SAND2008-0222P

SWMU 8: Open Dump (Coyote Canyon Blast Area), and SWMU 58: Coyote Canyon Blast Area, Foothills Test Area

This work supported by the United States Department of Energy under contract DE-AC04-94L85000.

Sandia National Laboratories

Environmental Restoration Project

Site History

- SWMUs 8 and 58 are located in the USFS Withdrawn Area on the east side of KAFB. SWMU 58 is approximately 288 acres and the boundary is defined as a 4000 ft diameter circle, selected to encompass the probable area of fragment dispersal from testing. SWMU 8, defined by selected debris areas, is approximately 30 acres in size and lies completely within the SWMU 58 radius.
- Over 100 research tests were conducted at the SWMUs from 1950 to the late 1960s. Tests at SWMU 58 included at-ground or above-ground explosive detonations, and ground penetration tests that did not involve hazardous materials. Primary materials dispersed at the site as a result of the tests included partially combusted HE, metals, and radionuclides. Debris from the SWMU 58 tests, and possibly from other sources, was disposed of at SWMU 8. Wood shipping crates, scrap metal from tests, and concrete comprised most of the solid waste at SWMU 8.

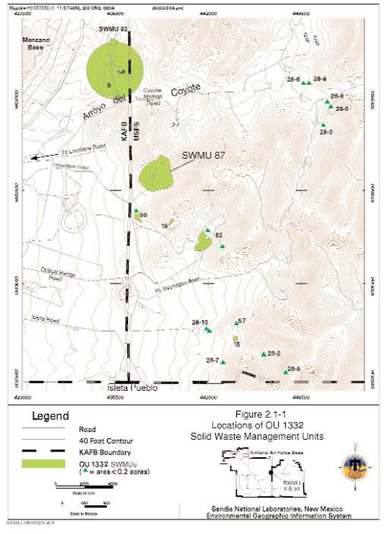
Photograph of SWMUs 8 and 58.
View to north.

Depth to Groundwater

- The depth to groundwater in the area is unknown, but is expected to be variable due to faulting in the area.

Constituents of Concern

- HE compounds
- Metals (arsenic, barium, beryllium, lead, mercury, and nickel)
- VOCs
- SVOCs
- Asbestos
- Petroleum fuels
- Radionuclides



Summary of Investigations

- SWMUs 8 and 58 were initially identified in mid-1980s, as part of the CEARP program.
- Numerous surveys were conducted throughout SWMUs 8 and 58 from 1993 through 2004 to identify areas and locations at the sites that contained radiologically-contaminated materials, high explosives, unexploded ordnance, and other miscellaneous types of wastes residing at the sites that would require subsequent removal.
- The surveys identified 60 individual locations (designated as "Features" in the April 2005 CAC report) within the SWMU 58 site boundary that contained potentially contaminated soil and debris, and that would require environmental characterization. Numerous other locations (designated as "Concrete or Housekeeping Features" in the CAC report) that contained non-regulated debris (primarily concrete, asphalt, wood, and other construction materials) were also identified as a result of the surveys.
- Multiple remediation projects, starting in the mid-1980s and continuing until 2000 have been conducted at numerous SWMUs 8 and 58 Features and locations, as shown in the table below. Approximately 1,390 cubic yards of various types of waste (shown below), 12 JATO motors, and other miscellaneous items have been removed as a result of remediation work conducted at the site.

Summary of Remediation and Cleanup (VCM) Activities Conducted at SWMUs 8 and 58

Activity Location (Feature)	Activity Date	Waste Type Removed	Waste Volume 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 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

Pre-cleanup photograph of wooden debris at Features 8Y/58B.
View to south.

Cleanup photograph of two JATO motors found at Features 8Y and 58B.

Photograph of Features 8Y/58B following site remediation/ restoration activities.
View to southeast.

Summary of Data Used for NFA Justification

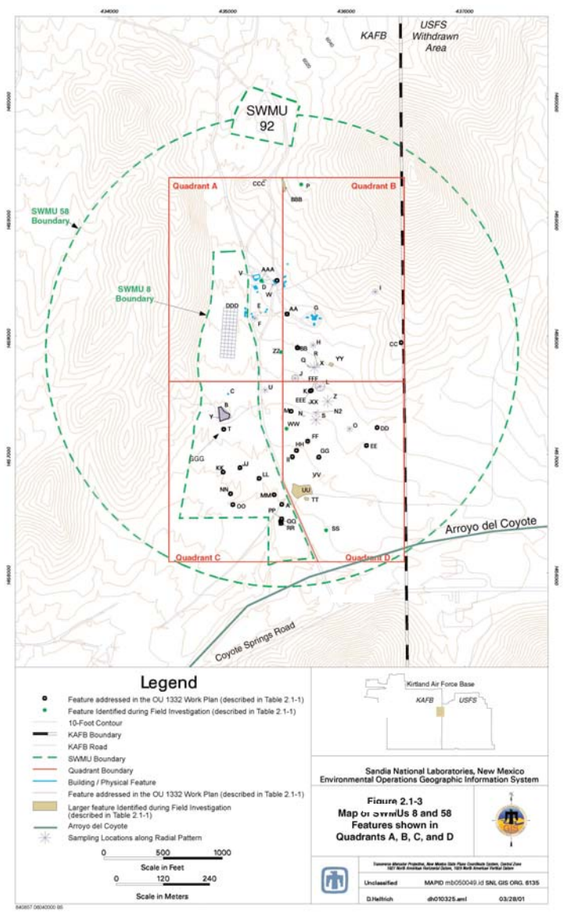
- A total of 1,395 confirmatory soil sample analyses have used as a basis for the final risk assessment for the site. These samples were collected from 1995 to 2006 to characterize existing surface or subsurface soil at numerous locations at the site, or soil that remained after remediation activities were completed at multiple individual SWMU 8 and 58 Features. Surface samples were collected with hand-held equipment, and sub-surface samples have been collected with auger rigs and larger rotary percussion drill rigs up to 100 ft bgs. The total number and types of sample analyses that were used in the final risk assessment are as follows:

  - 159 samples for VOCs
  - 93 samples for SVOCs
  - 53 samples for TPH
  - 254 samples for HE
  - 455 samples for metals
  - 337 samples for radionuclides by GS
  - 23 samples for radionuclides by AS
  - 21 samples for H3

- **The following table summarizes the sampling dates, sampling locations, and the number of the different types of confirmatory soil sample analyses that have been completed at individual SWMU 8 and 58 Features. The maximum concentrations of multiple COCs in these sample analyses were used as a basis for the final SWMU 8 and 58 risk assessment.**

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)
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)

Feature Location Maps for SWMUs 8 and 58



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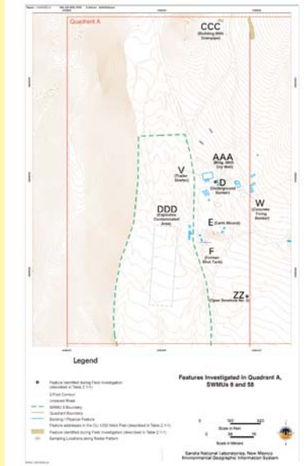
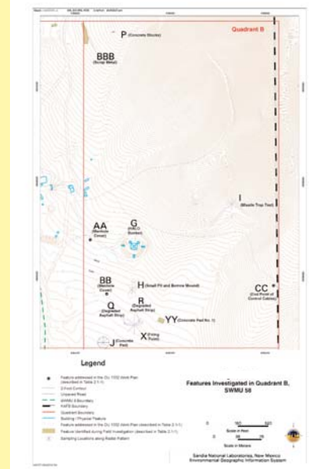
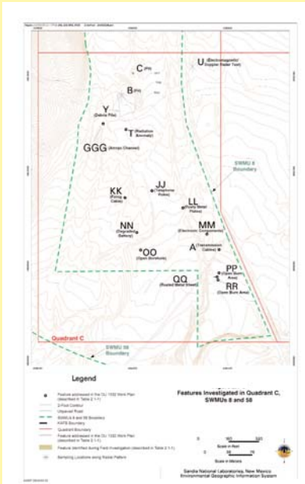
Northwest Quadrant Map



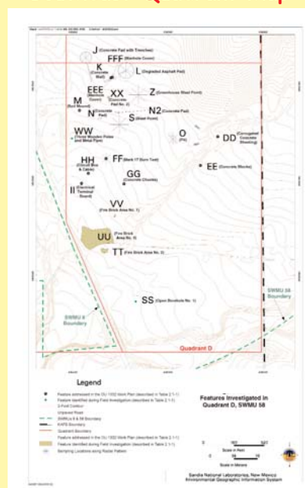
Northeast Quadrant Map



Southwest Quadrant Map



Southeast Quadrant Map



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SWMU 8: Open Dump (Coyote Canyon Blast Area), and SWMU 58: Coyote Canyon Blast Area, Foothills Test Area (continued)

EGIS

Environmental Restoration Project

Recommended Future Land Use

- Industrial land use is established for this site.

Results of Risk Analysis

- Risk assessment results for the residential scenario are calculated per NMED risk assessment guidance in 2003 as presented in the "Supplemental Risk Document Supporting Class 3 Permit Modification Process."
- Because COCs were present in concentrations greater than background-screening levels, it was necessary to perform a risk assessment for the site.
- Above-background metal concentrations of arsenic, beryllium, lead, and nickel were detected in a portion of the 1995 through 2006 soil samples that were collected at depths starting at 30 feet below ground surface at a number of SWMU 8 and 58 Features. It was considered highly unlikely that the known 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 above-background concentrations of these four metals in the deep subsurface samples are considered to be naturally occurring, and were not included in the risk assessment calculations. The maximum concentrations (summarized in the table below) of all metal and radiological COCs 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 feet at the site were evaluated in the SWMUs 8 and 58 risk assessment.
- The maximum concentration value for lead from this site was 15,000 mg/kg, detected in an April 1996 auger borehole. This maximum lead concentration is greater than all the EPA and NMED screening values. However, because the site has been adequately characterized, average concentrations are also more representative of actual SWMU 8 and 58 overall site conditions. The UCL of the mean concentration for lead is 239 mg/kg and is therefore less than all of the screening values. Lead was therefore eliminated from further consideration in the human health risk assessment.
- The risk assessment analysis evaluated the potential for adverse health effects for the residential and industrial land-use scenarios.

  Industrial Land-Use Scenario:

  The total human health HI was 0.96 for the industrial land-use scenario, which is lower than the accepted numerical standard of 1.0 suggested by risk assessment guidance from the EPA. The estimated excess cancer risk is 9E-5, which is above the acceptable risk value (1E-5) provided by the NMED for an industrial land-use scenario. Although the estimated excess cancer risk is above the NMED guideline, maximum concentrations were used in the risk calculation. Because SMWUs 8 and 58 have been adequately characterized, average concentrations are more representative of actual site conditions. Using the UCLs of the mean concentrations for the following main contributors to excess cancer risk reduces the total estimated excess cancer risk to 1E-6. Thus, by using realistic concentrations in the risk calculations that more accurately depict actual site conditions, both the total and estimated incremental excess cancer risks for the industrial land-use scenario are below NMED guidelines.

  Residential Land-Use Scenario:

  The total human health HI for the residential land-use scenario (11.43) is above the accepted EPA numerical standard of 1.0. The estimated excess cancer risk is 4E-4. which is also above the NMED guideline of 1E-5 for a residential land-use scenario. Although both the HI and estimated excess cancer risk values are above the NMED guidelines, maximum concentrations were again used in the risk calculation. Because the site has been adequately characterized, average concentrations are more representative of actual site conditions. Using the UCLs of the mean concentrations for the main contributors to excess cancer risk and hazards reduces the total HI and estimated excess cancer risk to 0.42 and 3E-6, respectively. Thus, by using realistic concentra tions in the risk calculations that more accurately depict actual site conditions, both the total and incremental HI and the estimated incremental excess cancer risk values for the residential land-use scenario are below NMED guidelines.
- For the radiological COCs, five of the constituents (tritium, cesium-137, thorium-232, uranium 235, and uranium-238) had either activity levels or MDA values greater than the corresponding background values. The incremental human health TEDE is 12 mrem/yr for the industrial land-use scenario, which is lower than the EPA numerical guidance of 15 mrem/yr. The incremental TEDE for the residential land-use scenario is 31 mrem/yr which is below the EPA guideline of 75 mrem/yr. Therefore, SWMUs 8 and 58 are eligible for unrestricted radiological release.
- None of the COCs warrant ecological concern because the ecological risks are acceptable based upon NMED guidance.
- In conclusion, based upon the SWMU 8 and 58 field investigation data, human health and ecological risk are acceptable per NMED guidance. Thus, a risk-based determination of CAC without Controls was recommended by SNL/NM for SWMUs 8 and 58 as a whole. However, the NMED has issued a certificate for CAC with Controls for the site, because some Features required controls on land use.

Human Health Risk Assessment Values for SWMU 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**	9E-5/**Below Background**	6.33/ **Below Background**	4E-4/ **Below Background**
Barium	58O	988 J/ **158**	0.02/ **Below Background**	--/--	0.19/ **Below Background**	--/--
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**	2E-9/ **Below Background**	0.15/ **Below Background**	4E-9/**Below Background**
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**.
-- = Information not available.

Processing soil collected from Borehole 58FF-GR-BH13 through a brass screen to remove oversized material. Power lines that traverse the Feature 58FF site can be seen behind the drilling rig. View to the southeast, October 23, 2005.

June 2006 Aerial Photograph of SWMUs 8 and 58.

Collecting borehole cuttings from the drilling rig cyclone with a plastic bucket during the drilling of Borehole 58FF-GR-BH15. September 15, 2005. View to the northeast.

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