



Los Alamos National Laboratory (LANL) Work Group Status: Special Exposure Cohort (SEC) Addendum SEC-00109, 1996–2005

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Advisory Board on Radiation and Worker Health (Board)

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LANL Work Group discussions of SEC Addendum SEC-00109

- ◆ **August 2017:** National Institute for Occupational Safety and Health (NIOSH) presentation of SEC-00109 Addendum and SC&A review
- ◆ **November 2018:** NIOSH response to SC&A review of SEC-00109 Addendum and SC&A response
- ◆ **July 2019:** NIOSH and SC&A reviews of U.S. Department of Energy (DOE) report NC ID 484 (LANL) based on 1999 LANL self-assessment of its internal dose evaluation program under Title 10 of the *Code of Federal Regulations* (CFR) Part 835
- ◆ **March 2022:** NIOSH presentations on Oak Ridge Associated Universities Team (ORAUT) reports ORAUT-RPRT-0101, “Bounding Intakes of Exotic Radionuclides at Los Alamos National Laboratory” (“RPRT-0101”) and ORAUT-RPRT-0102, “Assessment of Los Alamos National Laboratory Plutonium Bioassay Programs 1996 to 2001” (“RPRT-0102”)
- ◆ **December 2025:** NIOSH presentation on ORAUT-RPRT-0103, “Review of Potential Exposure to Exotic Radionuclides Using Radiological Work Permit Data at Los Alamos National Laboratory” (“RPRT-0103”) and SC&A reviews of RPRT-0101, RPRT-0102, and RPRT-0103, remaining internal dose issues

Background: LANL Special Exposure Cohort

- ◆ **Petition 61, 1943–1963:** NIOSH finds inability to dose reconstruct radioactive lanthanum exposures for specific LANL operations. Board recommends SEC class for potentially exposed workers October 11, 2006.
- ◆ **Petition 51, 1943–1975:** NIOSH finds inability to dose reconstruct. Board recommends SEC class for all workers (“should have been monitored”) May 23, 2007.
- ◆ **Petition 170, 1943–1975:** NIOSH finds inability to dose reconstruct. Board recommends SEC class for all workers June 11, 2010.
- ◆ **Petition 109, 1976–1995:** NIOSH finds inability to dose reconstruct exotic alpha emitters, mixed fission products, and mixed activation products (MAPs). Board recommends SEC class for all workers October 31, 2012.
- ◆ **Addendum to SEC-00109 evaluation report for 1996–2005:** NIOSH finds dose reconstruction with sufficient accuracy feasible for “Service Support Workers” given enactment of 10 CFR 835 requirements and “robust” field monitoring and contamination control.

NIOSH feasibility determination for SEC-00109 class for 1976–1995

NIOSH unable to demonstrate that limitations in internal dose evaluations in SEC-00051 and SEC-00170 did not persist beyond 1975:

“NIOSH could not locate sufficient documentation to demonstrate that some radionuclides (e.g., certain alpha-emitters and fission and activation products) were monitored in a manner equivalent . . . to other well-monitored nuclides (e.g., plutonium and uranium).” (U.S. Department of Health and Human Services, 2012)

Key questions of SEC-00109 evaluation report Addendum

- ◆ Was dose reconstruction feasible post-1995 for all radionuclides?
- ◆ Were LANL's monitoring programs for all radionuclides well-established and implemented by 1996?
- ◆ When was bioassay monitoring for exotics adequate for dose reconstruction?

NIOSH position on dose reconstruction for SEC-00109, 1996–2005

Dose reconstruction is feasible post-1995 because:

- ◆ NIOSH presumes the site complied with 10 CFR 835 starting January 1, 1996, to monitor workers likely to receive a committed effective dose equivalent (CEDE) of 100 mrem (millirem, a unit of radiation dose) or more in a year
- ◆ Field monitoring and contamination control programs at LANL were well-established and formalized by January 1, 1996 (intakes over 100 mrem were monitored)
- ◆ Initial findings are that workers were monitored for primary radionuclides (plutonium, uranium, tritium)
- ◆ “Weight of evidence” indicates that workers’ doses of unmonitored exotic radionuclides would not exceed 100 mrem threshold
- ◆ No reason to believe that intakes of exotic radionuclides by unmonitored workers would be substantially different

Key question: Were LANL's monitoring programs “well-established” and implemented by 1996?

NIOSH (2019), p. 28:

“LANL has robust field-monitoring programs designed and implemented to ensure that unmonitored individuals are unlikely to receive intakes of 100 mrem CEDE.”

Note: CEDE is now referred to as CED for committed effective dose; however; they reflect the same calculation.

Monitoring programs were questionable after January 1, 1996

- ◆ Only independent assessment of LANL monitoring programs, in 1999, found inadequate and incomplete bioassay enrollments and gaps in radiological work permit (RWP)-based bioassay submissions
- ◆ Basis of NIOSH's assumption for exotics based on 100 mrem committed effective dose (CED) per year founded largely on program descriptions, procedures, and survey data – not actual bioassay program results for exotic radionuclides
- ◆ Most program and procedures NIOSH cited were dated after 2000 – not reflective of the SEC period under examination
- ◆ Experience at other DOE sites in 1990s (such as Savannah River Site and Mound) showed actual implementation of 10 CFR 835 bioassay monitoring requirements (such as 100 mrem CED) took several years



Questionable if bioassay experience for primary radionuclides can be basis for dose reconstruction at 100 mrem CED/year for exotics

- ◆ Lack of monitoring data for exotics was prime basis for SEC class designated for 1972–1995.
- ◆ **Key Question:** When can the change in monitoring practice be demonstrated after January 1, 1996?

SC&A review of NIOSH weight of evidence position on radiation monitoring post-1996

- ◆ Discussions in RPRT-0102 are based on prevalence of routine bioassay data for primary radionuclides, not bioassay data for exotics
- ◆ Selected smear and air sampling data cited in RPRT-0101 and RPRT-0102 illustrate field monitoring, not job-specific bioassays
- ◆ RPRT-0101 is not based on a complete dataset by location or year – overall data completeness and representativeness unknown
- ◆ Examples of effective monitoring instructions cited were dated after 1995: 1997 and 2000
- ◆ Examples of incident contamination control were from one facility: Technical Area (TA) 55, LANL's plutonium facility

Technical Area 53 Los Alamos Neutron Science Center (LANSCE) airborne emissions and sitewide bioassay adequacy for exotics

- ◆ TA-53 was under a 1996 U.S. Environmental Protection Agency enforcement order to reduce air emissions of MAPs. LANL actions to reduce emissions began before the order was signed.
- ◆ LANL progressively tightened airborne MAP emissions, noted in SC&A (2018).
 - From 1990 to 1995, MAP emissions reduced by two thirds; estimated average occupational dose from gaseous MAPs declined by 90%.
 - While MAPs from LANSCE figured prominently in 1975–1995 SEC recommendation, not a factor in the period of interest.
- ◆ **Key Point:** Realization of 10 CFR Part 835 monitoring requirements by January 1, 1996, and the recommended 100 mrem CED/year threshold for exotic radionuclide exposures are the questions driving post-1996 SEC consideration of cutoff date.
- ◆ SC&A acknowledges the rigor of LANSCE emission controls for MAPs by mid-1990s; it is the balance of LANL operations that are for Board discussion.

“Weight of evidence” based on records review should not supplant actual on-the-ground verification of bioassay practice

- ◆ RPRT-0101 descriptions and accounts of LANL monitoring programs may not suffice for verifying bioassay monitoring adequacy and completeness for nonroutine exotics
- ◆ NIOSH characterization of LANSCE monitoring program and procedures for MAPs is valid; however, balance of laboratory operations beyond LANSCE are in question
- ◆ RPRT-0102 conclusions not transferrable to nonroutine, job-specific sampling for exotics
- ◆ RPRT-0103’s review of 24 example RWPs illustrates specified monitoring but does not address to what extent nonroutine bioassays were complete or representative for exotics
- ◆ NIOSH’s finding of “no evidence to the contrary” ignores the only actual evidence of LANL bioassay implementation against 100 mrem/year CED threshold: 1999 LANL self-assessment findings and LANL’s internal dose evaluation upgrade program were completed in 2000

SEC-00109 Addendum work group considerations for exotic radionuclides

- ◆ Bioassay data representativeness and LANL monitoring programs pre-1995 for exotic radionuclides (such as MAPs) were key bases for 1976–1995 SEC class.
- ◆ LANL Work Group requested that RWP-directed, job-specific bioassay data for exotics post-1995 be collected and reviewed for completeness and representativeness.
- ◆ **Key Question:** When was bioassay monitoring for exotics adequate for dose reconstruction?

Discussion: Bioassay monitoring for exotics versus weight of evidence

SC&A

- ◆ “Presumption of compliance” for 10 CFR 835-based January 1, 1996, threshold for 100 mrem CED application for unmonitored workers is not supportable
- ◆ SEC cutoff date needs to be based on objective bioassay data and demonstrated program adequacy for monitoring exotics

NIOSH

- ◆ “Weight of evidence” finds that LANL had implemented “robust field-monitoring programs designed and implemented to ensure that unmonitored individuals are unlikely to receive intakes of 100 mrem CEDE”

What is an appropriate date to assume the 10 CFR 835 100 mrem threshold was adequately implemented at LANL?

- ◆ Representative RWP-directed, job-specific bioassays for exotics at LANL are not available
 - Therefore, Board judgment on SEC-00106 Addendum would need to focus on *monitoring program implementation*
- ◆ NIOSH proposed starting date is January 1, 1996, but that can be questioned given the evidence of bioassay monitoring deficiencies as late as 1999
- ◆ 1999 LANL self-assessment cited 11 instances of 10 CFR 835 not being implemented adequately, impacting job-specific bioassays, checklists, and subcontractor enrollments, all of which impaired LANL's ability to monitor individuals "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" (10 CFR 835.402(c)(1))

LANL corrective action program for 10 CFR 835 bioassay program deficiencies – completed in 2000

- ◆ Upgraded the Dosimetry Participation Verification Program to ensure better management of worker bioassay participation
- ◆ Developed LANL-wide dosimetry enrollment criteria, facility-specific dosimetry matrices, and implementation of a new dosimetry enrollment process
- ◆ Implemented new or revised procedures for the following:
 - Health physics checklist procedure
 - Bioassay enrollment procedure
 - Bioassay kit circuit procedure
 - Radiological dose assessment process and examples
 - Special internal dosimetry and bioassay process
 - Terminations
 - Annual report card to workers
 - Radiation Exposure Information and Reporting System

SEC-00106 cutoff talking points for proposed date: December 31, 2000

- ◆ Wholesale upgrade of LANL bioassay program in 2000 based on LANL identified deficiencies provides assurance that 10 CFR 835 mandates for 100 mrem CED monitoring were being implemented.
- ◆ December 31, 2000, would define a time by which the internal monitoring program upgrades were accomplished and when representativeness of RWP job-specific bioassays would be assured.



Questions?

References

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