



SC&A Review of SEC-00188 Evaluation Report Addendum 2 for Sandia National Laboratories – Albuquerque

Bob Barton, SC&A, Inc.

Advisory Board on Radiation and Worker Health

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SC&A conclusions 1 & 2: ER Addendum 2

1. Is weight of evidence sufficient for feasible external and internal dose assessment?

Answer: Yes. Site profile questions remain concerning external dose at the Sandia Pulse Reactor (SPR) and the correct tabulation of available breathing zone (BZ) data used to justify 100 mrem annual dose assignment.

2. Was implementation of 10 CFR Part 835 requirements for internal exposure monitoring adequate to support 100 mrem committed effective dose equivalent (CEDE) annual monitoring requirement as bounding value in co-exposure model?

Answer: Yes. Program implementation documented by end of 1996.

SC&A conclusions 3 & 4: ER Addendum 2

3. Any limitations or uncertainties related to SNL-A reliance on personnel air sampling results as indicators for assignment of 100 mrem CEDE dose?

Answer: Weight of evidence supports this assignment, with completeness limitations of available BZ monitoring records mitigated by conservatism of NIOSH approach.

4. Is there evidence that security guards at SNL-A were potentially exposed to unmonitored intakes in excess of 100 mrem CEDE per year?

Answer: SC&A concludes that it is unlikely that security guards would have received an intake at or in excess of this annual dose.

Assessment of security guard exposure potential

- ◆ SC&A reviewed:
 - NIOSH security guard documentation and interviews: 2011, 2014, 2018
 - SNL-A radiological monitoring policies/procedures
 - SNL-A incident reports for 1997–2011 (104 rad incidents, 18 contaminations, no intakes)
- ◆ SC&A (with WG and NIOSH) conducted onsite tour and interviews in Jan 2020
- ◆ SC&A concluded that while some contaminations occurred, it is unlikely that security personnel experienced intakes that exceeded 100 mrem/year CEDE.

Breathing zone data completeness issues

- ◆ Unable to locate secondary sources that tabulate the total number of workers monitored via BZ nor the total number of BZ samples issued and processed (finding 1).
- ◆ Temporal trends in data suggest an incomplete dataset (observation 2).
- ◆ Comparison with other electronic data sources (WebDose) suggest an incomplete dataset (observation 3).
- ◆ Unable to quantify the level of incompleteness.
- ◆ Implications for dose reconstruction (DR): Are the available data representative or bounding of the missing data?

NIOSH response on data completeness

- ◆ NIOSH agrees that the dataset of raw field-monitoring BZ data sheets is incomplete to an unknown degree.
- ◆ Comparison of DAC-hr tracking logs for a portion of the SEC period and available dataset:
 - ~99% of those included in the DAC-hr logs were also included in the available data
 - Indicates potential to bias data set toward higher exposures
 - Comparison only available for portion of SEC period (roughly 36% of period)
- ◆ Comparison with WebDose is useful as weight of evidence
 - Designed to track highest exposed workers (not all workers)
 - Matches the DAC-hr log entries (potential to bias data set towards higher exposures)

Work Group response on completeness issues

- ◆ SC&A agreed with NIOSH response and assessment.
- ◆ Sandia Work Group (WG) discussed completeness issues related to Sandia on April 11, 2022
 - Agrees that completeness issues do not obviate DR feasibility in this instance.
 - WG closed finding 1 and observations 2 and 3 on this basis.
 - WG followup recommendation: SEC Issues WG should take up the program-wide issue of data completeness to develop uniform evaluation approach.

Observation 1: BZ data quality assurance and reporting

- ◆ Part 1: SC&A identified duplicate samples in the NIOSH BZ data set
- ◆ Part 2: SC&A believes the reported total number of BZ samples in the ER Addendum 2 is in error and should also be updated based on subsequent data capture.
- ◆ NIOSH response and proposed resolution:
 - Part 1: NIOSH removed duplicate samples and determined no change in resulting analysis.
 - Part 2: NIOSH will provide updated BZ totals in revision of SNL-A technical basis document (TBD) to reflect updated dataset and remove repeated tabulation of same samples.
- ◆ WG discussed issue and elected to close Part 1 and hold Part 2 in abeyance as a site profile issue (pending update to the TBD)

Observations 4 and 5: BZ data characteristics

- ◆ Substantial portion of available BZ samples per year are often assigned to just a few individuals (observation 4).
- ◆ Workers more frequently monitored by BZ also participated in the bioassay and in vivo monitoring program (observation 5)
- ◆ NIOSH concurs with this observation and believes that it does not affect feasibility of dose reconstruction.
- ◆ WG discussed observations 4 and 5 at the April 11, 2022, meeting and elected to close the observations.

Observation 6: Exposure potential indications from available BZ data

- ◆ SC&A noted fluctuations in exposure potential by individual year and area compared to the site-wide exposure potential averaged over the entirety of the SEC period (1997–2011)
- ◆ However, SC&A concluded this should not affect feasibility conclusions due to several mitigating factors in exposure analysis used to justify bounding approach of 100 mrem:
 - Assumed contaminant of concern was nearly always Pu-239
 - No consideration of respiratory protection worn in evaluating raw BZ data
 - Unlikely a single worker was exposed to 200 individual events necessary to exceed proposed DR approach
- ◆ WG concurred at the April 11, 2022, meeting that exposure fluctuations do not affect feasibility conclusion and elected to close observation 6

Observation 7: External dose issue for Sandia Pulse Reactor

- ◆ Geometric concerns over severe radiation gradient for workers located underneath reactor during shutdown maintenance activities
- ◆ NIOSH proposes to use extremity monitoring data (e.g., wrist and head dosimeters) to develop an appropriate correction factor (NIOSH indicated work is already underway)
- ◆ WG accepted proposed path forward and elected to designate this observation in progress as a site profile issue.

Summary of SC&A SEC-00188 Addendum 2 review

- ◆ Finding 1 and observations 2 and 3 on data completeness have been closed with the recommendation that the SEC Issues Work Group investigate ways to standardize completeness evaluations program wide.
- ◆ Observation 1 on documentation of total BZ data available for evaluation was placed in abeyance as a site profile issue.
- ◆ Observations 4 and 5 on BZ data characteristics were determined to not affect feasibility and were closed.
- ◆ Observation 6 on BZ exposure analysis as justification for 100 mrem DR approach was closed as not affecting feasibility conclusions.
- ◆ Observation 7 on external dose geometry considerations at the SPR was designated in progress as a site profile issue.
- ◆ SNL-A WG agrees with the NIOSH determination that DR is feasible for SEC-00188 Addendum 2 (summary class definition: all workers from January 1, 1997, to May 21, 2011).

References

National Institute for Occupational Safety and Health. (2019). *SEC petition evaluation report Petition SEC-00188, Addendum 2 (1997–2011) (rev. 0)*. <https://www.cdc.gov/niosh/ocas/pdfs/sec/sandianm/snlnmer-188-a2-508.pdf>

National Institute for Occupational Safety and Health. (2021). *NIOSH response to SC&A's review of SEC-00188 Sandia ER Addendum 2* [Response paper]. <https://www.cdc.gov/niosh/ocas/pdfs/dps/dc-snlsec188erad2-508.pdf>

SC&A, Inc. (2020). *Review of SEC petition evaluation report: Petition SEC-00188, Addendum 2 (1977–2011), for Sandia National Laboratories – Albuquerque (SCA-TR-2020-SEC004, rev. 0)*. <https://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-sec188erad2-508.pdf>

SC&A, Inc. (2021). *Reply to NIOSH's response to SC&A's review of the Sandia National Laboratories – Albuquerque SEC-00188 Addendum 2 evaluation report (SCA-TR-2021-SEC006, rev. 0)*. <https://www.cdc.gov/niosh/ocas/pdfs/abrwh/scarpts/sca-sandiasec188erad2-r0-508.pdf>