

Office of Compensation Analysis and Support Program Evaluation Report	Document Number: OCAS-PER-001 Effective Date: 09/08/2003 Revision No. 0
Misinterpreted dosimetry records resulting in an underestimate of Page 1 of 4 missed dose in SRS dose reconstructions	
Approval: <u>Signature on File</u> Date: <u>9/09/2003</u> J.W. Neton, Associate Director for Science	Supersedes: None

RECORD OF ISSUE/REVISIONS

ISSUE AUTHORIZATION DATE	EFFECTIVE DATE	REV. NO.	DESCRIPTION
09/08/2003	09/08/2003	0	New document to evaluate the programmatic effect of the misinterpreted dosimetry records resulting in an underestimate of the missed dose for Savannah River Site (SRS) Dose Reconstructions

1.0 Description

On September 4, 2003, an error in the interpretation of incomplete Savannah River Site dosimetry records between 1973 and 1988 was identified in the course of dose reconstruction review. Until this date, data gaps (missing dosimetry badge cycle information) were interpreted to indicate that the energy employee was not monitored for radiation exposure. NIOSH has since learned through conversations with site dosimetry personnel, ¹ that a missing dosimeter badge cycle on the "SLHP3" form could indicate 1) the energy employee was not monitored, 2) the energy employee was monitored and the result was below the limit of detection. In addition, the absence of an entire year from the SLHP3 form could result from 1) the data for that year was below the limit of detection, 2) the worker was not monitored for radiation exposure during that year (i.e., did not enter a radiological control area), or 3) a combination of both unmonitored and below the limit of detection for a given year. The result of this misinterpretation is that the missed dose was not added between the years 1973-1988 when no

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information was provided on the SLHP3 form. During these years, only the onsite ambient dose was added to the dose reconstruction.

2.0 Evaluation

2.1 *Dose Evaluation*

During August 2003, the ORAU team recognized that the SRS Technical Basis Document² (ORAUT-TKBS-0003 Rev 0) contained a significant overestimate of the onsite ambient dose between 1974 and 1998. Since this error resulted in an overestimate of the energy employee's onsite ambient dose (claimant favorable), no formal Program Evaluation Report (PER) was written. These values were corrected and noted in the revision of ORAUT-TKBS-0003 Rev 01³ approved on August 21, 2003.

The dose reconstructions effected by the misinterpretation of the dosimetry records were conducted under Rev 00² of the SRS Technical Basis Document and cover similar years of exposure. Table 1 provides a comparison of the difference in onsite ambient dose between Rev 00² and Rev 01³ of the SRS Technical Basis Documents and the associated missed dose (LOD/2) for the corresponding year.

Table 1 Comparison of the overestimated missed dose in Rev 00 with the missed dose due to misinterpretation of the dosimetry records. All values are in cSv.

Year	Missed Dose	Ambient Onsite Rev. 00 ²	Ambient Onsite Rev. 01 ³	Overestimate (Rev 00 ² - Rev 01 ³)	Overestimate - Missed Dose
1973	0.090	0.099	0.099	0.000	-0.090
1974	0.090	0.210	0.089	0.121	0.031
1975	0.090	0.210	0.085	0.125	0.035
1976	0.090	0.178	0.068	0.110	0.020
1977	0.090	0.240	0.090	0.150	0.060
1978	0.090	0.166	0.061	0.105	0.015
1979	0.090	0.161	0.065	0.096	0.006
1980	0.090	0.100	0.044	0.056	-0.034
1981	0.090	0.225	0.074	0.151	0.061
1982	0.090	0.178	0.065	0.113	0.023
1983	0.090	0.166	0.069	0.097	0.007
1984	0.030	0.156	0.093	0.063	0.033
1985	0.030	0.584	0.114	0.470	0.440
1986	0.030	0.146	0.059	0.087	0.057
1987	0.030	0.115	0.053	0.062	0.032
1988	0.030	0.209	0.050	0.159	0.129
Totals	1.140	3.143	1.178	1.966	0.826

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Table 1 indicates that on an annual basis the overestimate of the onsite ambient dose usually (88%) exceeded the median missed dose (LOD/2). If an energy employee worked the entire time period, his estimated dose would be overestimated by approximately 0.8 cSv, however, it should be noted that approximately 0.4 cSv (50%) is the result of one year (1985).

2.2 Probability of Causation (PC) Evaluation

Since missed dose reconstructed in accordance with NIOSH's External Dose Reconstruction Implementation Guideline⁴ (OCAS-IG-001) is not a single value but an uncertainty distribution with the upper 95th percentile calculated using the Limit of Detection (LOD) and since this portion of the uncertainty distribution exceeded the onsite ambient dose overestimate 70% of the time, a comparison of the probability of causation over the time period was conducted. In the dose reconstructions completed under Rev 00² of the SRS Technical Basis Document, a constant was used for the onsite ambient dose.

Table 2 provides a comparison of the probability of causation (PC) for a 60 year old male first exposed at age 30 using the overestimated difference in onsite ambient dose between Rev 00² and Rev 01³ as a constant and comparing the PC calculated using the missed dose uncertainty distribution. The cancers listed comprised the top ten cancer models (~85%) of the SRS claims currently in review or approved and forwarded to the Department of Labor as of September 4, 2003.

Table 2: Probability of Causation value comparison of top ten SRS claims

Cancer Type	# of Claims	Overestimate	Missed Dose
Prostate	105	3.03	2.09
Breast	43	6.73	4.64
Colon	35	5.60	4.07
Lymphoma	27	3.01	1.89
Skin Basel Cell	24	6.36	4.77
Rectum	19	1.76	1.27
Pancreas	16	2.18	1.60
Bladder	14	4.58	3.33
Nervous System	11	2.02	1.44
Malignant Melanoma	11	6.36	4.78

This table indicates that the PC at the 99th percentile was slightly greater for the onsite ambient dose compared to the missed dose. Even though the upper portion of the missed dose uncertainty distribution exceeded the differential in the onsite ambient dose, the resultant probability of causation would still be overestimated (Claimant favorable).

In summary the two errors (overestimate of onsite ambient dose and underestimate from missed dose) effectively offset each other with a slight bias in a claimant favorable direction (i.e. higher

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PC value). Thus the programmatic effect this misinterpretation has on previous dose reconstructions and dose reconstructions currently undergoing review has been determined to be insignificant.

Resolution / Corrective Action

The immediate resolution was to start interpreting the records correctly and guidance was set forth in OCAS-TIB-0006⁵ issued on September 8, 2003. This Technical Information Bulletin (TIB) provides specific guidance on the interpretation of the SLHP3 form.

Since the onsite ambient doses were overestimated and the difference offset the underestimated missed dose resulting in a more claimant favorable probability of causation, the misinterpretation of the dosimetry records has negligible impact on the current program. No further evaluation is necessary and dose reconstructions conducted using the SRS Technical Basis Document Rev 00² that have this misinterpretation can be approved by the OCAS reviewer providing there are no other substantial errors in the dose reconstruction methodology.

Summary

While the underestimated missed dose resulted in a non-claimant favorable estimate of missed dose, the overestimated onsite ambient dose offset this underestimate. As a result, no further evaluation is necessary since the offset still resulted in a slight claimant favorable bias in the dose estimate and resulting probability of causation.

References

- 1 Savannah River Site (2003), Telephone Conversation between Russ Morgan (SRS Dosimetry Records) and Tim Taulbee NIOSH, September 4, 2003.
2. ORAU Team, *Technical Basis Document for the Savannah River Site To Be Used for EEOICPA Dose Reconstructions*, ORAUT-TKBS-0003 Rev 00, (2003).
3. ORAU Team, *Technical Basis Document for the Savannah River Site To Be Used for EEOICPA Dose Reconstructions*, ORAUT-TKBS-0003 Rev 01, (2003).
4. NIOSH, *External Dose Reconstruction Implementation Guideline*, OCAS-IG-001 Rev 01, National Institute for Occupational Safety and Health, Office of Compensation Analysis and Support, Cincinnati, Ohio (2002).
5. NIOSH, OCAS-TIB-0006, Interpretation of External Dosimetry Records at the Savannah River Site (2003).