SEC Petition Evaluation Report
Petition SEC-00109

Report Rev Number:	Addendum
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Subject Expert(s):	Christopher Miles
Site Expert(s):	N/A

Petition Administrative Summary

Petition Under Evaluation

Petition Number:	SEC-00109
Petition Type:	83.13
Petition Receipt Date:	April 3, 2008
Qualification Date:	May 29, 2008
DOE/AWE Facility Name:	Los Alamos National Laboratory (LANL)

Petition Class

Class Evaluated by NIOSH:	Service Support Workers (which includes, but is not limited to, security guards, firefighters, laborers, custodians, carpenters, plumbers, electricians, pipefitters, sheet metal workers, ironworkers, welders, maintenance workers, truck drivers, delivery persons, rad technicians, and area work coordinators) who worked in any operational Technical Areas with a history of radioactive material use at the Los Alamos National Laboratory from January 1, 1996 through December 31, 2005.
NIOSH-Proposed Class(es) to be Added to the SEC:	None

Related Petition Summary Information

SEC Petition Tracking Numbers and Petition Types	SEC-00051 (83.13) SEC-00061 (83.14) SEC-00109 (83.13) SEC-00170 (83.14)
DOE/AWE Facility Name:	Los Alamos National Laboratory (LANL)
Petition Status:	SEC-00051: Class added to the SEC for Mar. 15, 1943 through Dec. 31, 1975 SEC-00061: Class added to the SEC for Sep. 1, 1944 through Jul. 18, 1963 SEC-00109: Class added to the SEC for Jan. 1, 1976 through Dec. 31, 1995 SEC-00170: Class added to the SEC for Mar. 15, 1943 through Dec. 31, 1975

Related Evaluation Report Information

Report Title:	SEC Petition Evaluation Report for Petition SEC-00051 SEC Petition Evaluation Report for Petition SEC-00061 SEC Petition Evaluation Report for Petition SEC-00109, Rev. 0 SEC Petition Evaluation Report for Petition SEC-00109, Rev. 1 SEC Petition Evaluation Report for Petition SEC-00170
DOE/AWE Facility Name:	Los Alamos National Laboratory (LANL)

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Addendum to Los Alamos National Laboratory (SEC-00109) Special Exposure Cohort Evaluation Report

Purpose and Scope of this Addendum

This document provides revised excerpts from Rev. 1 of the SEC-00109 Los Alamos National Laboratory (LANL) SEC Evaluation Report (ER) dated August 13, 2012 (NIOSH, 2012). In that document, NIOSH defined a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy. The class included all employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Los Alamos National Laboratory (LANL) in Los Alamos, New Mexico from January 1, 1976, through December 31, 1995.

NIOSH selected the class end date of December 31, 1995 based on its presumption that by January 1, 1996, LANL would have been in full compliance with 10 C.F.R. pt. 835, *Occupational Radiation Protection,* which states:

> ***§835.402 Individual monitoring.***
>
> *(c) For the purpose of monitoring individual exposures to internal radiation, internal dosimetry programs (including routine bioassay programs) shall be conducted for:*
>
> *(1) Radiological workers who, under typical conditions, are likely to receive a committed effective dose equivalent of 0.1 rem (0.001 sievert) or more from all occupational radionuclide intakes in a year.*

DOE Occupational Radiation Exposure (DOE/EH-0575, 1997), Section 2.1, Radiation Protection Requirements, states:

> *10 CFR 835 became effective on January 13, 1994, and required full compliance by January 1, 1996. In general, 10 CFR 835 codified existing radiation protection requirements in DOE Order 5480.11. The rule provides nuclear safety requirements that, if violated, will provide a basis for the assessment of civil and criminal penalties under the Price-Anderson Amendments Act of 1988, Public Law 100-408, August 20, 1988 as implemented by 10 CFR 820 "Procedural Rules for DOE Nuclear Activities," August 17, 1993.*

Dose reconstruction limitations during the specified class period included the inability to bound unmonitored intakes of exotic alpha-emitters, fission products, and activation products. During its presentation of Rev. 1 of the SEC-00109 LANL ER to the Advisory Board, NIOSH indicated that it would continue its evaluation of these issues for the post-1995 period.

Because this ER Addendum addresses post-1995 unmonitored intakes of the radionuclides for which dose reconstruction limitations were identified in Rev. 1 of the SEC-00109 ER, the evaluated class for this Addendum remains the same as defined in Rev. 1 except that the class start year has been changed from 1976 to 1996:

> Service Support Workers (which includes, but is not limited to, security guards, firefighters, laborers, custodians, carpenters, plumbers, electricians, pipefitters, sheet metal workers, ironworkers, welders, maintenance workers, truck drivers, delivery persons, rad technicians, and area work coordinators) who worked in any operational Technical Areas with a history of radioactive material use at the Los Alamos National Laboratory from January 1, 1996 through December 31, 2005.

Petition Evaluation Report Addendum Summary

Class Evaluated by NIOSH (in this Addendum)

Service Support Workers (which includes, but is not limited to, security guards, firefighters, laborers, custodians, carpenters, plumbers, electricians, pipefitters, sheet metal workers, ironworkers, welders, maintenance workers, truck drivers, delivery persons, rad technicians, and area work coordinators) who worked in any operational Technical Areas with a history of radioactive material use at the Los Alamos National Laboratory from January 1, 1996 through December 31, 2005.

NIOSH-Proposed Class to be Added to the SEC (in this Addendum)

NIOSH has obtained information regarding post-1995 use of exotic radioactive material at LANL as well as policies and procedures relating to implementation of 10 C.F.R. pt. 835. Based on its analysis of these available resources, NIOSH found no part of the class under evaluation for which it cannot estimate radiation doses with sufficient accuracy.

Feasibility of Dose Reconstruction

Per EEOICPA and 42 C.F.R. §83.13(c)(1), NIOSH has established that it has access to sufficient information to: (1) estimate the maximum radiation dose, for every type of cancer for which radiation doses are reconstructed, that could have been incurred in plausible circumstances by any member of the class; or (2) estimate radiation doses of members of the class more precisely than an estimate of maximum dose. Information available from the site profile and additional resources is sufficient to document or estimate the maximum internal and external potential exposure to members of the evaluated class under plausible circumstances during the specified period.

Health Endangerment Determination

Per EEOICPA and 42 C.F.R. §83.13(c)(3), a health endangerment determination is not required because NIOSH has determined that it has sufficient information to estimate dose for the members of the evaluated class from January 1, 1996 through December 31, 2005.

Revised Excerpts of the Evaluation Report

NOTE: FROM THIS POINT FORWARD, THIS ER ADDENDUM ONLY ADDRESSES THOSE SECTIONS IN REV. 1 OF THE SEC-00109 LANL ER THAT REQUIRE DISCUSSION REGARDING THE POST-1995 PERIOD; THEREFORE, THE SECTION NUMBERING IS NOT CONTIGUOUS. WHEN DEEMED HELPFUL TO THE READER, ADDITIONAL ER TEXT IS SOMETIMES INCLUDED FOR CONTEXT.

3.2 Class Evaluated by NIOSH

Service Support Workers (which includes, but is not limited to, security guards, firefighters, laborers, custodians, carpenters, plumbers, electricians, pipefitters, sheet metal workers, ironworkers, welders, maintenance workers, truck drivers, delivery persons, rad technicians, and area work coordinators) who worked in any operational Technical Areas with a history of radioactive material use at the Los Alamos National Laboratory from January 1, 1996 through December 31, 2005.

3.3 NIOSH-Proposed Class to be Added to the SEC

NIOSH has obtained information regarding post-1995 use of exotic radioactive material use at LANL as well as policies and procedures relating to implementation of 10 C.F.R. pt. 835. Based on its analysis of these available resources, NIOSH found no part of the class under evaluation for which it cannot estimate radiation doses with sufficient accuracy.

4.0 Data Sources Reviewed by NIOSH to Evaluate the Class

As is standard practice, NIOSH completed an extensive database and Internet search for information regarding LANL. 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, the DOE Office of Human Radiation Experiments website, and the DOE-National Nuclear Security Administration-Nevada Site Office-search. Attachment Two includes a summary of LANL documents. The summary specifically includes 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 the feasibility of dose reconstruction 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 conducted a data capture at LANL on November 2-6, 2015. Participants included representatives from NIOSH, ORAUT, and SC&A. The team captured 87 documents, including radiation work permits, work instructions, radiological surveys, airborne sample data, and personnel exposure data.

In response to NIOSH data requests and questionnaires, LANL provided the following information:

- LANL radiological policy documents
- LANL radiological procedures documents
- Background information on 10 C.F.R. pt. 835 implementation
- Organization charts for Health Physics (RP-1), Radiation Protection Division, and ESH Deployed Services Division
- List of non-routine radionuclides handled by LANL Waste Management
- Summary of the radiation dosimetry monitoring program
- Output from LANL's *Radioactive Sealed Sources Data Management System*

NIOSH investigated the following five databases in an effort to identify "exotics" on the LANL site and the manner in which they were handled relative to 10 C.F.R. pt. 835 requirements:

- LANL Nuclear Materials Management & Safeguards System (NMMSS) database: This database turned out to be not directly searchable; therefore, no "exotics" information was found.

- LANL Waste Management (WM) database: This database yielded a list of non-routine radionuclides encountered by WM.

- Los Alamos Historical Document Retrieval and Assessment (LAHDRA): NIOSH received DVDs containing images of 3,979 documents from this database, which were examined and loaded into the SRDB.

- DOE Nonconformance Tracking System (NTS): This database was reviewed for 10 C.F.R. pt. 835 violations, site responses, and corrective actions. A total of 384 documents were captured, of which 91 were deemed potentially relevant and loaded into the SRDB. The entire list of captured documents is available (NTS List, 2016). The titles and SRDB Ref IDs for the 91 selected documents are listed in Attachment 1. NTS documents considered pertinent to 10 C.F.R. §835.402(c)(1) and 835.702(a) compliance are discussed in Section 7.2.1.

- DOE Occurrence Reporting System (ORPS): This database was reviewed for 10 C.F.R. pt. 835 violations, site responses, and corrective actions. A total of 159 documents was accessed, of which 64 were deemed potentially relevant, captured, and loaded into the SRDB (ORPS Reports, 1993-2015). The report topics and SRDB Ref IDs for the 64 selected documents are listed in Attachment 1. The result of the ORPS review is discussed in Section 7.2.1.

4.4 Previous Dose Reconstructions

NIOSH reviewed its NIOSH DCAS Claims Tracking System (referred to as NOCTS) to locate EEOICPA-related dose reconstructions relevant to the time period under evaluation in this Addendum (January 1, 1996 through December 31, 2005). Table 4-1 summarizes the results of this review. (NOCTS data available as of December 14, 2016).

Table 4-1: No. of LANL Claims Submitted Under the Dose Reconstruction Rule

Description	Totals
Total number of claims submitted for dose reconstruction	1791
Total number of claims submitted for energy employees who worked during the period under evaluation (January 1, 1996 through December 31, 2005).	558
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).	430
Number of claims for which internal dosimetry records were obtained for the time period in the evaluated class definition	286
Number of claims for which external dosimetry records were obtained for the time period in the evaluated class definition	458

NIOSH reviewed each claim that fell within the time period under evaluation to determine whether internal and/or external personal monitoring records could be obtained for the employee. As indicated in Table 4-1, of the total number of claims submitted for energy employees who worked within the time period under evaluation in this Addendum, 286 (51%) contain internal monitoring data and 458 (82%) contain external monitoring data.

4.5 NIOSH Site Research Database

NIOSH also examined its Site Research Database (SRDB) to locate documents supporting the assessment of the evaluated class. Over 9400 documents in this database were identified as pertaining to LANL. These documents were evaluated for their relevance to this petition. The documents include historical background on external and internal dosimetry programs and evaluations, monitoring reports, annual environmental reports, reviews and assessments of LANL, evaluations of specific buildings, site surveys, and facility and process descriptions.

4.6 Documentation and/or Affidavits Provided by Petitioners

During the evaluation conducted for this Addendum, NIOSH reviewed the following document submitted by the petitioner:

- *Evaluation of Continuous Air Monitor Placement in a Plutonium Facility*, J. J. Whicker, J. C. Rodgers, C. I. Fairchild, R. C. Scripsick, R. C. Lopez; Los Alamos National Laboratory; Health Physics, May 1997, Volume 72, Number 5; SRDB Ref ID: Publicly available (Whicker, 1997)

6.0 Summary of Available Monitoring Data for the Class Evaluated by NIOSH

6.1 Available LANL Internal Monitoring Data

6.1.1 Field Monitoring Program and Associated Data

By January 1, 1996, the health physics field monitoring and contamination control programs at LANL were well-established and formalized, with over 60 procedures addressing various aspects of radiological protection (LANL Procedures, 1996) as well as an established process for tracking and notifying staff of revisions (Procedure Revisions, 1996). These procedures cover program administration, exposure and contamination control, monitoring, instrumentation, protective equipment, emergency response, and the As Low As Reasonably Achievable (ALARA) program.

In addition to site-wide procedures, area-specific procedures and instructions were also in effect. For example, the stated purpose of the *ESH-1/TA-55 Radiation Monitoring Instructions* is "to provide survey frequencies which are to be used by the ESH-1 Radiological Control Technicians (RCTs) and Health Protection Technicians (HPTs) in assisting the NMT Division in the implementation of the radiological control program at TA-55" (TA-55 Instructions, 2000). This document defines the routine monitoring tasks of the RCTs assigned to TA-55 and delineates responsibilities. Routine surveys are described with survey frequencies ranging from daily to annually. These instructions also specify types of routine external radiation surveys as well as air monitoring and TA-55 Technical Safety Requirements (TSRs), which include annual CAM system calibration, monthly performance tests, and daily operability checks.

NIOSH has obtained hundreds of radiological protection documents from LANL for the time period under evaluation. Examples include:

- Radiological Work Permits requiring contamination surveys and air monitoring (RWPs, 1997; RWPs, 2003)
- Monthly contamination surveys (Monthly Surveys, 1998; Monthly Surveys, 1999)
- Area-specific contamination surveys (TA-3 Survey Results, 1999; TA-18 Survey Results, 1997)
- Quarterly contamination survey summaries (Quarterly Summaries, 1999; Quarterly Summaries, 2003)
- Area-specific monitoring data quarterly reviews (CMR Quarterly Review, 1996; TA-55 Quarterly Review, 1995-1996)
- Air sample analysis data (Air Data, 1996-1997; Air Data, 2001)
- Air sampling/monitoring technical evaluations (Air Sampling Evaluation, 2001a; Air Sampling Evaluation, 2001b)
- Airborne radioactivity investigation reports (Airborne Radioactivity, 2001; Airborne Radioactivity, 2002)
- Task-specific radiological protection assessments/checklists (ESH-1 Checklist, 2001; Rad Protection Checklist, 1995)
- Standard operating procedures (SOP) tracking (SOP Matrices, 1996; SOP Revisions, 1996)

7.0 Feasibility of Dose Reconstruction for the Class Evaluated by NIOSH

7.2 Evaluation of Bounding Internal Radiation Doses at LANL

The principal sources of internal radiation doses for members of the class under evaluation were the variety of site processes and incidents involving plutonium, americium, tritium, and uranium (ORAUT-TKBS-0010-5). Less-common sources included Sr-90/Y-90, Th-230, Th-232, Np-237, Ac-227, Pa-231, Cm-244, fission products, activation products, special tritium compounds (STCs), and others. Although the focus of this Addendum is on these less-common sources, the dose-bounding methodologies described in this section may also be applicable to the principal radiation sources. The following subsections address the ability to bound internal doses, methods for bounding doses, and the feasibility of internal dose reconstruction.

7.2.1 Evaluation of Bounding Process-Related Internal Doses

In Rev. 1 of the SEC-00109 LANL ER, NIOSH concluded that the available monitoring records, process descriptions, and source term data are sufficient to complete dose reconstructions for the most commonly-encountered radioactive materials at LANL (i.e., plutonium, uranium, tritiated water, and gaseous tritium) from January 1, 1976 through December 31, 2005 (NIOSH, 2012). That conclusion is not the primary subject of this present evaluation and remains unchanged as a result of this current evaluation; however, the dose-bounding methods proposed here may also be applicable to these more common radionuclides.

Rev. 1 of the LANL ER also concluded that dose reconstruction for H-3 (all forms), MFP and MAP, Sr-90/Y-90, Th-230, Th-232, Am-241, Np-237, Ac-227, Pa-231, and Cm-244 is "likely feasible" after full implementation of 10 C.F.R. pt. 835 on January 1, 1996 (NIOSH, 2012). This current evaluation focuses on unmonitored intakes of these less-commonly-encountered radioactive materials, for which there are relatively few available bioassay data.

10 C.F.R. pt. 835 Regulatory Requirements

10 C.F.R. pt. 835, *Occupational Radiation Protection*, specifies regulations that are pertinent to all DOE facilities. These regulations were issued on December 14, 1993 with an implementation deadline of December 31, 1995. These regulations contained specific requirements related to individual monitoring (§835.402) and recordkeeping (§835.702).

The original rule, dated December 14, 1993, states the following regarding individual monitoring (10 C.F.R. §835.402):

> *§835.402 Individual monitoring.* [Original rule, 1993]
>
> *(c) For the purpose of monitoring individual exposures to internal radiation, internal dose evaluation programs (including routine bioassay programs) shall be conducted for:*
>
> *(1) Radiological workers who, under typical conditions, are likely to receive 0.1 rem (0.001 sievert) or more committed effective dose equivalent, and/or 5 rems (0.05 sievert) or more committed dose equivalent to any organ or tissue, from all occupational radionuclide intakes in a year.*

These monitoring thresholds correspond to 2% and 10%, respectively, of the occupational exposure limits for these categories of exposure for general employees (10 C.F.R. §835.202). The requirement for monitoring based on organ and tissue committed dose equivalent (CDE) was removed in 1998, as explained in the Federal Register notice:

> *The monitoring threshold based upon committed effective dose equivalent obviates the need for this threshold because, through application of the weighting factors defined in §835.2(b), the committed effective dose equivalent always provides a more restrictive basis for individual monitoring* (63 FR 59683).

The amended rule, dated November 4, 1998, states (10 C.F.R. §835.402):

> *§835.402 Individual monitoring.* [Amended rule, 1998]
>
> *(c) For the purpose of monitoring individual exposures to internal radiation, internal dosimetry programs (including routine bioassay programs) shall be conducted for:*
>
> *(1) Radiological workers who, under typical conditions, are likely to receive a committed effective dose equivalent of 0.1 rem (0.001 sievert) or more from all occupational radionuclide intakes in a year.*

Records of conducted monitoring were required to be maintained per §835.702 in order to document compliance with 10 C.F.R. §835.402:

> *§835.702 Individual monitoring records.*
>
> *(a) Records shall be maintained to document doses received by all individuals for whom monitoring was required pursuant to §835.402 and doses received during planned special exposures, accidents, and emergency conditions.*

DOE Occupational Radiation Exposure (DOE/EH-0575, 1997), Section 2.1, Radiation Protection Requirements, states:

> *10 CFR 835 became effective on January 13, 1994, and required full compliance by January 1, 1996. In general, 10 CFR 835 codified existing radiation protection requirements in DOE Order 5480.11. The rule provides nuclear safety requirements that, if violated, will provide a basis for the assessment of civil and criminal penalties under the Price-Anderson Amendments Act of 1988, Public Law 100-408, August 20, 1988 as implemented by 10 CFR 820 "Procedural Rules for DOE Nuclear Activities," August 17, 1993.*

LANL 10 C.F.R. pt. 835 Implementation Documentation

10 C.F.R. pt. 835 required all DOE sites to develop a radiation protection program (RPP) document outlining how compliance would be achieved and certifying compliance (or indicating elements that were not in compliance) by the December 1995 deadline. In Rev. 1 of the LANL ER (NIOSH, 2012), NIOSH selected the end date of December 31, 1995 for the proposed class based on its presumption that by January 1, 1996, LANL would have been in full compliance with 10 C.F.R. pt. 835.

The LANL 10 C.F.R. pt. 835 Radiation Protection Program (RPP) document, issued on May 9, 1995, includes the requirement for individual monitoring, as defined in 10 C.F.R. §835.402(c) (LANL RPP, 1995, PDF p. 11). The RPP references the LANL Radiological Control Manual (LANL Rad Control, 1994) as evidence of compliance. Article 521.1a1 of the manual states:

> *The following personnel shall participate in an internal dosimetry program: Personnel who have the potential to receive intakes resulting in a committed effective dose equivalent of 100 mrem or more in a year.*

In the RPP (LANL RPP, 1995), LANL acknowledges and accepts the requirements of 10 C.F.R. §835.402(c):

> *COMPLIANCE STATEMENT: LANL accepts the requirement that for the purpose of monitoring individual exposures to internal radiation, internal dose evaluation programs (including routine bioassay programs) SHALL be conducted for radiological workers who, under typical conditions, are likely to receive 0.1 rem (0.001 sievert) or more committed effective dose equivalent, and/or 5 rems (0.05 sievert) or more committed dose equivalent to any organ or tissue, from all occupational radionuclide intakes in a year.*

Just beneath the COMPLIANCE STATEMENT is the following:

> *ACTIONS/DOCUMENTS: Verify field implementation of requirement by 6/16/95* (LANL RPP, 1995, PDF p. 8).

The LANL Laboratory Standard, *Radiation Dosimetry Monitoring*, became effective on December 23, 1994 (LANL Dosimetry, 1994, PDF p. 15). The stated purpose of this document is to demonstrate compliance with dosimetry requirements set forth in 10 C.F.R. pt. 835 by establishing limits and implementing monitoring procedures for both internal and external exposure to radiation at the Laboratory.

This Laboratory Standard begins with the following statement in its introduction:

> *The Laboratory personnel radiation dosimetry program is designed to demonstrate compliance with the radiation protection standards defined in 10 CFR 835, "Occupational Radiation Protection" and in the Laboratory Radiological Control Manual* [LANL Rad Control, 1994]. (LANL Dosimetry, 1994).

One particularly relevant component of the LANL Laboratory Standard is the Employee Health Physics Checklist (LANL Dosimetry, 1994, PDF p. 34). The stated purpose of the checklist is:

- *To assess the potential radiation exposures of all personnel performing work at the Laboratory, including employees, affiliates, contractors, and any other non-employee workers.*
- *To assign those individuals to appropriate dosimetry programs.*

The *Monitoring Criteria* associated with the checklist includes a requirement for routine bioassay for workers with a potential to receive 0.1 rem committed effective dose equivalent from all occupational intakes of radioactive materials in one year.

10 C.F.R. pt. 835 Compliance Assessments

In May 1995, the LANL Internal Assessment Group conducted an assessment of the LANL Radiation Protection Program being implemented by LANL under 10 C.F.R. pt. 835. The team "did not identify any findings related to the implementation of 10 CFR 835." In the report, entitled *Assessment of the Radiation Protection Program at the Los Alamos National Laboratory (TITLE 10 CFR 835),* October 25, 1995 (Assessment, 1995), the only Finding was one associated with administrative controls for sealed sources. In addition to the single Finding, the report also included five Observations, one of

which was relevant to internal dose assessment. Observation 4 stated that the RPP office has not coordinated with support organizations to implement site-specific document control and records management programs. Problems were identified relating to document control and distribution of updated procedures, including those associated with internal dose monitoring.

The Department of Energy's National Nuclear Security Administration conducted an independent review of the Internal Dosimetry Program at LANL from July 23 to July 31, 2004 (Programmatic Assessment, 2004). The stated *Performance Requirements* for the assessment included an evaluation of compliance with 10 C.F.R. §835.702(a). No findings or observations were made regarding compliance with §835.702(a), although the assessment did conclude that LANL was not in full compliance with the requirements in Sections 104, 701(a), 702(g), and 704(e) of 10 C.F.R. pt. 835, *Occupational Radiation Protection*. In addition, the Laboratory was not in compliance with the requirements in Sections 122(d)(1) and 122(e)(1) of 10 C.F.R. pt. 830, *Nuclear Safety Management*.

The three non-compliance Findings noted in the assessment report were:

- Finding 1: LANL plutonium internal dosimetry documents are not current with respect to revision date, requirements, and incorporation of ICRP-60 models.

- Finding 2: Internal dosimetry document hierarchy is not clearly defined or consistent with HSR-12 Quality Assurance Program Plan (QAPP) nor does it meet regulatory procedure requirements.

- Finding 3: LANL's Internal Dosimetry Program scope is not clear.

These Findings, along with the Observations identified in the report, are primarily associated with procedural documentation of the internal dosimetry program. No issues were identified in the assessment that questioned the validity of the internal dose calculations. The review team also noted that "LANL's Internal Dosimetry Program is staffed with experts, resulting in calculations of internal dose estimates that are technically sound."

10 C.F.R. pt. 835 Exemption for Radon

Although radon is not considered a major source of radiation exposure for LANL workers, for completeness, it should be noted that LANL requested and appeared to receive DOE approval for an exemption from certain 10 C.F.R. pt. 835 requirements related to Rn-220 and Rn-222 (Radon Exemption, 1995). Specifically, LANL requested that guidance contained in ICRP-65 be used to establish DAC values for Rn-220 and Rn-222 (ICRP Pub. 65, 1993). As a result, the DAC values for each of these nuclides was increased by a factor of 2.5.

Nonconformance Tracking System (NTS) Findings

NIOSH reviewed the DOE Nonconformance Tracking System for LANL 10 C.F.R. pt. 835 violations, site responses, and corrective actions. A total of 384 documents were captured (NTS List, 2016), of which 91 were deemed potentially relevant and loaded into the SRDB (see Attachment 1).

The following two findings are considered pertinent to compliance with 10 C.F.R. §835.702(a):

- NTS-ALO-LA-LANL-LANL-1999-0014. NC ID: 652 (SRDB 164538). Noncompliance to the LANL Radiation Protection Program. Finding #3 of this report states:

  Records: (a) Non-laboratory exposure data was not included in all employee records for current year or lifetime dose. In some cases, when an employee's previous employer provided dose information, it was not included in the employees' current year or lifetime dose.

- NTS-ALO-LA-LANL-LANL-2003-0002. NC ID: 1377 (SRDB 164618). Noncompliance to the LANL Radiation Protection Program. Finding #4 of this report states:

  The Cumulative Total Effective Dose Equivalent (CTEDE) received by each individual as recorded and reported by LANL does not include doses received at other locations as required by the amended (1998) 10 CFR 835 rule. While such information is requested and ordinarily received, it is not routinely incorporated into the dose history database and reported. This noncompliance has been previously identified in NTS-ALO-LA-LANL-LANL-2000-011 and is currently being addressed through corrective actions contained therein.

The above two findings would not likely affect NIOSH's ability to perform individual dose reconstructions. This is because NIOSH considers all relevant dosimetry data from all sites for a claimant when performing dose reconstructions, regardless of whether such data were properly combined previously by a given site.

NIOSH did not identify any findings in these reports relating to non-compliance with 10 C.F.R. §835.402(c)(1).

Occurrence Reporting System (ORPS) Findings

NIOSH reviewed the DOE Occurrence Reporting System for LANL 10 C.F.R. pt. 835 violations, site responses, and corrective actions. A total of 159 documents was accessed, of which 64 were deemed potentially relevant, captured, and loaded into the SRDB (ORPS Reports, 1993-2015) (see Attachment 1 for a list of report topics). Following its review of these selected documents, NIOSH concluded that none of the findings was pertinent to 10 C.F.R. pt. 835 compliance.

7.2.3 Methods for Bounding Internal Dose at LANL

7.2.3.3 Bounding Methods by Radionuclide

Based on its review of radioactive material use at LANL and the associated radiation protection programs, NIOSH has concluded that intakes for unmonitored workers with access to controlled areas were unlikely to have resulted in committed effective dose equivalents (CEDE) in excess of 0.1 rem per year. This conclusion is based upon the implementation of 10 C.F.R. §835.402, which required personnel monitoring for workers who are likely to receive a CEDE of 0.1 rem or more from all occupational radionuclide intakes in a year. 10 C.F.R. §835.702 required that all associated personnel monitoring data be recorded and maintained. Therefore, in the absence of internal dosimetry records, NIOSH may assume that intakes by unmonitored workers did not result in doses exceeding 0.1 mrem CEDE.

Bounding intake quantities corresponding to a CEDE of 0.1 rem may be defined as 2% of the stochastic Annual Limit on Intake (ALI), or SALI. The ALI is defined in 10 C.F.R. §835.2 (Definitions). The SALI is the value of intake of a given radionuclide in a year by the reference man (ICRP Pub. 23, 1975) that would result in a CEDE of 5 rem (0.05 sievert). The DAC quantities published in 10 C.F.R. pt. 835, applicable to the period under evaluation in this Addendum, are based on U.S. Environmental Protection Agency's Federal Guidance Report No. 11, *Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion*, published September 1988 (EPA FGR-11, 1988). Since inhalation is the predominant pathway for worker intakes, the CDE conversion factors presented in Table 2.1, *Inhalation*, of U.S. EPA FGR-11 was used to determine the SALI for each radionuclide of interest, using the value presented in the "Effective" column.

Table 7-1 shows the bounding annual intake quantities for selected LANL radionuclides for unmonitored workers with access to controlled areas.

Table 7-1: Bounding Annual Intake Quantities for Unmonitored LANL Workers with Access to Controlled Areas

Radionuclide	Lung Clearance Class	CEDE Per Unit Intake* (Sv/Bq)	Annual Intake Quantity, 2% SALI (Bq)
H-3	V (water vapor)	1.73×10^{-11}	5.78×10^{7}
Sr-90	D	6.47×10^{-8}	1.55×10^{4}
Sr-90	Y	3.51×10^{-7}	2.85×10^{3}
Th-230	W	8.80×10^{-5}	1.14×10^{1}
Th-230	Y	7.07×10^{-5}	1.41×10^{1}
Th-232	W	4.43×10^{-4}	2.26×10^{0}
Th-232	Y	3.11×10^{-4}	3.22×10^{0}
U-234	D	7.37×10^{-7}	1.36×10^{3}
U-234	W	2.13×10^{-6}	4.69×10^{2}
U-234	Y	2.58×10^{-5}	3.88×10^{1}
Pu-238	W	1.06×10^{-4}	9.43×10^{0}
Pu-238	Y	7.79×10^{-5}	1.28×10^{1}
Pu-239	W	1.16×10^{-4}	8.62×10^{0}
Pu-239	Y	8.33×10^{-5}	1.20×10^{1}
Am-241	W	1.20×10^{-4}	8.33×10^{0}
Np-237	W	1.46×10^{-4}	6.85×10^{0}
Ac-227	D	1.81×10^{-3}	5.52×10^{-1}
Ac-227	W	4.65×10^{-4}	2.15×10^{0}
Ac-227	Y	3.49×10^{-4}	2.87×10^{0}
Pa-231	W	3.47×10^{-4}	2.88×10^{0}
Pa-231	Y	2.32×10^{-4}	4.31×10^{0}
Cm-244	W	6.70×10^{-5}	1.49×10^{1}

* Values taken directly from U.S. EPA FGR-11, Table 2.1, far right column ("Effective") (EPA FGR-11, 1988).

An unmonitored worker with access to controlled areas may be assumed to have been exposed to 2% of the SALI per year from any of these potential radionuclides. For purposes of bounding dose reconstruction, the radionuclide and lung clearance class selected for each year's intake would be the one resulting in the highest dose to the organ of interest at the time of cancer diagnosis.

The methodologies described in ORAUT-OTIB-0054, *Fission and Activation Product Assignment for Internal Dose-Related Gross Beta and Gross Gamma Analyses*, may be used to bound potential intakes to MFP and MAP. The specific 2%-SALI nuclide mixture (fission products and activation products) resulting in the highest dose to the organ of interest at the time of cancer diagnosis would be the selected intake.

Intakes of radon and their progeny by unmonitored workers with the potential for exposure may be bound by assuming an exposure of 40 DAC-hr per year. During the period under evaluation, 10 C.F.R. pt. 835 permitted the DAC values for Rn-220 and Rn-222 to be replaced by 1 working level (WL) and 1/3 WL, respectively. DCAS-TIB-011 provides a method for converting exposures expressed in working level months (WLM) into individual organ doses. A WLM is equivalent to 170 WL-hours. Therefore, 40 DAC-hrs is equivalent to 0.24 WLM for Rn-220 and 0.078 WLM for Rn-222.

Special Tritium Compounds (STCs)

Potential dosimetric issues associated with special tritium compounds (STCs), including stable metal tritides (SMTs) and organically bound tritium (OBT), were not formally recognized or addressed by LANL or DOE until the late 1990s. The 1998 LANL report, *Los Alamos National Laboratory Radiological Dose Assessment - Tritium Internal Dosimetry and Bioassay Programs* does specifically address bioassay for STCs (Inkret, 1998a).

Although the LANL internal dosimetry program was modified in the late 1990s to accommodate STCs, the potential for significant exposure to these compounds was small and dose assessments were rarely deemed necessary. Consequently, bioassay data specific to STCs are rare for the entire period of this evaluation. This situation is similar to that of the exotic alpha-emitters, where dose assessment capabilities existed, but internal dosimetry data are few due to their rare usage.

NIOSH can, however, bound unmonitored intakes of STCs in the same manner as intakes from other rare nuclides for which it lacks internal dosimetry data. This can be done by assuming that intakes of these compounds by unmonitored workers with access to controlled areas were unlikely to have exceeded 2% of the SALI. The SALI for STCs, applicable to the time period of this evaluation (January 1, 1996 through December 31, 2005), would be equivalent to that derived from the rule for tritiated water vapor. (DAC values specific for STCs were first promulgated in the 2007 revision of 10 C.F.R. pt. 835.) Dose reconstruction for intakes of STCs may be performed using the methodologies outlined in ORAUT-OTIB-0066.

7.2.4 Internal Dose Reconstruction Feasibility Conclusion

In Rev. 1 of the SEC-00109 LANL ER, NIOSH defined a single class of employees for which NIOSH cannot estimate radiation doses with sufficient accuracy (NIOSH, 2012). The class included all employees of the Department of Energy, its predecessor agencies, and their contractors and subcontractors who worked at the Los Alamos National Laboratory in Los Alamos, New Mexico from January 1, 1976 through December 31, 1995.

Dose reconstruction limitations during this period included the inability to bound unmonitored intakes of exotic alpha-emitters, fission products, and activation products. Because extensive bioassay programs were in place for plutonium and uranium, no dose reconstruction infeasibilities were identified for these materials. The tritium bioassay program was also extensive; however, NIOSH committed to continue to evaluate dose reconstruction feasibility for organically bound tritium (OBT) and stable metal tritide (SMT) tritium forms.

In that previous evaluation, NIOSH selected the class end date of December 31, 1995 based on its presumption that by January 1, 1996, LANL would have been in full compliance with 10 C.F.R. pt. 835, *Occupational Radiation Protection.* 10 C.F.R. §835.402 required personnel monitoring for workers who were likely to receive a CEDE of 0.1 rem or more from all occupational radionuclide intakes in a year. 10 C.F.R. §835.702 required that all associated personnel monitoring data be recorded and maintained. Therefore, in the absence of internal dosimetry records, NIOSH may assume that intakes by unmonitored workers did not result in doses exceeding 0.1 mrem CEDE.

The final rule for 10 C.F.R. pt. 835, *Occupational Radiation Protection*, was published on December 14, 1993 with an effective date of January 13, 1994. All DOE sites were required to be in compliance with the rule by January 1, 1996.

This Addendum addresses post-1995 unmonitored intakes of the radionuclides for which dose reconstruction limitations were identified in Rev. 1 of the SEC-00109 ER, and assesses the feasibility of dose reconstruction for such unmonitored workers. During the course of this evaluation, documentation relating to implementation of 10 C.F.R. pt. 835 was reviewed, particularly those documents associated with 10 C.F.R. §835.402, along with LANL and DOE compliance assessments and NTS and ORPS reports. These reviews did not reveal any compelling evidence to contradict NIOSH's previous presumption that, by January 1, 1996, LANL would have been in compliance with 10 C.F.R. §835.402. Given the presumption of compliance, the absence of internal dosimetry records indicates that unmonitored workers were deemed unlikely to have received intakes resulting in a CEDE 0.1 rem or more from all occupational radionuclide intakes in a year.

In conclusion, for the period of this evaluation (January 1, 1996 through December 31, 2005), NIOSH finds that it has access to sufficient information to: (1) estimate the maximum radiation dose for every type of cancer for which radiation doses are reconstructed, and that could have been incurred in plausible circumstances by any member of the class; or (2) estimate radiation doses of members of the class more precisely than an estimate of maximum dose.

7.5 Other Potential SEC Petition Issues Identified During the Evaluation

The issue of neptunium hazards, monitoring, controls, and dose estimation has been raised at the LANL site. In a supporting document provided by the petitioner, neptunium is discussed as part of a 2005 DOE inspection. In this section, NIOSH follows this issue as it makes its way through the DOE noncompliance system and evaluates whether the quantities and processes involving neptunium and the issues surrounding the LANL radiological safety program affect NIOSH's ability to bound dose for potential Np exposures.

Information Provided by the Petitioner

Included in the supporting documents received from the petitioner on May 23, 2008, is a November 2005 report by the DOE Office of Security and Safety Performance and Assurance entitled, *Inspection of Environment, Safety, and Health Programs at the Los Alamos National Laboratory*. This report includes the following discussion regarding neptunium (LANL Inspection, 2005):

> *Radiological hazards are prevalent throughout TA-55. However, these hazards also have not always been subjected to appropriate evaluation through work planning mechanisms and interface between line management and HSR* [Health, Safety and Radiation Protection Division]. *For example, in NMT-11, radiological hazards are identified but the unique hazards associated with use of neptunium during fuel production are not adequately called out, analyzed, or documented. Standard plutonium controls, such as plutonium bioassays, would not be adequate for neptunium but were not evaluated and/or modified for this operation. The process hazards analysis, HCPs* [Hazard Control Plans], *and work instructions for actinide fuels work do not adequately define or analyze the special hazards posed by the use of 100-gram quantities of neptunium powders by NMT-11 workers; for example, the site's standard bioassay program and TA-55 health physics questionnaire are only designed to account for plutonium, uranium, americium, and tritium. Specific controls must be put in place to ensure that appropriate neptunium bioassays are performed following workplace events involving neptunium because the standard plutonium bioassay would be ineffective in detecting or quantifying neptunium intakes. Further, the HSR-12 protocol for placing individuals on a routine bioassay program indicates that NMT-11 fuel production workers handling 100 gram quantities of neptunium may need to be on a routine neptunium bioassay program. Calculations performed by HSR-12 following Independent Oversight's inquiry indicated a threshold of nearly 1700 grams; however, the calculations were based on a release fraction of 0.001 for "solids and spotty contamination" versus a release fraction of 0.1 for "nonvolatile powders," which is more reflective of what NMT-11 handles. Using the latter release fraction, a threshold quantity of as low as 10 to 20 grams may warrant routine bioassay for neptunium in accordance with ANSI/HPS N13.29-2001, which the site uses to determine routine bioassay needs.*
>
> *In addition to bioassay concerns, there are also potential inadequacies in the assessment of neptunium airborne contamination from instruments designed and calibrated for plutonium. The lack of comprehensive hazards analysis has resulted in the lack of an appropriate, documented technical basis for addressing these issues.*

Finding #8. *Potential radiological hazards posed by neptunium and isotopes other than plutonium, americium, uranium, and tritium are not adequately addressed by existing LANL TA-55 hazards analysis processes or HSR mechanisms.*

Summary. *A variety of methods are used to identify hazards associated with activity-level program work. Process hazards analyses and HCPs identify hazards inherent in one or more groupings of similar manufacturing or research activities. At the task level, these documents are supplemented by work instructions and IWDs* [Integrated Work Documents], *which more specifically document the unique hazards a worker may encounter during operations. IMP-300.2 and its predecessor Notice 142 require linkage of hazards (and controls) to individual work steps, thereby enhancing the previous LANL work control processes. In most cases, the hazards analysis mechanisms result in a comprehensive listing of hazards associated with work activities. However, lack of required SME* [Subject Matter Expert] *involvement limits the effectiveness and accuracy of hazards analysis efforts. Insufficient rigor and analysis of hazards posed by chemicals and use of non-routine radioactive material at TA-55 has resulted in potentially inadequate controls.*

DOE Preliminary Notice of Violation, EA-2006-05

On February 16, 2007, DOE issued a Preliminary Notice of Violation (PNOV), EA-2006-05, to the University of California, Los Alamos National Laboratory. This notice was issued, in part, in response to the November 2005 inspection report cited above. This notice includes the following discussion (PNOV, 2007, PDF pp. 24-25):

III. Radiological Protection Violations
…C. Monitoring

10 CFR 835.401, General Requirements, requires that "(a) Monitoring of individuals and areas shall be performed to (2) Document radiological conditions; and (6) Identify and control potential sources of individual exposure to radiation and/or radioactive material."

10 CFR 835.403, Air Monitoring, requires that "(a) Monitoring of airborne radioactivity shall be performed, (2) As necessary to characterize the airborne radioactivity hazard where respiratory protection devices for protection against airborne radionuclides have been prescribed. (b) Real-time air monitoring shall be performed as necessary to detect and provide warning of airborne radioactivity concentrations that warrant immediate action to terminate inhalation of airborne radioactive material."

Contrary to the above, on multiple occasions LANL failed to adequately perform and/or document radiological monitoring intended to identify radiological conditions, identify potential sources of exposure, or characterize airborne respiratory hazards. Specific examples include:

6. *The Office of Independent Oversight 2005 inspection found that LANL failed to adequately establish personnel and area monitoring for TA-55 hazards of neptunium and isotopes other than uranium, plutonium, americium and tritium. Specific examples include:*

a. In NMT-11, radiological hazards are identified but the unique hazards associated with use of neptunium during fuel production are not adequately called out, analyzed or documented.

b. The process hazards analysis, hazard control plans, and work instructions for actinide fuels work do not adequately define or analyze the special hazards posed by the use of 100-gram quantities of neptunium powders by NMT-11 workers.

c. The site's standard bioassay program and TA-55 health physics questionnaire are only designed to account for plutonium, uranium, americium and tritium.

d. A documented technical basis has not been established to demonstrate that instruments designed and calibrated for plutonium will function adequately in detecting neptunium airborne contamination.

In its conclusion, the PNOV states that, pursuant to the provisions of 10 C.F.R. §820.24(b), the University of California is required to submit a written reply within 30 days. This reply is to include: (1) admission or denial of the alleged violations; (2) any facts set forth which are not correct; and (3) the reasons for the violations if admitted, or if denied, the basis for the denial. In the event the violations are admitted, this PNOV will constitute a Final Order (PNOV, 2007, PDF pp. 28).

LANL Reply to DOE Preliminary Notice of Violation, EA-2006-05

On March 5, 2007, LANL replied to PNOV EA-2006-05 (PNOV Reply, 2007). The reply was very brief and acknowledged that the violations occurred as stated in the PNOV and waived LANL's right to contest the Notice. The reply mentions DOE meetings with University of California representatives in August 2006 to discuss the following:

- April 2005 LANL investigation into the TA-50-66 worker uptakes
- July 2005 National Nuclear Security Administration (NNSA) Type B investigation of the offsite americium contamination event
- November 2005 Environment, Safety and Health Inspection performed by SSA's Office of Independent Oversight
- March 2006 LANL Summary of Recent Reports for Institutional Price-Anderson Nuclear Safety Noncompliances

At the latter meeting, there was a discussion of the causal factors detailed in the 2006 LANL Integrated Corrective Action Project (ICAP) (ICAP, 2006). On June 1, 2006, site management transferred from University of California to LANS, LLC. UC/LANL completed 21 of the identified compensatory actions and corrective actions by May 31, 2006. Twelve more actions had been started and were transferred over to LANS, LLC on June 1, 2006. LANS, LLC reviewed the remaining 58 actions and submitted an updated ICAP to the Los Alamos Site Office on September 11, 2006.

There is no mention of neptunium in the LANL reply to the PNOV. However, violations are entered into the DOE Noncompliance Tracking System (NTS) for follow-up action (see below).

DOE NTS Reports Related to LANL for 2005 and 2006

Violations cited in DOE PNOVs are entered into the DOE Noncompliance Tracking System (NTS) for follow-up action. Based on the discussion in the LANL reply to PNOV EA-2006-05 (cited above), NIOSH reviewed the following LANL-related NTS reports for 2005 and 2006 for Np-related discussions:

- NC ID: 1877, Unexpected Building, Personnel and Off-Site Contamination Discovered
- NC ID: 2106, Dose to Workers from Radioactive Material Inhalation in TA-50-66
- NC ID: 2305, Integrated Corrective Action Project
- NC ID: 2306, Airborne Release of Radioactive Contamination in the TA-55 Vault

Although the above reports discuss a variety of radiological program issues from the 2006 PNOV, neptunium is not specifically mentioned.

LANL Responses to NIOSH Inquiry Regarding Neptunium

In a data request to LANL dated December 4, 2012 (NIOSH Data Request, 2012), NIOSH asked the following:

> *A specific Np-237 issue has been a recurring subject in Advisory Board Work Group meetings and remains unresolved. The petitioner cited a specific situation in which the monitoring employed may have been inappropriate. This concerned an October/November 2005 inspection of LANL Environment, Safety & Health programs conducted by the DOE Office of Independent Oversight's Office of Environment, Safety and Health Evaluations. Page 35 of their report describes a situation in which standard plutonium controls, including plutonium bioassay, were inappropriately used for an operation involving Np-237. Can you provide any details on this situation?*

On March 19, 2013, LANL provided the following responses (LANL Response, 2013):

> *In the case of Np-237, the need for monitoring was formally evaluated in 2006. The quantity of Np-237 being used fell far below the monitoring criteria calculated by reference to established plutonium monitoring criteria and the dose potential of neptunium relative to plutonium. The quantities of Np-237 that would trigger internal monitoring were subsequently incorporated into the LANL Internal Dosimetry Technical Basis document* [LANL Technical Basis, 2010].

The [November 2005 DOE inspection] *report contained the following Finding (Finding #8): Potential radiological hazards posed by neptunium and isotopes other than plutonium, americium, uranium, and tritium are not adequately addressed by existing LANL TA-55 hazards analysis processes or HSR mechanisms.*

To address the issue specifically for neptunium work, internal dosimetry SMEs confirmed the appropriate threshold for requiring internal dose monitoring at 1700 g. This was documented in Radiological Dose Assessment Technical Issue Paper 018 (TIP 018) in 2006 [TIP 018, 2006]. *The conclusion was that workers associated with this finding were not required to be on additional internal dosimetry programs driven by their work with neptunium.*

NIOSH Considerations Regarding LANL Neptunium Monitoring

NIOSH reviewed information regarding the handling and monitoring of neptunium at LANL. NIOSH considered the following points:

- NIOSH has identified a difference in the radiological program documentation before and after 2005-2006. The 1993 document, *Internal Dosimetry and Dose Assessment at Los Alamos National Laboratory*, has a technical basis for internal dosimetry that mentions monitoring for 100 mrem; however it does not specifically mention Np (Inkret, 1993). The 2010 LANL document, *Internal Dosimetry Technical Basis*, mentions Np and the threshold quantity that would require internal dose monitoring (1.7 kg or more of Np-237) (LANL Technical Basis, 2010).

- In a 1998 paper on dose assessment at LANL, there is information regarding routine bioassay monitoring for workers likely to receive 100 mrem CEDE, but no specific mention of Np (Inkret, 1998b, PDF p. 9).

- A 2004 assessment of the LANL Internal Dosimetry Program does not specifically mention Np, but it does provide feedback that the site does not account sufficiently for all radionuclides in internal dosimetry. The assessment also states that LANL does not have TBDs for all required radionuclides (Programmatic Assessment, 2004, PDF p. 10).

- NIOSH has not located specifics regarding quantities of Np used, only that use was rare. The controls employed appear to be those in place for plutonium-related work. In the 2005 DOE inspection report, NMT-11 workers are discussed using “100 gram” quantities (LANL Inspection, 2005).

- PNOV EA-2006-05 discusses several incidents/violations in Section III (PNOV, 2007). It also discusses a general issue identified by the Office of Independent Oversight in 2005 in regard to the hazards of Np in T-55; however, no Np-specific violations or examples are identified.

- The 2005 and 2006 NTS reports related to PNOV EA-2006-05 (i.e., NC IDs: 1877; 2106; 2305; 2306) discuss Radiological Program issues but never mention Np (ICAP, 2006; NC ID: 1877, 2005; NC ID: 2106, 2005; NC ID: 2306, 2006).

- The 2010 LANL document, *Internal Dosimetry Technical Basis*, states: “Individuals who work with 1.7 kg or more of Np-237, and individuals with previous confirmed intakes of neptunium, are

monitored annually by RAS [alpha spectroscopy]" (LANL Technical Basis, 2010). LANL has maintained that no worker ever reached this threshold value to be monitored.

NIOSH Conclusions

The 2005 inspection conducted by the DOE Office of Independent Oversight, indicated that LANL failed to adequately establish personnel and area monitoring for hazards associated with neptunium. The examples presented in this report described inadequate hazards assessments, insufficient documentation of hazards, inadequate work planning, issues associated with the site's bioassay program procedures, and air monitoring technical basis documentation. While these issues appear to be legitimate concerns, they do not indicate that unmonitored intakes occurred.

Work involving neptunium was rare at LANL during the period of this evaluation, January 1, 1996 through December 31, 2005. The specific example discussed in the 2005 inspection report and 2007 PNOV involved the use of "100-gram quantities" of neptunium. There appears to have been some disagreement between the DOE inspection team and the LANL subject matter experts regarding the need for routine bioassay for workers using 100-gram quantities of neptunium. The DOE inspection team referenced *ANSI/HPS N13.29-2001* and concluded that the bioassay threshold could be as low as 10 to 20 grams of neptunium powder. The threshold determined by LANL was 1700 grams. LANL's contention therefore, was that routine bioassay monitoring thresholds were never exceeded.

NIOSH has not found any evidence of any breech in containment during these operations that resulted in significant release of airborne neptunium contamination. Given the robust field monitoring program described in Section 6.1.1, it is highly unlikely that such a release of material could have occurred without eventual detection. NIOSH has not found any evidence suggesting that unmonitored workers received neptunium intakes as a result of these operations. The 2005 DOE inspection report did not suggest or imply that unmonitored workers received neptunium intakes.

In conclusion, NIOSH finds that unmonitored workers involved with these operations were unlikely to have received intakes that would have resulted in 100 mrem CEDE. Therefore, the methodology described in Section 7 for bounding intakes for unmonitored workers is also appropriate for workers involved with these neptunium operations.

7.6 Summary of Feasibility Findings for Petition SEC-00109

This Addendum evaluates the feasibility for completing dose reconstructions for employees at LANL from January 1, 1996 through December 31, 2005. NIOSH found that the available monitoring records, process descriptions, and source term data available are sufficient to complete dose reconstructions for the evaluated class of employees.

Table 7-2 summarizes the results of the feasibility findings at LANL for each exposure source during the time period January 1, 1996 through December 31, 2005.

Table 7-2: Summary of Feasibility Findings for SEC-00109
January 1, 1996 through December 31, 2005

Source of Exposure	Reconstruction-Feasible (Yes or No)
Internal[1]	**Yes**
- Pu	Yes
- H-3	Yes
- U	Yes
- MFP and MAP	Yes
- Sr-90/Y-90	Yes
- Th-230 and Th-232	Yes
- Am-241	Yes
- Np-237	Yes
- Ac-227	Yes
- Pa-231	Yes
- Cm-244	Yes
External	**Yes**
- Gamma	Yes
- Beta	Yes
- Neutron	Yes
- Occupational Medical X-ray	Yes

[1] Internal includes an evaluation of urinalysis (*in vitro*), airborne dust, and lung/whole-body count (*in vivo*) data.

As of December 14, 2016, a total of 558 claims have been submitted to NIOSH for individuals who worked at LANL within the time period under evaluation in this Addendum. Dose reconstructions have been completed for 430 individuals (~77%).

8.0 Evaluation of Health Endangerment for Petition SEC-00109

The health endangerment determination for the class of employees covered by this evaluation report is governed by both EEOICPA and 42 C.F.R. §83.13(c) (3). Under these requirements, if it is not feasible to estimate with sufficient accuracy radiation doses for members of the class, NIOSH must also determine that there is a reasonable likelihood that such radiation doses may have endangered the health of members of the class. Section 83.13 requires 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.

This present evaluation is specific to internal dose reconstruction feasibility at LANL for the period from January 1, 1996 through December 31, 2005. In Rev. 1 of the SEC-00109 Petition Evaluation Report (August 13, 2012), NIOSH concluded that it was feasible to reconstruct internal dose from plutonium and uranium for this period, but concluded that it was only "likely" feasible to reconstruct internal dose to all radionuclides, including exotics. As a result of this present evaluation, NIOSH now concludes that it has access to sufficient information to estimate the maximum radiation dose for every type of cancer for which radiation doses are reconstructed, and that could have been incurred in plausible circumstances by any member of the class for the period from January 1, 1996 through December 31, 2005.

NIOSH's evaluation determined that it is feasible to estimate radiation dose for members of the NIOSH-evaluated class with sufficient accuracy based on the sum of information available from available resources. Therefore, a health endangerment determination is not required.

9.0 Class Conclusion for Petition SEC-00109

Based on its full research of the class under evaluation, NIOSH found no part of said class for which it cannot estimate radiation doses with sufficient accuracy. This class includes all on-site personnel who worked at the Los Alamos National Laboratory site from January 1, 1996 through December 31, 2005.

NIOSH has carefully reviewed all material sent in by the petitioner, including the specific assertions stated in the petition. NIOSH has also reviewed available technical resources and many other references, including the SRDB, for information relevant to SEC-00109. In addition, NIOSH reviewed its NOCTS dose reconstruction database to identify EEOICPA-related dose reconstructions that might provide information relevant to the petition evaluation.

These actions are based on existing, approved NIOSH processes used in dose reconstruction for claims under EEOICPA. NIOSH's guiding principle in conducting these dose reconstructions is to ensure that the assumptions used are fair, consistent, and well-grounded in the best available science.

Simultaneously, uncertainties in the science and data must be handled to the advantage, rather than to the detriment, of the petitioners. When adequate personal dose monitoring information is not available, or is very limited, NIOSH may use the highest reasonably possible radiation dose, based on reliable science, documented experience, and relevant data to determine the feasibility of reconstructing the dose of an SEC petition class. NIOSH contends that it has complied with these standards of performance in determining the feasibility or infeasibility of reconstructing radiation dose for the class under evaluation.

10.0 References for this Addendum

10 C.F.R. pt. 830, *Nuclear Safety Management*; accessed via Internet on January 16, 2017; https://www.gpo.gov/fdsys/pkg/CFR-2011-title10-vol4/pdf/CFR-2011-title10-vol4-part830.pdf

10 C.F.R. pt. 820, *Procedural Rules for DOE Nuclear Activities*; accessed via Internet on January 16, 2017; https://www.gpo.gov/fdsys/pkg/CFR-2011-title10-vol4/pdf/CFR-2011-title10-vol4-part820.pdf

10 C.F.R. §835.402, *Occupational Radiation Protection, Part 402, Individual Monitoring*; accessed via Internet on July 23, 2012; https://www.gpo.gov/fdsys/pkg/CFR-2011-title10-vol4/pdf/CFR-2011-title10-vol4-sec835-402.pdf

10 C.F.R. pt. 835, App. C, *Occupational Radiation Protection*, Appendix C: *Derived Air Concentrations (DAC) for Controlling Radiation Exposure to Workers at DOE Facilities*, accessed via the Internet on August 27, 2008; https://www.gpo.gov/fdsys/pkg/CFR-2016-title10-vol4/pdf/CFR-2016-title10-vol4-part835-appC.pdf

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. §2210 [Price-Anderson Amendments Act of 1988, Public Law 100-408] Indemnification and Limitation of Liability; August 20, 1988; https://www.gpo.gov/fdsys/granule/USCODE-2010-title42/USCODE-2010-title42-chap23-divsnA-subchapXIII-sec2210

42 U.S.C. §§7384-7385 [EEOICPA], *Energy Employees Occupational Illness Compensation Program Act of 2000*, as amended; available on OCAS website: https://www.cdc.gov/niosh/ocas/

63 FR 59683, *10 C.F.R. §835.402, Individual monitoring*; Federal Register/Vol. 63, No. 213; November 4, 1998/Rules and Regulations – Page 59683; https://www.gpo.gov/fdsys/pkg/FR-1998-11-04/pdf/98-27366.pdf

72 FR 31927, *10 C.F.R. §835.702, Individual monitoring records*; Federal Register/Vol. 72, No. 110; June 8, 2007/Rules and Regulations – Page 31927; https://www.gpo.gov/fdsys/pkg/FR-2007-06-08/pdf/E7-10477.pdf

Airborne Radioactivity, 2001, *Airborne Radioactivity Investigation Report*, Los Alamos National Laboratory; various dates in 2001; SRDB Ref ID: 151889 (UCNI)

Airborne Radioactivity, 2002, *Airborne Radioactivity Investigation Report*, Los Alamos National Laboratory; various dates in 2002; SRDB Ref ID: 151937 (UCNI)

Air Data, 1996-1997, *Air Sample Analysis Forms with Results for Various LANL Technical Areas in 1996-1997*, Los Alamos National Laboratory; various locations and dates in 1996-1997; SRDB Ref ID: 151918

Air Data, 2001, *Air Sample Analysis Forms with Results for Various LANL Technical Areas in 2001*, Los Alamos National Laboratory; various locations and dates in 2001; SRDB Ref ID: 55794 (OUO)

Air Sampling Evaluation, 2001a, *Air Sampling/Monitoring Technical Evaluation at CMR*, Los Alamos National Laboratory; January 8, 2001; SRDB Ref ID: 107403 (OUO)

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Attachment 1: DOE Database Results (NTS and ORPS)

The attachment lists the documents obtained as a result of searching the contents of two DOE databases: (1) the Nonconformance Tracking System (NTS); and (2) Occurrence Reporting System (ORPS). The purpose of the searches was to discover any evidence of 10 C.F.R. pt. 835 violations at LANL, the site's response, and the corrective actions undertaken.

Documents Obtained from the DOE's Nonconformance Tracking System (NTS)

NIOSH reviewed the DOE Nonconformance Tracking System (NTS) for 10 C.F.R. pt. 835 violations, site responses, and corrective actions. A total of 384 documents were captured, of which 91 were deemed potentially relevant and loaded into the SRDB. The entire list of captured documents is available (NTS List, 2016). Table A1-1 lists the titles and SRDB Ref IDs for the 91 selected documents.

Table A1-1: Document Obtained from the Nonconformance Tracking System (NTS)

Document Title/Description	SRDB Ref ID
Postponement of LANL/Nevada Test Site 10 C.F.R. pt. 835 Internal Assessment	164526
Failure to Wear External Dosimetry	164527
Potential Concerns Regarding Configuration Management of Monitoring Equipment at TA-18	164528
Potential Intakes of Radioactive Material	164530
Pu-238 Contamination Detected During Scanning Electron Microscope Process	164532
1993 Intake of 7.9 to 13 rem (CEDE)	164533
Pu-239 Equivalent Loading on Exhaust HEPA Filters Exceed AB	164534
Airborne Release at TA55-4-319	164536
HSS RP Program Audit Findings	164537
Radiation Protection Assessment - Corrective Action	164538
Inadequate Personnel Sweeps Prior to Radiological Activities	164539
Radiation Protection Program Assessment - HSR Self-Assessment Program	164540
Airborne Release of Radioactive Contamination in the TA-55 Vault	164541
Injury Sustained During Glovebox Work	164543
Radiation Protection Program Assessment Findings and Institutional Issues	164544
Altered Bioassay Data	164545
Radiation Protection Program Assessment - HSR-12 Will Develop Rad Engineering Design	164546
Radiation Protection Training Deadlines Not Met	164547
Amended 10 C.F.R. pt. 835 Rule Implementation Delay	164548
Intake of Radioactive Materials	164549
Radiation Protection Work Control Breakdown Results in Unplanned Uptake	164550
Americium-241 Contamination	164551
Radioactive Material Being Used in an Experiment Found in an Uncontrolled Area	164552
Integrated Work Management Team Report	164554
Internal Dose Evaluation Program	164555
Radiological Work Control Issues	164556
Radiological Worker Training	164557
IPF Contamination	164558
Release of Contaminated Item Offsite	164559
Issues with Implementation of the Work Control Process	164560
Lack of Accountability of Radioactive Material	164562

Document Title/Description	SRDB Ref ID
Lack of Site Specific RP Training	164563
Lack of Sustainable Corrective Actions	164564
Release of Contaminated Items	164566
Assessment of Radiation Generating Devices (RGD) Program	164567
LANL Internal Dose Calculations	164568
Removal of Records From Radiation Control Technician's (RCT) Logbook	164569
Basement Drain Line Leak/Contamination	164570
Routine Pu Bioassay Program Weakness	164571
LANSCE Contamination Event	164572
Bioassay Results Indicate Employee Uptake	164573
Skin Contamination During Work on Acid Waste Line Replacement	164574
CEDE Greater Than 100 mrem for CMR Employee - An On-going Investigation for This Event	164576
Special Dose Assessment Results Indicate a Reportable Intake	164577
TA-53 Radioactive Material Control Issues	164578
CEDE Greater Than 100 mrem for CMR Employee - The Casual Factors and Corrective Action	164579
TA-55 PF-4: Fixed Air Sampler Filter Collection Process	164580
TA-55 Puncture Wound	164581
Technical Safety Requirement (TSR) Violation; MAR Limit Exceeded in a Glovebox at TA-55	164583
CEDE Greater Than 100 mrem - A Safety Bulletin Issued to a TA-55	164584
Training Qualification Exam	164585
Conduct of Operation Concerns at CMR Facility	164586
Tritium Contamination in Uncontrolled Areas	164587
Two Employees Found Contaminated After Steam Line Replacement in Basement of TA-55 Building 4	164588
Contamination in Laboratory	164589
Unauthorized Work Results in a Contaminated Pipe in an Uncontrolled Area	164590
Craft Personnel Accessed the Roof Where ESA-AET Personnel Were Conducting X-Ray Radiographs	164591
Unexpected Building, Personnel and Off-Site Contamination Discovered	164593
Unposted High Radiation Area on Rooftop	164594
Weaknesses in RSS Inventory/Leak Testing	164595
Curium-244 Detected on Employee's Badge	164596
Weaknesses in the Exposure Assessment Program	164597
Delayed Radiological Dose Assessment	164598
Deliberate Tampering With Nasal Swipe Samples	164601
Disregard for Wearing Personal Dosimetry	164602
Dose to Workers from Radioactive Material Inhalation at TA-50-66	164603
Dosimetry Program	164604
DU238 Radioactive Check Sources Were Taken to a Private Residence TA-55	164605
Employee Receives Unplanned Occupational Exposure Greater Than 100 mrem CEDE	164606
Entry Into a Posted Contamination Area Without Current Radiological Worker Training	164607
Exceedance of Extremity Administrative Control Levels	164608
Extremity Dose Monitoring and Controls	164609
Extremity Radiation Exposures	164610
Failure to Fully Implement Controls for Very High Radiation Area	164611
LANSCE Division Unanticipated Neutron Dose Due To Inadequate Work Controls	164612
Leak Test Results for TRUPACT Containers	164613
Metallurgy Group (MST-6) Depleted Uranium Chip Fires	164614
Missing X-Ray Unit	164615
Noncompliance to 10 C.F.R. pt. 835 Monitoring in the Workplace at TA-55	164616
Noncompliance to LANL Occupational Radiation Protection Requirements	164617
Noncompliance to the LANL Radiation Protection Program	164618
Noncompliance to Work Procedures	164619

Document Title/Description	SRDB Ref ID
Noncompliances Associated With Personnel Contamination Discovered During Inventory Operations	164620
Noncompliances Identified in the Failure to Implement the Integrated Work Management	164621
Out-of-Calibration CAM - OSR Noncompliance	164622
Performance Degradation of Shielding	164623
Personnel Contamination - Individual not Permitted to Return and Disciplinary Action Will be Taken	164624
Personnel Contamination - The Investigation and Casual Analysis	164625
Personnel Contamination - Explicit Guidance Will be Added	164626
Personnel Dosimeter Assignment	164627
Positive Nasal Smears From Employee After He Performed Work in TA-55-4, Room 429	164628

Documents Obtained from the DOE's Occurrence Reporting System (ORPS)

NIOSH reviewed the DOE Occurrence Reporting System (ORPS) for 10 C.F.R. pt. 835 violations, site responses, and corrective actions. A total of 159 documents was accessed, of which 64 were deemed potentially relevant, captured, and loaded into the SRDB (ORPS Reports, 1993-2015). Table A1-2 lists the titles and SRDB Ref IDs for the 64 selected documents.

Table A1-2: Document Obtained from the Occurrence Reporting System (ORPS)

Document Title/Description	SRDB Ref ID
Noncompliance with Storage Requirements at Three Transuranic Waste Pads	165346
Uranium Metal Relic Found at TA-10	165346
6000 dpm/100 cm^2 on Metal Outside RCA	165347
H3-contaminated Soil from TA-3 Bldg 30 also Contains TCA	165347
Unauthorized Discharging into Sandia Canyon at TA-60, Sigma Mesa site	165347
TFF Management Unaware of DOE FSAR	165347
Compliance Order from State of New Mexico Citing 28 Violations and Monetary Penalties	165347
Security Officers Violating RCA Reqs for Protective Clothing	165347
Historical Fuel Contamination Discovered in Subsoil During Drill Testing at TA-61-16	165347
Compromise of Classified Material on LANL Videotape	165347
Grams of Depleted Uranium in Salvaged Material in Private Residence	165347
Historical Contamination Found During Demolition/Renovation	165347
Loss of Process Ventilation Without Pressure Inversion at TA-50-1 and TA-55	165347
Loss of Two Classified Documents	165347
Compromise of Classified Material	165347
Depleted Uranium in Timber Cut Onsite and Sold at Public Auction	165347
Computer System Found to be Contaminated	165347
Classified Material Found on Unclassified Computer	165347
Compliance Order from State of New Mexico Citing 2 Violations and Monetary Penalty	165347
Compliance Order from State of New Mexico Citing 4 Violations and Monetary Penalties	165347
Compliance Order from State of New Mexico Citing 3 Violations and Monetary Penalties	165347
Discovery of Contaminated Computers	165347
Compliance Order from State of New Mexico Citing 29 Violations and Monetary Penalties	165347
Compliance Order from State of New Mexico Citing 30 Violations and Monetary Penalty	165347
DOT Hazardous Material Regulation Non-Compliances	165347
Cerro Grande Fire Causes Unscheduled Site Shutdown	165347
Compliance Order from State of New Mexico Citing 18 Violations	165347
Draft Order Received from New Mexico Environment Dept.	165347

Document Title/Description	SRDB Ref ID
Inadequate Work Control Systems for Secondary Subcontractors	165347
Failure to Meet Deadline in Condition of Approval for JCO	165347
Compliance Order from State of New Mexico Citing 2 Violations and Monetary Penalties	165347
Onsite Shipments of Fissile Material Suspended Due to Discrepancy with Shipping Containers	165347
RCRA Compliance Order Resulting from Inspection	165347
Compliance Order Resulting from NOV Concerning RCRA Inspection	165347
Inadequate Safety Analysis of LANL Welding Program	165347
Inadequate Safety Analysis of Type A Designated Packaging for Fissile Content	165347
Suspension of Subcontractor Work Due to Safety Concerns	165347
Subcontractor Receipt of Clean Air Act Notice of Violation	165347
Lab-wide Suspension of Operations Due to Safety Concerns	165347
Lab-wide Potential Inadequate Safety Analysis Regarding Rescission of 30 Lab Performance Reqs	165347
Rad Facility Hazard Categorization Condition-of-Approval Violation	165347
Buildings Flooded Due to Excess Rain	165347
Possible Violation of Federal Clean Water Act at CMRR Construction Site	165348
Positive USQ Related to Seismic Hazards Assessment	165348
Workers Exposed to Silica Dust Above OSHA Limits	165348
Violation of Hazardous Waste Act	165348
Violations Discovered During Hazardous Waste Compliance Evaluation Inspection	165348
Failure to Submit Status Report for Supplemental Sampling at MDA A	165348
Demand for Payment of Stipulated Penalty Arising from Delta Prime Site Report	165348
Notice of Penalties for 2007 NMED RCRA Annual Inspection	165348
Excessive Time Between Abnormal Dosimetry Reading and Notification of Management	165348
Violation Relating to Well MCOBT-4.4	165348
Violation Associated with NPDES Permit	165348
Violation Associated with Hazardous Waste Management	165348
Facility Hazard Categorization at TA-35	165348
Las Conchas Wildland Fire Threatens LANL Property	165348
H3 Contamination Identified Upon Receipt Survey in an Area Not Controlled for Contamination	165348
Sole Supplier of Waste Drums from Supplier List	165348
Violation Associated with Facility Hazardous Waste Management and Permit	165348
New Commuter Air Service Potentially Impacts DSA at LANL Facilities	165348
Violation Associated with Facility Hazardous Waste Management and Permit	165348
Compliance Order Relative to LANL Hazardous Waste Management Violations	165348
Design Features Removed from Service with No Specified TSR Allowance	165348
Violation with Proposed Penalty for 2014 LANL RCRA Inspections	165348
EPA Administrative Order for 2014 LANL NPDES Permit Inspection	165348

Attachment 2: Data Capture Synopsis

Table A2-1: Summary of Holdings in the SRDB for Los Alamos National Laboratory

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Primary Site / Company Name: Los Alamos National Laboratory; DOE 1942-Present Alternate Site Names: Los Alamos Scientific Laboratory Physical Size of the Site: 43 square miles, >1,800 buildings. Site Population: Approximately 15,600 in 1993, 12,500 in 1995, 7,580 at beginning of CY-2012, and current estimate of 7,000.	Accelerator health protection progress report, air emissions monitoring program, air sampling analysis results, Albedo Thermal Luminescent Dosimeter (TLD) vs. film badge study for plutonium-239 recovery workers, aluminum ion plating of U(93) fast-burst reactor components, americium oxide production at Los Alamos National Laboratory (LANL), analyzing an environmental sample for Pu-244 at the Los Alamos Meson Physics Facility (LAMPF), neutron and collective dose values supplied by LANL, application of curium measurements for safeguarding at reprocessing plants, backgrounds for Nuclear Track A (NTA) film, bioassay data, division progress reports, curium-248 separation, detection limits for chest counting, disposal of solid contaminated waste materials, stack discharge reports, history of plutonium body burden from urine assays, enriched uranium processing operations, environmental monitoring program and reports, external dosimetry technical basis document, gamma analyses of LAMPF water samples, GMX-11 shots involving thorium, history of LANL's bioassay program, inventory of quantities and locations of radioactivity, determination of tritium in urine and water, LANL stack effluent results, locations of burial areas in Pajarito Canyon, lung and whole body counting results, multisphere neutron spectroscopy measurements, nasal swipe data, NTA film badge response to plutonium fuel form neutrons, overview of the neptunium-237 experiments, personnel exposure data, power reactor experiment, radioactivity produced in LAMPF water, radiological incidents, radiological surveys, report of the Los Alamos Historical Document Retrieval And Assessment (LAHDRA) project, special work permits, standard operating procedures, TLD badge neutron correction factor at LAMPF, trip reports, tritiated water output, urinalysis results, and whole body count results.	05/17/2016	822
State Contacted: NA	Contacting the state was not considered necessary since LANL is an active DOE site and cooperated with relevant data collection.	NA	0
Albany Research Center	Small source control, industrial uses of nuclear explosions, and analysis of uranium and plutonium.	03/23/2013	4

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Ames Laboratory	History of the Ames project under the Manhattan District and thorium shipments to various facilities.	07/27/2006	2
Argonne National Laboratory - East	Bioassay program reports, monthly summary of radiation safety activities, division reports of activities, radiation contamination investigation, special nuclear materials correspondence, plutonium scrap processing, Transient Reactor Test Facility (TREAT) schedule, and an Experimental Breeder Reactor (EBR-II) project newsletter.	06/16/2015	15
Battelle National Laboratory - King Avenue	Nuclear materials assessment 1981.	01/09/2013	1
Brookhaven National Laboratory (BNL)	Ambient air monitoring parameters at DOE facilities, body burdens and dose assessment for Bikini Island residents, Cs-137 concentration in deer meat at BNL, annual radiation exposure report, Department of Energy Laboratory Accreditation Program (DOELAP) accreditation for BNL, urinalysis reports, and a site annual report.	02/18/2009	11
Cincinnati Operations Center	Health and safety of tritides, bioassay limitations, and a proposed path forward to assigning dose.	01/02/2008	4
Cincinnati Public Library	Radiation safety in the Manhattan Project and historical information.	02/10/2011	3
Claimant Provided	Publication "The Atom", nuclear propulsion for rockets, a memo concerning technical overexposures, and a historic building assessment of Chemistry and Metallurgy Research (CMR).	11/05/2013	10
Colorado Mesa University, Tomlinson Library	Thorium - U-233 symposium 1958.	10/16/2012	1
Colorado State University Library	Reclassification of the Tritium Research Laboratory.	04/10/2006	1
Curtiss-Wright, Cheswick, PA	Shipping documentation, radiation exposure records, and an operations report.	05/01/2009	5
Department of Energy (DOE) / SC&A	Tritium contamination and weapon components.	02/22/2012	1
Department of Labor / Paragon	Boron-10 Production Plant shutdown/standby condition, low-level mixed waste inventory characteristics, Pinellas Plant overview, and tritium activities in the United States.	01/23/2012	7
DOE Carlsbad	Radiation properties of plutonium materials.	08/11/2010	1
DOE Environmental Management Consolidated Business Center (EMCBC) - Denver	Rocky Flats thorium shipment receipts and a site search warrant.	02/12/2014	3
DOE Germantown	Site history and characterization, Manhattan District history, Ra-Be sources, effects of the bombing in Japan, intrinsic radiation from early weapons and their components, and the status of pure plutonium-239 metal stored at LANL.	12/29/2015	26

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
DOE Legacy Management - Grand Junction Office	Problems of waste disposal water supply and environmental hazards, decontamination of real property, a description memo for Ultra-High-Temperature Reactor Experiment (UHTREX) decommissioning, engineering evaluation, environmental analysis of the Bayo Canyon, environmental assessment, low-level waste disposal capacity report, normal uranium scrap processing, progress reports, radiological surveys, summary of contractual procurement for site Y, and trip reports.	08/25/2011	53
DOE Legacy Management - Grand Junction Office / SC&A	Manager report, book one 1947-1950.	06/09/2010	1
DOE Legacy Management - Morgantown	Bibliography of epidemiological papers, employee dosimetry files, external dose reports, monthly progress reports, radiological incidents, radiological work permits, recycled uranium material balance, scope of subcontract work for Formerly Utilized Sites Remedial Action Program (FUSRAP), shipment and receipt documentation, source and special nuclear material accountability station symbols, remedial action report, and a certification docket.	03/01/2016	47
DOE Legacy Management - MoundView (Fernald Holdings, includes Fernald Legal Database)	Criticality dosimetry, Dayton polonium history file, DOE's annual radionuclide air emission report, effluent discharge information, history of polonium dose evaluation research project, history of the operation of the Feed Materials Production Center by National Lead of Ohio, Inc., Mound technical basis document for stable tritiated particulate and organically bound tritium, nationwide survey of normal uranium scrap materials, polonium-210 urinalysis data, precious metals program, production reports, radioactive waste management status report, radiological incidents, shipping radioactive and fissile material information, trip reports, weekly progress reports, and Mound-View newsletters.	02/01/2012	89
DOE Legacy Management - MoundView / Albany Research Center	Symposium on occupational health experiences in the uranium industry.	09/30/2003	1
DOE Legacy Management - Westminster Office	Acceptance and processing status of PuO2 scrap, tritium incident, history of incineration and landfill operations, MED/AEC/DOE external dosimetry technology, a technical basis document, plutonium metal recovery, pond 207 complex data sheets, and a follow-up study of individuals involved in plutonium inhalation related to a 1965 fire.	10/23/2014	25
DOE National Nuclear Security Administration (NNSA)	Contracted activities and information dissemination.	01/17/2012	2
DOE Nuclear Materials Management and Safeguards System (NMMSS)	Rocky Flats receipts of MT 82.	07/10/2013	2

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
DOE Oak Ridge Operations (ORO)	Definitions of weapons usable U-233, external dose by age and year, Mallinckrodt Chemical Works four plant study classifications of radium, radon and thorium exposures, radiation incidents, and a strategy for future use and disposition of U-233.	07/09/2012	10
DOE Oak Ridge Operations Office - Records Holding Task Group (RHTG)	Acceleration of the Thorex Pilot Plant Program, analytical and isotopic data for the shipment of U-233 solution, uranium production statistics, thorium inventory, disposition of U-233 from thorex recycle streams, monthly reports, and U-233 deliveries and requirement information.	08/14/2015	48
DOE Oak Ridge Operations Vault	TLD reader procedures.	10/19/2011	1
DOE Office of Scientific and Technical Information (OSTI)	Alternate breeder fuel development program report, annual progress reports, decontamination of laboratory surfaces for tritium, determination of the alpha counting efficiency of filter papers, development of techniques for rolling uranium metal, external monitoring data, process development quarterly reports, report on results of chest X-ray survey, survey of fission product release from Nuclear Engine for Rocket Vehicle Application (NERVA) fuel material, thorium receipts, research pool inventory, and quarterly reports.	08/21/2014	68
DOE Portsmouth/Paducah Project Office (PPPO)	Uranium dosimetry methodology and gamma spectrometry monitor.	01/31/2013	4
Eastern Kentucky University	Pantex Plant history.	04/17/2009	1
East Tennessee Technology Park (ETTP) Records Center	Holdup measurements at the Portsmouth Gaseous Diffusion Plant and a nondestructive assay measurement survey.	06/25/2013	2
Federal Record Center (FRC) - Boston	Personnel exposure summaries.	04/27/2012	1
Federal Record Center (FRC) - Chicago	Working group on radioactive waste management.	09/27/2012	1
Federal Record Center (FRC) - Dayton	Radiation dose determinations from indium foils.	03/03/2006	1

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Federal Record Center (FRC) - Denver	As Low As Reasonably Achievable (ALARA) reviews, radiation protection program assessment, autopsy related radiological analysis, basis for interim operations, bioassay program notebooks and operations documents, bioassay results, criticality safety review, cutting and encapsulation of Np-237 sample, decommissioning management plans, depleted uranium information, emissions from the Los Alamos Neutron Science Center (LANSCE), environmental assessment and findings, environment safety and health operations procedures, gamma analyses of LAMPF water samples, monthly progress reports, quality assurance program plan, hot lab and spectrometer information, instrument calibration, LAMPF experiments, LANL operations at Nevada Test Site, laser induced fluorescence, incoming radioactive material shipments, occupational radiation exposure report, radiation safety procedures, radioactive effluent data, radiological incidents, radiological surveys including airborne, radiation and contamination data, radiological work permits, radiation control technician logbooks, report for weekly LANL stack samples, shipment papers, target design for the accelerator production of tritium plant, tiger team self-assessment, waste characterization and minimization progress reports, and whole-body exposure.	02/17/2012	1,097
Federal Record Center (FRC) - Ft. Worth	X-ray machine inspection, quality assurance of TLD badge processing, and radiation exposure reports.	07/27/2006	3
Federal Record Center (FRC) - Lee's Summit	Report of significant DOE accidents, preferred alternatives for waste management, Nuclear and Industrial Safety Department monthly report, plasma decontamination, radiation and safety committee meeting minutes (1991), radiological evaluation at the Los Alamos National Laboratory, summary of unusual occurrence and accident/incident reports (1987), and a summary of noncompliance tracking system reports related to radiological protection.	06/14/2016	18
Federal Record Center (FRC) - Kansas City	Acid canyon report on health physics support, analysis of samples for uranium, remedial action at Pueblo Canyon, environmental evaluation of the Bayo Canyon alternatives, multimedia contaminant environmental exposure assessment methodology, the need for remedial action in Bayo Canyon, photos of Acid Pueblo and Bayo Canyon, radiological plan for Acid Pueblo, a radiological survey, and remedial action criteria.	10/09/2013	19

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Federal Record Center (FRC) - San Bruno	Corrective action plan, finger film dosimeter data, description of air sampling equipment, radiation and toxic chemical records review, trip report, quarterly reports, isotope receipt book (1949-1960), and tissue assay data.	07/31/2014	23
Florida State Archives	Summary report of activities for assuring the safety of underground nuclear testing.	02/25/2013	1
General Atomics	Shipment information and radiation injury claims.	11/02/2005	2
Hagley Museum and Library	Radiation incidents, plutonium button fabrication flow sheet, plutonium waste recovery process, trip report, solid radioactive waste incineration report, beta-gamma activity of plutonium, The Hanford Story, and Pu-238 production.	10/10/2010	33
Hanford	Incident reports, shipment documentation of plutonium metals and other nuclear materials, Hanford Laboratories operation monthly activities reports, Health Division annual reports, Hanford Plutonium Finishing Plant (PFP) history, film badge exchange for plutonium exposure comparisons, Los Alamos specifications for incoming oxide, photodosimetry procedures, plutonium isotopic values contract, operations production reports, material accountability report, status report on analytical support services action plan for US Testing, storage of 16 percent Pu-240 ceramic grade plutonium oxide, determination of americium in urine, determination of fluoride in plutonium metal by thorium titration, a weekly activities report, and a chemical processing program plan.	06/27/2016	88
Health and Safety Laboratory (HASL) - Environmental Measurements Laboratory (EML)	Airborne survey, urinalysis data, thorium sampling and storage, and criticality alarms and dosimetry.	01/21/2011	5
Health Physics Journal	Characterization of plutonium aerosol, excretion of plutonium, and Godiva IV radiation measurements.	08/31/2012	4
Idaho National Laboratory	Tritium experience and radioactive source information, radiological incidents, area exposure reports, bioassay reports, film exposure reports, dosimetry monthly reports, Idaho Chemical Processing Plant progress reports, neutron survey of the TREAT Reactor, radiological surveys, and tritium experience.	04/26/2016	102
Idaho National Laboratory - EDMS	Records storage information.	06/29/2016	1
Idaho National Laboratory - INTEC	Documented communication with site expert.	09/10/2014	1
Interlibrary Loan	Survey of mixed-waste HEPA filters in the DOE Complex, environmental levels of radioactivity at Atomic Energy Commission (AEC) installations, journal of Glenn Seaborg, nuclear criticality safety, and surface contamination symposium notes 1964.	08/31/2015	18

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Internet - Defense Technical Information Center (DTIC)	Chemical and radiochemical composition of thermally stabilized plutonium oxide from the plutonium, chloride-catalyzed corrosion of plutonium in glovebox atmospheres, effect of compositional variation in plutonium on process shielding design, actinide research quarterly report, laundry decontamination, final environmental statement, purification of 238 PuO2 scrap for heat source fuel, reactions of plutonium dioxide with water, a toxicological profile for plutonium, and particle accelerator conference proceedings 1987.	08/25/2016	52
Internet - DTIC / SC&A	Idaho site environmental report 1995.	01/09/2012	1
Internet - DOE	Guide to good practices for occupational radiological protection in plutonium facilities and a handbook on airborne release fractions/rates.	12/04/2008	3
Internet - DOE Comprehensive Epidemiologic Data Resource (CEDR)	Impact of downsizing and reorganization.	01/23/2010	1
Internet - DOE Hanford Declassified Document Retrieval System (DDRS)	Monthly engineering and operations reports, hazards of exposure to tritium and tritium oxide, Irradiation Processing Department monthly report, radiation protection criteria in the 234-5 Building, and trip reports.	03/20/2015	37
Internet - DOE Legacy Management Considered Sites	Monthly progress report.	04/24/2012	5
Internet - DOE Noncompliance Tracking System	Price-Anderson noncompliance reports related to 10 C.F.R. pt. 835 violations and related occurrence reports with assigned corrective actions.	11/17/2016	92
Internet - DOE Occurrence Reporting and Processing System (ORPS)	OPEN: ORPS access by ORAUT authorized by DOE. Awaiting resolution of technical issues by DOE.	01/26/2017	64
Internet - DOE Office of Environmental Management	Linking Legacies chapter 3: Wastes.	10/28/2007	1
Internet - DOE Office of Scientific and Technical Information (OSTI)	Decommissioning a tritium contaminated laboratory and handling tritium gas techniques.	09/16/2015	3
Internet - DOE OpenNet	Advisory committee on human radiation experiments final report, AEC response to LANL concerning biological testing (WINDSTORM, BUSTER, and JANGLE), declassification of highly enriched uranium inventories at DOE laboratories, history of the Armed Forces Special Weapons Project (AFSWP) 1947-1954 volume 5, manufacturing statement for weapons production schedule of transfers, mortality study of Los Alamos workers with higher exposures to plutonium, Mound Plant potential release site package, Newell Stannard interview, plutonium and environmental metals in man, quarterly progress report, radiation protection and the human radiation experiments, plutonium workers roundtable, history of the Inhalation Toxicology Research Institute, Hanford source and special nuclear material balance reports, and a Trinity site survey.	09/19/2016	108

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Internet - DOE OpenNet / Hanford	Human radiation studies information.	11/26/2007	1
Internet - DOE OpenNet / NIOSH	Annual report to Congress 1960.	01/11/2008	1
Internet - DOE OSTI / SC&A	Pinellas Plant facts, accidents and incidents involving radiation in Atomic Energy Commission activities.	02/21/2007	2
Internet - DOE OSTI Energy Citations	Account of Oak Ridge National Laboratory's thirteen nuclear reactors, annual report of waste generation prevention progress, estimation of Cm-244 intake by bioassay measurements following a contamination incident, fabrication options for depleted uranium components in shielded containers, fast burst reactors in the U.S.A., transuranic (TRU) waste phase I retrieval plan, bioassay and analytical chemistry annual meeting proceedings 1956, and financial information.	08/28/2013	58
Internet - DOE OSTI Information Bridge	184-inch synchrocyclotron decommissioning, annual site environmental report, annual report of waste generation and pollution prevention progress, annual reports of the biomedical and environmental research program, risk of transporting plutonium oxide and liquid plutonium nitrate by truck, characterization of transuranium-contaminated solid wastes residues, effects of neutron radiation on niobium, fuel irradiation project, integrated data base report for U.S. spent nuclear fuel and radioactive waste inventories, inventory and sources of transuranic solid waste, quarterly status reports, nuclear facility decommissioning, performance and improvements of the tritium handling facility, plutonium and americium processing chemistry and technology, laboratory notebook, review of major plutonium pyrochemical technology, state background radiation levels and results of measurements, stockpile management program quarterly report, transportation and disposal configuration for low-level and mixed waste, transuranic contaminated waste form, tritiated wastewater treatment, waste vitrification projects, and historical doses from tritiated water and hydrogen gas released from Lawrence Livermore National Laboratory.	12/02/2013	232
Internet - DOE OSTI Information Bridge / SC&A	Preparation and characterization of uranium oxides in support of the K Basin sludge treatment project.	03/15/2012	1

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Internet - DOE OSTI SciTech Connect	Report to Congress on long-term stewardship, summary of industrial accidents in US AEC facilities, survey of air monitoring program, advanced fuel systems program briefing (1976), aerosol sampling and characterization, centrifugal shot blast system deactivation and decommissioning, development of glass vitrification as a waste treatment technique, spent nuclear fuel strategic plan, nuclear waste programs semiannual progress report (1992), reactor development program progress reports, respirator studies, status and future requirements for the uranium-233 power reactor program, summary of 2012 occupational radiation exposure, and waste management progress reports.	10/03/2016	92
Internet - Energy Employees Claimant Assistance Project (EECAP)	Analytical electron microscopy characterization of Fernald soils, criticality measurements, emanation of tritiated water from disposal sites at Los Alamos, hazardous waste incinerator research, report on Portsmouth cascade header enrichment monitor, plutonium scrap processing, progress report of the Experimental Physics Division, radiochemical analysis of samples beneath a solid radioactive waste disposal pit, status of efforts related to Hiroshima and Nagasaki dose estimates, uranium removal from soils, and survivors of the early Los Alamos nuclear accidents.	03/25/2014	19
Internet - Google	Project experiments list, ALARA analysis, annual report on waste generation, transuranic waste inventory report, constructing predictive estimates for worker exposure to radioactivity during decommissioning, controlling particulates, temperature, and tritium in an inert glovebox, critical experiment logbooks, disposal of mixed radioactive waste, occupational radiation exposure, Durango Colorado uranium mill tailings inventory, environmental impact statement, environmental surveillance, historical timeline, incidents, report of the LAHDRA project, laboratory accomplishments, mixed analyte performance evaluation program, neutron tube target loading, NPX-A3 final report, overview of LANL, radionuclide air emissions, annual site environmental report radiological doses and releases, summary of contaminated sites, superconducting properties of protactinium, synchrotron-radiation-based investigations, transportation of pyrochemical salts, trip reports, validation of decontamination and volume reduction system potential cost savings, heat source project information 1980, and an annual report to Congress.	11/22/2016	429
Internet - Hathitrust	Dosimetry badge experiment orientation.	10/21/2015	1

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Internet - Health Physics Journal	Estimation of actinide skeletal content in humans based on bone samples collected at autopsy, thermal and fast neutron effects on dosimeter films, and ratios of U-234, U-238 and Th-230 in dog lungs exposed to uranium ore dust.	08/10/2016	8
Internet - Idaho National Laboratory	Radiation experiments on humans and animals.	07/25/2016	3
Internet - Idaho National Laboratory (Public Reading Room)	Analytical Chemistry Branch monthly report 1965.	05/02/2016	1
Internet - Los Alamos National Laboratory	Air monitoring and its evolution, curium concentration in spent nuclear fuel, environmental surveillance, passive nondestructive assay of nuclear materials, Los Alamos site overview, and an actinide research quarterly report.	06/27/2011	13
Internet - National Academies Press	Deactivating and decommissioning of energy facilities.	09/01/2010	2
Internet - National Institute for Occupational Safety and Health (NIOSH)	Residual radioactive contamination at atomic weapons employer facilities, evaluation report, and special exposure cohort information.	08/08/2016	9
Internet - National Service Center for Environmental Publications (NEPIS)	Mixed energy waste study 1987, corrective actions, and site remediation.	09/26/2014	2
Internet - NRC Agencywide Document Access and Management (ADAMS)	Defense waste and transportation management program implementation plan, final environmental impact statement, evaluation of the potential for recycling of scrap metals from nuclear facilities, exposure investigations of workers whose TLD badges recorded exposures over the quarterly limits, investigations in gallium removal, methods for estimating fugitive air emissions of radionuclides, process modeling of plutonium conversion, spent nuclear fuel management programs at other generator/ storage locations, storage and disposition of weapons, a waste management plan, and an audit of the West Valley waste certification program.	03/23/2015	134
Internet - Oak Ridge National Laboratory Library	Development of process for americium recovery, disposal of radioactive wastes, Electronuclear Research Division progress report, Homogeneous Reactor progress report, Metallurgy Division progress report, Neutron Physics Division progress report, NNSA type B accident investigation of the americium contamination accident at the Sigma Facility, Operations Division monthly report, Physics Division quarterly progress report, quarterly progress report Stable Isotope Research And Production Division, report on the disposal of radioactive wastes, and the Aircraft Nuclear Propulsion Project at the Oak Ridge National Laboratory quarterly progress report.	05/25/2015	105
Internet - Sandia National Laboratories, NM	Transfer of the neutron generator production mission.	04/01/2013	1

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Internet - University of North Texas	Nuclear instrumentation report and radiation protection system installation for the accelerator production of tritium/low energy demonstration accelerator project.	08/29/2016	2
Kansas City Plant	Annual occupational radiation dosimetry report from LANL/Pantex/SNL-NM/NTS/Rocky Flats, annual environmental summary reports, daily operations reports, forming heavy metal and safety precautions, radioactive waste management site plan, and storage handling and disposal of thorium nitrate.	03/03/2015	32
Kansas City Plant / SC&A	Redacted notes maintained during review of classified documents.	08/16/2013	1
Lawrence Berkeley National Laboratory	Individual exposure records and bioassay logbook and samples.	05/25/2007	3
Lawrence Livermore National Laboratory	Factors affecting the design of Albedo-neutron dosimeters, neutron and gamma-ray dose measurements at the solution high-energy burst assembly, neutron and gamma-ray measurements on the little boy comet assembly, Nevada Test Site personnel gamma radiation exposures summary, radiation protection quarterly report, and neutron spectrometry for radiation monitoring.	12/21/2015	45

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Los Alamos Historical Document Retrieval and Assessment (LAHDRA)	235-uranium containing filters, alpha radiation measurements in acid canyon, aerosol studies section air emissions annual report, room air-flow readings, ambient indoor air and stack air alpha concentration data, tritium effluent report, analysis of precipitation occurrences, appraisal of available information on uptake by plants of transplutonium elements and neptunium, evaluation of health aspects due to environmental radioactivity associated with the Trinity site test, improved Kanne tritium monitoring system, in situ radiological survey of three canyons at LANL, analysis reports for samples submitted to the Health Physics Analytical Laboratory from stacks, analytical results from soil samples, average daily curie output at the omega stack, Bayo Canyon activities, beam information, bioassay data, chronology of key events, CMR-12 progress reports, discharge of radioactive material from stacks, emergency preparedness documents, environmental surveillance quarterly reports, approval for tritium items for burial, fissile material burial, fluorometric determination of uranium, gamma analyses of LAMPF water samples, Godiva radiation related documents, logbooks and tritium swipe results, quarterly progress reports, historical stack release information, identification of fissile material, impact of strontium-90 and tritium on surface water and groundwater, iodine releases and issues, Kanne Chamber calibration data, LAMPF emissions, list of waste sources, misfired 500 curies experiment, neutron yields of initiator assemblies, neutron-excess nuclide procured by fast neutron reactions in LAMPF, estimating procedures for surface runoff, sediment yield, and contaminant transport, personnel exposure data, plutonium processing, Pu and americium radioactivity of solid waste generated, radioactive effluent and discharge monitoring report, radiological incidents, reports on stack particulate and vapor, strontium-90, cesium-137, and radioactive rare earths in environmental rain and air, summary of contaminated wastes to disposal pits, analysis reports from hot cell and stack, tritium analyses and data, and ventilation and exhaust stack information.	12/28/2009	3,973
Los Alamos National Laboratory LAHDRA / Internet - DOE OpenNet	H Division progress reports 1947-1955.	12/20/2006	6
Los Alamos National Laboratory / SC&A	Final site-wide environmental impact statement for the continued operation of LANL.	08/06/2004	1
Lovelace Respiratory Research Institute	General information on the LANL bioassay program.	09/11/2008	2
Metals and Controls Corporation	Analysis of possible nuclear material losses and possible liabilities associated with present fuel manufacturing.	08/24/2004	1

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Missouri Department of Natural Resources	Report on environmental, safety and health vulnerabilities associated with plutonium storage and an environmental impact statement.	10/03/2008	4
Mound Museum	Actinium process and equipment development, deuterium-tritium mixture sample results, liquid waste quarterly report, fabrication of weapon components, plutonium isotopic control, preparation of powdered thorium, tables used for decay of actinium-227, and trip reports.	01/26/2012	62
National Archives and Records Administration (NARA) - Atlanta	Shipment documentation, incidents, special reactor report, personnel medical information, monthly accountability reports, documentation regarding U-233 thorium project, Pu heat source standards, indoor radon study, and a summary of work done at Berkeley.	06/17/2008	24
National Archives and Records Administration (NARA) - Atlanta / SC&A	Dose rate from RTG heat sources, 239 PuBe neutron source information, and passive nondestructive assay of nuclear materials.	06/08/2006	3
National Archives and Records Administration (NARA) - Chicago	EBR-I and Mark-III mass analysis, EBR-I plutonium loading, and fast breeder reactor physics.	06/12/2015	6
National Archives and Records Administration (NARA) - College Park	Availability of medical grade plutonium-238, incident reports, NIOSH visit/review notes, production of fissionable materials, personnel radiation exposure, report of AEC reactor safeguard committee on plutonium fast reactor, toxicology of actinium, and material accountability.	09/12/2013	23
National Archives and Records Administration (NARA) - Kansas City	Preliminary survey and history of the Electromet Company.	07/11/2016	3
National Archives and Records Administration (NARA) - Seattle	Trip report on neutron monitoring development, radioactive material shipment records, and personnel exposure histories (1952-1962).	02/22/2016	3
National Institute for Occupational Safety and Health (NIOSH)	Bioassay program overview, cancer rate study, characterization wells at LANL, dangerous discrepancies on missing weapons plutonium at LANL, environmental impact statement, environmental surveillance, hazardous waste permit fact sheet, health hazards associated with rolling normal and enriched uranium - evaluation and control, improving the accuracy of dispersion models, investigation of excess thyroid cancer incidence, long-term risk from actinides in the environment, material control and accountability, national laboratory tritium technology deployments large scale demonstration and deployment project, radiological incident, radioactive lanthanum (RALA)/Bayo Canyon implosion program, research laboratory betatron files, security issues related to out-processing of employees, surface contamination control with uranium rolling operations, trip reports, unplanned airborne releases, uranium aerosols from machining and metallurgy operations, and radiation protection program (2011).	03/01/2016	237

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
NIOSH / Internet - DOE OSTI Information Bridge	Progress report for control section.	11/07/2006	1
NIOSH / SC&A	Engineered and administrative safety systems for the control of prompt radiation hazards at accelerator facilities and highly enriched uranium working group reports.	02/22/2012	7
Nevada Test Site (NTS)	Final environmental impact statement for the NTS, radioactive material shipping records, and a radiation survey of shipment from NTS to LANL.	07/16/2009	11
Nevada Test Site (NTS) / SC&A	Aerial measurement of the Kiwi transient nuclear test, aerial radiological monitoring Nevada Test Site, Kiwi transient nuclear test dose rate survey, and the behavior of coated particles in a large nuclear transient.	04/20/2004	7
New York State Archives	Waste disposal at Lake Ontario, weekly reports (1953), and a Manhattan District history book.	03/19/2012	4
NOCTS	Claimant interview.	12/14/2007	1
Nuclear Materials and Equipment Corp. (NUMEC)	Weekly reports (1970-1971).	04/07/2005	1
Nuclear Regulatory Commission Public Document Room	Apparatus for the determination of tritium in body fluids and aqueous solutions, review of research conducted by Los Alamos National Laboratory for the NRC with emphasis on Maxey Flats, Kentucky shallow land burial site, audit reports, certificate of disposition for disposal of neutron sources, response to Exxon Nuclear Company to accept donation of plutonium previously shipped to LANL, export license for tritium to Switzerland, projected transfer of all Pu-Be neutron sources, and license documentation.	11/04/2016	30
Oak Ridge Gaseous Diffusion Plant (K-25)	Internal dosimetry program.	07/15/2014	6
Oak Ridge Institute for Science and Education (ORISE)	Chelation DTPA data for DOE employees.	08/06/2009	22
Oak Ridge Library for Dose Reconstruction	History of the radioactive barium-lanthanum process and production, health physics research reactor hazards summary, Isotopes Division annual report, Operations Division monthly report, RALA source shipment, developments in uranium enrichment, remedial investigation/feasibility study for the Clinch River/Poplar Creek operable unit, and waste effluents committee reports.	05/20/2011	16
Oak Ridge National Laboratory (ORNL)	ORNL homogeneous reactor research and development program, technical review of liquid fuel reactors, decontamination of U-236, minutes from the homogeneous reactor project group leaders meeting, transuranium processing production report, and special nuclear material accountability reports.	03/21/2014	116

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
ORAU Team	Annual dose n/p ratio analysis, annual report radiation exposures for DOE and contractor employees, basis for development of an exposure matrix for the Mallinckrodt Chemical Company, class of employees from LANL, documented communications, environmental nuclide dose comparisons, exposure report for Pantex employees at LANL, health and mortality among contractor employees at Department of Energy facilities, Health Physics Department procedures, history of Granite City Steel, instrumentation technical basis document on Eberline personnel contamination monitor, internal dosimetry coworker data, notes on plutonium contamination on early pits, NTA film fading, Pantex film badge data and results, report on alpha continuous air monitors, response comparison of film and TLDs, a LANL technical basis document, documented communications, notes related to Nuclear Materials Management and Safeguards System (NMMSS) information.	04/27/2016	93
Pacific Northwest National Laboratory (PNNL)	Polycube oxidation and factors affecting concentrations of gaseous products.	04/26/2011	1
Pantex	LANL pits survey and exposure information.	02/06/2008	4
Pantex / SC&A	Radiation safety procedures and a Clarksville contamination survey.	06/30/2011	3
Princeton Plasma Physics Laboratory	Communication concerning monitoring of 1980 visitor.	05/09/2006	1
Rocky Flats Plant	Response to Defense Nuclear Facility Safety Board (DNFSB) and documented communication related to the Critical Mass Laboratory.	08/18/2004	2
Rocky Flats Reading Room - Front Range Community College	Semiannual report of beryllium surveillance.	09/15/2005	1
Sandia National Laboratories, CA	Exposure information, memo assigning tritium processes lead laboratory, shipping records, and tritium plasma experiment information.	04/29/2013	9

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
Sandia National Laboratories, NM	Beta dosimetry study and evaluation of Sandia National Laboratories Albuquerque, contracts of LANL providing whole body counting services for Sandia, health physics log, incident reports, Industrial Hygiene Division film dosimetry manual, instrument evaluation\calibration, interviews with workers, lung count data, operational procedures for portable ion chambers, personnel exposure information, plutonium neutron source, shipping data records, proceedings of the symposium on instrumentation, radioactive waste management data inventories and shipping spreadsheet, radiological surveys, Ross Aviation area surveys, sample dosimetry reports for Sandia personnel on trips to LANL and Pantex sites, shielding analysis and design for the Sandia Engineering Reactor Facility (SERF), the new Los Alamos Scientific Laboratory film badge and personnel neutron dosimetry packet, trip reports, urinalysis and bioassay records, exposure histories 1959-1991, and shipping inventories.	09/09/2014	60
Sandia National Laboratories, NM / SC&A	Radiological surveys of various areas.	09/15/2010	7
Santa Susana Field Laboratory (SSFL)	Characteristics of Pu-Be neutron source, ventilation system correspondence, and bioassay results.	11/18/2009	4
Santa Susana Field Laboratory (SSFL) / SC&A	Deposition of 1997.	01/12/2006	1
Savannah River Site	Californium packaging facility general information, dosimetry visitors cards, health protection monthly summary, historical Pu irradiations, material accountability worksheet, radiation survey logsheets, ratio of U-232 to U-233 in irradiated thorium, request for whole body comparison from Los Alamos National Laboratory , Savannah River Laboratory monthly report, trip report, and a Works Technical Department progress report.	03/19/2012	31
S. Cohen & Associates (SC&A)	Health and safety report Chemicals and Metallurgical Division, Operations Grommet and Toggle onsite radiological safety report, xenon separation and purification program, intersite analyses of deuterium-tritium mixture, indium foil data, review of Sandia symposium on instrumentation experience and problems in health physics tritium control, Works Technical Department progress report, tritium aging effects in LANL, and an AEC workshop on personnel neutron dosimetry.	08/05/2011	94
SC&A / Argonne National Laboratory - East	Chicago Operations Office investigation of radioactive contamination of a scientist and hot laboratory problems in isolating gram quantities of transplutonium elements.	06/24/2010	2

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
SC&A / Idaho National Laboratory	Airborne radionuclide waste management, Chemical Processing Plant (CPP) production monthly report, CPP radiation alarm system, inventory and manufacturing statement, and an environmental survey preliminary summary report of the defense production facilities.	06/24/2010	19
SC&A / Internet - DOE Hanford DDRS	Hanford monthly report.	10/05/2007	1
SC&A / Internet - DOE OpenNet	Plutonium the first 50 years.	10/28/2014	1
SC&A / Los Alamos National Laboratory	Accelerator facility, X-ray facility definitions, aerial radiological survey, annual X-ray protection survey, application of Bayesian techniques in the interpretation of bioassay data, assessment of contamination control, biological and medical research group (H-4) annual report, continuous air monitor correlation to fixed air sample data at LANL, Monte Carlo validation of internal dosimetry algorithms, occupational medicine operating procedures for the diagnostic X-ray unit, operational health physics and occupational radiation exposure experience at a medium energy, high-intensity linear proton accelerator, passive and active neutron measurement control and calibration, radiation exposure investigation, programmatic assessment of the internal dosimetry, ALARA and portable instruments programs, radiation surveys, dose assessment non-uniform skin dose, SC&A site expert interview questions and responses, and summary of medical and biological research activities.	03/29/2012	59
SC&A / Nevada Test Site	Santa Fe Operations manager report.	06/24/2010	1
SC&A / NIOSH	Plutonium working group report and an environment, safety and health progress assessment at Pantex Plant.	06/01/2011	2
SC&A / Pinellas Plant	Waste generation annual report 1993.	06/24/2010	1
SC&A / Sandia National Laboratories, CA	Albuquerque Operations Office end of year report.	02/16/2009	1
SC&A / Santa Susana Field Laboratory	Trip report and counting tritium smears.	06/24/2010	4
Science Applications International Corp (SAIC)	Radiation exposure summary.	09/02/2004	9
Senator John Heinz History Center	Uranium processing discussions.	12/20/2007	1
Southern Illinois University	Review of operations and thorium exposures at the Dow Chemical Company Madison Plant, evaluation of environmental control technologies for commercial uranium nuclear fuel fabrication facilities, disposal of radioactive wastes in the metropolitan St. Louis area, and environmental and health legacy of the Mallinckrodt Chemical Works.	10/29/2008	7
Stanford Linear Accelerator Center (SLAC) / SC&A	Documents related to actinide experiments.	04/13/2006	1
University of Colorado Norlin Library	Workshop on personnel neutron dosimetry and the study of cost and benefits of a formal safety program.	04/10/2006	2
University of Iowa	Listing of Burlington records from Pantex (1956-1973).	07/11/2003	1
University of Rochester, Rad Safety Unit	Shipping documentation.	08/20/2008	3

Data Capture Information	General Description of Documents Captured	Date Completed	Uploaded to SRDB
University of Tennessee Library	Actinide distribution in the human skeleton, biomedical aspects of plutonium, comparative particle sizing study, estimation of initial distribution of Am-241 in adult male human skeleton, report of plutonium task force 7, and a United States Transuranium and Uranium Registries annual report.	03/18/2012	15
Unknown	Bayo Canyon operations and procedures, description of technical areas and facilities, dosimetry for the Godiva 2, environmental surveillance, exposure level of employees, film badge method of differential measurements, gamma-ray signal produced by a neutron flux, high energy neutrons in a collimated beam from the fast plutonium reactor, history of the Neutron Science Center, history of the plutonium bioassay program, in vivo data, film badge procedures, introduction to neutron scattering, nuclear radiation measurements facilities at the radiochemistry laboratory, occupational radiation exposure report, periodic survey of canyon areas for radioactive contamination, photodosimetry evaluation book, radiation for Bayo Canyon shots, radioactive shipments, radioactivity contaminated precious metal, radiochemistry of the fission products, radiological incidents, response of film to X-radiation of energy up to 10 mev, study of selected plutonium workers, trip reports, urinalysis results, and whole body dose from tritium in body water.	02/10/2011	189
Unknown / SC&A	Operation Crossroads and Operation Phalanx onsite radiological safety report.	01/15/2004	7
U.S. Transuranium and Uranium Registries	Proposal to manage and operate the US Transuranium and Uranium Registries.	08/22/2005	1
Weldon Spring	Internal contamination during decontamination and decommissioning.	11/29/2004	1
Westinghouse Site (Hematite)	In vivo counting with uranium 235.	03/13/2009	2
Y-12	Radioactive material shipment inspection reports.	05/16/2012	6
TOTAL	Not applicable	Not applicable	**9470**

Table A2-2: Database Searches for Los Alamos National Laboratory

Database/Source	Keywords	Hits	Viewable Hits	Uploaded into SRDB
See Note	NOTE: Keyword Internet searches were not conducted for LANL due to it being an active DOE site, and the site having been cooperative with accessing relevant archived documentation.	See Note	See Note	See Note