



Sandia National Laboratories - Albuquerque SEC-00188 Addendum 2

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Advisory Board on Radiation and Worker Health (ABRWH) Meeting

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Summary of SEC-00188 Petition History

- Petition qualified (83.13) for evaluation: October 21, 2011
- Petitioner proposed class definition:
 - All Security Inspectors, Security Clerks, Firemen, Non-regular Recurrent Security Inspectors, Security Officers, Security Police Officers I, Security Police Officers II, Security Police Officers III, and Central Alarm System Operators that worked in any area at SNL-A for the period from January 1, 1963, through May 21, 2011
- NIOSH proposed the following class to be added to the SEC on February 21, 2012:
 - All personnel that worked in any area at Sandia National Laboratories in Albuquerque, New Mexico for the period from January 1, 1949, through December 31, 1994

Basis for 1949-1994 SEC Class

- Insufficient monitoring data and information to reconstruct internal dose from January 1, 1949 through December 31, 1994:
 - Lack of internal monitoring program documentation
 - Lack of internal monitoring data
 - Lack of process information
- The Evaluation Report published February 21, 2012, concluded that external doses, including medical X-rays performed onsite as a condition of employment can be reconstructed for the duration of the evaluation period January 1, 1949, through May 21, 2011
 - Continued evaluation since publication of the 2012 report has not identified any information which would contradict this conclusion regarding external dose

Summary of SEC-00188 Addendum (1995-1996)

- NIOSH proposed the following class to be added to the SEC on July 26, 2018:
 - All personnel that worked in any area at Sandia National Laboratories in Albuquerque, New Mexico for the period from January 1, 1995, through December 31, 1996

Basis for 1995 – 1996 SEC Class

- Internal monitoring program concerns
- Air monitoring data deficiencies
 - Uncertainties and concerns associated with the transitional and developmental nature of SNL-A's internal monitoring program
 - The site was making several improvements in the internal monitoring program including an increase in the use of personal and area air monitoring
 - The program seemed to be lacking formalization in that NIOSH did not find adequate evidence that some key implementing procedures were fully in place until 1996 & 1997

SEC-00188 Addendum 2 (1997 – 2011)

The focus of Addendum 2 was determining Internal Dose Reconstruction feasibility:

- Determine suitability of monitoring program and documentation
- Determine monitoring data sufficiency
- Address security guards' monitoring concerns

Data Sources Reviewed for SEC-00188 Addendum (1/2)

- 21 Interviews with 17 people
- 1 Site data capture effort/trip since last SEC designation
- 4 Written data capture requests
- Over 900 relevant documents captured and reviewed since SEC-0188 was issued in 2012 (NIOSH has over 5,500 total documents in its database pertaining to SNL-A):
 - Internal procedures and memos
 - 10 CFR pt. 835 Compliance and self-assessment reports/memos
 - Facility and process information
 - Radiation Work Permits
 - Incident reports
 - Air monitoring data
 - Internal and external radiological program audits and assessments

Data Sources Reviewed (2/2)

- Extracts from SNL-A's "WebDose" database which the site uses for bioassay monitoring and as a reporting tool
- Internal/external monitoring records
- Breathing Zone (BZ) monitoring and air sample records
- Derived Air Concentration (DAC)-hour tracking

Available Internal Monitoring (1/3)

WebDose Urine Bioassay

Year	Non-H3 Sample Results	Persons Sampled (Non-H3)	H3 Sample Results	Persons Sampled (H3)
1997	111	45	238	100
1998	144	59	375	126
1999	187	67	440	83
2000	119	46	375	50
2001	90	39	426	58
2002	111	46	575	78
2003	160	55	679	78
2004	158	51	677	70
2005	172	60	647	69
2006	128	40	500	51
2007	115	35	438	47
2008	101	33	424	40
2009	121	42	435	40
2010	138	48	446	39
2011	165	47	534	54
Total	2020	317	7209	362

Available Internal Monitoring (2/3)

WebDose WB/Thyroid Count Data

Year	Measurements	Persons Monitored
1997	59	54
1998	66	55
1999	58	52
2000	265	40
2001	73	33
2002	54	43
2003	102	61
2004	60	46
2005	65	58
2006	61	54
2007	45	42
2008	29	28
2009	48	40
2010	40	39
2011	90	50
Total	1115	207

Available Internal Monitoring (3/3)

Total Available BZ Samples

Year	Alpha BZ Results	Beta/Gamma BZ Results	Tritium BZ Results
1997	357	357	0
1998	1587	1587	0
1999	708	708	0
2000	347	347	0
2001	179	179	0
2002	408	408	0
2003	394	394	90
2004	131	137	119
2005	177	177	165
2006	75	72	88
2007	111	170	52
2008	189	362	55
2009	211	444	0
2010	321	549	1
2011	311	606	0
Total	5506	6497	570

Change in Internal Dose Monitoring Program

- Starting in 1995, SNL-A shifted the emphasis of the Internal Monitoring Program from reliance on bioassay to the use of breathing zone sampling and workplace indicators such as radiological surveys and radiological conditions to determine if bioassays were required
- SNL-A's position was that no individual was likely to receive an internal exposure of 100 mrem
 - This is stated in Internal Technical Basis documentation, the Radiation Protection Plan, and in external assessments performed in 1996 and 1999

Internal Dose Monitoring Program Evidence of Field Implementation (1/3)

- February 3, 1998, summary of Radiological and Mixed Waste Management Facility (RMWWMF) safety committee discussion regarding routine bioassay
 - *“The RCTs at the RMWWMF are on routine bioassay. If a trend developed indicating internal doses, RMWWMF personnel would undoubtedly [sic] be asked to submit special bioassay samples to determine the scope of the problem.”*
 - *“If trends developed indicating elevated air concentrations or increased surface contamination levels, special bioassay samples would be requested from appropriate facility personnel.”*
 - *“Job specific RWPs require bioassay, as appropriate, for those workers involved with tasks where significant levels of radionuclides, or certain specific radionuclides (e.g., ^3H) are handled.”*

Internal Dose Monitoring Program Evidence of Field Implementation (2/3)

- May 30, 2001, memo documenting the routine bioassay program for RCTs at TA-V
 - *“The current schedule calls for annual whole body counting and semi-annual urinalysis samples for U, Th, Am, and Pu.”*
 - *“The SNL bioassay program is confirmatory in nature. The bioassay program confirms the results and effectiveness of contamination control and other personnel protection activities.”*
 - *“Since Radiological Control technicians (RCTs) must be present in all work activities where the possibility of meaningful intakes is credible, their bioassay serves as a good proxy indicator for potentially exposed line personnel...”*

Internal Dose Monitoring Program Evidence of Field Implementation (3/3)

- Captured RWPs and work planning documents were reviewed for indication of airborne radioactive material, respiratory protection, personal/area air monitoring requirements, and bioassay
- Indications of surface and airborne radioactive materials were noted as was the use of respiratory protection, personal and/or area air monitoring requirements, and bioassay
- Review of RWPs supports Rad Program adherence to contemporary procedures

Analysis of Breathing Zone (BZ) Data

In order to evaluate the internal dose associated with BZ filters, the following steps were performed

- Intake quantity associated with each BZ filter was determined
- Committed Dose associated with the intake quantities were calculated and based on the stochastic Annual Limit on Intake (ALI) for the limiting nuclide for the analysis type (i.e., gross alpha, beta/gamma, tritium)
- Committed Dose analyzed to determine the distribution of the data grouped by event. An event is defined two ways: a radiological work task at a given location on a given day, and all radiological work on a given day

Results of Analysis of Breathing Zone (BZ) Data (1/2)

- The results of the NOSH BZ Data Analysis was that the median quantity of radioactive material available for internal uptake to individuals located alongside personnel performing radiological work would correspond to an internal dose of 0.5 mrem per work event or per workday
 - This dose quantity assumes that the individual is present inside the work area with no respiratory protection being used
 - The unmonitored individuals to whom this dose is assigned would not have been located in the radiological work area along side of the monitored workers. A significant reduction in intake potential would occur due to the separation between the actual work area and an area that can be occupied without the same level of radiological controls
 - Although respiratory protection was worn during many work events where BZ were used, respiratory protection was not considered in the dose calculation

Results of Analysis of Breathing Zone (BZ) Data (2/2)

- Considering these conservative assumptions, NIOSH concluded that it is not likely that an individual would be able to receive 100 mrem per year of internal exposure under these conditions (i.e., an individual would have to be present for 200 events, based on the median dose, to receive an exposure in excess of 100 mrem in a year)

Assigned Committed Dose (rem); WebDose: 1997 – 2011

Year	H3	BZ	Urine	Thyroid	Total
1997	0	0	0	0	0
1998	0	0.010	0	0	0.010
1999	0	0	0	0	0
2000	0	0	0	0.005*	0.005
2001	0	0	0	0	0
2002	0	0	0	0	0
2003	0	0.012*	0	0	0.012
2004	0	0	0	0	0
2005	0	0	0	0	0
2006	0	0	0	0	0
2007	0	0	0	0	0
2008	0	0	0	0	0
2009	0	0	0.023	0	0.023
2010	0	0.004	0.019	0	0.023
2011	0.004	0	0	0	0.004
Total	0.004	0.026	0.042	0.005	0.077

* Indicates dose was distributed among multiple individuals.

Feasibility of Dose Reconstruction 1/1/97 – 5/21/11 (1/3)

- Based on its review of radioactive material use at Sandia-Albuquerque 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 100 mrem per year
- This conclusion is not wholly based upon the implementation of 10 C.F.R. § 835.402, but rather on a review of exposure monitoring records for individuals involved in radiological activities with the highest risks at the site during the period under evaluation
- The total assigned internal dose (CEDE) for all employees combined for the 15-year period from 1997 through 2011 is 77 mrem

Feasibility of Dose Reconstruction 1/1/97 – 5/21/11 (2/3)

- A review of available breathing zone bioassay data indicates that the median quantity of radioactive material available for internal uptake to individuals located alongside personnel performing high-risk radiological work would correspond to an internal dose of 0.5 mrem per work event or per workday
 - Assumes the individual is present within the work area alongside of worker
 - Assumes no respiratory protection/breathing same concentration of air as worker
- In either case, consistent with the recorded internal dose of 77 mrem above, it is not likely that an individual would receive 100 mrem per year of internal exposure under these conditions
 - An individual would have to be present for 200 events, based on the median dose, to receive an exposure in excess of 100 mrem in a year

Feasibility of Dose Reconstruction 1/1/97 – 5/21/11 (3/3)

- As previously identified in SEC-00188 Evaluation Report in 2012, NIOSH finds it is feasible to reconstruct occupational medical doses and principal sources of external radiation exposure including beta, gamma, and neutron radiation for Sandia National Lab-Albuquerque employees with sufficient accuracy
- Considering the potential exposure scenarios, program policies, procedures, available monitoring data, and confirmation of low doses among monitored workers, NIOSH finds it is feasible to reconstruct internal doses with sufficient accuracy for the period
- NIOSH found no part of the class under evaluation for which it cannot estimate radiation doses with sufficient accuracy

Feasibility Findings

SEC-00188, Addendum 2 (January 1, 1997 – May 21, 2011)

Source of Exposure	Dose Reconstruction is Feasible
Internal – All Radionuclides	Yes
External – Beta/Gamma	Yes
External – Neutron	Yes
External – Occupational Medical X-Ray	Yes