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ADVISORY BOARD ON RADIATION AND WORKER HEALTH

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

A REVIEW OF NIOSH'S PROGRAM EVALUATION REPORT OCAS-PER-030, "SRS TBD REVISIONS"

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S. COHEN & ASSOCIATES: ***Technical Support for the Advisory Board on Radiation & Worker Health Review of NIOSH Dose Reconstruction Program***	Document No.: SCA-TR-PR2013-0030 Effective Date: Draft – July 1, 2013 Revision No.: 0 – (Draft)
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Record of Revisions

Revision Number	Effective Date	Description of Revision
0 (Draft)	07/01/2013	Initial issue.

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ABBREVIATIONS AND ACRONYMS

ABRWH or Advisory Board	Advisory Board on Radiation and Worker Health
Al	aluminum
CFR	*Code of Federal Regulations*
DOL	Department of Labor
DR	dose reconstruction
EEOICPA	Energy Employees Occupational Illness Compensation Program Act of 2000
HVL	half-value layer
L	liter
mm	millimeter
mrem	millirem
NIOSH	National Institute for Occupational Safety and Health
NOCTS	NIOSH/OCAS Claims Tracking System
OCAS	Office of Compensation Analysis and Support
ORAUT	Oak Ridge Associated Universities Team
PEP	Program Evaluation Plan
PER	Program Evaluation Report
PFG	photofluorography
POC	Probability of Causation
RU	recycled uranium
SC&A	S. Cohen and Associates (SC&A, Inc)
SRS	Savannah River Site
TBD	technical basis document
TIB	technical information bulletin
TLND	Thermoluminescent Neutron Dosimeter

1.0 STATEMENT OF PURPOSE

To support dose reconstruction (DR), the National Institute for Occupational Safety and Health (NIOSH) and the Oak Ridge Associated Universities Team (ORAUT) have assembled a large body of guidance documents, technical basis documents (TBD), workbooks, computer codes, and tools. In recognition of the fact that all of these supporting elements in DR may be subject to revisions, provisions exist for evaluating the effect of such programmatic revisions on the outcome of previously completed DRs. Such revisions may be prompted by document revisions due to new information, misinterpretation of guidance, changes in policy, and/or programmatic improvements.

The process for evaluating potential impacts of programmatic changes on previously completed DRs has been proceduralized in OCAS-PR-008, *Preparation of Program Evaluation Reports and Program Evaluation Plans*, Rev. 2 (OCAS 2006). This procedure describes the format and methodology to be employed in preparing a Program Evaluation Report (PER) and a Program Evaluation Plan (PEP).

A PER provides a critical evaluation of the effect(s) that a given issue/programmatic change may have on previously completed DRs. This includes a qualitative and quantitative assessment of potential impacts. Most important in this assessment is the potential impacts on the Probability of Causation (POC) of previously completed DRs with POCs of <50%.

As needed, a PEP may be issued that serves as formal notification of an impending PER. The PEP provides a preliminary description of the issue(s) that will be addressed in the PER, and summarizes the likely scope of the effort required to complete the PER.

S. Cohen and Associates (SC&A) was tasked by the Advisory Board to conduct a review of OCAS-PER-030, *SRS TBD Revisions* (OCAS 2007). In conducting a PER review, SC&A is committed to perform the following five subtasks, each of which is discussed in this report:

Subtask 1: Assess NIOSH's evaluation/characterization of the "issue" and its potential impacts on DR. Our assessment intends to ensure that the "issue" was fully understood and characterized in the PER.

Subtask 2: Assess NIOSH's specific methods for corrective action. In instances where the PER involves a technical issue that is supported by document(s) [e.g., white papers, technical information bulletins (TIBs), procedures] that have not yet been subjected to a formal SC&A review, Subtask 2 will include a review of the scientific basis and/or sources of information to ensure the credibility of the corrective action and its consistency with current/consensus science. Conversely, if such technical documentation has been formalized and previously subjected to a review by SC&A, Subtask 2 will simply provide a brief summary/conclusion of this review process.

Subtask 3: Evaluate the PER's stated **approach** for identifying the universe of potentially affected DRs, and assess the **criteria** by which a subset of potentially affected DRs was selected for re-evaluation. The second step may have important implications in instances

where the universe of previously denied DRs is very large and, for reasons of practicality, NIOSH's re-evaluation is confined to a subset of DRs that, based on their scientific judgment, have the potential to be significantly affected by the PER. In behalf of Subtask 3, SC&A will also evaluate the timeliness for the completion of the PER.

Subtask 4: Conduct audits of DRs affected by the PER under review. Based on information contained in the PER (and discussed in Section 5 below), the number of DRs selected for audit for a given PER will vary. (It is assumed that the selection of the DRs and the total number of DR audits per PER will be made by the Advisory Board.)

Subtask 5: Prepare a comprehensive written report that contains the results of the above-stated subtasks, along with our review conclusions.

2.0 SUBTASK 1: ASSESS NIOSH'S IDENTIFICATION OF THE ISSUES AND THEIR IMPACT ON DOSE RECONSTRUCTION

NIOSH has issued a TBD for the Savannah River Site (SRS), along with a number of revisions. As stated in OCAS-PER-030, these documents have been utilized to perform DRs for claims from the SRS. The TBD has been through several revisions. Although many of the revisions only added annotation and attribution or corrected errors that did not affect the DR methods, there were a number of substantial changes made that could affect the outcome of a DR. In the preparation of OCAS-PER-030, the technical changes made in the revisions of the TBD were reviewed to determine if any previously completed DRs would result in an increased dose using the current methods. The review was limited to identifying any increase in assigned dose, rather than any change or an overall increase.

A summary of the SRS TBD (ORAUT-TKBS-0003) revisions are listed below:

- July 15, 2003 – Rev. 00 (ORAUT 2003a)
- August 21, 2003 – Rev. 01 (ORAUT 2003b)
- October 29, 2004 – Rev. 02 (ORAUT 2004)
- April 4, 2005 – Rev. 03 (ORAUT 2005)

In addition, the Occupational Medical Dose Section was revised as a separate document and issued on November 30, 2009, Rev. 04 (ORAUT 2009).

2.1 ISSUANCE OF OCAS-PER-030

On December 18, 2007, NIOSH issued OCAS-PER-030 (OCAS 2007), which contained the following major sections:

Section 1.0 – This section provides a description of the reason there is a need to consider the changes in the revised SRS TBD (Rev. 01 of August 21, 2003) that could potentially increase assigned dose to claimants whose claims had previously been processed, with a resulting POC <50%, using an earlier version of the SRS TBD (Rev. 00 of July 15, 2003).

Section 2.0 – This section provides a summary of the issues identified by NIOSH from their evaluation of the changes in the SRS TBD. These were as follows:

- No reduction for 1.5 L – *Revision 0 required that urine samples be adjusted to a daily rate by assuming 1.4 liter per day standard rate. However, many samples were reported as activity per 1.5 liters. Revision 1 indicated that samples specified in this way could be considered to be a full day's excretion. Any samples specified as activity per 1.5 liters could have been reduced under revision 0 and would not be now. Therefore, claims completed prior to revision 1 being issued will have to be reviewed to determine if actual urine samples meeting this criterion were reduced.*

- Revised Environmental Plutonium Intakes – *Revision 0 provided a table that contained errors in the pre-calculated missed intakes for plutonium exposure. The values that were miscalculated in revision 0 were corrected in revision 1. All the values for type M plutonium were too high in revision 0 and the values for type S plutonium were too low. Because of this, claims that used the type S values from revision 0 will require a new dose estimate. Since the TBD did not require the use of these values, it is possible some estimates did not include this error. A review of the plutonium intakes will be necessary to determine which claims are affected.*

- 2,500 hours per year Environmental – *Some dose estimates include ambient external dose. The values in revision 0 assumed a 2000 hour work year. This was changed to 2500 hour work year in revision 1. Therefore, claims assigned ambient external dose using revision 0 will require a new dose estimate.*

- Environmental Plutonium and Uranium Headings Transposed – *Revision 0 of the TBD included a table of the maximum site wide ambient intakes of various isotopes. In that table, headings for plutonium and uranium were transposed. This was corrected in revision 1. Most dose estimates completed under revision 0 were performed with the aid of a computational tool. This tool created 7/25/2003 (10 days after revision 0 was issued) contained the appropriate values. However, claims completed using revision 0 must be reviewed to determine if the appropriate value was used.*

Section 3.0 – This section states that there were 54 SRS potentially impacted claims completed with a POC <50% prior to the issuance of the Rev. 01 TBD revision. It provides a plan of corrective action to resolve the issues created by the revision for any claim that was affected by changes in the TBD. This corrective action plan will be further discussed in Section 3 of this report.

2.2 SC&A'S ASSESSMENT OF THE DEVELOPMENT OF OCAS-PER-030

SC&A's review of the applicable SRS TBD revisions and OCAS-PER-030 indicates that NIOSH properly outlined the necessary steps to re-evaluate the claims potentially impacted by the revisions in the TBD as proceduralized in OCAS-PR-008, *Preparation of Program Evaluation Reports and Program Evaluation Plans,* Rev. 02 (OCAS 2006).

SC&A provides detailed analyses of our review in the following sections of this report.

3.0 SUBTASK 2: ASSESS NIOSH'S SPECIFIC METHODS FOR CORRECTIVE ACTION

In instances where the PER involves a technical issue that is supported by documents [e.g., white paper(s), TIB(s), and/or procedure(s)] that have not yet been subjected to a formal SC&A review, Subtask 2 will assess the scientific basis and/or sources of information to ensure the credibility of the corrective action and its consistency with current/consensus science.

Conversely, if such technical documentation has been formalized and previously subjected to a review by SC&A, Subtask 2 will simply provide a brief summary/conclusion of this review process.

3.1 SC&A'S EVALUATION OF CHANGES IN SRS TBD

A complete formal review of all the applicable SRS TBD revisions would be out of the scope and time resources of SC&A's task of evaluating OCAS-PER-030 and would be considered a complete SRS profile review. SC&A had performed in the past, or presently performed, the following evaluation/review of the SRS profile and related documents:

(1) Occupational Medical X-ray Organ Table – An error in analogues for organ dose assignments in Rev. 00 of the TBD (Table 2.04, page 49) and in Rev. 01 of the TBD (Table 2.3-1, page 50) was corrected in Rev. 02 (Table 2.3-1) and later revisions. This change and DR corrections were addressed in OCAS-PER-002 (OCAS 2003). SC&A reviewed OCAS-PER-002 and found it to adequately address the issue.

(2) SC&A Reviewed the SRS TBD in 2005 – The SRS TBD [ORAUT-TKBS-0003, Rev. 02 (ORAUT 2004)] was reviewed by SC&A in 2005 (SC&A 2005). This review document would contain the changes in the TBD that would be relevant to OCAS-PER-030 (which emphasized changes in Rev. 01). A short summary of SC&A's evaluation of the TBD (SC&A 2005) is provided in Attachment A of this report.

(3) SC&A's Current Review of TBD Rev. 03 – In conjunction with SC&A's evaluation of OCAS-PER-030, SC&A recently performed a paragraph-by-paragraph comparison of each TBD revision to the former TBD (i.e., SC&A compared Rev. 01 to the contents of Rev. 00, etc.) to determine if there were any changes in the later revision that could potentially increase the assigned dose. SC&A did not locate any changes that would potentially increase the assigned dose, except those changes already addressed by OCAS-PER-030.

(4) Revised Occupational Medical Section Rev. 04 of the TBD (ORAUT 2009) – OCAS-PER-030, effective December 18, 2007, states on page 2:

> *Some of the changes in these two revisions represented phased implementations… This is the case with photofluorography implemented in revision 2… Prior to these revisions, no method existed for these issues and*

> *claims determined to be affected by them where* [sic] *held until a method could be developed and documented.*

This statement was correct at the time OCAS-PER-030 was issued (if all pending claims were processed after the inclusion of the phased implementations). However, it is not currently correct concerning occupational medical dose assignments for some claims that were performed using the older version of the TBD instead of the revised 2009 edition of the occupational medical dose section.

In conjunction with SC&A's evaluation of OCAS-PER-030, SC&A recently performed a paragraph-by-paragraph comparison of the following documents' occupational medical dose sections to determine if there were any changes in the later revisions that could potentially increase the assigned dose:

- August 21, 2003, Rev. 01, was compared to July 15, 2003, Rev. 00
- October 29, 2004, Rev. 02, was compared to August 21, 2003, Rev. 01
- April 4, 2005, Rev. 03, was compared to October 29, 2004, Rev. 02
- November 30, 2009, Rev. 04, was compared to April 4, 2005, Rev. 03

From this evaluation, SC&A has the following findings:

Finding #1: Concerns with Phased Implementation
Page 2 of OCAS-PER-030 states:

> *Although two more revisions have been issued to the Savannah River Site TBD, the nature of the modifications made in these revisions do not require a review of completed dose reconstructions. The basis for this determination is as follows:*
>
> - *Some of the changes in these two revisions represented phased implementations. In this approach, a TBD is issued with some sections either marked "reserved" or a specific issued* [sic] *is not covered in order to allow the completion of claims unaffected by that aspect of dose reconstruction. A revision is later issued with the new information so that the affected claims can be completed. These types of modifications do not require an evaluation of affected claims because there was no increase in dose, it is simply the implementation of a method where no method existed. This is the case with photofluorography implemented in revision 2, type S Ce-144 intakes implemented in revision 2 and internal dose from food stuffs implemented in revision 3. Prior to these revisions, no method existed for these issues and claims determined to be affected by them where held until a method could be developed and documented.* [Emphasis added.]

This raises the following question: What documentation is available to verify that the SRS claims that were held waiting for the reserved sections to be completed were (or will be) evaluated when the new information became available?

Finding #2: **2009 Revised Occupational Medical Section**
SC&A's comparison of the SRS TBD (Occupational Medical Dose) Rev. 04 to previous revisions found that the later edition contains changes that could increase assigned dose for some claims compared to data contained in earlier editions of the TBD. Some examples are:

- On page 9 of Rev. 04 it states: *"Dose reconstructors should assume that workers had annual PFG examinations through 1960, unless the worker's X-ray records indicate otherwise*." This could add dose to some claims.

- Table 3-8 (p. 13) of Rev. 04 lists photofluorography (PFG) doses for the period 1951–**1960**, whereas Table B-4 of Rev. 02 (p. 160) and Rev. 03 (p. 162) lists PFG doses for only the period 1951–**1957**.

- While most PFG doses listed in Table 3-8 of Rev. 04 decreased in value compared to the values listed in Table B-4 of Rev. 02 and Rev. 03, the dose to the **thyroid increased** in the Rev. 04 edition compared to earlier versions.

- The x-ray machine filtration values changed in Rev. 04, as follows:

  - In Revs. 00, 01, 02, and 03, a half-value layer (HVL) of 1.5 mm Al for the year 1971 and before, and 2.5 mm Al for years after 1971 was stated.

  - In Rev. 04 (pp. 10 and 11), the value changed to 2.5 mm Al for the year of 1971 and before, and 3.5 mm Al for years after 1971.

The impact on assigned x-ray doses needs to be evaluated, especially to areas/organ not in the main primary beam, such as exit skin doses to the chest, which depend on the filtration value used in the computations.

Considering that there were significant changes in Rev. 04, it appears that an additional PER concerning Rev. 04 of the SRS Occupational Medical Dose site profile would be appropriate.

3.2 SC&A'S EVALUATION OF NIOSH'S CORRECTIVE ACTION PLAN

According to Section 3.0 of OCAS-PER-030, at the time OCAS-PER-030 was issued (December 18, 2007), NIOSH had identified 54 SRS claims that were completed prior to the issuance of Rev. 01 of the SRS TBD (August 21, 2003), and which had a POC below 50%. NIOSH will review the DR for each of these 54 claims to determine if the evaluation of dose would be impacted by the four issues addressed in Section 2.0 above.

NIOSH will provide the Department of Labor (DOL) with the list of the 54 claims, as well as a determination on each claim as to whether a new dose estimate is required. Documentation for each claim not requiring a new DR will provide the basis for that determination.

3.2.1 SC&A's Evaluation of TBD Changes and NIOSH's Corrective Action Plan

SC&A's evaluation of the impact of the SRS TBD changes on assigned dose, and NIOSH's corrective action plan is as follows:

- No reduction for 1.5 L – SC&A found that the original recommendation in Rev. 00, page 72, for correcting the 1.5 liter urine sample bioassay results to activity per 1.4 L was not necessarily always applicable (or claimant favorable), and concurs with NIOSH's recommendation in Rev. 01, page 73 (and later revisions), to assume a bioassay result reported as activity per 1.5 L to be a day's excretion, and that reduction to activity per 1.4 L is not needed. SC&A concurs with NIOSH's corrective action plan to review potentially impacted claims and correct calculations and resulting dose assignments if applicable.

- Revised Environmental Plutonium Intakes – SC&A's comparison of the Pu-239 Type S daily intake rates in Table 4.4.3-1, page 77, of Rev. 00 to those listed in Table 4.4.3-1, page 80, of Rev. 01 (and later revisions) indicates that some of the intake rates increased in the latter table; therefore, increased dose assignment is possible. SC&A concurs with NIOSH's corrective action plan to review potentially impacted claims and correct intake values and resulting dose assignments if applicable.

- 2,500 hours per year Environmental – SC&A found that the recommended ambient radiation dose levels for various SRS locations as listed in Table C-17 are in units of *mrem per 2000 hours per year* for all revisions of the SRS TBD. Generally, however, DR protocol recommends the use 2,500 hours per year. Therefore, the recommendation on page 64 of Rev. 01 (and later revisions) to multiply the values in Table C-17 by a factor of 2,500/2,000 = 1.25 is appropriate, and claimant favorable in most cases. The SRS maximum ambient radiation dose level has been selected from Table C-17 and multiplied by the 1.25 correction factor and listed on an annual basis in Table 3.4-1, page 65, of Rev. 01 (and in later revisions). SC&A concurs with NIOSH's corrective action plan to review potentially impacted claims and correct ambient dose level values and resulting dose assignments if applicable.

- Environmental Plutonium and Uranium Headings Transposed – SC&A found that the headings for plutonium and uranium appear to be transposed in Table C-17 of Rev. 00, compared to Table C-17 of Rev. 01 (and later revisions). This could result in insufficient intake/dose of plutonium being assigned for DRs using Table C-17 of Rev. 00. SC&A concurs with NIOSH's corrective action plan to review potentially impacted claims and correct intakes and resulting dose assignments if applicable.

3.2.2 Conclusions

SC&A found that OCAS-PER-030 sufficiently addressed the changes in the SRS TBD and recommended proper corrective action as of its effective date of December 18, 2007, if all pending claims were processed after the inclusion of the phased implementations. However, a review of the 2009 revision of the Occupational Medical Dose Section (Rev. 04) indicates that claims impacted by these changes need to be addressed.

4.0 SUBTASK 3: EVALUATE THE PER's STATED APPROACH FOR IDENTIFYING THE NUMBER OF DOSE RECONSTRUCTIONS REQUIRING RE-EVALUATION OF DOSE

4.1 NIOSH'S APPROACH

Section 3.0 of PER-030 identified the set of criteria used to determine the total population of claims that had the potential of being affected by changes in the SRS TBDs. At the time that OCAS-PER-030 was issued (December 18, 2007), NIOSH identified 54 SRS claims that were completed prior to that date and had a POC below 50%. NIOSH will review the DR for each of these 54 claims to determine if the evaluation of dose involved any of the issues outlined in Section 3 of this report and would be subject to NIOSH's corrective action plan.

4.2 NIOSH'S MAY 2013 UPDATE

At the February 5, 2013, Procedures Review Subcommittee meeting, NIOSH received an action item to follow up on actions for OCAS-PER-030 (SRS); the following describes the claims evaluation outcome (NIOSH 2013):

> *54 claims were listed as potentially affected. Six were returned to NIOSH for other reasons prior to being evaluated so they were never evaluated under PER 30. The remaining 48 were evaluated and none were found to meet any of the criteria. A spreadsheet with the claim numbers can be found in a separate folder (PER-030) in the existing "Procedures Subcommittee" folder on the Advisory Board drive (K:/ABRWH/AB Document Review drive).*

4.3 SC&A'S EVALUATION

SC&A queried the NIOSH/OCAS Claims Tracking System (NOCTS) database using the following criteria:

- Worked at SRS
- <50% POC
- The variable *"Draft DR sent date"* was set at 1/1/2000 to 8/21/2003.

This search indicated that 57 claims met all three criteria; additionally, a manual search identified 3 more claims that met these criteria, making a total of 60 claims identified by SC&A. The following is a summary of the comparison of SC&A's query results to NIOSH's list of 54 claims:

- 54 of the 60 claim numbers identified by SC&A matched those provided by NIOSH. SC&A corresponded with NIOSH concerning the status of the 6 claims identified by SC&A, but not present on NIOSH's list. The dispensation of these 6 claims was as follows:

- Three of these claims were returned to NIOSH by DOL for reasons other than PER-030, and then were reworked using Rev. 01, or a later revision, of the TBD. Therefore, none of the claims were affected by PER-030 because a rework using Rev. 01, or a later revision, of the TBD occurred prior to the issuance of the PER. SC&A used the NOCTS database to verify that this was true for each of these three claims.
- The DR for the remaining 3 claims was performed using Rev. 00 of the TBD. However, the DR used 2,500-hour per year ambient dose and hypothetical internal intakes; therefore, the changes recommended in OCAS-PER-030 would not apply to these 3 claims. SC&A used the NOCTS database to verify that this was true for each of these three claims.

The result of the comparison of the SC&A query and NIOSH's list of 54 claims indicates that NIOSH used the correct claims for re-evaluation under OCAS-PER-030.

5.0 SUBTASK 4: CONDUCT AUDITS OF A SAMPLE SET OF DRs AFFECTED BY OCAS-PER-030

Selection of DRs to Audit – Because NIOSH has completed the evaluation of the 54 potentially impacted claims under OCAS-PER-030 and found none met one or more of the four TBD changes/criteria that would affect dose and would, therefore, require new dose reconstructions, it is recommended that SC&A sample the 48 applicable claims (54 claims minus 6 claims returned to DOL for other reasons) and evaluate some of them to verify that changes in the SRS TBD did not impact the dose assignments as per criteria set forth in OCAS-PER-030. This sampling would consist of SC&A scanning the 48 claims and selecting the claims that potentially could be impacted by OCAS-PER-030 (such as those that had bioassay records, those that have an indication of the need for ambient external dose, and/or the need for environmental intakes). SC&A would then perform a more detailed evaluation of these selected claims to determine if any meet the criteria for re-evaluation as outlined in OCAS-PER-030. SC&A recommends that at least 5–15 claims be subjected to this detailed analysis.

6.0 REFERENCES

42 CFR 82, 2002. *Methods for Radiation Dose Reconstruction under the Energy Employees Occupational Illness Compensation Program Act of 2000*; Final Rule, Federal Register/Vol.67, No. 85/Thursday, May 2, 2002, p. 22314.

NIOSH 2013. E-mail from NIOSH to SC&A and the Procedures Workgroup, Subject: *PER-030 Claims Evaluation*. National Institute for Occupational Safety and Health, Office of Compensation Analysis and Support, Cincinnati, Ohio. April 11, 2013.

OCAS 2003. *SRS TBD - Error in surrogate organ assignment resulting in an underestimate of X-ray dose in SRS dose reconstructions*, OCAS-PER-002, Rev. 00, National Institute for Occupational Safety and Health, Office of Compensation Analysis and Support, Cincinnati, Ohio. December 15, 2003.

OCAS 2006. *Preparation of Program Evaluation Reports and Program Evaluation Plans*, OCAS-PR-008, Rev. 02, NIOSH's Office of Compensation Analysis and Support, Cincinnati, Ohio. December 6, 2006.

OCAS 2007. *SRS TBD Revisions*, OCAS-PER-030, Rev. 00, National Institute for Occupational Safety and Health, Office of Compensation Analysis and Support, Cincinnati, Ohio. December 18, 2007.

ORAUT 2003a. *Technical Basis Document for the Savannah River Site*, ORAUT-TKBS-0003, Rev. 00, Oak Ridge Associated Universities Team, Cincinnati, Ohio. July 15, 2003.

ORAUT 2003b. *Technical Basis Document for the Savannah River Site*, ORAUT-TKBS-0003, Rev. 01, Oak Ridge Associated Universities Team, Cincinnati, Ohio. August 21, 2003.

ORAUT 2004. *Technical Basis Document for the Savannah River Site*, ORAUT-TKBS-0003, Rev. 02, Oak Ridge Associated Universities Team, Cincinnati, Ohio. October 29, 2004.

ORAUT 2005. *Technical Basis Document for the Savannah River Site*, ORAUT-TKBS-0003, Rev. 03, Oak Ridge Associated Universities Team, Cincinnati, Ohio. April 5, 2005.

ORAUT 2009. *Technical Basis Document for the Savannah River Site – Occupational Medical Dose*, ORAUT-TKBS-0003, Rev. 04, Oak Ridge Associated Universities Team, Cincinnati, Ohio. November 30, 2009.

SC&A 2005. *Review of NIOSH Site Profile for Savannah River Site*, SCA-TR-TASK1-003. SC&A, Inc., McLean, Virginia, and Saliant, Inc., Jefferson, Maryland. March 21, 2005.

ATTACHMENT A: SC&A's PREVIOUS FINDINGS CONCERNING THE SRS TBD

On March 21, 2005, SC&A issued a draft report SCA-TR-TASK1-0003 titled, *Review of NIOSH Site Profile for Savannah River Site* (SC&A 2005). This draft report presents SC&A's evaluation of the NIOSH Site Profile for the SRS, Rev. 02 (ORAUT 2004). The following is a summary of those findings:

Finding 1: *The use of the "high-five" approach as surrogate data for internal dose for unmonitored workers and for target organs that do not concentrate the radionuclides in question is not necessarily a maximizing approach for making dose estimates, contrary to the claim in the TBD. The method is not consistent with the 42 CFR 82-recommended methodologies for the calculation of internal dose. The completeness of the database from which the intakes were derived is questionable.*

Finding 2: *The method used to reconstruct doses to unmonitored outdoor workers due to airborne emissions employs an atmospheric dispersion model, assumptions, and a resuspension factor that do not appear to be claimant favorable and is not entirely appropriate for this class of problem.*

Finding 3: *The site profile does not contain guidelines for resolving uncertainties related to recycled uranium (RU) in ways that give the benefit of the doubt to the claimants. For instance, the TBD does not consider internal dose contributions for plutonium, other transuranics, or fission products.*

Finding 4: *The beta/gamma dosimeter adjustment factors and uncertainties applied underestimated the true exposure measured by the dosimeter. Correction factors applied to dosimeter results account for on-phantom calibration and do not consider uncertainty from field exposure conditions.*

Finding 5: *The geometric mean and standard deviation that describe the post-1971 neutron-to-photon ratio are neither technically defensible nor likely to be claimant favorable to a large number of claimants. The TLND recorded neutron doses between 1971 and 1995, as well as the pre-1971 neutron doses (derived from neutron-to-photon ratios), suffer from a high degree of uncertainty. The use of the 95th percentile value for the TLND neutron dose of records is recommended for use.*

Finding 6: *The adequacy of the F- and H-area Tank Farm characterization in the TBD is questionable for use as dose reconstruction guidance. This is particularly true for early periods of operation, where primary records involving key operations and incidents are lacking. Moreover, no references are provided for the Tank Farm discussion in the TBD, and there is no analysis indicating how the conclusions were reached.*

> ***Finding 7:*** *Solubility, oro-nasal breathing, and ingestion should be carefully considered in regard to internal dose reconstruction. SC&A originally developed these points for the review in the Bethlehem Steel and Mallinckrodt Chemical Works site profile reviews, and they are applicable for all bioassay interpretations for EEOICPA.*

These findings are not directly applicable to the issues covered in OCAS-PER-030.