	Not Detected	---	9.10E-001
TL-207	Not Detected	---	1.55E+001
AM-241	Not Detected	---	1.79E-001
PU-239	Not Detected	---	3.79E+002
NP-237	Not Detected	---	2.02E+000
PA-233	Not Detected	---	6.09E-002
TH-229	Not Detected	---	2.02E-001

[Summary Report] - Sample ID: : 20118118

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.58E-002
AG-110m	Not Detected	---------	3.38E-002
BA-133	Not Detected	---------	4.49E-002
BE-7	Not Detected	---------	2.90E-001
CD-115	Not Detected	---------	3.00E-001
CE-139	Not Detected	---------	2.69E-002
CE-141	Not Detected	---------	5.16E-002
CE-144	Not Detected	---------	2.03E-001
CM-243	Not Detected	---------	1.84E-001
CO-56	Not Detected	---------	3.83E-002
CO-57	Not Detected	---------	2.56E-002
CO-58	Not Detected	---------	3.67E-002
CO-60	Not Detected	---------	3.99E-002
CR-51	Not Detected	---------	2.80E-001
CS-134	Not Detected	---------	5.02E-002
CS-137	Not Detected	---------	3.82E-002
EU-152	Not Detected	---------	7.64E-002
EU-154	Not Detected	---------	2.13E-001
EU-155	Not Detected	---------	1.17E-001
FE-59	Not Detected	---------	8.61E-002
GD-153	Not Detected	---------	6.60E-002
HG-203	Not Detected	---------	3.58E-002
I-131	Not Detected	---------	4.37E-002
IR-192	Not Detected	---------	3.06E-002
K-40	1.37E+001	1.93E+000	3.22E-001
MN-52	Not Detected	---------	5.97E-002
MN-54	Not Detected	---------	3.69E-002
MO-99	Not Detected	---------	7.92E-001
NA-22	Not Detected	---------	5.31E-002
NA-24	Not Detected	---------	6.41E+000
ND-147	Not Detected	---------	2.84E-001
NI-57	Not Detected	---------	5.40E-001
RU-103	Not Detected	---------	3.35E-002
RU-106	Not Detected	---------	2.90E-001
SB-122	Not Detected	---------	1.35E-001
SB-124	Not Detected	---------	3.18E-002
SB-125	Not Detected	---------	9.40E-002
SN-113	Not Detected	---------	4.07E-002
SR-85	Not Detected	---------	4.04E-002
TA-182	Not Detected	---------	1.81E-001
TA-183	Not Detected	---------	2.87E-001
TL-201	Not Detected	---------	2.42E-001
Y-88	Not Detected	---------	3.32E-002
ZN-65	Not Detected	---------	1.20E-001
ZR-95	Not Detected	---------	6.54E-002

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/27/02 2:34:46 AM

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Analyzed by: 8/27/02 Reviewed by: Beverly Key 8/27/02

****

Customer : SANDERS M (6135)
Customer Sample ID : 059689-003
Lab Sample ID : 20118119

Sample Description : 6560/1028-SP2-BH1-12-S
Sample Quantity : 679.400 gram
Sample Date/Time : 8/22/02 9:40:00 AM
Acquire Start Date/Time : 8/27/02 12:54:32 AM
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	---	5.32E-001
RA-226	1.43E+000	6.01E-001	8.73E-001
PB-214	7.64E-001	1.33E-001	1.19E-001
BI-214	6.95E-001	1.19E-001	6.99E-002
PB-210	Not Detected	---	9.14E+000
TH-232	8.96E-001	4.27E-001	2.37E-001
RA-228	5.48E-001	1.79E-001	2.20E-001
AC-228	7.12E-001	1.51E-001	1.12E-001
TH-228	1.11E+000	2.87E-001	4.52E-001
RA-224	8.08E-001	2.08E-001	1.06E-001
PB-212	7.87E-001	1.17E-001	3.94E-002
BI-212	1.09E+000	3.51E-001	4.23E-001
TL-208	7.02E-001	1.29E-001	9.77E-002
U-235	Not Detected	---	2.17E-001
TH-231	Not Detected	---	7.03E+000
PA-231	Not Detected	---	1.53E+000
TH-227	Not Detected	---	3.59E-001
RA-223	Not Detected	---	1.55E-001
RN-219	Not Detected	---	4.27E-001
PB-211	Not Detected	---	9.49E-001
TL-207	Not Detected	---	1.62E+001
AM-241	Not Detected	---	1.82E-001
PU-239	Not Detected	---	3.84E+002
NP-237	Not Detected	---	1.98E+000
PA-233	Not Detected	---	6.43E-002
TH-229	Not Detected	---	2.06E-001

[Summary Report] - Sample ID: : 20118119

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.47E-002
AG-110m	Not Detected	---------	3.46E-002
BA-133	Not Detected	---------	4.72E-002
BE-7	Not Detected	---------	2.78E-001
CD-115	Not Detected	---------	3.16E-001
CE-139	Not Detected	---------	2.72E-002
CE-141	Not Detected	---------	5.24E-002
CE-144	Not Detected	---------	2.10E-001
CM-243	Not Detected	---------	1.86E-001
CO-56	Not Detected	---------	3.90E-002
CO-57	Not Detected	---------	2.58E-002
CO-58	Not Detected	---------	4.07E-002
CO-60	Not Detected	---------	4.06E-002
CR-51	Not Detected	---------	2.73E-001
CS-134	Not Detected	---------	5.21E-002
CS-137	Not Detected	---------	3.71E-002
EU-152	Not Detected	---------	7.68E-002
EU-154	Not Detected	---------	2.09E-001
EU-155	Not Detected	---------	1.16E-001
FE-59	Not Detected	---------	9.50E-002
GD-153	Not Detected	---------	6.83E-002
HG-203	Not Detected	---------	3.62E-002
I-131	Not Detected	---------	4.22E-002
IR-192	Not Detected	---------	3.02E-002
K-40	1.59E+001	2.21E+000	3.30E-001
MN-52	Not Detected	---------	6.42E-002
MN-54	Not Detected	---------	3.86E-002
MO-99	Not Detected	---------	9.03E-001
NA-22	Not Detected	---------	4.95E-002
NA-24	Not Detected	---------	6.75E+000
ND-147	Not Detected	---------	3.04E-001
NI-57	Not Detected	---------	5.12E-001
RU-103	Not Detected	---------	3.24E-002
RU-106	Not Detected	---------	3.09E-001
SB-122	Not Detected	---------	1.50E-001
SB-124	Not Detected	---------	3.56E-002
SB-125	Not Detected	---------	9.30E-002
SN-113	Not Detected	---------	4.34E-002
SR-85	Not Detected	---------	4.31E-002
TA-182	Not Detected	---------	1.86E-001
TA-183	Not Detected	---------	2.89E-001
TL-201	Not Detected	---------	2.51E-001
Y-88	Not Detected	---------	3.67E-002
ZN-65	Not Detected	---------	1.28E-001
ZR-95	Not Detected	---------	6.81E-002

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/27/02 7:04:13 AM

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* Analyzed by: 8/27/02 Reviewed by: 8/27/02

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Customer : SANDERS M (6135)
Customer Sample ID : LAB_CONTROL_SAMPLE_USING_CG-134
Lab Sample ID : 20118120

Sample Description : MIXED_GAMMA_STANDARD_CG-134
Sample Quantity : 1.000 Each
Sample Date/Time : 11/01/90 12:00:00 PM
Acquire Start Date/Time : 8/27/02 6:53:58 AM
Detector Name : LAB02
Elapsed Live/Real Time : 600 / 604 seconds

Comments:

****

Nuclide Name	Activity (pCi/Each)	2-sigma Error	MDA (pCi/Each)
U-238	Not Detected	---	3.96E+003
RA-226	Not Detected	---	5.65E+003
PB-214	Not Detected	---	5.71E+002
BI-214	Not Detected	---	4.67E+002
PB-210	Not Detected	---	2.69E+005
TH-232	Not Detected	---	1.83E+003
RA-228	Not Detected	---	1.69E+003
AC-228	Not Detected	---	1.05E+003
TH-228	Not Detected	---	4.20E+005
RA-224	Not Detected	---	4.16E+003
PB-212	Not Detected	---	3.25E+004
BI-212	Not Detected	---	1.98E+005
TL-208	Not Detected	---	5.15E+004
U-235	Not Detected	---	1.52E+003
TH-231	Not Detected	---	6.93E+004
PA-231	Not Detected	---	1.23E+004
TH-227	Not Detected	---	2.54E+003
RA-223	Not Detected	---	1.00E+026
RN-219	Not Detected	---	5.56E+003
PB-211	Not Detected	---	1.26E+004
TL-207	Not Detected	---	1.73E+005
AM-241	8.07E+004	1.20E+004	4.00E+003
PU-239	Not Detected	---	2.68E+006
NP-237	Not Detected	---	1.42E+004
PA-233	Not Detected	---	5.09E+002
TH-229	Not Detected	---	1.52E+003

[Summary Report] - Sample ID: : 20118120

Nuclide Name	Activity (pCi/Each)	2-sigma Error	MDA (pCi/Each)
AG-108m	Not Detected	---	2.05E+002
AG-110m	Not Detected	---	2.27E+008
BA-133	Not Detected	---	7.89E+002
BE-7	Not Detected	---	1.00E+026
CD-115	Not Detected	---	1.00E+026
CE-139	Not Detected	---	5.27E+011
CE-141	Not Detected	---	1.00E+026
CE-144	Not Detected	---	5.52E+007
CM-243	Not Detected	---	1.85E+003
CO-56	Not Detected	---	1.86E+019
CO-57	Not Detected	---	1.19E+007
CO-58	Not Detected	---	4.97E+020
CO-60	8.25E+004	1.07E+004	6.28E+002
CR-51	Not Detected	---	1.00E+026
CS-134	Not Detected	---	1.20E+004
CS-137	7.05E+004	8.92E+003	3.16E+002
EU-152	Not Detected	---	1.10E+003
EU-154	Not Detected	---	2.29E+003
EU-155	Not Detected	---	4.94E+003
FE-59	Not Detected	---	1.00E+026
GD-153	Not Detected	---	1.54E+008
HG-203	Not Detected	---	1.00E+026
I-131	Not Detected	---	1.00E+026
IR-192	Not Detected	---	9.77E+019
K-40	Not Detected	---	1.10E+003
MN-52	Not Detected	---	1.00E+026
MN-54	Not Detected	---	3.54E+006
MO-99	Not Detected	---	1.00E+026
NA-22	Not Detected	---	3.25E+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	---	7.41E+006
SB-122	Not Detected	---	1.00E+026
SB-124	Not Detected	---	1.00E+026
SB-125	Not Detected	---	1.94E+004
SN-113	Not Detected	---	7.41E+013
SR-85	Not Detected	---	1.00E+026
TA-182	Not Detected	---	1.53E+014
TA-183	Not Detected	---	1.00E+026
TL-201	Not Detected	---	1.00E+026
Y-88	Not Detected	---	1.86E+014
ZN-65	Not Detected	---	1.21E+008
ZR-95	Not Detected	---	1.00E+026

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Sandia National Laboratories
Radiation Protection Sample Diagnostics Program
Quality Assurance Report

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Report Date : 8/27/02 7:04:20 AM
QA File : C:\GENIE2K\CAMFILES\LCS2.QAF
Analyst : RPREESE
Sample ID : 20118120
Sample Quantity : 1.00 Each
Sample Date : 11/01/90 12:00:00 PM
Measurement Date : 8/27/02 6:53:58 AM
Elapsed Live Time : 600 seconds
Elapsed Real Time : 604 seconds

Parameter	Mean	1S Error	New Value	< LU	SD	UD	BS >
AM-241 Activity	8.247E-002	3.740E-003	8.068E-002	<			>
CS-137 Activity	7.191E-002	3.245E-003	7.053E-002	<	✓		>
CO-60 Activity	8.019E-002	3.862E-003	8.090E-002	<			>

Flags Key: LU = Boundary Test (Ab = Above , Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action).

Reviewed by: _____ 8/27/02

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Sandia National Laboratories

Radiation Protection Sample Diagnostics Program

8/27/02 6:47:05 AM

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Analyzed by: 8/27/02 Reviewed by: 8/27/02

****

Customer : SANDERS M (6135
Customer Sample ID : LAB_CONTROL_SAMPLE_USING_CG-134
Lab Sample ID : 20118121

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 : 8/27/02 6:36:51 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	---	2.49E+003
RA-226	Not Detected	---	5.55E+003
PB-214	Not Detected	---	6.66E+002
BI-214	Not Detected	---	5.75E+002
PB-210	Not Detected	---	9.37E+004
TH-232	Not Detected	---	2.17E+003
RA-228	Not Detected	---	2.41E+003
AC-228	Not Detected	---	1.49E+003
TH-228	Not Detected	---	4.69E+005
RA-224	Not Detected	---	1.80E+004
PB-212	Not Detected	---	3.32E+004
BI-212	Not Detected	---	2.79E+005
TL-208	Not Detected	---	6.55E+004
U-235	Not Detected	---	1.42E+003
TH-231	Not Detected	---	4.19E+004
PA-231	Not Detected	---	1.41E+004
TH-227	Not Detected	---	2.59E+003
RA-223	Not Detected	---	1.00E+026
RN-219	Not Detected	---	6.94E+003
PB-211	Not Detected	---	1.53E+004
TL-207	Not Detected	---	2.42E+005
AM-241	8.79E+004	1.27E+004	1.83E+003
PU-239	Not Detected	---	2.34E+006
NP-237	Not Detected	---	1.25E+004
PA-233	Not Detected	---	5.90E+002
TH-229	Not Detected	---	1.23E+003

[Summary Report] - Sample ID: : 20118121

Nuclide Name	Activity (pCi/Each)	2-sigma Error	MDA (pCi/Each)
AG-108m	Not Detected	---------	3.09E+002
AG-110m	Not Detected	---------	2.71E+008
BA-133	Not Detected	---------	9.10E+002
BE-7	Not Detected	---------	1.00E+026
CD-115	Not Detected	---------	1.00E+026
CE-139	Not Detected	---------	4.89E+011
CE-141	Not Detected	---------	1.00E+026
CE-144	Not Detected	---------	4.85E+007
CM-243	Not Detected	---------	2.09E+003
CO-56	Not Detected	---------	2.27E+019
CO-57	Not Detected	---------	1.06E+007
CO-58	Not Detected	---------	6.64E+020
CO-60	7.76E+004	1.03E+004	1.09E+003
CR-51	Not Detected	---------	1.00E+026
CS-134	Not Detected	---------	1.46E+004
CS-137	6.90E+004	8.76E+003	4.01E+002
EU-152	Not Detected	---------	9.65E+002
EU-154	Not Detected	---------	3.43E+003
EU-155	Not Detected	---------	4.12E+003
FE-59	Not Detected	---------	1.00E+026
GD-153	Not Detected	---------	9.74E+007
HG-203	Not Detected	---------	1.00E+026
I-131	Not Detected	---------	1.00E+026
IR-192	Not Detected	---------	1.12E+020
K-40	Not Detected	---------	1.47E+003
MN-52	Not Detected	---------	1.00E+026
MN-54	Not Detected	---------	4.87E+006
MO-99	Not Detected	---------	1.00E+026
NA-22	Not Detected	---------	4.40E+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	---------	9.03E+006
SB-122	Not Detected	---------	1.00E+026
SB-124	Not Detected	---------	1.00E+026
SB-125	Not Detected	---------	2.32E+004
SN-113	Not Detected	---------	8.80E+013
SR-85	Not Detected	---------	1.00E+026
TA-182	Not Detected	---------	2.12E+014
TA-183	Not Detected	---------	1.00E+026
TL-201	Not Detected	---------	1.00E+026
Y-88	Not Detected	---------	2.27E+014
ZN-65	Not Detected	---------	1.68E+008
ZR-95	Not Detected	---------	1.00E+026

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Sandia National Laboratories
Radiation Protection Sample Diagnostics Program
Quality Assurance Report

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Report Date : 8/27/02 6:47:09 AM
QA File : C:\GENIE2K\CAMFILES\LCS1.QAF
Analyst : RPREESE
Sample ID : 20118121
Sample Quantity : 1.00 Each
Sample Date : 11/1/90 12:00:00 PM
Measurement Date : 8/27/02 6:36:51 AM
Elapsed Live Time : 600 seconds
Elapsed Real Time : 604 seconds

Parameter	Mean	1S Error	New Value	< LU	SD	UD	BS >
AM-241 ACTIVITY	8.570E-002	3.465E-003	8.786E-002	<			>
CS-137 Activity	6.836E-002	1.368E-003	6.897E-002	<			>
CO-60 Activity	7.657E-002	3.480E-003	7.757E-002	<			>

Flags Key: LU = Boundary Test (Ab = Above , Be = Below)
SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
BS = Measurement Bias Test (In = Investigate, Ac = Action)

Reviewed by: _____ 8/27/02