

**RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)**

Current Human Exposures Under Control

Facility Name: Sandia National Laboratories/ New Mexico (SNL)
Facility Address: 1515 Eubank SE, Albuquerque, New Mexico, 87123
Facility EPA ID #: NM5890110518

1. Has all available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been considered in this EI determination?

If yes - check here and continue with #2 below.
 If no - re-evaluate existing data, or
 if data are not available skip to #6 and enter 'IN' (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, gild ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

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2. Are groundwater, soil, surface water, sediments, or air media known or reasonably suspected to be "contaminated"¹ above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	<u>Yes</u>	<u>No</u>	<u>?</u>	<u>Rationale / Key Contaminants</u>
Groundwater	<u>X</u>	<u>—</u>	<u>—</u>	TCE, nitrate, fuel constituents
Air (indoors) ²	<u>—</u>	<u>X</u>	<u>—</u>	
Surface Soil (e.g., <2 ft)	<u>X</u>	<u>—</u>	<u>—</u>	Metals, TPH, depleted uranium
Surface Water	<u>—</u>	<u>X</u>	<u>—</u>	
Sediment	<u>—</u>	<u>X</u>	<u>—</u>	
Subsurf. Soil (e.g., >2 ft)	<u>X</u>	<u>—</u>	<u>—</u>	VOC's, SVOC's, metals, HE, TPH
Air (outdoors)	<u>X</u>	<u>—</u>	<u>—</u>	VOC's, metals, PCB's

 If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate "levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

X If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

 If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale and Reference(s):

A total of 298 Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) were evaluated at Sandia National Laboratories. Because of the large number and complexity of these sites, SWMUs/AOCs at SNL were grouped into four categories: SWMUs/AOC's not requiring corrective action, SWMUs/AOCs requiring characterization and/or corrective action, the Mixed Waste Landfill, and the Chemical Waste Landfill (Appendices A, B, C, and D, respectively). This CA-725 form is a conservative (worst-case) compilation of the information presented in Appendices A-D for the four categories of SWMUs/AOCs. Each category is briefly described below.

Category 1: SWMUs/AOCs not requiring corrective action (190 sites)

SWMUs/AOCs in Category 1 are not considered to have any potential to cause unacceptable human exposures and are further subdivided into three groups:

1. SWMUs/AOCs approved by the New Mexico Environment Department (NMED) for No Further Action (NFA). There are 93 sites in this subcategory.
2. SWMUs/AOCs appropriate or likely appropriate for NFA petition, but have not yet been subject to public notice and comment through a formal Class III permit modification process. (44 sites).
3. Non-Environmental Restoration Drainfields and Septic Systems (NERDSS). These sites have been inspected by the NMED and have been classified into two groups – those that require, and those that do not require a RCRA Facility Investigation (RFI). Only NERDSS not requiring a RFI are included in Category 1 (53 sites).

Category 1 sites were included in the CA-725 form for the sake of completeness and also to demonstrate that considerable work has already been completed at SNL by the facility and the NMED.

Category 2: SWMUs/AOCs requiring characterization and/or corrective action (106 sites)

SWMUs/AOCs in Category 2 include sites which need initial characterization, additional characterization, and if necessary, some form of remediation (54 sites). Most sites are not expected to require remediation. NERDSS

requiring a RFI are included in this category (52 sites). These SWMUs/AOCs are located within the boundaries of Kirtland Air Force Base and are not accessible by the public. Administrative controls are in place to prohibit industrial/construction activities from disturbing these sites. Sites in this category were carefully evaluated to determine whether they have any potential for causing unacceptable human exposures.

Category 3: Mixed Waste Landfill

The Mixed Waste Landfill (MWL) was placed into a separate category because it is considered by the NMED to be one of the most important corrective action units at SNL. The U. S. Department of Energy (DOE)/SNL have proposed capping the MWL with an evapotranspiration (ET) cover. Low levels of tritium are present in surface and subsurface soil. Low concentrations of cadmium are present in subsurface soil along the western portion of the landfill. There is no definitive evidence of ground-water contamination. Based on extensive characterization, the NMED believes that the MWL does not have any potential to cause unacceptable human exposures, unless the landfill is excavated. Administrative controls are in place to prohibit excavation of the landfill.

Category 4: Chemical Waste Landfill

Like the MWL, the Chemical Waste Landfill (CWL) was placed into a separate category because it is considered by the NMED to be a major corrective action unit at SNL. Additionally, the CWL is undergoing closure pursuant to an approved Closure Plan and is an interim status regulated RCRA unit. SNL is currently conducting a Voluntary Corrective Measure (VCM) to excavate contaminated soil and the contents of the landfill. Subsurface soil is contaminated with volatile and semi-volatile organic compounds, metals, polychlorinated biphenyls, and tritium. Ground water is contaminated with low levels of trichloroethene and possibly nickel and chromium. Strict administrative controls at the site related to VCM operations should preclude the possibility of causing unacceptable human exposures at the CWL.

See Appendices A and B for list of references for all areas, except the CWL and the MWL. References for the MWL and CWL are listed in Appendices C and D, respectively. All references are available at the NMED Hazardous Waste Bureau in Santa Fe, New Mexico; and the SNL Integrated Safety and Security Records Center.

Footnotes:

¹"Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

²Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor-air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risk.

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3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential Human Receptors (Under Current Conditions)

<u>"Contaminated" Media</u>	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food ³
Groundwater	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>			<u>NO</u>
Air (indoors)							
Soil (surface, e.g., <2 ft)	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>	<u>NO</u>
Surface Water							
Sediment							
Soil (subsurface e.g., >2 ft)				<u>NO</u>			<u>NO</u>
Air (outdoors)	<u>NO</u>	NO	<u>NO</u>	<u>NO</u>	<u>NO</u>		

Instructions for Summary Exposure Pathway Evaluation Table:

- Strike-out specific Media including Human Receptors' spaces for Media which are not "contaminated" as identified in #2 above.
- enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have check spaces (" "). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

X If no (pathways are not complete for any contaminated media-receptor combination) skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

_____ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

_____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code.

Rationale and references:

As mentioned above, this CA-725 form is a conservative (worst-case) compilation of the information presented in Appendices A-D for the four categories of SWMUs/AOCs. Ground water, surface soil, subsurface soil, and outdoor air are known or reasonably suspected to be contaminated above appropriately protective risk-based levels from releases subject to RCRA Corrective Action at the SWMUs/AOCs/ locations discussed below.

Contaminated Ground Water

Ground-water standards have been exceeded at four areas at SNL. These areas are listed below, along with the contaminants of concern and the maximum concentration measured:

- Technical Area V (TA-V), trichloroethene (0.023 mg/L)
- Tijeras Arroyo, trichloroethene (0.009 mg/L), nitrate (27 mg/L)
- Lurance Canyon Burn Site, nitrate (19.6 mg/L)
- Chemical Waste Landfill, trichloroethene (0.031 mg/L), chromium (0.69 mg/L), nickel (2.71 mg/L)

See Appendix B for list of references for all areas, except the CWL. References for the CWL are listed in Appendix D. All references are available at the NMED Hazardous Waste Bureau in Santa Fe, New Mexico; and the SNL Integrated Safety and Security Records Center.

Contaminated Surface and Subsurface Soil

Surface and subsurface soil are contaminated at the sites listed below, along with the contaminants of concern and the maximum concentrations measured:

1. SWMU 91 Lead Firing Site - lead (6800 mg/kg)
2. SWMU 154 Building 9960 Septic Systems - high explosive 2,4,6-trinitrotoluene (1430 mg/kg)
3. SWMU 4 Liquid Waste Disposal System Surface Impoundments – cadmium (154 mg/kg), chromium-6 (11.2 mg/kg), copper (239 mg/kg), silver (90.5 mg/kg), Cs-137 (7.5 pCi/g), Co-60 (11 pCi/g)
4. SWMU 68 Old Burn Site – lead (208,000 mg/kg)
5. SMWU 58 Coyote Canyon Blast Area – lead (62,000 mg/kg)
6. SWMU 190 Steam Plant Tank Farm - diesel fuel #2, Total Petroleum Hydrocarbons (39,000 mg/kg), dibenzofuran (3.53 mg/kg), Fluorene (3.59 mg/kg), 2-methyl naphthalene (7.28 mg/kg), phenanthrene (7.72 mg/kg)

For the CWL, significant contaminants and maximum levels in subsurface soil are as follows:

<u>Tritium</u>	<u>362,000 pCi/L</u>
<u>Polychlorinated biphenyls (total)</u>	<u>1,538 mg/kg</u>
<u>Arsenic</u>	<u>881 mg/kg</u>
<u>Chromium</u>	<u>9,000 mg/kg</u>
<u>Chromium +6</u>	<u>2,766 mg/kg</u>
<u>Lead</u>	<u>49,230 mg/kg</u>
<u>Mercury</u>	<u>500 mg/kg</u>
<u>1,1,1-trichloroethane</u>	<u>410 mg/kg</u>
<u>Pentachlorophenol</u>	<u>260 mg/kg</u>
<u>Benz(a)anthracene</u>	<u>29 mg/kg</u>
<u>Benzo(b)fluoranthracene</u>	<u>27 mg/kg</u>
<u>Benzo(k)fluoranthracene</u>	<u>27 mg/kg</u>
<u>1,4-Dichlorobenzene</u>	<u>25 mg/kg</u>
<u>Trichloroethene</u>	<u>4 mg/kg</u>

See Appendix B for list of references for all areas, except the CWL. References for the CWL are listed in Appendix D. All references are available at the NMED Hazardous Waste Bureau in Santa Fe, New Mexico; and the SNL Integrated Safety and Security Records Center.

Contaminated Air

Vapor from volatile organic compounds and contaminated fugitive dust (organics, metals, and PCBs) impacts air quality in the immediate vicinity of the CWL. This release is caused by the ongoing VCM to excavate contaminated debris and soil. Levels of air contamination vary widely depending on wind conditions and the contaminants exposed in the excavation and soil stockpiles. Air contaminant levels are expected to be significantly reduced after completion of the VCM.

References for the CWL are listed in Appendix D. All references are available at the NMED Hazardous Waste Bureau in Santa Fe, New Mexico; and the SNL Integrated Safety and Security Records Center.

Ground-Water Pathways

Contaminated ground water occurs at depths ranging from about 130 to 500 ft. Drinking-water supply wells are not currently impacted and are not likely to be impacted by SNL SWMUs/AOCs in the foreseeable future. Ground-water contamination at TA-V, the Lurance Canyon Burn Site, and the CWL occurs at remote locations, approximately 3 miles or more from the nearest drinking-water supply wells.

Water supply wells are located closer to Tijeras Arroyo; however, contamination in the Tijeras Arroyo area is confined chiefly to a shallow perched zone. The perched ground water flows to the southeast, opposite of the flow direction of ground water in the regional aquifer. Water supply wells are screened in the regional aquifer, not in the shallow perched zone.

Surface and Subsurface Soil Pathways

Explosives contamination at SWMU 154, a seepage pit, occurs in subsurface soil. Institutional controls requiring dig permits and signs are in place to prevent construction workers from exposures to this contaminated soil. Because of institutional controls, a pathway to human receptors currently does not exist at this site.

Contamination occurs in surface and shallow subsurface soils at SWMUs 91, 4, 68, and 58. Institutional controls are in place to prevent public access and construction. SWMU 91 is contained within the fenced secured area of TA-III. SWMUs 91, 68, and 58 are also located in remote areas. Because of physical and institutional controls, pathways to human receptors currently do not exist at these sites.

Surface and deep subsurface soils at SWMU 190 (a tank farm) are contaminated with diesel-fuel constituents. A passive soil-vapor venting system has been installed at the site to remediate the hydrocarbon contamination. A security fence to prevent unauthorized intrusion encompasses the site. Additionally, institutional controls requiring dig permits and signs are in place to prevent construction workers from accidental exposures. Because of physical and institutional controls, a pathway to human receptors currently does not exist at this site.

As mentioned earlier, the CWL is currently undergoing a VCM designed to excavate the contents of the landfill. Subsurface soil is contaminated with volatile and semi-volatile organic compounds, metals, polychlorinated biphenyls, and tritium. The site is located with the fenced secured area of TA-III. The perimeter of the landfill and the VCM Site-Operational Boundary are also fenced and are posted with warning signs. Site access is restricted to workers with appropriate training and personal protective equipment (PPE). Because of physical and institutional controls, a pathway to human receptors currently does not exist at this site.

Air Pathways

The CWL is the only SWMU at SNL that is expected to have any significant impact on air quality. Because of the ongoing VCM, site access is restricted to workers with appropriate training and PPE. The PPE used at the site is designed in part to prevent worker exposure to contaminated air. Physical and institutional controls currently preclude any air pathway to human receptors.

³ Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

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6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Sandia National Laboratories/NM facility, EPA ID #, NM5890110518 located at 1515 Eubank SE, Albuquerque, New Mexico, 87123 under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

NO - "Current Human Exposures" are NOT "Under Control:"

IN - More information is needed to make a determination.

Completed by (signature) William P. Moats Date 5/14/01
(print) William P. Moats
(title) SNL/KAFB Project Leader

Supervisor (signature) Steven P. Owen Date 6/8/01
(print) STEVEN OWEN
(title) WRG I
(EPA Region or State) New Mexico

Locations where References may be found:

Sandia National Laboratories/ New Mexico (SNL/NM) Environmental Restoration Project Office
SNL/NM Integrated Safety and Security Records Center
NMED Hazardous Waste Bureau (HWB)

Contact telephone number and e-mail address:

(name) William P. Moats, NM Environment Department Hazardous Waste Bureau
(phone #) (505) 284-5086
(e-mail) wpmoats@sandia.gov

(name) Paul Freshour, Sandia National Laboratories/ New Mexico
(phone #) (505) 845-3108
(e-mail) jpfresh@sandia.gov

FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.