FACT SHEET / STATEMENT OF BASIS

Request for Corrective Action Complete Status

for

Six Solid Waste Management Units

Sandia National Laboratories

(EPA ID No. NM5890110518)

November 2017

FACT SHEET / STATEMENT OF BASIS

Request for Corrective Action Complete (No Further Action) Status for Six Solid Waste Management Units

(Resource Conservation and Recovery Act (RCRA)
Permit Number NM5890110518-1)

Under authority of the New Mexico Hazardous Waste Act (Section 74-4-1 et seq., NMSA 1978, as amended, 1992) and the New Mexico Hazardous Waste Management Regulations (20.4.1 New Mexico Administrative Code [NMAC]), the New Mexico Environment Department (NMED) intends, pending public input, to approve a May 16, 2016, Class 3 permit modification request by the U.S. Department of Energy (DOE)/National Technology and Engineering Solutions of Sandia, LLC (NTESS) (collectively the Permittees) to grant corrective action complete (CAC) status for six Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) at the Sandia National Laboratories Facility (SNL). The Class 3 Permit modification request is being issued for public comment in accordance with 20.4.1.900 NMAC incorporating 40 Code of Federal Regulations (CFR) 270.42(c) and 20.4.1.901 NMAC. The SWMUs and AOCs are listed in the Permittees' Resource Conservation and Recovery Act (RCRA) Hazardous Waste Facility Permit.

A. Facility Description

SNL is located within the boundaries of Kirtland Air Force Base (KAFB) near Albuquerque in Bernalillo County, New Mexico (Figure 1). KAFB covers 52,223 acres on a high arid mesa approximately 5 miles east of the Rio Grande. SNL occupies 2,829 acres of land owned by the DOE and an additional 14,920 acres of land provided through land-use permits with KAFB, the U.S. Forest Service (USFS), the State of New Mexico, and the Isleta Indian Reservation. Sandia Corporation, a former subsidiary of American Telephone and Telegraph (AT&T) Corporation, operated the properties for the DOE from the time of its opening in 1945 until September 1993, when Martin Marietta Corporation (now Lockheed Martin) took over operations from AT&T. The management and operating name changed on May 1, 2017, from Sandia Corporation to National Technology and Engineering Solutions of Sandia, LLC (NTESS). NTESS is owned by Honeywell International. The Facility is owned by the DOE and co-operated by the DOE and NTESS.

SNL is engaged in research and development of conventional and nuclear weapons, alternative energy sources and a wide variety of national security-related research and development. SNL consists of five technical areas (TAs) and several test areas. The primary mission of SNL is to provide engineering and testing support for nuclear weapons components and related systems. During the late 1940s, the final assembly of weapons was conducted at SNL. Since 1949, SNL has been dedicated to research, development and testing. SNL currently employs approximately 9,300 people. Because of its testing and research activities, SNL generates hazardous, radioactive, mixed (wastes containing both hazardous and radioactive components) and solid wastes. From 1945 to 1988 most of these wastes were disposed of at SNL at numerous locations which have been classified by the NMED as SWMUs. The SWMUs include unpermitted landfills, septic system drainfields and seepage pits, outfalls, waste piles, test areas and surface discharge sites. Past waste management activities at SNL have caused the release of hazardous, mixed and radioactive contaminants into the environment.

SNL is located at 1515 Eubank SE, Albuquerque, New Mexico, 87123. The National Nuclear Security Administration (NNSA)/DOE Albuquerque Site Office (ASO) is located at Kirtland Air Force Base (KAFB) East of Pennsylvania & H Street, Albuquerque, NM 87116. The Permittee's primary contact for this action is Ms. James Todd, USDOE/NNSA Sandia Site Office, P. O. Box 5400, Albuquerque, NM 87185.

B. Background

The U.S. Environmental Protection Agency (EPA) issued a corrective action module, which was added to SNL's RCRA Operating Permit in accordance with the 1984 Hazardous and Solid Waste Amendments (HSWA) that required corrective action to address releases of hazardous waste or hazardous constituents to the environment. The HSWA module became effective on August 26, 1993 and required investigation and corrective action at approximately 200 Environmental Restoration (ER) sites (referred to as SWMUs in the permit). On January 2, 1996, the NMED received authorization from the EPA to implement corrective action under the HSWA and became the administrative authority for this action. This Statement of Basis describes corrective actions conducted at six SWMUs and AOCs.

If approved, the proposed modification would grant Corrective Action Complete (CAC) Status for the six SWMUs. Table K-2 in Appendix K of the Permittees' RCRA Permit lists SWMU/AOCs at the SNL facility where corrective action is necessary to characterize and/or remediate past releases of hazardous wastes or hazardous waste constituents. Based on public comments, it is possible that CAC status will not be approved for some of the SWMUs included in this permit modification request. If any of these SWMUs or AOCs are not approved for CAC status, the sites will remain listed on Table K.2. If this modification is approved by the NMED for some or all the six SWMUs, the units will be transferred from Table K-2 to Table K--3 or Table K-4. Tables K-3 and K-4 list SWMUs andAOCs for which corrective action is complete with and without controls, respectivley.

Additionally, the Department intends to make the following changes to Table K.3: the comment "controls needed" is being added to SWMUs 58FF, 58B/8Y and 154.

C. Investigation and Remediation

NMED has determined that the SWMUs were characterized and remediated as necessary in accordance with current applicable state and/or federal regulations, and confirmatory data indicate that any remaining contaminant concentrations do not pose an unacceptable level of risk to human health and the environment under current and potential future land uses.

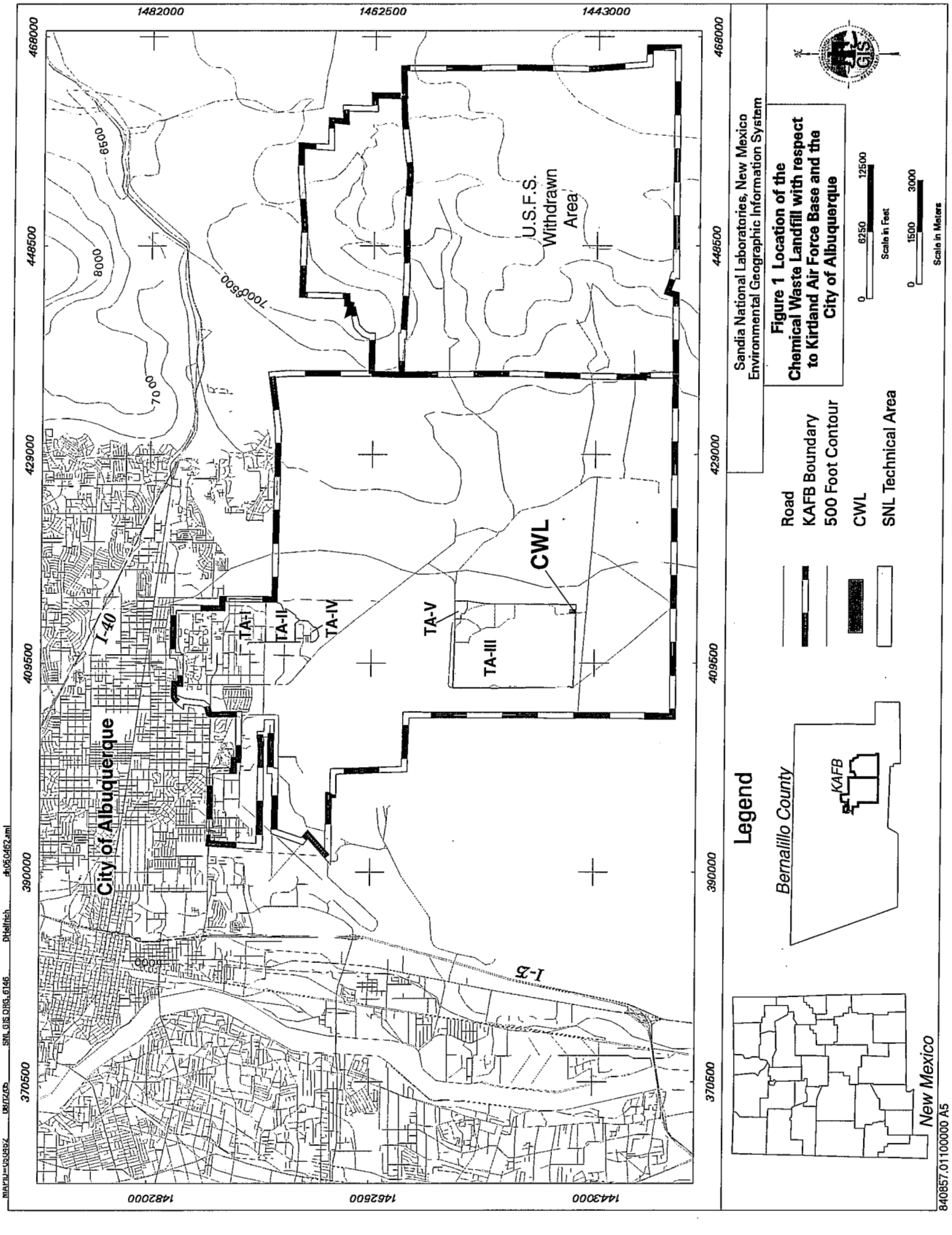

Figure 1. Location Map of Sandia National Laboratories, Albuquerque, New Mexico

Section I, below, briefly describes the location, history, evaluation of relevant information and the basis for determination for each of the six SWMUs proposed for CAC. More detailed descriptions of each SWMU can be found in the original RCRA Facility Investigation Report or other reports for each SWMU.

D. Administrative Record

The Administrative Record for this proposed action consists of the SNL Permit Modification Request, this Fact Sheet/Statement of Basis, the Public Notice, the draft Permit that consists of the proposed Tables K.1, K.2 and K.3 and the referenced supporting documentation. The complete Administrative Record may be reviewed at the following location during the public comment period:

NMED – Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Telephone: (505) 476-6000
Monday - Friday from 8:00 a.m. to 5:00 p.m.
Contact: Pam Allen

A copy of this Statement of Basis / Fact Sheet, the Public Notice and the draft Permit that includes the proposed Tables K-2, K-32 and K-43 are also available on the Department website at: https://www.env.nm.gov/hazardous-waste/sandia-national-laboratories/ under Corrective Action Complete/No Further Action
Anyone seeking additional information regarding this notice or the draft permit may also contact:

Mr. Dave Cobrain, Program Manager
Hazardous Waste Bureau - NMED
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
Monday - Friday from 7:30 a.m. to 4:00 p.m.
E-mail: dave.cobrain@state.nm.us
Telephone: (505) 476-6000
Fax: (505) 476-6030

To obtain a copy of the Administrative Record or a portion thereof, in addition to further information please contact Ms. Pam Allen at (505) 476-6064 or at the Santa Fe address given above. The NMED will provide copies, or portions thereof, of the administrative record at a cost to the requestor.

E. Corrective Action Complete (CAC) Criteria

The six SWMUs are proposed for CAC by the Permittees on the basis that they were characterized and/or remediated in accordance with current applicable state or federal regulations. Based on risk assessment results, future land use at SWMUs 58B/8Y, 58FF and 154 will be restricted to industrial use only.

F. Public Participation

Twenty-two people (including representatives from DOE, SNL and the Department) attended a public meeting arranged by the Permittees on June 21, 2016 at the Manzano Mesa Mutigenerational Center. No written comments were received about the Request from the public by the Permittees.

The Department issued a public notice on **November 17, 2017,** to announce the beginning of a 60-day comment period that will end at 5:00 p.m., **January 16, 2017.** Any person who wishes to comment on this action or request a public hearing should submit written or electronic mail (e-mail) comment(s) with the commenter's name and address to the respective address below. Only comments and/or requests received on or before 5:00 p.m., J**anuary 16, 2017** will be considered.

Dave Cobrain, Program Manager
New Mexico Environment Department - Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, New Mexico 87505-6303
E-mail: dave.cobrain@state.nm.us

Ref: Sandia National Laboratories – Six Sites Corrective Action Complete June 2017

Written comments must be based upon the administrative record. Documents in the administrative record need not be re-submitted if expressly referenced by the commenter. Requests for a public hearing shall provide: (1) a clear and concise factual statement of the nature and scope of the interest of the person requesting the hearing; (2) the name and address of all persons whom the requestor represents; (3) a statement of any objections to the proposed action, including specific references; and (4) a statement of the issues which such persons propose to raise for consideration at the hearing. Written comment and requests for Public Hearing must be filed with Mr. Dave Cobrain on or before 5:00 p.m., **January 16, 2017** at the above address. The Department will provide a minimum 30-day notice of a public hearing, if scheduled.

Arrangements for Persons with Disabilities

Any person with a disability requiring assistance or auxiliary aid to participate in this process should contact Donna Wright at the following address: New Mexico Environment Department, P.O. Box 5469, 1190 St. Francis Drive, Santa Fe, New Mexico, 87502-6110, (505) 827-9769. TDD or TDY users please access Ms. Wright's number via the New Mexico Relay Network at 1 (800) 659-8331.

Non-Discrimination Statement

NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Part 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non-discrimination programs, policies or procedures, you may contact:

Kristine Pintado, Non-Discrimination Coordinator
New Mexico Environment Department
1190 St. Francis Dr., Suite N4050
P.O. Box 5469
Santa Fe, NM 87502
(505) 827-2855
NMED.NDC@state.nm.us

If you believe that you have been discriminated against with respect to a NMED program or activity, you may contact the Non-Discrimination Coordinator identified above or visit our website at https://www.env.nm.gov/non-employee-discrimination-complaint-page/ to learn how and where to file a complaint of discrimination.

G. Next Steps

The NMED must ensure that the approved final Permit will be consistent with the New Mexico Hazardous Waste Management Regulations. All written comments submitted on the draft Permit will become part of the administrative record, will be considered in formulating a final decision, and may cause the draft Permit to be modified. The NMED will respond in writing to all significant public comment. The response will specify which provisions, if any, of the draft Permit have been changed in the final Permit decision, and the reasons for the change. The response will also be posted on the NMED website in addition to the NMED notifying all persons who provided written comments.

After consideration of all written public comments received, the NMED will issue, or modify and issue, or disapprove the Permit modification. If the NMED modifies the Permit, the Permittees shall be provided by mail a copy of the modified Permit and a detailed written statement of the reasons for the modifications. The NMED Secretary will make the final decision publicly available and shall notify the Permittees by certified mail. The Secretary's decision shall constitute a final agency decision and may be appealed as provided by the Hazardous Waste Act. All persons who provided written comments, or who requested notification in writing, will be notified of the final decision by mail.

The final decision will become effective 30 days after service of the decision to the Permittees, unless a later date is specified or review is requested under the New Mexico Hazardous Waste Management Regulations, 20.4.1 NMAC, Section 901.

H. Solid Waste Management Units Proposed for Corrective Action Complete

1. SWMUs 8 and 58, Open Dump and Coyote Canyon Blast Area

Site Location

SWMUs 8 and 58 (Figure 2) are in the USFS Withdrawn Area on the east side of KAFB. SWMU 58 is approximately 258 acres, and the boundary is defined as a 4000-foot (ft) diameter circle, selected to encompass the probable area of fragment dispersal from explosives testing. SWMU 8, defined by selected debris areas, is approximately 30 acres in size and lies completely within the SWMU 58 radius. The combined area of SWMUs 8 and 58 is the area of a circle with a 4000-ft diameter. Figure 3 shows the location of both SWMUs.

Operational History

Over 100 research tests were conducted at SWMUs 8 and 58 from 1950 to the late 1960s. Tests at SWMUs 8 and 58 included at-ground or above-ground explosive detonations and ground penetration tests. Primary materials dispersed at the site because of the tests included partially combusted high explosives (HE), metals, and radionuclides. Debris from the SWMUs 8 and 58 tests and possibly from other sources was disposed of at SWMUs 8 and 58. Most of the solid waste disposed at SWMUs 8 and 58 consisted of wood shipping crates, scrap metal from tests and concrete.

Depth to Groundwater

The depth to groundwater in the area is approximately 70 to 100 feet below ground surface (bgs).

Groundwater Monitoring

In April 2010, the NMED required the installation of two groundwater monitoring wells and the collection of eight quarters of groundwater samples at SWMUs 8 and 58. Monitoring wells CCBA-MW1 and CCBA-MW2 (Figure 8) were installed in August 2011 and were sampled on a quarterly basis from October 2011 to July 2013. The thirteenth and final groundwater samples were collected and groundwater sampling was discontinued in October 2014 (SNL/NM October 2014). Groundwater samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), high explosive (HE) compounds, nitrate plus nitrite (NPN), major anions and cations, alkalinity, Target Analyte List (TAL) metals plus uranium, perchlorate, total cyanide, gross alpha/beta activity and radionuclides by gamma spectroscopy.

The analytical results for monitoring wells CCBA-MW1 and CCBA-MW2 exceeded the MCLs for fluoride in all samples from CCBA-MW1, and for benzo(a)pyrene in the January 2013 sample from CCBA-MW2. All other analyses either were not detected or detected at concentrations less than EPA Safe Drinking Water Act Maximum Contaminant Levels (MCLs). The detection of benzo(a)pyrene was likely due to cross contamination related to the one time use of a fuel source heater. The use of the heater was discontinued and detections of SVOCs ceased. The detection of fluoride in CCBA-MW1 is attributed to the natural occurrence of fluorite minerals in the alluvium and bedrock (Skelly, August 2013).

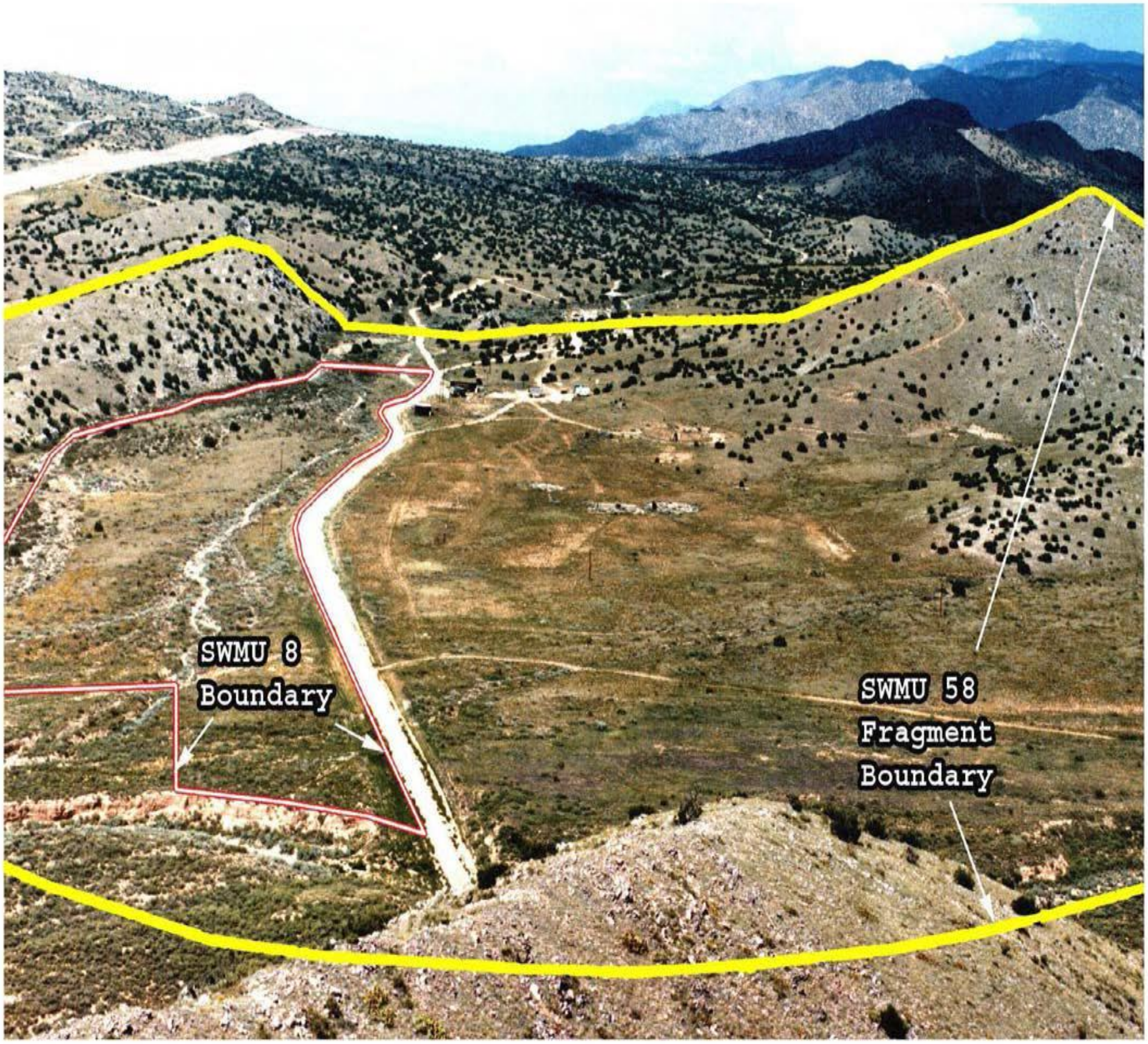

Figure 2. Aerial Photo of SWMUs 8 and 58 looking North

Evaluation of Relevant Information

SWMUs 8 and 58 were initially identified in mid-1980s, as part of the Comprehensive Environmental Assessment and Response Program (CEARP) program.

Numerous surveys were conducted throughout SWMUs 8 and 58 from 1993 through 2004 to identify areas and locations at the SWMUs that contained radiologically-contaminated materials, HE, unexploded ordnance (UXO), and other miscellaneous types of wastes that would require subsequent investigation and removal.

The surveys identified 60 individual locations (designated as "Features" in the April 2005 CAC Proposal) within the SWMU 58 site boundary that contained potentially contaminated soil and debris, that required environmental characterization (Figure 3, Figure 4, Figure 5, Figure 6 and Figure 7). Numerous other locations (designated as "Concrete or Housekeeping Features") that contained non-regulated debris, primarily concrete, asphalt, wood, and other construction materials were identified during the surveys.

Multiple remediation projects, starting in the mid-1980s and continuing until 2000 were conducted at numerous Features and locations within SWMUs 8 and 58. Approximately 1,390 cubic yards of various types of waste, 12 jet assist takeoff (JATO) motors, and other miscellaneous items have been removed during remediation work conducted at the SWMUs (Table 2).

A total of 1,395 soil sample analyses were used as the basis for the final risk assessment for the site. These samples were collected from 1995 to 2006 to characterize existing surface or subsurface soils at numerous locations at the site, or soils that remained after remediation activities were completed at multiple individual SWMU 8 and 58 Features. The total number and types of sample analyses that were used in the final risk assessment are as follows:

- 159 samples for volatile organic compounds (VOCs)
- 93 samples for semivolatile organic compounds (SVOCs)
- 53 samples for total petroleum hydrocarbons (TPH)
- 254 samples for HE
- 455 samples for metals
- 337 samples for radionuclides by gamma spectroscopy (GS)
- 23 samples for radionuclides by alpha spectroscopy (AS)
- 21 samples for tritium (H3)

Table 3 summarizes the sampling dates, sampling locations, and the number of the different types of confirmatory soil sample analyses that were completed at the identified SWMU 8 and 58 Features.

Evaluations of risk were completed for a few of the Features at SWMUs 8 and 58 as well as the combined area of SWMUs 8 and 58. Risk discussions are presented here for the combined area as well as several of the features including:

- SWMUs 8 and 58 Combined Area
- SWMUs 8 and 58, Features 8Y and 58B- Debris Pile and Pit Area
- SWMU 58, Feature 58FF- Pile of Fire Bricks
- SWMU 58, Feature 58OO - Open Borehole
- SWMU 58, Feature 58TT- Fire Brick Area No. 2

SWMUs 8 and 58 Combination Area

For the nonradiological constituents of concern (COCs), thirteen constituents were detected at concentrations greater than the background screening values. Twenty-three nonradiological COCs are organic compounds that do not have corresponding background screening values.

Above-background metal concentrations of arsenic, beryllium, lead, and nickel were detected at concentrations greater than background levels in soil samples collected at depths starting at 30 ft bgs at several SWMU 8 and 58 Features between 1995 and 2006. It was not considered likely that the surface testing activities conducted at SWMUs 8 and 58 would have resulted in metals contamination in the deep subsurface at the site. For this reason, the detected concentrations of these four metals in the deep subsurface samples are naturally occurring, and were not included in the risk assessment calculations. The maximum concentrations of all metal and radiological COCs (except for lead) that were detected above background, and other COCs that were detected but for which no background was available, in samples collected to a depth of 30 ft at the site were evaluated in the combined SWMU 8 and 58 risk assessment (Table 4). The only other metal detected below 30 feet bgs at concentrations above background levels was zinc. All detected concentrations for zinc were below residential soil screening levels.

The maximum concentration value for lead from this site was 15,000 milligrams/kilogram (mg/kg), detected in a soil sample collected at a depth of 5.5 feet bgs in an April 1996 auger borehole (58FF-GR-FF). This maximum lead concentration is greater than the EPA and NMED screening values. However, lead was not detected at a concentration greater than 20 mg/kg in soil samples obtained from a boring installed directly adjacent to boring 58-FF-GR-FF in 1997 (boring S58-BH4). It is likely that the high lead concentration was the result of the presence of a piece of elemental lead in the sample. Because the site has been adequately characterized and the only detected exceedance of the residential cleanup level for lead was in soils obtained from boring 58-FF-GR-FF, it was concluded that average concentrations are more representative of actual SWMU 8 and 58 overall site conditions. The upper confidence limit (UCL) of the mean concentration for lead is 239 mg/kg and is less than the screening values. Lead was therefore eliminated from further consideration in the human health risk assessment.

The SWMU 8 and 58 combined risk assessment analysis evaluated the potential for adverse health effects associated with non-radiological and radiological constituents for the industrial and residential land-use scenarios.

Figure 3. Map of SWMUs 8 and 58, Open Dump and Coyote Canyon Blast Area Including Locations of Quadrants A through D

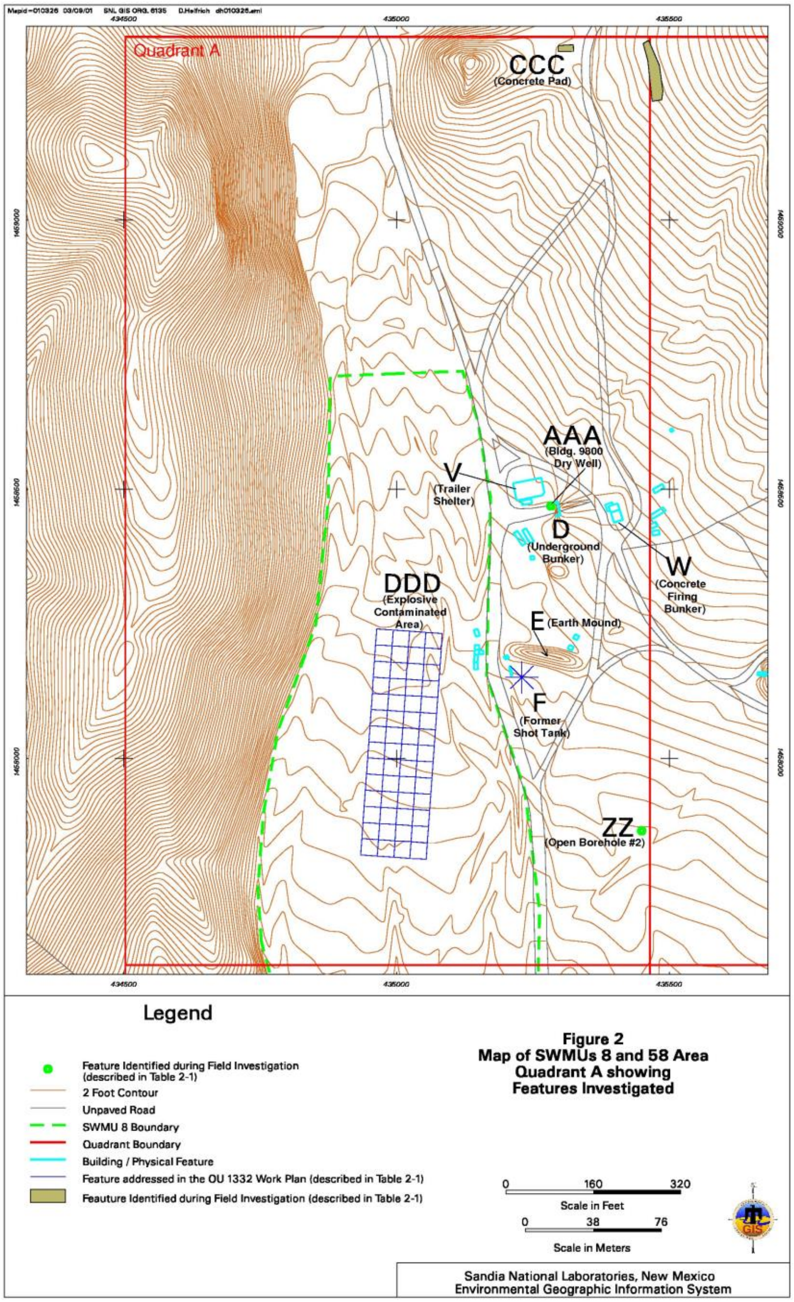

Figure 4. Map of SWMUs 8 and 58 Showing Features Investigated in Quadrant A

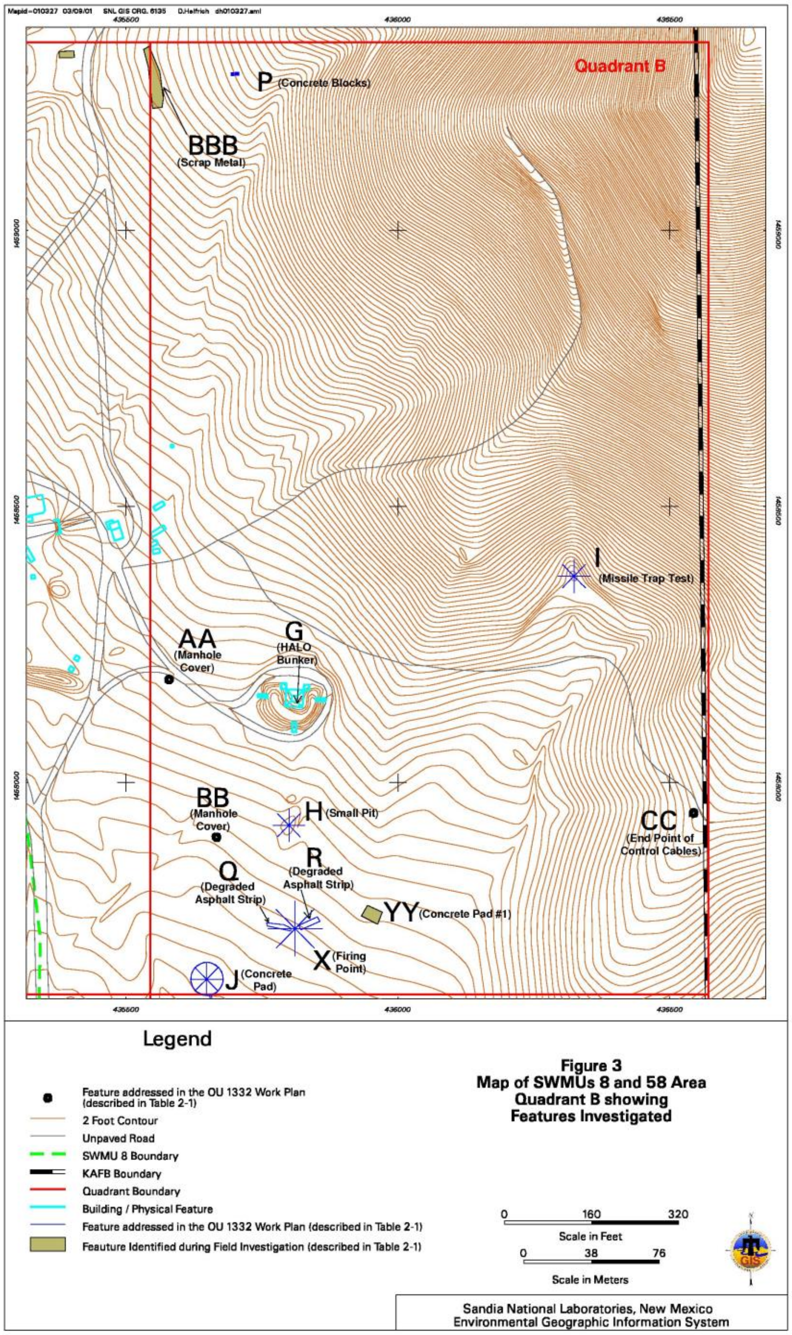

Figure 5. Map of SWMUs 8 and 58 Showing Features Investigated in Quadrant B

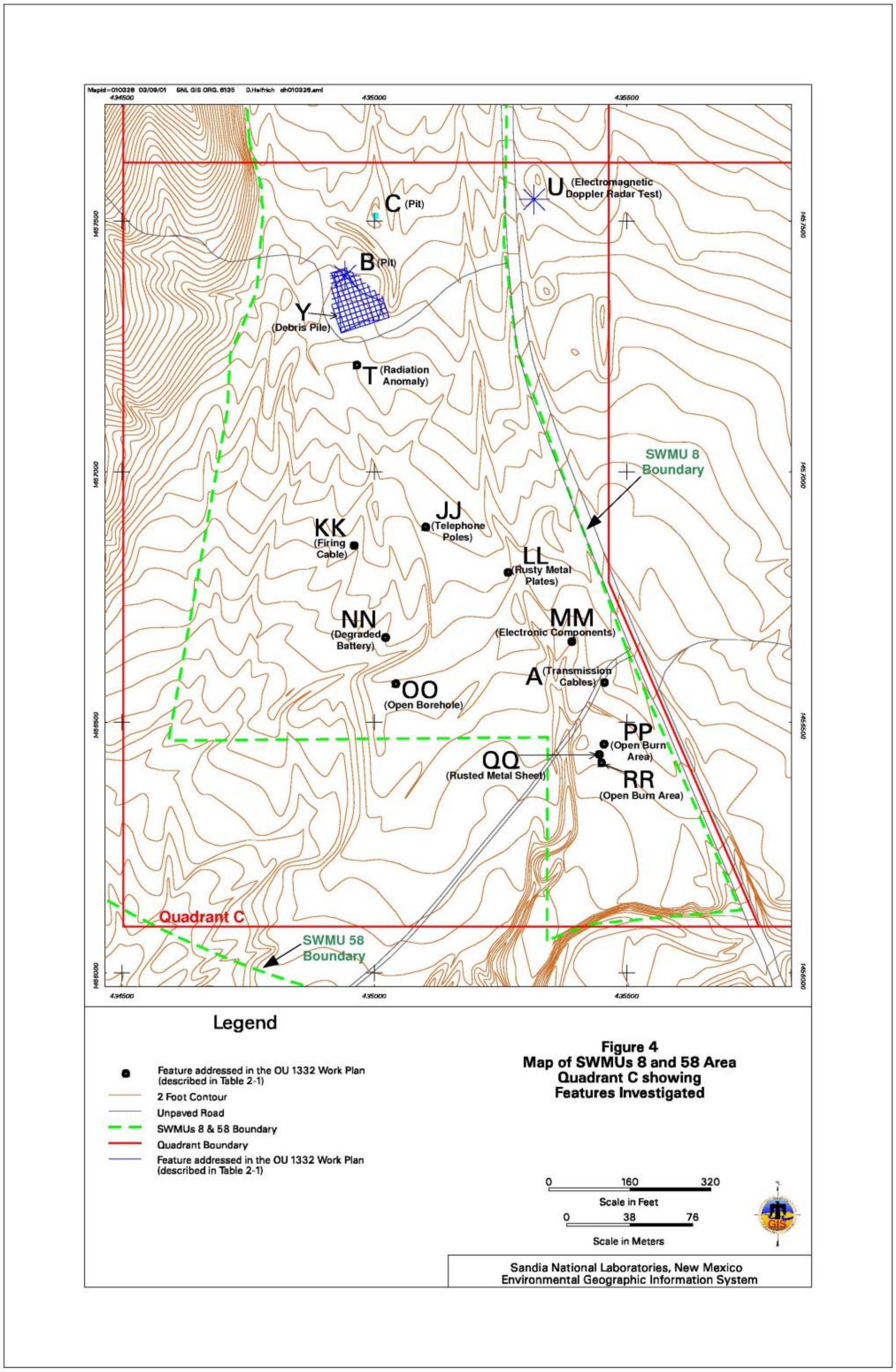

Figure 6. Map of SWMUs 8 and 58 Showing Features Investigated in Quadrant C

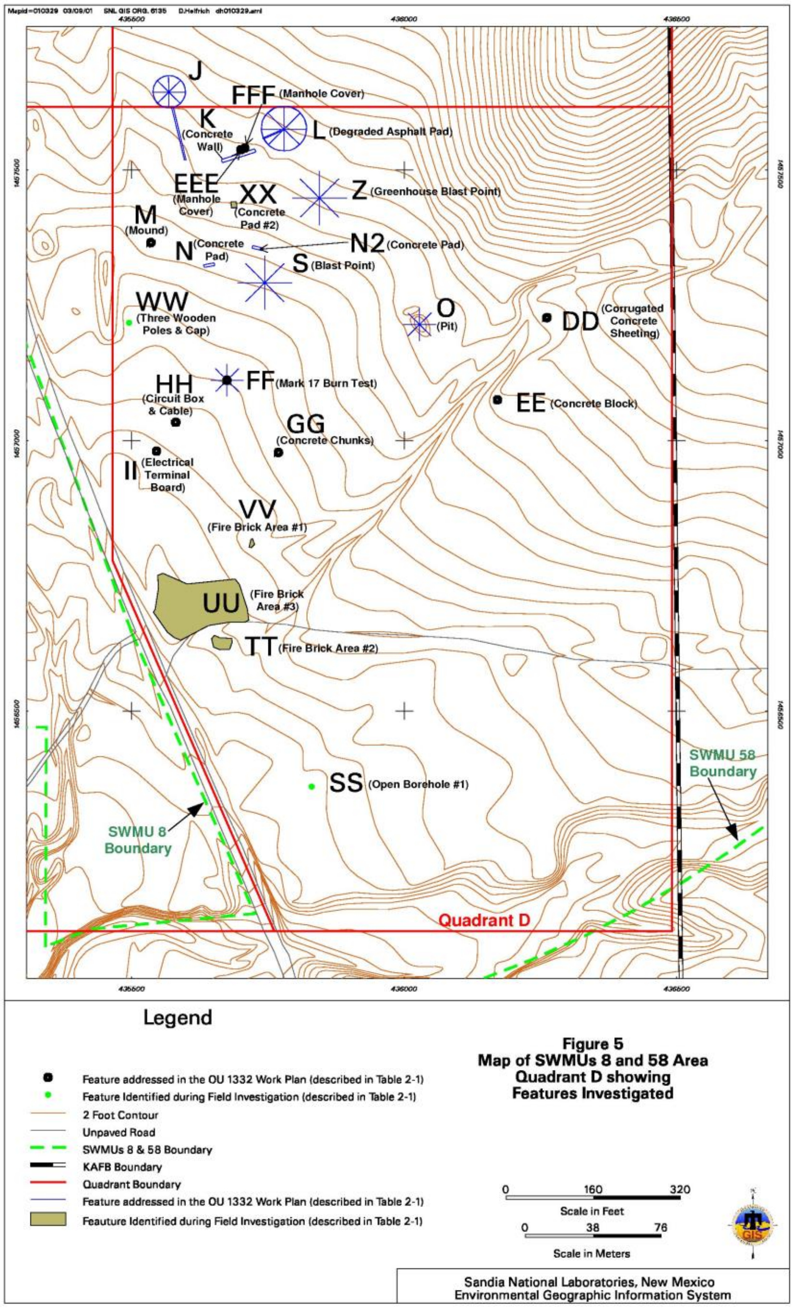

Figure 7. Map of SWMUs 8 and 58 Showing Features Investigated in Quadrant D

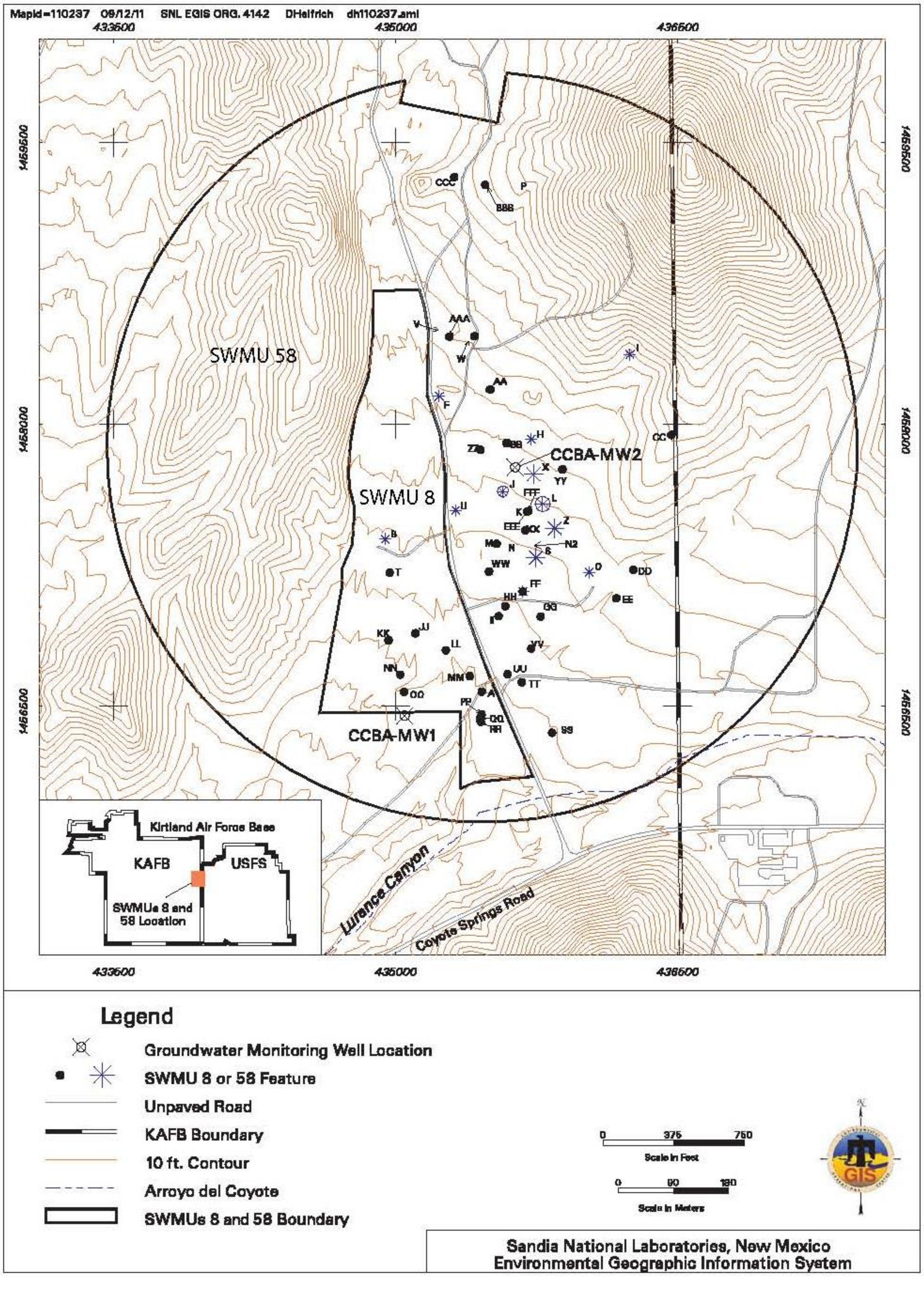

Figure 8. Map of SWMUs 8 and 58 and Monitoring Wells CCBA-MW1 and CCBA-MW2

Table 1
Summary of Remediation and Voluntary Corrective Measure Activities Conducted at SWMUs 8 and 58

Activity Location (Feature)	Activity Date	Waste Type Removed	Waste Removed
8 and 58	Mid-80s	HE/ UXO	2 truckloads (estimated 12 yd^3)
8 and 58	October 1993	HE/UXO	Over 80 UXO items
8DDD	October 1993	HE	5 lbs HE chunks
58	February, March 1995	Radiologically-contaminated soil	10 yd^3
8Y	February 1996	Solid waste (wood, metal, JATO motors)	120 yd^3 mainly wood, 35 yd^3 scrap metal, 2 JATOs
8Y, 58B	March 1996	JATO motors	10 JATOs
8Y, 58B	July 1996	Radiologically-contaminated wood and soil	27 yd^3
8PP and 8RR	June 1997, August 1998, January-March 2004	Radiological and non-radiologically-contaminated metal, metal-contaminated soil, batteries, and metal slag	76 yd^3
Multiple SWMU 8 Features	January 1998	Nonregulated debris (metal, asphalt, concrete, plastic, firebrick) and asbestos containing materials (ACM) (mainly transite tile)	30 yd^3 nonregulated debris, 10 yd^3 ACM
58FF, 58I, 58O	March through May 1998	ACM	15 yd^3
Various SWMU 58 Features	May & June 1998	Nonregulated debris, batteries, ACM	41 yd^3
8Y, 58B	September 1998	Nonregulated soil with a minimal amount of debris	220 yd^3
Multiple SWMU 8 and 58 Features	December 1998 through March 1999	Debris (batteries, firebrick, asphalt, concrete, plastic, wood, metal, transite tile) from 57 individual locations	150 yd^3
Multiple SWMU 8 and 58 Features	January & February 1999	Concrete from 13 individual locations	500 yd^3
UCS (58K, W, AA, BB, EEE, FFF)	October & November 2000	Metal, plastic, asbestos piping, concrete, and wood	136 yd^3

ACM = asbestos containing materials
JATO = jet-assisted take-off motors.
UXO = unexploded ordnance.
HE = high explosives.
UCS = Underground Conduit System.
yd^3 = cubic yards.

Table 2
Summary of Soil Sampling at SWMUs 8 and 58 Features

Feature Sampled	Sample Date (Month and Year)	Sample Type	Sample Type (Number of Samples)
58E	May 1996 & February 1997	Surface & subsurface samples	Metals (26), GS (23)
58F	March 1996, October 1997, September 1998	Surface samples	HE (18), Metals (19), GS (18), AS (6)
58G	April 1996	Surface samples	Metals (8), GS (7)
58H	March 1996 & October 1997	Surface samples	HE (17), Metals (19), GS (18), AS (6)
58I	April & May 1996, December 1997	Surface samples	VOCs (23), SVOCs (22), TPH (23)
58J	September 1998	Surface samples	HE (10), GS (9)
58L	September 1998	Surface samples	HE (10), GS (9)
58O	April 1996, April 1997, December 1997, & September 2005	Surface & subsurface samples	VOCs (21), SVOCs (21), HE (20), TPH (21), Metals (25)
58S	October 1997, September 2005	Surface samples	HE (22), GS (18)
58U	March 1996 & November 1997	Surface samples	HE (18), Metals (19), GS (18), H3 (5), AS (5)
58X	March-May 1996, September 2005	Surface and subsurface samples	HE (18), Metals (8), GS (25), AS (4)
58Z	June 1995, March-May 1996	Surface & subsurface samples	HE (21), GS (17)
58FF	June 1995, April and August 1996, April 1997, January 1999, October 2005, September 2006	Surface and subsurface samples	VOCs (22), SVOCs (22), HE (24), Metals (186), GS (46)
58OO	April 1997, September and October 2005	Surface and Subsurface samples	VOCs (6), SVOCs (6), HE (6), Metals (16), GS (6), AS (2)

Table 2
Summary of Soil Sampling at SWMUs 8 and 58 Features

Feature Sampled	Sample Date (Month and Year)	Sample Type	Sample Type (Number of Samples)
58SS	January 1999	Subsurface samples	VOCs (4), SVOCs (3), HE (3), Metals (4), GS (4)
58TT	March 1999, September 2005	Surface samples	HE (6), Metals (13), GS (13)
58UU	January 1999 & March 2000	Surface samples	Metals (13), GS (13)
58VV	January 1999	Surface samples	Metals (2), GS (2)
58WW	January 1999	Surface samples	HE (1), Metals (1), GS (1)
58XX	January 1999	Surface samples	HE (1), Metals (1), GS (1)
58YY	January 1999, September 2005	Surface samples	HE (1), Metals (6), GS (4)
58ZZ	January 1999	Subsurface samples	VOCs (3), SVOCs (3), HE (3), Metals (3), GS (3)
58AAA	January 1999	Surface & subsurface samples	VOCs (2), SVOCs (2), TPH (2), HE (2), Metals (2), GS (2)
58CCC	September 1996	Surface & subsurface samples	VOCs (7), SVOCs (7), HE (7), Metals (7), GS (6)
8DDD	October & June 1995, February 1998	Surface samples	HE (15), Metals (15), GS (14)
8GGG	November 1996, January 1998	Surface samples	HE (11), Metals (11), GS (7)
UCS (58K, 58W, 58AA, 58BB, 58EEE, 58FFF)	March-April 1996, October 2000	Surface and Subsurface samples	VOCs (64), Metals (11), GS (22)
8Y/58B	April 1996, September 1998, January 1999	Surface and subsurface samples	VOCs (7), SVOCs (7), TPH (7), HE (20), Metals (45), GS (20), H3 (16)
8PP/8RR	February 2004	Surface samples	Metals (11), GS (11)

AS = alpha spectroscopy.
GS = gamma spectroscopy.
H3 = tritium.
HE = high explosives.
VOCs = volatile organic compounds.
yd^3 = cubic yards.
TPH = total petroleum hydrocarbons.
SVOCs = semi-volatile organic compounds.

Table 3
Combined Risk Assessment Values for SWMUs 8 and 58 Nonradiological COCs

COC	Sample Location (Feature)	Maximum Concentration /**UCL** (All Samples) (mg/kg)	Industrial Land-Use Scenario		Residential Land-Use Scenario	
			Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic						
Arsenic	58OO	137 J/ **9.37**	0.54/**Below Background**[a]	9E-5/**Below Background**[a]	6.33/ **Below Background**[a]	4E-4/ **Below Background**[a]
Barium	58O	988 J/ **158**	0.02/ **Below Background**[a]	--/--	0.19/ **Below Background**[a]	--/--
Beryllium	58FF	79.3/ **2.3**	0.04/	3E-8/ **1E-9**	0.53/ **0.02**	7E-8/ **2E-9**
Cadmium	58AAA	6.02/ **0.62**	0.01/**Below Background**[a]	2E-9/ **Below Background**[a]	0.15/ **Below Background**[a]	4E-9/**Below Background**[a]
Chromium, total	58FF	161 J	0.00	--	0.00	--
Copper	58G	684/ **51.2**	0.02/ **0.00**	--/--	0.24/ **0.02**	--/--
Mercury	58U	0.585	0.00	--	0.03	--
Nickel	58FF	3960/ **65.5**	0.21/ **0.00**	--/--	2.60/**0.04**	--/--
Selenium	58E	79 J/**6.65**	0.02/**0.00**	--/--	0.21/**0.02**	--/--
Silver	58AAA	60.5/ **2.74**	0.01/ **0.00**	--/--	0.16/ **0.01**	--/--
Uranium	58X	41	0.01	--	0.18	--
Zinc	58B	225	0.00	--	0.01	--
Organic						
Acetone	58O	0.021	0.00	--/--	0.00	--
2-Amino-4,6-dinitrotoluene	8Y	0.45 J	0.00	--/--	0.01	--
4-Amino-2,6-dinitrotoluene	58S	0.68	0.00	--/--	0.01	--
Benzo(a)pyrene	58O	0.235 J/ **0.12**	0.00/ **0.00**	1E-6/ **6E-7**	0.00/ **0.00**	4E-6/ **2E-6**
Benzo(b)anthracene	58O	0.202 J	0.00	1E-7	0.00	3E-7
2-Butanone	58SS	0.075	0.00	--	0.00	--
Chloroform	58FF	0.0025	0.00	5E-9	0.00	1E-8
Chrysene	58O	0.248 J	0.00	1E-9	0.00	4E-9
Diethyl phthalate	58B	0.269 J	0.00	--/--	0.00	--
m-Dinitrobenzene	58F	0.15	0.00	--/--	0.02	--
2,4-Dinitrotoluene	58I	0.36 J	0.00	--/--	0.00	--
Ethylbenzene	58FF	0.0005	0.00	3E-11	0.00	7E-11
bis(2-Ethylhexyl) phthalate	58OO	3.41	0.00	2E-8	0.00	8E-8
Fluoranthene	58O	0.278 J	0.00	--	0.00	--
2-Hexanone	UCS	0.0157	0.00	--	0.00	--
HMX	8Y	5.6 J	0.00	--	0.00	--
Methylene chloride	UCS	0.0125	0.00	8E-8	0.00	2E-7
n-Nitrosodiphenylamine	58I	0.253 J	0.00	7E-10	0.00	3E-9
Pentachlorophenol	58AAA	0.27 J	0.00	1E-8	0.00	5E-8
Pyrene	58O	0.334 J	0.00	--	0.00	--
RDX	58O	19.9 J/ **2.66**	0.01/ **0.00**	1E-6/ **2E-7**	0.11/ **0.01**	5E-6/ **6E-7**
Toluene	58SS	0.025	0.00	--	0.00	--
2,4,6-Trinitrotoluene	8Y	20 J/ **1.59**	0.06/**0.00**	3E-7/ **3E-8**	0.65/ **0.05**	1E-6/ **1E-7**
Total			0.96/ **0.03**	9E-5/ **1E-6**	11.43/**0.42**	4E-4/**3E-6**

Note: UCLs are calculated only for risk drivers. UCL concentrations and associated risk are in **bold**.

[a]UCL concentration was below background screening level. Therefore, risk was not calculated.

COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
HMX = octahydro-1, 3, 5, 7-tetranitro-1, 3, 5, 7-tetrazocine
RDX = hexahydro-1, 3, 5-trinitro-1, 3, 5-triazine
mg/kg = Milligram(s) per kilogram.
– = Information not available.

For the nonradiological risk assessment for a residential land-use scenario, the hazard index(HI) for noncarcinogens of 11.43 is above the NMED numerical standard of 1.0 based on the maximum detected constituent concentrations. The estimated excess cancer risk is 4E-4 based on the maximum detected carcinogenic constituent concentrations, which is above the NMED guideline of 1E-5 for a residential land-use scenario. Calculation of risk Uusing the UCLs of the mean concentrations for the main contributors to excess cancer risk and hazard resulted in a total HI and estimated excess cancer risk to 0.42 and 3E-6, respectively, which are less than the NMED-accepted risk levels for noncarcinogens (HI=1) and the estimated incremental excess cancer risk values for the residential land-use scenario (1-E-5)..

For the radiological COCs, five of the constituents (tritium, cesium-137, thorium-232, uranium-235, and uranium-238) had either activity levels or minimum detectable activity (MDA) values greater than the corresponding background values. The incremental human health total effective dose equivalent (TEDE) is 12 millirem/year (mrem/yr) for the industrial land-use scenario, which is lower than the DOE guideline of 15mrem/yr. The incremental TEDE for the residential land-use scenario is 31 mrem/yr which is below the guideline of 75 mrem/yr for the residential exposure scenario. Therefore, SWMUs 8 and 58 are eligible for unrestricted radiological release.

In conclusion, based upon the SWMU 8 and 58 Combination Area field investigation data, human health risk is acceptable for the residential land-use scenario.

SWMUs 8 and 58, Feature 58B/8Y—Debris Pile and Pit Area

At the locations of the debris pile and pit area, eight nonradiological inorganic COCs were detected at concentrations greater than the background screening values. In addition, ten organic compounds were detected that do not have corresponding background screening values.

The maximum detected concentration of lead was 58.5 mg/kg. Lead is evaluated separately from other constituents. The US EPA recommends the use of the Adult Lead Methodology (ALM) for adults in evaluating occupational scenarios at sites where access by children is reliably restricted. The EPA screening level for the residential exposure scenario is 400 mg/kg and the screening level for industrial land use is 800 mg/kg. The maximum concentration value for lead at this Feature was less than 400 mg/kg; therefore, lead was eliminated from further consideration in the human health risk assessment.

For the radiological COCs, activities or MDA values greater than the background screening levels were detected for two constituents (H-3, and uranium-235).. The greater of either the maximum detection or the highest MDA was conservatively used in the risk assessment.

For the nonradiological COCs under the industrial land-use scenario, the HI is 0.13, which is less than the NMED standard HI of 1. The excess cancer risk is 4E-7. which is less than the cumulative excess lifetime cancer risk of 1E-5. These risk calculations indicate an acceptable risk to human health from nonradiological COCs for an industrial land-use scenario.

For the radiological COCs under the industrial land-use scenario, the incremental TEDE is 1.2E-2 mrem/yr, which is significantly lower than the EPA numerical guideline of 15 mrem/yr.

A Voluntary Corrective Measure (VCM) characterized and removed debris on the surface and in the shallow subsurface. The SWMU 58B pit was then filled with clean soil. Confirmatory sampling demonstrated that elevated levels of metals and HE compounds remained in the soil at some locations (Figure 9). The VCM addressed surface-water requirements by removing potential sources of COCs from the drainage pattern and revegetating disturbed areas.

For the nonradiological COCs under the residential land-use scenario, the calculated HI is 1.47, which is above the acceptable NMED hazard index of 1 (Table 5). The excess cancer risk is 1E-6, which is less than the acceptable cumulative excess lifetime cancer risk of 1E-5. The HI is above the NMED guideline for the residential land-use scenario and maximum concentrations were used in the risk calculation because there were not adequate numbers of samples collected to permit average concentrations to be used in the risk calculation.

The incremental TEDE for a residential land-use scenario from the radiological components is 3.0E-2 mrem/yr, which is lower than the numerical guideline of 75 mrem/yr.

In conclusion, based upon the field investigation data for Feature 58B/8Y, human health and ecological risk are acceptable for an industrial land-use scenario.

Table 4
Risk Assessment Values for SWMUs 8 and 58 Nonradiological COCs, Feature 58B/8Y, Debris Pile and Pit Area

COC	Maximum Concentration/**UCL** (All Samples) (mg/kg)	Industrial Land-Use Scenario		Residential Land-Use Scenario	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Cadmium	1.18 J	0.00	4E-10	0.03	8E-10
Chromium, total	61.8	0.00	–	0.00	–
Copper	543	0.02	–	0.19	–
Mercury	0.258	0.00	–	0.01	–
Nickel	815/**383**	0.04	–/–	0.54	–/–
Silver	6.71 J	0.00	–	0.02	–
Zinc	225	0.00	–	0.00	–
Organic					
2-Amino-4,6-dinitrotoluene	0.45 J	0.00	–	0.01	–
4-Amino-2,6-dinitrotoluene	0.48 J	0.00	–	0.01	–
2-Butanone	0.05 J	0.00	–	0.00	–
Diethyl phthalate	0.269 J	0.00	–	0.00	–
bis(2-Ethylhexyl) phthalate	0.408 J	0.00	2E-9	0.00	9E-9
HMX	5.6 J	0.00	–	0.00	–
Methylene chloride	0.0098	0.00	6E-8	0.00	1E-7
RDX	0.27 J	0.00	2E-8	0.00	6E-8
Toluene	0.017 J	0.00	–	0.00	–
2,4,6-Trinitrotoluene	20 J/**5.36**	0.06	3E-7	0.65	1E-6
Total		0.13	4E-7	1.47	1E-6

COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
J = Estimated concentration.
mg/kg = Milligram(s) per kilogram.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SWMU = Solid Waste Management Unit.
– = Information not available.

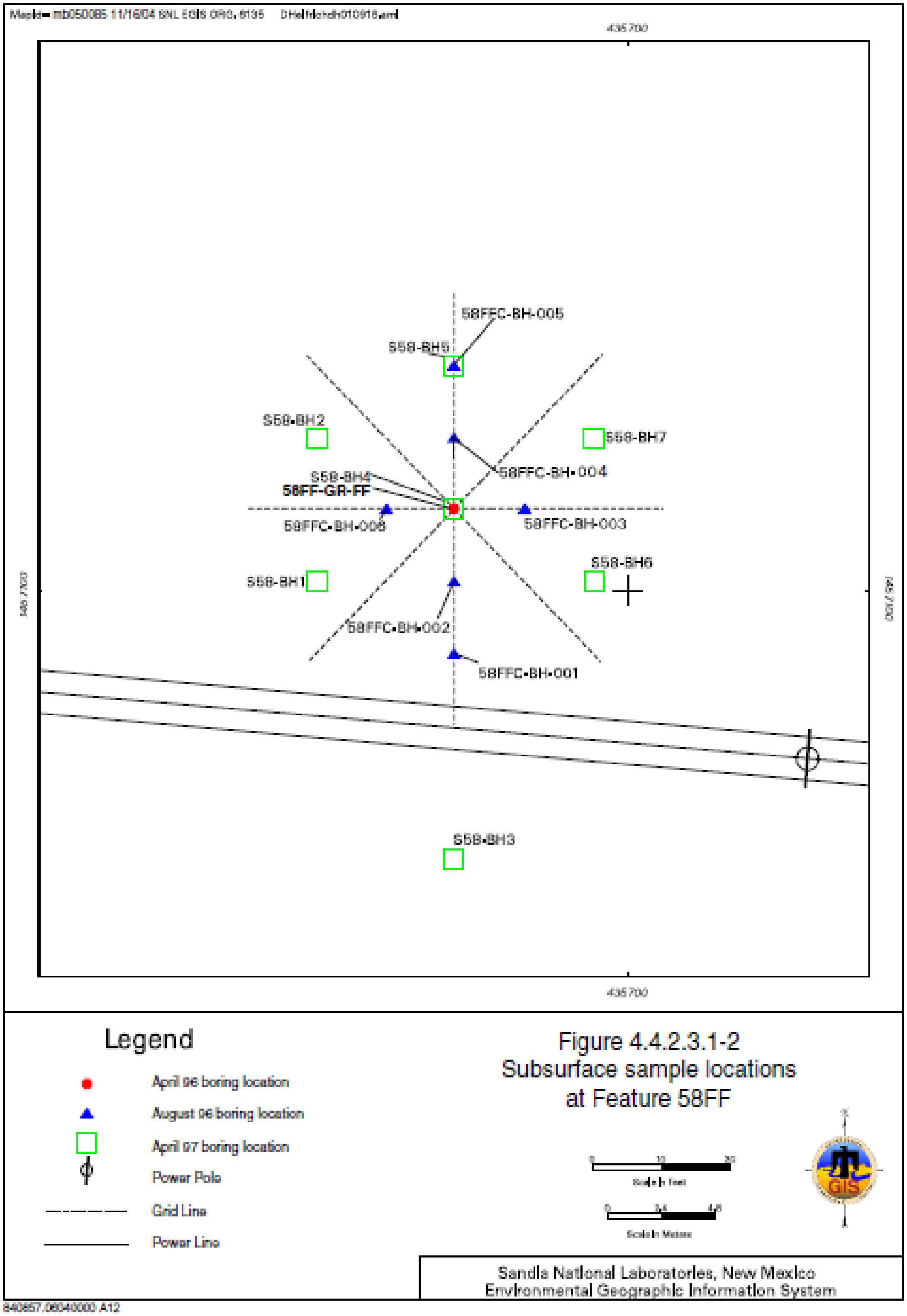

Figure 10. Feature 58FF Subsurface sample locations

SWMU 58, Feature 58FF- Pile of Fire Bricks

For the nonradiological COCs, eleven constituents were measured at concentrations greater than the background screening values. One nonradiological COC was an organic compound that does not have corresponding background screening value.

The maximum concentration value for lead that was evaluated in the March 2006 supplemental response risk assessment was 15,000 mg/kg (detected in an April 1996 auger borehole sample [Figure 10]). The maximum concentration value for lead from this site was 15,000 milligrams/kilogram (mg/kg), detected in a soil sample collected at a depth of 5.5 feet bgs in an April 1996 auger borehole (58FF-GR-FF). This maximum lead concentration is greater than the EPA and NMED screening values. However, lead was not detected at a concentration greater than 20 mg/kg in soil samples obtained from a boring installed directly adjacent to boring 58-FF-GR-FF in 1997 (boring S58-BH4). It is likely that the high lead concentration was the result of the presence of a piece of elemental lead in the sample. Because the site has been adequately characterized and the only detected exceedance of the residential cleanup level for lead was in soils obtained from boring 58-FF-GR-FF, it was concluded that average concentrations are more representative of actual SWMU 8 and 58 overall site conditions. The upper confidence limit (UCL) of the mean concentration for lead is 239 mg/kg and is less than the screening values. Lead was therefore eliminated from further consideration in the human health risk assessment. The calculated hazard index for detected noncarcinogens for the industrial land-use scenario is 0.67, which is lower than the NMED numerical standard of 1.0 (Table 6). The estimated excess cancer risk is 6E-5, which is above the acceptable risk level (1E-5) for an industrial land-use scenario.

Although the estimated excess cancer risk is above the NMED guideline for the industrial land-use scenario, maximum concentrations were used in the risk calculation. The total excess cancer risk based on the UCLs of the mean concentrations for the main contributors to excess cancer risk which include arsenic (9.51 mg/kg, which is below background and eliminated from further evaluation), beryllium (5.87 mg/kg), and nickel (135 mg/kg), is 8E-9 (Table 6). Therefore, the total excess cancer risk value for the industrial land-use scenario is less than the acceptable excess cancer risk for carcinogens of 1-E-05 for industrial land use..

The calculated risk for the nonradiological COCs indicate that the site does not meet the risk levels for the residential land-use scenario HI=8.07 and excess cancer risk is 3E-4. Therefore the site does not qualify for corrective action complete without control and site use must be restricted to industrial land use only.

In conclusion, based upon the Feature 58FF field investigation data, human health risk is acceptable for an industrial land-use scenario.

Table 5
Risk Assessment Values for Nonradiological COCs, SWMU 58, Feature 58FF, Fire Brick Area (1995–2006 Analytical Data)

COC	Maximum Concentration/**UCL** (All Samples) (mg/kg)	Industrial Land-Use Scenario		Residential Land-Use Scenario	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Arsenic	103 J/**9.51**	0.40/**Below Background**	6E-5/**Below Background**	4.76/**Below Background**	3E-4/**Below Background**
Barium	585 J	0.01	--	0.11	--
Beryllium	79.3/**5.87**	0.04/**0.00**	3E-8/**3E-9**	0.53/**0.04**	7E-8/**5E-9**
Cadmium	0.875	0.00	3E-10	0.02	6E-10
Chromium, total	161 J	0.00	--	0.00	--
Copper	62.1 J	0.00	--	0.02	--
Mercury	0.273	0.00	--	0.01	--
Nickel	3960/**135**	0.21/**0.01**	--/**--**	2.60/**0.11**	--/**--**
Silver	1.0	0.00	--	0.00	--
Zinc	108 J	0.00	--	0.00	--
Organic					
Chloroform	0.0025[a]	0.00	5E-9	0.00	1E-8
Total		0.67/**0.02**	6E-5/**8E-9**	8.07/**0.31**	3E-4/**2E-8**

[a] Maximum concentration is one-half the detection limit.

COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
J = Analytical result was qualified as an estimated value. mg/kg = Milligram(s) per kilogram.
SWMU = Solid Waste Management Unit.
UCL = Upper Confidence Limit in Bold.
-- = Information not available.

SWMU 58, Feature 58OO – Open Borehole

Concentrations of three metals of concern (arsenic, beryllium, and zinc) at Feature 58OO increase with depth. The trend of increasing metals concentrations as sample depths increase is the opposite of what would be expected if metals contamination were introduced into the environment at the site because of testing. There are no known activities conducted at the site that would have driven metals downward and cause a steady increase of metals concentrations with depth at this site.

The probable source of the elevated metals detected in alluvial material samples collected from the borehole is the highly altered and mineralized bedrock underlying Feature 58OO that was encountered at a depth of approximately 70 ft bgs in the borehole. Bedrock material will erode and weather over time and is the source for the overlying alluvial material at the site. To determine whether the altered, iron-stained bedrock is a potential metals source, a sample of the bedrock material collected at Feature 58OO was submitted to GEL and analyzed for Target Analyte List metals and gold. The laboratory crushed individual pieces of bedrock, thoroughly mixed the crushed material, and withdrew a representative aliquot of the crushed and blended bedrock for analysis. The arsenic, beryllium, and zinc concentrations in the bedrock sample were higher than those in any of the overlying alluvial material samples, and continued the trend of increasing arsenic, beryllium, and zinc concentrations with depth at this site.

Additional samples of the bedrock were also examined for evidence of hydrothermal mineralization. Figure 11 is a photograph of a sample of the altered bedrock with a small (approximately 2 millimeter) euhedral barite (barium sulfate) crystal in a cavity (circled area on the photograph). Figure 12 is a photomicrograph of that barite crystal. Microcrystals of botryoidal fluorite (calcium fluoride), as well as additional barite crystals were also found in this bedrock material. Crystals such as barite and fluorite are typically formed from hydrothermal fluids that migrate along and through open fractures and cavities in rock that encounter sufficient open space for euhedral crystals to form. Crystals such as these are considered evidence that the elevated metals concentrations found in both the bedrock and the overlying alluvial material at Feature 58OO are the result of hydrothermal activity in the area, and are present due to natural, rather than anthropogenic processes.

Therefore, the elevated metals concentrations detected in samples from this borehole are natural in origin and not the result of testing activities conducted at the site.

SWMU 58, Feature 58TT – Fire Brick Area No. 2

Only one constituent nonradiological constituent was measured at a concentration greater than the background screening value, and no organic compounds were detected in the samples collected from Feature 58TT.

The maximum concentration value for lead is 78.8 mg/kg. The maximum concentration value for lead at this site is less than the residential screening level of 400 mg/kg; therefore, lead was eliminated from further consideration in the human health risk assessment.

Calculation of risk for the nonradiological COCs show that for the industrial land-use scenario the HI=0.01, which is lower than the NMED standard HI of 1. There are no quantified estimated cancer risks. Thus, excess cancer risk is below the acceptable NMED risk level for an industrial land-use scenario.

The incremental TEDE for a residential land-use scenario from the radiological components is 6.8 mrem/yr, which is significantly lower than the numerical guideline of 75 mrem/yr.

Calculation of risk related to nonradiological COCs show that for the residential land-use scenario the HI=0.12, which is below the NMED standard HI of 1 (Table 7). There are no quantified estimated cancer risks. Thus, excess cancer risk is below the acceptable risk level for the residential land-use scenario. The risk calculations indicate insignificant risk to human health for the residential land-use scenario.

For the radiological COCs, two constituents (uranium-235 and uranium-238) had activities greater than the background screening levels. For the radiological COCs, the incremental TEDE is 2.6 mrem/yr, which is significantly lower than the EPA numerical guideline of 15 mrem/yr.

Based upon the Feature 58TT field investigation data, the human health risk is acceptable for the residential land-use scenario.

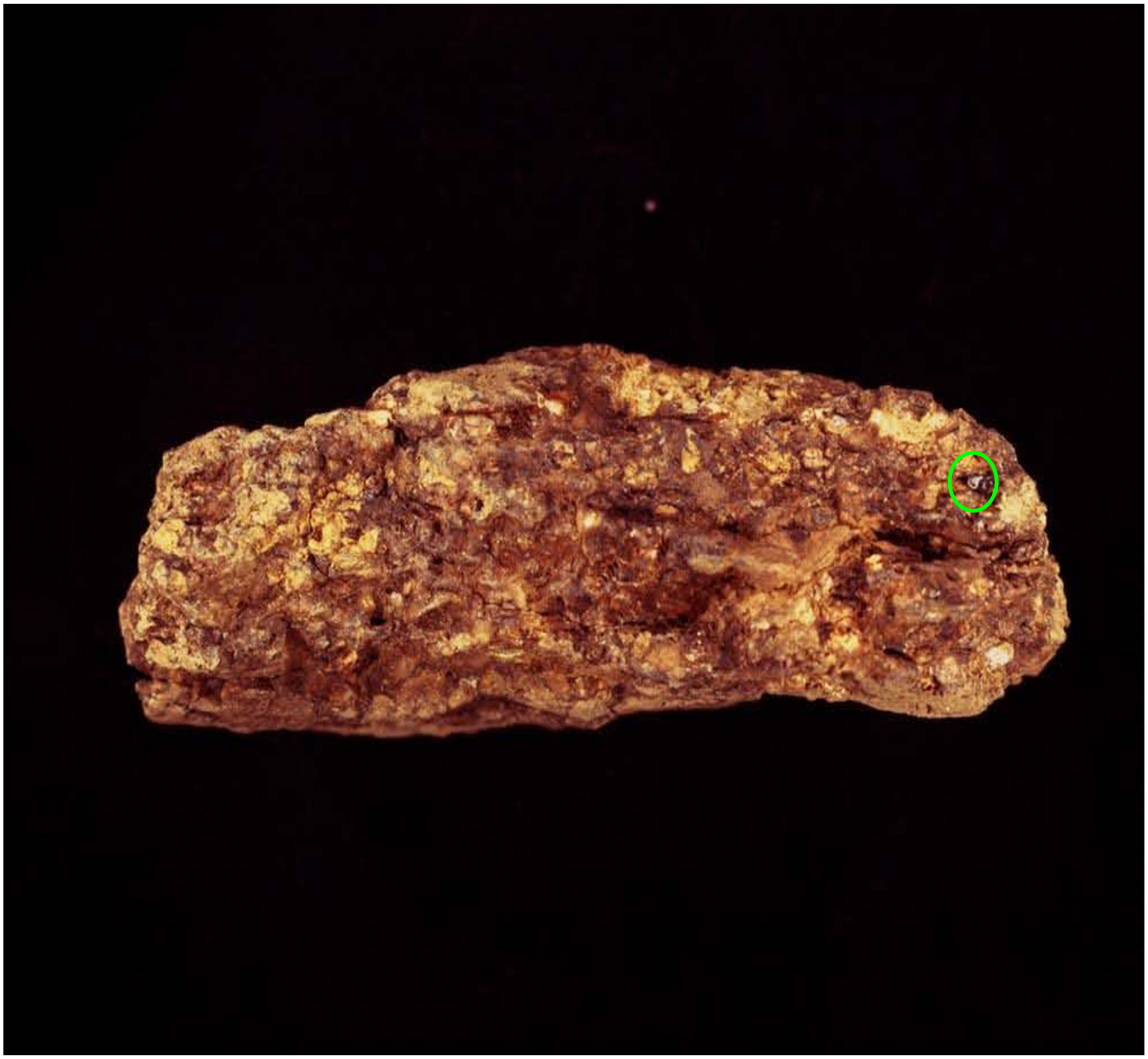

Figure 11. Side view of a 7.5-centimeter-wide fragment of iron oxide-impregnated and stained granitic bedrock from 71 feet bgs in Borehole 58OO-GR. A small (2 millimeter) barite crystal in a cavity in the upper right side of the fragment is circled and is also shown in Figure 12.

Figure 12. Photomicrograph of the 2-millimeter euhedral barite crystal in a cavity, contained in the circled area of the rock fragment shown in Figure 11.

Table 6
Risk Assessment Values for SWMU 58, Feature 58TT, Fire Brick Area No. 2, Nonradiological COCs

COC	Maximum Concentration (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Uranium	29.1	0.01	--	0.12	--
Total		0.01	--	0.12	--

[a]EPA 1989.
COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
mg/kg = Milligram(s) per kilogram.
SWMU = Solid Waste Management Unit.
-- = Information not quantified.

In conclusion, based upon the SWMU 8 and 58 field investigation data, the overall human health and ecological risk in soils are acceptable for a residential land-use scenario with the exception of the human health risk for Features 58FF and 58B and 8Y, which only meet acceptable risk under an industrial land-use scenario. Therefore, Features 58FF and 58B/8Y will be added to the permit as SWMUs 58FF and SWMU 58B/8Y and placed on Table K.2 as Corrective Action Complete with Controls.

Basis for Determination

SWMUs 8 and 58 has been characterized or remediated in accordance with current applicable state and/or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use (residential) with the exception of Features 58FF and 58B/8Y, which meet an acceptable level of risk under the industrial land use scenario.

2. SWMU 68, Old Burn Site

Site Location

SWMU 68, known as the Old Burn Site (Figure 11), encompasses approximately 6.5 acres on federally owned land controlled by the USAF. The site is located on the north side of Isleta Road, across from the 20-ft shock tube facility, approximately 1 mile east of the intersection of Lovelace and Isleta Roads.

Although not within the geographical boundary of SWMU 68, an area northwest of SWMU 68, designated as the 68A Mound, was administratively combined with SWMU 68 in 1996 because the debris was associated with activities conducted at SWMU 68. Immediately south of the 68A Mound is a small, east-west trending arroyo.

Operational History

From 1965 to 1978, pool fire tests were conducted at SWMU 68 to study the effects of fire on weapons components and to determine the potential for release of radioactive material in case of a transportation (air, truck or rail) accident. The type of pool fire tests conducted was related to the development of shipping containers, space nuclear power reactors (the Space Nuclear Auxiliary Program [SNAP] reactor) and survivability of nuclear weapons.

The testing procedure included preparing the instrumentation for the fire, placing the test unit on stands within the burn pan (Figure 12), filling the burn pan with water and floating a defined amount of fuel on top of the water to provide the desired burn time. Magnesium scrap was ignited in some of the burn tests involving SNAP reactors. The types of materials in the instrumentation included steel, fiberglass, asbestos and magnesium oxide. When tests were performed, all equipment was brought to the site in a trailer and a diesel generator was used for power. Water for the tests was brought by tanker truck and a USAF fuel truck delivered fuel.

Burn tests commonly lasted 30 minutes. The normal rate of burn was 0.25 inches of fuel per minute. Based upon the size of the burn pan, approximately 1,500 gallons of fuel would be used for a 30-minute test. All the fuel was normally consumed during the test. An interviewee involved in the testing indicated that jet petroleum-4 (JP-4) fuel was used primarily for the burn tests because of its availability from the USAF.

After a pool fire test was performed, the remaining water was released through the valve at the southwest corner of the burn pan and discharged into the drainage ditch, which drained to the overflow basin southwest of the burn pan. The test unit would then be recovered and returned to the project group for a post-test examination. In some tests, depending upon what materials were used in the test unit, the unit was taken directly to either the Chemical Waste Landfill or the Mixed Waste Landfill in TA-III for disposal.

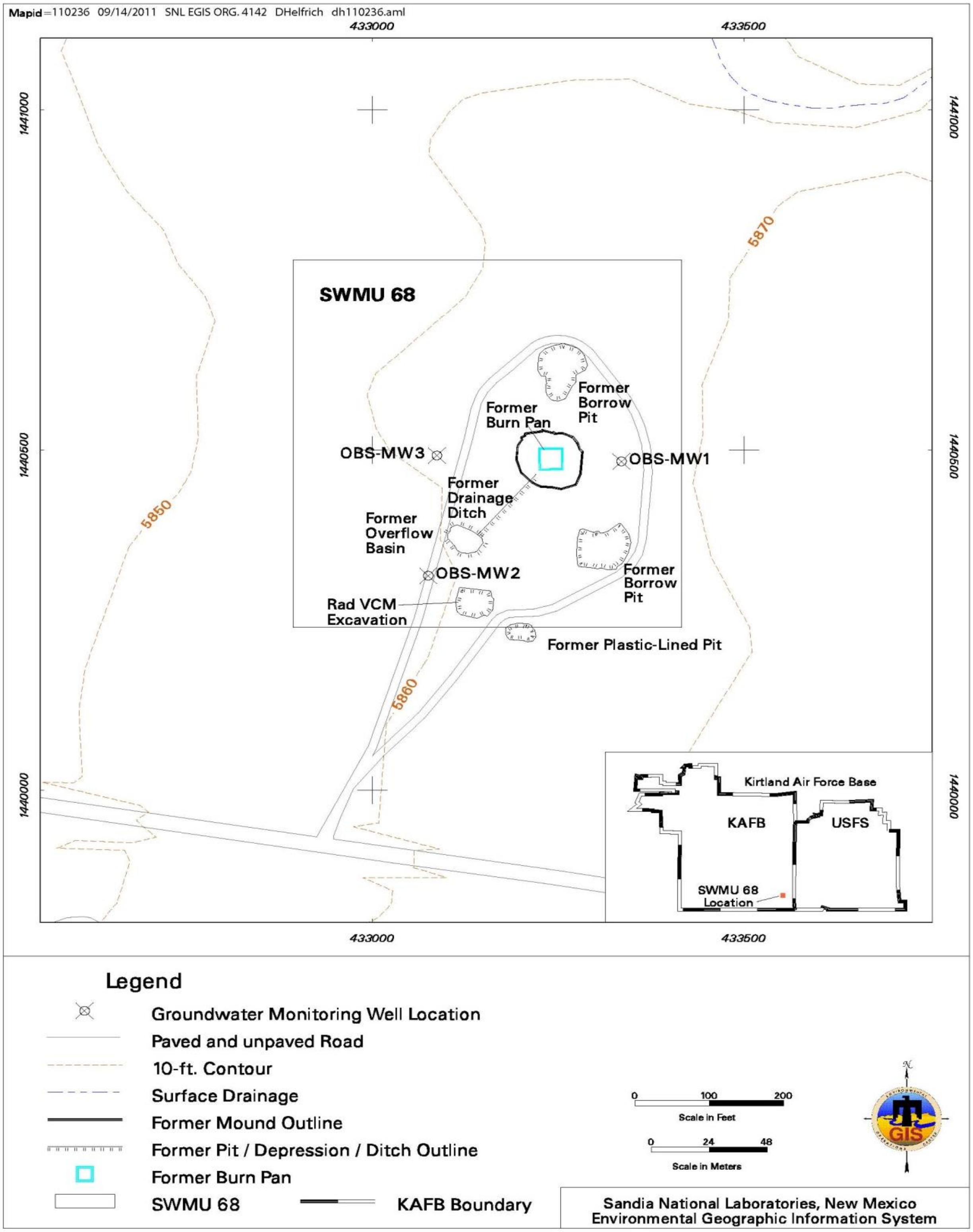

Figure 13. Map of SWMU 68 and Monitoring Wells OBS-MW1, OBS-MW2, and OBS-MW3

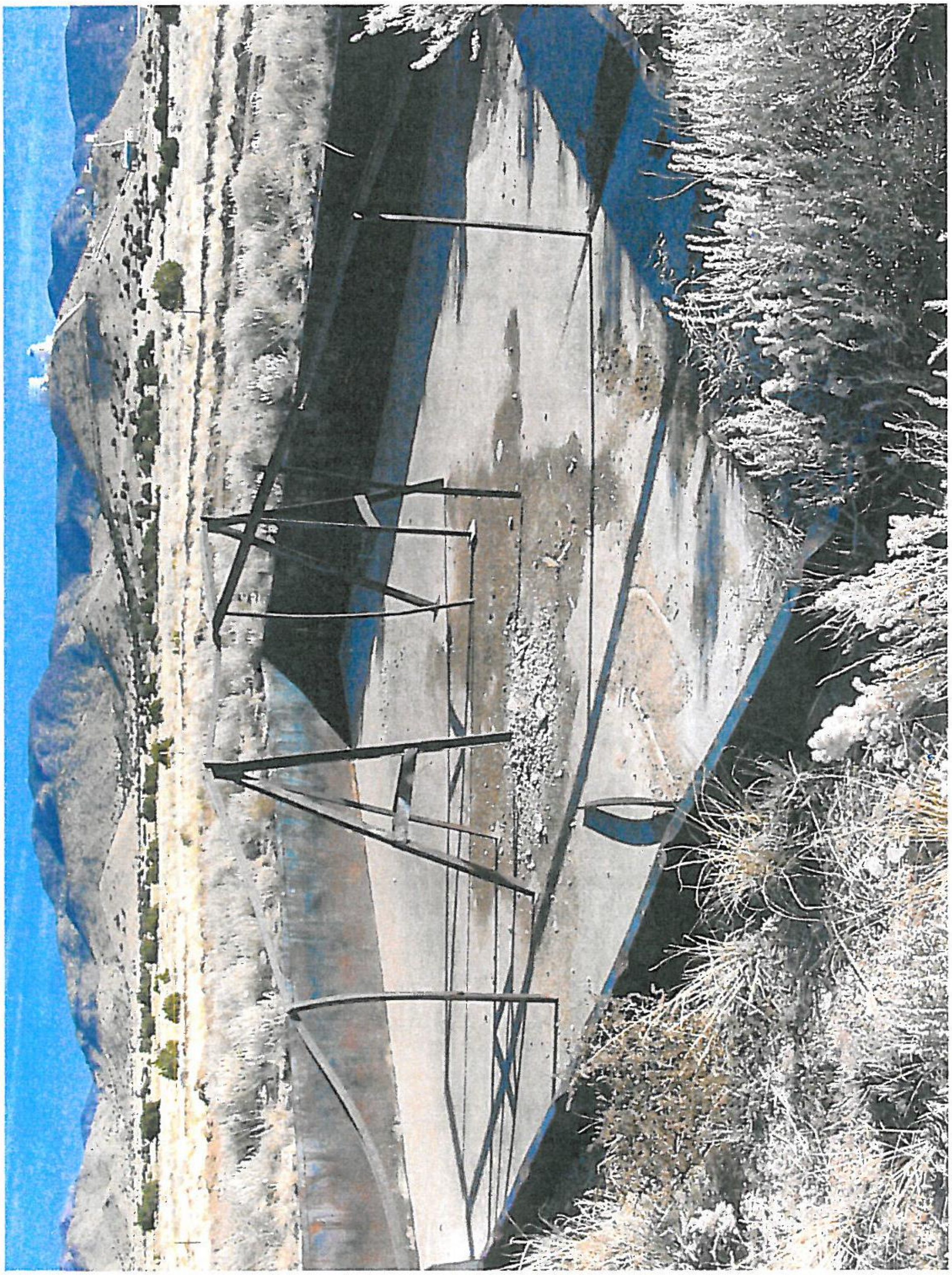

Figure 14. SWMU 68 Burn Pan

Burn tests with magnesium scrap and the SNAP reactors were conducted in the plastic-lined pit. The residual polyethylene was normally cleaned up and disposed of after the tests were completed. However, prior to investigation and remedial activities, remains of burned plastic and wooden frames were visible in the pit.

The materials for each test depended upon the item being tested. Shipping containers were tested without any weapons materials present. The containers used at the time were two basic types: one composite was made of redwood overlain by steel, and one was a lead-lined steel vessel.

Beryllium and small amounts of depleted uranium were present in some of the weapons components tested. Lead was not present in weapon components. Some of the alloys used contained thorium. A magnesium-thorium alloy was used for structural simulations.

Depth to Groundwater

The depth to groundwater in the area ranges from approximately 135 to 240 feet bgs.

Evaluation of Relevant Information

Between 1991 to 1994, several nonintrusive investigations were conducted including a UXO/HE visual survey, a Phase I surface radiological survey, personnel interviews and a review of historical aerial photographs.

RCRA Facility Investigation (RFI) investigative sampling took place in August, September and December 1996 and from October to November 1998. Soil samples were collected and analyzed for metals, VOCs, SVOCs and radionuclides.

A surface radiological voluntary corrective measure (VCM) was conducted from January to March 1995 and January to March 1996 (Figure 13). VCM activities were initially based upon the findings of the Phase I radiological survey. Of the sources identified during the Phase I survey, 240 point sources and eight small area sources were removed during the initial cleanup activities conducted from January to March 1995.

From January to March 1996, resurveying (scanning) was performed on 6-ft centers (100-percent coverage) and all point and area sources identified during this resurvey were removed during cleanup activities. Cleanup activities included radiation scanning to verify anomaly location, removal of fragment and / or soil until readings were at levels less than 1.3 times site-specific background levels and post-cleanup (verification) soil sampling for gamma spectroscopy analysis. After the removal of soil contaminated with radionuclides, seven post-cleanup (verification) samples were collected. Samples were collected in the immediate vicinity of point sources and at a frequency of one in every ten locations from area sources exhibiting the highest residual gamma radiation readings.

The cleanup activities conducted from January to March 1995 and from January to March 1996 produced 15 drums of soil, two drums of metal fragments and 3 drums of PPE. All waste streams were characterized as low-level radioactive waste and transported off site for disposal at an approved facility. Radiological VCM activities were continued from May to June 1998 to complete remediation of area source anomalies. During the remediation of area sources, buried debris and other materials were identified. An area approximately 30 ft by 36 ft by 4 ft was excavated resulting in the removal of 144 drums, 100 cubic yards (cy) of soil, and ten cy of contaminated scrap metal pieces, concrete, wire and other debris. The drums were disposed of offsite as low-level radioactive waste.

Figure 15. Radiological Screening of Soil during Excavation of the SWMU 68 Burn Pan

At the conclusion of the radiological VCM, geophysical surveys were conducted around the burn pan and surrounding area to evaluate for possible locations of additional buried waste. The 68A Mound was also surveyed. No anomalies were identified.

RFI sampling (Figure 14) took place in August, September and December 1996 and from October to November 1998. Samples were analyzed for metals, VOCs, SVOCs and radionuclides. Arsenic, barium, beryllium, chromium, lead, nickel, thallium and vanadium were detected above background values. Some of the lead concentrations in the overflow basin exceeded the EPA industrial concentration for lead of 800 mg/kg. Six VOCs and five SVOCs also were detected. Some samples contained cesium-137, thorium-232, uranium-235 and uranium-238 at activity levels above background activities.

In 2004, a VCM was conducted to remove the soil from the overflow basin where elevated lead concentrations were observed. The burn pan and the surrounding earthen berm and ancillary structures and debris remaining on the site were also removed. Approximately 425 cy of lead-contaminated soil from the overflow basin was excavated and transported off-site for disposal as hazardous waste. A concrete pad (12.5 by 11.5 ft by one foot) at the base of the basin was removed and disposed as construction debris. The final excavation of the overflow basin measured approximately 61 ft by 44 ft by 3.5 ft in depth. Fifteen confirmatory soil samples were collected from the excavation floor and sidewalls. The samples were analyzed for lead and SVOCs. None of the samples contained lead concentrations greater than the industrial screening for lead of 800 mg/kg. No SVOCs were detected the samples. The soil from the earthen berm was spread over the ground surface to a thickness of less than six inches and then surveyed for radiological anomalies. Approximately 1/8 cy of low-level, radiologically-contaminated soil was identified and removed. The burn pan was then disassembled and the concrete pad beneath the burn pan was removed. Six confirmatory soil samples were collected and tested for gamma spectroscopy analysis. No radionuclides were detected above background values. The 2004 VCM also consisted of housekeeping measures to remove any man-made objects from the site. All scrap wood, concrete chunks, plastic, fencing, cardboard, and burn test debris were collected and sent off site as solid waste. As a final measure, the disturbed areas were graded and reseeded.

Groundwater Monitoring

In April 2010, the NMED required the installation of three groundwater monitoring wells, and eight quarters of groundwater monitoring at SWMU 68. Monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3 (Figure 11) were installed in November 2011 and were sampled on a quarterly basis from October 2011 to July 2013. In October 2014, the thirteenth and final quarterly groundwater samples were collected and analyzed from SWMU 68. The groundwater samples were analyzed for VOCs, SVOCs, HE compounds, total kjeldahl nitrogen, major anions, major cations, alkalinity, TAL metals plus uranium, perchlorate, total cyanide, hexavalent chromium, gross alpha/beta activity, radionuclides by gamma spectroscopy, and isotopic uranium.

No contaminant concentrations were detected in samples obtained from monitoring wells OBS-MW1, OBS-MW2, and OBS-MW3 exceeded the MCLs or New Mexico Water Quality Control Commission (WQCC) numeric cleanup standards during the period of groundwater monitoring.

Risk Assessment

A human health risk screening assessment was performed to evaluate potential for adverse health effects for the industrial and residential land-use scenarios. For the industrial land-use scenario, the total HI and the estimated excess cancer risk were acceptable (Table 8). The site did not meet the NMED total HI and excess cancer cumulative risk targets for the residential land-use scenario based on the maximum detected concentrations.(Table 8). However, based on the UCL of the mean concentration for arsenic, the main contributor to excess cancer risk and hazard, the total HI and estimated excess cancer risk were acceptable.

For the radiological COCs (cesium-137, thorium-232, uranuim-235 and uranium-238) a total effective dose equivalent (TEDE) was calculated that results in a TEDE of 3.2 millirem (mrem)/year (yr). The estimated excess cancer risk of 4.3E-5 is not acceptable for residential land use. Most of the dose is due to short-lived radionuclides that will decay to acceptable levels in a relatively short time period. In August 2003, the DOE approved unrestricted radiological release for sites using 25 mrem/yr as the threshold guidance. However, the estimated excess cancer risk is not acceptable for a residential land-use scenario.

Ecological risks associated with SWMU 68 were estimated through a risk assessment that incorporated site-specific information when available. Initial predictions of potential risk to plants and deer mice from exposure to several metals were based upon maximum measured soil concentrations, highly conservative plant toxicity benchmarks and assumptions of high bioavailability. Calculation of UCLs of the mean soil concentrations resulted in acceptable levels of ecological risk.

In conclusion, the chemical human health and ecological risks are acceptable under a residential land-use scenario; however, the presence of radionuclide activities that exceed the acceptable annual dose equivalent for residential exposure limit the future land use to industrial use only.

Basis for Determination

SWMU 68 has been characterized or remediated in accordance with current applicable state and/or federal regulations, and the available data indicate that residual contaminants at the site pose an acceptable level of risk under an industrial land use scenario . Therefore, the site qualifies for corrective action complete with controls status.

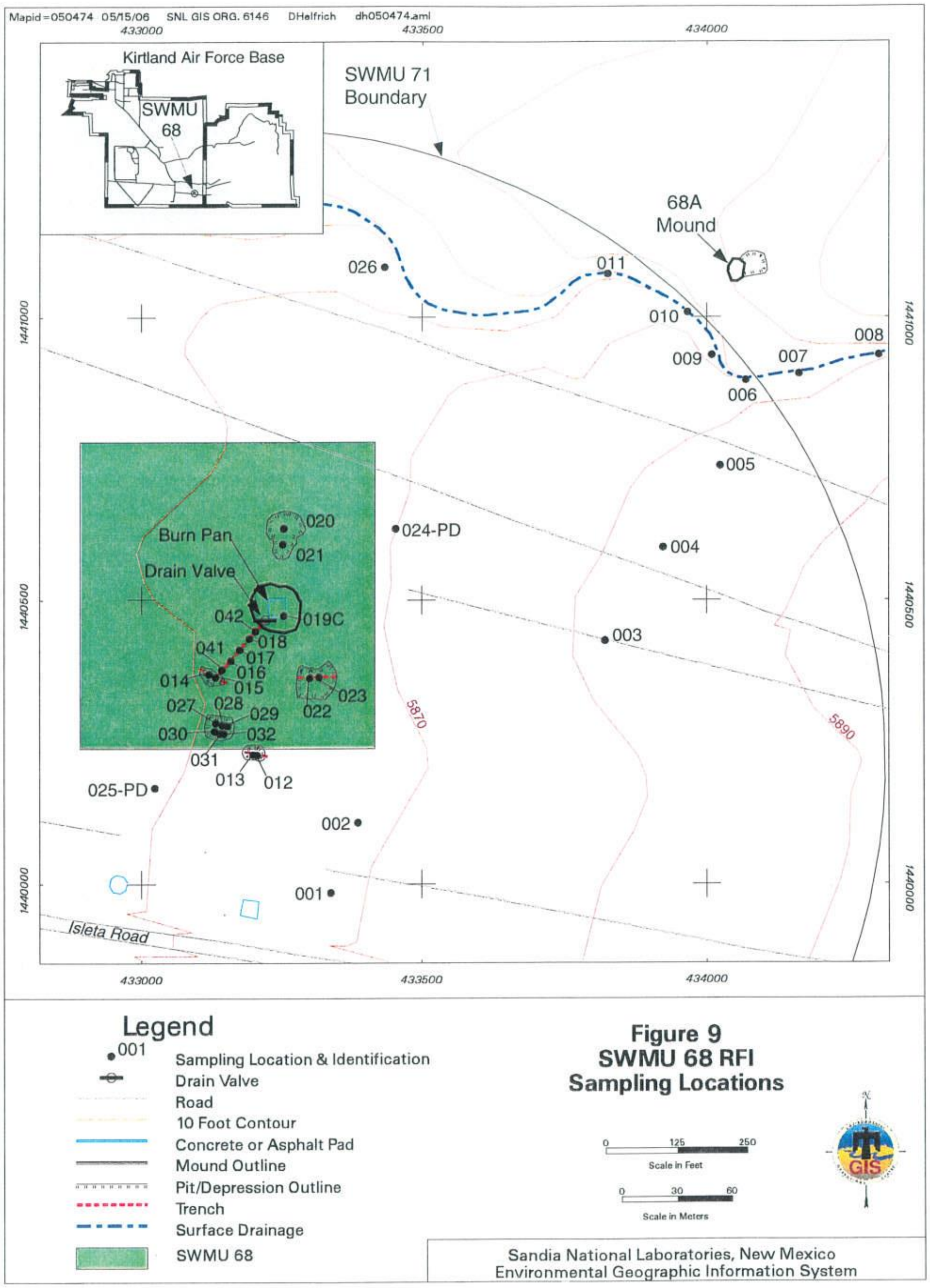

Figure 16. RFI Sampling Locations at SWMU 68, Old Burn Site

Table 7
Risk Assessment Values for SWMU 68 Nonradiological COCs

COC	Maximum Concentration /**UCL Concentration** (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Arsenic	13.4/**5.04**	0.05/**Below Background**[b]	8E-6/**Below Background**[b]	0.62/**Below Background**[b]	3E-5/ **Below Background**[b]
Barium	429	0.01		0.08	
Beryllium	1.3	0.00	6E-10	0.01	1E-9
Chromium, total	17.6	0.00		0.00	
Cobalt	6.6	0.00	3E-9	0.00	7E-9
Nickel	15.2	0.00		0.01	
Thallium	1.8	0.03		0.36	
Vanadium	24.7	0.00		0.05	
Organic					
Acetone	0.11 J	0.00		0.00	
Benzene	0.055	0.00	4E-8	0.00	9E-8
Benzoic acid	1.12	0.00		0.00	
Bromomethane	0.0036 J	0.00		0.00	
2-Butanone	0.012 J	0.00		0.00	
Chloromethane	0.005 J	0.00	2E-9	0.00	4E-9
Diethylphthalate	0.93	0.00		0.00	
Di-n-butyl phthalate	0.067 J	0.00		0.00	
2,4-Dinitrotoluene	5.1	0.00		0.04	
bis(2-Ethylhexyl) phthalate	0.1495[c]	0.00	8E-10	0.00	3E-9
Methylene chloride	0.0304	0.00	2E-7	0.00	4E-7
Total		0.10/**0.05**	9E-6/**2E-7**	1.18/**0.56**	4E-5/**5E-7**

Note: UCLs are calculated only for risk drivers. UCL concentrations and associated risk are in **bold**.

[a] EPA 1989.

[b] UCL concentration was below background screening level. Therefore, risk was not calculated.

[c] Nondetected concentration (concentration listed is one-half of the maximum detection limit, used for a conservative risk assessment).

COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
J = Concentration was qualified as an estimated value.
mg/kg = Milligram(s) per kilogram.
SWMU= Solid Waste Management Unit.

3. SWMU 149, Building 9930 Septic System

Site Location

SWMU 149, the Building 9930 Septic System, is located in the Coyote Test Field on federally owned land controlled by KAFB and permitted to the DOE. The abandoned septic system consisted of a 750-gallon septic tank connected to a single seepage pit (Figure 15).

Operational History

Building 9930 was constructed in 1961. It is assumed that the septic system was constructed at the same time. By 1993, the septic system discharges were routed to the City of Albuqueque (COA) sanitary sewer system. The old septic system line was disconnected and capped and the system was abandoned in place concurrent with this change. Waste in the septic tank was removed. The empty and decontaminated septic tank was inspected by the Department in November 1995, and a closure form was signed. The septic tank and seepage pit were backfilled with clean, native soil in early 1996. The identified COCs included VOCs, SVOCs, HE compounds, RCRA metals, hexavalent chromium, cyanide and radionuclides.

Depth to Groundwater

The depth to groundwater beneath the site is approximately 345 ft bgs.

Evaluation of Relevant Information

Six investigations were conducted at SWMU 149 between 1992 and 2002. In June 1992, April 1994 and November 1994 waste characterization samples were collected from the septic tank location. A geophysical survey was performed in May 1994 to locate areas of high moisture content. In June and July 1994, a passive soil-vapor survey was conducted to identify potential releases of VOCs and SVOCs. In January 1995, soil samples were collected near the septic tank and adjacent to the seepage pit, and in October 2002 one soil sample was collected near the seepage pit. In August 2001, groundwater monitor well CTF-MW3 was installed and eight quarters of groundwater samples were collected and analyzed. Additional groundwater sampling was performed from 2011 to 2014. The details of these investigations are discussed below.

Septic Tank Sampling

Aqueous and sludge samples were collected from the septic tank in June 1992. The sludge sample was analyzed for heavy metal and radionuclide constituents. The liquid sample was analyzed for VOCs, SVOCs, polychlorinated biphenyls (PCBs), pesticides, total cyanide, phenolics, nitrate/nitrite, oil and grease, total metals and radionuclides. Phenol was detected in the aqueous sample at a level of 0.12 mg/L and total phenolic compounds were detected at a level of 0.18 mg/L; chromium was detected

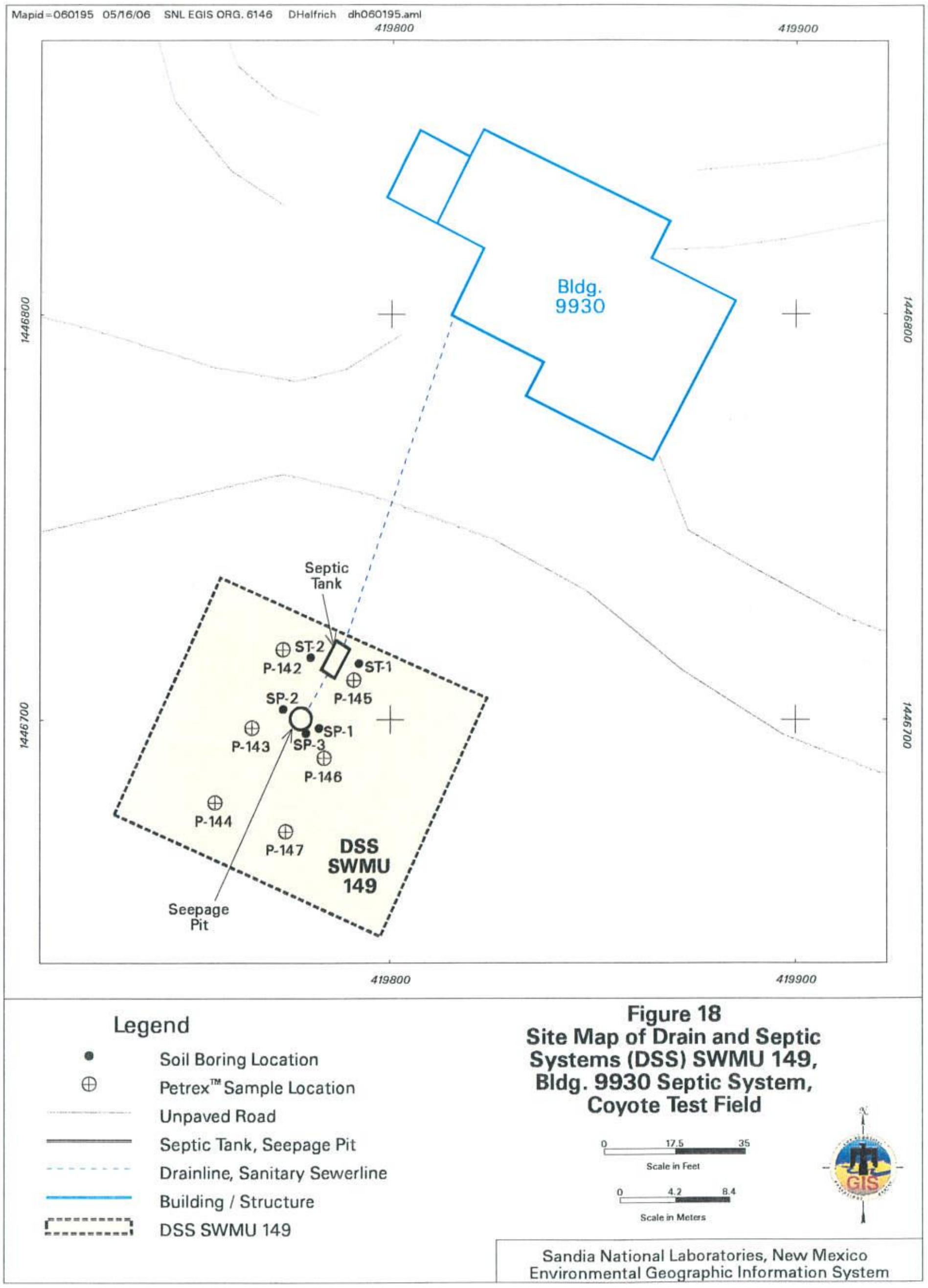

Figure 17. Map of SWMU 149, Bldg. 9930 Drain and Septic Systems, Coyote Test Field Soil Sampling Locations

in the aqueous sample at a level of 0.14 mg/L; and, silver was detected in the aqueous sample at a level of 0.16 mg/L. There were no significant findings regarding the radiological data.

A second round of septic tank sludge samples were collected for waste characterization purposes in April 1994 and were analyzed for VOCs, explosives, cyanide, total phenols and toxicity characteristic leaching procedure (TCLP) metals. Concentrations of four VOC compounds (acetone, 1,1-dichloroethane, methylene chloride and toluene), cyanide and total phenols were identified in the sludge. Explosive compounds were not detected. One RCRA metal (barium) was detected in the sludge sample.

A third round of waste characterization sludge and liquid samples was collected in November 1994. The sludge and liquid samples were analyzed for isotopic uranium, tritium, and gamma spectroscopy radionuclides. The isotopic uranium, tritium, and gamma spectroscopy results did not include any significant readings. The sludge was also analyzed for SVOCs. One SVOC (4-methylphenol) was identified in the sludge sample.

Geophysical Survey

A geophysical survey using a ground conductivity meter was performed in May 1994 to determine if there were any areas of higher moisture surrounding the seepage pit. The area around the seepage pit at SWMU 149 was highly disturbed, with much metal scrap visible at the surface. Although an attempt was made to remove the visible metal, interference due to the presence of metal prevented a definitive interpretation regarding areas of higher moisture content.

Passive Soil-Gas Survey

A passive soil-gas survey conducted in June and July 1994 used PETREX™ sampling tubes to identify any releases of VOCs and SVOCs from the seepage pit that may have occurred. Six tube samplers were placed in a grid pattern that covered the seepage pit and septic tank areas. Aliphatic and/or BTEX compounds at potentially significant concentrations were identified in soil gas at three of the six sampling locations. There were no detectable levels of tetrachloroethylene (PCE) or trichloroethylene (TCE) at any of the sample locations.

Soil Sampling

In October 1994, subsurface soil samples were collected from boreholes drilled at five locations adjacent to the effluent release points and areas (septic tank and seepage pit) to assess whether releases of effluent from the septic system resulted in unacceptable levels of subsurface contamination.

The soil samples were collected at sampling depths starting at seven feet bgs adjacent to the septic tank and eight feet bgs adjacent to the seepage pit. An attempt was made to collect both shallow and deep samples using Geoprobe™ direct push sampling equipment near the seepage pit. After several attempts, it proved impossible to obtain any samples below 12 to 12.5 ft bgs. Thus, there only shallow soil sample data are available. The intent was to have the shallow sampling intervals start at the depths at which effluent discharged from the septic tank and seepage pit would have entered the subsurface environment. However, because of the shallow refusal depth, the sampling interval for the seepage pit samples began at eight ft bgs rather than ten ft bgs (ten ft bgs was projected to be the depth of the bottom of the septic tank). The soil samples were analyzed for VOCs, SVOCs, RCRA metals, hexavalent chromium, cyanide, tritium and radionuclides by gamma spectroscopy. They were also screened for HE compounds.

Two VOCs (acetone and methylene chloride) were detected in the soil samples. These compounds were detected in the associated trip blank samples. No SVOCs, cyanide, hexavalent chromium or HE compounds were detected in any of the soil samples. No RCRA metals were detected above NMED-approved background concentrations. One radionuclide (tritium) was detected at 0.0255 (picocuries per gram (pCi/g), slightly above the background activity of 0.021 pCi/g. Except for tritium, no activities above background levels were detected in any of the soil samples analyzed. However, although not detected, the MDA for the one uranium-235 analysis exceeded the respective background activity.

In October 2002, one additional soil sample was collected and analyzed for HE compounds. The original intent was to collect the sample from a borehole drilled through the center of, and beneath, the seepage pit. However, underground utilities had been installed across the abandoned seepage pit, and the borehole had to be shifted approximately three feet south of th center of the pit. The sample was collected eight 8 feet bgs and tested for HE. HE compounds were not detected in the soil sample.

Groundwater Monitoring - July 2002 to June 2004

Groundwater monitor well CTF-MW3 was installed with an air-rotary casing hammer drilling rig in August 2001 (Figure 16). The borehole for the well was drilled to 430 feet bgs and backfilled to 365 feet bgs. The screened interval is from 340 to 360 feet bgs, with a sump from 360 to 365 feet bgs. Depth to groundwater was 302.2 feet bgs in January 2005. The well was sampled on a quarterly basis from July 2002 to June 2004 to acquire eight quarters of groundwater data. The eight quarters of groundwater samples were analyzed for VOCs, HE compounds, RCRA metals and cyanide. Additional samples were also collected and analyzed for NPN, and anions and cations. These additional samples were collected to further characterize the general ion chemistry of groundwater in this well and for purge water waste characterization purposes.

Groundwater samples were collected from well CTF-MW3 during eight quarterly groundwater monitoring events. Trace concentrations of five VOCs (acetone, bromodichloromethane, dibromochloromethane, chloroform, and toluene) were inconsistently detected in the groundwater samples. Acetone was detected in one sample. Bromodichloromethane was detected in the last two samples. Dibromochloromethane was detected in three of the samples. Chloroform was detected six of the eight samples. Toluene was detected in one sample and its associated trip blank. One HE constituent (2-amino-4,6-dinitrotoluene) was detected in the first sample collected from well CTF-MW3. HE compounds were not detected in any subsequent groundwater samples collected from this well. Selenium was detected in all eight groundwater samples at concentrations slightly above background concentration. All other metals concentrations were below background concentrations or other promulgated regulatory limits. Cyanide was detected in one of the eight quarterly samples. NPN was detected at concentrations slightly above background in the first five samples collected for the well. No regulatory or background limits have been established in groundwater for the anions and cations of bromide, calcium, chloride, magnesium, potassium, sodium or sulfate. The detected concentrations of these individual anions and cations were similar for the eight quarters of sampling. Fluoride concentrations exceeded the WQCC numeric standard in all eight samples collected. The fluoride detected is most likely naturally occurring and derived from Paleozoic and Precambrian bedrock (Skelly, August 2013). None of the known activities conducted at Building 9930 would have produced wastewater containing fluoride.

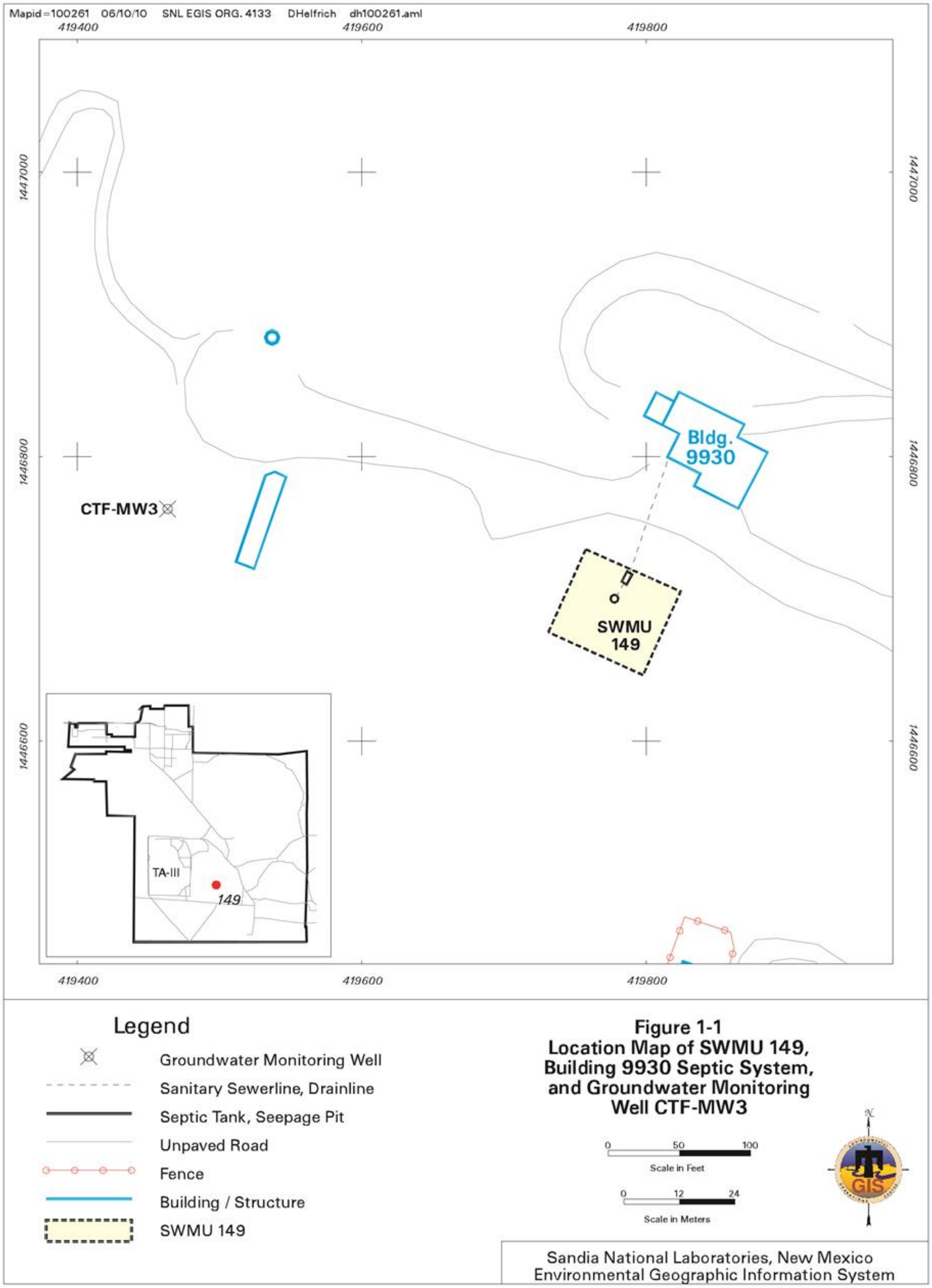

Figure 18. Map of SWMU 149, Bldg. 9930, Drain and Septic Systems and Groundwater Monitoring Well CTF-MW3, Coyote Test Field

Groundwater Monitoring - March 2011 to October 2014

In April 2010 (NMED, April 2010), the Department required further corrective action at SWMU 149 in the form of an additional eight quarters of groundwater monitoring at monitoring well CTF-MW3. The groundwater samples were analyzed for VOCs, NPN, alkalinity and anions, perchlorate, and Target Analyte List (TAL). Quarterly groundwater sampling resumed at monitoring well CTF-MW3 in March 2011.

During this second interval of groundwater monitoring at CTF-MW3 no VOCs were detected at concentrations above MCLs in any CTF-MW3 groundwater samples. NPN was detected at levels slightly above background, and all values were below the MCL of 10 mg/L. No measured values of alkalinity or anions exceeded their respective MCLs. Fluoride was reported at concentrations slightly above background. The likely source of fluoride is the Paleozoic and Precambrian bedrock (Skelly, August 2013). Perchlorate was not detected above the screening level/method detection limit of 4 µg/L. No TAL metals were detected above their respective MCLs. In October 2014 after 14 quarters, groundwater monitoring at SWMU 149 was discontinued.

Risk Assessment

A human health risk screening assessment was performed to evaluate the potential for adverse health effects for the industrial and residential land-use scenarios. For both the industrial and residential land-use scenarios, the total HI and estimated excess cancer risk are acceptable (Table 9).

For the radiological COCs (tritium and uranuim-235) a total effective dose equivalent (TEDE) was calculated that results in a TEDE of 5.3E-2 millirem (mrem)/year (yr). The estimated excess cancer risk is 5.1E-7 and is less than the acceptable risk for radionuclide exposure.

The exposure pathway analysis established that no complete ecological pathway exists for exposure of ecological species to contaminants at SWMU 149. All COCs were detected at depths greater than eight ft bgs.

In conclusion, human health and ecological risks are acceptable under a residential land-use scenario.

Table 8
Risk Assessment Values for SWMU 149 Nonradiological COCs

COC	Maximum Concentration (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Chromium VI	0.5[b]	0.00	1E-9	0.00	2E-9
Cyanide	0.5[b]	0.00		0.00	
Organic					
Acetone	0.0091 J	0.00		0.00	
Methylene Chloride	0.0022 J	0.00	1E-8	0.00	3E-8
Total		0.00	1E-8	0.00	3E-8

[a] EPA 1989.

[b] Nondetected concentration (concentration listed is one-half of the maximum detection limit, used for a conservative risk assessment).

COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
J = Estimated concentration.
mg/kg = Milligram(s) per kilogram.
SWMU = Solid Waste Management Unit.

Basis for Determination

The available data indicate that SWMU 149 does not pose an unacceptable level of risk under the residential land use scenario.

4. SWMU 154, Building 9960 Septic System, Septic Tanks, and Drainfields

Site Location

SWMU 154, Building 9960 (and 9961) Septic System, is located in the Coyote Test Field on federally owned land controlled by KAFB and permitted to DOE. SWMU 154 included two adjacent but separate systems associated with Building 9960 and a system associated with Building 9961. The Building 9960 east septic system consisted of a 900-gallon septic tank that discharged to a 5-ft-diameter, 10-ft-deep seepage pit. The west HE drain system consisted of two, 5-ft diameter, approximately 23-ft-deep seepage pits (Figure 17). The Building 9961 system consisted of a small (4-ft diameter by 7-ft deep) seepage pit located approximately 43 ft northwest of the building (Figure 18). There is a hand washing sink in the northeast corner of a small 16-ft long by 7-ft wide addition on the north side of Building 9961 that also drained to the seepage pit.

Operational History

Building 9960 was constructed in 1965, and it is assumed that the septic and HE drain systems were constructed at that time. It was constructed for machining and preparing explosive assemblies for tests at various locations in Coyote Test Field. By 1993, the septic system discharges were routed to the COA sanitary sewer system. The old septic system line was disconnected and capped, and the system was abandoned in place concurrent with this change. Waste in the septic tank was removed. The empty and decontaminated septic tank was inspected by the NMED in January 1996, and a closure form was signed. The septic tank and associated seepage pit were then backfilled with clean, native soil in early 1996. The HE drain system seepage pits were backfilled with clean, native soil in accordance with 20.7.3.410 NMAC in August 2005.

Building 9961, a small earth-covered bunker-type building, was constructed either in 1965 or soon after, and is located approximately 100 feet southwest of Building 9960. Facility personnel report that the building was originally used as a 1000-pound capacity HE storage bunker, and in the mid-1970s it was modified for use as an explosives powder pressing and component assembly building, and it continues to be used as such. Explosive powders composed of RDX (hexahydro-1,3,5-trinitro-1,3,5 triazine), PETN (pentaerythritol tetranitrate), HMX (octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine), Composition C-4 and other HE compounds are periodically pelletized, or pressed or hand-tamped into various configurations in this building. During these operations, personnel wear protective gloves and other PPE, and contaminated wipes are disposed as part of the explosives waste stream generated at this facility. The building sink has been used for personal hygiene (washing) after removal of the PPE. The drain line from the sink to the seepage pit was disconnected and re-routed to a branch of an extension of the COA sanitary sewer system that was constructed in the TA-III and CTF areas in the early 1990s. The seepage pit was backfilled with clean soil in August 2005.

The COCs include RCRA metals, hexavalent chromium, cyanide, HE compounds, VOCs, SVOCs and radionuclides.

Depth to Groundwater

The depth to groundwater in the area is approximately 120 feet bgs.

Evaluation of Relevant Information

Six assessment investigations have been conducted at this site. In June 1992 and May 1994, waste characterization samples were collected from the septic tank. Several geophysical surveys were performed in March 1994 to locate areas of high moisture content. In May and June 1994, a passive soil-vapor survey was conducted to identify potential releases of VOCs and SVOCs. In October 1994, October 1995, June and July 1996, March 1997, and January 1998, soil sampling was conducted near the Building 9960 septic tank and seepage pits. In August 2005, soil sampling was conducted through the center of the seepage pit associated with Building 9961. In August 2001, groundwater monitoring well CTF-MW2 was installed.

Septic Tank Sampling

Samples were collected from the Building 9960 septic tank for waste characterization purposes on two occasions. Liquid and sludge samples were first collected from the septic tank in June 1992. The liquid (supernate) samples were analyzed for VOCs, SVOCs, PCBs, explosive compounds, pesticides, total metals, selected radionuclides and several other miscellaneous analytes. Trace levels of one VOC (TCE) and two SVOCs (bis [2-ethylhexyl] phthalate and phenol) were identified. Explosives compounds, pesticides, PCBs, nitrates/nitrites and cyanide were not detected in the samples. Low levels of barium, chromium, copper, lead, manganese, mercury and zinc metals, phenolic compounds, formaldehyde, fluoride, oil and grease and radium-226 and radium-228 also were detected. The sludge samples (composed of 93.3 percent water) were analyzed for total metals, gross alpha and beta activity, tritium and selected radionuclide constituents. Barium, cadmium, copper, lead, manganese and zinc, gross alpha and beta activity, tritium, and a few radionuclides were detected in the material.

A second round of liquid and sludge septage samples were collected from the septic tank in May 1994. The liquid (supernate) samples were analyzed for isotopic uranium, tritium and for additional radionuclides by gamma spectroscopy. Trace activity levels of isotopic uranium and tritium were detected, but additional radionuclides were not detected by gamma spectroscopy. The sludge samples were analyzed for VOCs, SVOCs, phenolic and explosives compounds, total RCRA metals, isotopic uranium and for additional radionuclides using gamma spectroscopy. Trace levels of one VOC (methylene chloride), six SVOCs, phenolic compounds, isotopic uranium and several other radionuclides were identified. Explosives compounds were not detected.

Geophysical Survey

Several geophysical surveys using Geonics™ Model EM-31 and EM-38 ground conductivity meters were performed in the Building 9960 septic system and HE pit areas in March 1994. The purpose of the geophysical surveys was to attempt to locate any relatively wet areas around the seepage pit septic system or HE pits. The EM-31 instrument was used for deeper surveys (up to 18 ft bgs), and the EM-38 was employed for more shallow work (within 5 ft of the surface). Information generated by these surveys did not identify any areas of moist soil in the subsurface and was not useful in guiding the soil sampling effort.

Passive Soil-Gas Survey

A passive soil-gas survey was conducted in the Building 9960 septic system and HE pits in May and June 1994. PETREX™ sampling tubes were used to help identify any releases of VOCs and SVOCs that occurred via the septic systems. Six PETREX™ tube samplers were placed in a grid pattern that covered the area around and west of the septic system seepage pit. Six other PETREX™ samplers were placed in a grid pattern around the north and south HE pits. All the PETREX™ samplers placed at this site were analyzed for two individual constituents (PCE and TCE) and two groups of other organic compounds (BTEX and aliphatic compounds).

Significant levels of PCE and TCE were not detected in soil gas at any of the 12 PETREX™ sampling locations. BTEX compounds were identified in soil gas at concentrations at three out of the six sampling locations around the septic system, but at none of the six locations around the HE pits. Concentrations of aliphatic compounds in soil gas were identified at two of the six septic system locations, and at one of the six PETREX™ locations around the HE pits. VOCs were detected at trace levels in some of the soil samples collected during the investigation.

Soil Sampling

Soil sampling was conducted at the site on six different occasions to evaluate for releases of contaminants from the septic systems. Five of the investigations were conducted on the systems attached to Building 9960, and the sixth investigation was conducted at the seepage pit attached to Building 9961.

The first round of soil samples was collected in October 1994 from borings on either side of the east system septic tank and seepage pit, and from borings on either side of each of the two HE pits. Septic tank soil samples were collected from one depth interval in each of the two boreholes starting at the outside bottom of the tank, which was measured to be 9.5 feet bgs. Soil samples were also collected from two intervals in each of the two-east system seepage pit boreholes. The top of the shallow intervals started at the bottom of the unit, which was estimated to be 10 feet bgs based on a SNL facility engineering drawing and field measurements to the top of the gravel inside the unit. The lower (deep) intervals started at 20 feet bgs. A similar procedure was intended to be used to characterize soil around each of the two-west system HE pits; the original intent was to collect samples from two vertical intervals in each borehole. One sample interval was to start at the base of each HE pit, which was estimated to be approximately 23 feet bgs based on an SNL Facilities Engineering drawing, and a second sample interval was to be ten feet lower. However, subsurface refusal due to shallow bedrock was encountered at 25 to 26 feet bgs around these two units. Thus, soil from only one interval starting at the base of the HE pits and ending immediately above the subsurface bedrock was collected in each of the four HE pit boreholes.

The first-round septic system and HE pit soil samples were analyzed for VOCs, SVOCs, RCRA metals and hexavalent chromium. Also, to determine if radionuclides were released to the environment, two composite samples from both the septic system seepage pit boreholes and a single composite sample from the four HE pit boreholes were analyzed for isotopic uranium. Composite samples from both the shallow and deep septic system seepage pit sampling intervals were also analyzed for additional radionuclides using gamma spectroscopy.

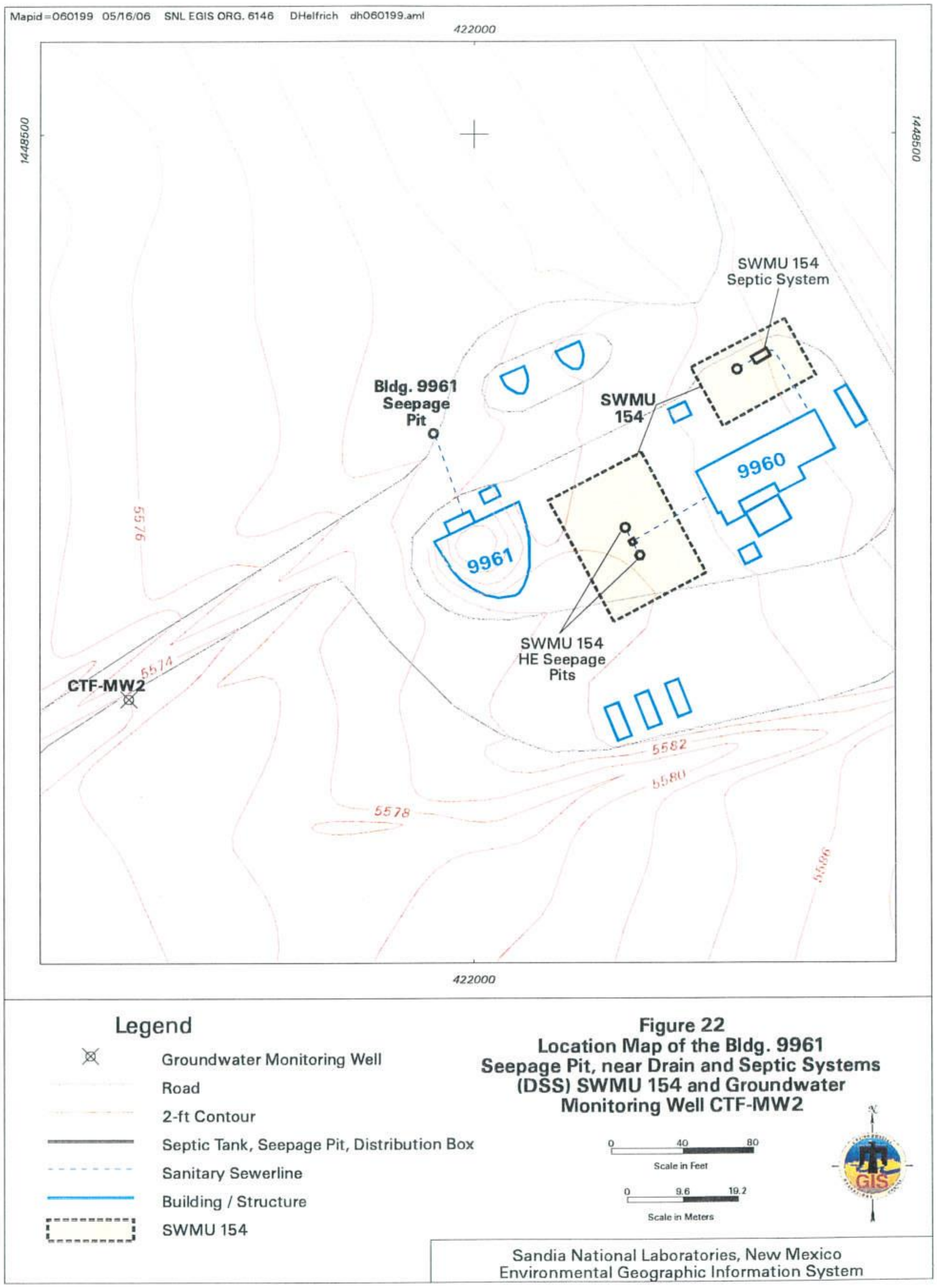

Figure 19. Map of SWMU 154, Bldg. 9960, Drain and Septic Systems, and Groundwater Monitor Well CTF-MW2, Coyote Test Field

Low to trace concentrations of three VOC compounds, acetone, methylene chloride and toluene were detected in the first-round soil samples. Below-reporting-limit estimated concentrations of one SVOC (2,4-dinitrotoluene) were detected in two of the samples from the HE pit boreholes, but no SVOCs were identified in samples collected from around the east system septic tank and seepage pit. Elevated barium concentrations of 1,460 and 1,230 mg/kg were detected in the north HE pit borehole SP2-2 and the south HE pit borehole SP1-1, respectively. A barium concentration of 241 mg/kg was detected in a sample collected from septic tank soil boring ST-1, which is above the NMED-approved background concentration of 214 mg/kg. A concentration of 15.2 mg/kg of chromium was detected in the deep soil sample collected from the east system seepage pit borehole SP3-1, which is above the NMED-approved background concentration of 12.8 mg/kg.

The second subsurface soil investigation was conducted in October 1995. The original plan was to collect samples from the four previous borehole locations next to the HE pits and from six new step-out borings to determine the extent of the elevated barium concentrations and to analyze for explosives compounds. However, sample collection and volume limitations due to drilling difficulties and associated equipment problems precluded completing the second-round sampling task as planned. One composite sample consisting of equal fractions of soil from north HE pit boring location SP2-2 and south HE pit SP1-1 was collected instead of the intended soil samples. The soil was retrieved from depths of 23 to 25 ft in each of the two borings. Analysis for explosives compounds detected 1,430 mg/kg of 2,4,6-trinitrotoluene in the material.

The third soil sampling event was completed in June and July 1996. Samples were collected from two previous boring locations around the north HE pit (SP2-1 and SP2-2) and from three new step-out locations around this unit (SP2-3, SP2-4 and SP2-5). Samples were also collected from two previous boring locations around the south HE pit (SP1-1 and SP1-2) and from three new step-out locations around the unit (SP1-3, SP1-4 and SP1-5). The samples from the four previous boring locations next to the HE pits were analyzed only for explosives compounds, which had not been performed previously. Samples from the six step-out borings were analyzed for explosives compounds and RCRA metals. Samples from six of the ten third-round sampling locations were also analyzed for nitrate plus nitrite. Soil was collected from 23 to 27 ft bgs in north HE pit borings, and 21.5 to 26.5 ft bgs in south HE pit borings. Sample collection depths varied in each borehole because of a slightly undulating bedrock surface and variations in the amount of soil recovered from each boring, which in turn dictated the length of each sampling interval. Explosives compounds were detected in all four of the third-round samples collected next to the HE pits. Explosives compounds were also detected in two of the six step-out locations (SP1-3 and SP2-3) located on the west side of the units. The contaminant concentrations detected at the step out locations were generally lower than those detected in samples obtained from immediately adjacent to the HE pits. Samples from the other four step-out borings SP1-4, SP1-5, SP2-4 and SP2-5 and on the south, east and north sides of the HE pits did not contain detectable levels of HE compounds. Nitrate plus nitrite were not identified in the six samples that were analyzed for these compounds. The RCRA metals analytical results of samples from the six step-out borings indicated that only silver was elevated relative to the NMED-approved background concentration.

A fourth round of soil sampling was completed in March 1997. Samples were collected from two more step-out boring locations west and northwest of the north HE pit (SP2-6 and SP2-7, (Figure 18) and from two additional step-out locations (SP1-6 and SP1-7) west and southwest of the south HE pit. Sampling depths ranged from 24.3 to 26 ft bgs in these boreholes. As before, the sample collection rationale was to retrieve soil from immediately above the bedrock surface since this material was considered to have the highest probability of containing explosives residue. The samples were analyzed for RCRA metals and explosive compounds. Explosives constituents were not detected in any of these boreholes, and with the exception of a lead concentration of 30 mg/kg in one borehole (SP2-6), elevated metals concentrations were not identified in any of the samples.

Sampling also was conducted in January 1998, as part of a five-site sampling comparison study required by the NMED. Additional samples were collected from boreholes drilled through the center of, and beneath, the two HE seepage pits (locations SP1-8 and SP2-8 in Figure 18). Samples were collected starting at a depth of 24 feet bgs in borehole SP1-8 and starting at a depth of 23 feet bgs in borehole SP2-8. The samples were analyzed for VOCs, SVOCs, metals and HE compounds. The results were submitted to the NMED, and were evaluated and summarized in an internal NMED report

Soil sampling associated with building 9961 was completed in August 2005. Soil samples were collected from a borehole drilled through the center of, and beneath, the Building 9961 seepage pit. A hllow-stem auger drilling rig was used to sample the borehole at two depth intervals. The shallow sample interval started at 7 feet bgs, the estimated base of the gravel aggregate in the bottom of the seepage pit, and the lower (deep) interval started at 12 feet bgs. The soil samples were analyzed for VOCs, SVOCs, HE compounds, RCRA metals, hexavalent chromium, cyanide and radionuclides. No VOCs, SVOCs, HE compounds, cyanide or hexavalent chromium were detected. All metals concentrations in the two samples were below their respective background values, except for selenium in the 12-ft deep sample. Although not detected, the selenium method detection limit (MDL) of 2.46 mg/kg was higher than the selenium background concentration of <1 mg/kg. For radionuclides, no activities above background levels were detected in the two samples. However, although not detected, the MDA for the two uranium-238 analyses exceeded the background activity because the standard gamma spectroscopy count time for soil samples (6,000 seconds) was not adequate to achieve a lower and more appropriate MDA. Regardless, the MDA was sufficiently low that the NMED accepted the sampling results. No gross alpha or beta activity was detected above background levels in either of the samples.

Groundwater Monitoring - July 2002 to June 2004

The groundwater monitoring well, CTF-MW2 (Figure 17), was installed in August 2001. The monitoring well location is shown in Figure 11. Although the borehole for the well was drilled to 190 feet bgs, the borehole caved in up to 135 feet bgs when the drill string was removed. The well was subsequently installed with the screened interval from 110 to 130 feet bgs and a sump from 130 to 135 feet bgs. The groundwater level rose significantly in the borehole after the well was installed and depth to groundwater was measured at 44 feet bgs on January 7, 2005.

Find cooThe monitoring well was sampled on a quarterly basis from July 2002 to June 2004 to acquire eight quarters of groundwater data. One VOC (acetone) was detected only in the first groundwater sample collected in July 2002 as well as in the August 2003 trip blank and equipment blank samples associated with this well. Bromoform was detected only in the December 2003 equipment blank sample and dibromochloromethane was detected in the

February and April 2003 equipment blank samples. Methylene chloride and toluene were detected only in trip blank samples. One HE compound (1,3,5-trinitrobenzene) was detected in the February 2003 groundwater sample. No other HE compounds were detected in the groundwater samples associated with this monitoring well. A trace of tetryl (methyl-2,4,6-trinitrophenylnitramine) and 4-amino-2,6-dinitrotoluene were detected in separate equipment blank samples associated with sampling of this well. One RCRA metal (arsenic) concentration exceeded background and regulatory limits. However, these concentrations were determined to be naturally occurring due to geologic conditions in the vicinity of the site. Arsenic occurs naturally in highly mineralized groundwater of deep origin that mixes with shallower groundwater along Rio Grande valley rift-bounding faults. The high arsenic concentrations at rift bounding faults are also accompanied by elevated concentrations of chloride and sodium which are also observed in the groundwater at SWMU 154. All other metals concentrations were below NMED-approved background or other cleanup levels. NPN was not detected at concentrations above any promulgated regulatory limit. No regulatory or background limits have been established for anions and cations that include bromide, calcium, chloride, magnesium, potassium, sodium or sulfate in groundwater. Except for chloride and bromide in the August 2003 sample, the concentrations measured for these individual anions and cations were similar and generally consistent for the eight quarters of sampling. Fluoride concentrations slightly exceeded the maximum allowable concentration in all eight primary and two duplicate samples collected, but were in all cases less than the MCL of 4.0 mg/L. The fluoride detected in monitoring well CTF-MW2 is likely naturally occurring. None of the known activities conducted at Building 9960 would have produced a discharge of fluoride to the environment.

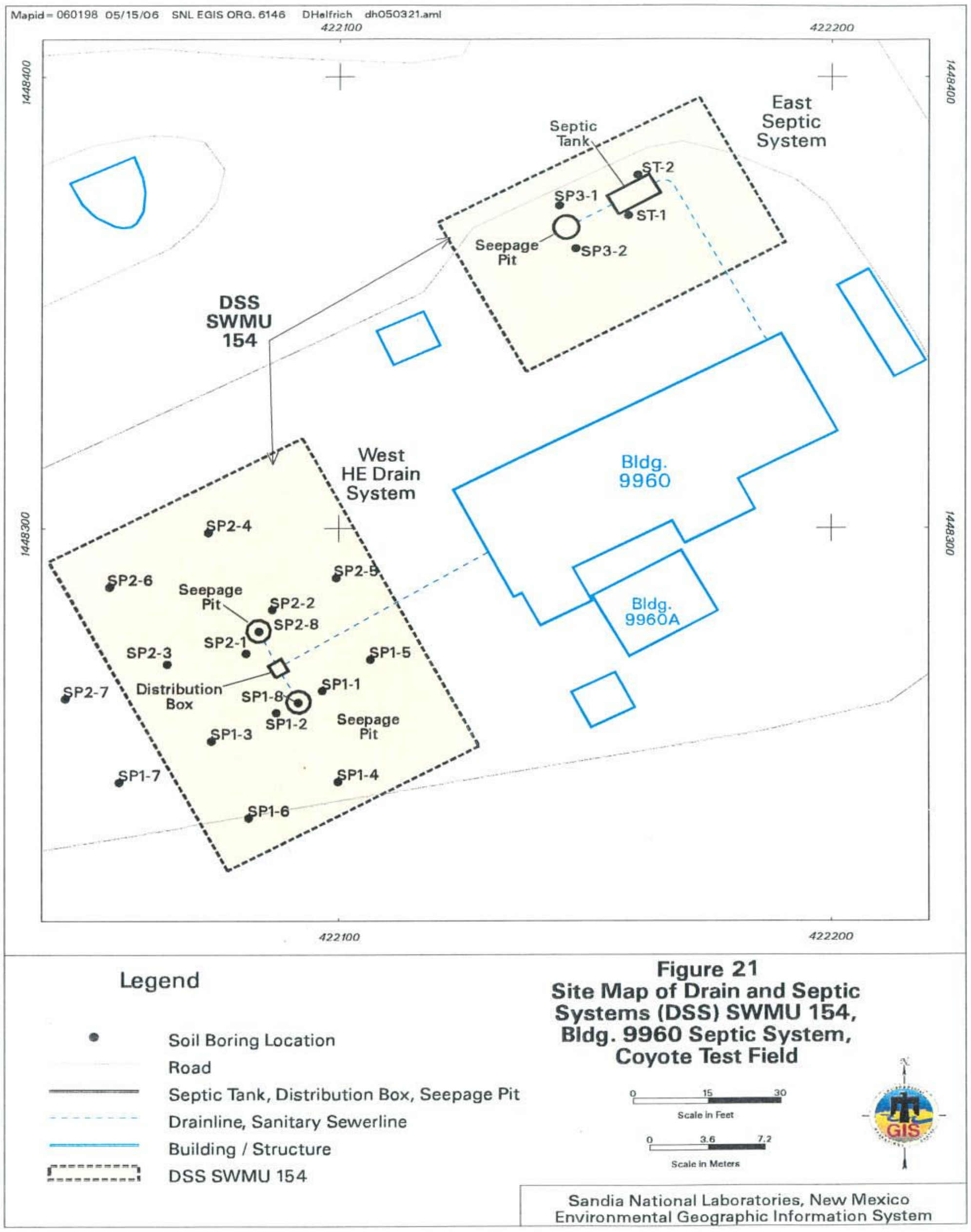

Figure 20. Map of SWMU 154, Bldg. 9960, Drain and Septic Systems, Coyote Test Field, Soil Boring Locations

Groundwater Monitoring - March 2011 to October 2014

In April 2010, the NMED (April 2010) required an additional eight quarters of groundwater monitoring at monitoring well CTF-MW2. The groundwater samples were analyzed for VOCs, NPN, HE compounds, alkalinity and anions, perchlorate, Target Analyte List (TAL) metals, gross alpha, gross beta, and isotopic uranium. Quarterly groundwater sampling resumed at monitoring well CTF-MW2 in March 2011.

During this second interval of groundwater monitoring at CTF-MW2, no VOCs were detected at concentrations above established MDLs in any CTF MW2 groundwater samples. HE compounds were not detected above the MDL, except for RDX. RDX was detected just above the MDL during the first 14 quarters of monitoring from March 2011 to June 2014. RDX was not detected in the 15th quarter and last quarter of sampling in September 2014. The concentration of RDX ranged from 0.124 to 0.357 µg/L. The MCL for RDX has not been established, but the NMED has a screening level for tap water of 7.02 µg/L. The amount of RDX that was detected is significantly below the NMED screening in level. All NPN values were below the MDL, except for a single sample in June 2012 with a concentration of 0.278 mg/L. This is below the NPN MCL of 10 mg/L. No alkalinity and anions measured values exceeded MCLs. Fluoride was reported at concentrations slightly above background. The likely source of fluoride is the Paleozoic and Precambrian bedrock (Skelly, August 2013), and not related to Sandia site activities. None of the activities conducted at Building 9960 would have produced wastewater containing fluoride. Perchlorate was not detected above the NMED-specified screening level/MDL of 4 µg/L. No TAL metals were detected above established MCLs, except for arsenic. Total arsenic concentrations ranged from 0.0341 mg/L to 0.0651 mg/L, and dissolved arsenic concentrations ranged from 0.0261 mg/L to 0.0610 mg/L. Analysis of trace gases and helium isotope data from groundwater samples collected from CTF-MW2 show that it is a mixture of shallow and upwelling endogenic (deeply derived) groundwater (Williams et. al., August 2013). This indicates that the elevated arsenic values in groundwater samples from CTF-MW2 are naturally occurring because CTF-MW2 taps a mixture of shallow and upwelling deeply derived groundwater. All radiological results were determined to be nonradioactive. In October 2014 groundwater monitoring at SWMU 154 was discontinued (SNL/NM October 2014).

Risk Assessment

A human health risk screening assessment was performed to evaluate the potential for adverse health effects for the industrial and residential land-use scenarios. For both the industrial and residential land-use scenario, the total HIs and estimated excess cancer risks are not acceptable (Table 10).

Although both the HI and estimated excess cancer risk are not acceptable for the industrial land-use scenario, maximum concentrations were used in the risk calculation. The maximum concentration for 2,4,6-trinitrotoluene (the main contributor to the risk) was from a single composite sample collected in October 1995 collected from two borings next to the north and south HE seepage pits.

In June 1996, to confirm the high 2,4,6-trinitrotoluene concentration and to define the size of the release, additional discrete (i.e., noncomposited) samples were collected from boreholes at the same two locations used for the composited HE compound sample (SP1-1 and SP2-2 in Figure 18). In June 1996 and January 1998, additional samples were collected from boreholes drilled directly beneath, and surrounding, the two seepage pits. The additional sampling from boreholes drilled after the initial composite samples were collected demonstrated that the high HE concentrations found in the composite samples was very limited in extent and the initial detected high concentration was not replicated in follow-up samples. The maximum 2,4,6-trinitrotoluene concentration measured in the additional discrete samples was 102 mg/kg in sample SP1-1-24-26. Using the maximum concentration in discrete samples from the additional sampling for the main contributor to excess cancer risk and hazards, 2,4,6-trinitrotoluene (102 mg/kg), changed the calculated total human health HI and estimated excess cancer risk to 0.40 and 7E-6, respectively for the industrial land use scenario. The additional discrete sampling maximum concentrations used in the risk calculations provided additional data from the original sample locations and as discrete samples better represent site conditions at the boring locations. Using these data, both the total human health HI and estimated excess cancer risk are acceptable for an industrial land use scenario, but not for a residential land-use scenario.

For the radiological COCs (uranuim-235 and uranium-238) a total effective dose equivalent (TEDE) was calculated that results in a TEDE of 1.5E-1 millirem (mrem)/year (yr). The estimated excess cancer risk is 1.3E-6.

The exposure pathway analysis established that no complete ecological exposure pathway exists for exposure of ecological species to contaminants at SWMU. All COCs are located at depths greater than 5 feet bgs.

In conclusion, human health and ecological risks are acceptable under an industrial land-use scenario.

Basis for Determination

The available data indicate that contaminants pose an acceptable level of risk under an industrial land use scenario. Based on the available information, SWMU 154 qualifies for corrective action complete with controls status.

Table 9
Risk Assessment Values for SWMU 154 Nonradiological COCs

COC	Maximum Concentration/**Discrete Maximum Concentration** (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Arsenic	7.25	0.03	5E-6	0.33	2E-5
Barium	1,740	0.03		0.33	
Chromium	15.2	0.00		0.00	
Chromium VI	0.1[b]	0.00	2E-10	0.00	5E-10
Selenium	5.0[b]	0.00		0.01	
Silver	6.2	0.00		0.02	
Organic					
Acetone	0.0073 J	0.00		0.00	
2-Amino-4,6-dinitrotoluene[c]	1.9	0.00		0.02	
4-Amino-2,6-dinitrotoluene[c]	1.2	0.00		0.02	
2,4-Dinitrotoluene	0.75	0.00		0.01	
HMX	81	0.00		0.03	
Methylene Chloride	0.0038 J	0.00	2E-8	0.00	5E-8
3-Nitrotoluene	0.098	0.00		0.00	
4-Nitrotoluene	0.190	0.00		0.00	–
RDX	12.0	0.00	8E-7	0.07	3E-6
Toluene	0.0025[b]	0.00		0.00	
1,3,5-Trinitrobenzene	5.2	0.00		0.00	
2,4,6-Trinitrotoluene	1,430/**102**	4.65/**0.33**	3E-5/**2E-6**	46.81/**3.34**	9E-5/**6E-6**
Total		4.72/**0.40**	3E-5/**7E-6**	47.65/**4.15**	1E-4/**3E-5**

Note: Maximum value from discrete samples and associated risk are in **bold.**

Note: UCLs are calculated only for risk drivers. UCL concentrations and associated risk are in **bold**.

[a] EPA 1989.

[b] Nondetected concentration (concentration listed is one-half of the maximum detection limit, used for a conservative risk assessment).

[c] 2,6-Dinitrotoluene was used as a surrogate chemical.

COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine.
J = Estimated concentration.
mg/kg = Milligram(s) per kilogram.
RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine.
SWMU = Solid Waste Management Unit.

5. SWMU 502 Building 9938 Surface Discharge Site

Site Location

The Solid Waste Management Unit (SWMU) 502, Building 9938 Surface Discharge Site (Site), located at Sandia National Laboratories/New Mexico (SNL/NM) Coyote Test Field, encompasses approximately 250 square feet of federally owned land controlled by Kirtland Air Force Base and permitted to the U.S. Department of Energy (DOE). Building 9938 is located west of Lovelace Road, approximately 0.3 miles south of Coyote Springs Road, and one-mile north of the Solar Test Facility. SWMU 502 (Figure 19) consists of exposed soil in a shallow engineered depression located approximately 65 feet south of Building 9938.

Operational History

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SNL/NM personnel conducted research and development and other activities involving the synthesis of explosives. Synthesis activities have been conducted at Buildings 9938 and 9939 between July 2010 and September 2012. The activities involved mixing and synthesis of materials for testing purposes, including: ammonium nitrate, urea nitrate, Research Department Explosives, and other explosive compounds.

Depth to Groundwater

The depth to groundwater in the area is approximately 350 ft bgs.

History of Discharge Site

Wastewater that was generated from processes used in the explosive synthesis activities was discharged to the ground surface in the area south of Building 9938. Approximately 250-gallons of wastewater were discharged to the ground surface. Several small zones of discolored soil within a total area approximately 10 feet wide by 25 feet long are observed. No odors were present. (Figure 22).

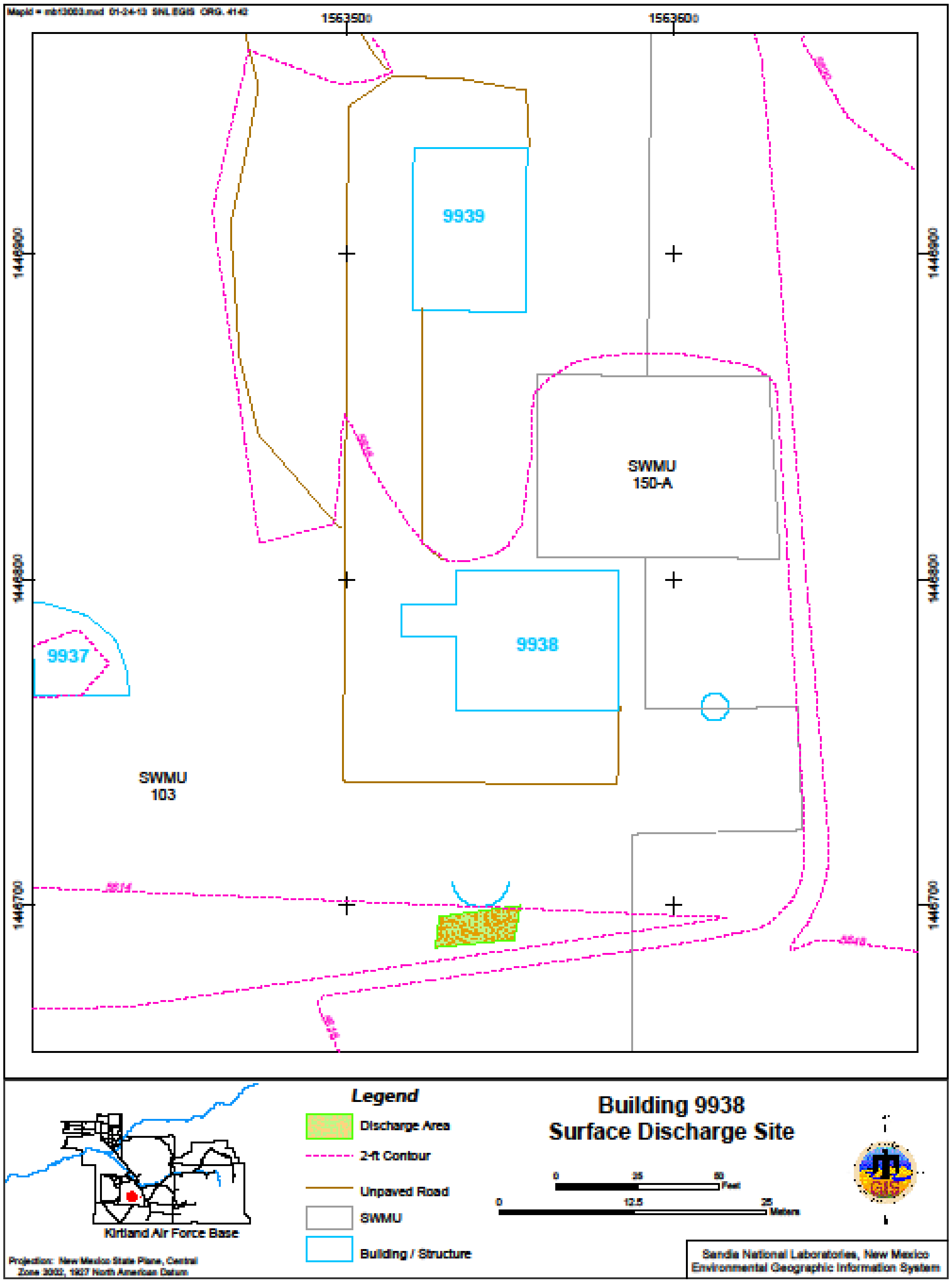

Figure 21. SWMU 502, Building 9938 Surface Discharge Site

Figure 22. SWMU 502 Discolored Soil from Discharge

The DOE and Sandia notified the Department of this newly identified or suspected SWMU by letter dated December 19, 2012. The DOE and Sandia submitted a SWMU Assessment Report to Department on February 12, 2013. In April 2013, supplemental information was submitted to the Department including a summary of analytical results for surface soil samples collected in January 2013. The submittal included a statement of intent to conduct a VCA. The DOE and Sandia submitted a VCA Plan to Department in June 2013. SNL personnel completed all field activities outlined in the VCA Plan in July 2013.

Site Investigation

The Permittees notified the NMED of this newly identified or suspected SWMU in December 2012 in accordance with the Compliance Order on Consent between the NMED, DOE, and Sandia (NMED, 2004). A January 2013 inspection revealed several small zones of discolored soil within a total area approximately 10 feet wide by 25 feet long. No odors were present and there was no evidence of other staining on surfaces surrounding the area.

In January 2013, surface soil samples were collected and analyzed for VOCs, SVOCs, perchlorate, NPN, HE compounds, and total metals. Results from the soil samples were provided to the NMED in reports dated February and April 2013. Additional soil samples were collected in July 2013 from the surface, two feet (ft) below ground surface (bgs), and five ft bgs; the samples were analyzed for HE compounds, metals, and perchlorate. A total of 44 samples were collected (Figure 23).

Wastewater Characteristics

The chemical makeup of the wastewater discharged to the surface soil is based upon information provided by personnel associated with its generation. The information indicated the wastewater consisted of a dilute solution of sodium nitrate, sodium chloride salts, and soluble sulfates. Minor amounts of grease and oil, and chemicals used during the nitrate-based processes, may have also been present. Chemicals and compounds used during the various synthesis activities are listed in Table 11.

Table 11
Chemicals and Compounds Used in Building 9938 Synthesis Activities

Hydrochloric Acid	Water	Sodium Carbonate	Ammonium Sulfate
RDX	Potassium Nitrate	Acetone	Calcium Nitrate
Isopropanol	Sodium Bicarbonate	Sulfuric Acid	Calcium Sulfate
Nitric Acid	Ammonium Nitrate	Hexamine	Pentaerythritol
Urea	Sodium Nitrate	Ethanol	Calcium Phosphate
Pentaerythritol tetranitrate	Erythritol	Propylene Glycol	Sodium Chloride
Nitrotoluenes	Trinitrotoluene	Dinitrotoluene	Cyclotrimethylene trinotrosamine

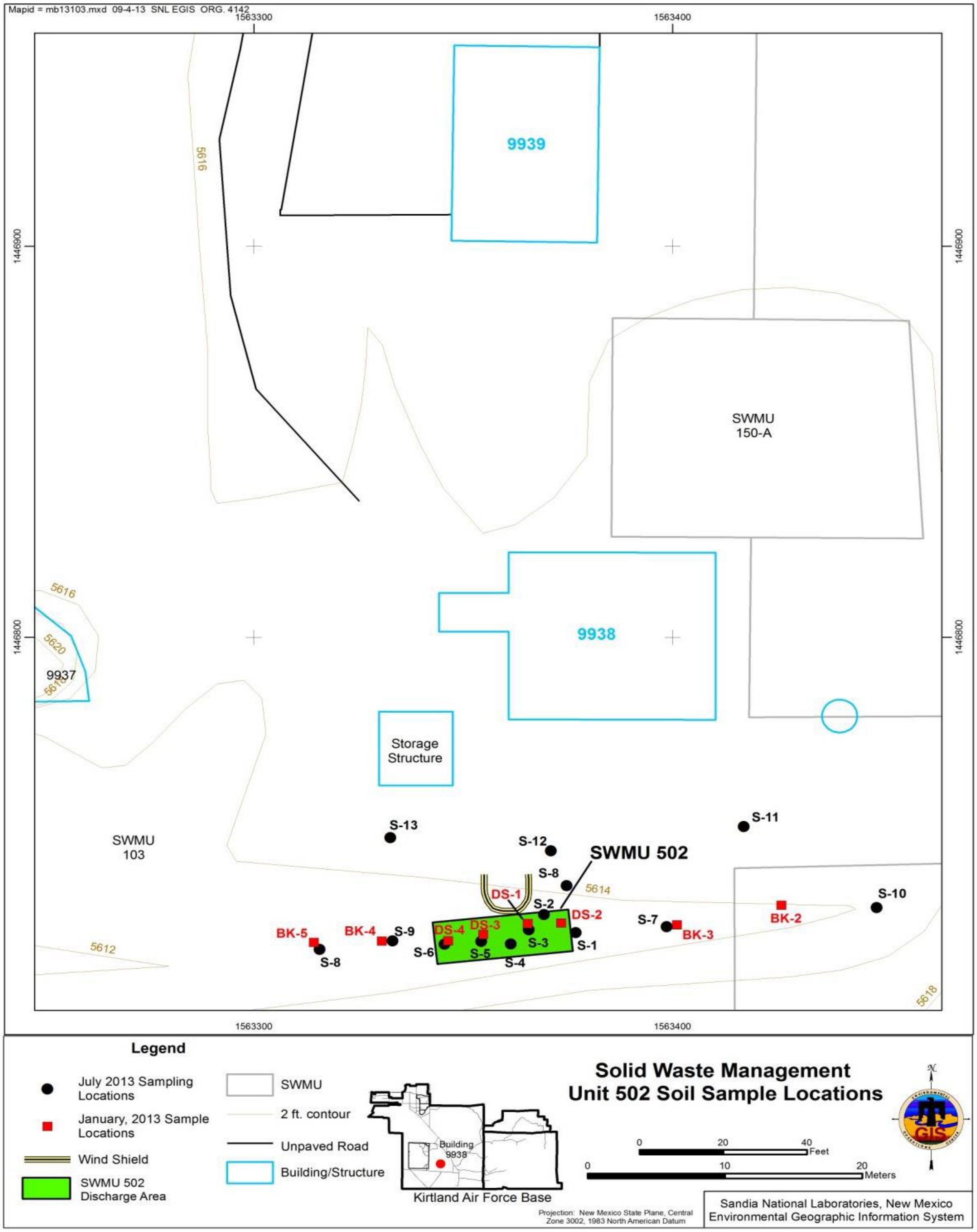

Figure 23. SWMU 502 Soil Sample Locations

Risk Assessment

For the nonradiological COCs under the residential land-use scenario, the calculated HI of 2.7 is above the numerical guidance. The excess cancer risk is 2.9E-5 (Table 12). NMED guidance states that cumulative excess lifetime cancer risk must be less than 1E-5; thus, the excess cancer risk for this site is above the acceptable risk value. The NMED standards for cummulative hazard (HI) is 1.0 and the acceptable cummuative cancer risk is 1.5E-5..

Though both the HI and estimated excess cancer risk are above the NMED guideline for the residential land-use scenario, maximum concentrations were used in the risk calculation. Average concentrations are more representative of actual site conditions. Using the upper 95% confidence limit of the mean concentrations for the main contributors to excess cancer risk and hazards, antimony (2.2 mg/kg), arsenic (5.9 mg/kg), barium (277 mg/kg), and pentaerythritol tetranitrate (PETN) (15.2 mg/kg) the total HI and estimated excess cancer risk are 0.97 and 1.8E-5, respectively. Thus, using concentrations more representative of site conditions in the risk calculations, the total HI is below NMED guidelines.

These risk calculations indicate that residual contamination does not present an unacceptable risk to human health from Nonradiological COCs based on a residential land-use scenario.

Ecological risks associated with SWMU 502 were estimated through a risk assessment that incorporated site-specific information. Initial predictions of potential risk to plants and deer mice from exposure to several COCs were based on maximum measured soil concentrations, highly conservative plant toxicity benchmarks, and assumptions of high bioavailability. Actual risk to these receptors is low based on more realistic exposure assumptions. Based upon this final analysis, the potential for ecological risks associated with SWMU 502 is expected to be low. Similar for the human health screen, all constituents greater than background were retained as constituents of potential ecological concern (COPECs). Site maximum concentrations were compared to the Tier 1 NMED ecological screening levels. Due to the small size of the SWMU 502 (approximately 0.006 acres), only the deer mouse and horned lark were receptors. The resulting HI for the deer mouse was 3.1E+01 and the HI for the horned lark was 4.3E+01. Both HIs are above the target risk level of 1.0. In lieu of conducting a full Tier 2 assessment, which includes refined calculations for ingestion pathways, area use factor (AUF) adjustments, and use of less conservative toxicity data, a quick calculation was done using the conservative Tier 1 screening levels but applying the AUF adjustment; this would result in a more conservative estimation of the HIs than a complete Tier 2 assessment. Just applying the AUFs resulted in a HI for the deer mouse of 6.3E-01 and a HI for the horned lark of 6.4E-02. Both of these HIs show acceptable levels of risk.

Basis for Determination

The available data indicate that contaminants pose an acceptable level of risk under the residential land use scenario; therefore the site qualifies for corrective action complete without controls status.

Table 11
Risk Assessment Values for SWMU 502 Nonradiological COCs

COC	Maximum Concentration (All Samples) (mg/kg)	Industrial Land-Use Scenario[a]		Residential Land-Use Scenario[a]	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
Inorganic					
Antimony	13.3	0.03	-	0.44	-
Arsenic	9.91	0.04	6.23E-06	0.46	2.55E-05
Barium	854	0.01	-	0.16	-
Cobalt	8.57	0.00	4.32E-09	0.01	9.19E-09
Copper	36.4	0.00	-	0.01	-
Nickel	14.8	0.00	-	0.01	-
Nitrate	6460	0.01	-	0.07	-
Silver	1.31	0.00	-	0.00	-
Vanadium	53.1	0.01	-	0.10	-
Zinc	124	0.00	-	0.01	-
Organics					
Acetone	0.0104	0.00	-	0.00	-
Benzo(a)anthracene	0.0209	-	9.91E-09	-	3.37E-08
Benzo(a)pyrene	0.0227	-	1.08E-07	-	3.66E-07
Benzo(b)fluoranthene	0.0394	-	1.87E-08	-	6.35E-08
Benzo(ghi)perylene	0.0119	-	5.64E-08	-	1.92E-07
Benzo(k)fluoranthene	0.0241	-	1.14E-09	-	3.88E-09
Bis 2-(Ethylhexyl)phthalate	0.177	0.00	9.23E-10	0.00	4E-09
Butanone, 2-	0.00256	0.00	-	0.00	-
Chloroform	0.00686	0.00	1.33E-08	0.00	2.85E-08
Chrysene	0.0154	-	7.3E-11	-	2.48E-10
Di-n-butyl phthalate	1.89	0.00	-	0.00	-
Dinitrophenol, 2,4-	10.9	0.01	-	0.06	-
Fluoranthene	0.0276	0.00	-	0.00	-
HMX	0.38	0.00	-	0.00	-
Indeno (1,2,3-c, d) pyrene	0.0136	-	6.45E-09	-	2.19E-08
Pentaerythritol tetranitrate (PETN)	142	0.12	3.3E-07	1.16	1.17E-06
Perchlorate	6.48	0.01	-	0.12	-
Phenanthrene	0.0108	0.00	-	0.01	-
Pyrene	0.0234	0.00	-	0.00	-
RDX	8.83	0.00	5.63E-07	0.05	2E-06
Styrene	0.000453	0.00	-	0.00	-
Total		0.24	7.34E-06	2.66/**0.47**	2.94E-05/ 3**.8E-6**

Note: UCLs are calculated only for risk drivers. UCL concentrations and associated risk are in **bold**.

[a]EPA 1989.

COC = Constituent of concern.
EPA = U.S. Environmental Protection Agency.
mg/kg = Milligram(s) per kilogram.
SWMU = Solid Waste Management Unit.
– = Information not available or not applicable.

J. References

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