1-1-2000

Statement of Basis Approval of No Further Action Volume 29 of 30, January 2000, Solid Waste Management Unit 94A, Operable Unit 1333, Round 11

Sandia National Laboratories/NM

Sandia National Laboratories

Statement of Basis
Approval of No Further Action
Volume 29 of 30

January 2000

Solid Waste Management Unit 94A
Operable Unit 1333
Round 11

(RCRA Permit No. NM5890110518)

NFA Originally Submitted September 15, 1998 (Chapter 6)

Environmental Restoration Project

United States Department of Energy
Albuquerque Operations Office

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6.0 SOLID WASTE MANAGEMENT UNIT 94A, ABOVEGROUND TANKS, LURANCE CANYON BURN SITE

6.1 Summary

Sandia National Laboratories/New Mexico (SNL/NM) is proposing a risk-based no further action (NFA) decision for Solid Waste Management Unit (SWMU) 94A, Aboveground Tanks, Operable Unit (OU) 1333. SWMU 94A is comprised of three aboveground storage tank locations: two inactive areas where the tanks have been removed and one active area. This NFA addresses historical releases from all three aboveground storage tank locations. However, the active aboveground storage tank location is operating in compliance with all current applicable state and federal regulations and is not regulated under the Resource Conservation Recovery Act (RCRA). The aboveground storage tanks have been used to store JP-4 and water to support testing operations at the Lurance Canyon Burn Site (LCBS). Review and analysis of all relevant data for SWMU 94A indicate that concentrations of constituents of concern (COC) at this site are less than applicable risk assessment action levels. Thus, SWMU 94A is proposed for an NFA decision based upon confirmatory sampling data demonstrating that COCs that may have been released from the SWMU into the environment pose an acceptable level of risk under current and projected future land uses as set forth by Criterion 5, which states, "The SWMU/AOC [area of concern] has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use" (NMED March 1998).

6.2 Description and Operational History

Section 6.2 describes SWMU 94A and discusses its operational history.

6.2.1 Site Description

SWMU 94A is a subunit of SWMU 94, identified as the LCBS on the RCRA Hazardous and Solid Waste Amendment permit. SWMU 94A is located on U.S. Air Force land withdrawn from the Bureau of Land Management and permitted to the U.S. Department of Energy (DOE) (SNL/NM July 1994a). The site is located on the canyon floor alluvium in the closed upper reaches of the Lurance Canyon drainage. This drainage is surrounded by moderately steep sloping canyon walls, and the immediate topographic relief around the site is over 500 feet (Figure 6.2.1-1). A 25- to 50-feet-wide road is cut on the hillsides as a firebreak and encircles the site (Figure 6.2.1-2). The canyon floor at the site is isolated by the canyon walls except for the western drainage into Arroyo del Coyote. Coyote Springs Road follows this drainage and is the main access road into the Lurance Canyon (Figure 6.2.1-1).

The LCBS is currently used for testing fire survivability of transportation containers, weapons components, simulated weapons, and satellite components (Author [unk] Date [unk], Martz November 1985, SNL/NM May 1986). Only a few of the permanent engineered structures present at the site are active today. The location of SWMU 94 coincides with SWMU 65, Lurance Canyon Explosive Test Site, an inactive site used for high explosives (HE) tests and for liquid and solid propellant burn tests.

In order to facilitate site characterization, SWMU 94 has been subdivided into seven subunits where hazardous constituents may have been released (Figure 6.2.1-2): SWMU 94A,

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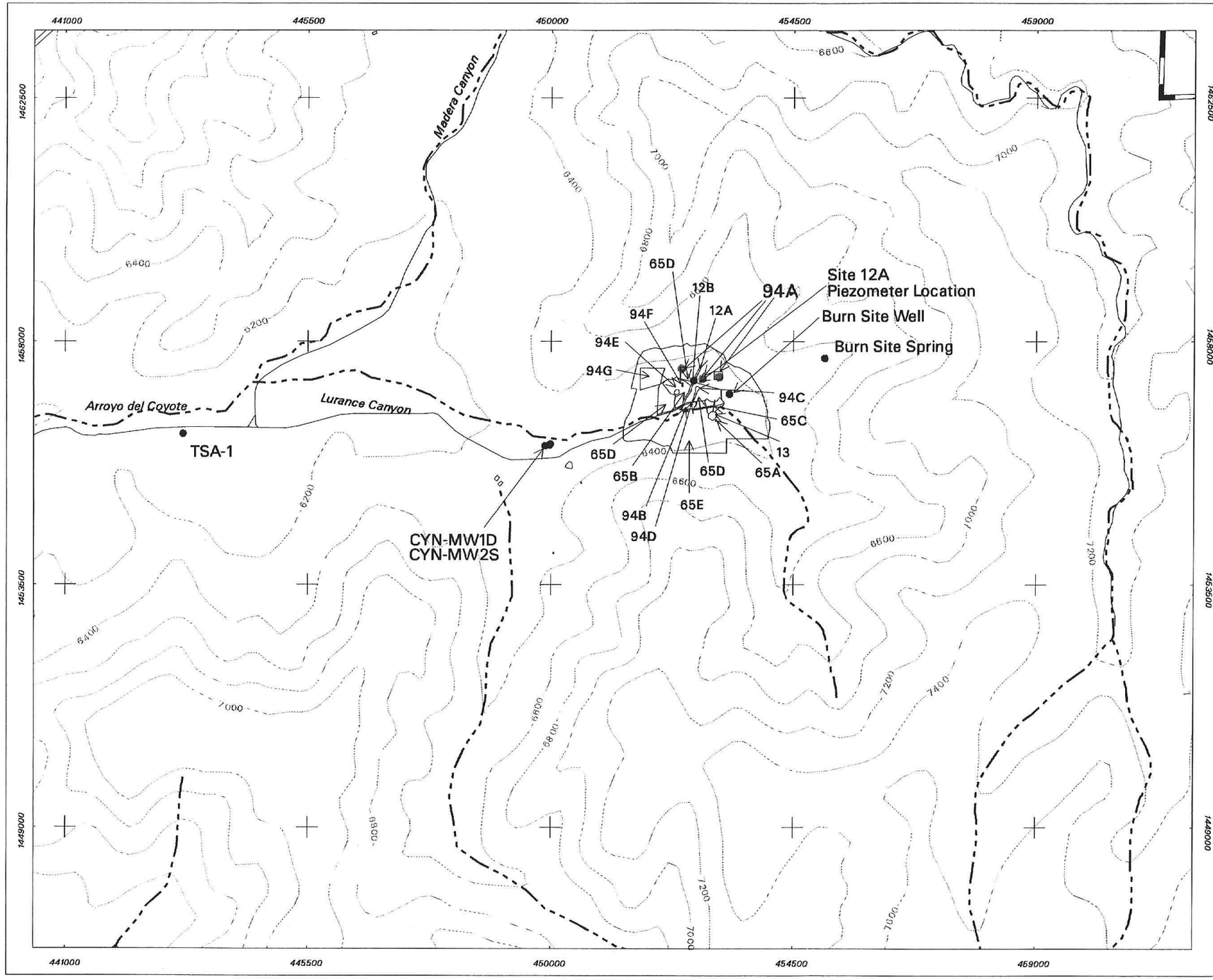

Legend

- SWMU 94A (Three Tank Areas)
- Well
- Piezometer Location
- Other SWMU Sites
- Kirtland Air Force Base Boundary
- Surface-Water Features
- 200 Foot Contour Interval

0 2000 4000
Scale in Feet

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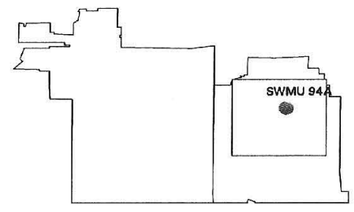
Scale in Meters



Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Figure 6.2.1-1
Location of SWMU 94A Aboveground Tanks within Operable Unit 1333

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum

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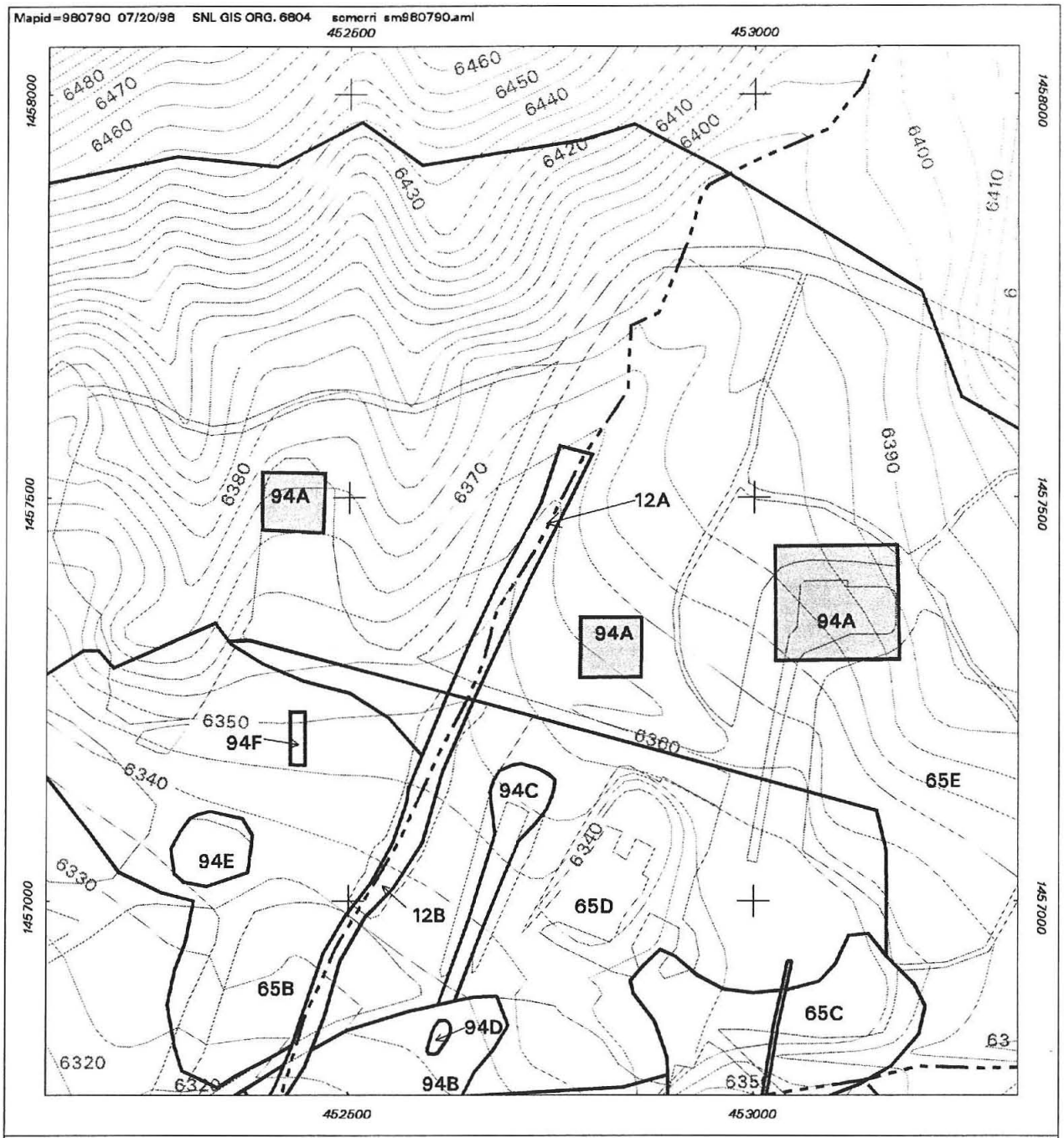
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6330
6320
94A
12A
94A
94A
94F
94C
94E
12B
65D
65E
65B
94D
94B
65C
Legend
Road
5 Foot Contour
Surface Drainage
SWMU 94A
Other SWMUs
Figure 6.2.1-2
Site Map
of SWMU 94A
0 100 200
Scale in Feet
0 24 48
Scale in Meters
Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Aboveground Tanks; SWMU 94B, Debris/Soil Mound Area; SWMU 94C, Bomb Burner Area and Discharge Line; SWMU 94D, Bomb Burner Discharge Pit; SWMU 94E, Small Surface Impoundment; SWMU 94F, Light Airtransport Accident Resistant Container (LAARC) Discharge Pit; and SWMU 94G, Scrap Yard. All of these subunits are inactive except for SWMU 94G (Scrap Yard), and SWMU 94A, which contains both active and inactive tanks. This NFA addresses historical releases from all three aboveground storage tank locations. However, the active aboveground storage tank location is operating in compliance with all current applicable state and federal regulations and is not regulated under the RCRA. Table 6.2.1-1 provides the rationale for subunit designation or omission. The SWMU 94 subunits are each addressed in separate NFA proposals. SWMUs 94B, 94C, 94D, 94E, 94F, and 94G will be addressed in future NFA submittals.

SWMU 94A consists of three individual areas within its total surface area of 0.8 acre (SNL/NM April 1995). The mean elevation of this subunit is 6,370 feet above sea level (SNL/NM April 1995). SWMU 94A includes all of the current and historic aboveground tank storage locations at SWMU 94—including the tank location north of the LAARC Unit (Tank Area 1) (Figure 6.2.1-3a), the former tank location north of the Bomb Burner Unit (Tank Area 2) (Figure 6.2.1-3b), and the active tank location north of the large open burn pool (LOBP) (Tank Area 3)—and is currently used to support the facility (Figures 6.2.1-3c and 6.2.1-3d). These tank areas have been included in this study because of documented and historical accidental releases of JP-4 fuel to the ground surface.

Historical published information regarding the hydrogeology of the Lurance Canyon has been summarized in the "RCRA Facility Investigation (RFI) Work Plan for the Operable Unit 1333, Canyons Test Area" (SNL/NM September 1995). Since that time, additional bedrock wells and alluvial piezometers have been installed in the Lurance Canyon, and data collected from the new bedrock wells have supported the hydrologic model of semiconfined to confined groundwater conditions at a depth of approximately 222 feet below ground surface (bgs) beneath the Lurance Canyon SWMUs. The data collected from the alluvial piezometers support the absence of alluvial groundwater. Hydrologic data have been based upon the Burn Site Well, CYN-MW1D, 12AUP01 (piezometer), and CYN-MW2S (piezometer). This section summarizes the hydrologic conditions at each monitoring location.

The Burn Site well (located approximately 700 feet southeast of SWMU 94A [Tank Area 3]) was drilled in February 1986 to a total depth of 350 feet bgs (Figure 6.2.1-1). A total of 74 feet of clay, silt, and shale units were encountered overlying the bedrock identified as metamorphic schists and fractured granite. Water-bearing bedrock was encountered at a depth of 222 to 350 feet bgs (New Mexico State Engineers Office Well Record RG-44986). Following well completion, the water level rose to 68 feet bgs.

A shallow underflow piezometer was installed in November 1996 in SWMU 12A approximately 150 feet southwest of SWMU 94A (Tank Area 2) (Figure 6.2.1-2). The piezometer was installed in conformance with a document of understanding between SNL/NM and the New Mexico Environment Department (NMED) Oversight Bureau (OB) (Dawson August 1996). The subsurface geology at the site is comprised of approximately 55 feet of alluvial sand, silt, and gravel overlying metamorphic phyllite to schist bedrock. The piezometer was completed to a depth of approximately 58 feet bgs and identified as 12AUP01. Moist soil was encountered in the first 5 feet of alluvium. The remaining 53 feet to bedrock were dry. No groundwater was encountered during drilling. The piezometer was instrumented in February 1997, and has been collecting data since that time. In addition, manual checks have been conducted for the

Table 6.2.1-1
Correlation of Burn Testing Structures and Associated Features to SWMU 94 Subunits

Burn Unit/Structure	Designated Subunit for Site Characterization	Type/Nature of Operational Release	Rationale for Characterization
Portable Pans	None	Detonations (HE, gun propellant, radionuclides)	Nature of operational release covered in sampling plans for SWMUs 65B and 65D
	SWMU 94E	Waste water	No operational historical releases in most tests; some documented releases to Small Surface Impoundment
Small Surface Impoundment	SWMU 94E	Waste water (JP-4 fuel and water mixture)	Documented releases and burn test in the Small Surface Impoundment
LOBP (30 x 60 feet)	None	Waste water (JP-4 fuel and water mixture)	Only operational historical releases to SWMU 13, no documented historical releases from accidental spills
SOBP (20 x 20 feet)	None	Waste water (JP-4 fuel and water mixture)	No operational historical releases and no documented historical releases from accidental spills
LAARC Unit	None	Waste water (JP-4 fuel and water mixture)	No documented historical releases within LAARC Unit from accidental spills
LAARC Discharge Pit	SWMU 94F	Waste water (JP-4 fuel and water mixture)	Operational historical releases to discharge pit
Bomb Burner Unit and Trench	SWMU 94C	Detonations (HE, radionuclides, metals) and waste water (JP-4 fuel and water mixture)	Documented operational historical releases inside and near the Bomb Burner Unit, removed in D&D activities in 1997
		Detonations (HE, radionuclides, metals)	Documented detonations in Bomb Burner Unit trench
Bomb Burner Discharger Pit	SWMU 94D	Waste water (JP-4 fuel and water mixture)	Documented operational historical releases to discharge pit
SWISH Unit	None	None (waste water recirculated, never disposed of waste water)	No operational historical releases and no documented historical releases from accidental spills
SMERF	None	None (waste water recirculated)	No operational historical releases
Bunker 9830	None	None	No operational historical releases outside structure; historical releases within structure covered in future D&D activities
Aboveground Tanks	SWMU 94A	Accidental spills of JP-4 fuel on soil	Documented historical releases from accidental spills
Debris/Soil Mounds	SWMU 94B	Metals or radionuclides leachate	Mounds have no documented history and contain radiological anomalies
Scrap Yard	SWMU 94G	Accidental spills of hydraulic oils on soil	Documented release of hydraulic oil

D&D = Decontamination and decommissioning.
HE = High explosive(s).
LAARC = Light Airtransport Accident Resistant Container.
LOBP = Large Open Burn Pool.
SMERF = Smoke Emission Reduction Facility.
SOBP = Small Open Burn Pool.
SWISH = Small Wind-Shielded.
SWMU = Solid waste management unit.

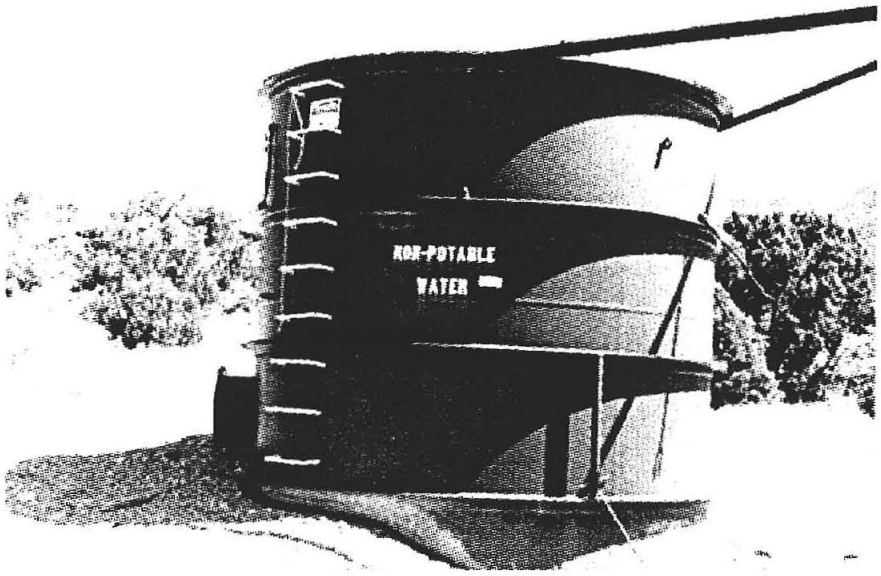

Figure 6.2.1-3a Photograph of the above-ground tank (SWMU 94A, Area 1) north of the LAARC Unit in April 1995. Additional above-ground tanks storing fuel were located here when the LAARC was active. View is to the northeast.

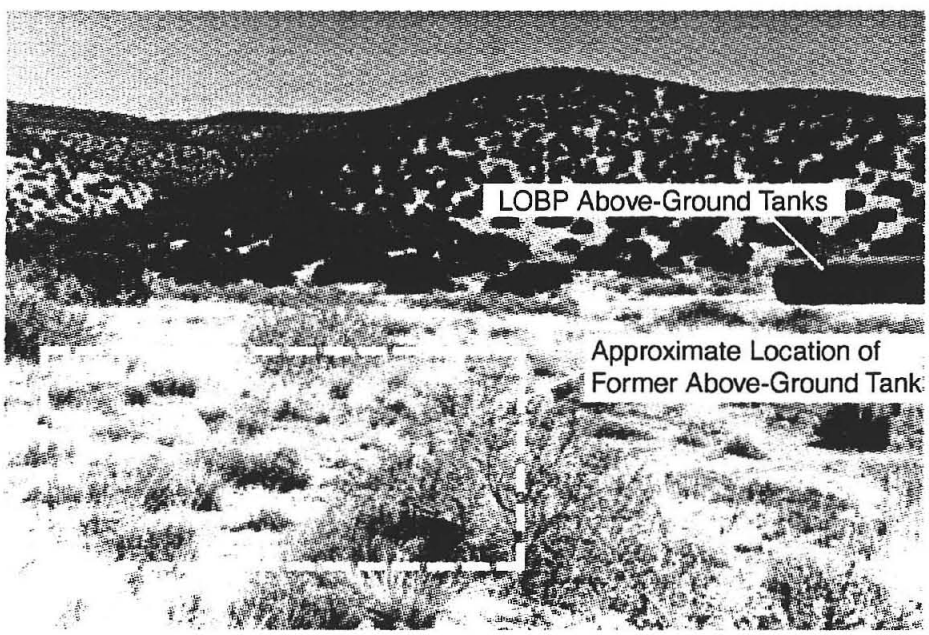

Figure 6.2.1-3b Photograph of the former above-ground tank location (SWMU 94A. Area 2) north of the Bomb Burner Unit in April 1995. The above-ground tanks north of the LOBP (SWMU 94A, Area 3) are visable in the background. View is to the northeast.

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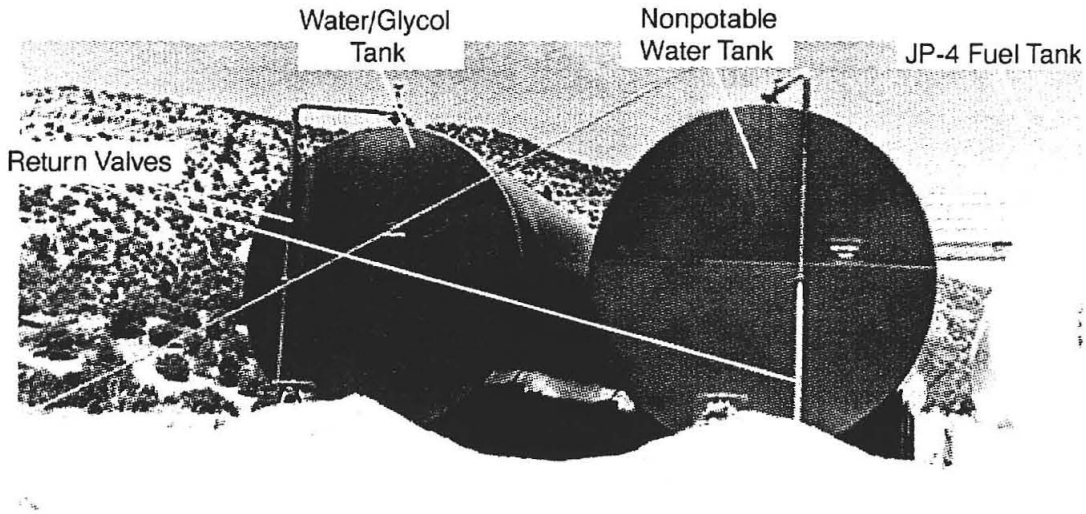

Figure 6.2.1-3c Photograph of the above-ground tanks north of the LOBP (SWMU 94A, Area 3) in April 1995. The above-ground tanks provide the recirculation system for the LOBP, SOBP, and for the SMERF. Nonpotable water is recirculated back to the labeled tank following testing. View is to the north.

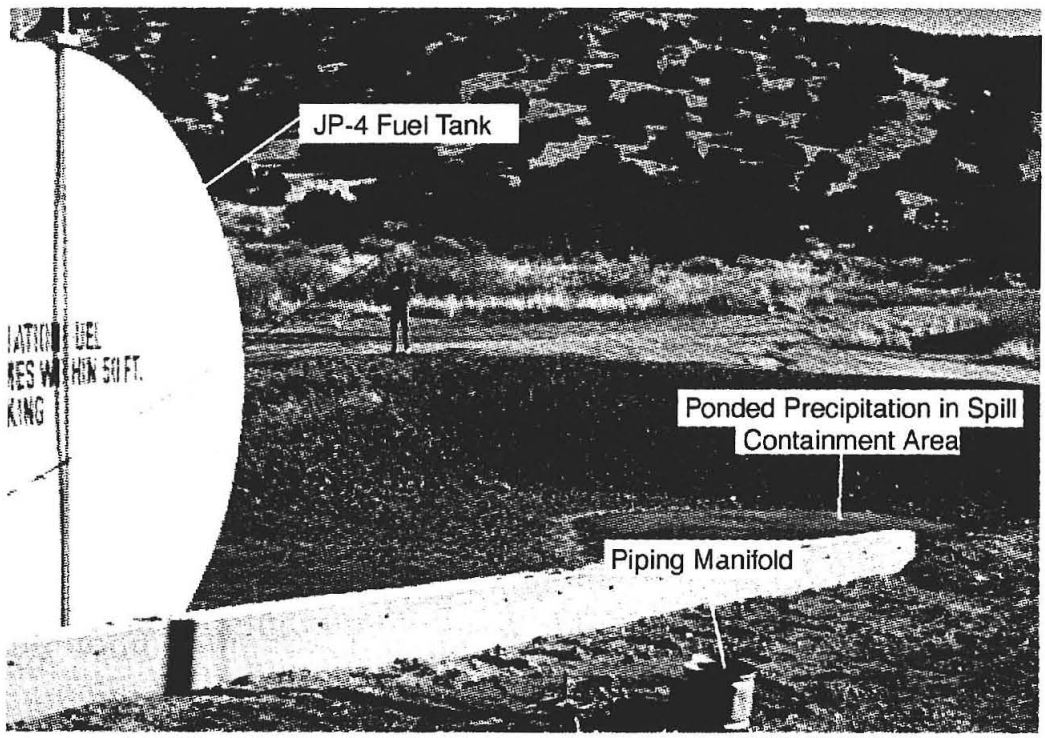

Figure 6.2.1-3d Photograph of the spill containment area surrounding the JP-4 fuel above-ground tank (SWMU 94A, Area 3) north of the LOBP in December 1994. The spill containment area is constructed of soil overlying a plastic liner. View is to the northeast.

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presence of water as a verification procedure. No water has been recorded in the piezometer subsequent to its installation.

The Burn Site Spring (Figure 6.2.1-1) is an ephemeral spring or, more accurately described, a seep, located approximately 2,100 feet east of SWMU 94A (Tank Area 3). The seep discharges small quantities of water from fractures and/or bedding plane permeability within the carbonate rocks (Goodrich [Unk.] 1993). It is believed that the source of the water is seasonal recharge of fractures from the surrounding mountain terrain.

A groundwater monitoring well nest was installed in November and December 1997 approximately 3,000 feet west (downgradient) of the LCBS (Figure 6.2.1-1). The groundwater wells were installed in conformance with the documents of understanding between SNL/NM and the NMED OB (SNL/NM July 1997, SNL/NM September 1997a). The monitoring well nest is comprised of a shallow underflow piezometer (CYN-MW2S) and a deep groundwater well (CYN-MW1D). The subsurface geology at the nest location is characterized by approximately 25 feet of alluvial sand, silt, and gravel, unconformably overlying the Manzanita Gneiss, which is fractured. No water was encountered while drilling activities were conducted in the alluvium, and no water has been recorded at CYN-M2S since its installation. Groundwater was first encountered in CYN-MWD at a depth of 372 feet bgs and the static level rose to 320 feet bgs. This indicated semiconfined to confined groundwater conditions similar to those encountered in the Burn Site Well (Figure 6.2.1-1).

In summary, the groundwater beneath the LCBS occurs at depths of at least 222 feet bgs under semiconfined to confined conditions in fractured metamorphic rock. There has been no record to date of shallow groundwater occurring in the alluvium overlying the bedrock.

For a detailed discussion regarding the local setting at SWMU 94A, refer to the "RFI Work Plan for Operable Unit 1333, Canyons Test Area" (SNL/NM September 1995).

6.2.2 Operational History

Historical aerial photographs indicate that the transition of testing activities from predominantly open-detonation explosives testing and JP-4 fuel fires in excavated pits (SWMU 65) to open burning of test units with JP-4 fuel fires in portable pans (SWMU 94) occurred between 1971 and 1982 (SNL/NM August 1994). Based upon test reports and interviews, open burning with JP-4 fuel fires in portable burn pans began by 1975. By 1980, the first permanent engineered burn unit (LAARC) was constructed on the former location of the Primary Detonation Area (SWMU 65B) and was in operation (Annex 6-A). The scrap yard (SWMU 94G) was established in the northwestern portion of the site within the former location of the Far-Field Dispersion Area (SWMU 65E) (Larsen and Palmieri October 1994). The scrap yard has historically been used to store spare materials used in explosives and burn tests, and is still in use today for storing nonliquid materials and used equipment.

By 1983, most of SWMU 94 was constructed, with a total of six permanent engineered burn units (the Large Open Burn Pool [LOBP], the Small Open Burn Pool [SOBP], the LAARC Unit, the Bomb Burner Unit, the Small Wind Shielded [SWISH] unit, and the Conical Container [CON-CON] Unit) placed on the graded area that was formerly the location of the Primary Detonation Area (SWMU 65B) and the Near-Field Dispersion Area (SWMU 65D) (SNL/NM August 1994) (Figure 6.2.2-1). Two of the burn units (SWISH Unit [and later the Smoke Emissions Reduction Facility (SMERF) Unit]) were constructed to provide testing facilities that would eliminate wind effects and provide accurate temperature control and instrumentation for test monitoring

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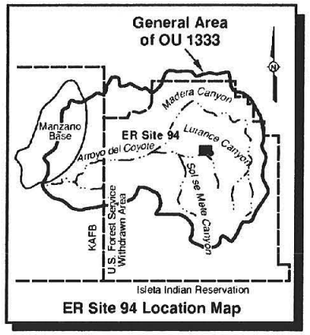

SWMU 94A, Area 1 Aboveground Storage Tanks
Nonpotable Water
Recirculation Tank
Fuel Tank
Bunker 9830
LAARC Unit
SWISH Unit
SWMU 94A, Area 2 Aboveground Storage Tanks
SWMU 94A, Area 3 Abovground Storage Tanks
Fuel Tank
Nonpotable Water Tanks
Firebreak Road
SWMU 94G Scrap Yard
Cable Conduit
CON-CON Unit
SWMU 94F LAARC Discharge Pit
SWMU 65B Primary Detonation Area
Camera Bunker
SWMU 94C Bomb Burner Unit Discharge Line and Trench
TABS Test Location B
Buried Discharge Line
LOBP
SWMU 94E Small Surface Impoundment
Location of Uncontained Pool Fire Tests
ER Site 65E Far Field Dispersion Area
Lurance Canyon (Main Arroyo)
SWMU 94D Bomb Burner Discharge Pit
SWMU 65A Small Debris Mound
SWMU 65D Near Field Dispersion Area
SWMU 13 Oil Surface Impoundment
Coyote Springs Road
Firebreak Road

LEGEND

- Active Road
- Arroyo Channel (Flow Direction)
- Slope Direction on Berm/Mound
- Scrap Yard
- Surface Depression
- Location of M5-155 Gun Propellant Canister Tests
- Aboveground Discharge Pipeline
- Trailer/Building
- Buried Portion of Arroyo
- Trench
- Location of Portable Pan Burn Tests
- Engineered Soil Berm
- Underground Fuel and Water Pipelines
- Underground Discharge Pipeline

0 100 200 FEET
0 50 METERS
APPROXIMATE SCALE

Base map modified from USGS, June 1983

Figure 6.2.2-1
SWMU 94
Lurance Canyon Burn Site
1983 Operations

(Palmieri April 1995). A small surface impoundment (SWMU 94E) is also visible southeast of Bunker 9830. Engineered soil berms had been constructed by 1983 in the southeastern portion of the site for flood protection from the main arroyo in the Lurance Canyon.

By 1992, the site contained all the current permanent engineered burn units (Figure 6.2.2-2). The CON-CON Unit, identified in the 1983 historical aerial photograph, was dismantled prior to 1989, and by 1992 a new burn unit (SMERF) was constructed in the same location (SNL/NM August 1994). Prior to 1992, a debris/soil mound area (SWMU 94B) was created in the southern portion of SWMU 94, directly north of the main arroyo in the Lurance Canyon (Figure 6.2.2-2). This debris/soil mound may be associated with ongoing grading activities at the site. Located to the northeast of the debris/soil mound area (SWMU 94B) is a second soil mound that was created during remediation of a waste-water spill from the SMERF on March 20, 1992 (Figure 6.2.2-2).

Burn testing at the LCBS has always been conducted with JP-4 fuel pool fires in open portable pans or contained within the permanent engineered structures (Jercinovic et al. November 1994). Pool fires provide the closest simulation of accidents involving flammable liquids (Author [unk] Date [unk]). For the tests, the pans are filled with approximately 1 to 2 feet of water, and an average 8-inch layer of JP-4 fuel is placed on the water. A test unit such as a transportation container is placed on a stand above the fuel. The fuel is ignited, and the fire typically burns until the JP-4 fuel is consumed. The length of the test is controlled by the volume (thickness) of the JP-4 fuel layer. After a burn test is completed, test units are retrieved and salvageable materials are collected and stored in the scrap yard located in the northwestern portion of the site (Figure 6.2.2-2). Any test object residue (e.g., metal slag) is recovered with the test unit and is removed from the site by the testing group. Only small residue particulates may be left in the water following the burn test (Larson and Palmieri October 1994). While no testing is currently conducted on components containing radioactive materials, SWMU 94 is currently classified as a Radiological Materials Management Area (RMMA) because of the presence of residual depleted uranium in the soil from earlier burn tests (Gaither December 1993) and from former explosives testing activities associated with SWMU 65 (Gaither January 1994). Annex 6-A presents tabulated data from SWMU 94 testing activities documented in test logs since 1979.

The aboveground tanks (SWMU 94A) have always been used to supply water, JP-4 fuel, and ethylene glycol coolant for burn testing at all of the engineered structures. There are three storage tank locations at SWMU 94 that served the LAARC Unit, the Bomb Burner Unit, the SMERF, the SOBP, and the LOBP. The aboveground tank locations include an area north of the LAARC Unit (Tank Area 1), north of the Bomb Burner Unit (Tank Area 2), and the tank location north of the LOBP (Tank Area 3) (Figure 6.2.2-2). This section discusses these three aboveground tank locations.

Tank Area 1, an aboveground tank labeled "nonpotable water," was previously located north of the LAARC Unit, which was used to supply water to the unit (Hickox November 1994). Two aboveground tanks were also formerly used for fuel storage at this location (Kervin April 1981). These two tanks have since been removed. The 1983 historical aerial photograph shows that three aboveground tanks were formerly located in Tank Area 2 north of the Bomb Burner Unit (SNL/NM 1983). These aboveground tanks were used to supply JP-4 fuel and water for testing at the Bomb Burner Unit. The tanks are no longer present at the site, and no documentation exists that describes their installation or removal. No physical evidence of their former locations exists at the site; however, a historical engineering drawing accurately identified the tank location.

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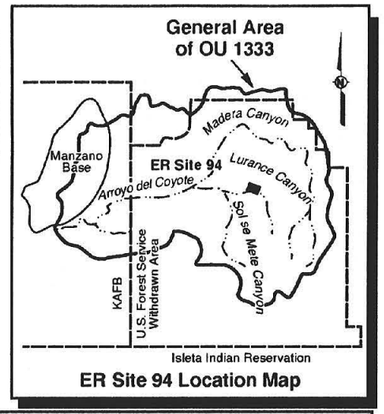
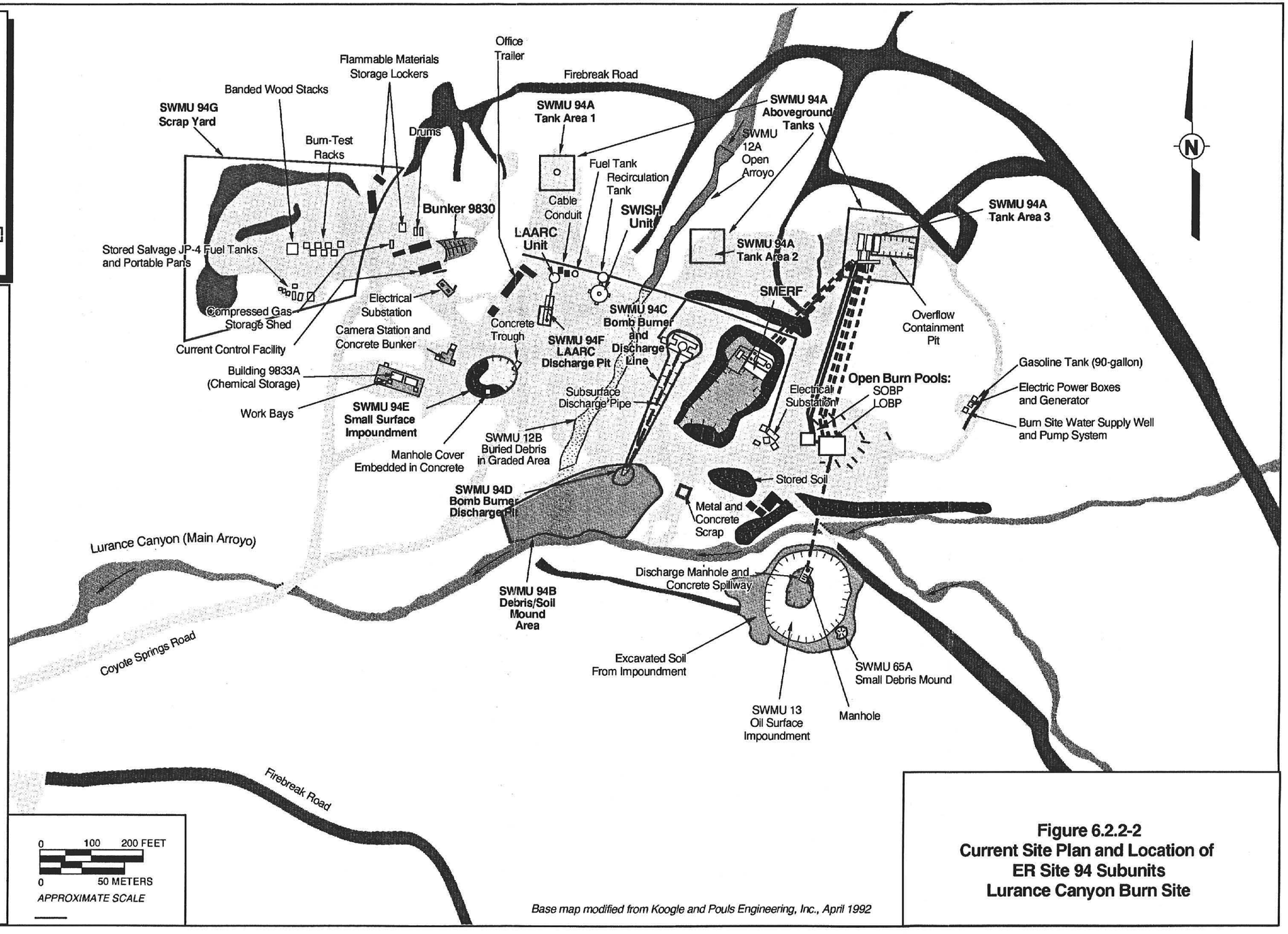


LEGEND

- Active Road/Graded Area
- Inactive Road
- Arroyo Channel (Flow Direction)
- Buried Portion of Arroyo
- Slope Direction on Berm/Mound
- Engineered Soil Berm
- Surface Depression
- Disturbed Area/Soil Mound
- Scrap Material
- Trailer/Building
- Concrete Pad
- Wind Screen
- Underground Water Pipeline
- Aboveground Water Pipeline
- Underground Fuel Pipeline
- Aboveground Fuel Pipeline
- Underground Discharge Pipeline
- Portable Tank
- Aboveground Discharge Pipeline
- Subunit Boundary



Base map modified from Koogle and Pouls Engineering, Inc., April 1992

Figure 6.2.2-2
Current Site Plan and Location of
ER Site 94 Subunits
Lurance Canyon Burn Site

Three aboveground tanks are now located in Tank Area 3 approximately 400 feet north of the LOBP: One contains JP-4 fuel, another contains nonpotable water, and the third contains glycol/water (Figure 6.2.1-2). Prior to 1992, when the nonpotable water and glycol/water tanks were installed, there were two nonpotable water tanks in addition to a JP-4 fuel tank at the same location (Hickox November 1994). The current nonpotable water and JP-4 fuel tanks provide water and fuel for burn tests conducted at the LOBP, the SOBP, and the SMERF. The glycol/water is used as a coolant for the SMERF. A plastic-lined, earthen, secondary overflow containment pit is installed around the aboveground tank that contains JP-4 fuel (Figure 6.2.1-3d) (Larson and Palmieri October 1994).

Two underground pipelines connect the LOBP to the JP-4 fuel tank and to the nonpotable water tank. Two aboveground 3.5-inch-diameter galvanized metal pipelines connect the SOBP to the JP-4 fuel tank and to the nonpotable water tank. Three underground pipelines run from the tanks to the SMERF: One connects to the JP-4 fuel tank, and the other two provide glycol/water coolant for circulation between the vertical walls and roof panels of the SMERF. A recirculation system currently routes waste water back to the water and water/glycol tanks for storage and reuse (Hickox November 1994, Larson and Palmieri October 1994). The pipelines move fluids to the burn units by gravity from the tanks. Transfer pumps located at the burn units recirculate the waste water or glycol back to the storage tanks. Most of the time the pipelines are nonpressurized and empty.

On February 7, 1990, a surface spill occurred in Tank Area 3 on the north side of the aboveground JP-4 fuel storage tank connected to the LOBP (Figure 6.2.1-2). The spill occurred when a fuel line became unscrewed during a filling operation in support of the SST testing program conducted in portable pans (Annex 6-A). Approximately 70 gallons of JP-4 fuel were spilled onto the ground. The soil was not removed (Palmieri April 1995). Facility personnel identified the spill location to sample team members. One soil sample was collected at a depth of 0 to 6 inches bgs and analyzed for volatile organic compounds (VOC) using U.S. Environmental Protection Agency (EPA) Method 624 (EPA November 1986). Soil analyses of the spill area in May 1990 indicated that no VOC exceeded the laboratory reporting limit (or practical quantitation limit) of 0.625 milligram (mg) per kilogram (/kg) (Table 6.2.2-1) (Nash June 1990).

Table 6.2.2-1
Summary of VOCs Detected from
JP-4 Fuel Spill February 1990, SWMU 94A,
Tank Area 3

Sample No: Sample Location: Sample Date:	SNLA002476-1 JP-4 Fuel Spill 5/15/90[a]	
Compound Detected, units	mg/kg	
VOCs (Method 624)[b]		RL
Toluene	0.48 J	0.625

[a]From Nash June 1990.

[b]EPA November 1986

EPA = U.S. Environmental Protection Agency.
J = Analyte present at less than reporting limit.
mg/kg = Milligram(s) per kilogram.
RL = Reporting limit.
VOC = Volatile Organic Compound.

A plastic-lined, earthen, overflow containment pit that surrounds the JP-4 fuel tank was constructed when the tanks were replaced after June 1992 (Figure 6.2.1-3c) (Palmieri December 1994b, Larson and Palmieri October 1994, Palmieri December 1994). There have been no documented historical releases of JP-4 fuel to the containment pit (Larson and Palmieri October 1994).

SNL/NM sampled and analyzed the waste water generated from burn tests for VOCs, semivolatile organic compounds (SVOC), metals, and inorganic compounds prior to negotiating the discharge date, location, and quantity with the City of Albuquerque for release to the publicly owned treatment works (Larson and Palmieri October 1994). Tables 6.2.2-2 through 6.2.2-4 summarize the analytical data that characterizes the waste water obtained from the two nonpotable water tanks that were removed after June 1992. Because the nature of the burn testing operations has been relatively unchanged, analyses of waste water from current operations are likely representative of recycled waste water stored in Tank Areas 1 and 2 during historical operations. The waste water contained several hundred micrograms (μg) per liter (/L) of fuel residues in each sampling event, including benzene, toluene, ethylbenzene, and xylenes (BTEX) and semivolatile petroleum hydrocarbons. Metal concentrations were low, with the exception of iron (at 4.9 mg/L) and zinc (at 4.5 mg/L), which were found in the June 1990 samples. The waste water had been held in the tanks and recycled since 1988 and had been used for a total of 46 burn tests, 39 tests from the LOBP, and 7 tests from the SOBP.

6.3 Land Use

This section discusses the current and future projected land uses for SWMU 94A.

6.3.1 Current

SWMU 94A is located within the boundaries of Kirtland Air Force Base (KAFB) (Figure 6.3.1-1) within the active industrial LCBS.

6.3.2 Future/Proposed

The projected land use for SWMU 94A is recreational (DOE et al. October 1995).

6.4 Investigatory Activities

SWMU 94A has been investigated in a series of three investigations. Section 6.4 discusses the SWMU 94A investigatory activities.

6.4.1 Summary

SWMU 94A was originally investigated under the DOE Comprehensive Environmental Assessment and Response Program (CEARP) in the mid-1980s (Investigation #1) in conformance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). In 1993 preliminary investigations began that included background information reviews, interviewing, field surveys, and scoping sampling (Investigation #2). In 1998 a passive soil-vapor survey (SVS) and confirmatory soil sampling were conducted (Investigation #3).

Table 6.2.2-2
Summary of Compounds Detected in Waste Water
SWMU 94A Tank Area 3, June 1990

Organic Compounds		
Sample No: Sample Location: Sample Date:	SNLA02816-1, -2, -3, East/West Tanks 6/26/90[a]	
Compounds Detected, units	µg/L	
Volatile Organics (Method 624)[b] Toluene	310	RL 250
Semivolatile Organics (Method 625)[b] None detected	ND	1000•5000
Polychlorinated biphenyls (Method 608)[b] None detected	ND	5.0•10
Inorganic Compounds		
Sample No: Sample Location: Sample Date:	SNLA02815-1, -2, -4, -5, -6 East/West Tanks 6/26/90[a]	
Compounds Detected, units	mg/L	
Dissolved Metals		RL
Barium (Method 200.7)[b]	0.074	0.010
Iron (Method 200.7)[b]	4.9	0.10
Lead (Method 239.2)[b]	0.024	0.010
Manganese (Method 200.7)[b]	0.29	0.010
Zinc (Method 200.7)[b]	4.5	0.020
Total Metals	Method 245.1	RL
Mercury (Method 245.1)[b]	ND	0.00020
Inorganics		RL
Cyanide (Method 335.2)[b]	ND	0.010
Nitrate (as N) (Method 353.2)[b]	ND	0.10
Phenolics (Method 420.2)[b]	0.25	0.010
Chloride (Method 300.0)[b]	43.1	3.0
Fluoride (Method 340.2)[b]	0.59	0.10
pH (Method 150.1)[b]	7.4 (units)	NA
Sulfate (Method 300.0)[b]	11.6	5.0
Total Dissolved Solids (Method 160.1)[b]	478	10.0

[a]From Bollinger July 1990.
[b]EPA November 1986.
EPA = U.S. Environmental Protection Agency.
LOPB = Large Open Burn Pool.
mg/L = Milligram(s) per liter.
NA = Not applicable.
ND = Not detected.
RL = Reporting limit.
µg/L = Microgram(s) per liter.

Table 6.2.2-3

Summary of Organic Compounds Detected in Waste Water
SWMU 94A Tank Area 3, March–April 1992

Sample No: Sample Location: Sample Date:	SNLA006427-3, SNLA006427-5 East Tank 3/31/92[a]		SNLA006429-3, SNLA006429-5 West Tank 3/31/92[a]		SNLA008301-1 East Tank 4/27/92[a]		SNLA008302-1 West Tank 4/27/92[a]	
Compounds Detected, units	µg/L		µg/L		µg/L		µg/L	
Volatile Organics (Method 8240/TCL)[b]						RL		RL
Acetone	NA		NA		ND	50	230	200
Benzene	NA		NA		290	25	ND	100
Ethylbenzene	NA		NA		41	25	ND	100
Toluene	NA		NA		110	25	ND	100
Xylenes (total)	NA		NA		200	25	ND	100
Semivolatile Organics (Method 8270/TCL)[b]	ND	RL 2,500–12,000	ND	RL 40,000–200,000	NA		NA	
Chlorinated Pesticides and Polychlorinated Biphenyls (Method 8080/TCL)[b]	ND	RL 1.0–100	ND	RL 1.0–100	NA		NA	

[a]From Lyon June 1992.
[b]EPA November 1986.
EPA = U.S. Environmental Protection Agency.
LOPB = Large Open Burn Pool.
NA = Not analyzed.
ND = Not detected.
RL = Reporting limit.
TCL = Target compound list.
µg/L = Microgram(s) per liter.

Table 6.2.2-4

Summary of Compounds Detected in Waste Water
SWMU 94A Tank Area 3
June 1992 and January 1993

Sample No:	SNLA007007-1,[a] 2, 3, 4, 5, 6, 10, 11		SNLA007008-1,[a] 2, 3, 4, 5, 6, 10, 11		SNLA011446-1, 2, 5, 8	
Sample Location:	West Tank		East Tank		Burn Pool	
Sample Date:	6/30/92[b]		6/30/92[b]		1/5/93	
Compounds Detected, units	mg/L		mg/L		mg/L	
Metals (Method 6010, 7000 series[c])		RL		RL		RL
Arsenic (7060[c])	ND	0.010	ND	0.010	ND	0.002
Barium (6010[c])	0.027	0.010	0.031	0.010	0.03	0.02
Cadmium (6010[c])	ND	0.0050	ND	0.0050	ND	0.005
Chromium, Total (6010[c])	ND	0.010	ND	0.010	ND	0.02
Copper (6010[c])	0.12	0.020	0.15	0.020	ND	0.02
Lead (7421[c])	ND	0.050	0.029	0.010	ND	0.04
Manganese (6010[c])	0.42	0.010	0.81	0.010	0.15	0.005
Mercury, Total (7470[c])	ND	0.00020	ND	0.00020	ND	0.0005
Nickel (6010[c])	ND	0.040	ND	0.040	0.02	0.02
Selenium (7740[c])	ND	0.010	ND	0.010	ND	0.002
Silver (6010[c])	ND	0.010	ND	0.010	ND	0.01
Zinc (6010[c])	0.16	0.020	0.77	0.020	0.09	0.02
Inorganics		RL		RL		RL
Chemical Oxygen Demand (Method 410.4[c])	4210	250	308	10.0	230	80
Cyanide, Total (Method 9012[c])	0.025	0.010	ND	0.010	0.01	0.01
Fluoride (Method 340.2[c])	0.88	0.10	0.89	0.10	0.8	0.1
Oil and Grease (Method 413.2[c])	80.2	25.0	8.7	2.0	6.1	1.0
Phenolic Compounds (Method 9065[c])	2.3	0.10	0.39	0.010	0.35	0.05
Total Petroleum Hydrocarbons (Method 418.1[c])	49.9	10.0	8.8	5.0	5.0	1.0

[a]Sample SNLA007007 and 7008, Method 8270 (EPA November 1986) detection limit raised, dilution due to target and nontarget compounds.
[b]From Lyon June 1992.
[c]EPA November 1986.
B = Compound also detected in associated blank (organic analyses only).
EPA = U.S. Environmental Protection Agency.
HSL = Hazardous substance list.
J = Estimated value.
LOBP = Large Open Burn Pool.
mg/L = Milligram(s) per liter.
NA = Not applicable.
ND = Not detected.
RL = Reporting limit.
SOBP = Small Open Burn Pool.
TCL = Target compound list.

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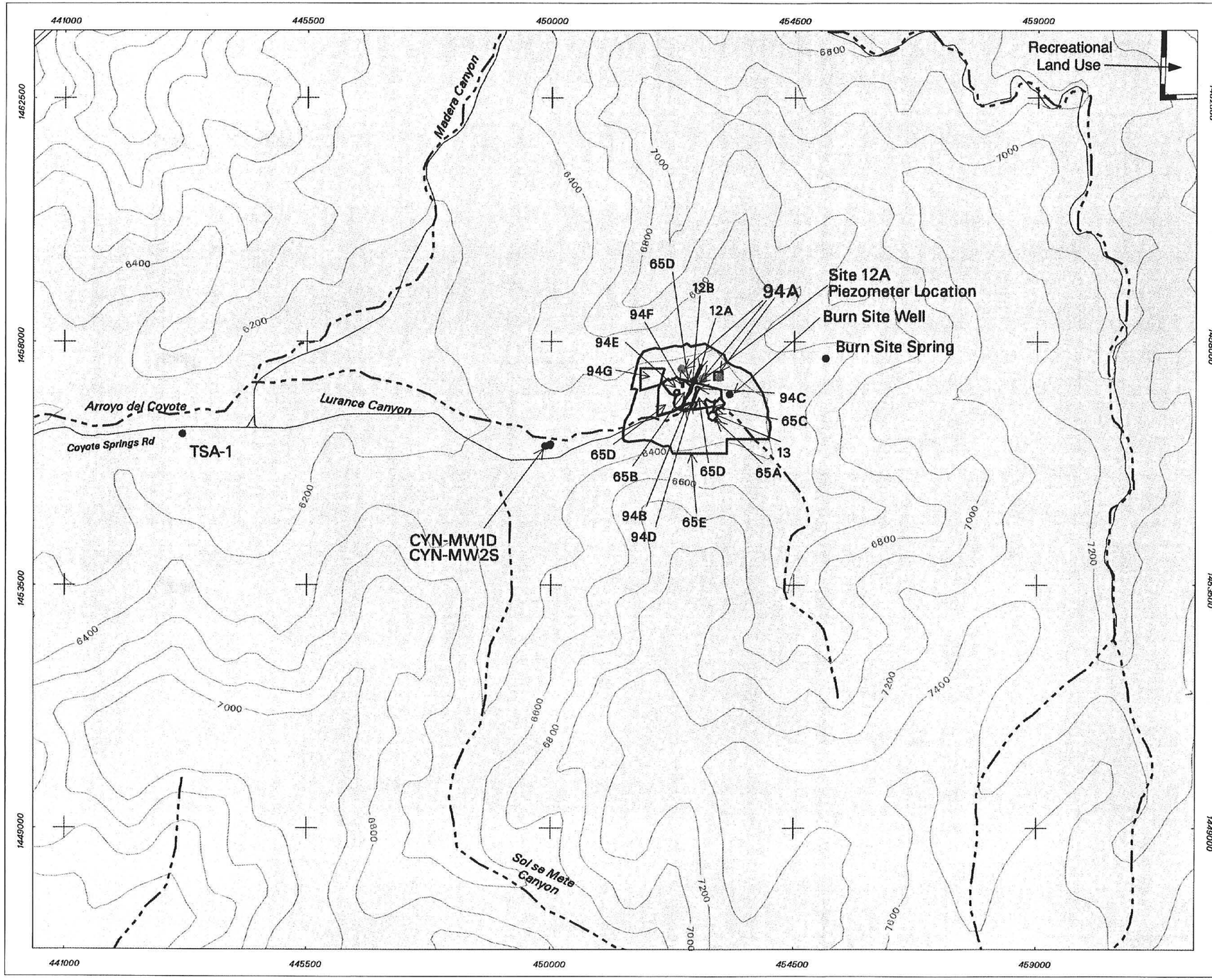
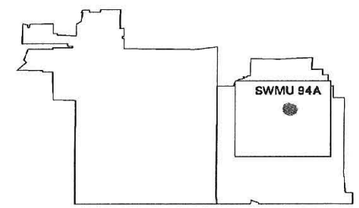


Legend

- Kirtland Air Force Base Boundary
- Surface-Water Features
- 200 Foot Contour Interval
- SWMU 94 (Three Tank Areas)
- OU 1333 SWMU Sites
- Well
- Piezometer Location
- Recreational Land Use
- Industrial Land Use

0 2000 4000
Scale in Feet
0 480 960
Scale in Meters



Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Figure 6.3.1-1
SWMU 94A, OU1333 SWMU Sites and Associated Land Uses within KAFB Boundary & Vicinity

Transverse Mercator Projection, New Mexico State Plane Coordinate System, Central Zone, 1927 North American Horizontal Datum, 1929 North American Vertical Datum

	1:24000	MAPID=980981
Unclassified		SNL GIS ORG. 6804
D Rizor	dr980981.aml	08/31/98

6.4.2 Investigation #1—Comprehensive Environmental Assessment and Response Program and RCRA Facility Assessment

6.4.2.1 Nonsampling Data Collection

SWMU 94 was evaluated during investigations conducted under the CEARP (DOE September 1987) and the RCRA Facility Assessment (RFA) (EPA April 1987). The CEARP Phase I report stated that SWMU 94 was constructed in the late 1970s and is currently used for studying the effects of fire on a variety of test units (e.g., weapons components, transportation containers). JP-4 is the standard fuel burned, but propellants and nitromethane were also used. Current test activities may release metallic particulates and other materials into the environment.

The RFA report (EPA April 1987) noted only that scrap metal, old equipment, empty drums, and empty tanks used in impact experiments are contained in a 3- to 5-acre area (SWMU 94G, Scrap Yard). The storage of liquids was not noted during the visual site inspection.

6.4.2.2 Sampling Data Collection

No sampling activities were conducted at SWMU 94A as part of the CEARP.

6.4.2.3 Data Gaps

Insufficient information was available to calculate a Hazard Ranking System (HRS) and Modified HRS migration mode scores.

6.4.2.4 Results and Conclusions

The CERCLA finding under the CEARP was uncertain for RCRA-regulated hazardous waste.

6.4.3 Investigation #2—SNL/NM Environmental Restoration Preliminary Investigations

6.4.3.1 Nonsampling Data Collection

This section describes the nonsampling data collected at SWMU 94A.

6.4.3.1.1 Background Review

A background review was conducted in order to collect available and relevant information regarding SWMU 94A. Background information sources included interviews with SNL/NM staff and contractors familiar with the site's operational history and reviews of existing historical site records and reports. The study was documented completely and has provided traceable references that sustain the integrity of the NFA proposal. Table 6.4.3-1 lists the information sources that were used to assist evaluating SWMU 94A.

Table 6.4.3-1
Summary of Background Information Review for SWMU 94A

Information Source	Reference	
Technical test reports and project log books	Hill [Date unk.] Kervin April 1981 Moore September 1981 Moore June 1982 Gill November 1982 Moore and Luna February 1983 Luna March 1983	Hooper May 1983 Luna and Moore June 1983 Mata December 1983 Cocke May 1984 Stevenson December 1985 SNL/NM November 1994
Engineering drawings "Burn Site" (Drawing Number T95597)	SNL/NM 1983	
Site inspections (field notes, aerial photograph review, site photographs, radiological, UXO/HE, biological, and cultural resource surveys)	Gaither [Date unk.] Luna October 1985 Gaither October 1992 Oldewage May 1993 Karas June 1993	Oldewage December 1993a Oldewage December 1993b Oldewage February 1994 SNL/NM August 1994 Young September 1994
Employee interviews, 24 interviews with 11 facility personnel (current and retired)	Martz September 1985 Martz November 1985 Brouillard June 1994 Larsen and Palmieri August 1994a Palmieri September 1994a Palmieri September 1994b Palmieri and Larsen October 1994 Jercinovic et al. November 1994 Palmieri November 1994a Palmieri November 1994b	Hickox and Abitz December 1994 Palmieri December 1994a Palmieri December 1994b Palmieri December 1994c Palmieri January 1995 Palmieri March 1995 Jercinovic April 1995 Palmieri April 1995a Palmieri April 1995b Palmieri August 1995

HE = High explosive(s).
SWMU = Solid waste management unit.
UXO = Unexploded ordnance.

6.4.3.1.2 UXO/HE Survey

In October 1993, KAFB Explosive Ordnance Disposal personnel conducted a visual survey for the presence of unexploded ordnance/HE on the ground surface at SWMU 94 in conjunction with SWMUs 65, 12, and 13. The survey identified one trip flare as live ordnance and one slap flare and one rifle-propelled illuminator round as ordnance debris. The survey report also documented that metal fragments were found in the hills surrounding these sites (Young September 1994).

6.4.3.1.3 Radiological Survey(s)

SWMU 94 is classified as a RMMA because it is co-located with the SWMU 65 RMMA (SNL/NM November 1994). On April 30 and May 4, 1993, the SNL/NM Radiation Protection Office personnel conducted contamination surveys of several sections of road in the Coyote Canyon area. Adhesive swipes that had been placed on the underside of the vehicle collected samples of air from behind the vehicle as it was moving. Analysis yielded no contamination, nor was airborne radioactivity detected in the dust kicked up by the vehicle (Oldewage May 1993).

During November and December 1993 and January 1994, RUST Geotech Inc. conducted a surface gamma radiation survey of SWMU 94 in conjunction with SWMUs 65, 12, and 13. The gamma scan survey was performed at 10-foot centers (70-percent coverage) over the surface of SWMU 94A. No surface gamma radiation anomalies were detected within the boundaries of the three SWMU 94A tank areas (SNL/NM September 1997b).

6.4.3.1.4 Cultural-Resources Survey

A cultural resources survey of SWMU 94 was conducted as part of the assessment of the LCBS. Seven cultural resources sites were identified at the LCBS (Hoagland and Dello-Russo February 1995). However, none of the cultural resource sites are within 100 feet of the SWMU 94A boundaries, and SWMU 94A sampling activities have no impact to the cultural resources.

6.4.3.1.5 Sensitive-Species Survey

A sensitive-species survey was conducted as part of a biological assessment of the LCBS (Biggs May 1991). No sensitive species were found during this survey (IT February 1995). The site is active and no undisturbed habitat remains in the graded portion of the LCBS.

6.4.3.1.6 Geophysical Survey(s)

No geophysical surveys were performed in the vicinity of SWMU 94A.

6.4.3.2 Sampling Data Collection

The purpose of the scoping sampling effort was to obtain preliminary data to support the Environmental Restoration (ER) Project site ranking and identification. Two sampling locations were selected in each of the three tank areas (Figure 6.4.3-1). A surface sample (0 to 6 inches) and a subsurface sample (1.5 to 2 feet) were collected at each location. The SNL/NM Environmental Restoration Chemistry Laboratory (ERCL) analyzed the twelve environmental samples and three sample duplicates for RCRA metals (plus beryllium) using modified EPA Method 6010 (EPA November 1986), for VOCs using EPA Method 8240 (EPA November 1986), and for total petroleum hydrocarbons (TPH) using an immunoassay method. Although analysis for metals was required by the sitewide scoping program, metals are not potential COCs at SWMU 94A based upon the site operating history (see Section 6.2.2).

6.4.3.3 Data Gaps

Information gathered through process knowledge, reviewing historical files, and interviewing personnel aided in identifying the most likely COCs at SWMU 94A and in selecting types of analyses to be performed on soil samples. Because the tanks have only been used to store water, fuel, and ethylene glycol (Tank Area 3 only), metals are not COCs. However, the preliminary scoping data are not adequate to define organic COCs or support a risk screening assessment.

6.4.3.4 Results and Conclusions

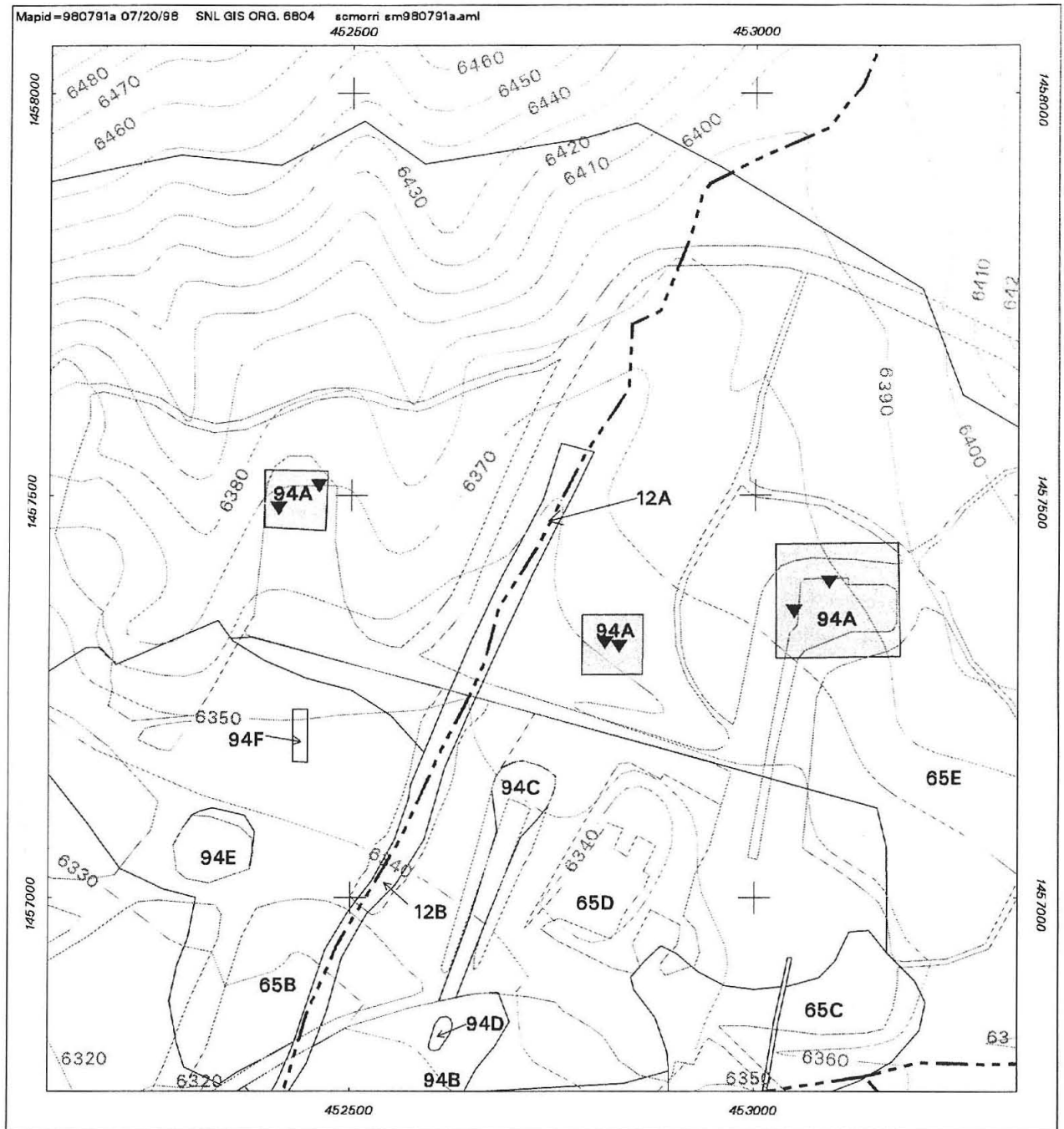
Only barium and lead were detected in the soil samples. Barium concentrations were below the background limit of 246 mg/kg. Lead concentrations were all estimated and ranged between 10 J mg/kg and 22 J mg/kg, with two of the eight samples exceeding the background limit of 18.9 mg/kg. Arsenic, cadmium, chromium, mercury, selenium, and silver were not detected. The method detection limits (MDL) ranged from 0.2 mg/kg (for mercury) to 50 mg/kg (for arsenic and selenium) exceeding the background limits. Duplicate metals analytical results were comparable.

The only VOC detected was acetone. The acetone occurred in almost all of the samples in very low concentrations (less than 10 µg/kg). No TPH concentrations were detected in any of the samples at the method detection limit of 10 parts per million (ppm), with the exception of one sample from Tank Area 3 which was reported at a concentration greater than 10 ppm and less than 100 ppm.

6.4.4 Investigation #3—SNL/NM ER Passive SVS and Confirmatory Sampling

6.4.4.1 Nonsampling Data Collection

There were no nonsampling data collection activities associated with Investigation #3 of SWMU 94A.



Legend

- Scoping Sample Location
- Road
- 10 Foot Contour
- Surface Drainage
- SWMU 94A
- Other SWMUs

Figure 6.4.3-1
Scoping Sample Locations at SWMU 94A

0 100 200
Scale in Feet

0 24 48
Scale in Meters

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Environmental Geographic Information System

6.4.4.2 *Sampling Data Collection*

This section discusses the passive SVS and confirmatory soil sampling at SWMU 94A.

6.4.4.2.1 *Passive SVS*

SNL/NM conducted a passive SVS of the entire LCBS in February 1998. All SVS activities were implemented in accordance with the rationale and procedures described in the sampling and analysis plan (SAP) for "Soil Vapor Surveys at the Lurance Canyon Burn Site" (SNL/NM February 1998a). The SAP combined the investigation activities proposed in the RFI work plan for OU 1333, Canyons Test Area (SNL/NM September 1995) with the comment responses to the request for supplemental information (RSI) relating to the OU 1333 RFI work plan (SNL/NM December 1997). In addition, the SAP was reviewed by the NMED and includes SNL/NM and NMED Oversight Bureau agreed-upon recommendations. The NMED recommended eliminating the finer grid sampling at SWMU 94A from that originally proposed in the OU 1333 Work Plan. This recommendation reduced the number of sample locations from 100 to 50. SVS samplers were installed approximately 18 to 36 inches bgs. The samplers were retrieved after approximately 16 days. The manufacturer-recommended installation depth and residence time are 18 inches bgs minimum and 14 days minimum, respectively.

A portion of the passive SVS grid covered each of the three aboveground tank locations at SWMU 94A. Within the boundaries of SWMU 94A, the survey was designed to determine the presence of VOCs and SVOCs associated with accidental historical releases to the soil. Passive soil vapor samplers were installed approximately 40 feet apart at 13 locations in Tank Area 1, at 13 locations in Tank Area 2, and at 24 locations in Tank Area 3. After approximately 16 days residence time, the samplers were retrieved for off-site analysis at W.L. Gore & Associates, Inc., in Elkton, Maryland. The samplers were analyzed for target VOCs (BTEX) using a modified EPA Method 8260 (EPA November 1986) and for target SVOCs using a modified EPA Method 8270 (EPA November 1986). These modified analytical methods involve thermal desorption, gas chromatography, and mass selective detection.

In the vicinity of Tank Area 1, VOCs were detected at levels above the reporting limit of 0.575 µg in grid locations 540,960 and 600,1000. No VOCs were detected above the reporting limit of 0.575 µg BTEX in Tank Areas 2 or 3. SVOCs (naphthalene and 2-methylnaphthalene) were detected above the reporting limit of 0.030 µg in Tank Area 2 only, at grid locations 900,740 and 940,740. The reporting limits are based upon the maximum contaminant level observed in the field on trip blanks.

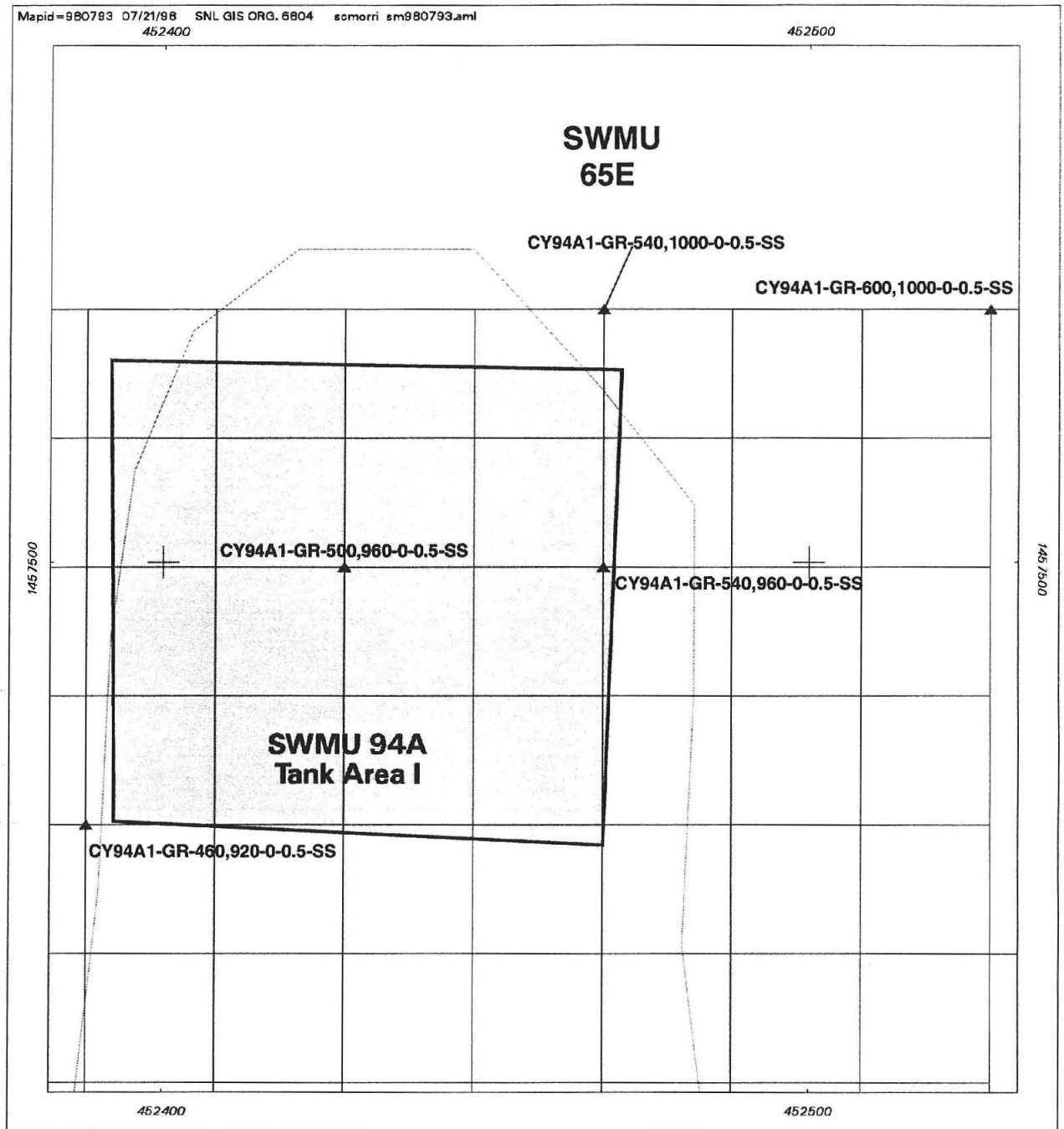
Annex 6-B presents complete results from the passive SVS final report (W.L. Gore & Associates, Inc. May 1998) for SWMU 94A. These results were used as a preliminary assessment of SWMU 94A in order to identify confirmatory soil sampling locations. Soil-vapor anomalies located outside the SWMU 94A boundaries were investigated separately and are not include in this proposal. SNL/NM is preparing a separate report that will summarize the results of the passive SVS outside the SWMU 94A boundaries.

6.4.4.2.2 Confirmatory Sampling

SNL/NM conducted confirmatory soil sampling at SWMU 94A in April and July 1998 to determine whether potential COCs were present at levels exceeding background limits at the site and/or were sufficient to pose a risk to human health or the environment. All sampling activities were performed in accordance with the rationale and procedures described in the RFI work plan for OU 1333, Canyons Test Area (SNL/NM September 1995) and the associated field implementation plan (FIP) addendum to the work plan (SNL/NM March 1998), as reviewed by the NMED. Information obtained from the passive SVS was used as a screening method to determine confirmatory soil sampling locations. SNL/NM chain-of-custody and sample documentation procedures were followed for all samples that were collected. Figures 6.4.4-1, 6.4.4-2, and 6.4.4-3 show the confirmatory sample locations for each of the three aboveground tank areas of SWMU 94A.

In April 1998 surface soil samples were collected from five locations associated with Tank Area 1, from five locations associated with Tank Area 2, and from seven locations within Tank Area 3. In Tank Area 1, three of the five soil sampling locations are related to SVS anomalies located just outside of the SWMU boundary. In Tank Area 2, two of the five soil sampling locations are related to SVS anomalies located just outside the SWMU boundary. These SVS anomalies were sampled to confirm the extent of potential contaminant migration from each tank location. In addition, subsurface samples were collected from two locations within Tank Area 1, from one location within Tank Area 2, and from one location within Tank Area 3. Locations for collecting subsurface samples were specified in the field based upon lithology (fine-grained sediment likely to retain organic compounds) and sample recovery success (shallow depth to bedrock throughout SWMU 94A). Although the confirmatory sample locations for SWMU 94A correspond with a passive SVS sample location, not all passive SVS sample locations were sampled during confirmatory sampling. A confirmatory sample was collected from each tank area at the location that yielded the highest concentrations of VOCs and/or SVOCs detected during the passive SVS. The confirmatory sample locations associated with Tank Area 1 correspond to the only SVS location inside the SWMU 94A boundary that yielded VOCs and/or SVOCs, to the three SVS locations adjacent to the SWMU 94A boundary that yielded VOCs and/or SVOCs, and to the center of Tank Area 1. The confirmatory sample locations associated with Tank Area 2 correspond to three SVS locations inside the SWMU 94A boundary (of which only one had detectable VOCs and/or SVOCs) and to two SVS locations adjacent to the SWMU 94A boundary. The confirmatory sample locations associated with Tank Area 3 correspond to the five SVS locations within the SWMU 94A boundary that yielded VOCs and/or SVOCs and to two additional SVS locations that yielded no VOCs and/or SVOCs.

All soil samples collected in April 1998 were analyzed off site for VOCs and SVOCs. Core Laboratories, Inc., of Aurora, Colorado, analyzed the samples for VOCs using EPA Method 8260 (EPA November 1986) and for SVOCs using EPA Methods 8270 (EPA November 1986). One surface soil sample from each of the three tank areas was also analyzed off site for gross alpha and gross beta activity. Core Laboratories, Inc., of Casper, Wyoming, analyzed the samples for gross alpha and gross beta activities using EPA Method 900.0 (EPA November 1986). SNL/NM Department 7713 Radiation Protection Sample Diagnostics (RPSD) Laboratory also analyzed one sample from each of the three tank areas on site for radionuclides using gamma spectroscopy to permit the off-site transport of samples to both Core Laboratories locations.



Legend

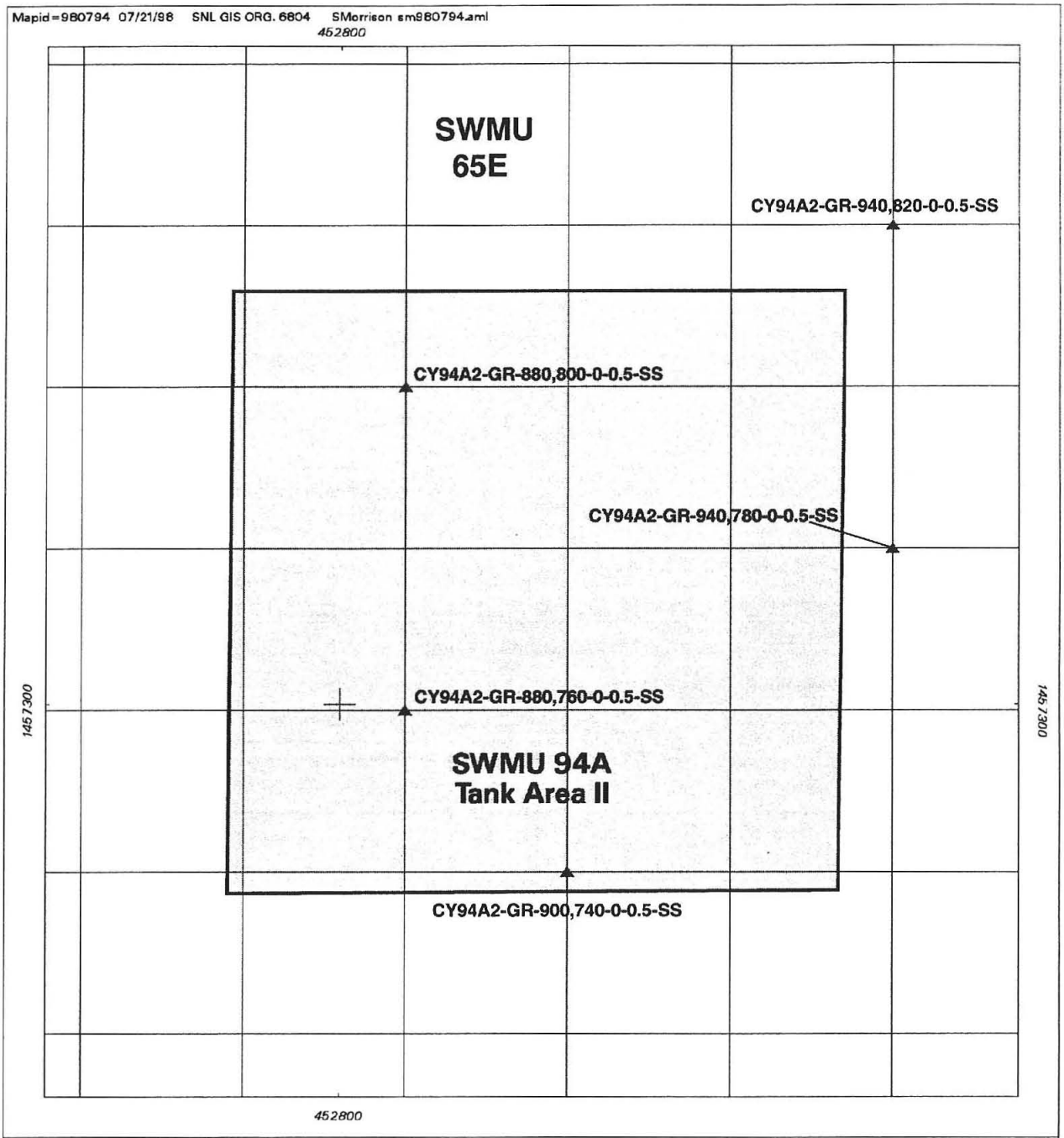
- Soil Sample
- Road
- 20' Sample Grid Line
- SWMU 94A
- Other SWMUs

Figure 6.4.4-1
Confirmatory Sample Locations
at SWMU 94A, Tank Area 1

0 12.5 25
Scale in Feet

0 3 6
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System



Legend

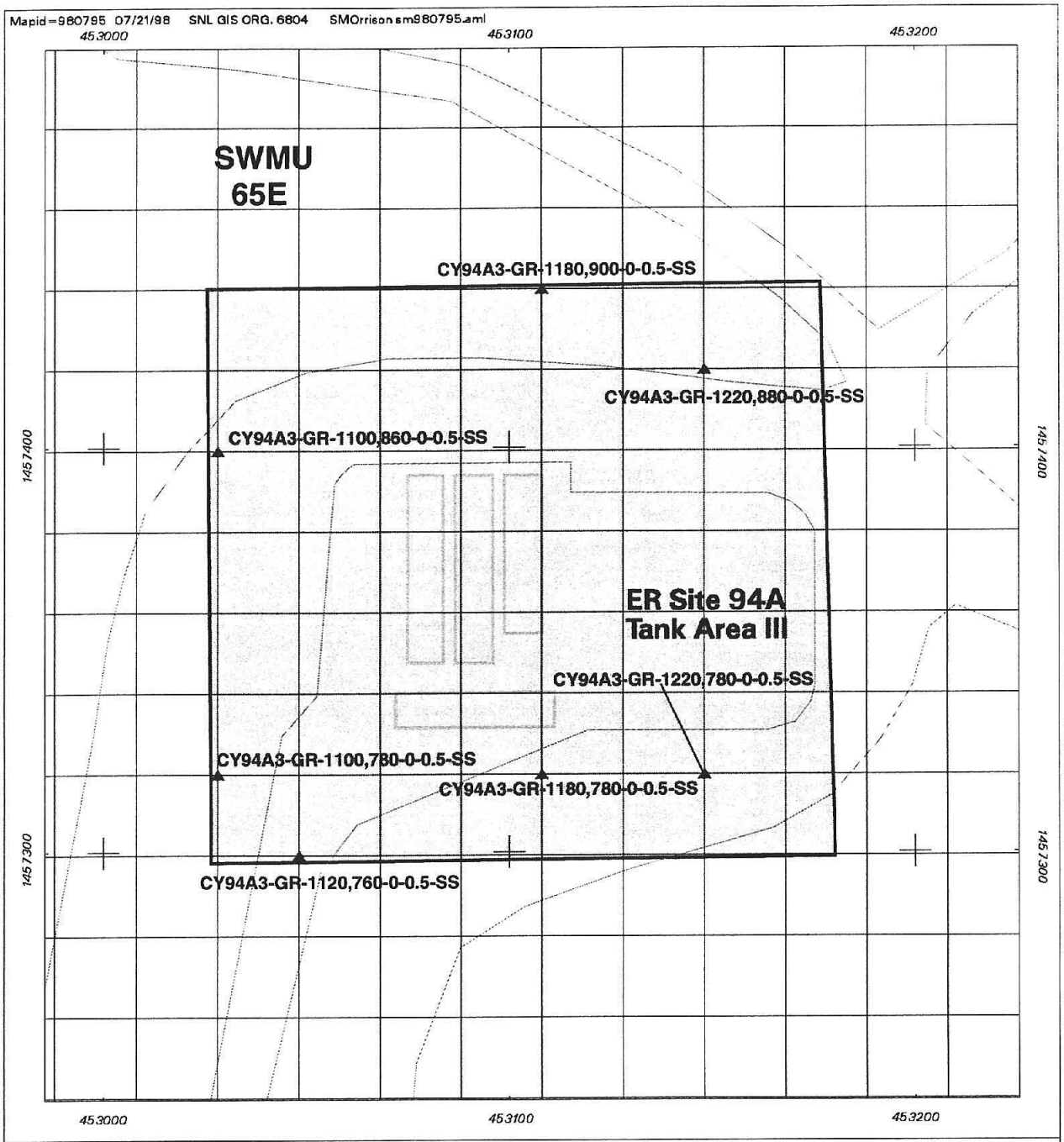
- Soil Sample
- 20' Sample Grid Line
- SWMU 94A
- Other SWMUs

Figure 6.4.4-2
Confirmatory Sample Locations
at SWMU 94A, Tank Area 2

0 10 20
Scale in Feet

0 2.4 4.8
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System



Legend

- Soil Sample
- Road
- 20' Sample Grid Line
- SWMU 94A
- Other SWMUs
- Storage Tank

Figure 6.4.4-3
Confirmatory Sample Locations
at SWMU 94A, Tank Area 3

0 20 40
Scale in Feet

0 4.8 9.6
Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

In July 1998 several confirmatory sample locations were resampled to define the extent of toluene and SVOC contamination that had been identified during the April 1998 sampling activities. Additional subsurface soil samples were collected from two locations within Tank Area 1 and from one location within Tank Area 2. These additional samples were analyzed off site for BTEX or SVOCs. General Engineering Laboratories (GEL) of Charleston, South Carolina, analyzed the samples for BTEX using EPA Method 8021 (EPA November 1986) and for SVOCs using EPA Method 8270 (EPA November 1986). SNL/NM Department 7713 (RPSD Laboratory) also analyzed one sample on site for radionuclides using gamma spectroscopy to permit the off-site transport of samples to GEL.

6.4.4.3 Data Gaps

Analytical data from confirmatory sampling are sufficient to characterize the nature and extent of historical releases of COCs at the site. There are no further data gaps regarding characterization of the SWMU 94A.

6.4.4.4 Results and Conclusions

In April and July 1998 soil samples were collected from five locations within Tank Area 1, from five locations within Tank Area 2, and from seven locations within Tank Area 3 at SWMU 94A in conformance with the RFI Work Plan (SNL/NM September 1995) and the FIP (SNL/NM March 1998) reviewed by NMED. Tables 6.4.4-1, 6.4.4-2, 6.4.4-3, 6.4.4-4, 6.4.4-5, and 6.4.4-6 summarize the VOC, SVOC, and radionuclide (i.e., gross alpha and gross beta, and gamma spectroscopy) analytical results for all of the confirmatory soil samples collected at SWMU 94A. Annex 6-C contains complete results for the gamma spectroscopy analyses. The remainder of this section describes the results of confirmatory sampling at SWMU 94A.

Sample numbers are coded to identify specific information regarding the samples. For example, CY94A-GR-460,920-0-0.5-SS designates a sample collected from SWMU 94A in the Canyons Test Area of SNL/NM (CY94A). The grab sample (GR) was collected from grid location 460, 920 at a depth interval of 0 to 0.5 foot bgs and is designated a soil sample (SS).

Volatile Organic Compounds

Because there are no applicable background concentrations for VOCs in soil, no comparison to the analytical results is possible. Therefore, any detectable VOCs are considered an indication of potential contamination. Only two VOCs were detected at SWMU 94A (methylene chloride and toluene). A brief description of the VOC analytical results is provided below for each of the three tank areas.

Table 6.4.4-1 summarizes the off-site VOC analysis results for five surface soil samples, four subsurface soil samples, and one duplicate surface soil sample that were collected from Tank Area 1 at SWMU 94A. Toluene was the only VOC detected at Tank Area 1. At the sample grid location 540,960, toluene was detected at 29 and 39 µg/kg in surface soil sample CY94A1-GR-540,960-0-0.5-SS and the duplicate, respectively. The concentration of toluene increased to 47 µg/kg in subsurface soil sample CY94A1-GR-540,960-3.5-4-SS. However, toluene was not

Table 6.4.4-1
Summary of SWMU 94A Confirmatory Soil Sampling VOC Analytical Results,
April–July 1998
(Off-site laboratory)

Sample Attributes			VOCs (EPA Method 8260A)[a] (µg/kg)	
Record Number[c]	ER Sample ID (Figures 6.4.4-1, 6.4.4-2, and 6.4.4-3)	Sample Depth (ft)	Methylene Chloride	Toluene
Tank Area 1				
600220	CY94A1-GR-460,920-0-0.5-SS	0-0.5	ND (0.48)	ND (0.66)
600521	CY94A-460-920-0.5-1.0-S	0.5-1	NT	ND (0.220)
600220	CY94A1-GR-460,920-3.5-4-SS	3.5-4	ND (0.48)	**26**[b]
600220	CY94A1-GR-500,960-0-0.5-SS	0-0.5	ND (0.48)	ND (0.66)
600220	CY94A1-GR-540,960-0-0.5-SS	0-0.5	ND (0.48)	**29**
600220	CY94A1-GR-540,960-0-0.5-DU	0-0.5	ND (0.48)	**39**
600220	CY94A1-GR-540,960-3.5-4-SS	3.5-4	ND (0.48)	**47**
600521	CY94A-540-960-8.5-9.0-S	8.5-9	NT	ND (0.220)
600220	CY94A1-GR-540,1000-0-0.5-SS	0-0.5	ND (0.48)	ND (0.66)
600220	CY94A1-GR-600,1000-0-0.5-SS	0-0.5	ND (0.48)	ND (0.66)
Tank Area 2				
600223	CY94A2-GR-880,760-0-0.5-SS	0-0.5	ND (0.48)	ND (0.66)
600223	CY94A2-GR-880,800-0-0.5-SS	0-0.5	ND (0.48)	ND (0.66)
600223	CY94A2-GR-900,740-0-0.5-SS	0-0.5	ND (0.48)	ND (0.66)
600223	CY94A2-GR-940,780-0-0.5-SS	0-0.5	ND (0.48)	ND (0.66)
600223	CY94A2-GR-940,820-0-0.5-SS	0-0.5	ND (0.48)	**11**
600223	CY94A2-BH-940,820-3.5-4-SS	3.5-4	**1.3 J (5)**	**53**
600521	CY94A-940-820-8.5-9.0-S	8.5-9	NT	ND (0.220)
600521	CY94A-940-820-8.5-9.0-S (duplicate)	8.5-9	NT	ND (0.220)
Tank Area 3				
600227	CY94A3-GR-1100,780-0-0.5-SS	0-0.5	**2.1 J (5)**	ND (0.66)
600227	CY94A3-GR-1100,780-0-0.5-DU	0-0.5	ND (0.48)	ND (0.66)
600227	CY94A3-GR-1100,860-0-0.5-SS	0-0.5	ND (0.48)	ND (0.66)
600227	CY94A3-GR-1120,760-0-0.5-SS	0-0.5	**1.8 J (5)**	ND (0.66)
600227	CY94A3-BH-1120,760-0.5-1-SS	0.5-1	**1.2 J (5)**	ND (0.66)
600227	CY94A3-GR-1180,780-0-0.5-SS	0-0.5	**1.8 J (5)**	ND (0.66)
600227	CY94A3-GR-1180,900-0-0.5-SS	0-0.5	ND (0.48)	ND (0.66)
600227	CY94A3-GR-1220,780-0-0.5-SS	0-0.5	**1.8 J (5)**	ND (0.66)
600227	CY94A3-GR-1220,880-0-0.5-SS	0-0.5	**1.3 J (5)**	ND (0.66)
Quality Assurance/Quality Control Samples (all in µg/L)				
600223	CY94A2-GR-EB	NA	ND (2.0) UJ	ND (2.0) UJ
600227	CY94A3-GR-EB	NA	ND (2.0)	ND (2.0)

[a]EPA November 1986.
[b]Numbers in bold represent detected values.
[c]Analysis request/chain-of-custody record.

BH = Borehole.
CY = Canyon.
DU = Duplicate sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
GR = Grab sample.
ID = Identification.
J = Analytical result was qualified as an estimation during data validation.
J ( ) = The reported value is greater than or equal to the method detection limit (MDL) but is less than the practical quantitation, shown in parenthesis.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected above the MDL, shown in parenthesis.
NT = Not tested.
SS = Surface soil sample.
SWMU = Solid waste management unit.
TBD = To be determined.
U = Analytical result was qualified as a nondetect during data validation.
VOC = Volatile organic compound.

Table 6.4.4-2
Summary of VOC Analytical Detection
Limits Used for SWMU 94A Grid Soil Sampling, April–July 1998
(Off-site laboratory)

Analyte	Method Detection Limit (µg/kg)
Benzene	0.250–0.96
Bromobenzene	0.83
Bromochloromethane	0.80
Bromodichloromethane	0.64
Bromoform	0.65
Bromomethane	2.1
n-Butylbenzene	0.67
sec-Butylbenzene	0.62
tert-Butylbenzene	0.52
Carbon Tetrachloride	0.69
Chlorobenzene	0.54
Chloroethane	0.86
Chloroform	0.72
Chloromethane	1.2
2-Chlorotoluene	0.58
4-Chlorotoluene	0.73
Dibromochloromethane	0.55
1,2-Dibromo-3-chloropropane	0.84
1,2-Dibromoethane	0.5
Dibromomethane	0.52
1,2–Dichlorobenzene	0.63
1,3–Dichlorobenzene	0.71
1,4–Dichlorobenzene	0.64
Dichlorodifluoromethane	1.2
1,1–Dichloroethane	0.78
1,2–Dichloroethane	0.64
1,1–Dichloroethene	0.77
cis-1,2-Dichloroethene	1.1
trans-1,2-Dichloroethene	0.73
1,1-Dichloropropene	0.81
1,2-Dichloropropane	0.76
1,3-Dichloropropane	0.79
2,2-Dichloropropane	0.61
Ethylbenzene	0.230–0.61
Hexachlorobutadiene	0.84
Isopropylbenzene	0.68
p-Isopropyltoluene	0.57
Methylene Chloride	0.48
Naphthalene	0.43
n-Propylbenzene	0.56
Styrene	0.47
1,1,1,2-Tetrachloroethane	0.55
1,1,2,2-Tetrachloroethane	0.38
Tetrachloroethene	0.5
Toluene	0.220–0.66
1,2,3-Trichlorobenzene	0.42

Refer to footnotes at end of table.

Table 6.4.4-2 (Concluded)
Summary of VOC Analytical Detection
Limits Used for SWMU 94A Grid Soil Sampling, April–July 1998
(Off-site laboratory)

Analyte	Method Detection Limit (µg/kg)
1,2,4-Trichlorobenzene	1.2
1,1,1-Trichloroethane	0.74
1,1,2-Trichloroethane	0.39
Trichloroethene	0.56
Trichlorofluoromethane	5.0
1,2,3-Trichloropropane	0.96
1,2,4-Trimethylbenzene	0.64
1,3,5-Trimethylbenzene	0.59
Vinyl Chloride	1.1
p,m-Xylene	1–5
Xylenes (total)	0.620–3.1

µg/kg = Microgram(s) per kilogram.
SWMU = Solid waste management unit.
VOC = Volatile organic compound.

Table 6.4.4-3
Summary of SWMU 94A Confirmatory Soil Sampling SVOC Analytical Results, April–July 1998
(Off-site laboratory)

Sample Attributes			SVOCs (EPA Method 8270)[a] (µg/kg)[b]								
Record Number[c]	ER Sample ID (Figures 6.4.4-1, 6.4.4-2, and 6.4.4-3)	Sample Depth (ft)	Acenaphthene	Bis (2-ethylhexyl) Phthalate	2-Chlorophenol	4-Chloro-3-methylphenol	1,4-Dichlorobenzene	Di-n-butyl Phthalate	n-Nitrosodi-n-propylamine	Pyrene	1,2,4-Trichlorobenzene
Tank Area 1											
600220	CY94A1-GR-460,920-0.5-1-SS	0.5-1	ND (0.5)	**75 J (330)**	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600220	CY94A1-GR-460,920-3.5-4-SS	3.5-4	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600220	CY94A1-GR-500,960-0-0.5-SS	0-0.5	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600220	CY94A1-GR-540,960-0-0.5-SS	0-0.5	ND (0.5)	**29 J (330)**	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600220	CY94A1-GR-540,960-0-0.5-DU	0-0.5	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600220	CY94A1-GR-540,960-2.5-4-SS	2.5-4	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600220	CY94A1-GR-540,1000-0-0.5-SS	0-0.5	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600220	CY94A1-GR-600,1000-0-0.5-SS	0-0.5	**60 J (330)**	ND (1.0)	**55 J (330)**	**59 J (330)**	**45 J (330)**	ND (0.3)	**56 J (330)**	**54 J (330)**	**54 J (330)**
600521	CY94A—600-1000-0.5-1.0-S	0.5-1	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)
600521	CY94A—600-1000-0.5-1.0-S (duplicate)	0.5-1	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)	ND (170)
Tank Area 2											
600223	CY94A2-GR-880,760-0-0.5-SS	0-0.5	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600223	CY94A2-GR-880,800-0-0.5-SS	0-0.5	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600223	CY94A2-GR-900,740-0-0.5-SS	0-0.5	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600223	CY94A2-GR-940,780-0-0.5-SS	0-0.5	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600223	CY94A2-GR-940,820-0-0.5-SS	0-0.5	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
600223	CY94A2-BH-940,820-3.5-4-SS	3.5-4	ND (0.5)	ND (1.0)	ND (0.5)	ND (0.9)	ND (1.3)	ND (0.3)	ND (0.8)	ND (1.0)	ND (0.4)
Tank Area 3											
600227	CY94A3-GR-1100,780-0-0.5-SS	0-0.5	ND (0.6)	ND (0.6)	ND (0.4)	ND (0.5)	ND (0.6)	ND (0.5)	ND (0.7)	ND (0.6)	ND (0.5)
600227	CY94A3-GR-1100,780-0-0.5-DU	0-0.5	ND (0.6)	ND (0.6)	ND (0.4)	ND (0.5)	ND (0.6)	ND (0.5)	ND (0.7)	ND (0.6)	ND (0.5)
600227	CY94A3-GR-1100,860-0-0.5-SS	0-0.5	ND (0.6)	**42 J (330)**	ND (0.4)	ND (0.5)	ND (0.6)	ND (0.5)	ND (0.7)	ND (0.6)	ND (0.5)
600227	CY94A3-GR-1120,760-0-0.5-SS	0-0.5	ND (0.6)	ND (0.6)	ND (0.4)	ND (0.5)	ND (0.6)	ND (0.5)	ND (0.7)	ND (0.6)	ND (0.5)
600227	CY94A3-BH-1120,760-0.5-.1-SS	0.5-1	ND (0.6)	ND (0.6)	ND (0.4)	ND (0.5)	ND (0.6)	ND (0.5)	ND (0.7)	ND (0.6)	ND (0.5)
600227	CY94A3-GR-1180,780-0-0.5-SS	0-0.5	ND (0.6)	ND (0.6)	ND (0.4)	ND (0.5)	ND (0.6)	ND (0.5)	ND (0.7)	ND (0.6)	ND (0.5)
600227	CY94A3-GR-1180,900-0-0.5-SS	0-0.5	ND (0.6)	ND (0.6)	ND (0.4)	ND (0.5)	ND (0.6)	ND (0.5)	ND (0.7)	ND (0.6)	ND (0.5)
600227	CY94A3-GR-1220,780-0-0.5-SS	0-0.5	ND (0.6)	**46 J (330)**	ND (0.4)	ND (0.5)	ND (0.6)	ND (0.5)	ND (0.7)	ND (0.6)	ND (0.5)
600227	CY94A3-GR-1220,880-0-0.5-SS	0-0.5	ND (0.6)	ND (0.6)	ND (0.4)	ND (0.5)	ND (0.6)	ND (0.5)	ND (0.7)	ND (0.6)	ND (0.5)
Quality Assurance/Quality Control Samples (all in µg/L)											
600223	CY94A2-GR-EB	NA	ND (0.6)	1.6 J (10) UJ	ND (0.4) UJ	ND (0.5) UJ	ND (0.6) UJ	ND (0.5) UJ	ND (0.7) UJ	ND (0.6) UJ	ND (0.5) UJ
600227	CY94A3-GR-EB	NA	ND (0.6)	**1.4 J (10)**	ND (0.4)	ND (0.5)	ND (0.6)	**1.6 J (10)**	ND (0.7)	ND (0.6)	ND (0.5)

[a] EPA November 1986.
[b] Numbers in bold represent detected values.
[c] Analysis request/chain-of-custody record.

B = Analyte detected in associated blank.
BH = Borehole.
CY = Canyon.
DU = Duplicate sample.
EB = Equipment blank.
EPA = U.S. Environmental Protection Agency.
ER = Environmental Restoration.
ft = Foot (feet).
GR = Grab sample.
ID = Identification.
J = Analytical result was qualified as an estimation during data validation.
J ( ) = The reported value is greater than or equal to the method detection limit (MDL) but is less than the practical quantitation limit, shown in parenthesis.
µg/kg = Microgram(s) per kilogram.
µg/L = Microgram(s) per liter.
NA = Not applicable.
ND = Not detected above the MDL, shown in parenthesis.
SS = Surface soil sample.
SWMU = Solid waste management unit.
SVOC = Semivolatile organic compound.
TBD = To be determined.
U = Analytical result was qualified as a nondetect during data validation.

Table 6.4.4-4
Summary of SVOC Analytical Detection
Limits Used for SWMU 94A Grid Soil Sampling, April–July 1998
(Off-site laboratory)

Analyte	Method Detection Limit (µg/kg)
1,2,4-Trichlorobenzene	0.4–170
1,2-Dichlorobenzene	0.5–170
1,3-Dichlorobenzene	0.3–170
1,4-Dichlorobenzene	0.6–170
2,4,5-Trichlorphenol	0.8–170
2,4,6-Trichlorophenol	0.6–170
2,4-Dichlorophenol	0.3–170
2,4-Dimethylphenol	0.5–170
2,4-Dinitrophenol	1.1–330
2,4-Dinitrotoluene	0.5–170
2,6-Dinitrotoluene	0.4–170
2-Chloronaphthalene	0.3–170
2-Chlorophenol	0.4–170
2-Methyl-4,6-dinitrophenol	0.7–170
2-Methylnaphthalene	0.5–170
2-Methylphenol	0.5–170
2-Nitroaniline	0.6–170
2-Nitrophenol	0.5–170
3,3-Dichlorobenzidine	0.7–830
3-Nitroaniline	0.6–170
4-Bromophenyl phenyl ether	0.6–170
4-Chloro-3-methylphenol	0.5–170
4-Chloroaniline	0.5–330
4-Chlorophenyl phenyl ether	0.5–170
4-Methylphenol	0.6–170
4-Nitroaniline	0.6–170
4-Nitrophenol	0.6–170
Acenaphthene	0.5–170
Acenaphthylene	0.4–170
Anthracene	0.6–170
Benzidine	0.4–50
Benzo(a)anthracene	0.4–170
Benzo(a)pyrene	0.4–170
Benzo(b)fluoranthene	0.5–170
Benzo(g,h,i)perylene	1.5–170
Benzo(k)fluoranthene	0.8–170
Benzoic Acid	0.5–667
Benzyl Alcohol	0.6–170
Bis(2-chloroethoxy) methane	0.3–170
Bis(2-chloroethyl) ether	0.6–170
Bis(2-chloroisopropyl) ether	0.6–170
Bis(2-ethylhexyl)phthalate	0.6–170

Refer to footnotes at end of table.

Table 6.4.4-4 (Concluded)
Summary of SVOC Analytical Detection
Limits Used for SWMU 94A Grid Soil Sampling, April–July 1998
(Off-site laboratory)

Analyte	Method Detection Limit (µg/kg)
Butylbenzylphthalate	0.5–170
Chrysene	0.3–170
Dibenzo(a,h)anthracene	1.8–170
Dibenzofuran	0.2–170
Diethylphthalate	0.6–170
Dimethylphthalate	0.3–170
Di-n-butylphthalate	0.3–170
Di-n-octylphthalate	0.6–170
Fluoranthene	0.3–170
Fluorene	0.4–170
Hexachlorobenzene	0.5–170
Hexachlorobutadiene	0.5–170
Hexachlorocyclopentadiene	2.0–170
Hexachloroethane	0.8–170
Indeno(1,2,3-cd)pyrene	0.4–170
Isophorone	0.5–170
Naphthalene	0.4–170
Nitrobenzene	0.5–170
n-Nitroso-di-n-propylamine	0.7–170
n-Nitrosodiphenylamine	0.6–170
Pentachlorophenol	2.3–170
Phenanthrene	0.6–170
Phenol	0.3–170
Pyrene	0.6–170

µg/kg = Microgram(s) per kilogram.
SVOC = Semivolatile organic compound.
SWMU = Solid waste management unit.

Table 6.4.4-5
Summary of SWMU 94A Confirmatory Soil Sampling Gamma Spectroscopy Analytical Results, April–July 1998
(On-site Laboratory)

Sample Attributes			Activity (pCi/g)							
			Uranium-238		Thorium-232		Uranium-235		Cesium-137	
Record Number[a]	ER Sample ID (Figure x.x-x)	Sample Depth (ft)	Result	Error[b]	Result	Error[b]	Result	Error[b]	Result	Error[b]
600522	CY94A Composite S	0	1.02E+00	1.11E+00	7.45E-01	3.82E-01	ND(1.66E-01)	--	4.95E-02	3.17E-02
Tank Area 1										
600219	CY94A1-GR-500,960-0-0.5-SS	0–0.5	ND (1.80E+00)	--	8.06E-01	4.00E-01	ND (2.06E-01)	--	5.49E-02	2.13E-02
Tank Area 2										
600222	CY94A2-GR-880,800-0-0.5-SS	0–0.5	7.29E-01	7.37E-01	7.77E-01	4.59E-01	ND (2.02E-01)	--	2.52E-01	6.50E-02
Tank Area 3										
600225	CY94A3-GR-1100,860-0-0.5-SS	0–0.5	ND (3.10E+00)	--	8.10E-01	4.18E-01	ND (2.24E-01)	--	2.55E-02	1.48E-02
Background Soil Activity, Upper Canyons[c]			2.31	NA	1.03	NA	0.16	NA	0.515	NA
Quality Assurance/Quality Control Sample (in pCi/mL)										
600225	CY94A2-EB	NA	ND (1.71E+00)	--	ND (1.52E-01)	--	ND (1.56E-01)	--	ND (1.98E-02)	--
600225	CY94A3-EB	NA	ND (1.75E+00)	--	ND (1.60E-01)	--	ND (1.57E-01)	--	ND (2.33E-02)	--

[a]Analysis request/chain-of-custody.
[b]Two standard deviations about the mean detected activity.
[c]From Dinwiddie September 1997.
CY = Canyons.
EB = Equipment blank.
ER = Environmental Restoration.
ft = Foot (feet).
GR = Grab sample.
ID = Identification.
NA = Not applicable.
ND = Not detected above the minimum detectable activity, shown in parenthesis.
pCi/g = Picocurie(s) per gram.
pCi/mL = Picocurie(s) per milliliter.
SS = Surface soil sample.
SWMU = Solid waste management unit.
-- = Error not calculated for nondetectable results.

Table 6.4.4-6
Summary SWMU 94A Confirmatory Sampling Gross Alpha and Beta Analysis, April 1998
(Off-site laboratory)

Sample Attributes			Activity (pCi/g)			
			Gross Alpha		Gross Beta	
Record Number[a]	ER Sample ID (Figure XXX)	Sample Depth (ft)	Result	Error[b]	Result	Error[b]
Tank Area 1						
600221	CY94A1-GR-500,960-0-0.5-SS	0-0.5	12.2	3.14	27.2	2.32
Tank Area 2						
600224	CY94A2-GR-880,800-0-0.5-SS	0-0.5	12.3	3.14	28.1	2.34
Tank Area 3						
600226	CY94A3-GR-1100,860-0-0.5-SS	0-0.5	13.2	3.18	28.7	2.35
Background Soil Activity, Canyons Area[c]			18.3	NA	52.7	NA

[a]Analysis request/chain-of-custody record.
[b]Two standard deviations about the mean detected activity.
[c]From Tharp July 1998.

CY = Canyon.
ER = Environmental Restoration.
ft = Foot (feet).
GR = Grab sample.
ID = Identification.
NA = Not applicable.
pCi/g = Picocurie(s) per gram.
SS = Surface soil sample.
SWMU = Solid waste management unit.

detected in the deepest subsurface soil sample collected from that location (CY94A 540,960-8.5-9-SS). At the sample grid location 460,920, toluene was detected at 26 µg/kg in subsurface soil sample CY94A1-GR-460,920-3.5-4-SS. However, toluene was not detected in surface soil sample CY94A1-GR-460-920-0-0.5-SS or subsurface sample CY94A 460,960-0.5-1-SS. Toluene was not detected in any other samples collected at Tank Area 1.

Table 6.4.4-1 summarizes the off-site VOC analysis results for five surface soil samples, two subsurface soil samples, and one duplicate subsurface soil sample that were collected from Tank Area 2. Both toluene and methylene chloride were detected at Tank Area 2. At sample grid location 940,820, toluene was detected at 11 µg/kg in surface soil sample CY94A2-GR-940,820-0-0.5-SS and at 53 µg/kg in subsurface sample CY94A2-BH-940,820-3.5-4-SS. However, toluene was not detected in the deepest subsurface samples collected at that location (CY94A2-GR-940,820-8.5-9.0-SS plus the duplicate). Toluene was not detected in any other samples collected from Tank Area 2. Although methylene chloride was also detected at sample grid location 940,820 in subsurface sample CY94A2-BH-940,820-3.5-4-SS, the concentration was reported at less than the practical quantitation limit and, therefore, was qualified as an estimated value. Methylene chloride was not detected in any other samples collected at Tank Area 2.

Table 6.4.4-1 summarizes the off-site VOC analysis results for seven surface soil samples, one subsurface soil sample, and one duplicate surface soil sample that were collected from Tank 3 at SWMU 94A. Methylene chloride was the only VOC detected in the samples from Tank Area 3. All but three of the samples collected at Tank Area 3 had detectable concentrations of methylene chloride. However, because the concentrations ranged from 1.2 J to 2.1 J µg/kg, which are below the practical quantitation limit, all the reported methylene chloride results were qualified as estimated values.

Due to the specific purpose of collecting additional subsurface samples in July 1998 (to define the extent of toluene and SVOC contamination), methylene chloride was not analyzed in several samples. These samples can be identified in Table 6.4.4-1 by the "NT" (not tested) code in the sample result column.

Table 6.4.4-2 summarizes the analytical method detection limits for the target analyte list VOCs used in the analysis of SWMU 94A soil samples that were collected from all three tank areas.

Semivolatile Organic Compounds

Because there are no applicable background concentrations for SVOCs in soil, no comparison to the analytical results is possible. Therefore, any detectable SVOCs are considered an indication of potential contamination. The SVOCs detected at SWMU 94A include acenaphthene; bis(2-ethylhexyl) phthalate; 2-chlorophenol; 4-chloro-3-methylphenol; 1,4-dichlorobenzene; n-nitrosodi-n-propylamine; pyrene; and 1,2,4-trichlorobenzene. A brief description of the SVOC analytical results is provided below for each of the three tank areas.

Table 6.4.4-3 summarizes the off-site SVOC analysis results for four surface soil samples, four subsurface soil samples, one duplicate surface soil sample, and one duplicate subsurface soil sample that were collected from Tank Area 1 at SWMU 94A. Several SVOCs were detected in the samples from Tank Area 1. At the sample grid location 600,1000, acenaphthene; 2-chlorophenol; 4-chloro-3-methylphenol; 1,4-dichlorobenzene; n-nitrosodi-n-propylamine; pyrene; and 1,2,4-trichlorobenzene were detected in surface soil sample

CY94A1-GR-600,1000-0-0.5-SS. However, no SVOCs were detected in the subsurface soil samples that were collected from that location (CY94A 600,1000-0.5-1.0-SS plus the duplicate). At the sample grid location 460,920, bis(2-ethylhexyl) phthalate was detected in surface soil sample CY94A1-GR-460,920-0.5-1-SS. However, bis(2-ethylhexyl) phthalate was not detected in the subsurface sample that was collected from that location (CY94A1-GR-460,920-3.5-4-SS). Similarly, bis(2-ethylhexyl) phthalate was detected in the surface soil sample that was collected at sample grid location 540,960 (CY94A1-GR-540,960-0.5-1-SS) but not in the corresponding duplicate sample (CY94A1-GR-540,960-0.5-1-SS). The concentrations of all SVOCs detected in the samples that were collected from Tank Area 1 are below the practical quantitation limits and were therefore qualified as estimated values.

Table 6.4.4-3 summarizes the off-site SVOC analysis results for five surface soil samples and one subsurface soil sample that were collected from Tank Area 2 at SWMU 94A. No SVOCs were detected in the samples that were collected from Tank Area 2.

Table 6.4.4-3 summarizes the off-site SVOC analysis results for seven surface soil samples, one subsurface soil sample, and one duplicate surface soil sample that were collected from Tank Area 3 at SWMU 94A. Bis(2-ethylhexyl) phthalate was the only SVOC detected in the samples from Tank Area 3. At sample grid locations 1100,860 and 1220,780, bis(2-ethylhexyl) phthalate was detected in surface soil samples CY94A3-GR-1100,860-0-0.5-SS and CY94A3-GR-1220,780-0-0.5-SS at 42 J and 46 J µg/kg, respectively. However, because the concentrations were detected at levels below the practical quantitation limit, the results were qualified as estimated values.

Table 6.4.4-4 summarizes the analytical method detection limits for the target analyte list SVOCs used in the analysis of SWMU 94A soil samples that were collected from all three tank areas.

Radionuclides

Table 6.4.4-5 summarizes the on-site gamma spectroscopy analysis results for four soil samples collected from the aboveground tanks at SWMU 94A. The gamma spectroscopy results indicate that no gamma activity was detected above the background concentration limits in the four samples that were analyzed. Gamma activity attributable to uranium-238 and uranium-235 was either not detected above the minimum detectable activity (MDA) or not detected above background. However, the MDA associated with nondetectable results for uranium-238 and uranium-235 exceeded background in several instances and is related to the sample counting time. The gamma activity from thorium-232 and cesium-137 did not exceed background in any of the samples that were analyzed.

Table 6.4.4-6 summarizes the off-site gross alpha and gross beta analysis results for three soil samples collected from the aboveground tanks at SWMU 94A. Gross alpha activity and gross beta activity did not exceed background in any of the samples that were analyzed.

Quality Assurance/Quality Control Results

Tables 6.4.4-1 and 6.4.4-3 present results of the analysis of VOC and SVOC quality assurance (QA)/quality control (QC) samples that were collected during the confirmatory sampling program at SWMU 94A. Those QA/QC samples consisted of two equipment blanks. Both QA/QC

samples were analyzed off site for VOCs and SVOCs. No VOCs were detected in the equipment blank samples. However, the SVOC bis(2-ethylhexl) phthalate was detected in both equipment blank samples, and di-n-butyl phthalate was detected in one equipment blank sample. The concentration of bis(2-ethylhexl) phthalate was at 1.6 J µg/L in sample CY94A2-GR-EB and at 1.4 J µg/kg in sample CY94A3-GR-EB. Because these concentrations are below the practical quantitation limit, the results are qualified as estimated values. Similarly, SVOC di-n-butyl phthalate was detected in sample CY94A3-GR-EB at 1.6 J µg/L and was qualified as an estimated value because the result is below the practical quantitation limit.

To assess the precision of soil sampling procedures, two surface soil samples (CY94A1-GR-540,960-0-0.5-SS and duplicate and CY94A3-GR-1100,780-0-0.5-SS and duplicate) were collected and analyzed in replicate off site. Because the majority of the results for the sample pairs yielded no detections, relative percent difference (RPD) calculations are limited. However, toluene was detected in the sample pair CY94A1-GR-540,960-0-0.5-SS and CY94A1-GR-540,960-0-0.5-DU. The corresponding RPD for toluene is 29.4 percent, which exceeds the acceptable limit of 25 percent. No other analytes (VOCs or SVOCs) were detected in either sample pair that was collected at SWMU 94A.

No QA/QC samples or sample duplicate pairs were collected for radionuclide analyses.

Data Validation

All off-site laboratory results were reviewed and verified/validated according to "Data Verification/Validation Level 3—DV-3" in Attachment C of the Technical Operating Procedure 94-03, Rev. 0 (SNL/NM July 1994b). 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 6-D contains off-site data validation reports. The verification/validation process confirmed that the data are acceptable for use in this NFA proposal for SWMU 94A.

6.5 Site Conceptual Model

The site conceptual model for SWMU 94A is based upon residual COCs identified in the soil samples collected from surface and subsurface at each of the three tank areas. This section summarizes the nature and extent of contamination and the environmental fate of COCs.

6.5.1 Nature and Extent of Contamination

The primary COCs at SWMU 94A are VOCs and SVOCs from waste water, coolant (glycol), and JP-4 aviation fuel managed in aboveground tanks. The tanks were used to store and supply fuel and coolant (clean and/or recycled) for burn tests conducted at engineered structures within the LCBS. Although the aboveground tanks have been removed from Tank Area 1 and Tank Area 2, three tanks remain at Tank Area 3. No containment measures existed during historical operations of the tanks and, therefore, potential historical releases to the soil may have occurred. A documented release of approximately 70 gallons (see Section 6.2.2) of JP-4 to the soil occurred at Tank Area 3 in February 1990. However, the tanks currently operating in Tank Area 3 have been upgraded in compliance with National Fire Protection Association 30 requirements and relevant aboveground tank standards.

Potential COCs were determined on the basis of detectable concentrations of VOCs and SVOCs in any soil sample. Because background concentrations for these constituents are not applicable, any detectable VOCs or SVOCs are considered potential contamination. Conversely, analytical results of samples that yielded no detections were not considered in evaluating potential COCs at SWMU 94A. As a result, VOC COCs include methylene chloride and toluene, and SVOC COCs include acenaphthene; bis(2-ethylhexyl) phthalate; 2-chlorophenol; 4-chloro-3-methylphenol; 1,4-dichlorobenzene; n-nitrosodi-n-propylamine; pyrene; and 1,2,4-trichlorobenzene. Table 6.5.1-1 summarizes the COCs and the sample locations where VOCs and SVOCs were detected.

Low concentrations of VOC COCs were found in both surface and subsurface soil samples at all three tank areas at SWMU 94A. Toluene was detected in the surface soil at levels of 29 to 39 µg/kg along the eastern boundary of Tank Area 1 and at a level of 11 µg/kg just outside the northeastern corner of Tank Area 2. Toluene was also detected at the 3.5 to 4.0-foot depth interval at the southwestern corner of Tank Area 1 (at a level of 26 µg/kg), along the eastern boundary of Tank Area 1 (at a level of 47 µg/kg), and just outside the northeastern corner of Tank Area 2 (at a level of 53 µg/kg). Toluene was not detected at Tank Area 3.

Methylene chloride is the only other VOC that was detected at SWMU 94A. Methylene chloride was detected in the majority of samples collected from Tank Area 3 and in one sample from Tank Area 2, but it was not detected in any samples from Tank Area 1. The concentrations of methylene chloride that were detected are very low, ranging from between 1.2 J and 2.1 J µg/kg. Because the concentrations detected were below the laboratory practical quantitation limit, all methylene chloride results were qualified as estimated values. Because the concentrations do not vary with sample depth or location and because methylene chloride is a common laboratory contaminant, this analyte is believed not to be a result of contamination from activities conducted at SWMU 94A.

Low concentrations of SVOCs were found only in surface soil samples from Tank Areas 1 and 3. No SVOCs were found in the soil samples from Tank Area 2. Bis(2-ethylhexyl) phthalate was detected in four surface soil samples and in the two equipment blanks that were collected during sampling activities. The concentrations of bis(2-ethylhexyl) phthalate are very low, ranging from between 75 J and 29 J µg/kg in the soil samples and from between 1.4 J and 1.6 J µg/kg in the equipment blank samples. Because the concentrations were below the laboratory practical quantitation limits, all bis(2-ethylhexyl) phthalate results were qualified as estimated values. Because the locations of the (2-ethylhexyl) phthalate detections are sporadic and because bis(2-ethylhexyl) phthalate is a common laboratory contaminant, this analyte is believed not to be a result of contamination from activities conducted at SWMU 94A.

The SVOCs acenaphthene; 2-chlorophenol; 4-chloro-3-methylphenol; 1,4-dichlorobenzene; n-nitrosodi-n-propylamine; pyrene; and 1,2,4-trichlorobenzene were detected only in one of three samples collected from outside the northeastern corner of Tank Area 1. These SVOCs were not detected in samples from any other locations at SWMU 94A. As a result, the contamination exists as a single isolated "hot spot."

Although SWMU 94A is located within an RMMA and is co-located with SWMU 65E, radionuclides were detected neither above background nor above the MDA in all samples collected from the tank areas. However, uranium-238 and uranium-235 are also considered

Table 6.5.1-1
Summary of COCs for SWMU 94A

COC Type	Number of Samples	COCs Detected in Soil Samples or Greater than Background	Maximum Background Limit/Canyons Area[a] (µg/kg except where noted)	Maximum Concentration (µg/kg except where noted)	Average Concentration[b] (µg/kg)	Sampling Locations Where COCs are Detected[c]
VOCs	21 environmental; 3 duplicates	Methylene Chloride	NA	2.1 J (5)	0.79	CY94A2-BH-940,820-3.5-4-SS CY94A3-GR-1100,780-0-0.5-SS CY94A3-GR-1120,760-0-0.5-SS CY94A3-GR-1120,760-0.5-1-SS CY94A3-GR-1180,780-0-0.5-SS CY94A3-GR-1220,780-0-0.5-SS CY94A3-GR-1220,880-0-0.5-SS
	24 environmental; 3 duplicates	Toluene	NA	53	6.19	CY94A1-GR-460,920-3.5-4-SS CY94A1-GR-540,960-0-0.5-SS CY94A1-GR-540,960-0-0.5-DU CY94A1-GR-540,960-3.5-4-SS CY94A2-GR-940,820-0-0.5-SS CY94A2-GR-940,820-3.5-4-SS
SVOCs	22environmental; 3 duplicates	Acenaphthene	NA	60 J (330)	16.5	CY94A1-GR-600,1000-0-0.5-SS
		Bis (2-ethylhexyl) Phthalate	NA	75 J (330)	21.9	CY94A1-GR-460,920-0.5-1-SS CY94A1-GR-540,960-0-0.5-SS CY94A3-GR-1100,860-0-0.5-SS CY94A3-GR-1220,780-0-0.5-SS
		2-Chlorophenol	NA	55 J (330)	16.6	CY94A1-GR-600,1000-0-0.5-SS
		4-Chloro-3-methylphenol	NA	59 J (330)	16.3	CY94A1-GR-600,1000-0-0.5-SS
		1,4-Dichlorobenzene	NA	45 J (330)	16.5	CY94A1-GR-600,1000-0-0.5-SS
		n-Nitrosodi-propylamine	NA	56 J (330)	16.5	CY94A1-GR-600,1000-0-0.5-SS
		Pyrene	NA	54 J (330)	16.5	CY94A1-GR-600,1000-0-0.5-SS
		1,2,4-Trichlorobenzene	NA	54 J (330)	16.1	CY94A1-GR-600,1000-0-0.5-SS

Table 6.5.1-1 (Concluded)
Summary of COCs for SWMU 94A

COC Type	Number of Samples	COCs Detected in Soil Samples or Greater than Background	Maximum Background Limit/Canyons Area[a] (µg/kg except where noted)	Maximum Concentration (µg/kg except where noted)	Average Concentration[b] (µg/kg)	Sampling Locations Where COCs are Detected[c]
Radionuclides	4 environmental	Uranium-238	2.31 pCi/g	ND (3.10E+00) pCi/g	Not calculated[d]	CY94A3-GR-1100,860-0-0.5-SS
		Uranium-235	0.16 pCi/g	ND (2.24E-01) pCi/g	Not calculated	CY94A1-GR-500,960-0-0.5-SS CY94A2-GR-880,800-0-0.5-SS CY94A3-GR-1100,860-0-0.5-SS CY94A Composite-S

[a]From Dinwiddie September 1997 (radionuclides only).
[b]Average concentration includes all samples. For nondetectable results, the detection limit is used to calculate the average.
[c]Includes all samples with detectable concentrations (for VOCs and SVOCs), or all samples with nondetectable results where the minimum detectable activity exceeds background (for radionuclides).
[d]An average activity is not calculated because of the variability in instrument counting error and the number of nondetectable activities.

J () = Reported value is greater than or equal to the method detection limit but is less than the practical quantitation limit, shown in parenthesis.
NA = Not applicable (for background concentrations of VOCs and SVOCs in soil).
ND () = Not detected at or above the method detection limit, shown in parenthesis.
µg/kg = Microgram(s) per kilogram.
pCi/g = Picocurie(s) per gram.
SVOC = Semivolatile organic compound.
TBD = To be determined.
VOC = Volatile organic compound.

potential COCs at SWMU 94A because the MDA associated with nondetectable results for these isotopes exceeded background in several instances. Because radioactive materials were not used in the operational activities at SWMU 94A and no detectable activities exceeded background in the samples collected, no spatial description of radionuclide contamination is necessary.

6.5.2 Environmental Fate

The primary source of COCs at SWMU 94A is waste water, coolant (glycol), and JP-4 aviation fuel managed in aboveground tanks to support burn tests that were conducted at engineered structures within the LCBS (Figure 6.5.2-1). The primary release mechanism of COCs is accidental discharges to the soil during liquid-handling operations. Although there is only one documented release to the soil at SWMU 94A (approximately 70 gallons of JP-4 [see Annex 6-A]), other potential historical releases may have occurred as a result of operator errors when filling or draining tanks or when transferring liquids to the test sites. Because no containment measures were used during historical operation of the aboveground tanks at SWMU 94A, any release would have been directly to the soil.

Table 6.5.1-1 summarizes potential COCs for SWMU 94A. Based upon the nature and extent of contamination at the site (Section 6.5.1), VOC and SVOC COCs occur sporadically at low concentrations in both surface and subsurface soils at each of the three tank areas. No distinct vertical or horizontal distribution of contamination is present. As discussed in Section 6.5.1, radionuclides are also potential COCs for SWMU 94A because the tank areas are located within an RMMA and co-located with SWMU 65E. All potential COCs were retained in the conceptual model and evaluated in the human health and ecological risk assessments.

Because the aboveground tanks were removed from Tank Area 1 and Tank Area 2 and were upgraded with secondary containment measures at Tank Area 3, only secondary sources of COCs remain at the site in the form of residual VOCs and SVOCs in the surface and subsurface soil. The secondary release mechanisms at SWMU 94A are the suspension and/or dissolution of COCs in surface-water runoff and percolation to the vadose zone, direct contact with soil (radionuclides only), VOC vapor emanations, dust emissions, and the uptake of COCs in the soil by biota (Figure 6.5.2-1). However, high partitioning coefficients and low mobility in the transporting medium would enhance dilution of the already low COC concentrations. In addition the depth to groundwater at the site is approximately 222 feet bgs, which precludes the migration of COCs to the aquifer. The pathways to receptors are surface water, soil water, air, and soil. Biota are also a pathway through food chain transfers. Annex 6-E, Section VI, provides additional discussion of the fate and transport of COCs at SWMU 94A.

The current land use for SWMU 94A is industrial. However, since the future land use for SWMU 94A is recreational (DOE et al. October 1995), the potential human receptor is considered a recreational user of the site. For all applicable pathways, the exposure route for the recreational user is dermal contact and ingestion/inhalation. Only ingestion of soil is considered a major exposure route for the recreational user. Potential biota receptors include flora and fauna at the site. Similar to the recreational user, direct ingestion of soil is considered the major exposure route for biota, in addition to ingestion through food chain transfers or direct uptake. Annex 6-E, Section V, provides additional discussion of the exposure routes and receptors at SWMU 94A.

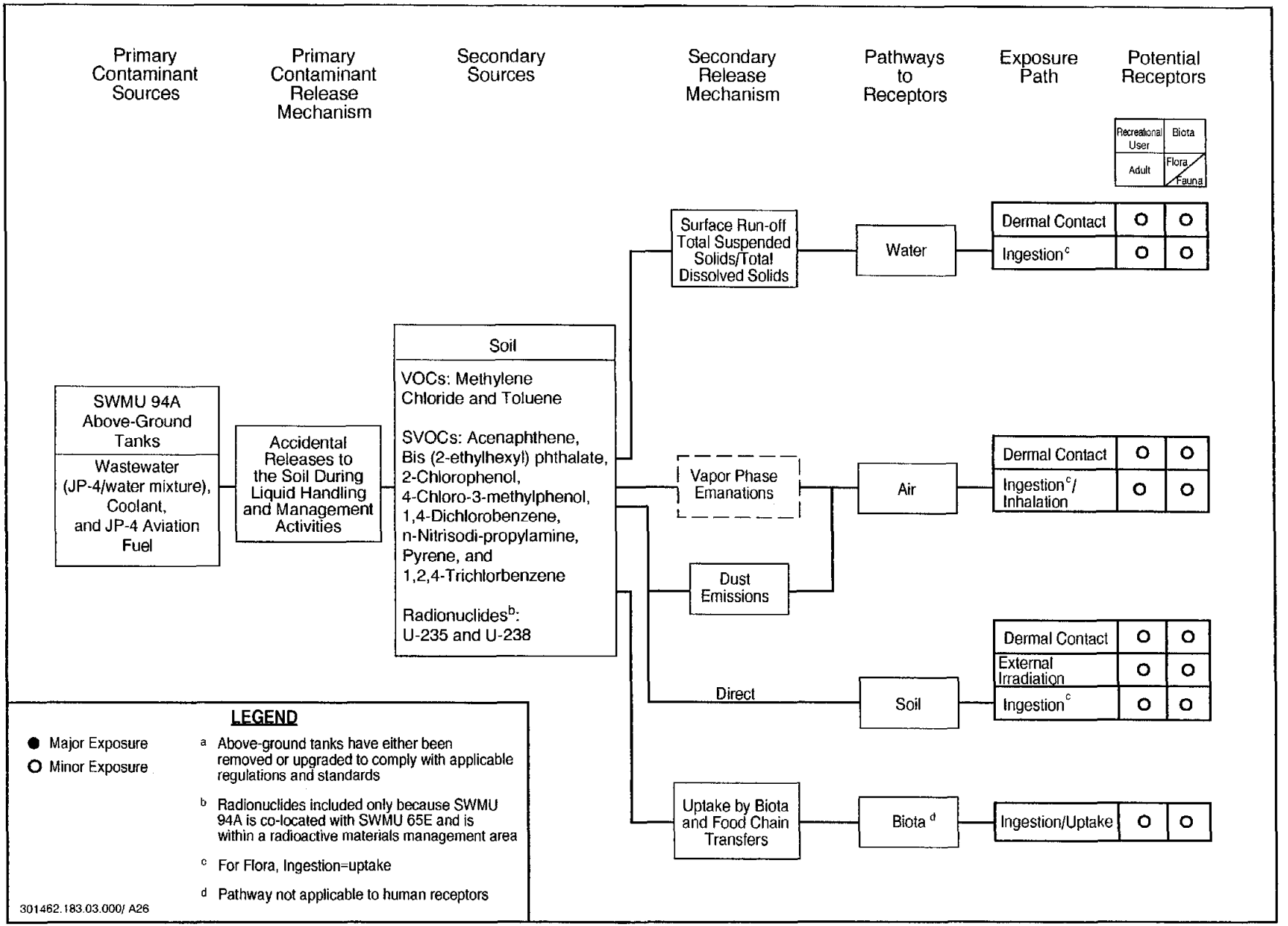


Figure 6.5.2-1

Conceptual Model Flow Diagram for SWMU 94A, Aboveground Tanks

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6.6 Site Assessments

The site assessment process for SWMU 94A includes risk screening assessments followed by risk baseline assessments (as required) for both human health and ecological risk. The following sections summarize the site assessment results. Annex 6-E provides details of the site assessment.

6.6.1 Summary

The site assessment concludes that SWMU 94A does not have significant potential to affect human health under a recreational land-use scenario. After considering the uncertainties associated with the available data and modeling assumptions, ecological risks associated with SWMU 94A were found to be very low. Section 6.6.2 briefly describes the site screening assessments and Annex 6-E provides details.

6.6.2 Screening Assessments

Risk screening assessments were performed for both human health risk and ecological risk for SWMU 94A. This section briefly summarizes the risk screening assessments.

6.6.2.1 Human Health

SWMU 94A has been recommended for recreational land-use (DOE et al. October 1995). Annex 6-E A provides a complete discussion of the risk assessment process, results, and uncertainties. Because COCs are present in concentrations or activities greater than background levels, it was necessary to perform a health risk assessment analysis for the site. This assessment included any VOCs or SVOCs detected above their reporting limits and any radionuclide compounds either detected above background levels and/or MDAs. The risk assessment process provides a quantitative evaluation of the potential adverse human health effects caused by constituents in the site's soil. The Risk Assessment Report calculated the hazard index (HI) and excess cancer risk for a recreational land-use setting. The excess cancer risk from nonradiological COCs and the radiological COCs is not additive (EPA 1989).

In summary, the HI calculated for SWMU 94A nonradiological COCs is 0.00 for a recreational land-use setting, which is less than the numerical standard of 1.0 suggested by risk assessment guidance (EPA 1989). The excess cancer risk for SWMU 94A nonradiological COCs is 3E-8 for a recreational land-use setting. Guidance from the NMED indicates that excess lifetime risk of developing cancer by an individual must be less than 1E-6 for Class A and B carcinogens and less than 1E-5 for Class C carcinogens (NMED March 1998). Thus, the excess cancer risk for this site is below the suggested acceptable risk value (1E-6).

The incremental total effective dose equivalent (TEDE) for radionuclides for a recreational land-use setting for SWMU 94A is 3.6E-3 mrem/yr, which is well below the recommended dose limit of 15 mrem/yr found in EPA's OSWER Directive No. 9200.4-18 and reflected in a document entitled "Sandia National Laboratories/New Mexico Environmental Restoration Project—RESRAD Input Parameter Assumptions and Justification" (SNL/NM February 1998). The incremental excess cancer risk for radionuclides is 4.6E-8 for recreational land-use scenario,

which is much less than risk values calculated from naturally occurring radiation and from intakes considered background concentration values.

The residential land-use scenarios for this site are provided only for comparison in the Risk Assessment Report (Annex 6-E). The report concludes that SWMU 94A does not have potential to affect human health under a recreational land-use scenario.

6.6.2.2 Ecological

An ecological screening assessment that corresponds with the screening procedures (NMED March 1998) in the EPA's Ecological Risk Assessment Guidance for Superfund (EPA 1997) was performed as set forth by the NMED Risk-Based Decision Tree. An early step in the evaluation is comparing COC concentrations and identifying potentially bioaccumulative constituents (see Annex 6-E, Sections III, VI, VII.2, and VII.3). This methodology also requires developing a site conceptual model and a food web model as well as selecting ecological receptors. Each of these items is presented in the "Predictive Ecological Risk Assessment Methodology for SNL/NM ER Program, Sandia National Laboratories/New Mexico" (IT July 1998) and will not be duplicated here. The screening also includes the estimation of exposure and ecological risk.

Tables 13, 14, and 15 of Annex 6-E present the results of the ecological risk assessment screen. Site-specific information was incorporated into the screening assessment when such data were available. Hazard quotients greater than unity were originally predicted; however, closer examination of the exposure assumptions revealed an overestimation of risk primarily attributed to exposure concentration (maximum COC concentration was used in the estimation of risk), exposure setting (area use factors of one were assumed), background risk, and the use of detection limits as exposure concentrations. Based upon an evaluation of these uncertainties, ecological risks associated with this site are expected to be very low.

6.6.3 Baseline Risk Assessments

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

6.6.3.1 Human Health

Based upon the fact that human health results of the screening assessment summarized in Section 6.6.2.1 indicate that SWMU 94A does not have potential to affect human health under a recreational land-use setting, a baseline human health risk assessment is not required for SWMU 94A.

6.6.3.2 Ecological

Based upon the fact that ecological results of the screening assessment summarized in Section 6.6.2.2 indicate that SWMU 94A has very low ecological risk, a baseline ecological risk assessment is not required for SWMU 94A.

6.6.4 Other Applicable Assessments

No other applicable assessments have been conducted at SWMU 94A.

6.7 No Further Action Proposal

6.7.1 Rationale

Based upon field investigation data and the human health risk assessment analysis, an NFA is being recommended for SWMU 94A for the following reason: No COCs (particularly VOCs, SVOCs, and radionuclides) were present in concentrations considered hazardous to human health for a recreational land-use scenario.

6.7.2 Criterion

Based upon the evidence provided above, SWMU 94A is proposed for an NFA decision in conformance with Criterion 5 (NMED March 1998), which states, "The SWMU/AOC has been characterized or remediated in accordance with current applicable state or federal regulations, and that available data indicate that contaminants pose an acceptable level of risk under current and projected future land use."

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ANNEX 6-A
Summary of Testing Activities at SWMU 94
Lurance Canyon Burn Site

The Lurance Canyon Burn Site (LCBS) was used for testing fire survivability of transportation containers, weapons components, simulated weapons, and satellite components. Testing programs at the LCBS can be grouped into the following six categories related to burn structures:

- Portable pan burn tests
- Small surface impoundment (Solid Waste Management Unit [SWMU] 94E)
- Large Open Burn Pool (LOBP)
- Small Open Burn Pool (SOBP)
- Light Airtransport Accident Resistant Container (LAARC) Unit (Discharge Pit, SWMU 94F)
- Bomb Burner Unit (Lines at Discharge Pit, SWMUs 94C and 94D)
- Small Wind Shielded (SWISH) Unit
- Smoke Emissions Reduction Facility (SMERF)
- Bunker 9830 and Support Buildings
- Aboveground tanks (SWMU 94A)
- Debris/soil mounds (SWMU 94B)
- Scrap Yard (SWMU 94G).

Table 6A-1 summarizes the burn testing structures and associated features at SWMU 94. This annex describes the historical operations at each of these structures and locations are shown on Figures 6A-1 and 6A-2.

A.1 PORTABLE PAN BURN TESTS

The test log for SWMU 94 records 65 burn tests involving seven testing programs that took place in portable pans (Table 6A-1) (SNL/NM November 1994), but additional tests may have taken place prior to the first 1979 entry. Portable pan burn tests were conducted from approximately 1975 to 1991 (Palmieri April 1995). Burn tests requiring a similar testing environment are now conducted in the SOBP. Round portable pans, 6 to 10 feet in diameter and 2 to 3 feet deep (Figure 6A-3), were set up with or without temporary chimneys in at least five locations within SWMU 94 (Gill November 1982, Hickox and Abitz December 1994, Palmieri April 1995). These sites are just north and just south of the Small Surface Impoundment (SWMU 93E), south of the SWISH Unit in the Bomb Burner Unit trench and at the current-day location of the SOBP (Palmieri April 1995). Following a test, water remaining in the portable pans was typically left to evaporate (Jercinovic et al. November 1994). However, some waste water from the portable pans may have been discharged into the Small Surface Impoundment located approximately 200 feet southwest of the LAARC Unit (Jercinovic et al. November 1994). This section describes some of the burn testing programs.

PARC Testing Program

One of the pre-logbook burn tests involved plutonium transportation containers. The Plutonium Accident Resistant Container (PARC) Testing Program was conducted in 1976 and 1977 with the Plutonium Air Transportable 1 (PAT-1) container (Caregeorges January 1994) at SWMU 65B (Figure 6A-1). The PAT-1 container was loaded with depleted uranium (DU) dioxide powder and placed in a 10-feet-diameter pan in a portable chimney for a 52-minute JP-4

Table 6A-1
Summary of Burn Testing and Associated Operations at SWMU 94, Lurance Canyon Burn Site

Test Unit/Structure	Test Type/ Operation	Test Date	Number of Recorded Tests (SNL/NM November 1994)	Test/Operational Release Location	Test Materials/ Operational Release	Reference
Portable Pans	Open Burning	1975 to March 1991 1985 to 1987 (none conducted)	65 (minimum)	Primary Detonation Area (SWMU 65B) and Near Field Dispersion Area (SWMU 65D)	Detonations (HE, gun propellant, radionuclides)	SNL/NM November 1994 Moore September 1981 Larson and Palmieri October 1994 Caregeorges January 1994 Hickox and Abitz December 1994 Palmieri December 1994e Palmieri April 1995
				None (most evaporated) Small Surface Impoundment	Waste water (JP-4 fuel and water mixture)	
Small Surface Impoundment	Open Burning	pre-1979 to 1980	4	Subsurface infiltration	Waste water (JP-4 fuel and water mixture)	SNL/NM November 1994
LOBP (30 x 60 feet)	Open Burning	1977 to present	53 (Includes Railcar Burn Test)	1977 test (evaporated) 1977 to 1983 (Inactive) 1983 to 1987 (SWMU 13) 1988 to present (City of Albuquerque POTW via trucking)	Waste water (JP-4 fuel and water mixture, radionuclides)	Appendix J Palmieri October 1994
SOBP (20 x 20 feet)	Open Burning	1992 to present	23	1992 to present (City of Albuquerque POTW via trucking; connected to the LOBP)	Waste water (JP-4 fuel and water mixture)	SNL/NM November 1994 Palmieri October 1994
LAARC Unit	Enclosed Burning	June 1980 to August 1987	63	Unlined discharge pit	Waste water (JP-4 fuel and water mixture)	SNL/NM November 1994
Bomb Burner Unit	Enclosed Burning	September 1982 to January 1988	23	Within Bomb Burner Unit	Detonations (HE radionuclides, metals)	SNL/NM November 1994
				Unlined discharge pit	Waste water (JP-4 fuel and water mixture)	
			1 TABS Test (Location B see Section 5.1.1)	Bomb Burner Unit trench	Detonation (HE, radionuclides, metals)	

Refer to footnotes at end of table.

Table 6A-1 (Concluded)
Summary of Burn Testing and Associated Operations at SWMU 94, Lurance Canyon Burn Site

Test Unit/Structure	Test Type/ Operation	Test Date	Number of Recorded Tests (SNL/NM November 1994)	Test/Operational Release Location	Test Materials/Operational Release	Reference
SWISH Unit	Enclosed Burning	January 1983 to April 1990	61	None (never disposed of waste water)	None (waste water recirculated, never disposed)	SNL/NM November 1994 Author [unk] Date [unk]c Palmieri October 1994 Palmieri December 1994d
SMERF	Enclosed Burning	August 1992 to present	27	1992 to present (City of Albuquerque POTW via trucking)	None (waste water recirculated)	
Bunker 9830	Enclosed Burning	1967 to present (Control Bunker/Storage) 1975 to 1988 (Burn Testing)	Cable testing 10 (fire suppressant)	None (contained within the bunker)	None	Larson and Palmieri August 1994a Palmieri November 1994a
Aboveground Tanks	Supply Water, JP-4 Fuel, and Coolant for Burn Testing	1980 to present	NA	Subsurface infiltration	Accidental spills of JP-4 fuel on soil	Hickox November 1994 Larson and Palmieri October 1994
Debris/Soil Mounds	Grading	pre-1992 to present	NA	Subsurface infiltration or surface runoff	Metals or radionuclides leachate	Palmieri April 1995
Scrap Yard	Storage of surplus test materials	1980 to present	NA	Subsurface infiltration	Accidental spills of hydraulic oils on soil	Hickox November 1994 Larson and Palmieri October 1994 Palmieri November 1994

HE = High explosive.
LAARC = Light Airtransport Accident Resistant Container.
LOBP = Large Open Burn Pool.
NA = Not applicable.
POTW = Publicly Owned Treatment Works.
SMERF = Smoke Emission Reduction Facility.
SNL/NM = Sandia National Laboratories/New Mexico.
SOBP = Small Open Burn Pool.
SWISH = Small Wind Shielded (Unit).
SWMU = Solid waste management unit.
TABS = Torch Activated Burn System.

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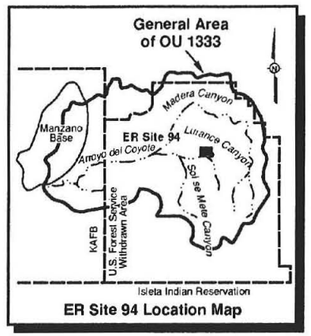

SWMU 94A, Area 1 Aboveground Storage Tanks
Nonpotable Water
Recirculation Tank
Fuel Tank
Bunker 9830
LAARC Unit
SWISH Unit
SWMU 94A, Area 2 Aboveground Storage Tanks
SWMU 94A, Area 3 Abovground Storage Tanks
Fuel Tank
Nonpotable Water Tanks
Firebreak Road
SWMU 94G Scrap Yard
Cable Conduit
CON-CON Unit
SWMU 94F LAARC Discharge Pit
LOBP
SWMU 65B Primary Detonation Area
Camera Bunker
SWMU 94C Bomb Burner Unit Discharge Line and Trench
TABS Test Location B
Buried Discharge Line
SWMU 94E Small Surface Impoundment
Location of Uncontained Pool Fire Tests
ER Site 65E Far Field Dispersion Area
Lurance Canyon (Main Arroyo)
SWMU 94D Bomb Burner Discharge Pit
SWMU 65A Small Debris Mound
Coyote Springs Road
SWMU 65D Near Field Dispersion Area
SWMU 13 Oil Surface Impoundment
Firebreak Road

LEGEND

- Active Road
- Arroyo Channel (Flow Direction)
- Slope Direction on Berm/Mound
- Scrap Yard
- Surface Depression
- Location of M5-155 Gun Propellant Canister Tests
- Aboveground Discharge Pipeline
- Trailer/Building
- Buried Portion of Arroyo
- Trench
- Location of Portable Pan Burn Tests
- Engineered Soil Berm
- Underground Fuel and Water Pipelines
- Underground Discharge Pipeline

0 100 200 FEET
0 50 METERS
APPROXIMATE SCALE

Base map modified from USGS, June 1983

Figure 6A-1
SWMU 94
Lurance Canyon Burn Site
1983 Operations

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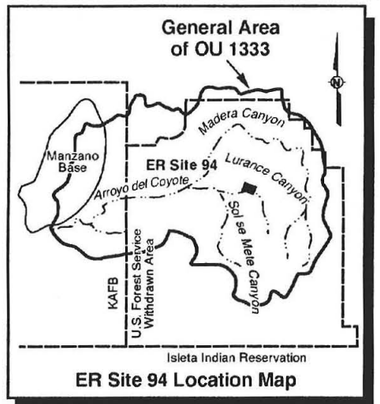
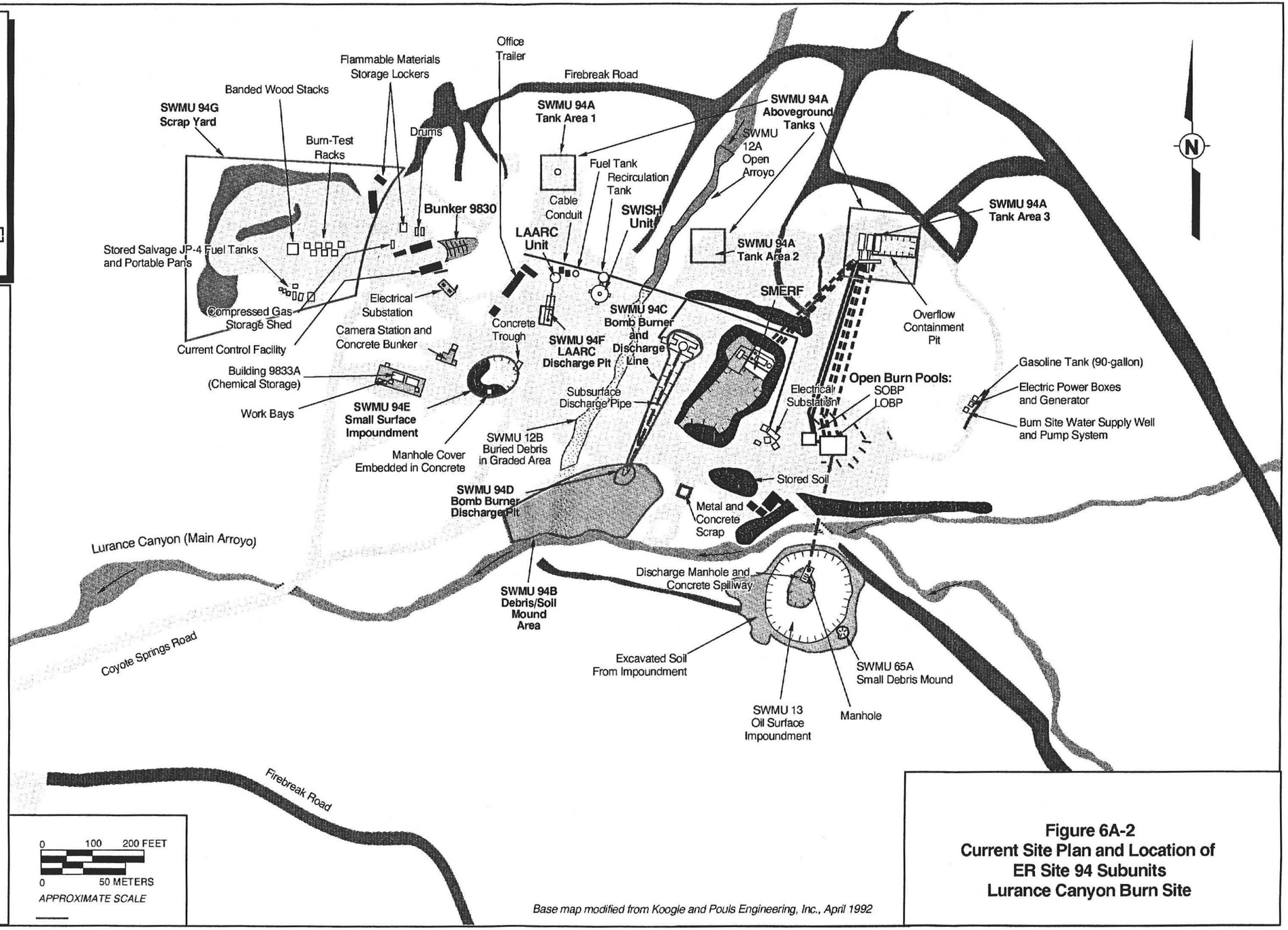


ER Site 94 Location Map

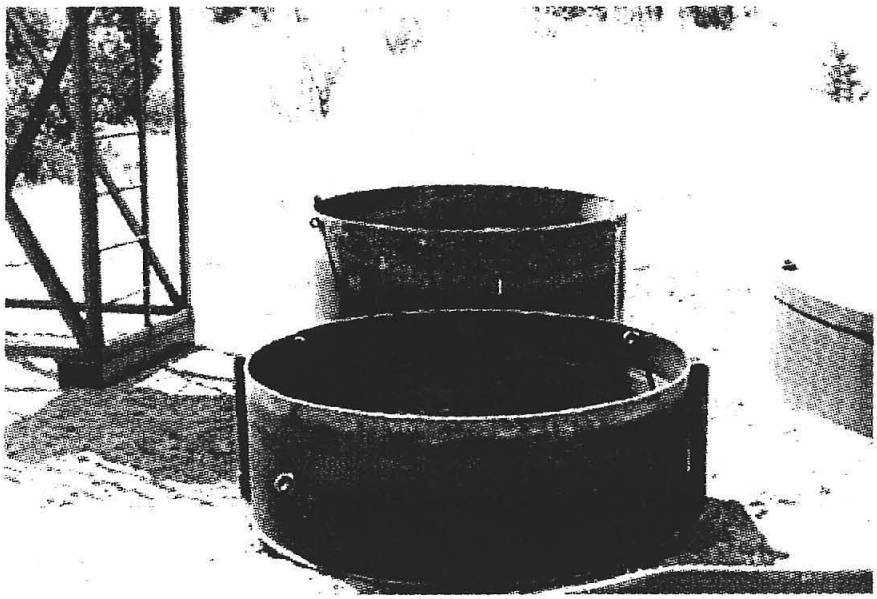
LEGEND

- Active Road/Graded Area
- Inactive Road
- Arroyo Channel (Flow Direction)
- Buried Portion of Arroyo
- Slope Direction on Berm/Mound
- Engineered Soil Berm
- Surface Depression
- Disturbed Area/Soil Mound
- Scrap Material
- Trailer/Building
- Concrete Pad
- Wind Screen
- Underground Water Pipeline
- Aboveground Water Pipeline
- Underground Fuel Pipeline
- Aboveground Fuel Pipeline
- Underground Discharge Pipeline
- Portable Tank
- Aboveground Discharge Pipeline
- Subunit Boundary



Base map modified from Koogle and Pouls Engineering, Inc., April 1992

Figure 6A-2
Current Site Plan and Location of ER Site 94 Subunits
Lurance Canyon Burn Site



Photograph of portable pans in the southern portion of the scrap yard in April 1995. The pans held JP-4 fuel and water used in small-scale burn tests at SWMU 94.

Figure 6A-3
Photograph of Portable Pan

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fuel fire at a minimum temperature of 1,850 degrees Fahrenheit (°F) (Caregeorges January 1994). After completing the test, the test unit was swipe tested to determine whether uranium dioxide was released (Larson and Palmieri October 1994). No radioactivity was found on the swipe samples.

Uncontained Pool-Fire Tests

In September 1981, five tests of uncontained pool fires were conducted in the area of the Bomb Burner Unit trench (SWMU 94C) to investigate the size of a fire produced from fuel leaking from an aircraft wing. JP-4 fuel was pumped from a 55-gallon tank onto a steel plate that rested on a pan, which was then covered with a concrete pad. A portable chimney was placed over the pan. The JP-4 fuel was pumped onto the steel plate at varying rates to control the size of the burn pool. No other materials were burned (Moore September 1981, Hickox and Abitz December 1994). These tests occurred prior to the first portable pan entry in the log book.

Gun-Propellant Canister Tests

In October 1982, five burn tests involving exposure of M5-155 gun-propellant canisters to JP-4 fuel fires were performed at SWMU 94 (Gill November 1982, Palmieri December 1994e, SNL/NM November 1994) in a portable pan located near the entrance to the site (Figure 6A-1). Gun and rocket propellants are composed primarily of nitrocellulose, but they differ in that gun propellant does not contain aluminum or potassium perchlorate (Hickox and Abitz December 1994). The purpose of the 11-minute burn tests was to observe and record the behavior of gun-propellant canisters in a fully engulfing fire representative of an accidental fire situation. A portable pan (6 feet in diameter and 2 feet deep) with an air curtain system was used for the tests. The air curtain, produced by a fan rated at 14,000 cubic feet per minute to blow air through an annular area around the lip of the burn pan, protected the fire from wind effects. In three of the tests, the M5-155 gun-propellant canister was breached in approximately 100 seconds, as evidenced by a brilliant flash associated with the ignition of the gun propellant. An accelerated burning of the fire ensued for about 15 to 20 seconds, presumably corresponding to the consumption of the gun propellant. In two of the tests, the accelerated burning stage was followed by an igniter explosion, which is not considered a large explosion (Hickox and Abitz December 1994). The igniter consisted of a mild detonating fuse surrounded by barium nitrate. No detailed information is available for two of the five tests.

Slow-Heat Tests

The vented slow-heat tests conducted in 1983 (Mata December 1983) were designed to investigate whether the combustion products of burning PBX-9502 (TATB-95 percent, Kel-F 800-5 percent) (Dobratz and Crawford January 1995) explosive would vent from the test unit without reaching critical internal pressure that would cause an explosion. A corrugated culvert chimney was placed over a portable burn pan in the Bomb Burner Unit trench, and a hole was cut in the side for a large water-cooled lever arm. The lever arm portion inside the corrugated culvert chimney extended over the portable pan. A mock weapon containing high explosives (HE) was placed on the end of the lever arm that extended over the burn pool, and the other end of the lever arm was attached to a piston-like instrument that determined the change in mass of the HE inside the weapon as a function of burn time (Hickox and Abitz

December 1994). Two burn tests were conducted to demonstrate the successful operation of the water-cooling system. On October 4, 1983, a third test with a vented stainless steel casing containing insensitive (i.e., nonshockwave initiated) HE was conducted in a JP-4 fuel fire at a nominal temperature of 2,000°F for approximately 60 minutes (Mata December 1983, Hickox and Abitz December 1994). The HE inside the weapon was completely burned without an explosion.

Nitromethane Calibration Tests

Thirty-eight nitromethane calibration tests were conducted at SWMU 94 between September and October 1984 (SNL/NM November 1994). The tests involved filling test units with nitromethane and exposing them to a JP-4 fuel fire. The purpose of these tests was to calibrate detonation velocity using liquid nitromethane and Composition-1 (C-1) and Composition-7 (C-7) explosives (Palmieri December 1994e). The tests were conducted in the Bomb Burner Unit trench. A trial test was conducted in August 1984 using gasoline rather than nitromethane. Neither the trial test using gasoline nor the first two nitromethane tests completely detonated the C-1 explosives. The remaining 36 tests were high-order detonations (see SNL/NM November 1994 for additional information on these tests).

A.2 SMALL SURFACE IMPOUNDMENT

SWMU 94E, Small Surface Impoundment is approximately 60 feet long, 25 feet wide, and less than 2 feet deep (Figure 6A-1) (Palmieri December 1994b, SNL/NM August 1994). The inactive impoundment is surrounded by low soil berms on the south and west sides (Larson and Palmieri October 1994) (Figures 6A-4a and 6A-4b). A crude concrete trough approximately 3 feet long is located at the northeastern edge of the impoundment, and a manhole is on the southern edge of the impoundment (Hickox November 1994, Palmieri December 1994b) (Figure 6A-4a). The exact use of the manhole is not known (Hickox November 1994, Palmieri December 1994b). It is believed that the small surface impoundment was used once to burn JP-4 fuel as a test demonstration (Jercinovic et al. November 1994). The first three log book entries (from October 1979 through February 1980) reference the "old facility" and the "culvert facility," which refer to portable chimney setups in the small surface impoundment (Palmieri April 1995, SNL/NM November 1994). These tests consisted only of JP-4 fuel fires and investigated the effectiveness of controlling the flames with portable chimneys. The impoundment currently receives storm runoff from the northwestern portion of the site and may have received liquids from the portable pans (Jercinovic et al. November 1994).

A.3 THE LARGE OPEN BURN POOL

The LOBP is an active burn unit located approximately 200 feet southeast of the SMERF (SNL/NM August 1994) (Figure 6A-2). The pool is formed by a rectangular concrete basin 30 by 60 feet and 3 feet deep (Figure 6A-5a) and is concrete/fiber-ceramic-lined (Palmieri October 1994, Larson and Palmieri October 1994). Fire tests at the LOBP were primarily performed on a variety of shipping containers, most of which burned in the LOBP and contained no radioactive materials (Palmieri October 1994). However, one test in 1991 involved an H1501 accident-resistant container (HARC) unit that did contain uranium-238 and beryllium (SNL/NM November 1994).

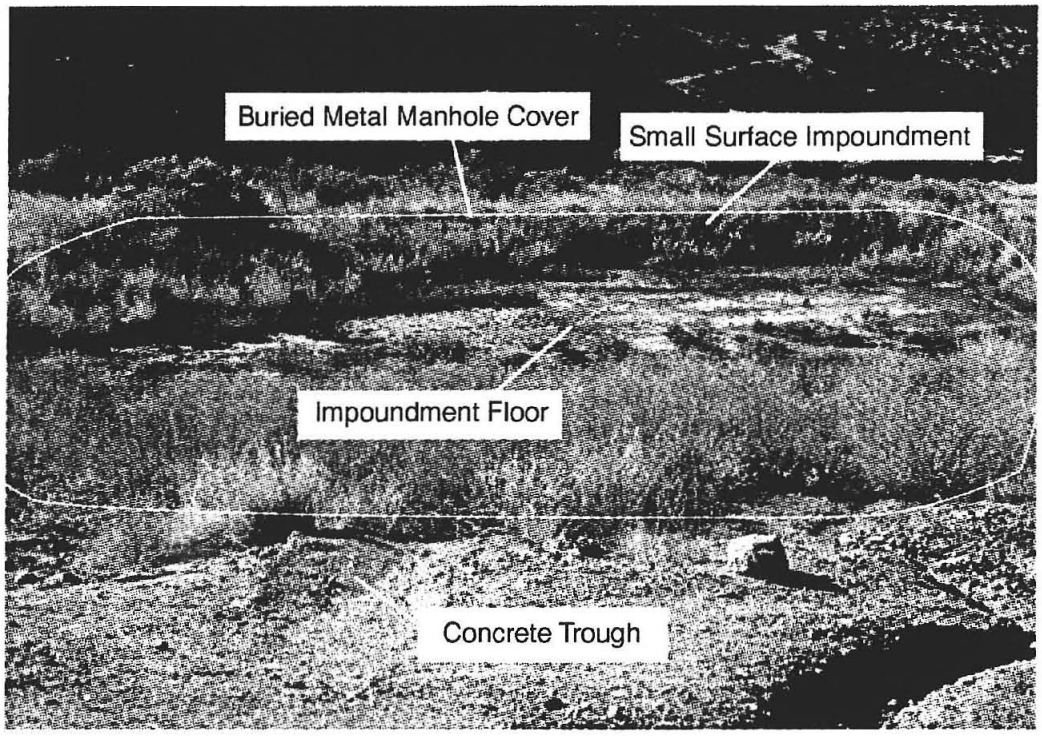

Figure 6A-4a Photograph of the small surface impoundment (SWMU 94E) in December 1994. The impoundment is located east of the camera bunker. View is to the southwest.

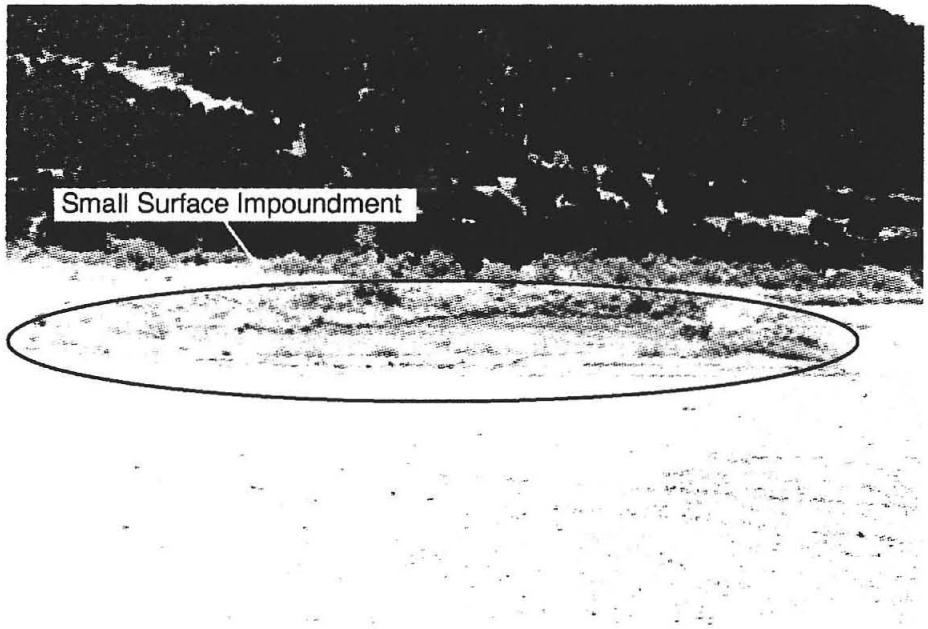

Figure 6A-4b Photograph of the small surface impoundment (SWMU 94E) in April 1995. Photograph was taken from the direction of surface runoff. View is to the southwest.

Figure 6A-4
Photographs of SWMU 94E, Small Surface Impoundment

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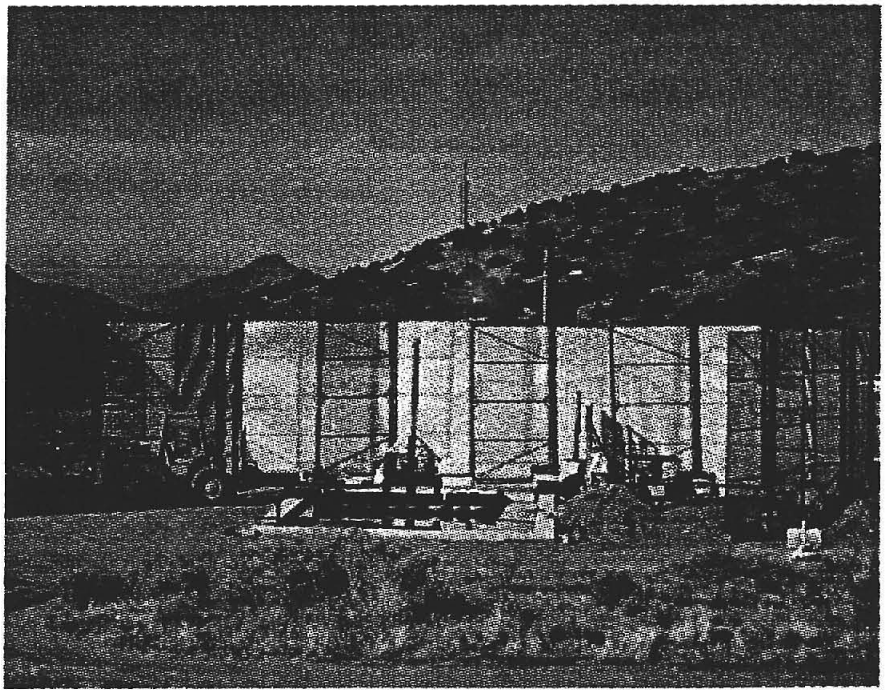

Figure 6A-5a Photograph of the LOBP under construction at SWMU 94 in 1977. View is to the northwest.

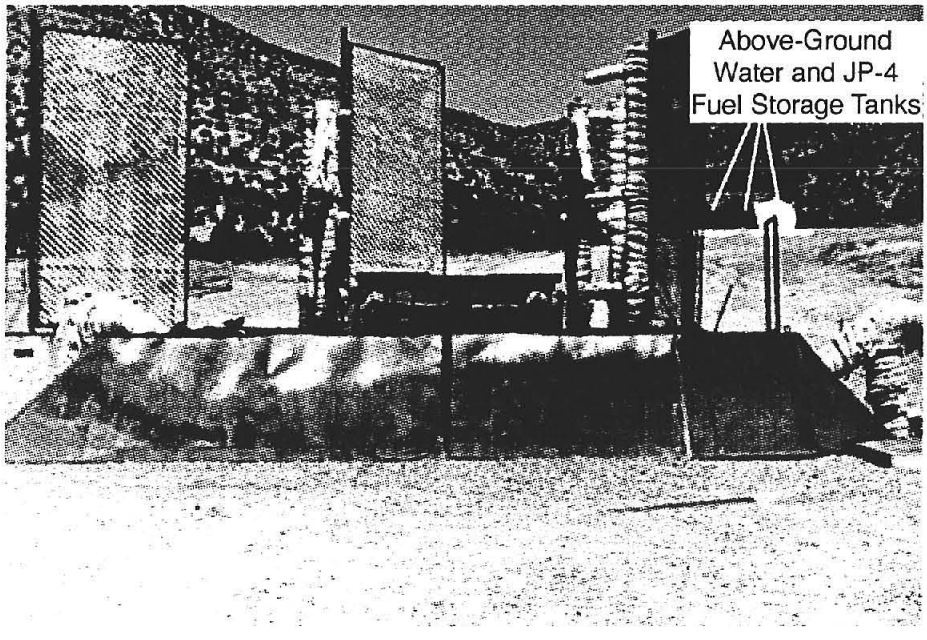

Figure 6A-5b Photograph of the SOBP at SWMU 94 in April 1995. View is to the north.

Figure 6A-5
Photographs of Large Open Burn Pool and Small Open Burn Pool

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The LOBP was built in 1977 in order to conduct the Railcar Burn Test (synonymous with the Yankee Cask Test) (Palmieri October 1994, Jercinovic et al. November 1994, Palmieri November 1994b). Waste water from this burn test was left in the LOBP to evaporate. Following the Railcar Burn Test in 1977, the LOBP was inactive until testing resumed in June 1983 (Jercinovic et al. November 1994, Palmieri December 1994e, SNL/NM November 1994).

In 1983 a drain was installed in the LOBP (Jercinovic et al. November 1994) in order to facilitate test unit access following a burn test. The drain was connected to the Oil Surface Impoundment (SWMU 13) with 24-inch-diameter corrugated culvert pipe. The Oil Surface Impoundment is located approximately 200 feet south of the LOBP (Figure 6A-2) (Palmieri October 1994, Jercinovic et al. November 1994).

Fifty-two burn tests have been conducted in the LOBP from June 1983, when burn testing resumed, to the present. From 1984 to 1987, the operational practice was to discharge the water and residual JP-4 fuel from the LOBP to the Oil Surface Impoundment after the JP-4 fuel burned out. Nine tests in the LOBP discharged waste water to the impoundment through the underground corrugated piping system during this time period (Larson and Palmieri October 1994, Jercinovic et al. November 1994). In 1987 waste-water discharges to the impoundment ceased (Palmieri October 1994, Larson and Palmieri October 1994), and a closed-loop, recirculation system was constructed between the LOBP and the aboveground tanks (SWMU 94A) north of the LOBP. All waste water associated with the burn testing is currently recycled to these tanks for reuse in subsequent burn tests. Recycled waste water is periodically tested and pumped into tanker trucks, removed from the site, and released to the City of Albuquerque publicly owned treatment works (POTW) under the SNL/NM allotment of 1 million gallons per year (Palmieri November 1994b). Nonhazardous solid waste such as damaged ceramic insulation was disposed of at the Kirtland Air Force Base landfill (Author [unk] Date [unk]a, Martz September 1985, Author [unk] Date [unk]d). The personnel conducting the tests are responsible for the disposal of solid residues remaining in the bottom of the LOBP (Larson and Palmieri October 1994).

A.4 THE SMALL OPEN BURN POOL

The SOBP (an active burn unit) is located approximately 8 feet west of the LOBP (Figure 6A-2). The SOBP was built in 1992 in order to reduce the amount of fuel required to perform the same length test in the LOBP and, thereby, reduce the total smoke emissions (Palmieri October 1994). Since its construction, 23 burn tests have been conducted in the SOBP on transportation containers and weapons components (SNL/NM November 1994). The pool is formed by a square concrete basin 20 by 20 feet and 3 feet deep and is lined with sheet steel (Figure 6A-5b). Metal sheets have been welded together and to the metal pan, so that a skirt is formed around the pan at a 45-degree angle. A metal mesh drain is located in the northeastern corner of the SOBP and is connected to the LOBP with a 2-inch-diameter underground pipeline. Waste water is drained from the SOBP to the LOBP in order to recirculate it back to the aboveground storage tanks to the north (Figure 6A-2) (Palmieri April 1995). Two aboveground 3.5-inch-diameter galvanized metal pipes supply water and fuel to the SOBP from the aboveground tanks. These pipes connect into a single 3-inch-diameter pipe that enters the SOBP. All testing in the SOBP was completely contained, and there have been no documented historical releases of hazardous constituents to the environment.

A.5 THE LAARC UNIT

The LAARC Unit is an inactive burn unit located approximately 200 feet east of Bunker 9830 (SNL/NM August 1994) (Figures 6A-2 and 6A-6a). This unit was the first permanent structure constructed at the site. The unit was constructed in approximately 1980 and was used for 63 fire tests of small transportation containers and mock weapons (Moore June 1982, Cocke May 1984, Luna and Moore June 1983, Moore and Luna February 1983, Palmieri October 1994, Jercinovic et al. November 1994, Larson and Palmieri August 1994a). The LAARC Unit was last used in August 1987 (SNL/NM November 1994; Author [unk], January 1993; Palmieri December 1994d) under an assurance of discontinuance with the City of Albuquerque Air Pollution Bureau (Palmieri October 1994).

The burn pan located inside the unit is approximately 10 feet in diameter (Moore and Luna February 1983) (Figure 6A-7). The LAARC received water and JP-4 fuel through an underground pipeline from aboveground tanks located approximately 200 feet north of the unit (Figure 6A-1) (Palmieri April 1995). Waste water was discharged from the burn pan through a 12-inch-diameter aboveground pipe to the LAARC Discharge Pit (SWMU 94F) located approximately 50 feet south of the unit (Figure 6A-6b).

The waste water was released into a 55-gallon drum in the bottom of the unlined discharge pit (Figures 6A-6b and 6A-7) (Martz November 1985). The drum functioned as a flame arrestor, sealing off and extinguishing any burning JP-4 fuel discharged with the waste water (Jercinovic et al. November 1994). As much as 1,500 gallons of waste water per test may have been discharged into the pit.

A.6 THE BOMB BURNER UNIT

The Bomb Burner Unit (also referred to as the Corrugated Facility) was removed in 1997 under the SNL/NM decontamination and decommissioning (D&D) program. The Bomb Burner Unit was constructed of corrugated galvanized steel and mantled by a concrete platform (Figure 6A-8a). It is located approximately 200 feet southeast of the SWISH Unit (SNL/NM August 1994) (Figure 6A-2). The Bomb Burner Unit was constructed in 1982 (Palmieri October 1994, Jercinovic et al. November 1994). Between 1982 and its shutdown in 1988, it was used for 23 burn tests involving the exposure of weapons (some containing DU) and components to abnormal environments (Hooper May 1983, Stevenson December 1895, Mata December 1983, Palmieri October 1994). The Bomb Burner Unit was built inexpensively as an expendable duplicate of the LAARC Unit for conducting burn tests on weapons to avoid risking damage to the LAARC Unit through a possible weapons detonation (Jercinovic et al. November 1994). The Bomb Burner Unit was closed in 1988 under an assurance of discontinuance agreement with the City of Albuquerque Air Pollution Bureau (Palmieri October 1994). The "RCRA [Resource Conservation Facility Investigation (RFI) Work Plan for OU 1333, Canyons Test Area" (SNL/NM September 1995) summarizes the tests conducted at the Bomb Burner Unit.

The Bomb Burner Unit was constructed below ground level to contain potential explosions that might have occurred during burn tests. A shallow, open trench extending southward from the Bomb Burner Unit was constructed to provide vehicle and equipment access to the unit (Figure 6A-8a). Engineering drawings and maps suggest that fuel and water were supplied to the burn unit from three aboveground tanks formerly located approximately 200 feet north of the

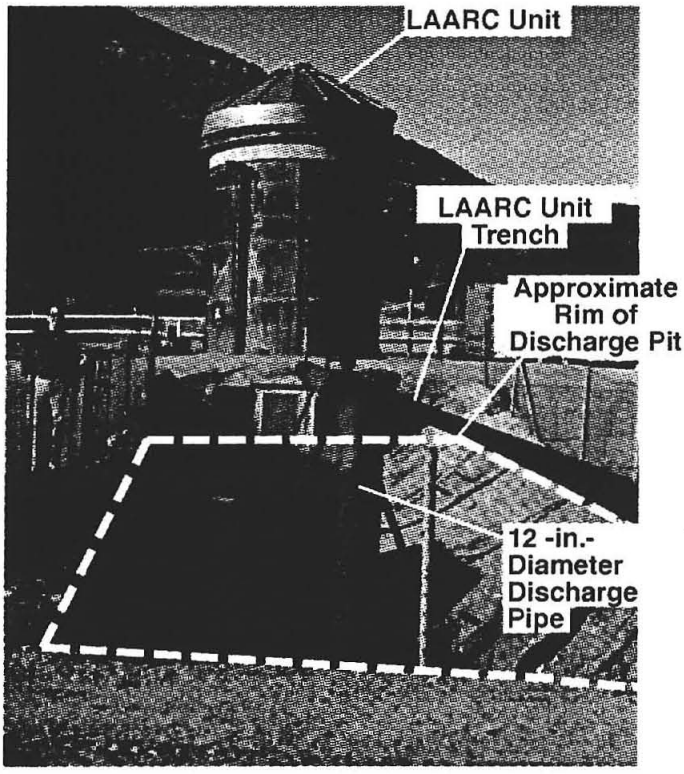

Figure 6A-6a February 1993 photograph of the LAARC Unit trench and discharge pit (SWMU 94F) showing the wastewater management system. Dashed lines show approximate location of the discharge pit rim. View is to the north.

Figure 6A-6b Photograph of LAARC Unit discharge pit (SWMU 94F). The wastewater is discharged through the 12 in.-diameter pipe into a 55-gal drum. The wastewater subsequently overflows into the pit.

Figure 6A-6
Photographs of LAARC Unit and SWMU 94F, LAARC Unit Discharge Pit

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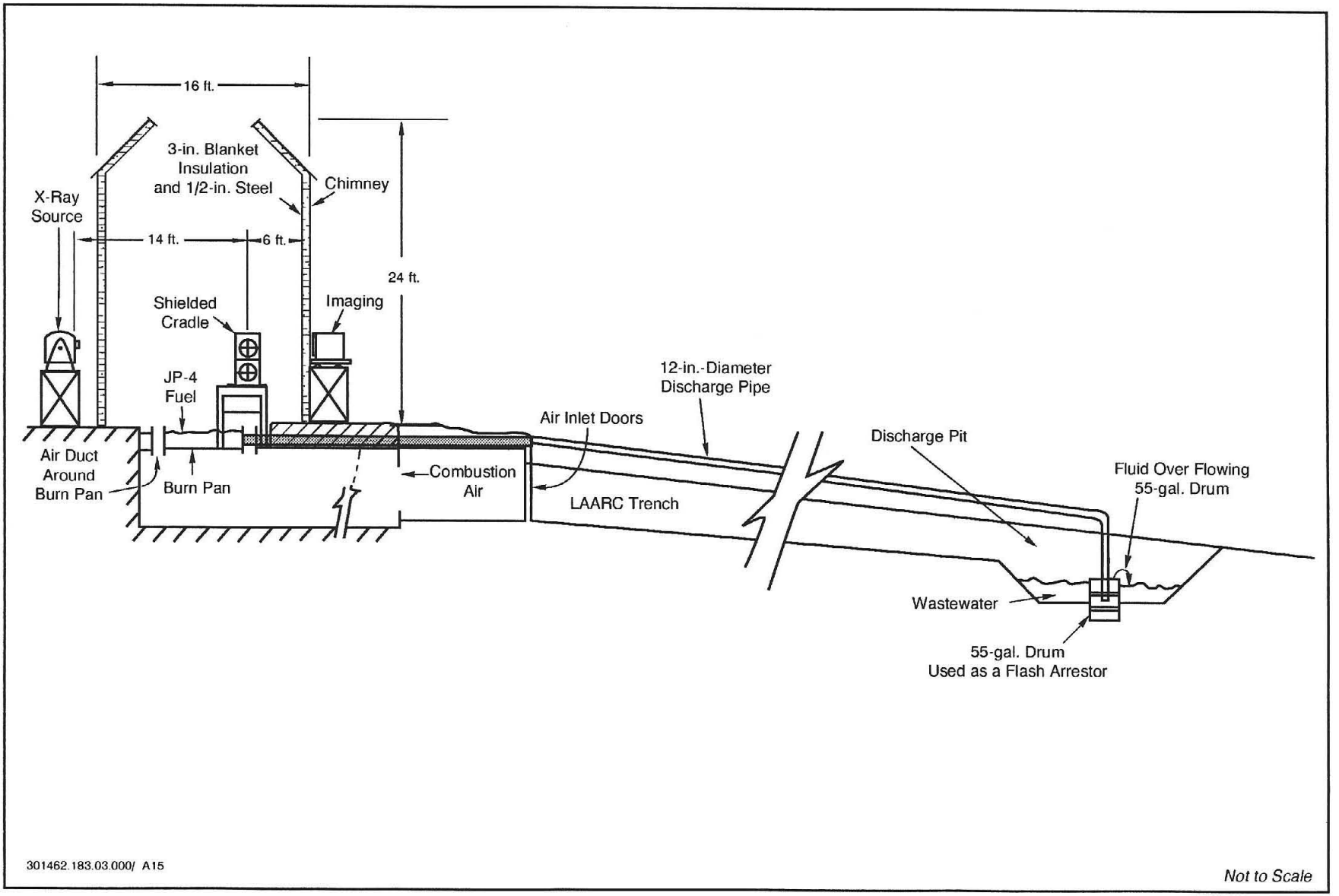

Figure 6A-7
Cross Section of LAARC Unit Showing Aboveground Burn Pan Test and Wastewater System

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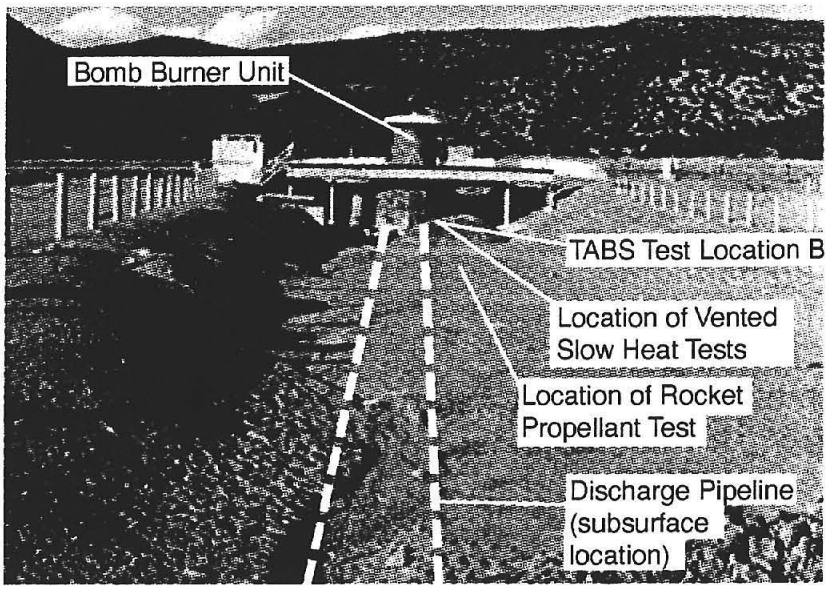

Figure 6A-8a Photograph of the Bomb Burner area and discharge line (SWMU 94C) in February 1993. Approximate locations of the discharge pipeline, TABS Test, Location B rocket propellant test, and vented slow-heat tests are indicated. The approximate location of the uncontained pool-fire tests, which were conducted at the southernmost end of the trench, is not pictured. View is to the north.

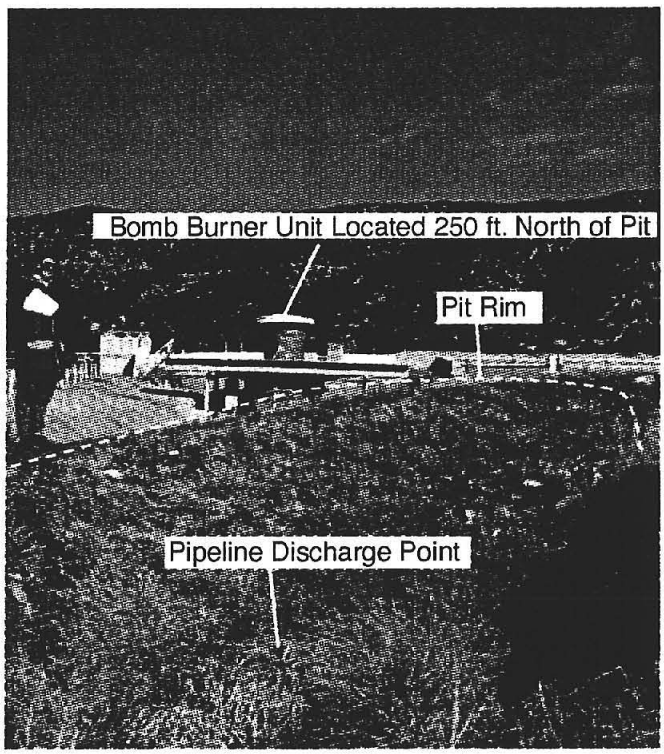

Figure 6A-8b Photograph of Bomb Burner discharge pit (SWMU 94D) in December 1994. The pit is approximately 10 ft wide x 25 ft long x 8 ft deep. View is to the north.

Figure 6A-8
Photographs of SWMU 94C, Bomb Burner Area and Discharge Line, and SWMU 94D, Bomb Burner Discharge Pit

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unit (Figure 6A-1) (SNL/NM 1983). These aboveground tanks have since been removed from the site. The burn pan used in the Bomb Burner Unit is 10 feet in diameter (Hooper May 1983, Mata December 1983). A 12-inch-diameter corrugated pipe connects the burn pan to the Bomb Burner Discharge Pit (SWMU 94D) located approximately 250 feet south of the Bomb Burner Unit (Figure 6A-1) (Palmieri October 1994, Jercinovic et al. November 1994). The discharge pit is approximately 25 feet long, 10 feet wide and 8 feet deep (Figure 6A-8b) (Palmieri December 1994b). Following tests that involved radionuclides, waste water from the Bomb Burner Unit was screened for radiological activity before being released into the discharge pit (Palmieri October 1994). As many as 1,500 gallons of waste water per test may have been discharged into the pit.

Test reports document a number of the tests at the Bomb Burner Unit (Hooper May 1983, Stevenson December 1895, Hill Date [unk], Mata December 1983) and describe the test set up and materials involved. The Bomb Burner Area and Discharge Line are designed as SWMU 94C. The remainder of this section describes two reported tests that are representative of the testing conducted in the Bomb Burner Unit.

In September 1982, a burn test was conducted on a W-69 warhead used in the SRAM missile (Hooper May 1983). Aluminum, steel, HE, and insulation materials were exposed to a JP-4 fuel fire in order to determine the response of the W-69 to an accidental fuel fire. The fuel fire was performed at a temperature of approximately 1,800°F for a total burn time of 95 minutes. The warhead remained in place on the test stand and, as expected, all aluminum and organic components melted (Hooper May 1983). The PBX-9404 HE did not detonate and was consumed in a nonviolent manner, and no warhead materials were expelled from the unit.

On March 9, 1983, a W-80 warhead was subjected to a high-intensity JP-4 fuel fire at a nominal temperature of 2,000°F for approximately 30 minutes (Hill Date [unk], Luna March 1983, SNL/NM November 1994). The purpose of the test was to determine the behavior of internal HE components and the inherent safety of the weapon when exposed to an accidental fuel fire. The test unit configuration consisted of the warhead external aluminum case, binary parts, live insensitive HE material, and a mass simulated canned subassembly placed 3.5 feet above the surface of the fuel. Test unit thermocouples were wrapped with cera-blanket insulation, shielded in a steel pipe, and then wrapped with additional insulation. The HE burned successfully without any explosive incident. Real-time radiography and video coverage of the warhead burn test was observed at Bunker 9830 (Hill Date [unk]).

Several burn tests have been conducted in the Bomb Burner Unit trench since 1982, including portable pan burn tests such as the vented slow-heat tests and uncontained pool fires. Nonpetroleum-fuel-fire burn testing conducted in the trench includes the Torch Activated Burn System (TABS) test Location B (Figure 6A-1) and one series of rocket propellant tests. The TABS test Location B resulted in detonation within the trench.

A.7 THE SWISH UNIT

The SWISH Unit (Figure 6A-9) is located approximately 300 feet east of Bunker 9830 (Figure 6A-2) (SNL/NM August 1994). This active unit was constructed in 1983 and is currently used to study the potential for protecting large pool burns from the wind (Author [unk] Date

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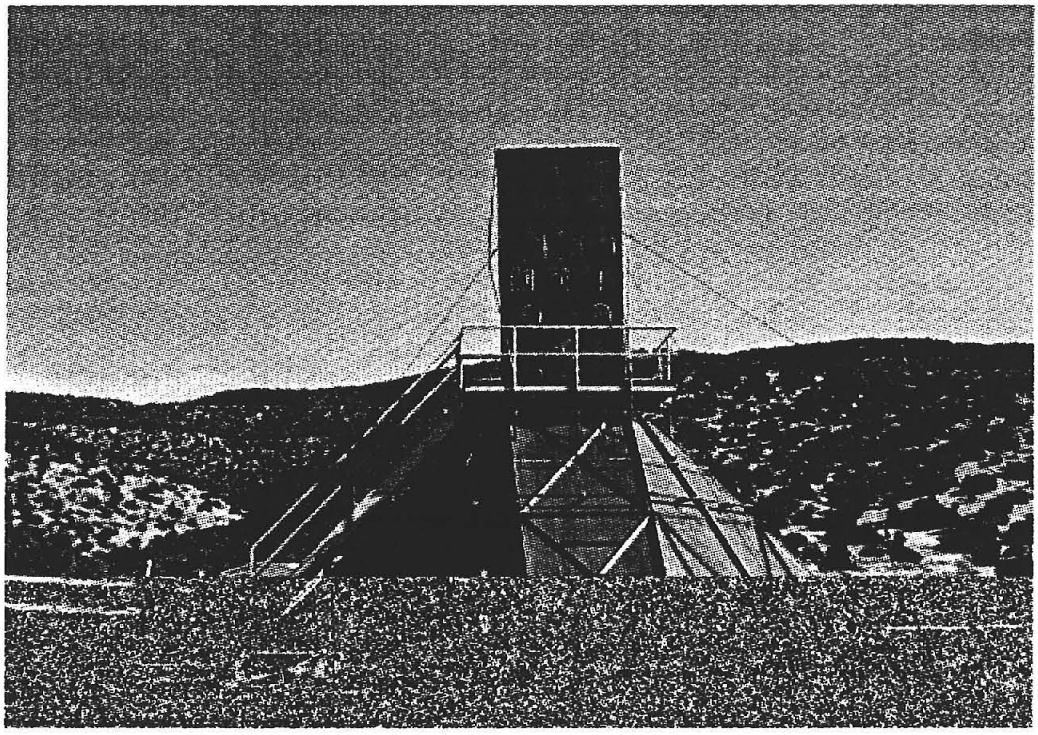

Figure 6A-9
Photograph of SWISH Unit

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[unk]c, Palmieri October 1994, Palmieri December 1994d). The SWISH Unit is the prototype for meeting air-quality requirements while conducting burn tests. To request an exemption from opacity requirements, testimony was given before the City of Albuquerque and Bernalillo County Joint Air Quality Board on September 13, 1995. Approval for the requested exemption is expected in October 1995. This unit has been used in 61 tests where large explosives fragments or blast overpressures were not expected. Typical tests require small volumes (of up to 150 gallons) of JP-4 fuel and involve test units such as hazardous materials shipping containers, small weapon components and weapons mockups containing insensitive HE. Burn pools, typically ranging from 6 feet up to 9 feet in diameter and 3 feet in depth were placed in the center of the SWISH Unit floor, which is about 25 by 25 feet (Author [unk] Date [unk]c, Jercinovic et al. November 1994). The base of the structure tapers to a stack assembly 3 by 6 feet by 13 feet tall (Figure 5-34). The stack is insulated and contains baffles to mix the flow and to reduce the visible air emissions. JP-4 fuel was delivered to the SWISH Unit using portable tanks (Hickox November 1994). Other records indicate that the small brown tank stationed between the SWISH and LAARC Units (Figure 6A-2) was used to store fuel for burn tests at either the SWISH or the LAARC Units (Palmieri December 1994b). The tank is portable, may have been supported by wheels, and holds approximately 100 gallons of fuel (Palmieri December 1994b). Waste water from burn tests conducted in the SWISH Unit is not discharged but is allowed to evaporate (Palmieri December 1994a). There have been no documented historical releases of hazardous constituents to the environment. An external sprinkler system cools the walls of the SWISH Unit. Water circulation pipes and spray nozzles are situated at numerous points on the outside structure. Cooling water that does not evaporate is captured in a shallow trough at the base and is routed to an underground tank for storage and reuse. Burn tests at the SWISH Unit are primarily performed on shipping containers, although lithium batteries have also been burned in the facility (SNL/NM November 1994).

A.8 THE SMERF

The SMERF (Figure 6A-10a and 6A-10b) is an active burn unit located approximately 150 feet east of the Bomb Burner Unit (Figure 6A-2). This facility was constructed after the removal of the CON-CON Unit in 1988 as a scale-up of the SWISH Unit (Author [unk] Date [unk]c, Palmieri October 1994, Larson and Palmieri October 1994). The first recorded test at the SMERF was conducted in August 1992. This burn unit was built to test hazardous materials shipping containers, transportation systems, weapons mockups, and associated materials under actual fire accident conditions (Kent July 1994). Soil removed to enlarge the CON-CON Unit site for the SMERF was bermed to direct surface-water flow away from the burn site facilities into the main arroyo of the Lurance Canyon (Engineered Soil Berms, Figure 6A-2) (Larson and Palmieri October 1994). To date, the only burns conducted in the SMERF have been performance tests with JP-4 fuel (SNL/NM November 1994) to demonstrate compliance with the City of Albuquerque Air Pollution Bureau regulations (Kent July 1994). To request an exemption from opacity requirements, testimony was given before the City of Albuquerque and Bernalillo County Joint Air Quality Board on September 13, 1995. Pending approval for the requested exemption is expected in October 1995.

The SMERF is accessed by a shallow, open trench that rises southward to the entry road (SNL/NM August 1994). The unit consists of a cubical test chamber approximately 20 by 20 feet. The chamber contains a 10- by 10-foot-square burn pan (Author [unk] Date [unk]c) that can be reduced to an 8- or 7-foot-square configuration (SNL/NM November 1994).

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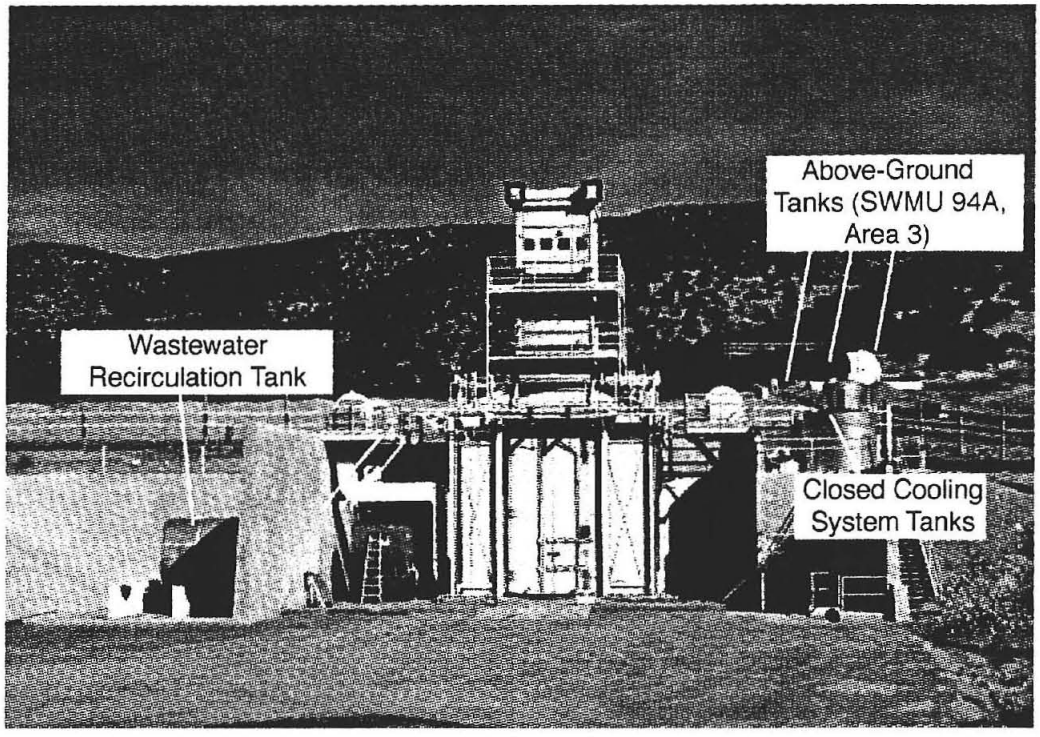

Figure 6A-10a Photograph of the SMERF at SWMU 94 in December 1994. View is to the north.

Figure 6A-10b Photograph of the SMERF conducting performance tests at SWMU 94 in December 1994. View is to the northeast.

Figure 6A-10
Photographs of SMERF

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A 20-foot-tall stack houses a passive afterburner to reduce smoke emissions (Author [unk] Date [unk]c, Kent July 1994). Underground pipelines connect the unit to two of the three aboveground tanks located north of the LOBP (SWMU 94A, Area 3). Two of the lines recirculate a glycol/water cooling mixture between the vertical walls, roof panels, and the storage tank. A third line supplies fuel from the JP-4 fuel tank. The underground pipes join the SMERF at a valve box on the northern side of the unit. The valves are marked "fuel," "water," and "water return." Three additional aboveground tanks are located inside a concrete berm enclosure on the eastern side of the SMERF. These tanks are connected to the incoming pipelines by 8- and 3-inch lines. The tanks are part of the water recirculation system. Two of these aboveground tanks are labeled "nonpotable water," and the third is labeled "water/glycol." These tanks are part of a closed recirculation system. Propylene glycol is used for active cooling of the walls and roof panels in the SMERF (Larson and Palmieri October 1994).

A.9 BUNKER 9830 AND SUPPORT BUILDINGS

Bunker 9830, located approximately 200 feet northwest of the LAARC Unit (Figure 6A-1), was constructed in 1967 to house instrumentation for SWMU 65 activities. The eastern half of Bunker 9830 was used from 1975 though 1980 for fire tests on nuclear reactor control cables (Larson and Palmieri August 1994a, Palmieri November 1994a). These tests were conducted as part of the reactor safety program in response to the Browns Ferry Reactor fire. In the initial test, a mockup of a nuclear reactor cable assembly was constructed in Bunker 9830 and was ignited to simulate the incident (Brouillard June 1994). The tests used heptane as a fuel source. The number of tests conducted is unknown. Fire suppression tests were conducted in Bunker 9830 from 1975 to 1980. A series of ten fire tests on cable insulation were conducted using propane gas (Palmieri and Larsen October 1994). The bunker is not involved in current SWMU 94 burn operations (Palmieri December 1994b) and is used to store equipment. All testing in Bunker 9830 was completely contained, and there have been no documented historical releases of hazardous constituents to the environment.

Several small trailers northwest of Bunker 9830 store equipment, tools, parts, insulation, cable, television monitors, instrumentation, and data systems (Larson and Palmieri October 1994). Several trailers are marked by placards indicating the storage of hazardous chemicals. According to interviewees, these designations are inaccurate for all but one identified trailer, because there actually is no chemical storage in these trailers (Larson and Palmieri October 1994, Palmieri December 1994b). Currently, all chemicals are stored in Building 9833A, which is located about 200 feet southwest of Bunker 9830 (Figure 6A-2) (Larson and Palmieri October 1994).

The control and instrumentation point for the Lurance Canyon Explosives Test Site during explosives testing was Building 9831 at SWMU 81 (New Aerial Cable Site). By 1979, the control facility was moved to what is now the lunch trailer (Palmieri April 1995) located 30 feet from Bunker 9830. Currently, the control facility is set up in a trailer located off the southwest corner of Bunker 9830 (Figure 6A-1) (Larson and Palmieri August 1994). Cables radiate from each of the previous control facilities to the various burn site units (Larson and Palmieri October 1994).

A.10 ABOVEGROUND TANKS

Aboveground tanks (SWMU 94A) have been used to supply water, JP-4 fuel, and coolant for burn testing at all of the engineered structures. There are three storage tank locations at SWMU 94 that served the LAARC Unit, the Bomb Burner Unit, the SMERF, the SOBP, and the LOBP. The aboveground tank locations include an area north of the LAARC Unit, north of the Bomb Burner Unit, and the current tank location north of the LOBP (Figure 6A-1). These three aboveground tank locations are discussed below.

North of the LAARC Unit (Area 1)

An aboveground tank labeled "nonpotable water" is currently located north of the LAARC Unit and was used to supply water to the unit (Figure 6A-1 and 6A-11a) (Hickox November 1994). Two aboveground tanks were also formerly used for fuel storage at this location (Kervin April 1981). These two tanks have since been removed.

North of the Bomb Burner Unit (Area 2)

The 1983 historical aerial photograph shows that three aboveground tanks were formerly located north of the Bomb Burner Unit (Figures 6A-1 and 6A-11b) (SNL/NM 1983). These aboveground tanks were used to supply JP-4 fuel and water for testing at the Bomb Burner Unit. The tanks are no longer present at the site, and no documentation exists that describes the installation and removal of the tanks. No physical evidence exists at the site to identify their former locations.

North of the LOBP (Area 3)

Three aboveground tanks are now located approximately 400 feet north of the LOBP: One contains JP-4 fuel, another contains nonpotable water, and the third contains glycol/water (Figures 6A-2 and 6A-11c). Prior to 1992, when the nonpotable water and glycol/water tanks were installed, there were two nonpotable water tanks in addition to a JP-4 fuel tank at the same location (Figure 6A-2) (Hickox November 1994). The current nonpotable water and JP-4 fuel tanks provide water and fuel for burn tests conducted at the LOBP, the SOBP, and the SMERF. The glycol/water is used as a coolant for the SMERF. A plastic-lined, earthen, secondary overflow containment pit is installed around the aboveground tank containing JP-4 fuel (Figure 6A-11d) (Larson and Palmieri October 1994).

Two underground pipelines connect the LOBP to the JP-4 fuel tank and to the nonpotable water tank. Two aboveground 3.5-inch-diameter galvanized metal pipelines connect the SOBP to the JP-4 fuel tank and to the nonpotable water tank. Three underground pipelines run from the tanks to the SMERF: One connects to the JP-4 fuel tank, and the other two provide glycol/water coolant for circulation between the vertical walls and roof panels of the SMERF. A recirculation system currently routes waste water back to the water and water/glycol tanks for storage and reuse (Hickox November 1994, Larson and Palmieri October 1994).

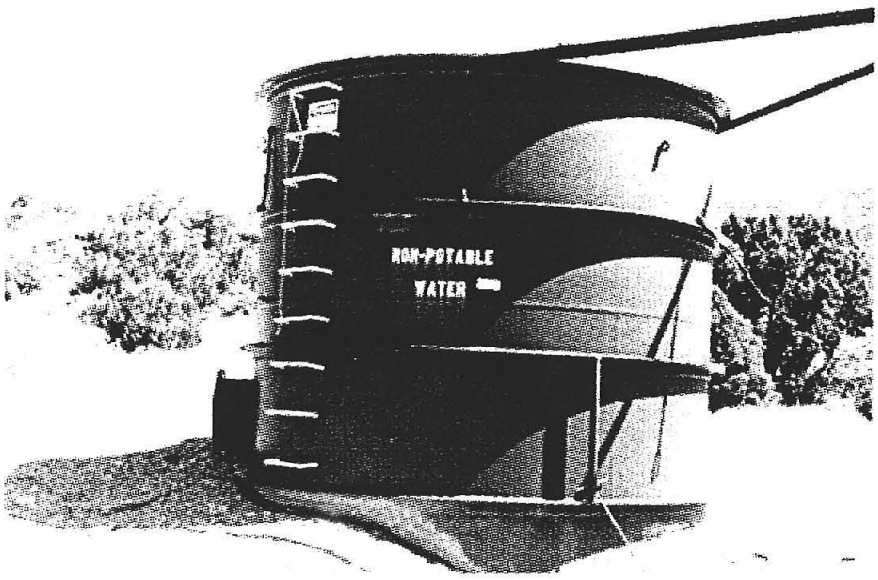

Figure 6A-11a Photograph of the above ground tank (SWMU 94A, Area 1) north of the LAARC Unit in April 1995. Additional above ground tanks storing fuel were located here when the LAARC was active. View is to the northeast.

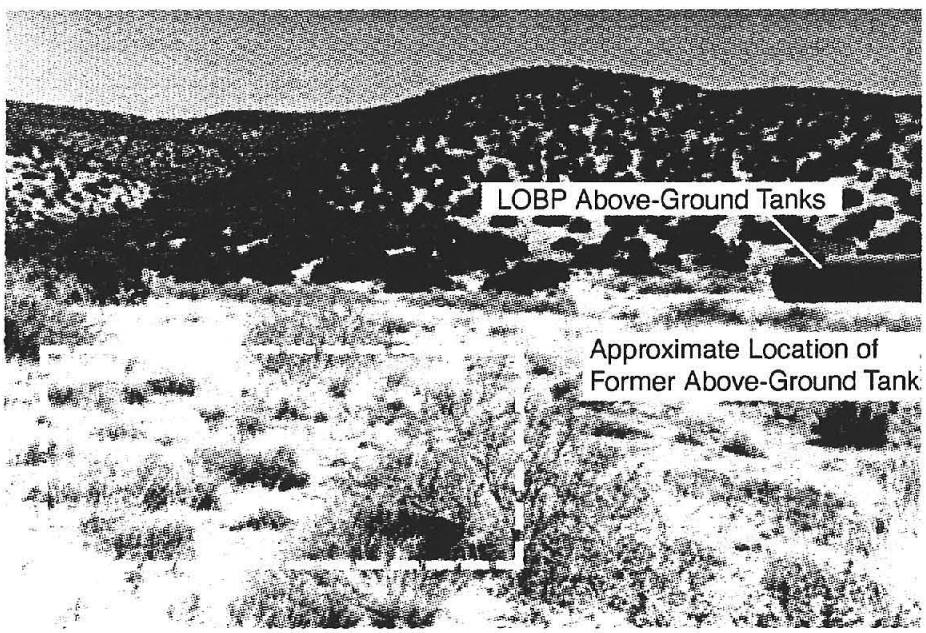

Figure 6A-11b Photograph of the former above ground tank location (SWMU 94A, Area 2) north of the Bomb Burner Unit in April 1995. The above ground tanks north of the LOBP are visable in the background. View is to the northeast.

Figure 6A-11
Photographs of SWMU 94A, Aboveground Tank North of LAARC Unit and Location of Former Aboveground Tank North of Bomb Burner Unit

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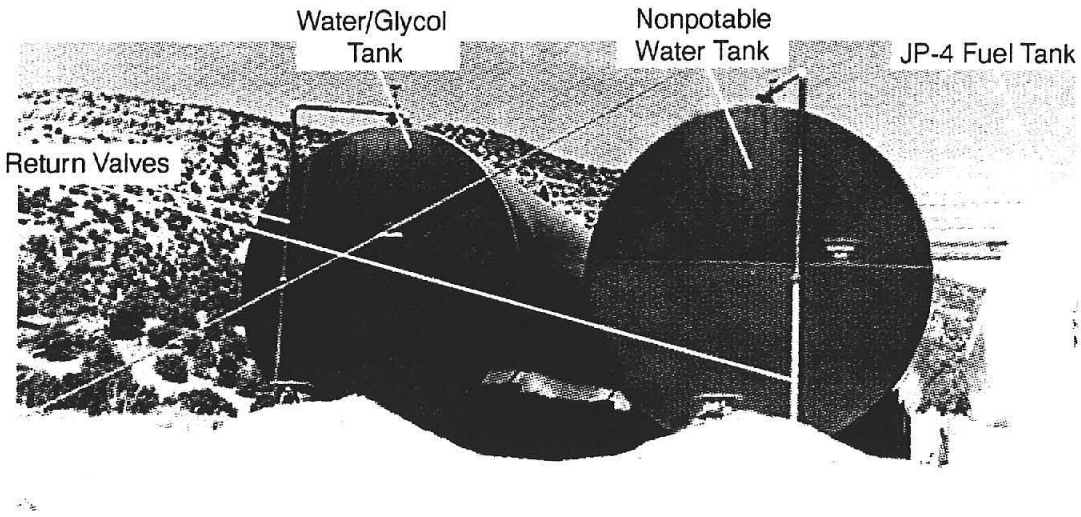

Figure 6A-11c Photograph of the aboveground tanks north of the LOBP (SWMU 94A, Area 3) in April 1995. The aboveground tanks provide the recirculation system for the LOBP, SOBP, and for the SMERF. Nonpotable water is recirculated back to the labeled tank following testing. View is to the north.

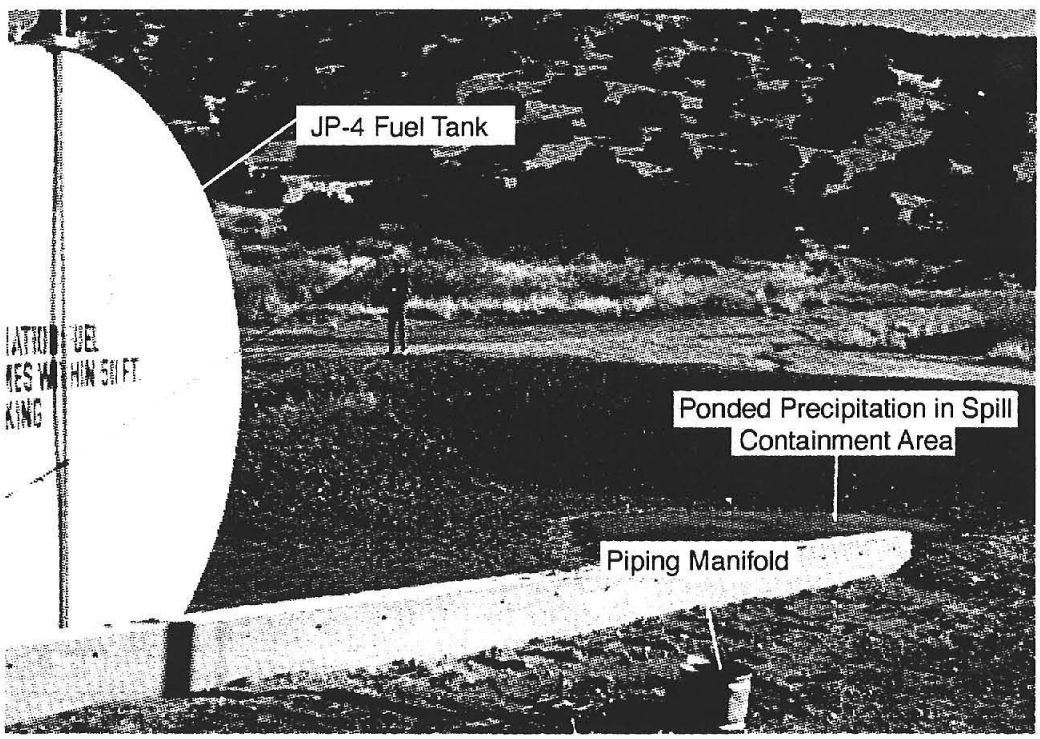

Figure 6A-11d Photograph of the spill containment area surrounding the JP-4 fuel aboveground tank (SWMU 94A, Area 3) north of the LOBP in December 1994. The spill containment area is constructed of soil overlying a plastic liner. View is to the northeast.

Figure 6A-11 (concluded)
Photographs of SWMU 94A, Aboveground Tanks North of LOBP

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A.11 Debris/Soil Mounds

A Debris/Soil Mound Area (SWMU 94B) is located on the southern portion of SWMU 94, north of the main arroyo in the Lurance Canyon (Figures 6A-2 and 6A-12). There is little documentation for the origination of the debris/soil mound area, but this site appears to be the product of grading and soil redistribution during the evolution of SWMU 94 since 1983. The mounds, which range in height from about 3 to 6 feet, are not clearly defined but merge together. The only apparent debris in the soil mound area is concrete fragments, electrical cables, and wood (Figure 6A-12). Several radiological anomalies have been identified in the debris/soil mound area. The radiological anomalies may be associated with past activities at SWMU 65.

A.12 SCRAP YARD

The Lurance Canyon Burn Site Scrap Yard (SWMU 94G) was started in 1980 in the northwestern portion of the site (Figures 6A-2 and 6A-13) (Palmieri November 1994). The scrap yard contains unused test equipment, portable generators, fiber/ceramic insulation, pipes, pump motors, cinder blocks, test stands, cables, wood, portable pans, empty tanks labeled JP-4, empty drums, and scrap metal (Figure 6A-13a and 6A-13b) (Hickox November 1994, Larson and Palmieri October 1994). In approximately 1990, hydraulic oil leaked onto the soil in the equipment/scrap yard (Larson and Palmieri October 1994). This is the only documented release of liquid at the scrap yard. The affected soil was placed in 55-gallon drums and removed (Larson and Palmieri October 1994). No other containerized fluids have ever been (nor are expected to be) stored in the scrap yard.

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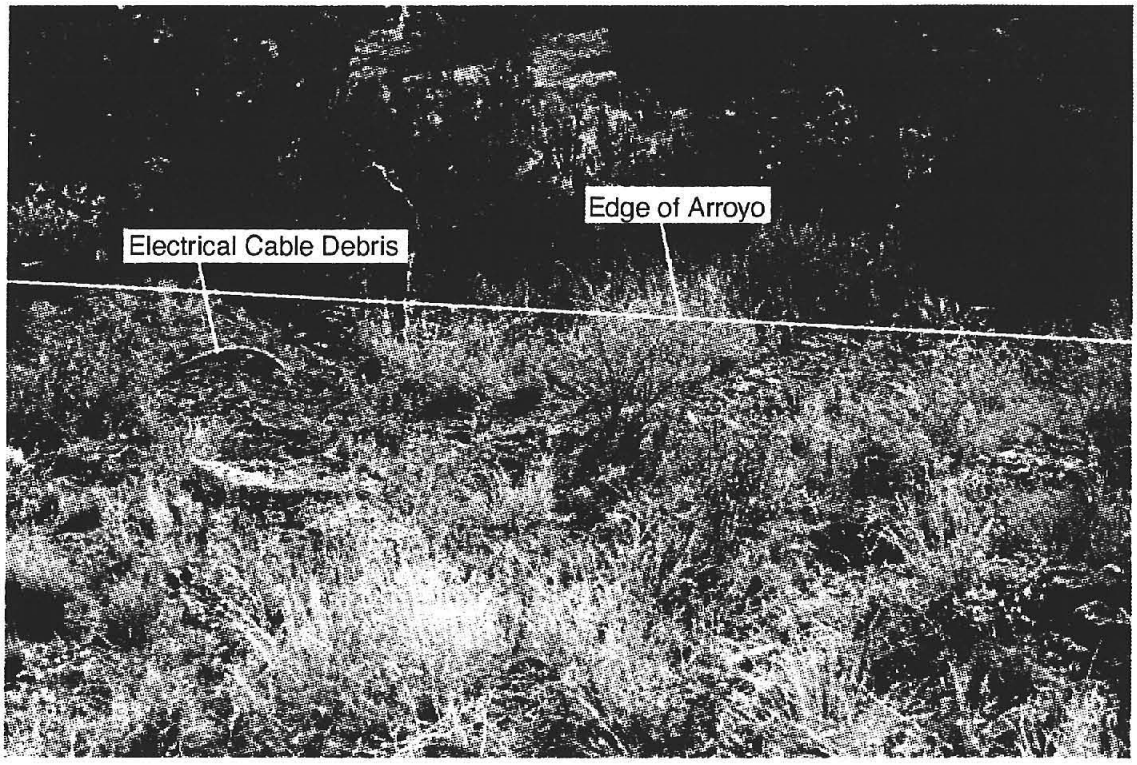

Photograph of part of the debris/soil mound area (SWMU 94B) in December 1994. Visible debris is identified. View is to the south.

Figure 6A-12
Photograph of SWMU 94B, Debris/Soil Mound Area

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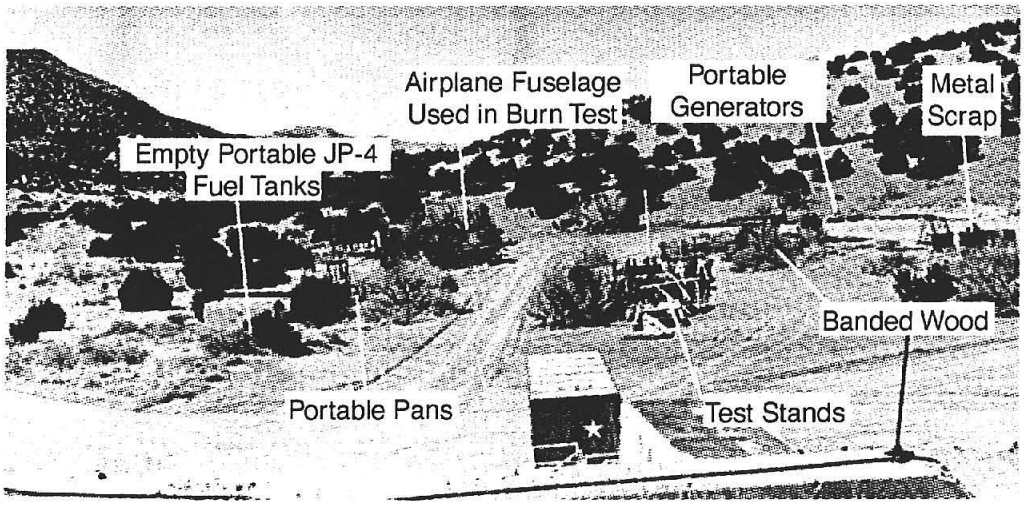

Figure 6A-13a Photograph of the scrap yard (SWMU 94G) in April 1995. Stored inventory is indicated. View is to the west.

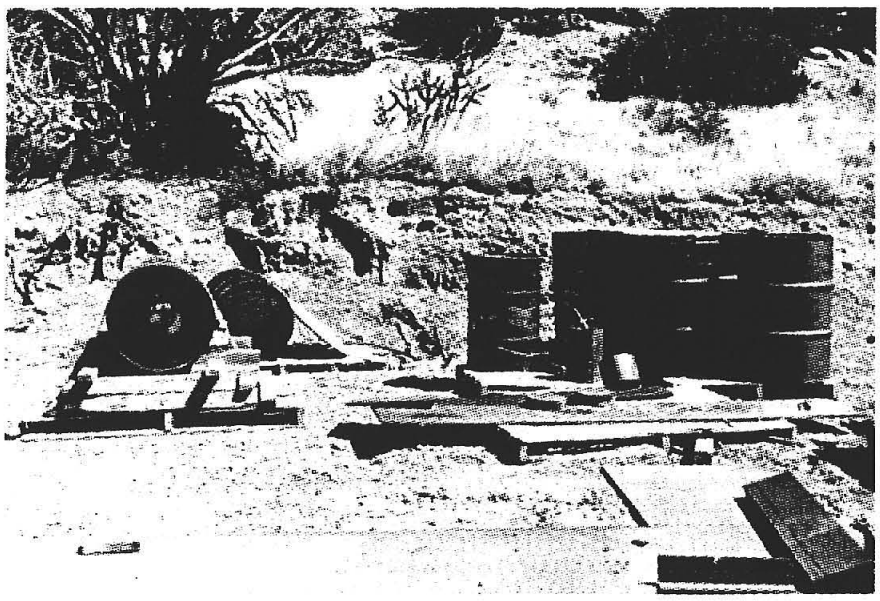

Figure 6A-13b Photograph of empty drums in the northern portion of the scrap yard (SWMU 94G) in April 1995. View is to the north.

Figure 6A-13
Photographs of SWMU 94G, Scrap Yard

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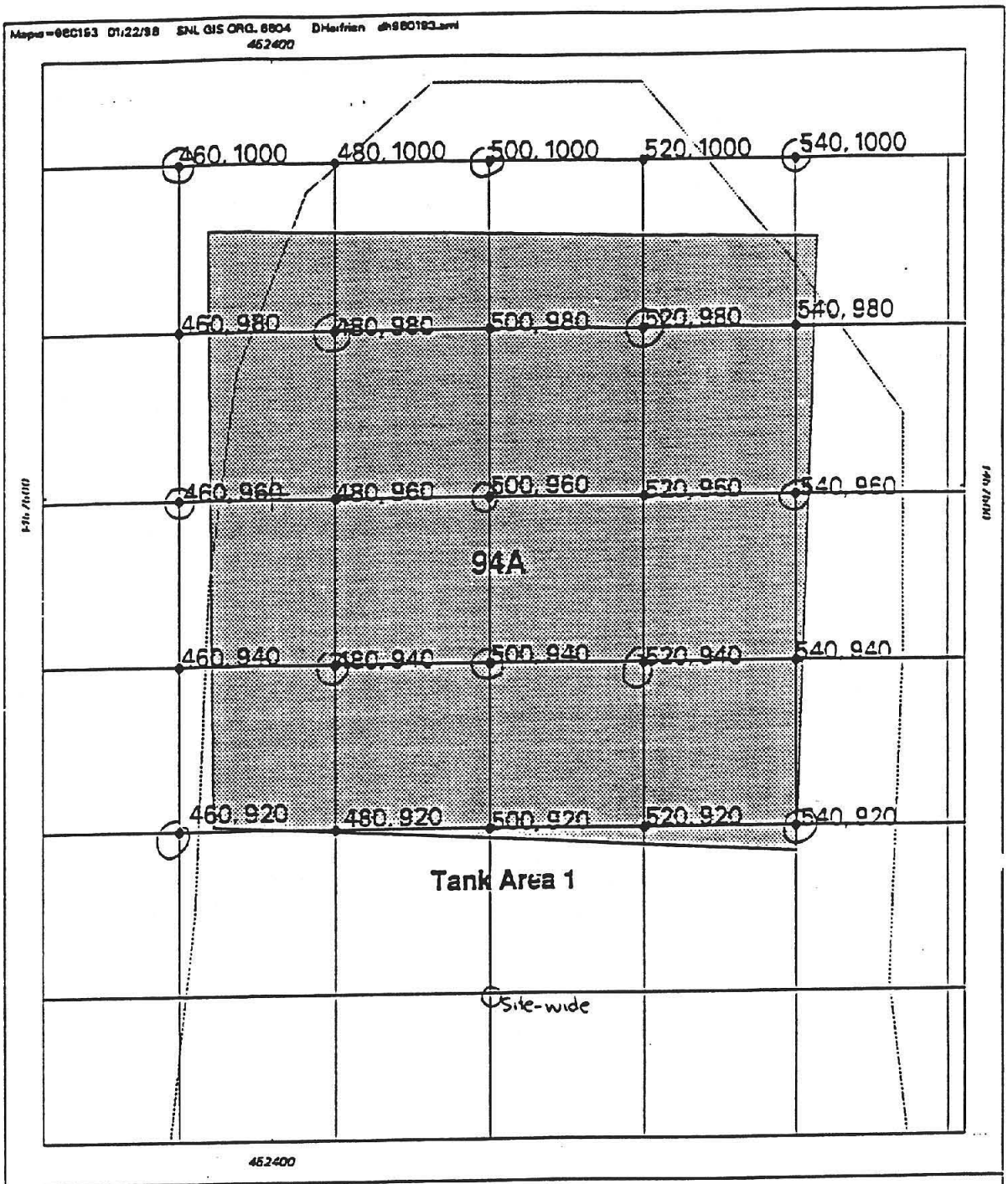
ANNEX 6-B
Summary of Gore-Sorber Passive Soil Gas Results
May 8, 1998



Legend

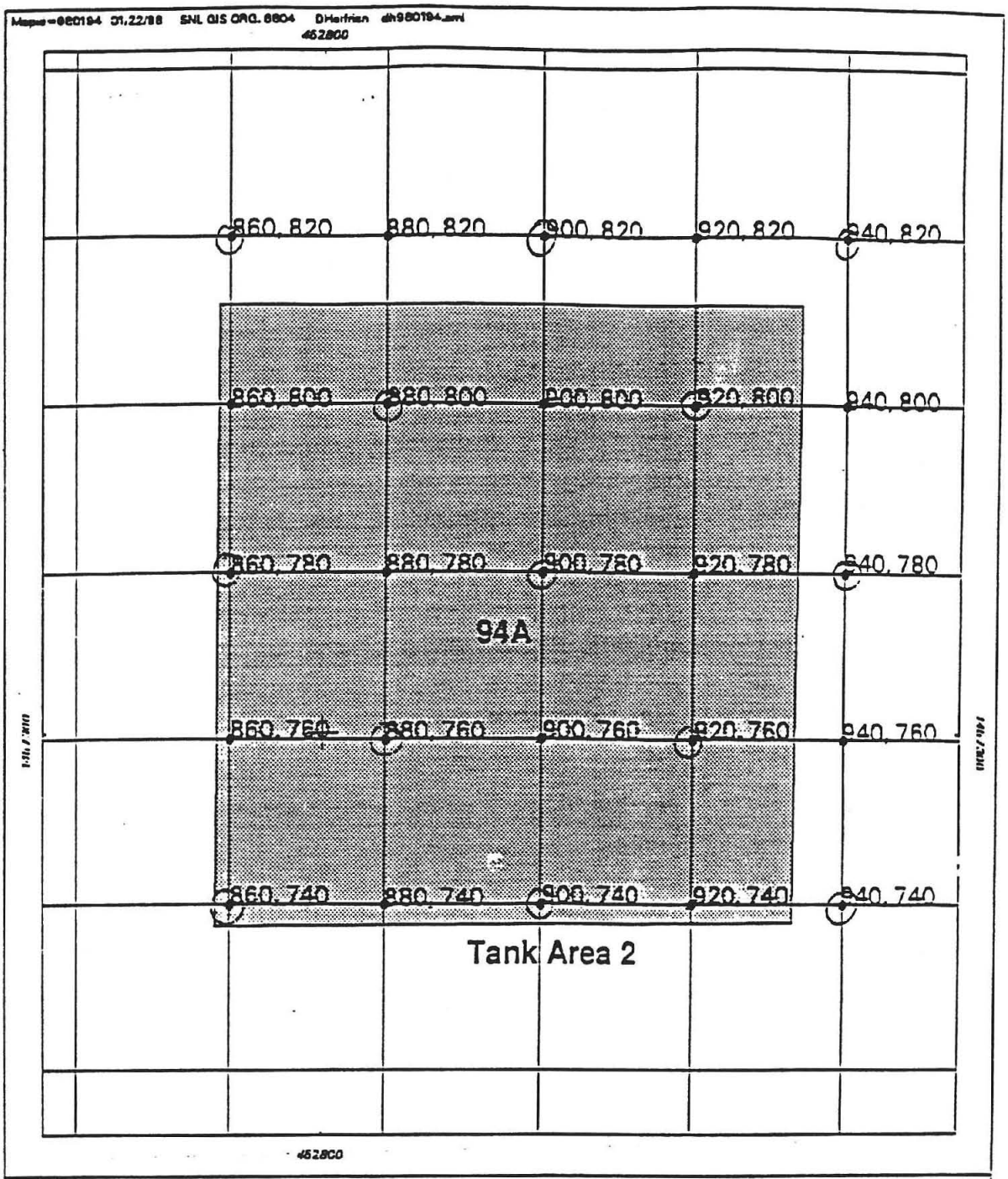
- Sample Location
- Road
- 20' Sample Grid Line
- ER Site 94A

Figure 3
ER Site 94A, Tank Area 1
Soil Vapor Sampling Locations

Scale in Feet

Scale in Meters

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

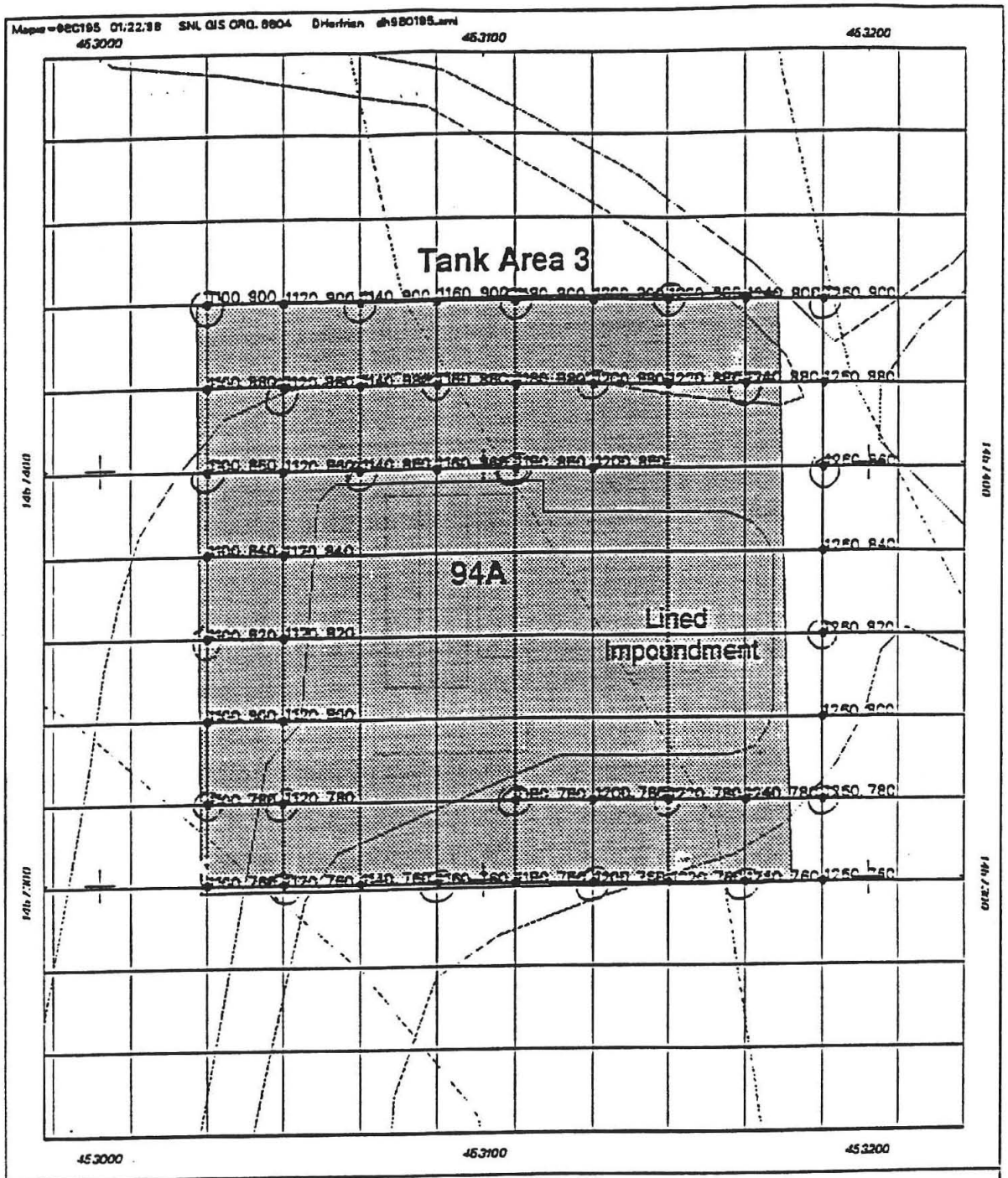


Legend

- Sample Location
- Road
- 20' Sample Grid Line
- ER Site 94A

Figure 4
ER Site 94A, Tank Area 2
Soil Vapor Sampling Locations

Sandia National Laboratories, New Mexico
Environmental Geographic Information System



Legend

- Sample Location
- Road
- 10 Foot Contour
- 20' Sample Grid Line
- Storage Tank
- ER Site 94A

Figure 5
ER Site 94A, Tank Area 3
Soil Vapor Sampling Locations

Sandia National Laboratories, New Mexico
Environmental Geographic Information System

Passive Soil Vapor Screening
Installation and Retrieval Form
GORE-SORBER

Sandia National Laboratories
OU 1333 Burn Site
Project Leader: Sharissa Young
ATL: Grace Haggerty (505) 284-2545

page __1__ of __1___

Recorder: W. Foutz/G. Haggerty

ER Site #: 94A-1

Date: 24-Feb-98

Line #	ER Sample Identification	GORE Sample Number	Depth Installed (inches)	Installation Date/Time	Retrieval Date/Time	Comments: Evidence of Hydrocarbons or Odor; Other
1	CY94A1-540,920-01-PSV	150634	36	2/24/98 (0950)	3/11/98 (1530)	Al
2	CY94A1-540,960-01-PSV	150635	36	2/24/98 (1000)	3/11/98 (1536)	Al
3	CY94A1-540,1000-01-PSV	150636	36	2/24/98 (1010)	3/11/98 (1537)	Al
4	CY94A1-520,980-01-PSV	150637	36	2/24/98 (1015)	3/11/98 (1538)	Al
5	CY94A1-520,940-01-PSV	150638	36	2/24/98 (1018)	3/11/98 (1540)	Al
6	CY94A1-500,1000-01-PSV	150639	36	2/24/98 (1020)	3/11/98 (1543)	Al
7	CY94A1-500,960-01-PSV	150640	36	2/24/98 (1023)	3/11/98 (1545)	Al
8	CY94A1-500,960-DU-PSV	150641	36	2/24/98 (1023)	3/11/98 (1545)	Al
9	CY94A1-500,940-01-PSV	150642	36	2/24/98 (1025)	3/11/98 (1546)	Al
		150643				Al
10	CY94A1-480,940-01-PSV	150644	36	2/24/98 (1050)	3/11/98 (1550)	Al
11	CY94A1-480,980-01-PSV	150645	36	2/24/98 (1115)	3/11/98 (1551)	Al
12	CY94A1-460,920-01-PSV	150646	24	2/24/98 (1120)	3/11/98 (1556)	Al
13	CY94A1-460,960-01-PSV	150647	36	2/24/98 (1110)	3/11/98 (1554)	Al
14	CY94A1-460,1000-01-PSV	150648	36	2/24/98 (1108)	3/11/98 (1552)	Al
15	CY94A1-FB-PSV	150649		2/24/98 (1108)	3/11/98 (1535)	Al

Passive Soil Vapor Screening
Installation and Retrieval Form
GORE-SORBER

Sandia National Laboratories
OU 1333 Burn Site
Project Leader: Sharissa Young
ATL: Grace Haggerty (505) 284-2545

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Recorder: Grace Haggerty/Walt Foutz

ER Site #: 94A-2

Date: 2/24/98

Line #	ER Sample Identification	GORE Sample Number	Depth Installed (inches)	Installation Date/Time	Retrieval Date/Time	Comments: Evidence of Hydrocarbons or Odor; Other
1	CY94A2-860,740-01-PSV	150657	36	2/24/98 (1450)	3/11/98 (1622)	Al
2	CY94A2-900,740-01-PSV	150658	36	2/24/98 (1455)	3/11/98 (1620)	Al
3	CY94A2-940,740-01-PSV	150659	36	2/24/98 (1510)	3/11/98 (1625)	Al
4	CY94A2-920,760-01-PSV	150660	36	2/24/98 (1525)	3/11/98 (1624)	Al
5	CY94A2-880,760-01-PSV	150661	36	2/24/98 (1520)	3/11/98 (1626)	Al
6	CY94A2-860,780-01-PSV	150662	36	2/24/98 (1530)	3/11/98 (1627)	Al
7	CY94A2-900,780-01-PSV	150663	36	2/24/98 (1535)	3/11/98 (1635)	Al
8	CY94A2-940,780-01-PSV	150664	36	2/24/98 (1540)	3/11/98 (1637)	Al
9	CY94A2-880,800-01-PSV	150665	36	2/24/98 (1545)	3/11/98 (1641)	Al
10	CY94A2-920,800-01-PSV	150666	36	2/24/98 (1550)	3/11/98 (1640)	Al
11	CY94A2-860,820-01-PSV	150667	36	2/24/98 (1555)	3/11/98 (1642)	Al
12	CY94A2-900,820-01-PSV	150668	36	2/24/98 (1600)	3/11/98 (1643)	Al
13	CY94A2-940,820-01-PSV	150669	36	2/24/98 (1605)	3/11/98 (1644)	Al

Passive Soil Vapor Screening
Installation and Retrieval Form
GORE-SORBER

Sandia National Laboratories
OU 1333 Burn Site
Project Leader: Sharissa Young
ATL: Grace Haggerty (505) 284-2545

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Recorder: Grace Haggerty

ER Site #: 94A-3

Date:

Line #	ER Sample Identification	GORE Sample Number	Depth Installed (inches)	Installation Date/Time	Retrieval Date/Time	Comments: Evidence of Hydrocarbons or Odor; Other
1	CY94A3-1120,780-01-PSV	150670	36	2/25/98 (1155)	3/12/98 (1303)	Al
2	CY94A3-1100,780-01-PSV	150671	36	2/25/98 (1150)	3/12/98 (1300)	Al
3	CY94A3-1120,760-01-PSV	150672	36	2/25/98 (1200)	3/12/98 (1302)	Al
4	CY94A3-1100,820-01-PSV	150673	36	2/25/98 (1210)	3/12/98 (1305)	Al
5	CY94A3-1100,860-01-PSV	150674	36	2/25/98 (1212)	3/12/98 (1307)	Al
6	CY94A3-1100,900-01-PSV	150675	36	2/25/98 (1213)	3/12/98 (1310)	Al
7	CY94A3-1140,860-01-PSV	150676	36	2/25/98 (1215)	3/12/98 (1311)	Al
8	CY94A3-1180,860-01-PSV**	150677		2/25/98 (1214)	3/12/98 (1312)	Al
9	CY94A3-1180,860-DU-PSV**	150678	36	2/25/98 (1215)	3/12/98 (1312)	Al
10	CY94A3-1120,880-01-PSV	150679	36	2/25/98 (1225)	3/12/98 (1317)	Al
11	CY94A3-1160,880-01-PSV	150680	36	2/25/98 (1227)	3/12/98 (1320)	Al
12	CY94A3-1200,880-01-PSV	150681	36	2/25/98 (1229)	3/12/98 (1322)	Al
13	CY94A3-1240,880-01-PSV	150682	36	2/25/98 (1235)	3/12/98 (1325)	Al
14	CY94A3-1140,900-01-PSV	150683	36	2/25/98 (1405)	3/12/98 (1326)	Al
15	CY94A3-1180,900-01-PSV	150684	36	2/25/98 (1415)	3/12/98 (1327)	Al

Passive Soil Vapor Screening
Installation and Retrieval Form
GORE-SORBER

Sandia National Laboratories
OU 1333 Burn Site
Project Leader: Sharissa Young
ATL: Grace Haggerty (505) 284-2545

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Recorder: Grace Haggerty

ER Site #: 94A-3

Date:

Line #	ER Sample Identification	GORE Sample Number	Depth Installed (inches)	Installation Date/Time	Retrieval Date/Time	Comments: Evidence of Hydrocarbons or Odor; Other
16	CY94A3-1220,900-01-PSV	150685	36	2/25/98 (1417)	3/12/98 (1328)	AI
17	CY94A3-1260,900-01-PSV	150686	36	2/25/98 (1418)	3/12/98 (1329)	AI
18	CY94A3-1260,860-01-PSV	150687	36	2/25/98 (1420)	3/12/98 (1330)	AI
19	CY94A3-1260,820-01-PSV	150688	36	2/25/98 (1422)	3/12/98 (1332)	AI
20	CY94A3-1260,780-01-PSV	150689	36	2/25/98 (1425)	3/12/98 (1334)	AI
21	CY94A3-1220,780-01-PSV	150690	36	2/25/98 (1430)	3/12/98 (1336)	AI
22	CY94A3-1180,780-01-PSV	150691	36	2/25/98 (1440)	3/12/98 (1338)	AI
23	CY94A3-1160,760-01-PSV	150692	36	2/25/98 (1442)	3/12/98 (1339)	AI
24	CY94A3-1200,760-01-PSV	150693	36	2/25/98 (1445)	3/12/98 (1337)	AI
25	CY94A3-1240,760-01-PSV	150694	36	2/25/98 (1448)	3/12/98 (1335)	AI
26	CY94A3-FB-PSV					Field Blank

Trip Blanks 150930 /
150931 /
150932 /

150926, 927 listed on p 2 of 2 for Site # 81C

SVS Data 3:34 PM 3/26/98

GORE SORBER SCREENING SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABORATORY, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
OU1333 BURN SITE, ALBUQUERQUE, NM
SITE ALS - PRODUCTION ORDER #093733

DATE ANALYZED	MODULE NUMBER	BTEX, ug	BENZ, ug	EtBENZ, ug	TOL, ug	mpXYL, ug	oXYL, ug	C11, C13, &C15, ug	PENTADEC, ug	UNDEC, ug
	MDL=	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.04
03/24/98	150634	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150635	13.56	0.05	nd	13.29	0.18	0.04	0.17	bdl	0.16
03/24/98	150636	0.48	nd	nd	0.48	nd	nd	bdl	bdl	bdl
03/24/98	150637	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150638	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150639	nd	nd	nd	nd	nd	nd	nd	bdl	nd
03/24/98	150640	nd	nd	nd	nd	nd	nd	bdl	nd	bdl
03/24/98	150641	nd	nd	nd	nd	nd	nd	bdl	bdl	bdl
03/24/98	150642	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150643	0.08	0.04	nd	nd	0.03	nd	bdl	bdl	nd
03/24/98	150643	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150645	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150646	0.25	nd	nd	0.19	0.05	nd	bdl	nd	bdl
03/24/98	150647	nd	nd	nd	nd	nd	nd	nd	bdl	nd
03/24/98	150648	0.15	0.06	nd	0.08	bdl	nd	bdl	bdl	bdl
03/24/98	150650	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150651	1.31	nd	nd	1.31	nd	nd	bdl	bdl	nd
03/24/98	150652	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150653	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150654	0.07	nd	nd	0.07	nd	nd	0.03	0.03	nd
03/24/98	150655	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150656	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150657	nd	nd	nd	nd	nd	nd	nd	nd	nd
/24/98	150658	bdl	nd	nd	nd	bdl	nd	nd	nd	nd
/24/98	150659	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150660	0.03	nd	nd	nd	0.03	nd	bdl	bdl	nd
03/24/98	150661	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150662	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150663	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150664	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150665	0.02	nd	nd	nd	0.02	nd	bdl	bdl	bdl
03/24/98	150666	0.05	nd	nd	nd	0.05	nd	nd	nd	nd
03/24/98	150667	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150668	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150669	0.14	nd	nd	0.10	0.03	nd	0.10	nd	0.10
03/24/98	150670	0.09	nd	nd	nd	0.07	bdl	nd	nd	nd
03/24/98	150671	0.37	nd	nd	0.17	0.13	0.07	bdl	bdl	nd
03/24/98	150672	0.09	nd	nd	0.06	0.03	nd	nd	nd	nd
03/24/98	150673	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150674	0.09	nd	nd	0.06	0.02	nd	bdl	bdl	nd
03/24/98	150675	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150676	nd	nd	nd	nd	nd	nd	nd	bdl	nd
03/24/98	150677	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150678	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150679	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150680	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/25/98	150681	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150682	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150683	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150684	0.16	nd	nd	0.16	nd	nd	bdl	bdl	bdl
03/24/98	150685	nd	nd	nd	nd	nd	nd	nd	nd	nd
/24/98	150686	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
/24/98	150687	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150688	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150689	nd	nd	nd	nd	nd	nd	nd	bdl	nd

GORE SORBER SCREENING SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABORATORY, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
OU1333 BURN SITE, ALBUQUERQUE, NM
SITE ALS - PRODUCTION ORDER #093733

DATE ANALYZED	MODULE NUMBER	BTEX, ug	BENZ, ug	EtBENZ, ug	TOL, ug	mpXYL, ug	oXYL, ug	C11, C13, &C15, ug	PENTADEC, ug	UNDEC, ug
	MDL=	0.02	0.03	0.02	0.03	0.02	0.03	0.02	0.03	0.04
03/24/98	150690	0.12	nd	nd	0.09	0.03	nd	0.06	bdl	0.05
03/25/98	150691	nd	nd	nd	nd	nd	nd	0.04	0.04	nd
03/25/98	150692	nd	nd	nd	nd	nd	nd	nd	bdl	nd
03/25/98	150693	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/25/98	150694	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150713	nd	nd	nd	nd	nd	nd	nd	nd	nd
03/24/98	150714	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/24/98	150715	bdl	nd	nd	nd	bdl	nd	nd	nd	nd
03/23/98	150716	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/23/98	150725	11.63	nd	1.00	4.86	4.20	1.57	2.20	nd	2.20
03/23/98	150716 26	8.91	nd	1.20	2.21	4.11	1.39	0.98	nd	0.97
03/23/98	150727	0.36	nd	0.04	0.14	0.13	0.05	bdl	bdl	bdl
03/23/98	150728	5.03	nd	0.60	1.91	1.93	0.60	0.11	bdl	0.10
03/23/98	150729	1.20	nd	0.13	0.59	0.38	0.11	bdl	nd	bdl
03/23/98	150730	nd	nd	nd	nd	nd	nd	bdl	nd	bdl
03/23/98	150731	0.14	nd	nd	0.12	0.03	nd	bdl	nd	bdl
03/23/98	150749	nd	nd	nd	nd	nd	nd	nd	bdl	nd
03/23/98	150750	nd	nd	nd	nd	nd	nd	0.03	0.03	nd
03/23/98	150752	0.13	nd	nd	0.10	0.03	nd	bdl	bdl	bdl
03/23/98	150754	0.22	0.09	nd	nd	0.10	0.04	0.12	nd	0.11
03/23/98	150755	0.07	nd	bdl	nd	0.04	bdl	bdl	bdl	bdl
03/23/98	150756	0.05	nd	nd	nd	0.05	nd	bdl	bdl	nd
03/23/98	150757	0.05	nd	nd	0.05	nd	nd	nd	bdl	nd
03/23/98	150759	0.04	nd	nd	nd	0.04	nd	bdl	bdl	nd
03/23/98	150760	0.97	nd	nd	0.93	0.04	nd	bdl	bdl	bdl
03/23/98	150764	0.06	nd	nd	0.06	nd	nd	bdl	bdl	nd
03/23/98	150765	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/23/98	150766	nd	nd	nd	nd	nd	nd	bdl	bdl	nd
03/23/98	150767	0.21	0.06	nd	nd	0.11	0.04	bdl	bdl	nd
03/24/98	FB1 - 150649	0.21	0.07	0.03	nd	0.08	0.03	0.08	bdl	bdl
03/25/98	TB1 - 150928	0.06	nd	nd	0.06	nd	nd	0.02	bdl	nd
03/25/98	TB2 - 150929	0.58	nd	nd	0.58	nd	nd	bdl	bdl	nd
	Max. Detected	13.56	0.09	1.20	13.29	4.20	1.57	2.20	0.04	2.20

GORE SORBER SCREENING SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABORATORY, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
OU1333 BURN SITE, ALBUQUERQUE, NM
SITE ALS - PRODUCTION ORDER #093733

MODULE NUMBER	TRIDEC, ug	TMBs, ug	124TMB, ug	135TMB, ug	ct12DCE, ug	t12DCE, ug	c12DCE, ug	NAPH&2-MN, ug	NAPH, ug	2MeNAPH, ug
MDL=	0.02	0.02	0.02	0.02	0.02	0.05	0.02	0.03	0.03	0.03
150634	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150635	nd	0.08	bdl	0.07	nd	nd	nd	nd	nd	nd
150636	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd
150637	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150638	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd
150639	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150640	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd
150641	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd
150642	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150643	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150643	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150645	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150646	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150647	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150648	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150650	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150651	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150652	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150653	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150654	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150655	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150656	nd	nd	nd	nd	nd	nd	nd	0.04	nd	0.04
150657	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150658	nd	0.03	0.02	bdl	nd	nd	nd	0.06	nd	0.06
150659	nd	0.02	0.02	nd	nd	nd	nd	0.04	nd	0.04
150660	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150661	nd	nd	nd	nd	nd	nd	nd	bdl	nd	bdl
150662	nd	nd	nd	nd	nd	nd	nd	bdl	nd	bdl
150663	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150664	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150665	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150666	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150667	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150668	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150669	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150670	nd	bdl	bdl	bdl	nd	nd	nd	bdl	nd	bdl
150671	nd	bdl	bdl	nd	nd	nd	nd	bdl	nd	bdl
150672	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150673	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150674	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150675	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150676	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150677	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150678	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150679	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150680	nd	bdl	bdl	nd	nd	nd	nd	nd	nd	nd
150681	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150682	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150683	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150684	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150685	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150686	bdl	nd	nd	nd	nd	nd	nd	nd	nd	nd
150687	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150688	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150689	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

GORE SORBER SCREENING SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABORATORY, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
OU1333 BURN SITE, ALBUQUERQUE, NM
SITE ALS - PRODUCTION ORDER #093733

MODULE NUMBER	TRIDEC, ug	TMBs, ug	124TMB, ug	135TMB, ug	ct12DCE, ug	t12DCE, ug	c12DCE, ug	NAPH&2-MN, ug	NAPH, ug	2MeNAPH, ug
MDL=	0.02	0.02	0.02	0.02	0.02	0.05	0.02	0.03	0.03	0.03
150690	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150691	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150692	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150693	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150694	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150713	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150714	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150715	nd	nd	nd	nd	nd	nd	nd	bdl	nd	bdl
150716	nd	bdl	nd	bdl	nd	nd	nd	nd	nd	nd
150725	nd	1.64	1.32	0.32	nd	nd	nd	1.53	1.35	0.18
150716	bdl	1.16	0.92	0.23	nd	nd	nd	1.31	0.84	0.46
150727	nd	bdl	bdl	nd	nd	nd	nd	0.04	0.03	bdl
150728	nd	0.22	0.18	0.03	nd	nd	nd	0.49	0.40	0.08
150729	nd	0.03	0.03	nd	nd	nd	nd	0.08	0.04	0.03
150730	nd	nd	nd	nd	nd	nd	nd	bdl	nd	bdl
150731	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150749	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150750	nd	nd	nd	nd	nd	nd	nd	0.06	nd	0.06
150752	nd	bdl	bdl	nd	nd	nd	nd	nd	nd	nd
150754	bdl	0.08	0.06	0.02	nd	nd	nd	0.05	0.03	bdl
150755	nd	bdl	bdl	bdl	nd	nd	nd	bdl	nd	bdl
150756	nd	0.04	0.03	bdl	nd	nd	nd	nd	nd	nd
150757	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150759	nd	bdl	bdl	nd	nd	nd	nd	bdl	nd	bdl
150760	nd	bdl	bdl	nd	nd	nd	nd	bdl	nd	bdl
150764	nd	nd	nd	nd	nd	nd	nd	bdl	nd	bdl
150765	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150766	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150767	nd	0.07	0.05	0.02	nd	nd	nd	nd	nd	nd
FB1 - 150649	0.02	0.07	0.05	bdl	nd	nd	nd	bdl	bdl	nd
TB1 - 150928	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
TB2 - 150929	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Max. Detected	0.00	1.64	1.32	0.32	0.00	0.00	0.00	1.53	1.35	0.46

GORE SORBER SCREENING SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABORATORY, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
OU1333 BURN SITE, ALBUQUERQUE, NM
SITE ALS - PRODUCTION ORDER #093733

MODULE NUMBER	MTBE, ug	11DCA, ug	CHCl3, ug	111TCA, ug	12DCA, ug	CCl4, ug	TCE, ug	OCT, ug	PCE, ug	CIBENZ, ug	14DCB, ug
MDL=	0.16	0.01	0.01	0.02	0.02	0.04	0.02	0.02	0.03	0.02	0.02
150634	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150635	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150636	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150637	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150638	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150639	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150640	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150641	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150642	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150643	nd	nd	nd	nd	nd	nd	bdl	nd	nd	nd	nd
150643	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150645	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150646	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150647	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150648	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150650	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150651	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150652	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150653	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150654	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150655	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150656	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150657	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150658	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150659	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150660	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150661	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150662	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150663	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150664	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150665	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150666	nd	nd	nd	nd	nd	nd	nd	0.10	nd	nd	nd
150667	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150668	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150669	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150670	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150671	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150672	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150673	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150674	nd	nd	0.03	nd	nd	nd	nd	nd	nd	nd	nd
150675	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150676	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150677	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150678	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150679	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150680	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150681	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150682	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150683	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150684	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150685	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150686	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150687	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150688	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150689	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd

GORE SORBER SCREENING SURVEY ANALYTICAL RESULTS
SANDIA NATIONAL LABORATORY, ALBUQUERQUE, NM
GORE STANDARD TARGET VOCs/SVOCs (A1)
OU1333 BURN SITE, ALBUQUERQUE, NM
SITE ALS - PRODUCTION ORDER #093733

MODULE NUMBER	MTBE, ug	11DCA, ug	CHCl3, ug	111TCA, ug	12DCA, ug	CCl4, ug	TCE, ug	OCT, ug	PCE, ug	CIBENZ, ug	14DCB, ug
MDL=	0.16	0.01	0.01	0.02	0.02	0.04	0.02	0.02	0.03	0.02	0.02
150690	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150691	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150692	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150693	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150694	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150713	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150714	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150715	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150716	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150725	nd	nd	nd	nd	nd	nd	nd	4.18	nd	nd	nd
150716	nd	nd	nd	nd	nd	nd	nd	4.90	nd	nd	nd
150727	nd	nd	nd	nd	nd	nd	nd	0.11	nd	nd	nd
150728	nd	nd	nd	nd	nd	nd	nd	1.26	nd	nd	nd
150729	nd	nd	nd	nd	nd	nd	nd	0.29	nd	nd	nd
150730	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150731	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150749	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150750	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150752	nd	nd	nd	nd	nd	nd	0.04	nd	nd	nd	nd
150754	nd	nd	nd	nd	nd	nd	nd	0.32	nd	nd	nd
150755	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150756	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150757	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150759	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150760	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150764	nd	nd	0.07	nd	nd	nd	nd	nd	nd	nd	nd
150765	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
150766	nd	nd	nd	nd	nd	nd	nd	nd	0.12	nd	nd
150767	nd	nd	nd	nd	nd	nd	nd	0.08	nd	nd	nd
FB1 - 150649	nd	nd	nd	nd	nd	nd	nd	0.15	nd	nd	nd
TB1 - 150928	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
TB2 - 150929	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Max. Detected	0.00	0.00	0.07	0.00	0.00	0.00	0.04	4.90	0.12	0.00	0.00

ANNEX 6-C
Gamma Spectroscopy Results

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

Internal Lab Batch No. 80387

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/MR No.

Page 1 of

AR/COC- 600522

Dept. No./Mail Stop: 6133 MS 1147
Project/Task Manager: P. Fashaw
Project Name: 94A
Record Center Code: ER94A/CSA/DAT
Logbook Ref. No.: 0153
Service Order No.: CR0509

Date Sample(s) Shipped: 7/8/98
Carrier/Waybill No.:

Lab Contact: E. Kent/B Ames
Lab Destination: GEL/B Ames/A RSD 991
SMO Contact/Phone: T. McDonald
Send Report to SMO: 11

Contract No.:
Case No.: 72114.2314
SMO Authorization: S Tapp
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location Tech Area CY
Building NA Room NA

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV (available at SMO) Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE Lab Sampl ID
241562-003	CY94A-Composite-S	0'	94A	7-7-98 1030	S	P M	500	None	GR	SA	Gamma Spec.	

RUSH

RMMA ■Yes ☐No Ref. No.
Sample Disposal ■Return to Client ☐Disposal by lab

Sample Tracking (LAB USE)
Date Entered (mm/dd/yy)
Entered by

Special Instructions/QC Requirements
EDD ☐Yes ☐No
Raw data package ☐Yes ☐No
If 24 hr. turnaround To release off site samples (AR-COC 600521)

Abnormal/Unusual Conditions on Receipt (LAB USE)

Turnaround Time ☐Normal ■Rush 24 hr. Required Report Date

QC Inits

	Name	Signature	Init	Company/Organization/Phon
Sample Team Members	S Boyd	S Boyd	SB	IT/(663) 754-3307
	C. Cacciatore	Connie Cacciatore	CC	mbm (631) 589-9193

1. Relinquished by	S Boyd	Org. IT	Date 7-8-98	Time 0758	4. Relinquished by	Org.	Date
1. Received by	[illegible]	Org. 7577	Date 7-8-98	Time 0758	4. Received by	Org.	Date
2. Relinquished by	[illegible]	Org. 7577	Date 7-8-98	Time 0815	5. Relinquished by	Org.	Date
2. Received by	[illegible]	Org. 1518	Date 7/8/98	Time 0815	5. Received by	Org.	Date
3. Relinquished by	for KAT	Org. SNL7571	Date 7/9/98	Time 0915	6. Relinquished by	Org.	Date
3. Received by	[illegible]	Org. 7527	Date 7/9/98	Time 0915	6. Received by	Org.	Date

Original To Accompany Samples, Laboratory Copy (White) | 1st Copy To Accompany Samples, Return to SMO (Blue) | 2nd Copy SMO Suspense Copy (Yellow) | 3rd Copy Field Copy (Pink)

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
7-08-98 4:20:00 PM

Analyzed by: 7/8/98 Reviewed by: 7/8/98

Customer : P.FRESHOUR/D.PERRY (6133/SMO)
Customer Sample ID : 041552-003
Lab Sample ID : 80138701

Sample Description : MARINELLI SOLID SAMPLE
Sample Quantity : 803.000 gram
Sample Date/Time : 7-07-98 10:30:00 AM
Acquire Start Date/Time : 7-08-98 8:23:11 AM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	1.02E+00	1.11E+00	1.09E+00
TH-234	1.14E+00	2.88E-01	3.29E-01
RA-226	1.46E+00	6.66E-01	4.65E-01
PB-214	6.64E-01	1.13E-01	3.75E-02
BI-214	5.79E-01	1.49E-01	3.52E-02
PB-210	Not Detected	---------	8.11E+00
TH-232	7.45E-01	3.82E-01	1.20E-01
RA-228	6.45E-01	1.71E-01	1.19E-01
AC-228	6.42E-01	1.53E-01	6.37E-02
TH-228	5.32E-01	1.91E-01	3.72E-01
RA-224	7.63E-01	3.03E-01	6.91E-02
PB-212	6.38E-01	1.06E-01	3.09E-02
BI-212	6.37E-01	2.72E-01	2.43E-01
TL-208	6.09E-01	1.20E-01	4.99E-02
U-235	Not Detected	---------	1.66E-01
TH-231	Not Detected	---------	1.76E+00
PA-231	Not Detected	---------	3.03E+00
TH-227	Not Detected	---------	2.87E-01
RA-223	Not Detected	---------	1.33E-01
RN-219	Not Detected	---------	3.10E-01
PB-211	Not Detected	---------	7.16E-01
TL-207	Not Detected	---------	1.10E+01
AM-241	Not Detected	---------	1.91E-01
PU-239	Not Detected	---------	3.00E+02
NP-237	~~5.13E-01~~	~~1.30E-01~~	~~1.64E-01~~ Not detected
PA-233	Not Detected	---------	4.90E-02
TH-229	Not Detected	---------	1.73E-01

7/8/98

[Summary Report] - Sample ID: : 80138701

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.19E-02
AG-110m	Not Detected	---------	2.86E-02
BA-133	Not Detected	---------	5.63E-02
BE-7	Not Detected	---------	1.97E-01
CD-109	Not Detected	---------	5.56E-01
CD-115	Not Detected	---------	7.23E-02
CE-139	Not Detected	---------	2.25E-02
CE-141	Not Detected	---------	3.70E-02
CE-144	Not Detected	---------	1.64E-01
CO-56	Not Detected	---------	2.58E-02
CO-57	Not Detected	---------	2.12E-02
CO-58	Not Detected	---------	2.49E-02
CO-60	Not Detected	---------	2.75E-02
CR-51	Not Detected	---------	1.98E-01
CS-134	Not Detected	---------	4.03E-02
CS-137	4.95E-02	3.17E-02	2.07E-02
EU-152	Not Detected	---------	6.39E-02
EU-154	Not Detected	---------	1.47E-01
EU-155	Not Detected	---------	9.81E-02
FE-59	Not Detected	---------	5.45E-02
GD-153	Not Detected	---------	7.31E-02
HG-203	Not Detected	---------	2.52E-02
I-131	Not Detected	---------	2.36E-02
IR-192	Not Detected	---------	2.25E-02
K-40	1.34E+01	2.00E+00	2.06E-01
KR-85	Not Detected	---------	6.88E+00
LA-138	Not Detected	---------	3.69E-02
MN-52	Not Detected	---------	2.70E-02
MN-54	Not Detected	---------	2.76E-02
MO-99	Not Detected	---------	2.40E-01
NA-22	Not Detected	---------	3.32E-02
NA-24	Not Detected	---------	7.32E-02
NB-95	Not Detected	---------	1.57E-01
ND-147	Not Detected	---------	1.65E-01
NI-57	Not Detected	---------	3.78E-02
NP-239	Not Detected	---------	8.87E-02
RU-103	Not Detected	---------	2.34E-02
RU-106	Not Detected	---------	2.32E-01
SB-122	Not Detected	---------	4.11E-02
SB-124	Not Detected	---------	2.51E-02
SB-125	Not Detected	---------	6.78E-02
SN-113	Not Detected	---------	2.88E-02
TA-182	Not Detected	---------	1.27E-01
TA-183	Not Detected	---------	1.85E-01
TC-99m	Not Detected	---------	2.72E-01
TL-201	Not Detected	---------	1.22E-01
XE-133	Not Detected	---------	1.28E-01
Y-88	Not Detected	---------	2.09E-02
ZN-65	Not Detected	---------	8.61E-02
ZR-95	Not Detected	---------	4.52E-02

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

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

Press F1 for instructions for each field.

AR/COC- 600225

Dept. No./Mail Stop: 6133 ms-1148
Project/Task Manager: Grace Haggerty
Project Name: ER Site 94A-1,3
Record Center Code: ER/1333/94A/DAT
Logbook Ref. No.: ER-0153
Service Order No.: CF0509

Date Sample(s) Shipped: _____ SMO USE
Carrier/Waybill No.: _____
Lab Contact: FernandoDominguez
Lab Destination: RPSD Building 881
SMO Contact/Phone: Doug Salmi/844-3110
Send Report to SMO: Angela Chavez

Contract No.: AJ-2480C
Case No.: 7214.221400
SMO Authorization _____
Bill to: Sandia National Laboratories
Supplier Services, Dept. _____
P.O. Box 5800 MS 0154

Location Tech Area NA
Building NA Room NA

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft	ER Site No	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE Lab Sample ID
040477-004	CY94A3-GR-1100,B60-0-0.5 SS	0-0.5	94A3	4-20-98/1300	S	M	500 ml	None	GR	SA	Gamma Spectroscopy	
040477-005	CY94A3-EB	NA	94A3	4-20-98/1420	DIW	M	500ml	none	EB	EB	γ spec	
040477-006	CY94A2-EB	NA	94A2	4-20-98/1200	DIW	M	500ml	none	EB	EB	γ spec	
-												
-												
-												
-												
-												
-												
-												

RMMA ☒Yes ☐No Ref. No. _____
Sample Disposal ☐Return to Client ☒Disposal by lab
Turnaround Time ☐Normal ☒Rush Required Report Date _____

Sample Tracking SMO USE
Date Entered (mm/dd/yy) _____
Entered by _____
QC Initials _____

Special Instructions/QC Requirements
EDD ☐Yes ☒No
Raw data package ☐Yes ☒No
*Please send copy of report to Grace Haggerty/284-2545
*COC# 600225 releases
COC# 600227, 600226, 600223
Please list as separate report.

Abnormal Conditions Receipt LAB USE

Sample Team Members	Name	Signature	Init	Company/Organization/Phone
	AngelB. Vega			MDM/6131/844-9081
	Walt Foutz	W Foutz	WF	MDM/6133/284-2553
	Grace Haggerty	G Haggerty	GH	

1. Relinquished by	Grace Haggerty	Org. 6134	Date 4/22/98	Time 1058	4. Relinquished by		Org.	Date
1. Received by		Org. 7578 SNL	Date 4/22/98	Time 1058	4. Received by		Org.	Date
2. Relinquished by		Org.	Date	Time	5. Relinquished by		Org.	Date
2. Received by		Org.	Date	Time	5. Received by		Org.	Date
3. Relinquished by		Org.	Date	Time	6. Relinquished by		Org.	Date
3. Received by		Org.	Date	Time	6. Received by		Org.	Date

Original To Accompany Samples, Laboratory Copy (White) | 1st Copy To Accompany Samples, Return to SMO (Blue) | 2nd Copy SMO Suspense Copy (Yellow) | 3rd Copy Field Copy (Pink)

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
4-22-98 3:31:50 PM

Analyzed by: 4/23/98 Reviewed by:

Customer : G.HAGGERTY/BISWELL (6133/SMO)
Customer Sample ID : 040477-004
Lab Sample ID : 80074101

Sample Description : SOIL SAMPLE IN MARINELLI
Sample Quantity : 780.000 gram
Sample Date/Time : 4-20-98 1:00:00 PM
Acquire Start Date/Time : 4-22-98 1:48:59 PM
Detector Name : LAB02
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---------	3.10E+00
TH-234	1.27E+00	4.22E-01	5.37E-01
RA-226	1.42E+00	1.38E+00	4.79E-01
PB-214	6.81E-01	1.13E-01	4.04E-02
BI-214	6.42E-01	1.21E-01	5.68E-02
PB-210	Not Detected	---------	3.26E+01
TH-232	8.10E-01	4.18E-01	1.33E-01
RA-228	7.75E-01	2.92E-01	1.43E-01
AC-228	8.13E-01	1.80E-01	7.22E-02
TH-228	6.57E-01	3.15E-01	4.48E-01
RA-224	7.31E-01	2.32E-01	7.29E-02
PB-212	7.58E-01	1.60E-01	1.34E-01
BI-212	8.18E-01	3.43E-01	2.89E-01
TL-208	5.78E-01	4.33E-01	5.97E-02
U-235	Not Detected	---------	2.24E-01
TH-231	Not Detected	---------	2.09E+00
PA-231	Not Detected	---------	3.55E+00
TH-227	Not Detected	---------	3.30E-01
RA-223	Not Detected	---------	2.08E-01
RN-219	Not Detected	---------	3.39E-01
PB-211	Not Detected	---------	7.74E-01
TL-207	Not Detected	---------	1.22E+01
AM-241	Not Detected	---------	4.32E-01
PU-239	Not Detected	---------	4.09E+02
NP-237	~~4.02E-01~~	~~1.52E-01~~	2.75E-01
PA-233	Not Detected	---------	5.33E-02
TH-229	Not Detected	---------	2.33E-01

not detected

4/23/98

[Summary Report] - Sample ID: : 80074101

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.79E-02
AG-110m	Not Detected	---------	3.02E-02
AM-243	Not Detected	---------	9.60E-02
BA-133	Not Detected	---------	6.41E-02
BE-7	Not Detected	---------	2.46E-01
CD-109	Not Detected	---------	9.34E-01
CD-115	Not Detected	---------	1.20E-01
CE-139	Not Detected	---------	2.75E-02
CE-141	Not Detected	---------	5.05E-02
CE-144	Not Detected	---------	2.26E-01
CO-56	Not Detected	---------	3.35E-02
CO-57	Not Detected	---------	2.85E-02
CO-58	Not Detected	---------	2.98E-02
CO-60	Not Detected	---------	3.30E-02
CR-51	Not Detected	---------	2.25E-01
CS-134	Not Detected	---------	4.59E-02
CS-137	2.55E-02	1.48E-02	1.73E-02
EU-152	Not Detected	---------	8.56E-02
EU-154	Not Detected	---------	1.76E-01
EU-155	Not Detected	---------	1.35E-01
FE-59	Not Detected	---------	6.32E-02
GD-153	Not Detected	---------	9.77E-02
HG-203	Not Detected	---------	2.97E-02
I-131	Not Detected	---------	3.15E-02
IR-192	Not Detected	---------	2.58E-02
K-40	1.26E+01	2.08E+00	2.66E-01
KR-85	Not Detected	---------	7.97E+00
MN-52	Not Detected	---------	3.65E-02
MN-54	Not Detected	---------	3.26E-02
MO-99	Not Detected	---------	3.45E-01
NA-22	Not Detected	---------	3.92E-02
NA-24	Not Detected	---------	2.96E-01
NB-95	Not Detected	---------	2.25E-01
ND-147	Not Detected	---------	2.11E-01
NI-57	Not Detected	---------	6.28E-02
NP-239	Not Detected	---------	1.22E-01
RU-103	Not Detected	---------	2.68E-02
RU-106	Not Detected	---------	2.59E-01
SB-122	Not Detected	---------	6.22E-02
SB-124	Not Detected	---------	2.77E-02
SB-125	Not Detected	---------	7.58E-02
SN-113	Not Detected	---------	3.44E-02
TA-182	Not Detected	---------	1.35E-01
TA-183	Not Detected	---------	4.86E-01
TC-99m	Not Detected	---------	8.27E+00
TL-201	Not Detected	---------	2.69E-01
XE-133	Not Detected	---------	2.58E-01
Y-88	Not Detected	---------	2.53E-02
ZN-65	Not Detected	---------	9.11E-02
ZR-95	Not Detected	---------	5.21E-02

****

Sandia National Laboratories

Radiation Protection Sample Diagnostics Program [881 Laboratory]

4-22-98 5:15:55 PM

****

Analyzed by: 4/23/98 Reviewed by: 4/23/98

****

Customer : G.HAGGERTY/BISWELL (6133/SMO)
Customer Sample ID : 040477-005
Lab Sample ID : 80074102

Sample Description : WATER SAMPLE IN MARINELLI
Sample Quantity : 500.000 mL
Sample Date/Time : 4-20-98 2:20:00 PM
Acquire Start Date/Time : 4-22-98 3:34:00 PM
Detector Name : LAB02
Elapsed Live/Real Time : ·6000 / 6001 seconds

Comments:

****

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---	1.75E+00
TH-234	Not Detected	---	3.99E-01
RA-226	Not Detected	---	4.98E-01
PB-214	Not Detected	---	5.34E-02
BI-214	Not Detected	---	5.73E-02
PB-210	Not Detected	---	1.45E+01
TH-232	Not Detected	---	1.60E-01
RA-228	Not Detected	---	1.34E-01
AC-228	Not Detected	---	8.64E-02
TH-228	Not Detected	---	4.96E-01
RA-224	Not Detected	---	1.25E-01
PB-212	Not Detected	---	3.82E-02
BI-212	Not Detected	---	3.17E-01
TL-208	Not Detected	---	6.19E-02
U-235	Not Detected	---	1.57E-01
TH-231	Not Detected	---	1.63E+00
PA-231	Not Detected	---	2.53E+00
TH-227	Not Detected	---	1.41E-01
RA-223	Not Detected	---	1.15E-01
RN-219	Not Detected	---	2.35E-01
PB-211	Not Detected	---	5.56E-01
TL-207	Not Detected	---	9.70E+00
AM-241	Not Detected	---	2.38E-01
PU-239	Not Detected	---	2.82E+02
NP-237	Not Detected	---	1.81E-01
PA-233	Not Detected	---	4.43E-02
TH-229	Not Detected	---	1.43E-01

[Summary Report] - Sample ID: : 80074102

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.34E-02
AG-110m	Not Detected	---------	2.35E-02
AM-243	Not Detected	---------	6.32E-02
BA-133	Not Detected	---------	3.31E-02
BE-7	Not Detected	---------	1.91E-01
CD-109	Not Detected	---------	6.08E-01
CD-115	Not Detected	---------	7.44E-02
CE-139	Not Detected	---------	2.02E-02
CE-141	Not Detected	---------	3.46E-02
CE-144	Not Detected	---------	1.59E-01
CO-56	Not Detected	---------	3.11E-02
CO-57	Not Detected	---------	1.97E-02
CO-58	Not Detected	---------	2.21E-02
CO-60	Not Detected	---------	2.52E-02
CR-51	Not Detected	---------	1.70E-01
CS-134	Not Detected	---------	2.71E-02
CS-137	Not Detected	---------	2.33E-02
EU-152	Not Detected	---------	5.91E-02
EU-154	Not Detected	---------	1.06E-01
EU-155	Not Detected	---------	9.17E-02
FE-59	Not Detected	---------	4.43E-02
GD-153	Not Detected	---------	6.07E-02
HG-203	Not Detected	---------	2.29E-02
I-131	Not Detected	---------	2.56E-02
IR-192	Not Detected	---------	2.05E-02
K-40	Not Detected	---------	3.65E-01
KR-85	Not Detected	---------	6.92E+00
MN-52	Not Detected	---------	3.06E-02
MN-54	Not Detected	---------	2.29E-02
MO-99	Not Detected	---------	2.85E-01
NA-22	Not Detected	---------	2.67E-02
NA-24	Not Detected	---------	2.45E-01
NB-95	Not Detected	---------	9.65E-02
ND-147	Not Detected	---------	1.59E-01
NI-57	Not Detected	---------	8.55E-02
NP-239	Not Detected	---------	8.08E-02
RU-103	Not Detected	---------	2.20E-02
RU-106	Not Detected	---------	2.34E-01
SB-122	Not Detected	---------	4.96E-02
SB-124	Not Detected	---------	2.37E-02
SB-125	Not Detected	---------	5.75E-02
SN-113	Not Detected	---------	2.85E-02
TA-182	Not Detected	---------	7.62E-02
TA-183	Not Detected	---------	2.68E-01
TC-99m	~~3.47E+00~~	~~5.59E+00~~	5.41E+00 Not detected
TL-201	Not Detected	---------	1.56E-01
XE-133	Not Detected	---------	1.46E-01
Y-88	Not Detected	---------	2.85E-02
ZN-65	Not Detected	---------	5.26E-02
ZR-95	Not Detected	---------	3.99E-02

4/23/18

****
* Sandia National Laboratories *
* Radiation Protection Sample Diagnostics Program [881 Laboratory] *
* 4-22-98 6:59:52 PM *
****

Analyzed by: 4/23/98 Reviewed by: 4/23/98

Customer : G.HAGGERTY/BISWELL (6133/SMO)
Customer Sample ID : 040477-006
Lab Sample ID : 80074103

Sample Description : WATER SAMPLE IN MARINELLI
Sample Quantity : 500.000 mL
Sample Date/Time : 4-20-98 12:00:00 PM
Acquire Start Date/Time : 4-22-98 5:17:59 PM
Detector Name : LAB02
Elapsed Live/Real Time : ·6000 / 6001 seconds

Comments:

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
U-238	Not Detected	---	1.71E+00
TH-234	Not Detected	---	3.84E-01
RA-226	Not Detected	---	4.70E-01
PB-214	Not Detected	---	4.92E-02
BI-214	Not Detected	---	5.81E-02
PB-210	Not Detected	---	1.55E+01
TH-232	Not Detected	---	1.52E-01
RA-228	Not Detected	---	1.40E-01
AC-228	Not Detected	---	8.10E-02
TH-228	Not Detected	---	4.87E-01
RA-224	Not Detected	---	1.21E-01
PB-212	Not Detected	---	3.91E-02
BI-212	Not Detected	---	3.30E-01
TL-208	Not Detected	---	6.60E-02
U-235	Not Detected	---	1.56E-01
TH-231	Not Detected	---	1.66E+00
PA-231	Not Detected	---	2.64E+00
TH-227	Not Detected	---	1.45E-01
RA-223	Not Detected	---	1.10E-01
RN-219	Not Detected	---	2.74E-01
PB-211	Not Detected	---	6.01E-01
TL-207	Not Detected	---	9.30E+00
AM-241	Not Detected	---	2.49E-01
PU-239	Not Detected	---	2.77E+02
NP-237	Not Detected	---	1.86E-01
PA-233	Not Detected	---	4.18E-02
TH-229	Not Detected	---	1.45E-01

[Summary Report] - Sample ID: : 80074103

Nuclide Name	Activity (pCi/mL)	2-sigma Error	MDA (pCi/mL)
AG-108m	Not Detected	---------	2.41E-02
AG-110m	Not Detected	---------	2.06E-02
AM-243	Not Detected	---------	6.29E-02
BA-133	Not Detected	---------	2.94E-02
BE-7	Not Detected	---------	1.90E-01
CD-109	Not Detected	---------	6.07E-01
CD-115	Not Detected	---------	7.67E-02
CE-139	Not Detected	---------	1.93E-02
CE-141	Not Detected	---------	3.50E-02
CE-144	Not Detected	---------	1.54E-01
CO-56	Not Detected	---------	2.94E-02
CO-57	Not Detected	---------	1.89E-02
CO-58	Not Detected	---------	2.25E-02
CO-60	Not Detected	---------	2.28E-02
CR-51	Not Detected	---------	1.82E-01
CS-134	Not Detected	---------	2.76E-02
CS-137	Not Detected	---------	1.98E-02
EU-152	Not Detected	---------	5.68E-02
EU-154	Not Detected	---------	1.11E-01
EU-155	Not Detected	---------	9.00E-02
FE-59	Not Detected	---------	4.84E-02
GD-153	Not Detected	---------	6.01E-02
HG-203	Not Detected	---------	2.13E-02
I-131	Not Detected	---------	2.55E-02
IR-192	Not Detected	---------	1.96E-02
K-40	Not Detected	---------	3.12E-01
KR-85	Not Detected	---------	7.14E+00
MN-52	Not Detected	---------	3.30E-02
MN-54	Not Detected	---------	2.00E-02
MO-99	Not Detected	---------	2.45E-01
NA-22	Not Detected	---------	2.22E-02
NA-24	Not Detected	---------	3.04E-01
NB-95	Not Detected	---------	1.03E-01
ND-147	Not Detected	---------	1.65E-01
NI-57	Not Detected	---------	9.34E-02
NP-239	Not Detected	---------	7.99E-02
RU-103	Not Detected	---------	2.52E-02
RU-106	Not Detected	---------	2.31E-01
SB-122	Not Detected	---------	5.20E-02
SB-124	Not Detected	---------	2.49E-02
SB-125	Not Detected	---------	5.95E-02
SN-113	Not Detected	---------	2.64E-02
TA-182	Not Detected	---------	7.23E-02
TA-183	Not Detected	---------	2.91E-01
TC-99m	Not Detected	---------	9.91E+00
TL-201	Not Detected	---------	1.54E-01
XE-133	Not Detected	---------	1.47E-01
Y-88	Not Detected	---------	2.77E-02
ZN-65	Not Detected	---------	4.83E-02
ZR-95	Not Detected	---------	3.49E-02

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

Internal Lab Batch No. 800707

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

Press F1 for instructions for each field.

AR/COC- 600222

Dept. No./Mail Stop: 6133 ms-1148
Project/Task Manager: Grace Haggerty
Project Name: ER Site 94A-1
Record Center Code: ER/1333/94A/DAT
Logbook Ref. No.: ER-0153
Service Order No.: CF0509

Date Sample(s) Shipped: 4/17/98 SMO USE
Courier/Waybill No.: [redacted]

Lab Contact: FernandoDominguez
Lab Destination: RPSD Building 801
SMO Contact/Phone: Doug Salmi/844-3110
Send Report to SMO: Angela Chavez

Contract No.: AJ-2480C
Case No.: 7214.221400
SMO Authorization: [signature]
Bill to: Sandia National Laboratories
Supplier Services, Dept. _____
P.O. Box 5800 MS 0154

Location
Tech Area NA
Building NA
Room NA

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested
040167-0011	CY94A2-GR-980800-	0	94A2	41598 1130	S	M	500 ml	None	GR	SA	Gamma Spectroscopy

Reference LOV (available at SMO)

RMMA ☒Yes ☐No Ref. No. ____
Sample Disposal ☐Return to Client ☒Disposal by lab.

Sample Tracking SMO USE
Date Entered (mm/dd/yy): 4/29/98
Entered by: [signature]

Special Instructions/QC Requirements
EDD ☐Yes ☒No
Raw data package ☐Yes ☒No
*Please send copy of report to Graco Haggerty/284-2545
*COC# releases
COC#
Please list as separate report.

Abnormal Conditions on Receipt LAB USE

Turnaround Time ☐Normal ☒Rush Required Report Date

QC Initials

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	Angel B. Vega	[signature]	AV	MDM/6131/844-9081
	Walt Feutz			MDM/6133/284-2553
	Chris Cutrelis	[signature]	CC	MDM/6131/844-3196

1. Relinquished by	[signature]	Org. 6131	Date 41798	Time 1040	4. Relinquished by	Org.	Date
1. Received by	[signature]	Org. 7578	Date 4/17/98	Time 1040	4. Received by	Org.	Date
2. Relinquished by	[signature]	Org. 7578	Date 4/17/98	Time 1125	5. Relinquished by	Org.	Date
2. Received by	[signature]	Org. 7578	Date 4-17-98	Time 1125	5. Received by	Org.	Date
3. Relinquished by		Org.	Date	Time	6. Relinquished by	Org.	Date
3. Received by		Org.	Date	Time	6. Received by	Org.	Date

Original To Accompany Samples, Laboratory Copy (White) | 1st Copy To Accompany Samples, Return to SMO (Blue) | 2nd Copy SMO Suspense Copy (Yellow) | 3rd Copy Field Copy (Pink)

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

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

Press F1 for instructions for each field.

AR/COC- 600225

Dept. No./Mail Stop: 6133 ms-1148
Project/Task Manager: Grace Haggerty
Project Name: ER Site 94A-1,3
Record Center Code: ER/1333/94A/DAT
Logbook Ref. No.: ER-0153
Service Order No.: CF0509

Date Samples Shipped: SMO USE
Carrier/Waybill No.
Lab Contact: FernandoDominguez
Lab Destination: RPSD Building 881
SMO Contact/Phone: Doug Salmi/844-3110
Send Report to SMO: Angela Chavez

Contract No.: AJ-2480C
Case No.: 7214.221400
SMO Authorization
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location Tech Area NA
Building NA Room NA

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Reference LOV (available at SMO): Sample Matrix	Container: Type	Container: Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE: Lab Sample ID
040477-004	CY94A3-GR-1100,860-0-0.5 SS	0-0.5	94A3	4-20-98/1300	S	M	500 ml	None	GR	SA	Gamma Spectroscopy	
040477-005	CY94A3-EB	NA	94A3	4-20-98/1420	DIW	M	500ml	none	EB	EB	γ spec	
040477-006	CY94A2-EB	NA	94A2	4-20-98/1200	DIW	M	500ml	none	EB	EB	γ spec	

RMMA ☒Yes ☐No Ref. No.
Sample Disposal ☐Return to Client ☒Disposal by lab

Sample Tracking SMO USE
Date Entered (mm/dd/yy)
Entered by

Special Instructions/QC Requirements
EDD ☐Yes ☒No
Raw data package ☐Yes ☒No
*Please send copy of report to Grace Haggerty/284-2545
*COC# 600225 releases
COC# 600227, 600226, 600223
Please list as separate report.

Abnormal Conditions on Receipt LAB USE

Turnaround Time ☐Normal ☒Rush Required Report Date
QC Initials

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	AngelB. Vega			MDM/6131/844-9081
	Walt Foutz	W Foutz	WF	MDM/6133/284-2553
	~~Grace Haggerty~~	G Haggerty	GH	

1. Relinquished by	Grace Haggerty	Org. 6134	Date 4/22/98	Time 1058	4. Relinquished by	Org.	Date
1. Received by		Org. 7578 SMO	Date 4/22/98	Time 1058	4. Received by	Org.	Date
2. Relinquished by		Org.	Date	Time	5. Relinquished by	Org.	Date
2. Received by		Org.	Date	Time	5. Received by	Org.	Date
3. Relinquished by		Org.	Date	Time	6. Relinquished by	Org.	Date
3. Received by		Org.	Date	Time	6. Received by	Org.	Date

Original To Accompany Samples, Laboratory Copy (White) | 1st Copy To Accompany Samples, Return to SMO (Blue) | 2nd Copy SMO Suspense Copy (Yellow) | 3rd Copy Field Copy (Pink)

Radiation Protection Sample Diagnostics Program [881 Laboratory]
4-17-98 2:33:14 PM

Analyzed by: KG 4/17/98 Reviewed by: JAM 4/17/98

Customer : G.HAGGERTY/D.BISWELL (1148/SMO)
Customer Sample ID : 040467-004
Lab Sample ID : 80070701

Sample Description : SOIL MARINELLI SAMPLE
Sample Quantity : 727.000 gram
Sample Date/Time : 4-15-98 2:30:00 PM
Acquire Start Date/Time : 4-17-98 11:33:38 AM
Detector Name : LAB03
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	7.29E-01	7.37E-01	8.28E-01
TH-234	1.62E+00	4.32E-01	4.03E-01
RA-226	Not Detected	---	5.78E-01
PB-214	7.70E-01	1.36E-01	4.76E-02
BI-214	6.19E-01	3.73E-01	5.48E-02
PB-210	Not Detected	---	4.56E+00
TH-232	7.77E-01	4.59E-01	1.61E-01
RA-228	8.61E-01	3.01E-01	1.77E-01
AC-228	7.61E-01	2.45E-01	9.72E-02
TH-228	4.25E-01	3.31E-01	4.63E-01
RA-224	8.36E-01	2.24E-01	9.96E-02
PB-212	7.49E-01	1.26E-01	4.10E-02
BI-212	9.53E-01	5.68E-01	3.49E-01
TL-208	7.17E-01	1.69E-01	7.35E-02
U-235	Not Detected	---	2.02E-01
TH-231	Not Detected	---	2.29E+00
PA-231	Not Detected	---	3.80E+00
TH-227	Not Detected	---	3.57E-01
RA-223	Not Detected	---	1.45E-01
RN-219	Not Detected	---	4.20E-01
PB-211	Not Detected	---	9.83E-01
TL-207	Not Detected	---	1.51E+01
AM-241	Not Detected	---	1.59E-01
PU-239	Not Detected	---	3.45E+02
NP-237	Not Detected	---	2.70E-01
PA-233	Not Detected	---	6.16E-02
TH-229	Not Detected	---	1.85E-01

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	4.39E-02
AG-110m	Not Detected	---------	5.95E-02
AM-243	Not Detected	---------	5.25E-02
BA-133	Not Detected	---------	7.34E-02
BE-7	Not Detected	---------	2.79E-01
CD-109	~~2.19E+00~~	~~6.42E-01~~	~~6.36E-01~~ NOT DETECTED KE 4/19/18
CD-115	Not Detected	---------	1.26E-01
CE-139	Not Detected	---------	2.72E-02
CE-141	Not Detected	---------	4.52E-02
CE-144	Not Detected	---------	1.94E-01
CO-56	Not Detected	---------	3.69E-02
CO-57	Not Detected	---------	2.32E-02
CO-58	Not Detected	---------	3.53E-02
CO-60	Not Detected	---------	4.01E-02
CR-51	Not Detected	---------	2.58E-01
CS-134	Not Detected	---------	5.59E-02
CS-137	2.52E-01	6.50E-02	2.69E-02
EU-152	Not Detected	---------	6.97E-02
EU-154	Not Detected	---------	2.07E-01
EU-155	Not Detected	---------	1.08E-01
FE-59	Not Detected	---------	7.89E-02
GD-153	Not Detected	---------	7.63E-02
HG-203	Not Detected	---------	3.32E-02
I-131	Not Detected	---------	3.45E-02
IR-192	Not Detected	---------	2.87E-02
K-40	1.36E+01	2.27E+00	3.07E-01
KR-85	Not Detected	---------	9.15E+00
MN-52	Not Detected	---------	4.50E-02
MN-54	Not Detected	---------	4.01E-02
MO-99	Not Detected	---------	4.12E-01
NA-22	Not Detected	---------	5.03E-02
NA-24	Not Detected	---------	3.29E-01
NB-95	Not Detected	---------	2.17E-01
ND-147	Not Detected	---------	2.24E-01
NI-57	Not Detected	---------	1.43E-01
NP-239	Not Detected	---------	9.85E-02
RU-103	Not Detected	---------	2.99E-02
RU-106	Not Detected	---------	3.35E-01
SB-122	Not Detected	---------	7.07E-02
SB-124	Not Detected	---------	3.56E-02
SB-125	Not Detected	---------	9.35E-02
SN-113	Not Detected	---------	3.97E-02
TA-182	Not Detected	---------	1.73E-01
TA-183	Not Detected	---------	1.73E-01
TC-99m	Not Detected	---------	4.64E+00
TL-201	Not Detected	---------	1.33E-01
XE-133	Not Detected	---------	1.52E-01
Y-88	Not Detected	---------	3.22E-02
ZN-65	Not Detected	---------	1.19E-01
ZR-95	Not Detected	---------	6.68E-02

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

Internal Lab Batch No.

ANALYSIS REQUEST AND CHAIN OF CUSTODY

SAR/WR No.

Press F1 for instructions for each field.

AR/COC- 600219

Dept. No./Mail Stop: 1148
Project/Task Manager: Grace Haggerty
Project Name: ER Site 94A1
Record Center Code: ER/1333/94A1/DAT
Logbook Ref. No.: ER-0153
Service Order No.: CF0509

Date Samples Shipped: SMO USE:
Carrier/Waybill No.:
Lab Contact: FernandoDominguez
Lab Destination: RPSD Building 881
SMO Contact/Phone: Doug Salmi/848-0963
Send Report to SMO: Grace Haggerty

Contract No.: AJ-2480C
Case No.: 7214.221400
SMO Authorization
Bill to: Sandia National Laboratories
Supplier Services, Dept.
P.O. Box 5800 MS 0154

Location Tech Area NA
Building NA Room NA

Sample No. - Fraction	ER Sample ID or Sample Location Detail	Beginning Depth in Ft.	ER Site No.	Date/Time Collected	Sample Matrix	Container Type	Container Volume	Preservative	Sample Collection Method	Sample Type	Parameter & Method Requested	LAB USE Lab Sample ID
~~040448-004~~ 56	~~CY85C-GR-500,960~~ 600-1000 ~~SS~~	~~0-0.5~~	~~94A1~~		~~S~~	~~M~~	~~500 ml~~	~~None~~	~~G~~	~~SA~~	~~Gamma Spectroscopy~~ AV	
040456 004	CY94A1-GR-500,960-0-.5 SS	0	94A	41598 1205	S	P	500 ml	none	GR	SA	Gamma Spec.	
-												
-												
-												
-												
-												
-												
-												
-												

RMMA ☒Yes ☐No Ref. No.
Sample Disposal ☒Return to Client ☐Disposal by lab

Sample Tracking SMO USE:
Date Entered (mm/dd/yy)
Entered by

Special Instructions/QC Requirements
EDD ☐Yes ☒No
Raw data package ☐Yes ☒No
*Please send copy of report to Grace Haggerty/284-2545
*COC#600219 releases COC#'S 600220 & 600221
Please list as separate report.

Abnormal Conditions on Receipt LAB USE:

Turnaround Time ☐Normal ☒Rush Required Report Date
QC Inits:

	Name	Signature	Init	Company/Organization/Phone
Sample Team Members	AngelB. Vega			MDM/6131/844-9081
	Walt Foutz			MDM/6131/284-2553
	Chris Catechis	Cl. Catal.	CC	MDM/6131/881-3196

1. Relinquished by	Org. 6131	Date 4/17/98	Time 1040	4. Relinquished by	Org.	Date
1. Received by	Org. SMO 7578	Date 4/17/98	Time 1040	4. Received by	Org.	Date
2. Relinquished by	Org.	Date	Time	5. Relinquished by	Org.	Date
2. Received by	Org.	Date	Time	5. Received by	Org.	Date
3. Relinquished by	Org.	Date	Time	6. Relinquished by	Org.	Date
3. Received by	Org.	Date	Time	6. Received by	Org.	Date

Original To Accompany Samples, Laboratory Copy (White) | 1st Copy To Accompany Samples, Return to SMO (Blue) | 2nd Copy SMO Suspense Copy (Yellow) | 3rd Copy Field Copy (Pink)

Sandia National Laboratories
Radiation Protection Sample Diagnostics Program [881 Laboratory]
4-17-98 1:14:41 PM

Analyzed by: [illegible] 4/17/98 Reviewed by: [illegible] 4/17/98

Customer : G.HAGGERTY/D.BISWELL (1148/SMO)
Customer Sample ID : 040456-004
Lab Sample ID : 80070601

Sample Description : SOIL MARINELLI SAMPLE
Sample Quantity : 707.000 gram
Sample Date/Time : 4-15-98 12:05:00 PM
Acquire Start Date/Time : 4-17-98 11:31:50 AM
Detector Name : LAB04
Elapsed Live/Real Time : 6000 / 6003 seconds

Comments:

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
U-238	Not Detected	---	1.80E+00
TH-234	1.48E+00	4.21E-01	4.56E-01
RA-226	2.04E+00	5.71E-01	5.05E-01
PB-214	9.06E-01	1.45E-01	4.44E-02
BI-214	8.24E-01	1.49E-01	4.07E-02
PB-210	Not Detected	---	9.54E+00
TH-232	8.06E-01	4.00E-01	1.72E-01
RA-228	7.59E-01	2.53E-01	1.31E-01
AC-228	8.18E-01	1.86E-01	6.96E-02
TH-228	9.06E-01	2.52E-01	4.30E-01
RA-224	7.73E-01	2.65E-01	8.19E-02
PB-212	8.29E-01	1.43E-01	3.61E-02
BI-212	1.01E+00	3.57E-01	2.67E-01
TL-208	7.68E-01	1.48E-01	6.09E-02
U-235	Not Detected	---	2.06E-01
TH-231	Not Detected	---	2.21E+00
PA-231	Not Detected	---	3.64E+00
TH-227	Not Detected	---	3.43E-01
RA-223	Not Detected	---	1.72E-01
RN-219	Not Detected	---	3.75E-01
PB-211	Not Detected	---	8.57E-01
TL-207	Not Detected	---	1.24E+01
AM-241	Not Detected	---	2.27E-01
PU-239	Not Detected	---	3.61E+02
NP-237	Not Detected	---	2.15E-01
PA-233	Not Detected	---	5.65E-02
TH-229	Not Detected	---	2.06E-01

[Summary Report] - Sample ID: : 80070601

Nuclide Name	Activity (pCi/gram)	2-sigma Error	MDA (pCi/gram)
AG-108m	Not Detected	---------	3.82E-02
AG-110m	Not Detected	---------	3.33E-02
AM-243	Not Detected	---------	6.80E-02
BA-133	Not Detected	---------	6.92E-02
BE-7	Not Detected	---------	2.40E-01
CD-109	~~1.97E+00~~	~~5.00E-01~~	~~7.30E-01~~ NOT DETECTED KET 4/17/98
CD-115	Not Detected	---------	1.19E-01
CE-139	Not Detected	---------	2.68E-02
CE-141	Not Detected	---------	4.65E-02
CE-144	Not Detected	---------	1.99E-01
CO-56	Not Detected	---------	2.93E-02
CO-57	Not Detected	---------	2.53E-02
CO-58	Not Detected	---------	2.94E-02
CO-60	Not Detected	---------	3.07E-02
CR-51	Not Detected	---------	2.37E-01
CS-134	Not Detected	---------	4.98E-02
CS-137	5.49E-02	2.31E-02	2.03E-02
EU-152	Not Detected	---------	7.53E-02
EU-154	Not Detected	---------	1.76E-01
EU-155	Not Detected	---------	1.17E-01
FE-59	Not Detected	---------	6.33E-02
GD-153	Not Detected	---------	8.85E-02
HG-203	Not Detected	---------	2.92E-02
I-131	Not Detected	---------	3.15E-02
IR-192	Not Detected	---------	2.70E-02
K-40	1.36E+01	2.08E+00	2.33E-01
KR-85	Not Detected	---------	7.93E+00
MN-52	Not Detected	---------	3.46E-02
MN-54	Not Detected	---------	3.20E-02
MO-99	Not Detected	---------	3.72E-01
NA-22	Not Detected	---------	3.60E-02
NA-24	Not Detected	---------	2.69E-01
NB-95	Not Detected	---------	2.30E-01
ND-147	Not Detected	---------	2.10E-01
NI-57	Not Detected	---------	1.14E-01
NP-239	Not Detected	---------	1.06E-01
RU-103	Not Detected	---------	2.81E-02
RU-106	Not Detected	---------	2.66E-01
SB-122	Not Detected	---------	6.21E-02
SB-124	Not Detected	---------	2.89E-02
SB-125	Not Detected	---------	7.54E-02
SN-113	Not Detected	---------	3.48E-02
TA-182	Not Detected	---------	1.46E-01
TA-183	Not Detected	---------	2.53E-01
TC-99m	Not Detected	---------	6.21E+00
TL-201	Not Detected	---------	1.81E-01
XE-133	Not Detected	---------	2.17E-01
Y-88	Not Detected	---------	2.44E-02
ZN-65	Not Detected	---------	1.02E-01
ZR-95	Not Detected	---------	5.37E-02

ANNEX 6-D
Level 3 Validation of Off-Site Laboratory Results

Site: Site 94A-1

AR COC: 600221 Data Classification: Radiometrics

Sample Fraction No.	Analysis	DV Qualifiers	Comments
No data is qualified			
Data is acceptable			
QC measures appear to be adequate			

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method. use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470/1, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: Kevin A Lambert Date: 7/9/98

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

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) do not meet acceptance criteria.
A1	Laboratory accuracy and/or bias measurements for the associated Surrogate Spike do not meet acceptance criteria.
A2	Laboratory accuracy and/or bias measurements for the associated Matrix Spike (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
J1	The method requirements for sample preservation/temperature were not met for the sample analysis. The associated value is an estimated quantity.
J2	The holding time was exceeded for the associated sample analysis. The associated value is an estimated quantity.
P	Laboratory precision measurements for the Laboratory Control Sample and duplicate (LCS/LCSD) do not meet acceptance criteria.
P1	Laboratory precision measurements for the Matrix Spike Sample and associated duplicate (MS/MSD) do not meet acceptance criteria.
P2	Insufficient quality control data to determine laboratory precision.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

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

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST

KHC 7/14/98

Project Name: Site 94A-1	~~Site Name~~: Case # 7214.2214
Laboratory Name/Job No./Batch No.: CORE / 981119	Chain of Custody No.: 600221
Analysis Method: EPA 900.0	Parameter List: Gross Alpha / Beta

REVIEW ITEM	YES	NO	NA	COMMENTS
A. HOLDING TIMES				
1. Preparation and analysis holding times met?				SEE CVR FORM
2. Short-half life parameters analyzed for and checked?				
B. CALIBRATION VERIFICATION				Met Acceptance Criteria
1. Detectors numbered and documented?	✓			
2. Frequency: Daily ✓, weekly ____, or monthly ____?	✓			
3. Acceptance criteria: Met?	✓			
C. LABORATORY CONTROL SAMPLES				Note: Gross Beta LCS %REC is not reported on QC Report but is present in raw data and meets acceptance criteria. Also, Gross Alpha LCS %REC is not correctly transcribed from raw data to QC Report. LCS %REC is OK, No data qualified
1. Standard: Independent, certified reference material?	✓			
2. Frequency: Each batch?	✓			
3. % Recovery (80-120%) or ____?	✓			
D. METHOD BLANK				
1. Frequency: Each batch?	✓			No Target analytes were detected above RL
2. Matrix: Matrix specific?	✓			
3. Preparation: Entire procedure?	✓			
4. Blanks show contamination?		✓		
E. MATRIX SPIKE				No MS/MSD was run on ARCOC group. Their acceptability is not addressed for the batch from another ARCOC group
1. Frequency: Each batch?			✓	
2. Matrix: Matrix specific?			✓	
3. Preparation: Entire procedure?			✓	
4. % Recovery: 75-125% or ____?			✓	
F. ANALYTICAL YIELDS/OTHER				
1. Tracer: Correct type, recovery met?			✓	
2. Ingrowth and/or decay: Correct factors applied?			✓	
3. Solids density: Planchette loading <5 mg/cm^2?			✓	
G. DUPLICATE				No duplicate was run on ARCOC group. A duplicate was run on another ARCOC group in the batch (see RAW Data). The duplicate error ratio (DER) met acceptance criteria
1. Type: Lab or (field)?	✓			
2. Frequency: Each batch?	✓			
3. Matrix: Matrix specific?	✓			

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST (CONTINUED)

Project Name	Same as other side	Site Name
Laboratory Name/Job No./Batch No.		Chain of Custody No.
Analysis Method		Parameter List:

REVIEW ITEM	YES	NO	NA	COMMENTS
4. Preparation: Entire procedure?	✓			
H. ANALYTE DETECTION				
1. Detection limit sample/batch specific?	✓			
2. Errors evaluated?	✓			
3. False positives/negatives suspected?		✓		

Reviewed by: Kevin A Lambert 7/9/98

(1) The sample was prepared and analyzed with accepted procedures and specified methods. All compounds were successfully analyzed. There were no major problems with the data package which resulted in the qualification of data.

(2) RAD Analysis: Calibration met acceptance criteria. The LCS %REC met control limits. Note the LCS %REC for Gross Beta is not presented in QC Report but is available in RAW DATA. Also, Gross Alpha LCS %REC is not correctly transcribed from raw data to QC Report. Review of raw data for Gross Alpha & Gross Beta show LCS %REC met acceptance criteria. No data were qualified. OBTAIN REVISED QC Report from LAB. No target analytes were detected above RL in method blanks. No MS/MSD were run on ARCOC group. Their acceptability is not addressed for the batch from another ARCOC group. A duplicate was not run on ARCOC group but was run on another ARCOC group for the batch (SEE RAW DATA). The DER met acceptance criteria, no data were qualified.

(3) Data is acceptable. QC measures appear to be adequate

Site: 94A-1

AR/COC: 600224 Data Classification: Radiometrics

Sample Fraction No.	Analysis	DV Qualifiers	Comments
	No data is qualified		
	Data is acceptable		
	QC measures appear to be adequate		

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method. use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate. needs modification because of an unusual circumstance. or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010. EPA6020. EPA7470/1, EPA8015B. EPA8081. EPA8260. EPA8260-M3. EPA8270. HACH_ALK. HACH_NO2. HACH_NO3. MEKC_HE. PCBRISC

Reviewed by: Kevin A Lambert Date: 7/9/98

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

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) do not meet acceptance criteria.
A1	Laboratory accuracy and/or bias measurements for the associated Surrogate Spike do not meet acceptance criteria.
A2	Laboratory accuracy and/or bias measurements for the associated Matrix Spike (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
J1	The method requirements for sample preservation/temperature were not met for the sample analysis. The associated value is an estimated quantity.
J2	The holding time was exceeded for the associated sample analysis. The associated value is an estimated quantity.
P	Laboratory precision measurements for the Laboratory Control Sample and duplicate (LCS/LCSD) do not meet acceptance criteria.
P1	Laboratory precision measurements for the Matrix Spike Sample and associated duplicate (MS/MSD) do not meet acceptance criteria.
P2	Insufficient quality control data to determine laboratory precision.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

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

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST

KAL 7/9/98

Project Name: Site 94A-1	~~Site Name~~ Case# 7214.2214
Laboratory Name/Job No./Batch No.: CORE / 981120	Chain of Custody No.: 600224
Analysis Method: EPA 900.0	Parameter List: Gross Alpha / Beta

REVIEW ITEM	YES	NO	NA	COMMENTS
A. HOLDING TIMES				
1. Preparation and analysis holding times met?				SEE CVR Form
2. Short-half life parameters analyzed for and checked?				
B. CALIBRATION VERIFICATION				Met Acceptance Criteria
1. Detectors numbered and documented?	✓			
2. Frequency: Daily ✓, weekly ____, or monthly ____?	✓			
3. Acceptance criteria: Met?	✓			
C. LABORATORY CONTROL SAMPLES				Note: Gross Beta LCS %REC is not reported in QC Report. LCS %REC is present in raw data and meets acceptance criteria. No data were qualified.
1. Standard: Independent, certified reference material?	✓			
2. Frequency: Each batch?	✓			
3. % Recovery: 80-120% or ____?	✓			
D. METHOD BLANK				No target compounds were detected above RL
1. Frequency: Each batch?	✓			
2. Matrix: Matrix specific?	✓			
3. Preparation: Entire procedure?	✓			
4. Blanks show contamination?		✓		
E. MATRIX SPIKE				
1. Frequency: Each batch?			✓	No MS/MSD was run on ARCOC group. Acceptability is not addressed for the batch from another ARCOC group
2. Matrix: Matrix specific?			✓	
3. Preparation: Entire procedure?			✓	
4. % Recovery: 75-125% or ____?			✓	
F. ANALYTICAL YIELDS/OTHER				
1. Tracer: Correct type, recovery met?			✓	
2. Ingrowth and/or decay: Correct factors applied?			✓	
3. Solids density: Planchette loading <5 mg/cm^2?			✓	
G. DUPLICATE				No duplicate was run on ARCOC group. A duplicate was run on another ARCOC group in the batch (see raw data). The DER (duplicate error ratio) met acceptance criteria
1. Type: Lab or field?	✓			
2. Frequency: Each batch?	✓			
3. Matrix: Matrix specific?	✓			

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST (CONTINUED)

Project Name				Site Name
Laboratory Name/Job No./Batch No.				Chain of Custody No.
Analysis Method				Parameter List:
REVIEW ITEM	YES	NO	NA	COMMENTS
4. Preparation: Entire procedure?	✓			
H. ANALYTE DETECTION				
1. Detection limit sample/batch specific?	✓			
2. Errors evaluated?	✓			
3. False positives/negatives suspected?		✓		

Reviewed by: Kevin A Lambert 7/9/98

(1) Sample was prepared and analyzed with accepted procedures and specified methods. All compounds were successfully analyzed. There were no major problems with the data package which resulted in the qualification of data.

(2) Rad Analysis: Calibration met acceptance criteria. LCS %REC met control limits. Note, the LCS %REC for Gross Beta is not presented in the QC report but was available in the raw data. Also, the LCS %REC for Gross Alpha is not correctly transcribed from raw data to the QC report. Review of the raw data for Gross Alpha & Gross Beta indicate LCS %REC met control limits KHL 7/9/98
No data were qualified. ~~A Revised QC report may be~~ KHL 7/9/98
Obtained revised QC report from laboratory. No target analytes were detected above RL in method blanks. No MS/MSD were run on ARCOC group. Acceptability is not addressed for the batch from another ARCOC group. A duplicate was not run on ARCOC group but was run on another ARCOC group for the batch (see RAW data). The DER met acceptance criteria, no data were qualified. KHL 7/9/98

(3) Data is acceptable. QC measures appear to be adequate

Site: 99A-3

AR/COC: 600226 Data Classification: Radiometrics

Sample Fraction No.	Analysis	DV Qualifiers	Comments
	No data is qualified		
	Data is acceptable		
	QC measures appear to be adequate		

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method. use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate. needs modification because of an unusual circumstance. or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010. EPA6020. EPA7470/1, EPA8015B. EPA8081. EPA8260. EPA8260-M3. EPA8270. HACH_ALK. HACH_ NO2, HACH_NO3. MEKC_HE. PCBRISC

Reviewed by: Kevin A Lambert Date: 7/9/98

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

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) do not meet acceptance criteria.
A1	Laboratory accuracy and/or bias measurements for the associated Surrogate Spike do not meet acceptance criteria.
A2	Laboratory accuracy and/or bias measurements for the associated Matrix Spike (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
J1	The method requirements for sample preservation/temperature were not met for the sample analysis. The associated value is an estimated quantity.
J2	The holding time was exceeded for the associated sample analysis. The associated value is an estimated quantity.
P	Laboratory precision measurements for the Laboratory Control Sample and duplicate (LCS/LCSD) do not meet acceptance criteria.
P1	Laboratory precision measurements for the Matrix Spike Sample and associated duplicate (MS/MSD) do not meet acceptance criteria.
P2	Insufficient quality control data to determine laboratory precision.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

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

Updated:March 10, 1998

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST

HH 7/9/98

Project Name	Site 94A-3			Site Name/Case #	7214.2214
Laboratory Name/Job No./Batch No.	CORE/98118			Chain of Custody No.	600226
Analysis Method	EPA 900.0			Parameter List:	Gross Alpha/Beta
REVIEW ITEM	YES	NO	NA	COMMENTS	
A. HOLDING TIMES					
1. Preparation and analysis holding times met?				SEE CVR Form	
2. Short-half life parameters analyzed for and checked?					
B. CALIBRATION VERIFICATION				Met Acceptance Criteria	
1. Detectors numbered and documented?	✓				
2. Frequency: Daily ✓, weekly ____, or monthly ____?	✓				
3. Acceptance criteria: Met?	✓				
C. LABORATORY CONTROL SAMPLES				Note: Transcription errors from	
1. Standard: Independent, certified reference material?	✓			RAW Data to the QC report. LCS %Rec	
2. Frequency: Each batch?	✓			met acceptance criteria in raw data	
3. % Recovery 80-120% or ____?	✓			No data is qualified	
D. METHOD BLANK					
1. Frequency: Each batch?	✓			No target compounds were detected	
2. Matrix: Matrix specific?	✓			above RL	
3. Preparation: Entire procedure?	✓				
4. Blanks show contamination?		✓			
E. MATRIX SPIKE					
1. Frequency: Each batch?			✓	No MS/MSD was run on ARCOC group	
2. Matrix: Matrix specific?			✓	Their acceptability is not addressed	
3. Preparation: Entire procedure?			✓	for the batch from another ARCOC group	
4. % Recovery: 75-125% or ____?			✓		
F. ANALYTICAL YIELDS/OTHER					
1. Tracer: Correct type, recovery met?			✓		
2. Ingrowth and/or decay: Correct factors applied?			✓		
3. Solids density: Planchette loading <5 mg/cm^2?			✓		
G. DUPLICATE				No duplicate was run on ARCOC group.	
1. Type: Lab or field?	✓			A duplicate was run on another ARCOC	
2. Frequency: Each batch?	✓			group in the batch (see RAW data). The	
3. Matrix: Matrix specific?	✓			duplicate error ratio (DER)	
				met acceptance criteria.	

ANALYTICAL RADIOCHEMISTRY DATA VALIDATION CHECKLIST (CONTINUED)

Project Name	Same as other side			Site Name	
Laboratory Name/Job No./Batch No.				Chain of Custody No.	
Analysis Method				Parameter List:	
REVIEW ITEM	YES	NO	NA	COMMENTS	
4. Preparation: Entire procedure?	✓				
H. ANALYTE DETECTION					
1. Detection limit sample/batch specific?	✓				
2. Errors evaluated?	✓				
3. False positives/negatives suspected?		✓			

Reviewed by: Kevin A Tarbet 7/9/98

(1) The sample was prepared and analyzed with accepted procedures and specified methods. All compounds were successfully analyzed. There were no major problems with the data package which resulted in the qualification of data

(2) Rad Analysis: Calibration met acceptance criteria. LCS % REC met control limits. NOTE: The LCS % REC for Gross Beta is not reported in the QC Report but was present in the raw data. Also, the LCS % REC for Gross Alpha is not correctly transcribed from the raw data to the QC Report. Review of the raw data for Gross Alpha & Gross Beta show LCS % REC met control limits, no data were qualified. OBTAIN REVISED QC report from LAB. No target analytes were detected above RL in the Method Blanks. No MS/MSD was run on ARCOC group. Their acceptability is not addressed for the batch from another ARCOC group. A Duplicate was not run on ARCOC group but was run on another ARCOC group for the batch (see raw data). The DER met acceptance criteria, no data were qualified.

(3) Data is acceptable. QC measures appear to be adequate

Site: Site 94A

AR/COC: 600220 Data Classification: Organic

Sample Fraction No.	Analysis	DV Qualifiers	Comments
No Data were Qualified			
Data is acceptable			
QC measures appear to be adequate			

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method, use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate, needs modification because of an unusual circumstance, or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010, EPA6020, EPA7470/1, EPA8015B, EPA8081, EPA8260, EPA8260-M3, EPA8270, HACH_ALK, HACH_NO2, HACH_NO3, MEKC_HE, PCBRISC

Reviewed by: Kevin A Lambert Date: 8-25-98

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

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) do not meet acceptance criteria.
A1	Laboratory accuracy and/or bias measurements for the associated Surrogate Spike do not meet acceptance criteria.
A2	Laboratory accuracy and/or bias measurements for the associated Matrix Spike (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
J1	The method requirements for sample preservation/temperature were not met for the sample analysis. The associated value is an estimated quantity.
J2	The holding time was exceeded for the associated sample analysis. The associated value is an estimated quantity.
P	Laboratory precision measurements for the Laboratory Control Sample and duplicate (LCS/LCSD) do not meet acceptance criteria.
P1	Laboratory precision measurements for the Matrix Spike Sample and associated duplicate (MS/MSD) do not meet acceptance criteria.
P2	Insufficient quality control data to determine laboratory precision.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

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

MEMORANDUM

DATE: August 25, 1998

TO: File

FROM: Kevin Lambert KAL

SUBJECT: Organic Data Review and Validation
Site 94A, ARCOC No. 600220, Case No. 7214.2214

See the attached Data Assessment Summary Forms for supporting documentation on the data review and validation.

Summary

All samples were prepared and analyzed with accepted procedures and specified methods (VOCs – EPA8260A and SVOCs – EPA8270). All compounds were successfully analyzed. No major problems were identified with the data package that result in the qualification of any data. A few minor issues were identified, however they do not result in the qualification of any data. Data is acceptable and QC measures appear to be adequate.

The following sections discuss the data review and validation.

Holding Times

The samples was extracted and analyzed within the prescribed holding times.

Calibration

Initial calibration for VOC and SVOC analysis met acceptance criteria. Continuing calibration for VOC analysis met acceptance criteria except one compound (choromethane) on the target compound list (TCL) and two compounds not on the TCL were outside the control limits. Since there were no detectable concentration of these compounds in the site samples, no data were qualified. Continuing calibration for SVOC analysis met acceptance criteria except two compounds not on the TCL were outside the control limits. No data were qualified.

Blanks

No target analytes were detected in the method blanks.

Surrogates

The surrogate recoveries met QC acceptance limits.

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

The MS/MSD for VOC analysis met acceptance criteria except the percent recovery for chlorobenzene was slightly below the lower QC limit in the MS/MSD and the percent recovery for toluene and trichloroethene were slightly below the lower QC limit in the MSD. The LCS/LCSD met acceptance criteria for chlorobenzene and there was no detectable concentration of this compound in the site samples. No data were qualified. The MS and LCS/LCSD met acceptance criteria for toluene and trichloroethene, no data were qualified.

No MS/MSD was run on the ARCOC group for SVOC analysis. The MS/MSD acceptability was not addressed from another ARCOC group in the batch.

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

The LCS/LCSDs met acceptance criteria.

Internal Standards Evaluation

The internal standards met acceptance criteria.

Other QC

No field blank (FB) or equipment blank (EB) was submitted on ARCOC. The field duplicate pair for VOC analysis met %RPD criteria. No target analytes were detected in the field duplicate pair for SVOC analysis.

No other specific issues were identified which affect data quality.

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

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

SITE OR PROJECT 94A
ANALYTICAL LABORATORY CORE
LABORATORY REPORT # 98107O
CASE NO. 7214.2214
ARCOC# 600220

SAMPLE IDS 16 soil
NO. OF SAMPLES
CY94A1-GR-XXX,XXXX

DATA ASSESSMENT SUMMARY

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

		VOC	SVOC	PEST/PCB	OTHER
1.	HOLDING TIMES/PRESERVATION	✓	✓	NA	NA
2.	GC/MS INST. PERFORM.	✓	✓		
3.	CALIBRATIONS/WINDOWS	✓	✓		
4.	BLANKS	✓	✓		
5.	SURROGATES	✓	✓		
6.	MATRIX SPIKE/DUP	✓	NA		
7.	LABORATORY CONTROL SAMPLES	✓	✓		
8.	INTERNAL STANDARDS	✓	✓		
9.	COMPOUND IDENTIFICATION	✓	✓		
10.	SYSTEM PERFORMANCE	✓	✓		
11.	OVERALL ASSESSMENT	✓	✓		

✓ (check mark) — Acceptable: Data had no problems or qualified due to minor problems
N - Data qualified due to major problems
X - Problems, but do not affect data
Qualifiers: J - Estimate
UJ - Undetected, estimated

NA- Not Applicable

ACTION ITEMS: SEE D.V. Narrative

AREAS OF CONCERN:

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

PROJECT/TASK LEADER: _____

ACTION ITEMS: SEE D.V. Narrative

AREAS OF CONCERN: _____

OVERALL DATA QUALITY ASSESSMENT _____

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

1.0 HOLDING TIMES AND PRESERVATION

Indicate the holding time criteria below that was used to evaluate the samples.

SW-846, 3rd. ed.
Other: _____

List below samples that were over holding time criteria.

Sample ID	VTSR	Date Analyzed	Action

SEE CVP FORM

NOTE: VTSR = Validated time of sample receipt.

Were the correct preservatives used? Yes ☐ No ☐

List below samples that were incorrectly preserved.

Sample No.	Type of Sample	Deficiency	Action

Reviewed By: Kevin A Lambert

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

2.0 GC/MS TUNING CRITERIA

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

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

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

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

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

Date/Time	Problem	Sample Affected (Action)
	Met Criteria	

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

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

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

3.0 GC INSTRUMENT PERFORMANCE.

Not Applicable

3.1 DDT Retention Time

Is DDT retention time for packed columns >12 minutes (except for OV-1 and OV-101)?
Yes ☐ No ☐

If no, list below the DDT standards that failed criteria: _____

Affected samples and compounds: _____

_____

_____

3.2 Retention Time Windows

List below compounds that were not within the retention time windows.

Date.Time	Compound	RT	RT Window	Action	Affected Samples

Reviewed By: Kevin A Lambert

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

3.3 DDT and Endrin Degradation

Not Applicable

List below the standards that have a DDT or Endrin breakdown of >20% (or a combined breakdown of >20%).

Date/Time	Standard ID	DDT/Endrin	% Breakdown	Action	Affected Samples

3.4 DBC Retention Time Check

Is the %D between EVAL A and each analysis (quantitation and confirmation) DBC retention time within QC limits (2% for packed column, 0.3% capillary ID <0.32 mm, and 1% for megabore)?

Yes ☐ No ☐

Date	Sample ID	DBC %D	Action

For the above criteria outlined in Sections 8.1–8.4, check for transcription/calculation errors.

If errors are found, list below with necessary corrections: _____

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

4.0 INITIAL CALIBRATION

Has initial calibration been performed as required in the EPA method? Yes ☑ No ☐

Were the correct number of standards used to calibrate the instrument? Yes ☑ No ☐

For GC analyses of PCBs and Pesticides, did the laboratory follow the correct 72-hour sequence of analysis?
Yes ☐ No ☐ Not Applicable

List below compounds which did not meet initial calibration criteria outlined by the EPA method.

Instrument ID	Date	Compound	RF/%RSD	Action	Samples Affected
			Met criteria		

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

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

5.0 CONTINUING CALIBRATION

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

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

	Instrument ID	Date	Compound	RF/%D	Action	Samples Affected
VOCs	GC/MS INS	4/24/98 1323	Chloromethane	29.5	±25	Sample results are ND
↓	↓	↓	Methacrylonitrile	26.0	↓	No data were qualified
			2-Butanone	26.2		
SVOCs	GC/MS SYS	5/8/98 0851	Benzidine	33.5	±25	Sample results are ND
↓	↓	5/15/98 0926	Pyridine	32.6	↓	No data were qualified

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

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

6.0 BLANK ANALYSES

6.1 Method/Reagent and Instrument Blanks

Has a method/reagent blank been analyzed for each set of samples or for every 20 samples of similar matrix, whichever is more frequent? Yes ☑ No ☐

Has an instrument blank been analyzed at least once every twelve hours for each GC/MS system used? Yes ☑ No ☐

6.2 Field/Rinse/Equipment Blanks

Are there field/rinse/equipment blanks associated with each sampling day or at frequency specified in the sampling plan. Yes ☐ No ☑ Not submitted on ARCOC

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

Date	Blank ID	Compound	Conc. ( )	PQL ( )	Action Level	Samples Affected (Action)
			No target analytes were detected			

PQL = Practical Quantitation Limit from EPA Method.

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

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

_____

_____

_____

7.0 SURROGATE RECOVERY

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

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

Surrogate Compound	Control Limits
Lab Specified	

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

Date	Sample ID/Matrix	Surrogate Compound	%Rec	Action
		Met criteria		

Reviewed By: Kevin A Lambert
Date: 8-25-98

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

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

Yes ☐ No ☐ Not Applicable

Are method blank surrogate recoveries outside of limits upon reanalysis? Yes ☐ No ☐ Not Applicable

Are transcription/calculation errors present? Yes ☐ No ☑

If yes, note necessary corrections. _____

_____

_____

_____

_____

Reviewed By: Kevin A Lambert

Date: 8-25-98

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

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

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

Yes ☑ No ☐ VOCs Only. Not run on ARCOC group for SVOC analysis and acceptability was not addressed from another ARCOC group in the batch.

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

Date	Sample ID/Matrix	Compound	%Rec / RPD		Action
VOCs ↓ 4/24/98 1905	040457-003 -MS /Soil	Chlorobenzene	64	70-130	Sample result is ND LCS/LCSD met criteria
↓ 1935	040457-003 -MSD /Soil	↓	52	70-130	No data qualified
↓	↓	toluene	61	70-130	MS met criteria LCS/LCSD met criteria
↓	↓	Trichloroethene	66	70-130	No data were qualified

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

9.0 LABORATORY CONTROL SAMPLE ANALYSIS

Have laboratory control samples containing a representative number of the compounds of interest been analyzed at the frequency specified in the EPA method or QAPjP?

Yes ☑ No ☐

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

Date	Compound	%Rec	Control Limits	Action	Samples Affected
			Met criteria		

Control Limit Reference: _____

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

Date	Compound	%Rec	Control Limits	Action	Samples Affected
			Met criteria		

Control Limit Reference: _____

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

10.0 INTERNAL STANDARDS EVALUATION

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

Date	Sample ID	Internal Out	Acceptable Range	Action
		Met criteria		

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

11.0 TARGET COMPOUND LIST ANALYTES
11.1 GC/MS Analyses

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

Is chromatographic performance acceptable with respect to:

Baseline stability? Yes ☑ No ☐

Resolution? Yes ☑ No ☐

Peak shape? Yes ☑ No ☐

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

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

Other: _____

Is the RRT of each reported compound within the limits given in the method of the standard RRT in the continuing calibration? Yes ☑ No ☐

Are all the ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the mass spectrum? Yes ☑ No ☐

Do sample and standard relative intensities agree within 20%? Yes ☑ No ☐

If no for any of the above, indicate below problems and qualifications made to data:

_____

_____

_____

11.2 GC Analyses Not Applicable

Are there any transcription/calculation errors between the raw data and the reporting forms?
Yes ☐ No ☐

If yes, review errors and necessary corrections below; if errors are large, resubmittal of laboratory package may be necessary.

_____

_____

_____

Are retention times of sample compounds within the calculated retention time windows for both quantitation and confirmation analysis? Yes ☐ No ☐

Was GC/MS confirmation performed when required by the EPA method? Yes ☐ No ☐

If no for any of the above, reject positive results except for retention time windows if associated standard compounds are similarly shifted.

Reviewed By: Kevin K Lambert
Date: 8-25-98

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

Samples affected: Not Applicable

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

Samples affected: _____

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

12.0 FIELD DUPLICATE ANALYSIS

Were field duplicates submitted for analysis? Yes ☑ No ☐

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

Date	Sample ID	Compound	Sample Result	Duplicate Result	RPD	Affected Samples
VOCs => Met Criteria						
					No	data
SVOCs => Sample results are				ND.	were	
					qualified	

13.0 COMPOUND QUANTITATION/REPORTED DETECTION LIMITS

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

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

Reviewed By: Kevin A. Lombard
Date: 8-25-98

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

13.1 Chromatogram Quality

Were baselines stable? Yes ☑ No ☐

Were any negative peaks or unusual peaks present? Yes ☐ No ☑

Were early eluting peaks resolved to baseline? Yes ☑ No ☐

If incorrect quantitations are evident, note corrections necessary below: _____

_____

_____

Are the required quantitation limits (detection limits) adjusted to reflect sample dilutions and for soils, sample moisture? Yes ☑ No ☐

If no, make necessary corrections and note below.

_____

_____

_____

14.0 TENTATIVELY IDENTIFIED COMPOUNDS

No TICs Identified

Are Tentatively Identified Compounds (TIC) properly identified with scan number or retention time, estimated concentration, and J qualifier? Yes ☐ No ☐

Are the mass spectra for TICs and associated "best match" spectra included? Yes ☐ No ☐

Are any TCL compounds listed as TIC compounds? Yes ☐ No ☐

Are each of the ions present in the reference mass spectra with a relative intensity greater than 10% also present in the sample mass spectrum? Yes ☐ No ☐

Reviewed By: Kevin A Lambert
Date: 8-25-98

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

Do TIC and "best match" standard relative ion intensities agree within 20%? Yes ☐ No ☐

Comments No TICs Identified

Reviewed By: Kevin A Lambert

Date: 8-25-98

Approved By:* _____

Date _____

*Data package must be approved by Project/Task Leader.

Site: 94A

AR'COC: 600223 Data Classification: ORGANICS

Sample Fraction No.	Analysis	DV Qualifiers	Comments
CY94A2-GR-EB	EPA 8260	UJ	
↓	EPA 8270	↓	
Data is acceptable			
QC measures appear to be adequate			

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method. use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate. needs modification because of an unusual circumstance. or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010. EPA6020. EPA7470/1, EPA8015B. EPA8081. EPA8260. EPA8260-M3. EPA8270. HACH_ALK. HACH_ NO2. HACH_NO3. MEKC_HE. PCBRISC

Reviewed by: Kevin A Lambert Date: 8/14/98

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

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) do not meet acceptance criteria.
A1	Laboratory accuracy and/or bias measurements for the associated Surrogate Spike do not meet acceptance criteria.
A2	Laboratory accuracy and/or bias measurements for the associated Matrix Spike (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
J1	The method requirements for sample preservation/temperature were not met for the sample analysis. The associated value is an estimated quantity.
J2	The holding time was exceeded for the associated sample analysis. The associated value is an estimated quantity.
P	Laboratory precision measurements for the Laboratory Control Sample and duplicate (LCS/LCSD) do not meet acceptance criteria.
P1	Laboratory precision measurements for the Matrix Spike Sample and associated duplicate (MS/MSD) do not meet acceptance criteria.
P2	Insufficient quality control data to determine laboratory precision.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

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

MEMORANDUM

DATE: August 14, 1998

TO: File

FROM: Kevin Lambert KAL

SUBJECT: Organic Data Review and Validation
Site 94A, ARCOC No. 600223, Case No. 7214.2214

See the attached Data Assessment Summary Forms for supporting documentation on the data review and validation.

Summary

All samples were prepared and analyzed with accepted procedures and with specified methods (VOCs - EPA8260 and SVOCs – EPA8270). All compounds were successfully analyzed. One major problem was identified with the data package that resulted in the qualification of data from the equipment blank.

The equipment blank samples for VOCs was analyzed 15 days after holding time and the SVOCs was extracted 10 days after holding time. Sample results for these two samples were non-detects and are "UJ" coded due to holding time violation.

No other specific problems were identified which affect data quality. A few minor issues were identified but they do not result in the qualification of any data. Data is acceptable and QC measures appear to be adequate.

The following sections discuss the data review and validation.

Holding Times

All site samples were extracted and analyzed within the prescribed holding times except for the equipment blank samples discussed above.

Calibration

Initial calibration met acceptance criteria except several VOC compounds were outside control limits. These compounds are not on the Target Compound List (TCL) and no data were qualified. Continuing calibration met acceptance criteria except several SVOCs compounds were outside the control limits. These compounds are not on the TCL and no data were qualified.

Blanks

No target analytes were detected except for methylene chloride (9.5 ug/kg) in the method blank. Since there were no detectable concentration of this compound in the site samples, no data were qualified. Phthalate esters (bis[2-ethylhexyl]phthalate and di-n-butyl phthalate) were observed at estimated values (i.e., "J" coded) in the method blank associated with equipment blank. Since there were no detectable concentration of these compounds in the equipment blank, no data were qualified.

Surrogates

The surrogate recovery for the VOC and SVOC samples met acceptance criteria.

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

The MS/MSD for the VOC and SVOC samples met acceptance criteria for accuracy (% REC) and precision (RPD).

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

For VOC samples, the LCS met QC limits except % REC for methylene chloride was above the upper control limit. No LCSD was analyzed, however the MS/MSD met acceptance limits. Since there were no detectable concentration of this compound in the site samples, no data were qualified. For SVOC samples, the LCS/LCSD met QC limits except in the LCSD % REC for benzidine was above the upper control limit. The LCS met acceptance limits, and since there were no detectable concentration of this compound in the site samples, no data were qualified.

Internal Standards Evaluation

The internal standards for the VOC and SVOC samples met acceptance criteria.

Other QC

No field duplicate pair was submitted on ARCOC.

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

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

SITE OR PROJECT Site 94A
ANALYTICAL LABORATORY CORE
LABORATORY REPORT # 98113
CASE NO. 7214, 2214
ARCOC # 600223

SAMPLE IDS 14: 12 soil, 2 aqueous
NO. OF SAMPLES
CY94A2-GR-940,820-XXX
880,800-XXX
890,760-XXX
900,740-XXX
940,780-XXX
940,820-XXX
+GR-EB

DATA ASSESSMENT SUMMARY

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

		VOC	SVOC	PEST/PCB	OTHER
1.	HOLDING TIMES/PRESERVATION	UJ	UJ	NA	NA
2.	GC/MS INST. PERFORM.	✓	✓		
3.	CALIBRATIONS/WINDOWS	✓	✓		
4.	BLANKS	✓	✓		
5.	SURROGATES	✓	✓		
6.	MATRIX SPIKE/DUP	✓	✓		
7.	LABORATORY CONTROL SAMPLES	✓	✓		
8.	INTERNAL STANDARDS	✓	✓		
9.	COMPOUND IDENTIFICATION	✓	✓		
10.	SYSTEM PERFORMANCE	✓	✓		
11.	OVERALL ASSESSMENT	✓	✓		

✓ (check mark) — Acceptable: Data had no problems or qualified due to minor problems
N - Data qualified due to major problems
X - Problems, but do not affect data
NA - Not Applicable
Qualifiers: J - Estimate
UJ - Undetected, estimated

KAL 8/14/98
ACTION ITEMS: SEE ATTACHED DATA VALIDATION NARRATIVE

KAL 8/14/98
AREAS OF CONCERN:

Reviewed By: Kevin A. Lambert
Date: 8/14/98

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

PROJECT/TASK LEADER: _____

8/14/98 KAL
~~ACTION ITEMS:~~

KAL 8/14/98
~~AREAS OF CONCERN:~~

OVERALL DATA QUALITY ASSESSMENT SEE ATTACHED DATA VALIDATION NARRATIVE

Reviewed By: Kevin A Lambert
Date: 8/14/98

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

1.0 HOLDING TIMES AND PRESERVATION

Indicate the holding time criteria below that was used to evaluate the samples.

SW-846, 3rd. ed.
Other: _____

List below samples that were over holding time criteria.

Sample ID	~~VTSR~~ Date Sampled KHL 7/28/98	Date Analyzed	Action
040472-003 VOC	4/20/98	Anal. - 5/19/98	~~Hold time is 7 days w/o~~ pH adjustment. "UJ" code result
040472-007 SVOC	4/20/98	Ext. - 5/14/98 Anal. - 5/19/98	Ext. Hold Time is 7 days "UJ" code results

Eq. B. ↓

NOTE: VTSR = Validated time of sample receipt.

Were the correct preservatives used? Yes ☑ No ☐

List below samples that were incorrectly preserved.

Sample No.	Type of Sample	Deficiency	Action
		None	

Reviewed By: Kevin A Lambert 7/28/98

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

2.0 GC/MS TUNING CRITERIA

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

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

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

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

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

Date/Time	Problem	Sample Affected (Action)
	Met Criteria	

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

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

Reviewed By: Kevin A Lambert
Date: 8/14/98

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

3.0 GC INSTRUMENT PERFORMANCE.

3.1 DDT Retention Time

Not Applicable

Is DDT retention time for packed columns >12 minutes (except for OV-1 and OV-101)?

Yes ☐ No ☐

If no, list below the DDT standards that failed criteria: _____

Affected samples and compounds: _____

3.2 Retention Time Windows

Not Applicable

List below compounds that were not within the retention time windows.

Date.Time	Compound	RT	RT Window	Action	Affected Samples

Reviewed By: Kevin A Lambert 8/14/98

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

3.3 DDT and Endrin Degradation

Not Applicable

List below the standards that have a DDT or Endrin breakdown of >20% (or a combined breakdown of >20%).

Date/Time	Standard ID	DDT/Endrin	% Breakdown	Action	Affected Samples

3.4 DBC Retention Time Check

Is the %D between EVAL A and each analysis (quantitation and confirmation) DBC retention time within QC limits (2% for packed column, 0.3% capillary ID <0.32 mm, and 1% for megabore)?

Yes ☐ No ☐

Date	Sample ID	DBC %D	Action

For the above criteria outlined in Sections 8.1–8.4, check for transcription/calculation errors.

If errors are found, list below with necessary corrections: _____

Reviewed By: Kevin A Lambert
Date: 7/28/98

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

4.0 INITIAL CALIBRATION

Has initial calibration been performed as required in the EPA method? Yes ☑ No ☐

Were the correct number of standards used to calibrate the instrument? Yes ☑ No ☐

For GC analyses of PCBs and Pesticides, did the laboratory follow the correct 72-hour sequence of analysis?
Yes ☐ No ☐ Not Applicable

List below compounds which did not meet initial calibration criteria outlined by the EPA method.

Instrument ID	Date	Compound	RF/%RSD	Action	Samples Affected
VOCs: Several compounds were outside control limits (SEE RAW DATA) but are not on TCL. No data qualified					
SVOCs: Met calibration criteria					

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

Reviewed By: Kevin A Lambert
Date: 8/14/98

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

5.0 CONTINUING CALIBRATION

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

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

Instrument ID	Date	Compound	RF/%D	Action	Samples Affected
VOCs:	Met calibrations criteria				
SVOCs:	Some compounds were outside control limits				
	(SEE RAW DATA) but are not on TCL. No				
	data qualified				

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

Reviewed By: Kevin A Tarbert
Date: 8/14/98

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

6.0 BLANK ANALYSES

6.1 Method/Reagent and Instrument Blanks

Has a method/reagent blank been analyzed for each set of samples or for every 20 samples of similar matrix, whichever is more frequent? Yes ☑ No ☐

Has an instrument blank been analyzed at least once every twelve hours for each GC/MS system used? Yes ☑ No ☐

6.2 Field/Rinse/Equipment Blanks

Are there field/rinse/equipment blanks associated with each sampling day or at frequency specified in the sampling plan. Yes ☑ No ☐

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

Date	Blank ID	Compound	Conc. (ug/Kg)	PQL (ug/Kg)	Action Level	Samples Affected (Action)
Batch 33812 4/28/98 0248	MB	methylene chloride	9.5	5	Compound was not detected in the site samples. No data is qualified.	

PQL = Practical Quantitation Limit from EPA Method.

Note: Bis(2-ethylhexyl)phthalate & Di-n-butyl phthalate were observed at estimated values in the MB for Batch 34721 associated w/ aqueous samples. Sample results were non-detects except for Bis(2-ethylhexyl)phthalate which was observed at an estimated value. No data is qualified

Reviewed By: Kevin A Lambert

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

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

7.0 SURROGATE RECOVERY

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

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

Surrogate Compound	Control Limits

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

Date	Sample ID/Matrix	Surrogate Compound	%Rec	Action
		Met criteria		

Reviewed By: Kevin A Lambert
Date: 7/29/98

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

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

Yes ☐ No ☐ Not Applicable

Are method blank surrogate recoveries outside of limits upon reanalysis? Yes ☐ No ☐ Not Applicable

Are transcription/calculation errors present? Yes ☐ No ☑

If yes, note necessary corrections. _____

_____

_____

_____

_____

Reviewed By: Kevin A Lambert 7/28/98

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

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

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

Yes ☑ No ☐

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

Date	Sample ID/Matrix	Compound	%Rec RPD	Action
		Met criteria		

Reviewed By: Kevin A Lambert
Date: 7/30/98

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

9.0 LABORATORY CONTROL SAMPLE ANALYSIS

Have laboratory control samples containing a representative number of the compounds of interest been analyzed at the frequency specified in the EPA method or QAPjP?

Yes ☑ No ☐

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

Batch	Date	Compound	%Rec	Control Limits	Action	Samples Affected
1721 LCSD	5/19/98 1725	Benzidine	227	1-200	LCS met acceptance criteria and compound was not detected in the site samples No data is qualified	
894 LCS	4/28/98 0149	Methylene chloride	143	70-130	No LCSD analyzed. MS/MSD met acceptance criteria Compound was not detected in the site samples No data is qualified	

Control Limit Reference: _____

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

Date	Compound	%Rec	Control Limits	Action	Samples Affected
			Met criteria		

Control Limit Reference: _____

Reviewed By: Kevin A Lambert
Date: 7/30/98

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

10.0 INTERNAL STANDARDS EVALUATION

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

Date	Sample ID	Internal Out	Acceptable Range	Action
		Met Criteria		

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

11.0 TARGET COMPOUND LIST ANALYTES
11.1 GC:MS Analyses

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

Is chromatographic performance acceptable with respect to:

Baseline stability? Yes ☑ No ☐

Resolution? Yes ☑ No ☐

Peak shape? Yes ☑ No ☐

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

Reviewed By: Kevin A Lambert
Date: 8/14/98

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

Other: _____

Is the RRT of each reported compound within the limits given in the method of the standard RRT in the continuing calibration? Yes ☑ No ☐

Are all the ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the mass spectrum? Yes ☑ No ☐

Do sample and standard relative intensities agree within 20%? Yes ☑ No ☐

If no for any of the above, indicate below problems and qualifications made to data:

_____

_____

_____

11.2 GC Analyses Not Applicable

Are there any transcription/calculation errors between the raw data and the reporting forms?
Yes ☐ No ☐

If yes, review errors and necessary corrections below; if errors are large, resubmittal of laboratory package may be necessary.

_____

_____

_____

Are retention times of sample compounds within the calculated retention time windows for both quantitation and confirmation analysis? Yes ☑ No ☐

Was GC/MS confirmation performed when required by the EPA method? Yes ☐ No ☐

If no for any of the above, reject positive results except for retention time windows if associated standard compounds are similarly shifted.

Reviewed By: Kevin A Lambert
Date: 8/14/98

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

Samples affected: Not Applicable

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

Samples affected: _____

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

12.0 FIELD DUPLICATE ANALYSIS

Were field duplicates submitted for analysis? Yes ☐ No ☑ Not submitted on ARCOC

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

Date	Sample ID	Compound	Sample Result	Duplicate Result	RPD	Affected Samples
			Not submitted on ARCOC			

13.0 COMPOUND QUANTITATION/REPORTED DETECTION LIMITS

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

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

Reviewed By: Kevin A Lambert
Date: 8/14/98

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

13.1 Chromatogram Quality

Were baselines stable? Yes ☑ No ☐

Were any negative peaks or unusual peaks present? Yes ☑ KAL 8/14/98 No ☑

Were early eluting peaks resolved to baseline? Yes ☑ No ☐

If incorrect quantitations are evident, note corrections necessary below: _____

Are the required quantitation limits (detection limits) adjusted to reflect sample dilutions and for soils, sample moisture? Yes ☑ No ☐

If no, make necessary corrections and note below.

14.0 TENTATIVELY IDENTIFIED COMPOUNDS

Are Tentatively Identified Compounds (TIC) properly identified with scan number or retention time, estimated concentration, and J qualifier? Yes ☑ No ☐

Are the mass spectra for TICs and associated "best match" spectra included? Yes ☑ No ☐

Are any TCL compounds listed as TIC compounds? Yes ☐ No ☑

Are each of the ions present in the reference mass spectra with a relative intensity greater than 10% also present in the sample mass spectrum? Yes ☑ No ☐

Reviewed By: Kevin A Lambert
Date: 8/14/98

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

Do TIC and "best match" standard relative ion intensities agree within 20%? Yes ☑ No ☐

Comments Look good

Reviewed By: Kevin A Lambert

Date: 8/14/98

Approved By:* _____

Date _____

*Data package must be approved by Project/Task Leader.

SAMPLE FINDINGS SUMMARY

Site: 94A

AR/COC: 600521 KAL 8-20-98 Data Classification: Organics

Sample Fraction No.	Analysis	DV Qualifiers	Comments
No Data were Qualified			
Data is Acceptable			
QC measures appear to be adequate			

Sample No./Fraction No. - This value is located on the Chain of Custody in the ER Sample Id field.

Analysis - Use valid test methods provided below or if the result applies to an individual analyte within a test method. use the CAS number from the analytical data sheet.

DV Qualifiers - The entry will be taken from the list of valid qualifiers and associated comments. If other qualifiers not on the list are needed, contact Tina Sanchez to coordinate adding them to the list.

Comments - This is only to be used if a comment associated with the qualifier is not appropriate. needs modification because of an unusual circumstance. or additional clarification is warranted.

Test Methods - Anions_CE, EPA6010. EPA6020. EPA7470/1, EPA8015B. EPA8081. EPA8260. EPA8260-M3. EPA8270, HACH_ALK. HACH_ NO2. HACH_NO3. MEKC_HE. PCBRISC

Reviewed by: Kevin A Lambert Date: 8-20-98

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

Qualifier	Comment
A	Laboratory accuracy and/or bias measurements for the associated Laboratory Control Sample (LCS) do not meet acceptance criteria.
A1	Laboratory accuracy and/or bias measurements for the associated Surrogate Spike do not meet acceptance criteria.
A2	Laboratory accuracy and/or bias measurements for the associated Matrix Spike (MS) do not meet acceptance criteria.
B	Analyte present in laboratory method blank
B1	Analyte present in trip blank.
B2	Analyte present in equipment blank.
B3	Analyte present in continuing calibration blank.
J	The associated value is an estimated quantity. (Note: this qualifier may be used in conjunction with other qualifiers (i.e., A,J)
J1	The method requirements for sample preservation/temperature were not met for the sample analysis. The associated value is an estimated quantity.
J2	The holding time was exceeded for the associated sample analysis. The associated value is an estimated quantity.
P	Laboratory precision measurements for the Laboratory Control Sample and duplicate (LCS/LCSD) do not meet acceptance criteria.
P1	Laboratory precision measurements for the Matrix Spike Sample and associated duplicate (MS/MSD) do not meet acceptance criteria.
P2	Insufficient quality control data to determine laboratory precision.
Q	Quantitation limit reported does not meet Data Quality Objective (DQO) requirements.
R	The data are unusable for their intended purpose (Note: Analyte may or may not be present.)
U	The analyte is a common laboratory contaminant. The associated result is less than ten times the concentration in any blank.
U1	The analyte was also detected in a blank. The associated result is less than five times the concentration in any blank.
UJ	The analyte was analyzed for but was not detected. The associated value is an estimate and may be inaccurate or imprecise.

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

MEMORANDUM

DATE: August 20, 1998

TO: File

FROM: Kevin Lambert KHL

SUBJECT: Organic Data Review and Validation
Sandia North, ARCOC No. 600521, Case No. 7214.2214

See the attached Data Assessment Summary Forms for supporting documentation on the data review and validation.

Summary

All samples were prepared and analyzed with accepted procedures and specified methods (BTEX – EPA8260 and SVOCs – EPA8270). All compounds were successfully analyzed. No major problems were identified with the data package that result in the qualification of any data. A minor issue was identified, however it does not result in the qualification of any data. Data is acceptable and QC measures appear to be adequate.

The following sections discuss the data review and validation.

Holding Times

The sample was extracted and analyzed within the prescribed holding times.

Calibration

Initial calibration for BTEX and SVOC analysis met acceptance criteria except several compounds not on the target compound list (TCL) were outside the control limits. No data were qualified. Continuing calibration for BTEX and SVOC analysis met acceptance criteria except several compounds not on the target compound list (TCL) were outside the control limits. No data were qualified.

Blanks

No target analytes were detected in the method blanks.

Surrogates

The surrogate recoveries met QC acceptance limits.

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

No MS/MSD for BTEX analysis was run on the ARCOC group. The MS/MSD from another ARCOC group for the batch met acceptance criteria, no data were qualified. The MS/MSD for SVOC analysis met QC acceptance limits.

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

The LCS/LCSDs met acceptance criteria.

Internal Standards Evaluation

The internal standards met acceptance criteria.

Other QC

No field blank (FB), trip blank (TB), or equipment blank (EB) was submitted on ARCOC. No target analytes were detected in the field duplicate pair for BTEX and SVOC analysis.

No other specific issues were identified which affect data quality.

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

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

SITE OR PROJECT 94A
ANALYTICAL LABORATORY GEL
LABORATORY REPORT # 9807334
CASE NO. 7214.2214
ARCOC # 600521

SAMPLE IDS 6 soil
NO. OF SAMPLES CY94A-460-920-XXX,
CY94A-540-960-XXX,
CY94A-600-1000-XXX,
CY94A-940-820-XXX,

DATA ASSESSMENT SUMMARY

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

		VOC	SVOC	PEST/PCB	OTHER
1.	HOLDING TIMES/PRESERVATION	✓	✓	NA	NA
2.	GC/MS INST. PERFORM.	✓	✓		
3.	CALIBRATIONS/WINDOWS	✓	✓		
4.	BLANKS	✓	✓		
5.	SURROGATES	✓	✓		
6.	MATRIX SPIKE/DUP	✓	✓		
7.	LABORATORY CONTROL SAMPLES	✓	✓		
8.	INTERNAL STANDARDS	✓	✓		
9.	COMPOUND IDENTIFICATION	✓	✓		
10.	SYSTEM PERFORMANCE	✓	✓		
11.	OVERALL ASSESSMENT	✓	✓		

✓ (check mark) — Acceptable: Data had no problems or qualified due to minor problems
N - Data qualified due to major problems
X - Problems, but do not affect data
Qualifiers: J - Estimate
UJ - Undetected, estimated

ACTION ITEMS: SEE D.V. NARRATIVE

AREAS OF CONCERN:

Reviewed By: Kevin A Lambert
Date: 8-20-98

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

PROJECT/TASK LEADER: _____

ACTION ITEMS: SEE D.V. NARRATIVE

AREAS OF CONCERN: _____

OVERALL DATA QUALITY ASSESSMENT _____

Reviewed By: Kevin A Lambert
Date: 8-20-98

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

1.0 HOLDING TIMES AND PRESERVATION

Indicate the holding time criteria below that was used to evaluate the samples.

SW-846, 3rd. ed.
Other: _____

List below samples that were over holding time criteria.

Sample ID	VTSR	Date Analyzed	Action
		SEE CVR FORM	

NOTE: VTSR = Validated time of sample receipt.

Were the correct preservatives used? Yes ☐ No ☐

List below samples that were incorrectly preserved.

Sample No.	Type of Sample	Deficiency	Action

Reviewed By: Kevin A Lambert 8-20-98

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

2.0 GC/MS TUNING CRITERIA

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

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

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

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

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

Date/Time	Problem	Sample Affected (Action)
	Met criteria	

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

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

Reviewed By: Kevin A Lambert
Date: 8-20-98

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

3.0 GC INSTRUMENT PERFORMANCE.

3.1 DDT Retention Time

Not Applicable

Is DDT retention time for packed columns >12 minutes (except for OV-1 and OV-101)?
Yes ☐ No ☐

If no, list below the DDT standards that failed criteria: _____

Affected samples and compounds: _____

_____

_____

3.2 Retention Time Windows

List below compounds that were not within the retention time windows.

Date.Time	Compound	RT	RT Window	Action	Affected Samples

Reviewed By: Kevin A Lambert 8-20-98

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

3.3 DDT and Endrin Degradation

Not Applicable

List below the standards that have a DDT or Endrin breakdown of >20% (or a combined breakdown of >20%).

Date/Time	Standard ID	DDT/Endrin	% Breakdown	Action	Affected Samples

3.4 DBC Retention Time Check

Is the %D between EVAL A and each analysis (quantitation and confirmation) DBC retention time within QC limits (2% for packed column, 0.3% capillary ID <0.32 mm, and 1% for megabore)?

Yes ☐ No ☐

Date	Sample ID	DBC %D	Action

For the above criteria outlined in Sections 8.1–8.4, check for transcription/calculation errors.

If errors are found, list below with necessary corrections: _____

Reviewed By: Kevin A Lambert
Date: 8-20-98

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

4.0 INITIAL CALIBRATION

Has initial calibration been performed as required in the EPA method? Yes ☑ No ☐

Were the correct number of standards used to calibrate the instrument? Yes ☑ No ☐

For GC analyses of PCBs and Pesticides, did the laboratory follow the correct 72-hour sequence of analysis?
Yes ☐ No ☐ Not Applicable

List below compounds which did not meet initial calibration criteria outlined by the EPA method.

Instrument ID	Date	Compound	RF/%RSD	Action	Samples Affected
VOCs:	Several compounds, not on TCL, were outside acceptance limits. No data were qualified (SEE QC Summary Data)				
SVOCs:	Several compounds, not on TCL, were outside acceptance limits. No data were qualified. ~~One compound on TCL was out but ND~~ One compound on TCL was outside limits but ND, no data were qualified. KHL 8-20-98 (SEE QC Summary Data)				

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

Reviewed By: Kevin A Lambert
Date: 8-20-98

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

5.0 CONTINUING CALIBRATION

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

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

Instrument ID	Date	Compound	RF/%D	Action	Samples Affected
VOCs:	Several compounds were outside limits but are not on TCL. No data were qualified (SEE QC Summary Data)				
SVOCs:	Several compounds, not on TCL were outside limits. No data were qualified (SEE QC Summary Data)				

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

Reviewed By: Kevin A. Lambert
Date: 8-20-98

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

6.0 BLANK ANALYSES

6.1 Method/Reagent and Instrument Blanks

Has a method/reagent blank been analyzed for each set of samples or for every 20 samples of similar matrix, whichever is more frequent? Yes ☑ No ☐

Has an instrument blank been analyzed at least once every twelve hours for each GC/MS system used? Yes ☑ No ☐

6.2 Field/Rinse/Equipment Blanks

Are there field/rinse/equipment blanks associated with each sampling day or at frequency specified in the sampling plan. Yes ☐ No ☑ No submitted on ARCOC. No TB for VOCs.

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

Date	Blank ID	Compound	Conc. ( )	PQL ( )	Action Level	Samples Affected (Action)

No target analytes were detected

PQL = Practical Quantitation Limit from EPA Method.

Reviewed By: Kevin A Lambert
Date: 8-20-98

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

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

_____

_____

_____

7.0 SURROGATE RECOVERY

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

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

Surrogate Compound	Control Limits

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

Date	Sample ID/Matrix	Surrogate Compound	%Rec	Action
		Met criteria		

Reviewed By: Kevin A Lambert
Date: 8-20-98

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

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

Yes ☐ No ☐ Not Applicable

Are method blank surrogate recoveries outside of limits upon reanalysis? Yes ☐ No ☐ Not Applicable

Are transcription/calculation errors present? Yes ☐ No ☑

If yes, note necessary corrections. _____

_____

_____

_____

_____

Reviewed By: Kevin A Lambert 8-20-98
Date:

ORGANIC DATA ASSESSMENT SUMMARY FORM

(Data Verification/Validation Level 3 DV-3)

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

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

Yes ☑ No ☐

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

Date	Sample ID/Matrix	Compound	%Rec RPD	Action
		Met criteria		

Note: Not run for BTEX analysis from ARCOC group. MS/MSD Run on another ARCOC group in Batch and met acceptance criteria

Reviewed By: Kevin A Lambert
Date: 8-20-98

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

9.0 LABORATORY CONTROL SAMPLE ANALYSIS

Have laboratory control samples containing a representative number of the compounds of interest been analyzed at the frequency specified in the EPA method or QAPjP?

Yes ☑ No ☐

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

Date	Compound	%Rec	Control Limits	Action	Samples Affected
			Met criteria		

Control Limit Reference: _____

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

Date	Compound	%Rec	Control Limits	Action	Samples Affected
			Met criteria		

Control Limit Reference: _____

Reviewed By: Kevin A Lambert
Date: 5-20-98

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

10.0 INTERNAL STANDARDS EVALUATION

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

Date	Sample ID	Internal Out	Acceptable Range	Action
			Met criteria	

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

11.0 TARGET COMPOUND LIST ANALYTES
11.1 GC/MS Analyses

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

Is chromatographic performance acceptable with respect to:

Baseline stability? Yes ☑ No ☐

Resolution? Yes ☑ No ☐

Peak shape? Yes ☑ No ☐

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

Reviewed By: Kevin A Zachwieja
Date: 8-20-98

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

Other: _____

Is the RRT of each reported compound within the limits given in the method of the standard RRT in the continuing calibration? Yes ☑ No ☐

Are all the ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the mass spectrum? Yes ☑ No ☐

Do sample and standard relative intensities agree within 20%? Yes ☑ No ☐

If no for any of the above, indicate below problems and qualifications made to data:

_____

_____

_____

11.2 GC Analyses Not Applicable

Are there any transcription/calculation errors between the raw data and the reporting forms?
Yes ☐ No ☐

If yes, review errors and necessary corrections below; if errors are large, resubmittal of laboratory package may be necessary.

_____

_____

_____

Are retention times of sample compounds within the calculated retention time windows for both quantitation and confirmation analysis? Yes ☐ No ☐

Was GC/MS confirmation performed when required by the EPA method? Yes ☐ No ☐

If no for any of the above, reject positive results except for retention time windows if associated standard compounds are similarly shifted.

Reviewed By: Kevin A Lambert
Date: 8-20-98

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

Samples affected: Not Applicable

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

Samples affected: _____

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

12.0 FIELD DUPLICATE ANALYSIS

Were field duplicates submitted for analysis? Yes ☑ No ☐

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

Date	Sample ID	Compound	Sample Result	Duplicate Result	RPD	Affected Samples
		No Target Analytes were detected				

13.0 COMPOUND QUANTITATION/REPORTED DETECTION LIMITS

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

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

Reviewed By: Kevin A Lambert
Date: 8-20-98

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

13.1 Chromatogram Quality

Were baselines stable? Yes ☑ No ☐

Were any negative peaks or unusual peaks present? Yes ☐ No ☑

Were early eluting peaks resolved to baseline? Yes ☑ No ☐

If incorrect quantitations are evident, note corrections necessary below: _____

_____

_____

Are the required quantitation limits (detection limits) adjusted to reflect sample dilutions and for soils, sample moisture? Yes ☑ No ☐ Not KAL 8-20-98

If no, make necessary corrections and note below.

_____

_____

_____

14.0 TENTATIVELY IDENTIFIED COMPOUNDS

No TICs Identified

Are Tentatively Identified Compounds (TIC) properly identified with scan number or retention time, estimated concentration, and J qualifier? Yes ☐ No ☐

Are the mass spectra for TICs and associated "best match" spectra included? Yes ☐ No ☐

Are any TCL compounds listed as TIC compounds? Yes ☐ No ☐

Are each of the ions present in the reference mass spectra with a relative intensity greater than 10% also present in the sample mass spectrum? Yes ☐ No ☐

Reviewed By: Kevin A Lambert
Date: 8-20-98

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

Do TIC and "best match" standard relative ion intensities agree within 20%? Yes ☐ No ☐

Comments Not Identified

Reviewed By: Kevin A Lambert

Date: 8-20-98

Approved By:* _____

Date _____

*Data package must be approved by Project/Task Leader.

ANNEX 6-E
Risk Screening Assessment

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SWMU 94A: RISK SCREENING ASSESSMENT ANALYSIS

I. Site Description and History

Solid Waste Management Unit (SWMU) 94A is a subunit of SWMU 94, identified as Lurance Canyon Burn Site on the Resource Conservation and Recovery Act (RCRA) Hazardous and Solid Waste Amendments permit. SWMU 94 is located on U.S. Air Force (USAF) land withdrawn from the Bureau of Land Management (BLM) and permitted to the U.S. Department of Energy (DOE) (SNL/NM July 1994a). The site is located on the canyon-floor alluvium in the closed upper reaches of the Lurance Canyon drainage. This drainage is surrounded by moderately steep sloping canyon walls and the immediate topographic relief around the site is over 500 feet. A 25- to 50-ft-wide road is cut on the hillsides as a firebreak and encircles the site. The canyon floor at the site is isolated by the canyon walls except for the western drainage into Arroyo del Coyote. Coyote Springs Road follows this drainage and is the main access road into Lurance Canyon.

The Lurance Canyon Burn Site is currently used for testing fire survivability of transportation containers, weapons components, simulated weapons, and satellite components (94-1, 94-6, 94-12). The location of SWMU 94 coincides with SWMU 65, Lurance Canyon Explosive Test Site, an inactive site used for high explosives (HE) tests and for liquid and solid propellant burn tests. Only a few of the permanent engineered structures present at the site are active today.

SWMU 94A, Aboveground Tanks includes all of the current and historic aboveground tank storage locations at SWMU 94 including the current tank location north of the large open burn pool (LOBP), the current tank location north of the light airtransport accident resistant container (LAARC) Unit, and the former tank location north of the Bomb Burner Unit. These tank areas have been included due to documented and potential accidental releases of JP-4 fuel. SWMU 94A comprises three individual areas, having a total surface area of 0.8 acres (SNL/NM April 1995). The mean elevation of this subunit is 6,370 feet above sea level (SNL/NM April 1995).

In order to facilitate site characterization, SWMU 94 has been subdivided into seven subunits where hazardous constituents may have been released: SWMU 94A, Aboveground Tanks; SWMU 94B, Debris/Soil Mound Area; SWMU 94C, Bomb Burner Area and Discharge line; SWMU 94D, Bomb Burner Discharge Pit; SWMU 94E, Small Surface Impoundment; SWMU 94F, LAARC Discharge Pit; SWMU 94G, Scrap Yard. All of these subunits are inactive except for SWMU 94G (Scrap Yard), and SWMU 94A which contains both active and inactive tank areas. This NFA and risk screening assessment address historical releases from all three aboveground storage tank locations. However, the active aboveground storage tank location is operating in compliance with all current applicable state and federal regulations and is not regulated under RCRA. The SWMU 94 subunits are each addressed in separate NFA proposals. SWMUs 94B, 94C, 94D, 94E, and 94F will be addressed in future NFA submittals.

For a detailed discussion regarding the local setting at SWMU 94A, refer to the "RCRA [Resource Conservation and Recovery Act] Facility Investigation [RFI] Work Plan for OU 1333, Canyons Test Area" (SNL/NM September 1995).

Historical aerial photographs indicate that the transition of testing activities from predominantly open detonation explosives testing and JP-4 fuel fires in excavated pits (SWMU 65) to open burning of test units with JP-4 fuel fires in portable pans (SWMU 94) occurred between 1971 and 1982 (SNL/NM August 1994). Based on test reports and interviews, open burning with JP-4 fuel fires in portable burn pans began by 1975. By 1980, the first permanent engineered burn unit was constructed on the former location of the Primary Detonation Area, SWMU 65B, and was in operation. The scrap yard was established in the northwestern portion of the site within the former location of the Far Field Dispersion Area (SWMU 65E) (94-141). The scrap yard has historically been used to store spare materials used in explosives and burn tests and is still in use today for storing nonliquid materials and used equipment.

By 1983, most of SWMU 94 was constructed with a total of five permanent engineered burn units (the LOBP, the Small Open Burn Pool [SOBP], the Light Airtransport Accident Resistant Container [LAARC] Unit, the Bomb Burner Unit, the Small Wind-Shielded (SWISH) unit, and the CON-CON) placed on the graded area that was the former location of the Primary Detonation Area, SWMU 65B, and Near Field Dispersion Area, SWMU 65D (SNL/NM August 1994). Two of the burn units (SWISH Unit [and later the SMERF Unit]) were constructed to provide testing facilities that would eliminate wind effects and provide accurate temperature control and instrumentation for test monitoring (94-163). A small surface impoundment is also visible southeast of Bunker 9830. Engineered soil berms had been constructed by 1983 in the southeastern portion of the site for flood protection from the main arroyo in Lurance Canyon.

By 1992, the site contained all the current permanent engineered burn units. The CON-CON Unit (Section 5.1.1.3), identified in the 1983 historical aerial photograph, was dismantled prior to 1989 and by 1992, a new burn unit (SMERF) was constructed in the same location (SNL/NM August 1994). Prior to 1992, a debris/soil mound area was created in the southern portion of SWMU 94, immediately north of the main arroyo in Lurance Canyon. This debris/soil mound may be associated with on-going grading activities at the site. Located to the northeast of the debris/soil mound area is a soil mound that was created during the remediation of a wastewater spill from the SMERF on March 20, 1992 (Section 5.3.1.3).

Burn testing at the Lurance Canyon Burn Site has always been conducted with JP-4 fuel pool fires in open portable pans or contained within the permanent engineered structures (94-125). Pool fires provide the closest simulation of accidents involving flammable liquids (94-15). For the tests, the pans are filled with approximately 1 to 2 ft of water, and an average 8-in. layer of JP-4 fuel is placed on the water. The test unit, such as a transportation container, is placed on a stand above the fuel. The fuel is ignited, and the fire typically burns until the JP-4 fuel is consumed. The length of the test is controlled by the volume (thickness) of the JP-4 fuel layer. After a burn test is completed, test units are retrieved and salvageable materials are collected and stored in the scrap yard located in the northwest portion of the site. Any test object residue (e.g., metal slag) is recovered with the test unit and removed from the site by the testing group. Only small residue particulates may be left in the water following the burn test (94-126). While no testing is currently conducted on components containing radioactive materials, SWMU 94 is currently classified as an RMMA because of the presence of residual DU in the soil from earlier burn tests (94-60), and from former explosives testing activities associated with SWMU 65 (94-61).

Aboveground Tanks

Aboveground Tanks (SWMU 94A) have been used to supply water, JP-4 fuel, and coolant for burn testing at all of the engineered structures. There are three storage tank locations at SWMU 94 that served the LAARC Unit, the Bomb Burner Unit, the SMERF, the SOBP, and the LOBP. The aboveground tank locations include an area north of the LAARC Unit, north of the Bomb Burner Unit, and the current tank location north of the LOBP. These three aboveground tank locations are discussed below.

North of the LAARC Unit

An aboveground tank labeled "nonpotable water" is currently located southwest of the SWISH and was used to supply water to the unit (94-124). Two aboveground tanks were also formerly used for fuel storage at this location (94-79). These two tanks have since been removed.

North of the Bomb Burner Unit

The 1983 historical aerial photograph shows that three aboveground tanks were formerly located north of the Bomb Burner Unit (94-49). These aboveground tanks were used to supply JP-4 fuel and water for testing at the Bomb Burner Unit. The tanks are no longer present at the site, and no documentation exists that describes the installation and removal of the tanks. No physical evidence exists at the site to identify their former locations.

North of the LOBP

Three aboveground tanks are now located approximately 400 ft north of the LOBP: one contains JP-4 fuel, another contains nonpotable water, and the third contains glycol/water. Prior to 1992, when the nonpotable water and glycol/water tanks were installed, there were two nonpotable water tanks in addition to a JP-4 fuel tank at the same location (94-124). The current nonpotable water and JP-4 fuel tanks provide water and fuel for burn tests conducted at the LOBP, the SOBP, and the SMERF. The glycol/water is used as a coolant for the SMERF. A plastic-lined, earthen, secondary overflow containment pit is installed around the aboveground tank containing JP-4 fuel (94-126).

Two underground pipelines connect the LOBP to the JP-4 fuel tank and to the nonpotable water tank. Two aboveground 3.5-in.-diameter galvanized metal pipelines connect the SOBP to the JP-4 fuel tank and to the nonpotable water tank. Three underground pipelines run from the tanks to the SMERF: one connects to the JP-4 fuel tank, and the other two provide glycol/water coolant for circulation between the vertical walls and roof panels of the SMERF. A recirculation system currently routes wastewater back to the water and water/glycol tanks for storage and reuse (94-124, 94-126).

On February 7, 1990, a surface spill occurred on the north side of the aboveground JP-4 fuel storage tank connected to the LOBP. The spill occurred when a fuel line became unscrewed during a filling operation in support of the SST testing program conducted in portable pans. Approximately 70 gal of JP-4 fuel were spilled onto the ground. The soil was not removed

(94-163). Soil analyses of the spill area in May 1990, indicated no VOCs exceeding the reporting limit of 0.625 mg/kg (94-113).

A plastic-lined, earthen, overflow containment pit which surrounds the JP-4 fuel tank was constructed when the tanks were replaced after June 1992 (94-144, 94-126, 94-149). There has never been a release of JP-4 fuel to the containment pit (94-126).
Prior to negotiating the discharge date, location, and quantity with the City of Albuquerque for release to the POTW (94-126), SNL/NM samples and analyzes the wastewater generated from burn tests for VOCs, SVOCs, metals, and inorganic compounds. The wastewater contained several hundred µg/liter (L) of fuel residues in each sampling event, including BTEX and semivolatile petroleum hydrocarbons. Metal concentrations were low, with the exception of iron (4.9 mg/L) and zinc (4.5 mg/L) which were found in the June 1990 samples. The wastewater had been held in the tanks and recycled since 1988 and had been used for a total of 46 burn tests, 39 tests from the LOBP and 7 tests from the SOBP.

II. Comparison of Results to Data Quality Objectives

The confirmatory sampling conducted at SWMU 94A was designed to collect adequate samples to:

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

Table 1 summarizes the sample location design for SWMU 94A. The primary source of constituents of concern (COC) at SWMU 94A are volatile organic compounds (VOC) and semivolatile organic compounds (SVOC) from wastewater, coolant (glycol), and JP-4 aviation fuel managed in aboveground tanks. The liquids stored in the tanks were used to support burn tests conducted at engineered structures within the Lurance Canyon Burn Site. A documented release of JP-4 to the soil occurred at Tank Area 3 in February 1990 (approximately 70 gallons). Other potential releases may have occurred as a result of operational errors when filling or draining tanks, or when transferring liquids to the test sites. Since there were no containment measures used during historical operation of the aboveground tanks at SWMU 94A, any release would have been directly to the soil. Although the aboveground tanks have been removed from Tank Area 1 and Tank Area 2, three tanks remain at Tank Area 3. However, these tanks have been upgraded in compliance with National Fire Protection Association 30 requirements and relevant aboveground tank standards. Radionuclides are also potential COCs for SWMU 94A because the site is located within an Radioactive Materials Management Area and co-located with SWMU 65E (the far-field dispersion area for explosive tests conducted at the Lurance Canyon Explosive Test Site).

The number and location of the samples collected was dependent on the completeness of historical information regarding former tank locations as well as results from a soil vapor survey conducted at the Lurance Canyon Burn Site in February and March, 1998 (W. L. Gore & Associates, Inc. May 1998). Sampling locations were adjacent to soil vapor sample locations.

To assess the extent of lateral contamination at SWMU 94A, surface samples were collected at each sample location between 0 to 0.5 feet below ground surface (bgs). Similarly, the vertical extent of contamination was determined by collecting subsurface samples from two locations at Tank Area 1 and one location at Tank Area 2. Subsurface samples were collected at depth intervals of 3.5 to 4 feet and 8.5 to 9 feet bgs. However, due to the shallow depth of bedrock, a single subsurface sample was collected at Tank Area 3 between 0.5 and 1.0 feet bgs.

Table 1
Summary of Sampling Performed to Meet Data Quality Objectives

SWMU 94A Sampling Areas	Potential COC Source	Number of Sampling Locations	Sample Density	Sampling Location Rationale
Tank Area 1	Soil Contaminated from accidental releases JP-4 Aviation Fuel	5	Surface and subsurface samples collected at specific grid locations coinciding with soil vapor survey locations.	Sample locations based on soil vapor survey results and likely former tank locations.
Tank Area 2	Soil Contaminated from accidental releases JP-4 Aviation Fuel	5	Surface and subsurface samples collected at specific grid locations coinciding with soil vapor survey locations.	Sample locations based on soil vapor survey results and likely former tank locations.
Tank Area 3	Soil Contaminated from accidental releases of Wastewater, Coolant, and/or JP-4 Aviation Fuel	7	Surface and subsurface samples collected at specific grid locations coinciding with soil vapor survey locations.	Sample locations based on soil vapor survey results and former tank locations.

COC = Constituent of concern.
SWMU = Solid waste management unit.

Table 2 summarizes the analytical methods and data-quality requirements necessary to (1) adequately characterize hazardous waste or hazardous constituents associated with wastewater discharged to the pit and (2) support screening risk assessments.

A total of five locations were sampled at Tank Area 1, five locations at Tank Area 2, and seven locations at Tank Area 3. All samples collected were analyzed offsite for SVOCs and either VOCs or benzene, toluene, ethylbenzene, and xylene (BTEX). The BTEX analyses were performed on samples collected to further define the extent of toluene contamination identified during initial sampling activities. One surface samples from each tank area was also analyzed offsite for gross alpha and gross beta. SNL/NM on-site laboratories analyzed four samples for radionuclides using gamma spectroscopy to permit the transport of samples to the off-site laboratory.

All off-site laboratory results were reviewed and verified/validated according to "Data Verification/Validation Level 3—DV-3" in Attachment C of the Technical Operating Procedure 94-03, Rev. 0 (SNL/NM July 1994). All gamma spectroscopy data were reviewed by SNL/NM Department 7713 Radiation Protection Sample Diagnostic Laboratory [RPSD]) according to "Laboratory Data Review Guidelines", Procedure No: RPSD-02-11, Issue No: 02 (SNL/NM July 1996). The reviews performed confirmed that the data are acceptable for use in the No Further

Action (NFA) proposal for SWMU 94A. The data quality objectives (DQOs) for SWMU 94A have been met.

Table 2
Summary of Data Quality Requirements

Analytical Requirement	Data Quality Level	Radiation Protection Sample Diagnostics Laboratory Department 7713 SNL/NM	Core Laboratories Inc., Casper, Wyoming	Core Laboratories Inc., Aurora, Colorado
VOCs EPA Method 8260	Level 3	NA	NA	21 samples 2 sample (internal duplicate)
BTEX EPA Method 8021	Level 3	NA	NA	3 samples 1 sample (internal duplicate)
SVOCs EPA Method 8270	Level 3	NA	NA	22 samples 1 sample (internal duplicate)
Gamma Spectroscopy EPA Method 901.1	Level 2	4 samples	NA	NA
Gross Alpha Gross Beta EPA Method 900.0	Level 3	NA	3 samples	NA

BTEX = Benzene, toluene, ethylbenzene, and xylene.
SVOC = Semivolatile organic compound.

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

III.1 Introduction

The determination of the nature, rate, and extent of contamination at SWMU 94A was based upon an initial conceptual model validated with confirmatory sampling at the site. The initial conceptual model was developed from historical background information including site inspections, personal interviews, historical photographs, historical operating records, and radiological surveys. The data quality objectives contained in the Work Plan for OU 1333 (SNL/NM September 1995) and Field Implementation Plan (FIP) addendum to the Work Plan (SNL/NM June 1998) identified the sample locations, sample density, sample depth, and analytical requirements. The sample data collected were subsequently used to develop the final conceptual model for SWMU 94A which is presented in Section 6.5 of the associated NFA proposal. The quality of the data specifically used to determine the nature, rate, and extent of contamination are described below.

III.2 Nature of Contamination

The nature of contamination at SWMU 94A was determined by soil vapor surveys, analytical testing of soil media, and the potential for degradation of relevant COCs (Section V). The analytical requirements included VOC and SVOC analyses were used to characterize potential JP-4, wastewater, or coolant releases that may have occurred during liquid handling and management activities associated with the aboveground tanks. Gamma spectroscopy and gross alpha/gross beta analyses were also performed to verify no radioactive materials are present at the site. These analytes and methods are appropriate to characterize the COCs and potential degradation products associated with the historical activities conducted at SWMU 94A.

III.3 Rate of Contaminant Migration

Although Tank Area 1 and Tank Area 2 are inactive, Tank Area 3 remains active. However, recent construction upgrades to the aboveground tanks at Tank Area 3 in the form of secondary containment measures have mitigated the potential for future releases to the soil. As a result, all primary sources of COCs (accidental releases of liquids from the tanks) have been eliminated. Currently, only secondary sources of COCs remain at the site in the form of adsorbed, dissolved, or volatilized organic compounds in soil. The rate of COC migration is dependent predominantly on site meteorological and surface hydrologic processes as described in Section V. Data available from the Site-Wide Hydrogeologic Characterization Project (published annually); numerous SNL/NM air, surface water, and radiological monitoring programs; biological surveys; and other governmental atmospheric monitoring at the Kirtland Air Force Base (i.e., National Oceanographic and Atmospheric Administration) are adequate to characterize the rate of COCs migration at SWMU 94A.

III.4 Extent of Contamination

Surface soil samples were collected at five locations from Tank Area 1, five locations from Tank Area 2, and seven locations from Tank Area 3. In addition, subsurface soil samples were collected from one or two locations from each of the three tank areas. The samples were collected at soil vapor survey locations where former aboveground tanks resided or likely resided. These sample locations are deemed appropriate to determine the lateral extent of COC migration.

The surface soil sample density at SWMU 94A was judgmental, based on soil vapor survey results and the areas most likely occupied by the former aboveground tanks. In addition, subsurface samples density was estimated on the basis potential soil impacts from accidental releases of small liquid volumes. The number of samples collected was deemed sufficient to establish the presence of detectable COCs from wastewater, coolant, and JP-4 associated with tests conducted at the Lurance Canyon Burn Site. The sample density ranged from 3 to 20 samples per acre, which is consistent with comparable U.S. Environmental Protection Agency (EPA) RI/FS studies (Selman et al., 1994).

Because the primary release mechanism of COCs to SWMU 94A was in the form of accidental discharges to the soil during liquid handling operations, there is potential for vertical migration of contamination. However, the rate of vertical migration of COCs is expected to be limited by the

relatively low solubility of most organic compounds and the high evapotranspiration rate for the area. Subsurface samples were collected at one or two locations at each tank area to investigate the vertical extent of contamination. Subsurface soil samples were collected at depth intervals of 3.5 to 4 feet bgs and 8.5 to 9 feet bgs, depending on the depth of bedrock at each subsurface sample location. Therefore, the sample collection depths are considered representative of the media potentially impacted by site activities and sufficient to determine the vertical extent of COCs migration.

In summary, the design of the confirmatory sampling was appropriate and adequate to determine the nature, rate, and extent of contamination.

IV. Comparison of COCs to Background Screening Levels

Site history and characterization activities are used to identify potential COCs. The identification of COCs and the sampling to determine the concentration levels of those COCs across the site are described in the SWMU 94A NFA proposal. Generally, COCs evaluated in this risk assessment include all detected organics and radiological contaminants and all inorganic COCs that were analyzed for. If the detection limit of an organic compound was too high (could possibly cause an adverse effect to human health or the environment), the compound was retained. Nondetect organics that were not included in this assessment were determined to have low enough detection limits 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 determined for the entire site. The SNL/NM maximum background concentration (Dinwiddie September 1997, Zamorski December 1997) was selected to provide the background screen in Tables 3 and 4. Human health nonradiological COCs were also compared to SNL/NM proposed Subpart S action levels (Table 3) (IT July 1994).

Both radiological and nonradiological COCs are evaluated. The nonradiological COCs evaluated in this risk assessment include only organics.

Table 3 lists nonradiological COCs for Human Health and Ecological Risk Assessment at SWMU 94A. Table 4 lists radiological COCs. The associated SNL/NM maximum background concentration values are shown show on the tables (Dinwiddie September 1997, Zamorski December 1997). Section VI.4 and Sections VII.2 and VII.3 provide a discussion of Tables 3 and 4.

V. Fate and Transport

The primary releases of COCs at SWMU 94A were to surface soils. Wind, water, and biota are natural mechanisms of COC transport from the primary release point. Because the site is situated within Lurance Canyon in the Manzanita Mountains and is within woodland vegetation, it is protected from strong winds at the ground surface. Therefore, wind is probably not a significant transport mechanism for COCs adsorbed to soil particles. However, because the COCs are primarily VOCs and SVOCs, moderate and light wind will be important in transporting COCs that volatilize at the soil surface.

Surface water runoff at this site can transport COCs, either directly in solution or adsorbed to surface soil particles being transported. Water at SWMU 94A is received as precipitation (rain

Table 3
Nonradiological COCs for Human Health and Ecological Risk Assessment at SWMU 94A with Comparison to the Associated SNL/NM Background Screening Value, BCF, Log K_{ow} and Subpart S Screening Value

COC Name	Maximum Concentration (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)	Subpart S Screening Value[c]	Is Individual COC less than 1/10 of the Action Level?
Methylene Chloride	0.0021 J	NA	**NA**	5[d]	1.25[d]	No	90	Yes
Toluene	0.053	NA	**NA**	10.7[e]	2.69[e]	No	20,000	Yes
Acenaphthene	0.060 J	NA	**NA**	389[f]	3.92[f]	**Yes**	5,000	Yes
bis (2-Ethylhexyl) phthalate	0.075 J	NA	**NA**	851[g]	7.6[f]	**Yes**	50	Yes
2-Chlorophenol	0.055 J	NA	**NA**	214[g]	2.15[g]	**Yes**	400	Yes
4-Chloro-3-methylphenol	0.059 J	NA	**NA**	2.13[f]	3.10[f]	No	NC	**NA**
1,4-Dichlorobenzene	0.045 J	NA	**NA**	55.6[e]	3.52[e]	**Yes**	30	Yes
n-Nitrosodi-n-propylamine	0.056 J	NA	**NA**	217[f]	3.13[f]	**Yes**	0.1	**No**
Pyrene	0.054 J	NA	**NA**	36,300[e]	5.32[f]	**Yes**	2,000	Yes
1,2,4-Trichlorobenzene	0.054 J	NA	**NA**	2,800[g]	4.02[g]	**Yes**	800	Yes

[a]Zamorski (December 1997) Canyons Areas.
[b]NMED (March 1998).
[c]IT (July 1994).
[d]BCF and/or Log K_{ow} from Howard (1990).
[e]BCF and/or Log K_{ow} from Yanicak (March 1997).
[f]BCF and/or Log K_{ow} from Micromedex (1998)
[g]BCF and/or Log K_{ow} from Howard (1989).

BCF = Bioconcentration factor.
COC = Constituent of concern.
J = Estimated concentration.
K_{ow} = Octanol-water partition coefficient.
Log = Logarithm (base 10).
mg/kg = Milligrams per kilogram.
NA = Not applicable.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.

Table 4
Radiological COCs for Human Health and Ecological Risk Assessment at SWMU 94A with Comparison to the Associated SNL/NM Background Screening Value, BCF, and Log K_{ow}

COC Name	Maximum Concentration (pCi/g)	SNL/NM Background Concentration (pCi/g)[a]	Is Maximum COC Concentration Less Than or Equal to the Applicable SNL/NM Background[a] Screening Value?	BCF (maximum aquatic)	Bioaccumulator? (BCF>40, log K_{ow}>4)
Cs-137	0.25	0.515	Yes	3000[b]	**Yes**[b]
Th-232	0.81	1.03	Yes	3000[c]	**Yes**[b]
U-235[b]	0.22	0.16	**No**	900[c]	**Yes**[c]
U-238	3.10	2.31	**No**	900[c]	**Yes**[c]

[a]Dinwiddie (September 1997) Southwest Test Area.
[b]Bioconcentration factor from Yanicak (1997).
[c]Baker and Soldat (1992).
BCF = Bioconcentration factor.
COC = Constituent of concern.
Log = Logarithm (base 10).
pCi/g = Picocurie(s) per gram.
SNL/NM = Sandia National Laboratories/New Mexico.
SWMU = Solid waste management unit.

or occasionally snow), which will either infiltrate or form runoff. The slopes at this site will produce runoff during intense rainfall events and during extended rainfall periods when soils are near saturation from previous rainfall. Surface runoff is to an ephemeral drainage, which is a tributary to Arroyo del Coyote in the lower part of the canyon. Because of the relatively steep slopes on and near the three areas comprising SWMU 94A and the tendency for precipitation to be received as intense downpours during the summer months, the potential for transport of COCs in surface soils by runoff may be significant.

Infiltration at the site is enhanced by the coarse texture of the canyon soils (Tesajo-Millett stony sandy loam [USDA June 1977]). Water that infiltrates into the soil will continue to percolate through the soil until field capacity is reached. Based upon observations made during the installation of a piezometer at the arroyo channel immediately west of the Bomb Burner tank location of SWMU 94A, the alluvium above the bedrock is 58 feet in thickness. Moist soil was observed in the first 5 feet of alluvium, and the remaining 53 feet (to bedrock) were dry. The Burn Site Well, about 500 feet southeast of the site, did not encounter groundwater until 222 feet bgs. The groundwater level subsequently rose to a depth of 68 feet bgs indicating semiconfined to confined groundwater conditions. Therefore, infiltration from the arroyo does not appear to be sufficient to contact groundwater in the area of the Lurance Canyon Burn Site.

Plant roots can take up COCs that are in the soil solution. These COCs may be transported to the aboveground tissues with the xylem stream and may then be consumed by herbivores or returned to the soil as litter. Aboveground litter is capable of transport by wind until consumed by decomposer organisms in the soil. Constituents in plant tissues that are consumed by herbivores may pass through the gut and be returned to the soil (at the site or transported from the site in the herbivore) in feces, or be absorbed into tissues and held, metabolized, or later excreted. The herbivore may be eaten by a primary carnivore or scavenger and the constituents still held in the consumed tissues will repeat the sequence of absorption, metabolization, excretion, and consumption by higher predators, scavengers, and decomposers. The potential for transport of the constituents within the food chain is dependent upon the mobility of the species that comprise the food chain and the potential for the constituent to be transferred across the links in the food chain. Although much of SWMU 94A has been highly disturbed and is essentially bare of vegetation, other parts are vegetated. Therefore, food chain uptake is a potential transport mechanism at SWMU 94A.

Degradation of COCs at SWMU 94A may result from biotic or abiotic processes. Degradation processes for VOCs and SVOCs at this site may include 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 is the result of metabolic breakdown of the compound by plants, animals, and microorganisms.

Table 5 summarizes the fate and transport processes that may occur at SWMU 94A. Because the site is situated within Lurance Canyon, and is therefore sheltered by surrounding slopes and woodland vegetation, significant transport of soil particles by wind is unlikely. The loss of COCs at the soil surface through volatilization and photolysis may be significant. Transport of COCs in the surface soil by surface water runoff may also be significant due to the slopes found on the site, although spill containment features built around some of the tanks will prevent off-site transport of COCs by surface water. Subsurface migration of COCs is unlikely to reach

groundwater. The potential for degradation and/or biotransformation of the VOCs and SVOCs is moderate to high and food chain transfers are not expected to be significant for these COCs.

Table 5
Summary of Fate and Transport at SWMU 94A

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

SWMU = Solid waste management unit.

VI. Human Health Risk Screening Assessment

VI.1 Introduction

Human health risk screening 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:

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 includes two screening procedures. One screening procedure 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 subjected to a second screening procedure that compares the maximum concentration of the COC to the SNL/NM proposed Subpart S action level.
Step 4.	Toxicological parameters are identified and referenced for COCs that are not eliminated during the screening steps.
Step 5.	Potential toxicity effects (specified as a Hazard Index [HI]) and 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 only occurs 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 EPA and U.S. Department of Energy (DOE) to determine if further evaluation, and potential site clean-up, is required. Nonradiological COC risk values are also compared to background risk so that an incremental risk may be calculated.
Step 7.	Uncertainties are discussed in the previous steps.

VI.2 Step 1. Site Data

Section I provides the description and history for SWMU 94A. Section II presents comparison of results to DQOs. Section III describes the determination of the nature, rate and extent of contamination.

VI.3 Step 2. Pathway Identification

SWMU 94A has been designated with a future land-use scenario of recreational (DOE et al. October 1995) (see Appendix 1 for default exposure pathways and parameters). Because of the location and the characteristics of the potential contaminants, the primary pathway for human exposure is considered to be soil ingestion for the nonradiological COCs and, for the radiological COCs, direct gamma exposure. The inhalation pathway for both nonradiological and radiological COCs is included because of the potential to inhale dust and volatiles. Soil ingestion is included for the radiological COCs as well. No contamination at depth was determined, and therefore no water pathways to the groundwater are considered. Depth to groundwater at SWMU 94A is approximately 222 feet bgs. Because of the lack of surface water or other significant mechanisms for dermal contact, the dermal exposure pathway is considered not to be significant. No intake routes through plant, meat, or milk ingestion are considered appropriate for the recreational land-use scenario. However, plant uptake is considered for the residential land-use scenario.

Pathway Identification

Nonradiological Constituents	Radiological Constituents
Soil ingestion	Soil ingestion
Inhalation (dust and volatiles)	Inhalation (dust)
Plant uptake (residential only)	Plant uptake (residential only)
	Direct gamma

VI.4 Step 3. COC Screening Procedures

This section discusses Step 3 and includes two screening procedures. The first screening procedure compares the maximum COC concentration to the background screening level. The second screening procedure compares maximum COC concentrations to SNL/NM proposed Subpart S action levels. This second procedure applies only to COCs that are not eliminated during the first screening procedure.

VI.4.1 Background Screening Procedure

VI.4.1.1 Methodology

Maximum concentrations of COCs are compared to the SNL/NM maximum screening level for this area (Dinwiddie September 1997, Zamorski December 1997). SNL/NM has been verbally informed that all the metals background values from the Canyons Study, with the exception of selenium, will be approved (NMED May 1998). Samples have been collected to resolve the selenium issue. The SNL/NM maximum background concentration is selected to provide the background screen. Only the COCs that are above their respective SNL/NM maximum background screening level or COCs that do not have a quantifiable background screening level are considered in further risk assessment analyses.

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

VI.4.1.2 Results

SWMU 94A nonradiological COCs are anthropogenic organic compounds and do not have background screening values. Therefore, all 10 constituents fail the background screening procedure.

For the radiological COCs, only two constituents had minimum detectable activities (MDA) slightly greater than their respective background (U-238 and U-235). While no analytical results exceeded background concentrations, the MDA values reported for U-238 and U-235 were carried forward in the Risk Assessment.

VI.4.2 Subpart S Screening Procedure

VI.4.2.1 Methodology

The maximum concentrations of nonradiological COCs not eliminated during the background screening process were compared with action levels (IT July 1994) calculated using methods and equations promulgated in the proposed RCRA Subpart S (EPA 1990) and Risk Assessment Guidance for Superfund (RAGS) (EPA 1989). Accordingly, all calculations were based upon the assumption that receptor doses from both toxic and potentially carcinogenic compounds result most significantly from ingestion of contaminated soil. Because the samples

were all taken from the surface or near-surface, this assumption is considered valid. If there were 10 or fewer COCs, and each had a maximum concentration less than 1/10 of the action level, then the site would be judged to pose no significant health hazard to humans. If there were more than 10 COCs, the Subpart S screening procedure was not performed.

VI.4.2.2 Results

Table 3 shows the COCs and the associated proposed Subpart S action level. The table compares the maximum concentration values to 1/10 of the proposed Subpart S action level. This methodology was guidance given to SNL/NM from the EPA Region 6 (EPA 1996a). One COC exceeds 1/10 of the proposed Subpart S action level. Because of this COC, the site fails the Subpart S screening criteria and a hazard quotient (HQ) and excess cancer risk value must be calculated for all the COCs.

Radiological COCs do not have predetermined action levels analogous to proposed Subpart S levels, and therefore this step in the screening process is not performed for radiological COCs.

VI.5 Step 4. Identification of Toxicological Parameters

Tables 6 (nonradiological) and 7 (radiological) show the COCs retained in the risk assessment and the values for the available toxicological information. The toxicological values used for nonradiological COCs in Table 6 are from the Integrated Risk Information System (IRIS) (EPA 1998), Health Effects Assessment Summary Tables (HEAST) (EPA 1997a), and the EPA Region 9 (EPA 1996c) electronic database. Dose conversion factors (DCF) used in determining the excess TEDE values for radiological COCs for the individual pathways were the default values provided in the RESRAD computer code (Yu et al. 1993a) as developed in the following documents:

- DCFs for ingestion and inhalation are taken from Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion (EPA 1988).
- DCFs for surface contamination (contamination on the surface of the site) were taken from DOE/EH-0070, External Dose-Rate Conversion Factors for Calculation of Dose to the Public (DOE 1988).
- DCFs for volume contamination (exposure to contamination deeper than the immediate surface of the site) were calculated using the methods discussed in "Dose-Rate Conversion Factors for External Exposure to Photon Emitters in Soil" (*Health Physics* 28:193-205 [Kocher 1983]), and ANL/EAIS-8, "Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil" (Yu et al. 1993a).

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 value and the excess cancer risk, for both

Table 6
Toxicological Parameter Values for SWMU 94A Nonradiological COCs

COC Name	RfD_o (mg/kg-day)	Confidence[a]	RfD_{inh} (mg/kg-day)	Confidence[a]	SF_o (mg/kg-day)$^{-1}$	SF_{inh} (mg/kg-day)$^{-1}$	Cancer Class[b]
Methylene Chloride	6E-2[c]	M	8.6E-1[d]	--	7.5E-3[c]	1.7E-3[c]	B2
Toluene	2E-1[c]	M	1.1E-1[c]	M	--	--	D
Acenaphthene	6E-2[c]	L	6E-2[e]	--	--	--	--
bis (2-Ethylhexyl) phthalate	2E-2[e]	--	2.2E-2[e]	--	1.4E-2[e]	1.4E-2[e]	--
2-Chlorophenol	5E-3[c]	L	5E-3[e]	--	--	--	--
4-Chloro-3-methylphenol	--	--	--	--	--	--	--
1,4-Dichloro-benzene	2.3E-1[e]	--	2.3E-1[c]	M	2.4E-2[d]	2.4E-2[e]	--
n-Nitrosodi-n-propylamine	--	--	--	--	7E+0[c]	7E+0[e]	B2
Pyrene	3E-2[c]	L	3E-2[e]	--	--	--	D
1,2,4-Trichloro-benzene	1E-2[c]	M	5.7E-2[d]	--	--	--	D

[a]Confidence associated with IRIS (EPA 1998a) database values (L = low, M = medium).

[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989) taken from IRIS (EPA 1998a):

B2 – Probable human carcinogen. Sufficient evidence in animals and inadequate or no evidence in humans.

D – Not classifiable as to human carcinogenicity.

[c]Toxicological parameter values from IRIS electronic database (EPA 1998a).

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

[e]Toxicological parameter values from EPA Region 9 (EPA 1996b).

COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
HEAST = Health Effects Assessment Summary Tables.
IRIS = Integrated Risk Information System.
mg/kg-day = Milligram(s) per kilogram day.
(mg/kg-day)$^{-1}$ = Per milligram per kilogram day.
RfD_o = Oral chronic reference dose.
RfD_{inh} = Inhalation chronic reference dose.
SF_o = Oral slope factor.
SF_{inh} = Inhalation slope factor.
SWMU = Solid waste management unit.
-- =Information not available.

Table 7
Radiological Toxicological Parameter Values for SWMU 94A COCs Obtained from RESRAD Risk Coefficients[a]

COC Name	SF_o (1/pCi)	Sf_{inh} (1/pCi)	SF_{ev} (g/pCi-yr)	Cancer Class[b]
U-235	4.70E-11	1.30E-08	2.70E-07	A
U-238	6.20E–11	1.20E–08	6.60E–08	A

[a]From Yu et al. (1993b).
[b]EPA weight-of-evidence classification system for carcinogenicity (EPA 1989): A - human carcinogen.
COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
g/pCi-yr = Gram(s) per picocurie-year.
SF_o = Oral (ingestion) slope factor.
SF_{inh} = Inhalation slope factor.
SF_{ev} = External volume exposure slope factor.
1/pCi = One per picocurie.

the potential nonradiological COCs and associated background for recreational and residential land uses. The incremental TEDE and incremental estimated cancer risk are provided for the background-adjusted radiological COCs for both recreational and residential land uses.

VI.6.1 Exposure Assessment

Appendix 1 shows the equations and parameter input values used in calculating intake values and subsequent HI and excess cancer risk values for the individual exposure pathways. The appendix shows parameters for both recreational and residential land-use scenarios. The equations for nonradiological COCs are based upon RAGS (EPA 1989). Parameters are based upon information from RAGS (EPA 1989) and other EPA guidance documents and reflect the reasonable maximum exposure (RME) approach advocated by the RAGS (EPA 1989). For 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, Version 5.0* (Yu et al. 1993a).

Although the designated land-use scenario is recreational for this site, risk and TEDE values for a residential land-use scenario are also presented. These residential risk and TEDE values are presented only to provide perspective of potential risk to human health under the more restrictive land-use scenario.

VI.6.2 Risk Characterization

Table 8 shows that for the SWMU 94A nonradiological COCs, the HI value is 0.00, and the excess cancer risk is 3E-8 for the designated recreational land-use scenario. The numbers presented included exposure from soil ingestion and dust and volatile inhalation for the nonradiological COCs.

Table 8
Risk Assessment Values for SWMU 94A Nonradiological COCs

COC Name	Maximum Concentration (mg/kg)	Recreational Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		HI	Cancer Risk	HI	Cancer Risk
Methylene chloride	0.0021 J	0.00	9E-12	0.00	2E-8
Toluene	0.053	0.00	--	0.00	--
Acenaphthene	0.060 J	0.00	--	0.00	--
bis (2-Ethylhexyl) phthalate	0.075 J	0.00	4E-11	0.00	2E-9
2-Chlorophenol	0.055 J	0.00	--	0.01	--
4-Chloro-3-methylphenol	0.059 J	--	--	--	--
1,4-Dichlorobenzene	0.045 J	0.00	3E-10	0.00	6E-8
n-Nitrosodi-n-propylamine	0.056 J	0.00	3E-8	0.00	3E-4
Pyrene	0.054 J	0.00	--	0.00	--
1,2,4-Trichlorobenzene	0.054 J	0.00	--	0.00	--
TOTAL		**0.00**	**3E-8**	**0.01**	**3E-4**

[a]EPA (1989).
COC = Constituents of concern.
EPA = U.S. Environmental Protection Agency.
HI = Hazardous Index.
J = Estimated concentration.
mg/kg = Milligram(s) per kilogram.
SWMU = Solid waste management unit.
-- = Information not available.

For the radioactive COCs, contribution from the direct gamma exposure pathway is included. For the recreational land-use scenario, a TEDE was calculated for an recreational person who spends 4 hours per week on the site. This resulted in an incremental TEDE of 3.6E-3 millirem per year (mrem/yr). In accordance with EPA guidance found in OSWER Directive No. 9200.4-18 (EPA August 1997c), an incremental TEDE of 15 mrem/yr is used for the probable land-use scenario (recreational in this case); the calculated dose value for SWMU 94A for the recreational land use is well below this guideline. The estimated excess cancer risk is 4.6E-8.

For the residential land-use scenario nonradiological COCs, the HI value increases to 0.01, and the excess cancer risk is 3E-4 (Table 8). The numbers presented included exposure from soil ingestion, dust and volatile inhalation, and plant uptake. Although EPA (1991) generally recommends that inhalation not be included in a residential land-use scenario, this pathway is included because of the potential for soil in Albuquerque, New Mexico, to be eroded and, subsequently, for dust to be present in predominantly residential areas. Because of the nature of the local soil, other exposure pathways are not considered (see Appendix 1).

For the radiological COCs, the incremental TEDE for the residential land-use scenario is 8.2E-2 mrem/yr. The guideline being utilized is an excess TEDE of 75 mrem/yr (SNL/NM 1998) for a complete loss of institutional controls (residential land use in this case); the calculated dose value for SWMU 94A for the residential land-use is well below this guideline. Consequently, SWMU 94A is eligible for unrestricted radiological release as the residential land-use scenario resulted in an incremental TEDE to the on-site receptor of less than 75 mrem/yr. The estimated excess cancer risk is 9.8E-7. The excess cancer risk from the nonradiological COCs and the radiological COCs is not additive, as noted in RAGS (EPA 1989).

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

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

For the recreational land-use scenario nonradiological COCs, the HI calculated is 0.00 (much less than the numerical guideline of 1 suggested in RAGS [EPA 1989]). The excess cancer risk is estimated at 3E-8. Guidance from the NMED indicates that excess lifetime risk of developing cancer by an individual must be less than 1E-6 for Class A and B carcinogens and less than 1E-5 for Class C carcinogens (NMED March 1998). The excess cancer risk is driven by n-Nitrosodi-n-propylamine which is a Class B2 carcinogen. Thus, the total excess cancer risk for this site is below the suggested acceptable risk value of 1E-6.

For radiological COCs of the recreational land-use scenario, the incremental TEDE is 3.6E-3 mrem/yr, which is significantly less than EPA's numerical guideline of 15 mrem/yr. The incremental estimated excess cancer risk is 4.6E-8.

For the residential land-use scenario nonradiological COCs, the calculated HI is 0.01 which is also significantly below the numerical guidance. The excess cancer risk is estimated at 3E-4. The excess cancer risk is again driven by n-Nitrosodi-n-propylamine which is a class B2 carcinogen. Therefore, the total excess cancer risk for this site is above the suggested acceptable risk value of 1E-6.

The incremental TEDE for a residential land-use scenario from the radiological COCs is 8.2E-2 mrem/yr, which is significantly less than the numerical guideline of 75 mrem/yr suggested in SNL/NM RESRAD Input Parameter Assumptions and Justification (SNL/NM February 1998). The estimated excess cancer risk is 9.8E-7.

VI.8 Step 7. Uncertainty Discussion

The determination of the nature, rate, and extent of contamination at SWMU 94A was based upon an initial conceptual model validated with confirmatory sampling conducted at the site. The confirmatory sampling was implemented in accordance with the RCRA Facility Investigation (RFI) Work Plan for OU 1333 (SNL/NM September 1995) and the FIP addendum to the Work Plan (SNL/NM June 1998). The DQOs contained in the RFI Work Plan and FIP Addendum are appropriate for use in screening risk assessments. The data collected, based on sample location, density, and depth, are representative of the site. The analytical

requirements and results satisfy the DQOs. Data quality were validated in accordance with SNL/NM procedures (SNL/NM July 1994). Therefore, there is no uncertainty associated with the data quality used to perform the screening risk assessment at SWMU 94A.

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

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

Table 6 shows the uncertainties (confidence) in nonradiological toxicological parameter values. There is a mixture of estimated values and values from IRIS (EPA 1998a), HEAST (EPA 1997a), and the EPA Region 9 (EPA 1996c) electronic database. Where values are not provided, information is not available from the HEAST (EPA 1997a), IRIS (EPA 1998a), or the EPA regions (EPA 1996b and 1997b). There are no toxicological values for 4-chloro-3-methylphenol. However, because of the low maximum concentration of 4-chloro-3-methylphenol it is not expected to make a significant contribution to human health risk. Because of the conservative nature of the RME approach, the uncertainties in toxicological values are not expected to be sufficiently high to change the conclusion from the risk assessment analysis.

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

For radiological COCs, the conclusion of the risk assessment is that potential effects on human health, for both recreational and residential land-use scenarios are within guidelines and are 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 considered not significant with respect to the conclusion reached.

VI.9 Summary

SWMU 94A has identified COCs consisting of some organic compounds and radiological compounds. Because of the location of the site, the designated recreational land-use scenario, and the nature of contamination, potential exposure pathways identified for this site included soil ingestion and dust and volatile inhalation for chemical constituents and soil ingestion, dust inhalation, and direct gamma exposure for radiological COCs. Plant uptake was included as an exposure pathway for the residential land-use scenario.

Using conservative assumptions and employing an RME approach to risk assessment, calculations for nonradiological COCs show that for the recreational land-use scenario the HI of

0.00 is significantly less than the accepted numerical guidance from the EPA. The total excess cancer risk of 3E-8 is below the acceptable risk value provided by the NMED for a recreational land use (NMED March 1998).

The incremental TEDE and corresponding estimated cancer risk from radiological COCs are much less than EPA guidance values; the estimated TEDE is 3.6E-3 mrem/yr for the recreational land-use scenario. This value is much less than the numerical guidance of 15 mrem/yr in EPA guidance (EPA 1997c). The corresponding incremental estimated cancer risk value is 4.6E-8 for the recreational land-use scenario. Furthermore, the incremental TEDE for the residential land-use scenario that results from a complete loss of institutional control is only 8.2E-2 mrem/year with an associated risk of 9.8E-7. The guideline for this scenario is 75 mrem/yr (SNL/NM February 1998). Therefore SWMU 94A is eligible for unrestricted radiological release.

Uncertainties associated with the calculations are considered small relative to the conservativeness of risk assessment analysis. It is therefore concluded that this site does not have potential to affect human health under a recreational land-use scenario.

VII. Ecological Risk Screening Assessment

VII.1 Introduction

This section addresses the ecological risks associated with exposure to constituents of potential ecological concern (COPECs) in soils at SWMU 94A. A component of the NMED Risk-Based Decision Tree is to conduct an ecological screening assessment that corresponds with that presented in EPA's Ecological Risk Assessment Guidance for Superfund (EPA 1997c). The current methodology is tiered and contains an initial scoping assessment followed by a more detailed screening assessment. Initial components of NMED's decision tree (a discussion of DQOs, a data assessment, and evaluations of bioaccumulation and fate-and-transport potential) are addressed in the scoping assessment (Section VII.2 of this report), with the exception of DQOs which are reviewed in Section II 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 screening assessment whereby a more quantitative estimate of ecological risk is conducted. Although this assessment incorporates conservatisms in the estimation of ecological risks, ecological relevance and professional judgment are also used as recommended by the EPA (1998b) 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 be exposed 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. A Scoping Risk Management Decision will involve a summary of the scoping results

and a determination as to whether further examination of potential ecological impacts is necessary.

VII.2.1 Data Assessment

As indicated in Section IV (Tables 3 and 4), constituents in soil within the 0- to 5-foot depth interval that were either detected organic analytes or radionuclides that exceeded background concentrations were:

- 1,2,4-trichlorobenzene
- 1,4-dichlorobenzene
- 2-chlorophenol
- 4-chloro-3-methylphenol
- Acenaphthene
- Bis(2-ethylhexyl) phthalate
- Methylene chloride
- n-nitrosodi-n-propylamine
- Pyrene
- Toluene
- U-235
- U-238

VII.2.2 Bioaccumulation

Among the COPECs listed in Section VII.2.1, the following were considered to have bioaccumulation potential in aquatic environments (Section IV, Tables 3 and 4):

- 1,2,4-trichlorobenzene
- 1,4-dichlorobenzene
- 2-chlorophenol
- Acenaphthene
- Bis(2-ethylhexyl) phthalate
- n-nitrosodi-n-propylamine
- Pyrene
- U-235
- U-238

It should be noted, however, that as directed by the NMED (NMED March 1998), bioaccumulation for inorganics is assessed exclusively based upon maximum reported bioconcentration factors (BCF) for aquatic species. Because only aquatic BCFs are used to evaluate the bioaccumulation potential, bioaccumulation in terrestrial species is likely to be overpredicted.

VII.2.3 Fate and Transport Potential

The potential for the COPECs to move from the source of contamination to other media or biota is discussed in Section V. As noted in Table 5 (Section V), surface-water runoff is expected to be of moderate to high significance, while wind dispersion, and food chain uptake are expected to be of moderate and low significance for the COPECs at this site, respectively. The COPECs are principally organics and the potential for biotransformation and degradation of these constituents is considered of moderate to high significance at the site. Migration to groundwater is not anticipated.

VII.2.4 Scoping Risk Management Decision

Based upon information gathered through the scoping assessment, it was concluded that complete ecological pathways may be associated with this SWMU and that COPECs also exist at the site. As a consequence, a screening assessment was deemed necessary to predict the potential level of ecological risk associated with the site.

VII.3 Screening Assessment

As concluded in Section VII.2.4, complete ecological pathways and COPECs are associated with this SWMU. The screening 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 ecological risks are not underpredicted.

Components within the screening assessment include:

- 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.
- Screening Assessment Scientific/Management Decision Point—presents the decision to risk managers based upon the results of the Screening Assessment.

VII.3.1 Problem Formulation

Problem Formulation is the initial stage of the screening assessment that provides the introduction to the risk evaluation process. Components that are addressed in this section include a discussion of ecological pathways and the ecological setting, identification of COPECs, and selection of ecological receptors. The conceptual model, ecological food webs, and ecological endpoints (other components commonly addressed in a screening assessment) are presented in the "Predictive Ecological Risk Assessment Methodology for SNL/NM ER [Environmental Restoration] Program" (IT July 1998) and are not duplicated here.

VII.3.1.1 Ecological Pathways and Setting

SWMU 94A is located at the Lurance Canyon Burn Site in the upper part of Lurance Canyon in the Manzanita Mountains. The site is comprised of three separate areas that cover a combined area 0.8 acres. The three areas are generally disturbed, although ruderal and early successional vegetation has become established at these sites. The aboveground tanks have been removed from the area north of the Bomb Burner Unit; however, tanks remain at the other two areas. Relatively undisturbed natural habitat (piñon-juniper woodland) occurs in the area surrounding the Lurance Canyon Burn Site and is in fairly close proximity to portions of SWMU 94A. A biological and sensitive species survey of the Burn Site and surrounding areas was conducted in 1991, with no threatened, endangered, or sensitive species found (Biggs 1991a and 1991b).

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

VII.3.1.2 COPECs

SWMU 94A consists of three areas where aboveground tanks were placed to provide fuel (JP-4) and water (recirculated) for burn tests conducted at the Lurance Canyon Burn Site (SWMU 94). The site has been used since 1971 for burn tests in portable burn pans, and later at permanent burn units. The latter included the Large Open Burn Pit (LOBP), the Small Open Burn Pit (SOBP), the Light Airtransport, Accident Resistant Container (LAARC) Unit, the Bomb Burner Unit, the Small Wind-Shielded (SWISH) Unit, and the Conical Containment (Con-Con) Unit. The three sites where aboveground tanks were located were upslope (north) of the LOBP, Bomb Burner Unit, and LAARC Unit. Due to documented and potential accidental releases at these tanks, these three sites have been identified as part of SWMU 94. Potential COCs at SWMU 94A include volatile and semivolatile organic compounds. Because these areas are within the far-field dispersion area of the Lurance Canyon Explosive Test Site (SWMU 65E), radionuclides are also potential COPECs at this site.

In order to provide conservatism in this ecological risk assessment, the assessment is based upon the maximum soil concentrations of the COPECs as measured in soil samples within the first 5 feet of soil. Both nonradiological and radiological COPECs are evaluated. The nonradiological COCs consist of all organic analytes detected in these soil samples. Chemical analysis of soils did not include metals analysis. Radionuclides were screened against background concentrations, and those that exceeded the approved SNL/NM background screening levels (Dinwiddie September 1997) for the area were considered to be COPECs. Maximum COPEC concentrations are reported in Tables 3 and 4.

VII.3.1.3 Ecological Receptors

As described in detail in IT (July 1998), a nonspecific perennial plant was selected as the receptor to represent plant species at the site. Vascular plants are the principal primary producers at the site and are key to the diversity and productivity of the wildlife community associate with the site. A deer mouse (*Peromyscus maniculatus*) and burrowing owl (*Speotyto cunicularia*) were used to represent wildlife use. Because of its opportunistic food habits, the deer mouse was used to represent a mammalian herbivore, omnivore, and insectivore. The burrowing owl was selected as the top predator. It is present in the grassland habitat at SNL/NM and is designated as 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). The burrowing owl is a small raptor and will therefore conservatively represent risk to other raptors potentially occurring in the woodland habitat, such as the western screech owl (*Otus kennicottii*).

VII.3.2 Exposure Estimation

Direct uptake of COPECs from the soil was considered the only significant route of exposure for terrestrial plants. Exposure modeling for the wildlife receptors was limited to food and soil ingestion pathways. Inhalation and dermal contact were considered insignificant pathways with respect to ingestion (Sample and Suter 1994). Drinking water was also considered an insignificant pathway because of the lack of perennial surface water at this site. The deer mouse was modeled under three dietary regimes: as an herbivore (100 percent of its diet as plant material), as an omnivore (50 percent of its diet as plants and 50 percent as soil invertebrates), and as an insectivore (100 percent of its diet as soil invertebrates). The burrowing owl was modeled as a strict predator on small mammals (100 percent of its diet as deer mice). Because the exposure in the burrowing owl from a diet consisting of equal parts of herbivorous, omnivorous, and insectivorous mice would be equivalent to the exposure consisting of only omnivorous mice, the diet of the burrowing owl was modeled with intake of omnivorous mice only. Both species were modeled with soil ingestion comprising 2 percent of the total dietary intake. Table 9 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).

Table 9
Exposure Factors for Ecological Receptors at SWMU 94A

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

Although home range is also included in this table, exposures for this risk assessment were modeled using an area use factor of 1, implying that all food items and soil ingested are from the site being investigated. The maximum measured COPEC concentrations from surface soil samples were used to conservatively estimate potential exposures and risks to plants and wildlife at this site.

For the radiological dose rate calculations, the deer mouse was modeled as an herbivore (100 percent of its diet as plants), and the burrowing owl was modeled as a strict predator on small mammals (100 percent of its diet as deer mice). Both were modeled with soil ingestion comprising 2 percent of the total dietary intake. Receptors are exposed to radiation both internally and externally from U-235 and U-238. Internal and external dose rates to the deer mouse and burrowing owl are approximated using modified dose rate models from the *Hanford Site Risk Assessment Methodology* (DOE 1995) as presented in the ecological risk assessment methodology document for the SNL/NM ER Program (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 only transfer 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 due to exposure to radionuclides in soil.

Table 10 presents the transfer factors used in modeling the concentrations of COPECs through the food chain. Table 11 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

Benchmark toxicity values for the plant and wildlife receptors are presented in Table 12. 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. Insufficient toxicity information was found to estimate the LOAELs or NOAELs for some COPECs for terrestrial plant life and wildlife receptors, respectively.

The benchmark used for exposure of terrestrial receptors to radiation was 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

Table 10
Transfer Factors Used in Exposure Models for
Constituents of Potential Ecological Concern at SWMU 94A

Constituent of Potential Ecological Concern	Soil-to-Plant Transfer Factor[a]	Soil-to-Invertebrate Transfer Factor[b]	Food-to-Muscle Transfer Factor[a]
Organic			
1,2,4-trichlorobenzene	1.8E-4	2.1E+1	2.6E-6
1,4-dichlorobenzene	4.0E-1	2.0E+1	6.6E-5
2-chlorophenol	2.2E+0	1.7E+1	3.1E-6
4-chloro-3-methylphenol	6.3E-1	1.9E+1	2.9E-5
Acenaphthene	2.1E-1	2.1E+1	2.1E-6
Bis(2-ethylhexyl)phthalate	2.3E-3	3.1E+1	6.4E-1
Methylene chloride	7.3E+0	1.5E+1	3.6E-7
n-nitroso di-n-propylamine	6.3E+0	1.5E+1	4.7E-7
Pyrene	3.3E-2	2.4E+1	5.8E-3
Toluene	1.0E+0	1.8E-1	1.3E-5

[a]From equations developed in Travis and Arms (1988).
[b]From equations developed in Connell and Markwell (1990).
SWMU = Solid waste management unit.

Table 11
Media Concentrations[a] for Constituents of
Potential Ecological Concern at SWMU 94A

Constituent of Potential Ecological Concern	Soil (maximum)	Plant Foliage[b]	Soil Invertebrate[b]	Deer Mouse Tissues[c]
Organic				
1,2,4-trichlorobenzene	5.4E-2	9.9E-3	1.1E+0	4.7E-4
1,4-dichlorobenzene	4.5E-2	1.8E-2	8.8E-1	9.3E-5
2-chlorophenol	5.5E-2	1.2E-1	9.3E-1	5.0E-6
4-chloro-3-methylphenol	5.9E-2	3.7E-2	1.1E+0	5.3E-5
Acenaphthene	6.0E-2	1.3E-2	1.2E+0	4.0E-4
Bis(2-ethylhexyl)phthalate	7.5E-2	1.2E-4	2.4E+0	4.8E+0
Methylene chloride	2.1E-3	1.5E-2	3.2E-2	2.7E-8
n-nitroso di-n-propylamine	5.6E-2	3.6E-1	8.6E-1	8.9E-7
Pyrene	5.4E-2	1.8E-3	1.3E+0	1.2E-2
Toluene	5.3E-2	5.3E-2	9.6E-1	2.0E-5

[a]In milligrams per kilogram. All are based upon dry weight of the media.
[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 in food times the food-to-muscle transfer factor times the wet weight-dry weight conversion factor of 3.125 (from EPA 1993).
SWMU = Solid waste management unit.

Table 12
Toxicity Benchmarks for Ecological Receptors at SWMU 94A

		Mammalian NOAELs			Avian NOAELs		
Constituent of Potential Ecological Concern	Plant Benchmark[a,b]	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]
Organic							
1,2,4-trichlorobenzene	---	Rat[h]	1.48[h]	2.90	---[i]	---	---
1,4-dichlorobenzene	---	Rat[j]	134[j]	262	---	---	---
2-chlorophenol	---	Rat[k]	0.50[k]	0.98	---	---	---
4-chloro-3-methylphenol	---	Rat[l]	1.37[l]	2.68	---	---	---
Acenaphthene	20	Mouse[m]	17.5[m]	18.5	---	---	---
Bis(2-ethylhexyl)phthalate	---	Mouse	18.3	19.4	Ringed Dove	1.1	1.1
Methylene chloride	---	Rat	5.85	11.4	---	---	---
n-nitroso di-n-propylamine	---	Rat	1.11[n]	2.18	---	---	---
Pyrene	---	Mouse[o]	7.5[o]	7.94	---	---	---
Toluene	200	Mouse	26.0	27.5	---	---	---

[a]In milligrams per kilogram soil.
[b]From Efroymson et al. (1997).
[c]Body weights (in kilograms) for the no-observed-adverse-effect level (NOAEL) conversion are as follows: lab mouse, 0.030; lab rat, 0.350 (except where noted).
[d]From Sample et al. (1996), except where noted.
[e]In milligrams per kilogram 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 kilogram 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]Based upon a subchronic NOAEL of 14.8 mg/kg/d from Robinson et al. (1981) and an uncertainty actor of 0.1.
[i]--- designates insufficient toxicity data.
[j]Based upon a test species NOAEL for rats exposed to 1,2-dichlorobenzene and the ratio of LD_{50} values from Micromedex (1998).
[k]Based upon a subchronic NOAEL of 5.0 mg/kg/d from Exon and Koller (1982) and an uncertainty actor of 0.1.
[l]Based upon a test species NOAEL for rats exposed to 2-chlorophenol (Exon and Koller 1982) and the ratio of LD_{50} values from Micromedex (1998).
[m]Based upon a subchronic NOAEL of 175 mg/kg/d from EPA (1998a) and an uncertainty actor of 0.1.
[n]Based upon a test species NOAEL for rats exposed to n-nitrosodiethylamine and the ratio of LD_{50} values from Micromedex (1998).
[o]Based upon a subchronic NOAEL of 75 mg/kg/d from EPA (1989b) and an uncertainty actor of 0.1.
SWMU = Solid waste management unit.

than vertebrates (Whicker and Schultz 1982), the dose of 0.1 rad per day should also offer sufficient protection to other components within the terrestrial habitat of SWMU 94A.

VII.3.4 Risk Characterization

Maximum concentrations in soil and estimated dietary exposures were compared to plant and wildlife benchmark values, respectively. Results of these comparisons are presented in Table 13. HQs are used to quantify the comparison with benchmarks for plants and wildlife exposure.

No individual chemical was predicted with a HQ greater than unity. This is true for each of the receptors examined. As directed by the NMED, HIs were calculated for each of the receptors (the HI is the sum of chemical-specific HQ for all pathways for a given receptor). No receptors were predicted to have HIs greater than unity.

Tables 14 and 15 summarize the internal and external dose rate model results for the two radionuclides. The total radiation dose rate to the deer mouse was predicted to be 4.3E-5 rad/day. Total dose rate to the burrowing owl was predicted to be 2.4E-5 rad/day. The internal dose rate due to exposure to these radionuclides for both receptors is the primary contributor to the total dose rate. The dose rates for the deer mouse and the burrowing owl are considerably less than the benchmark of 0.1 rad/day.

VII.3.5 Uncertainty Assessment

Many uncertainties are associated with the characterization of ecological risks at SWMU 94A. These uncertainties result from assumptions used in calculating risk that may overestimate or underestimate true risk presented at a 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 measured analyte concentrations in soil to evaluate risk, the use of wildlife toxicity benchmarks based upon NOAEL values, the incorporation of strict herbivorous and strict insectivorous diets for predicting the extreme HQ values for the deer mouse, and the use of 1.0 as the area use factor for wildlife receptors regardless of seasonal use or home range size. Each of these uncertainties, which are consistent among each of the SWMU-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).

Insufficient toxicity data were available in the literature to assess potential risk to plants and birds following exposure to many of the organic compounds. This assessment, therefore, focused on compounds for which sufficient toxicity data exist to assess ecological risk.

Uncertainties associated with the estimation of risk to ecological receptors following exposure to U-235 and U-238 are primarily related to those inherent in the radionuclide-specific data. Radionuclide-dependent data are measured values that have their associated errors, which are typically negligible. The dose rate models used for these calculations are based upon conservative estimates on receptor shape, radiation absorption by body tissues, and intake

Table 13
Hazard Quotients for Ecological Receptors at SWMU 94A

Constituent of Potential Ecological Concern	Plant HQ	Deer Mouse HQ (Herbivorous)	Deer Mouse HQ (Omnivorous)	Deer Mouse HQ (Insectivorous)	Burrowing Owl HQ
Organic					
1,2,4-trichlorobenzene	---	5.9E-4	3.1E-2	6.1E-2	---
1,4-dichlorobenzene	---	1.1E-5	2.7E-4	5.2E-4	---
2-chlorophenol	---	2.0E-2	8.4E-2	1.5E-1	---
4-chloro-3-methylphenol	---	2.2E-3	3.3E-2	6.5E-2	---
Acenaphthene	3.3E-3	1.2E-4	5.3E-3	1.0E-2	---
Bis(2-ethylhexyl)phthalate	---	1.3E-5	9.5E-3	1.9E-2	4.9E-1
Methylene chloride	---	2.1E-4	3.2E-4	4.3E-4	---
n-nitroso di-n-propylamine	---	2.6E-2	4.4E-2	6.2E-2	---
Pyrene	3.0E-3	5.6E-5	1.3E-2	2.6E-2	---
Toluene	2.7E-4	3.1E-4	2.9E-3	5.4E-3	---
HI[a]	6.8E-3	4.9E-2	2.2E-1	4.0E-1	4.9E-1

[a]The HI is the sum of individual HQs.

HI = Hazard index.
HQ = Hazard quotient.
SWMU = Solid waste management unit.
--- = Designates insufficient toxicity data available for risk estimation purposes.

Table 14
Internal and External Dose Rates for
Deer Mice Exposed to Radionuclides at SWMU 94A

Radionuclide	Maximum Concentration (pCi/g)	Internal Dose (rad/day)	External Dose (rad/day)	Total Dose (rad/day)
U-235[a]	2.2E-1	2.4E-6	3.7E-6	6.1E-6
U-238	3.1E+0	3.1E-5	6.2E-6	3.7E-5
Total		3.3E-5	9.9E-6	4.3E-5

[a]The U-235 value was calculated using the U-238 concentration and assuming that the U-238 to U-235 ratio was equal to that detected during waste characterization of depleted uranium-contaminated soils generated during the radiological voluntary corrective measures project, where U-235=U-238/73 (Brown January 1998).
pCi/g = Picocurie(s) per gram.
SWMU = Solid waste management unit.

Table 15
Internal and External Dose Rates for
Burrowing Owls Exposed to Radionuclides at SWMU 94A

Radionuclide	Maximum Concentration (pCi/g)	Internal Dose (rad/day)	External Dose (rad/day)	Total Dose (rad/day)
U-235[a]	2.2E-1	9.8E-7	3.7E-6	4.7E-6
U-238	3.1E+0	1.3E-5	6.2E-6	1.9E-5
Total		1.4E-5	9.9E-6	2.4E-5

[a]The U-235 value was calculated using the U-238 concentration and assuming that the U-238 to U-235 ratio was equal to that detected during waste characterization of depleted uranium-contaminated soils generated during the radiological voluntary corrective measures project, where U-235=U-238/73 (Brown January 1998).
pCi/g = Picocurie(s) per gram.
SWMU = Solid waste management unit.

parameters. The goal is to provide a realistic, but conservative, estimate of a receptor's exposure to radionuclides in soil, both internally and externally.

One large uncertainty associated with the prediction of ecological risks at this site is the use of the maximum measured concentrations in soil to evaluate risk. This results in a conservation exposure scenario that does not necessarily reflect actual site conditions. The assumption of an area use factor of 1.0 is a source of uncertainty for the burrowing owl. Because this site is composed of three separate areas, the home range of a deer mouse may also exceed the size of the smaller of these areas.

Analytical data were examined more closely to assess variability within the data. 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, 2-chlorophenol, 4-chloro-3-methylphenol, acenaphthene, n-nitroso dipropylamine, pyrene were only detected in one of the 23 soil samples collected and analyzed from the site. Bis(2-ethylhexyl)phthalate was detected in four samples, methylene chloride in seven, and toluene in 6 of the samples. The use of maximum detected concentrations in the risk assessment did not, however, result in a prediction of ecological risk. Metals were not analyzed for in soils from this site.

Based upon this uncertainty analysis, ecological risks at SWMU 94A are expected to be very low. No HQs greater than unity were predicted through this screening assessment.

VII.3.6 Risk Interpretation

Ecological risks associated with SWMU 94A were estimated through a screening assessment that incorporated site-specific information when available. An examination of existing data did not indicate ecological risks following exposure of receptors to maximum detected radionuclide and organic analyte concentrations detected at the site. Based upon this final analysis, ecological risks associated with SWMU 94A are expected to be very low.

VII.3.7 Screening Assessment Scientific/Management Decision Point

Once potential ecological risks associated with the site have been assessed, a decision is made as whether the site should be recommended for NFA or additional data collected to more thoroughly assess actual ecological risk at the site. With respect to this site, ecological risks were predicted to be very low. The scientific/management decision is to recommend this site for NFA.

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APPENDIX 1
EXPOSURE PATHWAY DISCUSSION FOR CHEMICAL AND RADIONUCLIDE CONTAMINATION

Sandia National Laboratories (SNL/NM) proposes that a default set of exposure routes and associated default parameter values be 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 would be invoked for risk assessments unless site-specific information suggested other parameter values. Because many SNL/NM solid waste management units (SWMU) 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 will facilitate the risk assessments and subsequent review.

The default exposure routes and parameter values suggested 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 proposes that these default exposure routes and parameter values be used in future risk assessments.

At SNL/NM, all SWMUs exist within the boundaries of the Kirtland Air Force Base (KAFB). Approximately 157 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, the biological resources present and proposed land-use scenarios for the SNL/NM SWMUs. 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. 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), risk and dose values. The EPA (EPA 1989a) 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 shell fish
- 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 does not currently occur any consumption of fish, shell fish, fruits, vegetables, meat, eggs, or dairy products that originate on site. Additionally, no potential for swimming in surface water is present due to the high-desert environmental conditions. As documented in the RESRAD computer code manual (ANL 1993), risks resulting from immersion in contaminated air or water are not significant compared to risks from other radiation exposure routes.

For the industrial and recreational land-use scenarios, SNL/NM ER has, therefore, excluded the following four potential exposure routes from further risk assessment evaluations at any SNL/NM SWMU:

- Ingestion of contaminated fish and shell fish
- Ingestion of contaminated fruits and vegetables
- Ingestion of contaminated meat, eggs, and dairy products
- Ingestion of contaminated surface water while swimming.

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

For the residential land-use scenario, we will include ingestion of contaminated fruits and vegetables because of the potential for residential gardening.

Based upon this evaluation, for future risk assessments, the exposure routes that will be considered are shown in Table 1. Dermal contact is included as a potential exposure pathway in all land use scenarios. However, the potential for dermal exposure to inorganics is not considered significant and will not be included. In general, the dermal exposure pathway is generally considered to not be significant relative to water ingestion and soil ingestion pathways but will be considered for organic components. Because of the lack of toxicological parameter values for this pathway, the inclusion of this exposure pathway into risk assessment calculations may not be possible and may be part of the uncertainty analysis for a site where dermal contact is potentially applicable.

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 equations for calculating potential intakes via these routes are shown below. The equations are from the Risk Assessment Guidance for Superfund (RAGS): Volume 1 (EPA 1989a, 1991). These general equations also apply to calculating potential intakes for radionuclides. A more in-depth discussion of the equations

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	Dermal contact	Dermal contact
External exposure to penetrating radiation from ground surfaces	External exposure to penetrating radiation from ground surfaces	Ingestion of fruits and vegetables
		External exposure to penetrating radiation from ground surfaces

used in performing radiological pathway analyses with the RESRAD code may be found in the RESRAD Manual (ANL 1993). Also shown are the default values SNL/NM ER suggests for use in RME risk assessment calculations for industrial, recreational, and residential 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).

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 [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.

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.

The evaluation of the carcinogenic health hazard produces a quantitative estimate for excess cancer risk resulting from the COC present at the site. This estimate is evaluated for

determination of further action by comparison of the quantitative estimate with the potentially acceptable risk range of 10^{-4} to 10^{-6}. 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 due to radioactive compounds produces a quantitative estimate of doses resulting from the COCs present at the site.

The specific equations used for the individual exposure pathways can be found in RAGS (EPA 1989a) and the RESRAD Manual (ANL 1993). Table 2 shows the default parameter values suggested for used by SNL/NM at SWMUs, based upon the selected land use scenario. References are given at the end of the table indicating the source for the chosen parameter values. The intention of SNL/NM is to use default values that are consistent with regulatory guidance and consistent with 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 proposes the described default exposure routes and parameter values for use 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 this scenario has been requested to be considered by the NMED. 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. The values are generally consistent with those proposed by Los Alamos National Laboratory, with a few minor variations. 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.

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EPA see U.S. Environmental Protection Agency.

Table 2
Default Parameter Values for Various Land Use Scenarios

Parameter	Industrial	Recreational	Residential
General Exposure Parameters			
Exposure frequency (day/yr)	***	***	***
Exposure duration (yr)	30[a,b]	30[a,b]	30[a,b]
Body weight (kg)	70[a,b]	56[a,b]	70 adult[a,b] 15 child
Averaging Time (days) for carcinogenic compounds (= 70 y x 365 day/yr) for noncarcinogenic compounds (= ED x 365 day/yr)	25550[a] 10950	25550[a] 10950	25550[a] 10950
Soil Ingestion Pathway			
Ingestion rate	100 mg/day[c]	6.24 g/yr[d]	114 mg-yr/kg-day[a]
Inhalation Pathway			
Inhalation rate (m^3/yr)	5000[a,b]	146[d]	5475[a,b,d]
Volatilization factor (m^3/kg)	chemical specific	chemical specific	chemical specific
Particulate emission factor (m^3/kg)	1.32E9[a]	1.32E9[a]	1.32E9[a]
Water Ingestion Pathway			
Ingestion rate (L/day)	2[a,b]	2[a,b]	2[a,b]
Food Ingestion Pathway			
Ingestion rate (kg/yr)	NA	NA	138[b,d]
Fraction ingested	NA	NA	0.25[b,d]
Dermal Pathway			
Surface area in water (m^2)	2[b,e]	2[b,e]	2[b,e]
Surface area in soil (m^2)	0.53[b,e]	0.53[b,e]	0.53[b,e]
Permeability coefficient	chemical specific	chemical specific	chemical specific

***The exposure frequencies for the land use scenarios are often integrated into the overall contact rate for specific exposure pathways. When not included, the exposure frequency for the industrial land use scenario is 8 hr/day for 250 day/yr; for the recreational land use, a value of 2 hr/wk for 52 wk/yr is used (EPA 1989b); for a residential land use, all contact rates are given per day for 350 day/yr.

[a]RAGS, Vol 1, Part B (EPA 1991).

[b]Exposure Factors Handbook (EPA 1989b)

[c]EPA Region VI guidance.

[d]For radionuclides, RESRAD (ANL 1993) is used for human health risk calculations; default parameters are consistent with RESRAD guidance.

[e]Dermal Exposure Assessment (EPA 1992).

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