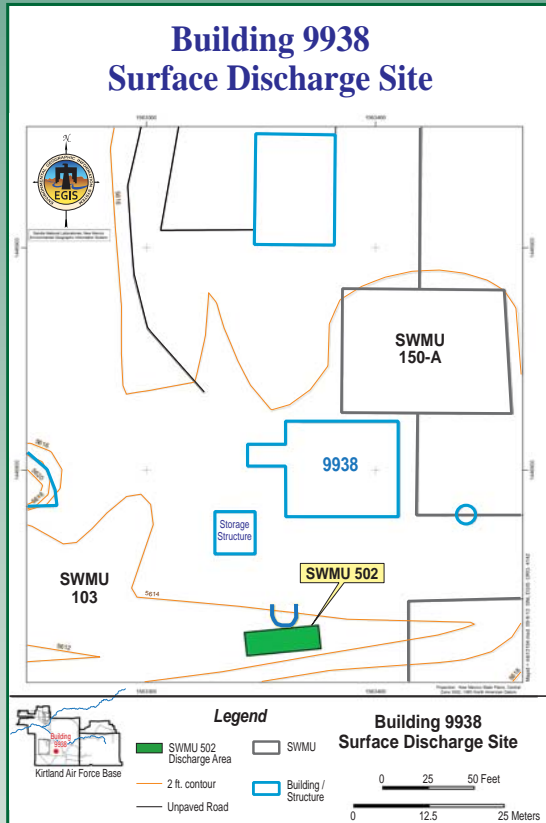


# Solid Waste Management Unit 502

## Part 1

### Where is Solid Waste Management Unit (SWMU) 502?

- The Site (SWMU 502) consists of exposed soil in a shallow engineered depression located approximately 65 feet south of Building 9938, adjacent to a small earthen berm capped with vegetation. 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.



Looking east at the discharge area. A corrugated steel wind screen is visible on the left and a solid waste container is visible beyond the discharge area. The berm adjacent to the south edge of the SWMU is on the right. An area of discolored soil is visible in the foreground.



Looking south from Building 9938 to the Building 9938 Surface Discharge Area and adjacent berm. A corrugated steel wind screen is visible to the right.

### What Happened at SWMU 502?

- Between July 2010 and through September 2012, SNL/NM personnel conducted research and development and other activities involving the synthesis of explosives. The activities involved mixing and synthesis of materials for testing purposes, including: ammonium nitrate, urea nitrate, 1,3,5-trinitroperhydro-1,3,5-triazine (RDX), and other explosive compounds. Wastewater was generated from processes associated with explosive synthesis activities, and containerized in polyethylene plastic containers. Upon completion of each synthesis activity, the wastewater was discharged to the ground surface in the area south of Building 9938, and behind a corrugated steel wind screen. The wastewater generated from each synthesis was conservatively estimated at 10 gallons. A total of 25 synthesis activities were held, thus approximately 250- gallons of wastewater were discharged to the ground surface.

### Constituents of Concern

- High Explosives (HE) Compounds

### Site History

- The DOE and Sandia formally notified the NMED of this newly identified or suspected SWMU by letter dated December 19, 2012. Several small zones of discolored soil within a total area approximately 10 feet wide by 25 feet long were identified. No odors were present and there was no evidence of staining on surfaces surrounding the discharge area.
- In January 2013 Sandia collected surface soil samples to obtain data regarding the presence of chemical constituents associated with the Site. The samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), perchlorate, nitrate plus nitrite (NPN), high explosive compounds (HE), and total metals. Results from January 2013 soil samples were provided to NMED in a report dated March 29, 2013. Based upon the findings presented in the SWMU Assessment Report (SAR), a Voluntary Corrective Action (VCA) was proposed.
- On April 3, 2013, the NMED approved the SAR.
- The VCA was performed in July 2013 to address the remediation initiative to reduce any potential impacts to human health and the environment, determine the nature and extent of HE compounds, and perform a risk assessment. Soil samples were collected in July 2013 for HE compounds, metals, and perchlorate from unconsolidated material at the surface, 2 feet (ft) below ground surface (bgs), and 5 ft bgs.
- The concentrations reported in the soil samples (January 2013 and July 2013) were compared to the approved background concentrations for SNL/NM and soil screening levels presented in *New Mexico Environment Department Risk Assessment Guidance for Site Investigation and Remediation*, the *Environmental Protection Agency (EPA) Regional Screening Levels, Region 6*, and the *EPA's Ecological Risk Assessment Guidance for Superfund*. Results from soil samples and risk assessment were presented to NMED in the November 2013 Investigation Report for the VCA.
- On February 29, 2016, the NMED approved the Investigation Report for the VCA.

# Solid Waste Management Unit 502

## Part 2

### Summary of Analytical Data used for Risk Assessment

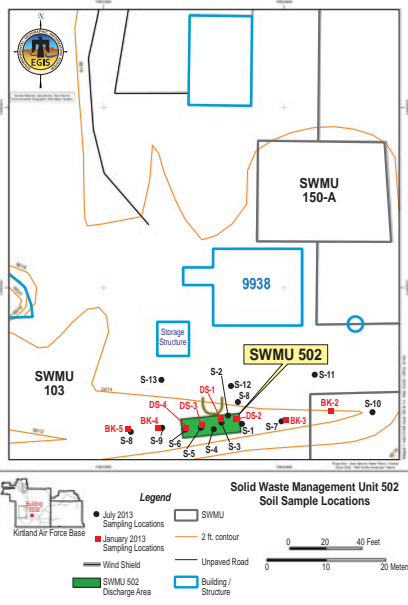
- Three HE compounds were detected; including octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX), RDX, and pentaerythritol tetranitrate (PETN). HMX was detected in only one surface sample at a concentration of 380 micrograms per kilogram ( $\mu\text{g}/\text{kg}$ ). PETN was detected at concentrations ranging from 445  $\mu\text{g}/\text{kg}$  to 142000  $\mu\text{g}/\text{kg}$ . RDX was detected at concentrations ranging from 156  $\mu\text{g}/\text{kg}$  to 8830  $\mu\text{g}/\text{kg}$ . All maximum HE values were detected in surface samples, and concentration levels decreased with depth and distance from the discharge area. There are no established background concentrations for HE compounds in soil.
- VOCs and SVOCs were analyzed in surface samples only. Compounds detected were; acetone, 2-butanone, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, chloroform, chrysene, di-n-butyl phthalate, 2,4 dinitrophenol, bis(2-Ethylhexyl)phthalate, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, pyrene, and styrene. There are no established background concentrations for VOCs and SVOCs in soil.
- NPN was reported in surface samples at concentrations ranging from 4 milligrams per kilogram (mg/kg) to 6460 mg/kg. There is no established background concentration for nitrate in soil.
- Perchlorate was reported at concentrations ranging from 0.019 mg/kg to 6.48 mg/kg. Detections were specific to the discharge area, as only two samples outside the discharge area reported perchlorate concentrations above the analytical detection limits. There is no established background concentration for perchlorate in soil.
- Antimony, arsenic, barium, cobalt, copper, nickel, silver, vanadium, and zinc were detected above established background concentrations.

### Results of Risk Assessment

A risk assessment for the SWMU was provided to NMED in an Investigation Report for the VCA.

- Potential COCs may have been released into the vadose zone via infiltration of rain water and surface water runoff. However, the primary COCs (HE compounds) are relatively immobile and transport through the vadose zone is unlikely. Contamination at the site resulted from wastewater, generated from processes associated with the production, isolation, and purification of materials used in explosive synthesis activities, discharged to the ground surface. Although some residual COCs remain in the soil at SWMU 502, gross contamination (i.e., HE compounds) was not discovered. The collection of soil samples and analysis of the associated analytical data is sufficient to characterize residual contamination present (i.e. current conditions).
- Significant leaching into the subsurface soil is unlikely, and leaching into the groundwater at this site is assumed to be non-existent. The depth to groundwater at the site is approximately 350 ft bgs. The potential for transformation of COCs is low.
- For the COCs under the NMED guidelines for residential land-use scenario, the incremental risk calculations indicate slight risk to human health.
  - Though both the Hazardous Index (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.
  - Because the site has been adequately characterized, average concentrations are more representative of actual site conditions.
  - The 95th percentile upper confidence limit (UCL) of the mean concentrations for the main contributors to excess cancer risk and hazards provide more realistic concentrations in the risk calculations that more accurately depict actual site conditions. These incremental risk calculations using UCL indicate insignificant risk to human health from COCs considering a residential land-use scenario.
  - Therefore, it is concluded that this site poses insignificant risk to human health under both the industrial and residential land-use scenarios.
- Using the SNL/NM ecological risk assessment methodology, the potential for ecological risks associated with SWMU 502 is expected to be low.
- The current and proposed land use at SWMU 502 and the surrounding area is industrial.

### Solid Waste Management Unit 502 Soil Sample Locations



### Summary of Detected SWMU 502 VCA Soil Sample Results

Analyte	SNL/NM Background Concentration	Total Samples	Number of Detections	Minimum Concentration	Maximum Concentration
<b>HE Compounds in <math>\mu\text{g}/\text{kg}</math></b>					
HMX	NE	44	1	380	380
PETN	NE	44	24	445	142000
RDX	NE	44	27	156	8830
<b>VOCs and SVOCs in <math>\mu\text{g}/\text{kg}</math></b>					
Acetone	NE	10	6	1.72	10.4
2-Butanone	NE	10	2	1.97	2.56
Chloroform	NE	10	5	0.43	0.86
Styrene	NE	10	1	0.453	0.453
Benzo(a)anthracene	NE	10	1	20.9	20.9
Benzo(a)pyrene	NE	10	1	22.7	22.7
Benzo(b)fluoranthene	NE	10	2	16.7	39.4
Benzo(ghi)perylene	NE	10	1	11.9	11.9
Benzo(k)fluoranthene	NE	10	1	24.1	24.1
Chrysene	NE	10	1	15.4	15.4
Di-n-butyl phthalate	NE	10	2	103	1100
2,4-Dinitrophenol	NE	10	2	1210	10900
bis(2-Ethylhexyl)phthalate	NE	10	3	146	177
Fluoranthene	NE	10	2	17.7	27.6
Indeno(1,2,3-c,d)pyrene	NE	10	1	11.6	11.6
Phenanthrene	NE	10	1	10.8	10.8
Pyrene	NE	10	2	13.6	23.4
<b>Inorganics in mg/kg</b>					
NPN	NE	10	10	4.20	6460
Perchlorate	NE	44	27	0.019	6.48
Aluminum	NE	44	44	3620	12400
Antimony	NE	44	27	0.025	13.3
Arsenic	NE	44	44	1.85	9.91
Barium	NE	44	44	95.9	854
Bismuth	NE	44	44	0.118	0.132
Cadmium	NE	44	44	0.0966	0.527
Calcium	NE	44	44	12200	157000
Chromium	NE	44	44	24.94	13.4
Cobalt	NE	44	44	1.50	8.57
Copper	NE	44	44	2.41	16.4
Iron	NE	44	44	3320	10700
Lead	NE	44	44	3.31	19.5
Magnesium	NE	44	44	1910	15900
Manganese	NE	44	44	61.3	286
Mercury	< 0.25	44	23	0.00469	0.0439
Nickel	NE	44	44	3.23	14.8
Potassium	NE	44	44	792	11100
Silver	< 1.0	44	44	1.21	1.31
Sulfur	NE	44	44	83.3	11000
Thallium	< 1.1	44	28	0.0637	0.202
Vanadium	NE	44	44	1.35	15.1
Zinc	NE	44	44	12.2	124

Notes:  
 HE = High explosive  
 HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine  
 $\mu\text{g}/\text{kg}$  = Microgram(s) per kilogram  
 mg/kg = Milligram(s) per kilogram  
 NE = Not established  
 PETN = Pentaerythritol tetranitrate  
 RDX = 1,3,5-Trinitroperhydro-1,3,5-triazine  
 SNL/NM = Sandia National Laboratories New Mexico

### Risk Assessment Values for SWMU 502 Nonradiological COCs

COC	Maximum Concentration (All Samples) (mg/kg)	Industrial Land-Use Scenario <sup>a</sup>		Residential Land-Use Scenario <sup>a</sup>	
		Hazard Index	Cancer Risk	Hazard Index	Cancer Risk
<b>Inorganic</b>					
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	26.4	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	-
<b>Organics</b>					
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	-	3.68E-07
Benzo(k)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	0.00256	0.00	-	0.00	-
Chloroform	0.00886	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)	0.142	0.12	3.3E-07	1.16	1.17E-06
Perchlorate	6.48	0.01	-	0.12	-
Phenanthrene	0.0208	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	-
<b>Total</b>		0.24	7.34E-06	2.66	2.94E-05

Notes:  
<sup>a</sup> 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

### Recommendation

Based upon field investigation results, soil sample analytical data, and the results of human health and ecological risk assessment, a determination of corrective action complete (CAC) without controls is recommended for SWMU 502 for the following explanations:

- COCs are not present in the soil at levels considered hazardous to human health for either an industrial or residential land-use scenario.
- COCs warrant no ecological concern because ecological risks are acceptable using NMED guidance.

This site has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants pose an acceptable level of risk under current and projected future land use.

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