SEC Petition Evaluation Report

Petition SEC-00234

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Subject Expert(s):	Monica Harrison-Maples
Site Expert(s):	None

Petition Administrative Summary

Petition Under Evaluation

Petition Number:	SEC-00234
Petition Type:	83.14
Petition A Receipt Date:	August 2, 2016
Qualification Date:	August 5, 2016
DOE/AWE Facility Name:	Area IV of the Santa Susana Field Laboratory

Petition Class

NIOSH-Proposed Class Definition:	All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area at Area IV of the Santa Susana Field Laboratory in Ventura County, California, from January 1, 1965 through December 31, 1988, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort.

Related Petition Summary Information

SEC Petition Tracking Number(s):	SEC-00093 SEC-00156
Petition Type:	83.13 83.14
DOE/AWE Facility Name:	Area IV of the Santa Susana Field Laboratory Area IV of the Santa Susana Field Laboratory
Petition Status:	Class added to the SEC for January 1, 1955 through December 31, 1958 Class added to the SEC for January 1, 1959 through December 31, 1964

Related Evaluation Report Information

Report Title:	SEC Petition Evaluation Report for Petition SEC-00093 SEC Petition Evaluation Report for Petition SEC-00156
DOE/AWE Facility Name:	Santa Susana Field Laboratory-Area IV Area IV of the Santa Susana Field Laboratory

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Evaluation Report Summary: SEC-00234, Area IV of the Santa Susana Field Laboratory (SSFL)

The National Institute for Occupational Safety and Health (NIOSH) prepared this evaluation report in response to a petition to add a class of employees at Area IV of the Santa Susana Field Laboratory (SSFL) to the Special Exposure Cohort (SEC). The *Energy Employees Occupational Illness Compensation Program Act of 2000*, as amended, (EEOICPA) and 42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort under the Energy Employees Occupational Illness Compensation Program Act of 2000*, describe the process for adding new classes to the SEC.

NIOSH-Proposed Class to be Added to the SEC

All employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area at Area IV of the Santa Susana Field Laboratory in Ventura County, California, from January 1, 1965 through December 31, 1988, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort.

Dose Reconstruction Feasibility Findings

NIOSH does not have sufficient biological monitoring data, air monitoring information, or process and radiological source information to allow it to estimate with sufficient accuracy the potential internal exposures to thorium (including associated progeny) or americium, to which the proposed class may have been subjected. NIOSH finds that it has sufficient information to reconstruct other potential internal exposures, external exposures, and occupational medical dose for Area IV of the Santa Susana Field Laboratory employees with sufficient accuracy.

The NIOSH dose reconstruction findings are based on the following:

- Principal sources of internal radiation for members of the proposed class may have included exposures to plutonium, uranium, mixed fission products, thorium (including associated progeny), and americium. Exposures were from inhalation and ingestion during the processing operations.
- NIOSH has determined that there are insufficient internal dosimetry data or air monitoring data available to bound intakes of thorium (including associated progeny) and americium, for the period from January 1, 1965 through December 31, 1988. Although there are limited monitoring data that may be applied for these radionuclides during the period from 1965 through 1988, the data do not represent all operations at Area IV of the SSFL.
- NIOSH has not identified any data that suggest the possibility for significant operational thorium or americium exposures after 1988 that cannot be bounded. Therefore, NIOSH has established an end date of December 31, 1988, for this SEC class.
- Principal sources of external radiation for members of the proposed class included exposures to beta particles, gamma photons, and neutrons. The radiation sources potentially contributing to these exposures would have included reactor research and nuclear operations; nuclear support operations such as fuel fabrication and disassembly; reactor disassembly and examination; and waste disposal.

- Beta, photon and neutron monitoring data are available for Area IV of the SSFL in the form of individual dosimetry records and area monitoring surveys.
- Consistent with the findings in its 2009 and 2010 evaluation reports, NIOSH finds that it is able to reconstruct external and medical X-ray dose for all Area IV of the SSFL employees for all periods at the site.
- Following 42 C.F.R. § 83.13(c) (1), NIOSH determined that there is insufficient information to either: (1) estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that could have been incurred under plausible circumstances by any member of the class; or (2) estimate the radiation doses of members of the class more precisely than ~~a~~ maximum dose estimate.

Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any internal and external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Therefore, dose reconstructions for individuals employed at Area IV of the SSFL from January 1, 1965 through December 31, 1988, but who do not qualify for inclusion in the SEC, may be completed using these data as appropriate.

Health Endangerment Determination

The NIOSH evaluation did not identify any evidence supplied by the petitioners or from other resources that would establish that the class was exposed to radiation during a discrete incident likely to have involved exceptionally high-level exposures, such as nuclear criticality incidents or other events involving similarly high levels of exposures. However, the evidence reviewed in this evaluation indicates that some employees in the class may have accumulated chronic radiation exposures through intakes of fission products, reactor fuel radionuclides, and other radionuclides and from direct exposure to radioactive materials. Therefore, 42 C.F.R. § 83.13(c) (3) (ii) requires NIOSH to specify that health may have been endangered for those employees covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

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SEC Petition Evaluation Report for SEC-00234

ATTRIBUTION AND ANNOTATION: This is a single-author document. All conclusions drawn from the data presented in this evaluation were made by the ORAU Team Lead Technical Evaluator: Monica Harrison-Maples, Oak Ridge Associated Universities (ORAU). The rationales for all conclusions in this document are explained in the associated text.

1.0 Purpose and Scope

This report evaluates the feasibility of reconstructing doses for employees who worked at Area IV of the Santa Susana Field Laboratory (SSFL) (sometimes referred to as Area IV throughout this report) during a specified time. It provides information and analysis germane to considering a petition for adding a class of employees to the Congressionally created SEC.

This report does not make any determinations concerning the feasibility of dose reconstruction that necessarily apply to any individual energy employee who might need a dose reconstruction from NIOSH, with the exception of the employee whose dose reconstruction could not be completed, and whose claim consequently led to this petition evaluation. The finding in this report is not the final determination as to whether or not the proposed class will be added to the SEC. This report will be considered by the Advisory Board on Radiation and Worker Health (the Board) and by the Secretary of Health and Human Services (HHS). The Secretary of HHS will make final decisions concerning whether or not to add one or more classes to the SEC in response to the petition addressed by this report.

This evaluation, in which NIOSH provides its findings both on the feasibility of estimating radiation doses for members of this class with sufficient accuracy and on health endangerment, was conducted in accordance with the requirements of EEOICPA and 42 C.F.R. § 83.14.

2.0 Introduction

Both EEOICPA and 42 C.F.R. pt. 83 require NIOSH to evaluate qualified petitions requesting that the Department of Health and Human Services add a class of employees to the SEC. The evaluation is intended to provide a fair, science-based determination of whether it is feasible to estimate, with sufficient accuracy, the radiation doses of the proposed class of employees through NIOSH dose reconstructions.[1]

NIOSH is required to document its evaluation in a report, and to do so, relies upon both its own dose reconstruction expertise as well as technical support from its contractor, Oak Ridge Associated Universities (ORAU). Once completed, NIOSH provides the report to both the petitioners and the Advisory Board on Radiation and Worker Health. The Board will consider the NIOSH evaluation report, together with the petition, comments of the petitioner(s) and such other information as the Board considers appropriate, to make recommendations to the Secretary of DHHS on whether or not

[1] NIOSH dose reconstructions under EEOICPA are performed using the methods promulgated under 42 C.F.R. pt. 82 and the detailed implementation guidelines available at the NIOSH Radiation Dose Reconstruction Program page.

to add one or more classes of employees to the SEC. Once NIOSH has received and considered the advice of the Board, the Director of NIOSH will propose a decision on behalf of DHHS. The Secretary of DHHS will make the final decision, taking into account the NIOSH evaluation, the advice of the Board, and the proposed decision issued by NIOSH. As part of this final decision process, the petitioner(s) may seek a review of certain types of final decisions issued by the Secretary of DHHS.[2]

3.0 NIOSH-Proposed Class Definition and Petition Basis

In NIOSH's *Petition Evaluation Report, Petition SEC-00093* (NIOSH, 2009), NIOSH determined that it could not estimate radiation doses with sufficient accuracy for the period from January 1, 1955 through December 31, 1958, for employees at Area IV of the SSFL. NIOSH's decision was primarily based on a lack of internal monitoring data for potentially exposed individuals from January 1, 1955 through December 31, 1958. However, NIOSH determined that it could reconstruct external dose, including occupational medical dose, for the period from January 1, 1955 through December 31, 1958. In June 2009, the Department of Health and Human Services (DHSS) issued a letter designating the January 1, 1955 through December 31, 1958, period for inclusion in the SEC (DHHS, 2009).

In NIOSH's *Petition Evaluation Report, Petition SEC-00156* (NIOSH, 2010), NIOSH determined that it could not reconstruct radiation doses with sufficient accuracy for the period from January 1, 1959 through December 31, 1964, for employees at Area IV of the SSFL. NIOSH's decision was primarily based on incomplete bioassay, air monitoring, or process and radiological source data from January 1, 1959 through December 31, 1964. However, NIOSH determined that it could reconstruct external dose, including occupational medical dose, for the period from January 1, 1959 through December 31, 1964. In April 2010, DHHS issued a letter designating the January 1, 1959 through December 31, 1964, period for inclusion in the SEC (DHHS, 2010).

In this evaluation, the NIOSH-proposed class includes all employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area at Area IV of the Santa Susana Field Laboratory in Ventura County, California, from January 1, 1965 through December 31, 1988, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort. During this period, employees at this facility were involved with energy-related research, testing and development projects that may have included various nuclear reactors and particle accelerator operations, low-power criticality testing, reactor fuels manufacturing, reactor component disassembly and inspection, and disassembly and inspection of reactor fuel assemblies.

The evaluation responds to Petition SEC-00234, which was submitted by an EEOICPA claimant whose dose reconstruction could not be completed by NIOSH due to a lack of sufficient dosimetry-related information. NIOSH's determination that it is unable to complete a dose reconstruction for an

[2] See 42 C.F.R. pt. 83 for a full description of the procedures summarized here. Additional internal procedures are available at the NIOSH Radiation Dose Reconstruction Program page.

EEOICPA claimant is a qualified basis for submitting an SEC petition pursuant to 42 C.F.R. § 83.9(b).

4.0 Radiological Operations Relevant to the Proposed Class

The following subsections summarize the radiological operations at Area IV from January 1, 1965 through December 31, 1988, and the information available to NIOSH to characterize particular processes and radioactive source materials. Using available sources, NIOSH has attempted to gather process and source descriptions, information regarding the identity and quantities of radionuclides of concern, and information describing processes through which the radiation exposures of concern may have occurred and the physical environment in which they may have occurred. The information included within this evaluation report is meant only to be a summary of the available information.

4.1 Operations Description

The SSFL consists of a total of 2,850 acres, located in the Simi Hills of Ventura County, approximately 30 miles northwest of downtown Los Angeles, California. SSFL is divided into four administrative and operational portions based on ownership and operations. DOE operations are conducted in facilities on the 290-acre westernmost administrative and operational portion, designated as Area IV.

The SSFL was initially established by North American Aviation in 1947, to meet the requirements for a field test laboratory to static-fire large rocket engines, but it also met North American Aviation's need for a nuclear research facility. Area IV was established at the SSFL in 1953 as a nuclear research and development facility. In December 1955, these two North American Aviation groups (rocket development and nuclear development) were transformed into separate divisions: Atomics International and Rocketdyne. Rocketdyne, operating across all areas of the SSFL, focused on rocket engine design and production. Atomics International, functioning primarily in Area IV, focused on nuclear development and the Liquid Metal Engineering Center, which was a center for research and testing of non-nuclear components related to liquid metals. The site's history of operators and administrative divisions is complex. More detailed information on the operators and organization of the site is available in the technical basis document, *Energy Technology Engineering Center-Site Description* (ORAUT-TKBS-0038-2).

Area IV operations consisted of two functional areas: nuclear reactor development and testing and nuclear support operations.

Area IV nuclear reactor development and testing included operations associated with the following:

- Homogeneous water boiler reactors;
- Sodium-cooled graphite-moderated reactor, designated as the Sodium Reactor Experiment (SRE);
- Uranium-zirconium hydride reactors, associated with the Systems for Nuclear Auxiliary Power (SNAP) program;
- Critical test facilities;
- Civilian nuclear power test facilities;
- Organic moderated reactor (OMR);
- Sodium graphite reactor (SGR);

- Advanced epithermal thorium reactor (AETR); and
- Fast critical experiment laboratory

Area IV nuclear support operations included work associated with the following:

- Reactor fuel manufacturing;
- Fuel storage;
- Disassembly and examination of reactors and used reactor fuel assemblies;
- Radioactive source fabrication, use, and storage;
- Radioactive material disposal preparation;
- Research on reprocessing used reactor fuel;
- Particle accelerator operations;
- Research using radioisotopes;
- Fuel storage;
- Corrosion testing;
- Mechanical component development; and
- Sodium disposal

Table 4-1 includes Area IV Primary Radiological Building Operations. Additional information regarding Area IV functional areas and radiological operations can be found in ORAUT-TKBS-0038-2 and the SEC-00093 Evaluation Report (NIOSH, 2009).

Table 4-1: Area IV Primary Radiological Building Operations

Operations	Building Number	Facility Information	Dates of Reactor Operation/Program Duration
Reactor	4093	Water-Boiler Neutron Source (WBNS) reactor or L-85 Reactor (3 kWthr)	1956–1980
Reactor	4143	Sodium Reactor Experimental (SRE) Reactor (20 MWthr)	1957–1964
Reactor	4010	SNAP Experimental Reactor (SER) (50 kWthr)	1959–1960
Reactor	4010	SNAP 8 Experimental Reactor (S8ER) (600 kWthr)	1963–1965
Reactor	4024	SNAP 2 Development Reactor (S2DR) (50 kWthr)	1961–1962
Reactor	4024	SNAP 10 Flight Simulation Reactor (S10FS) (37 kWthr)	1965–1966
Reactor	4028	Shield Test Reactor (50 kWthr)	1961–1964
Reactor	4028	Shield Test and Irradiation Reactor (STIR) (1 MWthr)	1964–1972
Reactor	4059	SNAP 8 Developmental Reactor (S8DR) (600 kWthr–1 MWthr)	1968–1969
Reactor	4012	SNAP Critical Test Facility: Second SNAP Critical Test Facility	1962–1968
Reactor	4373	SNAP Critical Test Facility: First SNAP Critical Test Facility	1957–1963
Reactor	4019	SNAP Flight System Critical Facility	1964–1965
Reactor	4009	OMR Critical Facility: OMR Low Power Critical Experiment	1958–1967
Reactor	4009	SGR Critical Facility: SGR Low Power Critical Experiment	1958–1967
Reactor	4100	Advanced Epithermal Thorium Reactor (AETR) Test Facility	1960–1974
Reactor	4100	Fast Critical Experiment Laboratory: Used to study different reactor core configurations	1961–1980
Nuclear Support	4003	Engineering Test Building: Reactor fuel manufacturing facility supporting SRE	1954–1964
Nuclear Support	4003	Hot Cave: Hot cell for reprocessing used reactor fuel	1954–1964
Nuclear Support	4654	Interim Storage Facility for SRE fuels	1958–1964

Operations	Building Number	Facility Information	Dates of Reactor Operation/Program Duration
Nuclear Support	4030	Van de Graaff Accelerator: Particle Accelerator	1960–1964
Nuclear Support	4020	Hot Lab: Used for disassembly and examining used reactor fuel	1957–1988
Nuclear Support	4023	Corrosion Testing Laboratory: Liquid Metals Component Testing Facility	1962–1986
Nuclear Support	4029	Radioactive Measurement Facility: Used for radiological material storage and radiation detection instrument calibration	1959–1974
Nuclear Support	4064	Fuel Storage Facility: Vault for fissionable fuel material (enriched uranium and plutonium) storage	1958–1993
Nuclear Support	4021/4022 Complex	Radioactive Materials Disposal Facility: Used for fuel storage and processing both solid and liquid waste for disposal in conjunction with the SRE operation	1959–Present
Nuclear Support	4143	SRE Support Complex: Used for component storage (Building 4041), radiological storage (Buildings 4686, 4653, 4654, 4689), site services (Building 4163), cold trap vault (Building 4695), Sodium Lab Instrument Building (Building 4606), and the liquid radioactive waste vault (Building4653)	1957–1964
Nuclear Support	4363	Mechanical Component Development and Counting Building: Used for sodium systems in support of SRE	1956–1963

Table 4-1 is compiled from information in Table 2-1 of ORAUT-TKBS-0038-2.
Note: kWthr refers to kilowatt thermal. MWthr refers to megawatt thermal.

In addition to Area IV, radiological operations were also conducted at the De Soto Avenue Facility, which was originally the headquarters of Atomics International. The facility was constructed in 1959, and Atomics International conducted work using nuclear fuel materials and other radioactive materials in Buildings 101 and 104 (DOE, 2009). The De Soto Avenue Facility is another EEOICPA covered site, which requires separate evaluation, but is mentioned in this report because some employees moved between the De Soto Avenue Facility and Area IV for their occupational responsibilities and assignments.

4.2 Radiation Exposure Potential from Operations

There were many different energy-related research, testing, and development projects conducted at different types of facilities at Area IV. These facilities included reactors, critical test facilities, accelerator facilities, calibration facilities, fuel preparation facilities, post-irradiation examination facilities, and support facilities. Reactor operations involved the largest quantities of radiological material. Between 1954 and 1980, nuclear reactors were built, tested, and operated on behalf of DOE or its predecessor agencies. Most of the reactors at Area IV were low power, with the maximum being 20 MWth (megawatt thermal). All reactors had relatively short operating histories.

Nuclear reactor operations create fission products, transuranic materials, and activation products. When part of the fissionable material in the fuel element is expended, or when a reactor is decommissioned, the fuel elements are removed. These spent fuel elements contain the fission products and transuranic materials generated by reactor operations, and the activation products in the cladding. At Area IV of the SSFL, a total of 135 million curie (Ci) of radioactivity was generated in the fuel from about 7,200 MWd of total reactor operation. Almost 90% of the total SSFL radioactivity was generated by the 20-MWth SRE. The sources of internal radiation exposure in the

reactor areas were associated with fissionable materials, mixed fission products, activation products, and transuranics in reactor fuel. These radionuclides included plutonium-238, plutonium-239, uranium-234, uranium-235, uranium-238, thorium-228, thorium-230, thorium-232, americium-241, cobalt-60, strontium-90, cesium-137, and tritium. While exposures to plutonium, uranium, cobalt, strontium, and cesium were monitored for or can be estimated, neither thorium nor americium were detected using the chosen monitoring methods. Reactor operations workers also had potential for unmonitored exposure to thorium or americium through inhalation or ingestion during routine reactor operations, shutdowns, modifications, and during refueling. These exposures would generally have been chronic rather than acute, but there were incidents that could have resulted in higher short-term exposures.

The SRE was a sodium cooled, graphite moderated, thermal reactor that used slightly enriched uranium metal fuel in Core I (May 4, 1958–November 10, 1959), and uranium-thorium metal alloy fuel in Core II (July 22, 1960–-February 15, 1964) (Ureda, 1975, PDF p.13). Core I contained 35 standard 7-rod elements of unalloyed uranium, one 19-rod UO_2 element, 2 Th-7.6 wt % U elements, and 5 experimental elements containing uranium alloys, uranium, and Th-5.4 wt % U alloy (Atomics International, 1961, PDF p. 133). Fuel slugs were assembled in metal tubes in the Engineering Test Building (Building 4003) to create the fuel rods. The Core II fuel was Th-232 and enriched uranium (EU) alloy. All fissile material from Cores I and II were stored in the fuel storage vault at the Radioactive Materials Disposal Facility (RMDF) after it was removed from the SRE. The fuel was initially stored at the RMDF at Area IV. In 1974, fuel assembly processing began at the Hot Laboratory for shipment to Savannah River where the fuel would be reprocessed. Core II fuel processing for shipment began in January 1976 with shipment occurring sometime after June 1976. Documentation indicates approximately 1,972 kg of thorium was shipped to Savannah River as declad fuel (Dennison, 1977, PDF p. 38).

The AETR, which operated from 1960–1974, also used thorium-containing fuel. The AETR was built to study and test reactor core configurations for thorium- and uranium-fuel reactors. The AETR's first nine-core configuration (through 1965) contained various amounts of U-233 and Th-232, and were driven by 93% EU fuel. For both the SRE and AETR, the thorium isotopes present in the fuel would have consisted mainly of Th-232 and its decay progeny Th-228 in partial equilibrium. Thorium-232 is also an activation product that was generated from reactor operations at SSFL (Rucker, 2009; ORAUT-TKBS-0038-2; ORAUT-TKBS-0038-5).

Research on reprocessing used nuclear fuel by partial separation of the mixed fission products was conducted in the Hot Cave of the Engineering Test Building. Research-related experiments used quantities of up to 1 kg of uranium and thorium (Oldenkamp, 1990, PDF p. 32) and up to 100 g quantities of highly irradiated materials.

Employees in the fuel examination and manufacturing facilities, reactor facilities, and critical facilities handled fissionable fuels with various enrichments, mostly compounds of uranium including carbides. The facilities also contained relatively small quantities of plutonium and thorium (with the exception of Buildings 4023, 4029, and 4030, where no thorium or plutonium was handled). Because chemical separations of irradiated fuel were not done in Area IV, there were minimal gross fission product issues (ORAUT-TKBS-0038-6, PDF pp. 9-10). Area IV employees performed decladding operations on some fuel elements in the hot cells, resulting in quantities of fission products with high fission yields (e.g., strontium-90 and cesium-137) in the hot cell environment. There were smaller amounts

of europium-152, europium-154, and tritium. Containment within the hot cell helped minimize the risk of fission product exposures.

Americium is transuranic, meaning that it is produced artificially and is radioactive. At Area IV, it was produced in the reactor cores. Documentation also shows that Area IV had sealed sources of americium. Transuranic radionuclide contamination from the fuel within the reactors could have contributed to radiological exposures at the reactor buildings in Area IV. The book, *Radiological Assessment, A Textbook on Environmental Dose Analysis* quantified the transuranics present in spent reactor fuels (Till, 1983). The majority of the transuranic activity would have been from plutonium-238, plutonium-239, plutonium-240, plutonium-241, americium-241, and curium-244. The research activities conducted on the spent fuel, including decladding operations in hot cells, could have potentially been a path of exposure for employees conducting this research. Workers who subsequently performed decontamination procedures on the hot cells were also potentially exposed to these isotopes.

Some of the research at Area IV required using small amounts of special radioisotopes that were prepared and brought to the SSFL and used in laboratories under carefully controlled conditions. The Transuranic Management by Propartitioning-Separation (TRUMP-S) program, a joint project between the United States and Japan, was one of these research programs. TRUMP-S involved separating long-lived transuranics from spent nuclear fuel and conducting research into finding a way to destroy long-lived radioactive isotopes by fissioning them in a nuclear reactor or accelerator. TRUMP-S used small quantities of plutonium, neptunium, and americium. The materials for the TRUMP-S testing included 4 g of americium, which was stored in the Fuel Storage Facility, Building 4064, until the tests were transferred to the University of Missouri Research Reactor sometime after 1990. By May 1991, the material was no longer stored in Building 4064 (Oldenkamp, 1990, PDF p. 33).

Area IV of SSFL's nuclear reactor development and testing, nuclear support operations, and non-nuclear energy research and development operations are described more thoroughly (including a chronological representation of the programs and a table indicating building/site-specific nuclear operations and the associated time period) in ORAUT-TKBS-0038-2. These operations had the potential to result in both irradiated and non-irradiated radiological materials, including americium and thorium, for Area IV employees during period from January 1, 1965 through December 31, 1988. Table 5-2 in the SEC-00093 Evaluation Report (NIOSH, 2009) gives the radioisotopes associated with the nuclear operations, by facility.

Nuclear reactor operations at Area IV ended by 1980. Most nuclear support operations, with the exception of operations that supported closure and cleanup activities, ended by 1988. Limited deactivation and decommissioning support functions continued past 1988, including Fuel Storage Facility operations, which were terminated in 1993; operations in the Radiation Instrument Calibration Laboratory, which were terminated in 1996, with instrument calibration moved to Building 4100; and the Radiological Materials Handling Facility, which is still operating to support DOE's cleanup effort and its operations will end when the facility goes into full closure. Because most nuclear support operations ended by 1988, 1988 represents a significant change in operations and a significant change in exposure potential across Area IV.

4.3 Time Period Associated with Radiological Operations

Per the DOE Office of Health, Safety and Security, the time period associated with DOE operations at Area IV is from 1955-1988, with a DOE remediation period from 1988 to the present (DOE, 2016). As presented in Section 3.0 of this report, DHHS has already included employees at Area IV of SSFL during the periods from January 1, 1955 through December 31, 1958, and from January 1, 1959 through December 31, 1964, in the SEC. Nuclear support operations at Area IV ended by 1988, significantly reducing the potential for radiation exposure after 1988. NIOSH has determined that it cannot estimate internal radiation doses from exposures to certain radionuclides, with sufficient accuracy, for the employees who worked in any area at Area IV of the SSFL through December 31, 1988. Radiological operations associated with this evaluation begin on January 1, 1965 (the end of the most current SEC class designation) and continue through December 31, 1988.

4.4 Site Locations Associated with Radiological Operations

NIOSH has determined that the site-specific and claimant-specific data available for the period from January 1, 1965 through December 31, 1988, do not allow NIOSH to characterize employee movements across Area IV of the SSFL site. NIOSH is therefore unable to define individual employee exposure scenarios based on specific work locations within Area IV during the period under evaluation.

4.5 Job Descriptions Affected by Radiological Operations

NIOSH has determined that the site-specific and claimant-specific data available for Area IV of the SSFL for the time- period included in this evaluation (January 1, 1965– December 31, 1988) are not sufficient to allow NIOSH to determine that any specific work group was not potentially exposed to radioactive material releases or possible subsequent contamination.

NIOSH has insufficient information associating job titles and/or job assignments with specific radiological operations or conditions. Without such information, NIOSH is unable to define potential radiation exposure conditions based on employee job descriptions.

5.0 Summary of Available Monitoring Data for the Proposed Class

The primary data used for determining internal exposures are derived from personal monitoring data, such as urinalyses, fecal samples, and whole-body counting results. If these are unavailable, the air monitoring data from breathing zone and general area monitoring are used to estimate the potential internal exposure. If personal monitoring and breathing zone area monitoring are unavailable, internal exposures can sometimes be estimated using more general area monitoring, process information, and information characterizing and quantifying the source term.

This same hierarchy is used for determining the external exposures to the cancer site. Personal monitoring data from film badges or thermoluminescent dosimeters (TLDs) are the primary data used to determine such external exposures. If there are no personal monitoring data, exposure rate surveys, process knowledge, and source term modeling can sometimes be used to reconstruct the potential exposure.

A more detailed discussion of the information required for dose reconstruction can be found in OCAS-IG-001, *External Dose Reconstruction Implementation Guideline*, and OCAS-IG-002, *Internal Dose Reconstruction Implementation Guideline*. These documents are available on the Radiation Dose Reconstruction Program (DR) page.

5.1 Data Capture Efforts and Sources Reviewed

As a standard practice, NIOSH completed an extensive database and Internet search for information regarding Area IV. The database search included the DOE Legacy Management Considered Sites database, the DOE Office of Scientific and Technical Information (OSTI) database, the Energy Citations database, and the Hanford Declassified Document Retrieval System. In addition to general Internet searches, the NIOSH Internet search included OSTI OpenNet Advanced searches, OSTI Information Bridge Fielded searches, Nuclear Regulatory Commission (NRC) Agency-wide Documents Access and Management (ADAMS) web searches, and the DOE-National Nuclear Security Administration (NNSA)-Nevada Site Office-search. Attachment One contains a summary of Area IV documents. The summary specifically identifies data capture details and general descriptions of the documents retrieved.

In addition to the database and Internet searches listed above, NIOSH identified and reviewed numerous data sources to determine information relevant to determining its ability to reconstruct dose for the class of employees under evaluation. This included determining the availability of information on personal monitoring, area monitoring, industrial processes, and radiation source materials. NIOSH's Site Research Database (SRDB) currently contains over 2,300 documents associated with Area IV of the SSFL. The following subsections summarize the data sources identified and reviewed by NIOSH.

5.2 Previous Dose Reconstructions

NIOSH reviewed its NIOSH DCAS Claims Tracking System (referred to as NOCTS) to locate EEOICPA-related dose reconstructions that might provide information relevant to the petition evaluation. Table 5-1 summarizes the results of this review. (NOCTS data available as of August 10, 2016)

Table 5-1: No. of Area IV of the SSFL Claims Submitted Under the Dose Reconstruction Rule

Description	Totals
Total number of claims submitted for dose reconstruction	311
Total number of claims submitted for energy employees who worked during the period under evaluation (January 1, 1965–December 31, 1988)	216
Number of dose reconstructions completed for energy employees who worked during the period under evaluation (i.e., the number of such claims completed by NIOSH and submitted to the Department of Labor for final approval).	174
Number of claims for which internal dosimetry records were obtained for the identified years in the evaluated class definition	62
Number of claims for which external dosimetry records were obtained for the identified years in the evaluated class definition	54

5.3 Worker Interviews

There have been numerous interviews conducted with former Area IV employees, including 51 interviews conducted by the Environmental Protection Agency (EPA) as documented in the *Draft Final Former Employee Interview Report, Santa Susana Field Laboratory Site Area IV Radiological Study, Ventura County, California* (HydroGeoLogic, 2012), 107 conducted by DOE and documented in *Santa Susana Field Laboratory Former Worker Interviews* (P2 Solutions, 2011), and 23 separate documented communications with 37 former employees conducted by the EEOICPA program. As always, NIOSH also reviewed the Compute Assisted Telephone Interview (CATI) reports contained in NOCTS. NIOSH does not expect that additional interviews will provide new information for the January 1, 1965 through December 31, 1988, SEC-00234 evaluation period. Therefore, additional interviews were not conducted for this evaluation report.

5.4 Internal Monitoring Data

Exposure to fission products was possible, though as described in Section 4.2, exposures were limited by hot cell containment. Exposure to fissionable material, transuranics, and activation products was also possible (NIOSH, 2009). Summaries of the available *in vitro* and *in vivo* data, as well as general overviews of sampling and analytical protocols, are provided in the previous SEC-00093 Evaluation Report (NIOSH, 2009). Additional details, including analytical methods, detectable activities, and reporting protocols can be found in *Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility, the Downey Facility, and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International)-Occupational Internal Dose* (ORAUT-TKBS-0038-5).

After evaluating SEC-00156, NIOSH and ORAUT staff continued to assess the post-December 31, 1964 period to see if radiation doses could be reconstructed. They developed an internal dose coworker study, *Internal Coworker Dosimetry Data for Area IV of the Santa Susana Field Laboratory and the De Soto Avenue Facility*, which includes the post-December 31, 1964 period (ORAUT-OTIB-0080). Initially, upon limited analysis of the available data, NIOSH believed that the data would be sufficient for developing bounding coworker internal dose distributions. ORAUT-OTIB-0080 was developed, using urinalysis bioassay data obtained directly from the site. The data came in the form of electronic scans of original bioassay records. These records contain data from the Area IV internal bioassay records and records from the analytical laboratories that performed urinalyses. Area IV received urinalysis data from the laboratories and transcribed that data onto internal forms, which the site refers to as "8 X 11" and "McBee cards" (ORAUT-OTIB-0080, PDF pp. 7-8). NIOSH has over 1,350 urinalysis results for 1965 and over 17,000 results for post-1964 years.

The Area IV of the SSFL Advisory Board Working Group reviewed the ORAUT-OTIB-0080 coworker study, identified a concern, and issued a Finding, stating that the study did not address thorium, americium, cesium, strontium, polonium, or cobalt. The coworker model that is included in ORAUT-OTIB-0080 addresses exposures to strontium, as a fission product, as well as cesium and cobalt, which can be assessed with strontium. Documentation has not confirmed that polonium was a contaminant at the site. Thus, polonium is not included in this evaluation. Regarding the radionuclides thorium and americium, NIOSH responded to the Working Group's concern and agreed that there is a lack of sufficient bioassay data to support developing a coworker study. As part of this evaluation, NIOSH has completed a more extensive review of the available thorium and americium

monitoring and source term data. Based on this review NIOSH concludes that a source term existed at Area IV of SSFL, for both thorium and americium for which exposures were unmonitored.

5.5 External Monitoring Data

NIOSH has access to photon, beta, and neutron external dosimetry results, as well as other supporting data representing Area IV site operations through 1988. SSFL's policy was to assign external dosimetry based on job assignments that required potential exposure to radioactive materials (NIOSH, 2009; ORAUT-TKBS-0038-6). Summaries of the available external monitoring data can be found in the SEC-00093 Evaluation Report (NIOSH, 2009). Details regarding the various analyses used, and the associated minimum detectable activities, are presented in ORAUT-TKBS-0038-6.

Through the course of on-going dose reconstruction efforts and investigations associated with both SEC-00093 and SEC-00156, NIOSH determined that although external monitoring data are available for most employees at Area IV, some employees could have received external radiation exposures that went unmonitored. To assess potential external dose to unmonitored employees, NIOSH developed a coworker dose distribution model (ORAUT-OTIB-0077).

5.6 Workplace Monitoring Data

NIOSH has access to workplace air, surface, and environmental monitoring data for Area IV buildings. The SSFL Area IV health physics program records include air samples for alpha (in limited cases) and beta-emitters.

An environmental monitoring program, including air emissions and ambient air monitoring, was established at Area IV of the SSFL in May 1954, prior to the first radiological facility being completed (Sapere, 2005). From 1955 to present, gross-beta activity in air has been measured continuously in Area IV. Potential inhalation intakes from onsite atmospheric radionuclide concentrations can be estimated using average annual concentrations of facility stack emissions (ORAUT-TKBS-0038-4). Stack emission data from various facilities for 1988-1999, are available and the data were used to characterize radionuclide emissions for all years (ORAUT-TKBS-0038-4).

While workplace-monitoring data are available, the workplace-monitoring data for the period evaluated in this report are not adequate to reconstruct radiation doses with sufficient accuracy. The workplace-monitoring data do not support dose reconstruction for potential americium or thorium exposures. Additional information regarding the available workplace and air-monitoring data can be found in the previous SEC-00093 Evaluation Report (NIOSH, 2009) and ORAUT-TKBS-0038-4.

5.7 Radiological Source Term Data

The diverse reactor, accelerator, and support operations at Area IV resulted in potential exposures to various radioisotopes. In May 2005, Volume 1 of the Historical Site Assessment (HSA) of Area IV of the SSFL (Sapere, 2005) was published. The HSA summarizes the operational history of Area IV from a radiological perspective. This summary identifies areas of radiological operations, compiles prior radiological cleanups and releases, and identifies additional actions needed to ensure the radiological cleanup of Area IV. This report identifies potential radionuclides of concern, both in nuclear reactor operations areas and in support areas. HSA Tables 2-1 and 2-2 indicate americium,

cesium, cobalt, europium, plutonium, radium, strontium, thorium, tritium, and uranium as potential radionuclides in Area IV.

In the absence of employee or workplace-monitoring data, the source term and activity data available to NIOSH are not adequate to reconstruct radiation doses with sufficient accuracy. Summaries of the general and building-specific source term information available to NIOSH for Area IV can be found in the previous SEC-00093 Evaluation Report (NIOSH, 2009) and ORAUT-TKBS-0038-2.

6.0 Feasibility of Dose Reconstruction for the Proposed Class

42 C.F.R. § 83.14(b) states that DHHS will consider a NIOSH determination that there was insufficient information to complete a dose reconstruction, as indicated in this present case, to be sufficient, without further consideration, to conclude that it is not feasible to estimate the levels of radiation dose for individual members of the class with sufficient accuracy.

In the case of a petition submitted to NIOSH under 42 C.F.R. § 83.9(b), NIOSH has already determined that a dose reconstruction cannot be completed for an employee at the DOE or AWE facility. This determination by NIOSH provides the basis for the petition by the affected claimant. Per § 83.14(a), the NIOSH-proposed class defines those employees who, based on completed research, are similarly affected and for whom, as a class, dose reconstruction is similarly not feasible.

In accordance with § 83.14(a), NIOSH may establish a second class of co-workers at the facility for whom NIOSH believes that dose reconstruction is similarly infeasible, but for whom additional research and analysis is required. If so identified, NIOSH would address this second class in a separate SEC evaluation rather than delay consideration of the claim currently under evaluation (see Section 10). This would allow NIOSH, the Board, and DHHS to complete, without delay, their consideration of the class that includes a claimant for whom NIOSH has already determined a dose reconstruction cannot be completed, and whose only possible remedy under EEOICPA is the addition of a class of employees to the SEC.

This section of the report summarizes research findings by which NIOSH determined that it lacked sufficient information to complete the relevant dose reconstruction and on which basis it has defined the class of employees for which dose reconstruction is not feasible. NIOSH's determination relies on the same statutory and regulatory criteria that govern consideration of all SEC petitions.

6.1 Feasibility of Estimating Internal Exposures

NIOSH has evaluated the available employee and workplace monitoring data and source term information and has determined that there are insufficient data for estimating internal exposures, as described below.

As presented in Section 3.0 of this report, DHHS has previously designated two SEC classes for Area IV of the SSFL: January 1, 1955 through December 31, 1958 (DHHS, 2009) and January 1, 1959 through December 31, 1964 (DHHS, 2010).

In its previous SEC-00093 Evaluation Report (NIOSH, 2009), NIOSH determined that a routine bioassay monitoring program was established at Area IV in late 1958. In NIOSH's SEC-00156 Evaluation Report (NIOSH, 2010), NIOSH determined that there were insufficient access controls in

place at Area IV. As a result, some employees who should have been monitored were not monitored. Although bioassay data are available for most monitored employees after 1958, NIOSH determined that some Area IV employees could have received intakes of radioactive materials that went unmonitored. After its initial evaluation of SEC-00093, NIOSH continued its data capture activities in an attempt to locate additional data that could be used to develop the internal dose coworker distributions, beginning in 1959. However, the available data contained a large amount of ambiguous or indeterminate results for periods prior to 1965, making the available data inadequate for developing bounding coworker distribution models for years prior to 1965.

Available bioassay data for Area IV employees include plutonium bioassay, uranium bioassay, and data representing fission products. As described in Section 5.7 of this report, the potential radionuclides in Area IV resulting from the reactor and nuclear support operations have been researched and documented over the years, as part of the site decontamination and decommissioning efforts. The available bioassay monitoring data represent exposures to uranium, plutonium, and mixed fission products. The available Area IV data were statistically analyzed according to *Analysis of Coworker Bioassay Data for Internal Dose Assignment* (ORAUT-OTIB-0019) and the statistical methods in *Analysis of Stratified Coworker Datasets* (ORAUT-RPRT-0053), as reported in ORAUT-OTIB-0080. The results were entered into the Integrated Modules for Bioassay Analysis (IMBA) computer program to obtain intake rates for the assignment of dose distributions. Through this analysis, NIOSH is able to assign dose for strontium, cesium, and cobalt exposures, which addresses some of the SSFL Advisory Board Working Group's internal dose reconstruction concerns.

Much of the source term information for Area IV is available through site records. SSFL established and maintained a centralized radiological records program. The health physics records and source term and process information, including types and quantities of specific radionuclides and sources present, their chemical and physical form, and the types and frequency of operations (including controls) in which these sources were utilized are available to NIOSH. However, the americium source term associated with the spent fuel was not quantified in terms of total quantity or ratio to other fuel nuclides in records reviewed by NIOSH. NIOSH has more information on thorium source term; however, the information is uncertain. Without additional well-defined information regarding the total americium or thorium source term across the diverse reactor operations, over time, NIOSH cannot use source term estimates to bound potential americium or thorium internal exposures.

NIOSH has concluded, based on assessment of the available employee monitoring data, that there are insufficient internal dosimetry data or air-monitoring data available to bound intakes of thorium and americium (including their associated progeny) for the period from January 1, 1965 through December 31, 1988. Nor does NIOSH have access to sufficient source term data, for programs or facilities over time, to estimate potential internal exposures to americium or thorium during the period of DOE operations. Consequently, NIOSH finds that it is not feasible to estimate, with sufficient accuracy, internal exposures to americium or thorium and resulting doses for the class of employees covered by this evaluation. NIOSH has sufficient monitoring information to estimate intakes of uranium, plutonium, and fission products as described in ORAUT-OTIB-0080.

Although NIOSH found that it is not possible to completely reconstruct internal radiation doses for the period from January 1, 1965 through December 31, 1988, NIOSH intends to use any internal monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Dose reconstructions for individuals employed at Area IV of the SSFL during the period from January 1, 1965 through December 31,

1988, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

6.2 Feasibility of Estimating External Exposures

This evaluation responds to a petition based on NIOSH determining that internal radiation exposures to certain radionuclides and fission products could not be reconstructed for a dose reconstruction referred to NIOSH by the Department of Labor (DOL). As noted above, DHHS will consider this determination sufficient, without further consideration to determine that it is not feasible to estimate the levels of radiation doses of individual members of the class with sufficient accuracy. Consequently, it is not necessary for NIOSH to fully evaluate the feasibility of reconstructing external radiation exposures for the class of employees covered by this report.

In its previous SEC-00093 and SEC-00156 class designations, NIOSH has found that it has access to sufficient employee monitoring and workplace monitoring data to bound potential external exposures for employees at Area IV of the SSFL for January 1, 1955 through December 31, 1958, and January 1, 1959 through December 31, 1964. This current evaluation has found no evidence to the contrary for the period from January 1, 1965 through December 31, 1988. NIOSH has established that it has access to sufficient information to either: (1) estimate the maximum external radiation dose for every type of cancer for which radiation doses are reconstructed that could have been incurred under plausible circumstances by any member of the class; or (2) estimate the external radiation doses to members of the class more precisely than a maximum dose estimate.

Adequate medical dose reconstruction is possible by using the assumptions described in *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures* (ORAUT-OTIB-0006) and site profile documents for Area IV of the SSFL.

6.3 Class Parameters Associated with Infeasibility

DHHS has designated an SEC class for Area IV employees for the period from January 1, 1955 through December 31, 1958 (DHHS, 2009), and one for the period from January 1, 1959 through December 31, 1964 (DHHS, 2010). Through the course of on-going dose reconstruction, continued data capture efforts, and the development of the internal coworker study (ORAUT-OTIB-0080), NIOSH has determined that the inability to estimate, with sufficient accuracy, the total internal dose for Area IV employees extends through December 31, 1988. Therefore, NIOSH recommends that the NIOSH-proposed class include the period from January 1, 1965 through December 31, 1988.

As discussed in Section 4.4, NIOSH is unable to define individual employee exposure scenarios based on specific work locations within Area IV. Therefore, NIOSH recommends that the proposed class definition include all areas of Area IV of the SSFL during the specified time-period.

NIOSH has found insufficient documentation associating job titles and/or job assignments with specific radiological operations or conditions. Without this information, NIOSH is unable to define the proposed SEC class based on job descriptions or the availability of individual monitoring data. NIOSH therefore recommends that the proposed class definition include all employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area at Area IV during the specified time-period, regardless of whether an employee was monitored for radiation exposure.

7.0 Summary of Feasibility Findings for Petition SEC-00234

This report evaluates the feasibility for completing dose reconstructions for employees at Area IV of the SSFL from January 1, 1965 through December 31, 1988. Based on its review of documentation, NIOSH concludes that a source term existed at Area IV of SSFL, for both thorium and americium that was sufficient from a dosimetric perspective to present a personnel exposure concern. NIOSH determined that members of this class may have received radiation exposures from intakes of americium and thorium. NIOSH lacks sufficient information, which includes biological monitoring data, sufficient air monitoring information, or sufficient process and radiological source information that would allow it to estimate the potential internal exposures to which the proposed class may have been exposed.

NIOSH has documented here that it cannot complete the dose reconstructions related to this petition. The basis of this finding demonstrates that NIOSH does not have access to sufficient information to estimate either the maximum radiation dose incurred by any member of the class or to estimate such radiation doses more precisely than a maximum dose estimate.

Dose reconstruction for external radiation exposures, occupational medical dose, and internal dose due to uranium isotopes, plutonium isotopes, and fission products (strontium, cesium, and cobalt) as described in ORAUT-OTIB-0080 can be reconstructed for this class of employees.

Although NIOSH found that it is not possible to completely reconstruct radiation doses for the proposed class, NIOSH intends to use any internal and external monitoring data that may become available for an individual claim (and that can be interpreted using existing NIOSH dose reconstruction processes or procedures). Therefore, dose reconstructions for individuals employed at Area IV of the SSFL during the period from January 1, 1965 through December 31, 1988, but who do not qualify for inclusion in the SEC, may be performed using these data as appropriate.

8.0 Evaluation of Health Endangerment for Petition SEC-00234

The health endangerment determination for the class of employees covered by this evaluation report is governed by EEOICPA and 42 C.F.R. § 83.14(b) and § 83.13(c) (3). Pursuant to these requirements, if it is not feasible to estimate with sufficient accuracy radiation doses for members of the class, NIOSH must determine that there is a reasonable likelihood that such radiation doses may have endangered the health of members of the class. The regulations require NIOSH to assume that any duration of unprotected exposure may have endangered the health of members of a class when it has been established that the class may have been exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. If the occurrence of such an exceptionally high-level exposure has not been established, then NIOSH is required to specify that health was endangered for those employees who were employed for a number of work days aggregating at least 250 work days within the parameters established for the class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

NIOSH has determined that members of the class were not exposed to radiation during a discrete incident likely to have involved levels of exposure similarly high to those occurring during nuclear criticality incidents. However, the evidence reviewed in this evaluation indicates that some employees in the class may have accumulated chronic radiation exposures through intakes of fission

products or other radionuclides from direct exposure to radioactive materials. Consequently, NIOSH is specifying that health was endangered for those employees covered by this evaluation who were employed for ~~a~~ number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

9.0 NIOSH-Proposed Class for Petition SEC-00234

The evaluation defines a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. This class includes all employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked in any area at Area IV of the Santa Susana Field Laboratory in Ventura County, California, from January 1, 1965 through December 31, 1988, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort.

10.0 Evaluation of Second Similar Class

Following § 83.14(a), NIOSH may establish a second class of co-workers at the facility, similar to the class defined in Section 9.0, for whom NIOSH believes that dose reconstruction may not be feasible, and for whom additional research and analyses is required. If a second class were identified, it would require additional research and analyses. Such a class would be addressed in a separate SEC evaluation rather than delay consideration of the current claim. At this time, NIOSH has not identified a second similar class of employees at Area IV of the SSFL for whom dose reconstruction may not be feasible.

11.0 References

42 C.F.R. pt. 81, *Guidelines for Determining the Probability of Causation Under the Energy Employees Occupational Illness Compensation Program Act of 2000;* Final Rule, Federal Register/Vol. 67, No. 85/Thursday, p 22,296; May 2, 2002; SRDB Ref ID: 19391

42 C.F.R. pt. 82, *Methods for Radiation Dose Reconstruction Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 2, 2002; SRDB Ref ID: 19392

42 C.F.R. pt. 83, *Procedures for Designating Classes of Employees as Members of the Special Exposure Cohort Under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule; May 28, 2004; SRDB Ref ID: 22001

42 U.S.C. §§ 7384-7385 [EEOICPA], *Energy Employees Occupational Illness Compensation Program Act of 2000*; as amended; DCAS website

Atomics International, 1961, *SRE Fuel Element Damage*, Final Report; Atomics International; Issued June 30, 1961; SRDB Ref ID: 20586

Dennison, 1977, *Final Report-SRE Fuel Decladding*; W. F. Dennison; February 22, 1977; SRDB Ref ID: 158246

DHHS, 2009, *DHHS Designation of Additional Members of the Special Exposure Cohort under the Energy Employees Occupational Illness Compensation Program Act for Santa Susana Field Laboratory-Area IV*; Department of Health and Human Services (DHHS); June 18, 2009; SRDB Ref ID: 134474

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DOE, 2009, *Energy Technology Engineering Center-DeSoto Avenue Facility*, website; Department of Energy (DOE); web page accessed on November 3, 2009; SRDB Ref ID: 76394

DOE, 2016, *Office of Environment, Health, Safety and Security Find Energy Facility Search for Area IV of the Santa Susana Field Laboratory*, website; Department of Energy (DOE); web page accessed on August 19, 2016; SRDB Ref ID: 159351

HydroGeoLogic, 2012, *Draft Final Former Employee Interview Report, Santa Susana Field Laboratory Site Area IV Radiological Study, Ventura County, California*; HydroGeoLogic, Inc.; February 2012; SRDB Ref ID: 139699

NIOSH, 2009, *SEC Petition Evaluation Report for Petition SEC-00093, Santa Susana Field Laboratory-Area IV*, Rev. 1; National Institute for Occupational Safety and Health (NIOSH); April 28, 2009; SRDB Ref ID: 76961

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Oldenkamp, 1990, *Nuclear Operations at Rockwell's Santa Susana Field Laboratory—a Factual Perspective*; R. D. Oldenkamp and J. C. Mills; January 1990; SRDB Ref ID: 75029

ORAUT-OTIB-0006, *Dose Reconstruction from Occupationally Related Diagnostic X-Ray Procedures*, Rev. 03; ORAU TEAM Dose Reconstruction Project for NIOSH; August 2, 2005; SRDB Ref ID: 19422

ORAUT-OTIB-0019, *Analysis of Coworker Bioassay Data for Internal Dose Assignment*, Rev. 01; ORAU TEAM Dose Reconstruction Project for NIOSH; effective October 7, 2005; SRDB Ref ID: 19438

ORAUT-OTIB-0077, *External Coworker Dosimetry Data for Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility (Vanowen Building), and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International)*, Rev. 00; ORAU TEAM Dose Reconstruction Project for NIOSH; effective August 3, 2009; SRDB Ref ID: 72162

ORAUT-OTIB-0080, *Internal Coworker Dosimetry Data for Area IV of the Santa Susana Field Laboratory and the De Soto Avenue Facility*, Rev. 00; ORAU TEAM Dose Reconstruction Project for NISOH; effective March 14, 2014; SRDB Ref ID: 131215

ORAUT-RPRT-0053, *Analysis of Stratified Coworker Datasets*, Rev. 01; ORAU TEAM Dose Reconstruction Project for NIOSH; effective July 16, 2012; SRDB Ref ID: 116168

ORAUT-TKBS-0038-2, *Energy Technology Engineering Center-Site Description*, Rev. 00; ORAU TEAM Dose Reconstruction Project for NIOSH; effective February 2, 2006; SRDB Ref ID: 22140

ORAUT-TKBS-0038-4, *Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility (Vanowen Building), the Downey Facility, and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International)-Occupational Environmental Dose*, Rev. 01; ORAU TEAM Dose Reconstruction Project for NIOSH; effective March 8, 2007; SRDB Ref ID: 30622

ORAUT-TKBS-0038-5, *Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility, the Downey Facility, and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International)-Occupational Internal Dose*, Rev. 01; ORAU TEAM Dose Reconstruction Project for NIOSH; effective April 26, 2010; SRDB Ref ID: 80541

ORAUT-TKBS-0038-6, *Area IV of the Santa Susana Field Laboratory, the Canoga Avenue Facility, the Downey Facility, and the De Soto Avenue Facility (sometimes referred to as Energy Technology Engineering Center [ETEC] or Atomics International)-Occupational External Dose*, Rev. 02; ORAU TEAM Dose Reconstruction Project for NIOSH; effective April 26, 2010; SRDB Ref ID: 80538

P2 Solutions, 2011, *Santa Susana Field Laboratory Former Worker Interviews*; P2 Solutions; November 2011; SRDB Ref ID: 134601

Rucker, 2009, *Radionuclides Related to Historical Operations at the Santa Susana Field Laboratory Area IV*; Thomas L. Rucker; March 2009; SRDB Ref ID: 132139

Sapere, 2005, *Historical Site Assessment of Area IV Santa Susana Field Laboratory, Ventura County, California*, Volume 1-Methodology; Sapere Consulting, Inc. (Sapere) and Boeing Company; May; 2005; SRDB Ref ID: 20531

Till, 1983, *Radiological Assessment, a Textbook on Environmental Dose Analysis*; Edited by John E. Till and H. Robert Meyer; Printed in September 1983; SRDB Ref ID: 40438

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Attachment One: Data Capture Synopsis

Table A1-1: Summary of Holdings in the SRDB for Area IV of the Santa Susana Field Laboratory

Data Capture Information	Data Capture Description	Completed	No. Uploaded into SRDB
Primary Site/Company Name: Area IV of the Santa Susana Field Laboratory DOE 1955-1988, DOE remediation 1988-present Other Site Names: Nuclear Development Field Laboratory (NDFL); Liquid Metal Engineering Center (LMEC); Energy Technology Engineering Center (ETC) Physical Size of the Site: SSFL is a total of 2,850 acres with Area IV being 290 acres. Approximately 104 buildings are located in Area IV based on a 2005 aerial photo, of which 27 were radiological facilities. Site Population: In 1973, at its height, ETEC employed 450 people. Between 1950 and 1993, 4,563 Rocketdyne/AI employees were monitored for external radiation exposure and 2,297 were monitored for internal radiation exposure (Note: the 2,297 is primarily a subset of the 4,563). In 1991, there were about 150 employees at ETEC and less than 1,000 throughout the SSFL Complex.	Environmental surveys (1952-1955), drop air sampling data (1977-1981), basis for routine urine sampling of workers exposed to Pu-239, activity released to atmosphere (1959-1962), AE-6 reactor operations neutron and gamma exposure (1959-1960), air sample data (1951-1955, 1960-1962, 1964, 1967-1970, 1975, 1976, 1978-1980), airflow measurements in ventilation systems, ALARA report (1991), authorization for test operation of Organically Moderated Reactor Experiment (OMRE), annual radiation exposure reports (1965, 1967, 1970 and 1971), annual review of radiological controls (1977, 1979), approval for critical loading and low power tests in the OMRE, area film badge readings with gamma and neutron data (1959), effluent monitoring report for special nuclear material license SNM-21, health physics procedures, bioassay data (1958-1961), control film adjustments for film badges, trip report, disposal of excess property, dosimeter exposure records (1952-1954), effluent monitoring report (1976-1989), environmental sampling (1954-1970), excretion of strontium-90 following accidental inhalation, exhaust stack data, fast test reactors information (1958), film badge calibration data (1955-1956), first experimental data bioassay logbook (1958), neutron data, dose rates (1963), health and safety manual, incident reports, lapel sample data (1975-1976), license information and renewals, list of operations and rooms for Santa Susana Field Laboratory (SSFL) and Vanowen (1959), location badge results (1952-1954), location of air sample stations, medical program description, neutron/gamma radiation survey, nuclear operations at SSFL, nuclear safety, plutonium contamination levels, radiation safety plan, source inventory, radiological characterization, radiological surveys, reactor and fuel element data, reactor operations monthly reports (1969), Sodium Reactor Experiment (SRE) related information, stack characterization, tritium production and release to groundwater at SSFL, U-235 lung measurements (1982), uranium fire incident (1967), urinalysis results (1959-1963), and a wound monitoring procedure.	06/09/2016	736
State Contacted: California Department of Public Health	Amendments and inspection reports associated with licenses 0015-19, 0273-59, 0015-70, 0015, 0015-59 and SNM-21, confirmation radiological surveys for Buildings T363, T019, T013, T012, T059, T626, T038,T023, T030, and 009, encapsulation of the 1000 ci Po-Be neutron source, exposures received by Atomics International personnel at the University of Washington cyclotron (1975), radiological procedures, post-remediation ambient gamma radiological survey of the former Sodium Disposal Facility, reviews of the Rocketdyne Radiation Worker Health Study, survey of contaminated fume hood and HEPA filter system, and a verification survey of the De Soto Mass Spectroscopy Laboratory.	12/28/2009	56

Data Capture Information	Data Capture Description	Completed	No. Uploaded into SRDB
Albany Research Center (ARC)	Atomic Energy Commission (AEC) hot cells and related facilities information.	03/21/2013	1
Argonne National Laboratory East (ANL-E)	Health and Safety Plan for technical support to the ANL-E Area 317 Project (1993).	09/22/2005	1
Atomics International	Questions on external dosimetry and background doses (2005- 2006).	05/15/2007	2
Cincinnati Library	History of the United States Atomic Energy Commission Volume III, beta-gamma delayed coincidence method for U-238 activation analysis, computing absolute thermal neutron flux from measurements made with indium foils, disposal of OMRE high boiler fractions by burning, evaluation of fallout data, neutron-flux distribution, and thorium-uranium fuel elements for the SRE.	09/30/2009	12
Claimant Provided	Collection of technical data records on Systems for Nuclear Auxiliary Power (SNAP) and the implosion of Plexiglas bubble on welding in Building 001.	06/03/2009	2
Department of Labor - Paragon	Surplus Facilities Management Program (SFMP) year-end review and contract DE-ACO1-88NE46125 monthly progress report (1989).	12/30/2008	2
DOE Carlsbad	Annual groundwater monitoring report SSFL (1992-1999), Atomics International Skywriter newsletter, environmental monitoring report (1990-1992), fission product and fissile content of SRE fuel, flux mapping study for SNAP 10a and 2, measurement of the 10-B(N, He) and 6-Li(N, He) reaction rates in Zero Power Physics Reactor (ZPPR) r-13c, contract AT(04-3)-701 information, monthly decontamination report (1975-1976), radiological safety responsibilities, reactor safety survey report Kinetic Experiments on Water Boilers (KEWB), removal of primary sodium components from the sodium service vaults, flight test experience, snapshot vehicle dosimeters, weekly progress reports (1958), threshold helium generation reaction rate measurements in Fast Flux Test Facility (FFTF), and the transfer of excess 3.02 per cent U-235 uc from Hallam Nuclear Power Facility (HNPF) to Advanced Sodium Cooled Reactor (ASCR).	08/16/2010	47
DOE Environmental Management Consolidated Business Center (EMCBC) - Oakland	Decommissioning safety analysis reports, environmental monitoring reports, groundwater management, monitoring program for industrial wastewater, onsite Radiological Contingency Plan under special nuclear material license SNM-21, posting radiologically controlled areas, radiation incident reports, radiological surveys, reports detailing activities on the groundwater program, and unusual shipment occurrence.	12/18/2009	19
DOE Germantown	Area IV (ETEC) SSFL De Soto Avenue Facility Canoga Avenue Facility/Vanowen Building Downey Facility (Boeing Company) search procedures and Building 059 phase 1 pipe chase room remediation.	03/07/2011	4

Data Capture Information	Data Capture Description	Completed	No. Uploaded into SRDB
DOE Legacy Management - Grand Junction Office	Memorandum for decontamination and decommissioning of the surplus facilities at the SSFL, radiological survey reports for the SRE and Hot Cave (Building 003), radiological investigation reports, decontamination and disposition final reports, depleted uranium for Argonne National Laboratory (1951), recommendations concerning the sewer system, interim post remedial action survey report for KEWB, interim post remedial action survey reports, radiation exposure data for personnel records file, site maps and photographs, special aerospace medicine report, a groundwater bi-monthly report, request for uranyl nitrate hexahydrate reagent grade, and depleted metal orders.	06/17/2011	51
DOE Legacy Management - Morgantown	Department of Energy (DOE) Ohio Field Office recycled uranium report, resurvey program, Fernald enriched uranium production orders (1957-1960), and the National Emission Standards For Hazardous Air Pollutants proposed standards for radionuclides.	12/01/2011	8
DOE Legacy Management - MoundView (Fernald Holdings, includes Fernald Legal Database)	History of the operation of the Feed Materials Production Center by NLO, Inc., temporary stoppage of shipments of low-level nuclear waste to commercial burial grounds, DOE's annual radionuclide air emission report (1985), and a semi-annual index of nuclear energy unusual occurrence reports (1983).	02/07/2007	7
DOE Oak Ridge Operations Office - Records Holding Task Group (RHTG)	Resumption of activities (1954) and monthly status and progress reports (1952).	06/27/2012	3
DOE Office of Scientific and Technical Information (OSTI)	Absolute thermal neutron determination, neutron leakage from the 30 megawatt Sodium Graphite Reactor (SGR), quarterly technical progress report (1965), report on survey of irradiation facilities, thermal neutron flux in a lattice cell, and waste management site maps and facilities listing.	02/21/2012	11
Energy Technology Engineering Center (ETEC)	Bioassay program information, industrial and radiological accidents in USACE facilities, activity report for radiation protection and health physics services, American Nuclear Insurers audit reports (1978-1990), annual review of radiological controls (1975-1988), thorium oxide material users permit and machining of thorium oxide components (1971), Atomics International environmental monitoring and facility effluent annual report (1975), health physics procedures, bioassay information (1965-1967), dosimetry record descriptions, environmental monitoring report (1972), ETEC occupational medical exposure on activities at Building 038 (Vanowen Building), internal/external dosimetry technical basis documents, Landauer film dosimeter information, monthly progress report on health, safety, and the environment, neutron survey of "SRE Hot Cell" containing a 14 mev neutron generator, report of in-vivo counting for Atomic International Division, Rocketdyne Division environmental monitoring annual report, thorium machining, and updated whole body counting data and errors (1968).	01/21/2011	112
Federal Records Center (FRC) - Kansas City	Argonne National Laboratory nuclear fuel cycle and waste management field work package and task proposal/agreements (1983, 1984, and 1985).	08/15/2008	1

Data Capture Information	Data Capture Description	Completed	No. Uploaded into SRDB
Federal Records Center (FRC) - San Bruno	Environmental monitoring reports (1984-1989), air emissions annual report (1985), appraisal of Atomics International Radiation Safety program (1967), groundwater monitoring report (1989), CERCLA assessment, employee safety concerns, ETEC radioactive materials and waste management, radiological surveys, external dosimetry NVLAP at ETEC, hazardous materials inventory, health physics quarterly reports, internal dose assessment procedures, investigation of naturally occurring radionuclides, appraisal of Occupational Medical program Atomics International (1970), exposure during chest x-ray, radiological decontamination, request waiver of DOE Laboratory Accreditation Program (DOELAP) for personnel dosimetry, Rocketdyne exposures (1984), summaries of fuels and materials development programs (1966), and a facility effluent report (1988).	08/02/2012	62
General Atomics	Fatality at Scrap Recovery Plant in Wood River Junction, SNAP 8-ER.	08/16/2005	1
Hanford	Hanford laboratories operation monthly activities reports (1958), irradiated test fuel at Hanford, and test procedure for flow measurement using pulsed neutron activation technique.	09/18/2014	8
Idaho National Laboratory (INL)	Idaho annual exposure records (1952), progress report (1964), radiological surveys, and shipment documents, material receipts for the ZPPR 1975-1978, and Rocky Flats solid waste shipments (1954-1970).	04/07/2016	22
Interlibrary Loan	Twenty-fifth semi-annual report of the AEC, Organic Moderator Reactor (OMR) operating history and experience, and environmental levels of radioactivity (1965-1972).	05/16/2016	16
Internet - CEDR	Mortality among radiation workers at Rocketdyne (Atomics International) (1948-1999) and a Rocketdyne worker health study final report.	08/31/2009	3
Internet - Defense Technical Information Center (DTIC)	Baseline environmental management report (1995), second international conference uranium hexafluoride handling, and radiological health data Vol. 6 No. 9 (1965).	06/24/2016	3
Internet - DOE Environmental Management Consolidated Business Center (EMCBC)	Material orders and estimates.	04/09/2010	1
Internet - DOE ETEC Website	Environmental monitoring report (1961).	09/03/2009	1
Internet - DOE Hanford Declassified Document Retrieval System (DDRS)	Reports of the SSFL advisory panel, potential pathways for release of gaseous radioactivity following fuel damage at the SRE, and monthly Hanford operations reports (1955-1956).	10/31/2008	4
Internet - DOE Legacy Management Considered Sites	FUSRAP item involving Gilman Hall and a site management guide (2012).	08/01/2012	2
Internet - DOE NNSA Nevada Site Office	No relevant documents identified.	07/20/2016	0
Internet - DOE OpenNet	AEC financial report (1964).	09/20/2012	1

Data Capture Information	Data Capture Description	Completed	No. Uploaded into SRDB
Internet - DOE OpenNet / NIOSH	Annual report to Congress of the AEC (1960).	01/11/2008	1
Internet - DOE OSTI	Radial thermal and fast neutron flux distributions in the SRE, radiological implications concerning the use of argon as the core cover, procedures for low-power physics experiments, SRE standard operating procedures, study of sodium fires, Monte Carlo method for computing the basic lattice parameters and the space dependent neutron spectra, analysis of neutron flux in the shielding of the SRE, reactor physics quarterly progress report (1953-1954), and sodium fires and the release characteristics of particulates and fission products.	01/28/2010	18
Internet - DOE OSTI / SC&A	Nuclear experiments on the SRE, preliminary radiation survey of the SRE, and radiological hazards from rupture of the secondary coolant system.	07/31/2009	3
Internet - DOE OSTI Energy Citations	Proceedings of the conference on decontamination and decommissioning, Piqua Nuclear Power Facility surveillance and recovery final report, experimental testing of core component handling for HNPF, environmental monitoring report (1960), annual report Rockwell Hot Laboratory decommissioning, gamma-ray and fast neutron annular streaming evaluation, fast neutron monitoring with film packets, annual report of waste generation (1995), nuclear fission at the HNPF, and the experience from two small quantity Rh-Tru waste sites.	01/26/2013	20
Internet - DOE OSTI Information Bridge	Swing check valve testing, small-quantity-site transuranic waste disposition alternatives, annual report FY 1998 shipments to and from the Nevada Test Site (NTS), annual report of waste generation and pollution prevention progress, annual report Rockwell International Hot Laboratory decommissioning, design and performance of induction pump for the SRE, eddy-current brake for a sodium-cooled reactor, emergency preparedness information, environmental management progress, evaluation of irradiated experimental OMR fuel elements, evaluation of thorium-uranium alloys, fuel burnup studies for Advanced Sodium Graphite Reactor, hydraulic tests of a prototype Hallam fuel element, spent fuel and radioactive waste inventories, projections, and characteristics, irradiation of U-Mo base alloys, managing spent nuclear fuel at the Idaho National Laboratory, neutron flux measurements in the mock-up of the uranium converter reactor, Savannah River Site approved site treatment plan, SRE systems and component experience, summary of radionuclide air emissions, and transuranic contaminated waste form characterization and data volume.	03/29/2013	125
Internet - DOE OSTI Information Bridge / SC&A	Environmental assessment for off-site transportation of low-level waste, neutron scattering from supporting structures of SNAP 8, and a SNAP technology handbook.	08/31/2009	3

Data Capture Information	Data Capture Description	Completed	No. Uploaded into SRDB
Internet - DOE OSTI SciTech Connect	Preliminary services for SNAP 8 flight prototype test facility Building 056 (1964), SNAP II program characteristics, kinetic behavior of water boiler type reactors (1956), feasibility report for fabrication of SNAP fuel elements, Sandia Corporation bibliography radiation effects, document review to characterize Atomic International fuels shipped to Idaho National Laboratory (1966-1973), DOE decontamination and decommissioning experience, progress reports, program report Hallam fuel decladding, feasibility report for fabrication of SNAP fuel elements, performance of cesium thermionic diodes, nuclear space power systems, SNAP power conversion, history of the AEC sodium components, developmental testing SNAP fuel elements, final evaluation report HNPF (1964), summary review of the kinetics experiments on water boilers (1963), steam generator for the Liquid Metal Fast Breeder Reactor (LMFBR), fission energy program of the DOE (1979), estimated airborne release of plutonium from Atomics International's Nuclear Materials Development Facility as a result of postulated damage from severe wind and earthquake hazard (1981), planning for uranium carbide transient heating experiments, Heavy Water Organic Cooled Reactor (HWOCR) dual channel cross flow studies, summary of industrial accidents, operating manual for the AE-6 Reactor (1960), Special Power Excursion Reactor test program review (1960), environmental laboratory and equipment information (1964), retirement of the SRE (1968), and a fuel summary report (1994).	07/26/2016	198
Internet - Energy Employees Claimant Assistance Project (EECAP)	No relevant documents identified.	07/20/2016	0
Internet - Google	Chronology of radiation protection, hazards associated with the North American Aviation water boiler neutron source, master work plan/field sampling and analysis plans, airborne radioactive contamination in SRE during reactor operation (1959), ALARA analysis, annual site environmental reports, Area 1 burn pit work plan, Area IV characterization, health and safety plan, request for approval to ship soil, building verification surveys, remedial action certification docket - SRE Complex, calculation of uranium and plutonium inventories in the SRE 1st core loading (1960), final status survey reports, confirmatory radiological surveys, construction of the SRE, distribution of fission product contamination in the SRE, DOE occupational radiation exposures, dose reconstruction for epidemiologic studies, effects of internal radiation exposure on cancer mortality in nuclear workers at Rocketdyne/Atomics International, environmental impact statements, environmental monitoring and facility effluent annual reports (1959, 1960, 1961, 1967-1972, 1985), facilities dismantling plan for SRE, Radioactive Materials Handling Facility building surveys, final gamma radiation scanning reports, final groundwater report, final radiological characterization of soils, MARSSIM final status survey reports, health physics survey reports, historical location of sites Area IV map, historical site assessment of Area IV, NPDES discharge monitoring report, radiological procedures, radiological safety incident reports, residual radioactivity summary, retirement of the SRE, SSFL site description and history, shipment of SRE sodium to Hanford, and a timeline of the Downey property.	07/15/2016	359

Data Capture Information	Data Capture Description	Completed	No. Uploaded into SRDB
Internet - Google / SC&A	From Cleanup to Stewardship Appendix E.	08/27/2009	1
Internet - Health Physics Journal	No relevant documents identified.	07/20/2016	0
Internet - Journal of Occupational and Environmental Hygiene	No relevant documents identified.	07/20/2016	0
Internet - National Academies Press (NAP)	No relevant documents identified.	08/10/2009	0
Internet - National Institute for Occupational Safety and Health (NIOSH)	Report on residual radioactive and beryllium contamination at Atomic Weapons Employer and beryllium facilities, and the NIOSH Advisory Board on Radiation and Worker Health 70th meeting (2010).	08/31/2015	12
Internet - National Service Center for Environmental Publications (NEPIS)	Toxicological review of trichloroethylene, site characterization and monitoring, and the hazardous materials spill warning system (1981).	07/14/2016	5
Internet - NRC Agencywide Document Access and Management (ADAMS)	Integrated database for 1991-92 spent fuel and radioactive waste inventories, special nuclear materials license SNM-33, application for byproduct material license, feasibility report DEM-6, fabrication of 164 enriched (10 per cent) fuel pins for the SRE test program, renewed special nuclear materials license SNM-21, environmental restoration wastes, final Hanford solid waste program environmental impact statement, environmental monitoring annual report (1988), protective radiation standards, SSFL routine inspection report, occupational exposure, confirmatory radiological survey of the phase II area, status of the decommissioning program 2008-2011 annual report, and a license application for promethium-147 fuel capsule for cathode heating program.	03/28/2013	53
Internet - Oak Ridge National Laboratory (ORNL) Library	Operations Division monthly reports (1952-1954), and Oak Ridge National Laboratory (ORNL) status and progress reports (1961).	12/18/2012	10
Internet - US Army Corps of Engineers (USACE)	No relevant documents identified.	07/18/2016	0
Internet - US Transuranium and Uranium Registries	No relevant documents identified.	08/10/2009	0
Kansas City Plant	Daily operations reports (1991).	10/20/2014	1
Los Alamos National Laboratory	Accelerator health physics characterization report of DOE laboratories.	02/28/2012	1
Los Alamos National Laboratory / Los Alamos Historical Document Retrieval and Assessment (LAHDRA)	Quantities and characteristics of the contact-handled low-level mixed waste streams for the DOE Complex.	12/06/2007	1
National Archives and Records Administration (NARA) - Atlanta	Results of the DOE indoor radon study, Volumes 1 and 2, and a summary of industrial accidents.	10/20/2005	2

Data Capture Information	Data Capture Description	Completed	No. Uploaded into SRDB
National Institute for Occupational Safety and Health (NIOSH)	Environmental survey preliminary report at SSFL, annual report to Congress of the AEC (1959, 1961, 1963, 1964,1966, 1968 and 1969), worker outreach meeting minutes, burn pit chemical profile, disposal of NASA area soils, soil sampling for radionuclides results and statistical analysis, waste characterization sample location maps, SSFL RCRA Facility investigation report, plot plan - Propulsion Field Laboratory map 1956 boundary, assessment of pond sediments, verification survey of the 17th Street drainage area, incidents or releases of chemical and radiological contamination, reclaim water flow schematic, decontamination plan, product material license 4-4292-1, radiation safety standard analysis, run-off and dilution effects for retention ponds, and site test areas and landfills.	02/26/2015	87
Nevada Test Site	Final environmental impact statement for Nevada Test Site.	10/01/2003	2
NOCTS	Sodium Reactor Experiment wash cell incident (1959/redacted).	03/25/2015	1
Oak Ridge National Laboratory (ORNL)	Isotope generation and depletion code matrix exponential method (1991).	05/18/2006	1
ORAU Team	Potential for tritium in water supply at SSFL, documented communications, radiation exposures for DOE and DOE contractor employees (1985-1988), external coworker dosimetry data for Area IV of the SSFL, the Canoga Avenue Facility, and the De Soto Avenue Facility, potable water delivered to SSFL (1962-1965), a spreadsheet created using SSFL unredacted dosimetry database, review of a sample of ETEC archive x-ray films, technical basis document for the Energy Technology Engineering Center, and a summary of an SSFL call with NIOSH, DOE, DOL and Boeing on interpreting SSFL employment and exposure records.	06/28/2016	35
S. Cohen & Associates (SC&A)	Tiger Team assessment Energy Technology Engineering Center (1991), Chemical Processing Plant (CPP) production monthly report (1960), and the counting of tritium smears.	06/24/2010	16
Sandia National Laboratory, NM	Health physics log (1971-1972).	03/03/2006	1
Sandia National Laboratory, NM / SC&A	Radiological surveys (1991).	09/15/2010	1
Santa Susana Field Laboratory / SC&A	Basis for routine urine sampling of workers exposed to Pu-239, Helgeson lung count results, health physics procedures, bioassay MDA (1963), external dosimetry procedures (1965-1987), film badge procedure, fire in Building 021, health and safety facility condition checklist, neutron data, dose rates (1963), and tritium production and release to groundwater at SSFL.	11/18/2009	38
SC&A / INL	CPP production monthly reports (1960).	06/24/2010	4
SC&A / NIOSH	Proceedings of the Sodium Reactor Experiment Forum (1958).	06/09/2016	1
SC&A / Pinellas Plant	Annual report on waste generation and minimization (1993).	06/24/2010	1

Data Capture Information	Data Capture Description	Completed	No. Uploaded into SRDB
SC&A / SSFL	Personnel interviews, elimination of unneeded radioactive material, amendment to license 0015-70, environmental, health, and safety self-assessment, specification for metal for ZPPR fuel elements, plutonium and uranium, authorization for use of radioactive materials or radiation producing devices, bioassay information, criticality study for handling plutonium, determination of airborne plutonium radioactivity, determination of total plutonium activity in air and water, based on alpha counting, including corrections for Pu-241 content, discontinuance of routine use of lapel air samplers, dosimeter calibration, errors in UCLA whole body counting data, fabrication of mixed oxide pellets, uranium fuel fabrication bioassays, industrial hygiene program - thoria, description of analytical procedures and accuracy, internal monitoring results (in-vivo lung scanning), worker exposure histories, listing of locations in SSFL Area IV associated with radioactive materials, medical examinations for radiation workers, modification of film badge program, plutonium urinalysis, plutonium wound monitor status, quarterly inspection of for radiation safety (1978), radiation exposure incidents, radiation surveys, radiation machines registered with the state of California, fires in the hot cell, radiological safety at Atomics International, survey of stray radiation, trip reports, monthly progress reports (1966), and inspection of fuels fabrication/storage areas (1967).	06/24/2010	132
Unknown	Review of criticality accidents (2000), analysis for the decommissioning of the BORAX-V Reactor Facility, database report for Sylvania Corning Nuclear Corp, decommissioning information, investigations, and summary reports of thorium, surveys, articles, facility list and database report information, and Westinghouse Nuclear Fuels Division and Westinghouse Atomic Power Development Plant information (1940-2002).	11/14/2006	13
TOTAL	Not applicable	Not applicable	**2,345**

Table A1-2: Database Searches for Area IV of the Santa Susana Field Laboratory

Database/Source	Keywords	Hits	Uploaded into SRDB
Defense Technical Information Center (DTIC) COMPLETED 07/20/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	793	0
DOE CEDR COMPLETED 08/10/2009	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	0	0

Database/Source	Keywords	Hits	Uploaded into SRDB
DOE Hanford Declassified Document Retrieval System (DDRS) COMPLETED 07/08/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	576	1
DOE Legacy Management Considered Sites COMPLETED 07/18/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	25	2
DOE NNSA - Nevada Site Office COMPLETED 07/20/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	38	0
DOE OpenNet COMPLETED 08/09/2009	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	611	0
DOE OSTI Energy Citations COMPLETED 08/08/2009	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	7,156	0
DOE OSTI Information Bridge COMPLETED 08/06/2009	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	5,763	3
DOE OSTI SciTech Connect COMPLETED 07/18/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	3,105	220
Energy Employees Claimant Assistance Project (EECAP) COMPLETED 07/20/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	14	0
Google COMPLETED 07/11/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	936,430	244
Health Physics Journal COMPLETED 07/20/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	0	0
Journal of Occupational and Environmental Health COMPLETED 07/20/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	0	0
National Academies Press COMPLETED 08/10/2009	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	6,758	0
National Service Center for Environmental Publications (NEPIS) COMPLETED 07/18/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	28	6
NRC ADAMS Reading Room COMPLETED 01/13/2012	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	5,393	43

Database/Source	Keywords	Hits	Uploaded into SRDB
United States Army Corps of Engineers (USACE) COMPLETED 07/18/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	5	0
United States Army Corps of Engineers (USACE) Los Angeles District COMPLETED 07/18/2016	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	6	0
U.S. Transuranium & Uranium Registries COMPLETED 08/10/2009	Database search terms and Internet URL are available in the Excel file called "Area IV of the SSFL Rev 00 (83.13) 08-05-16."	0	0