

**INL SEC 0219: Compilation of SC&A Review Issues, Comments, and Recommendations**

No.	Description	References	Notes & Additional Comments
<p><b>Issue A: Test Area North (TAN) – Scope of Review: (1) Applicability of ORAUT-OTIB-0054 (OTIB-0054 or ORAUT 2013) and Tables 5-22 and 5-23 of the site profile internal dosimetry technical basis document (TBD) (ORAUT-TKBS-0007-5) to the performance of internal dose reconstruction for facilities that handled and stored spent and irradiated fuel; (2) unique circumstances associated with the Aircraft Nuclear Propulsion (ANP) program; (3) completeness of the external dosimetry data at the various TAN facilities.</b></p>			
<p><b>A-1</b></p>	<p>“...we do not believe we can consistently assign the external dosimetry monitoring data to the different work areas, operations, and campaigns within TAN, at least given the data we reviewed. The implications are that NIOSH [the National Institute for Occupational Safety and Health] might not be able to build coworker models for many of the different subdivisions at TAN. This could be an important SEC [Special Exposure Cohort] issue for TAN, because the types of activities at TAN were so diverse that different coworker models might be required.”</p>	<p><i>Review of NIOSH Strategy for Reconstructing Internal Doses to Workers at Test Area North, SC&amp;A Report SCA-TR-2015-SEC0074A, Revision 0, draft, September 28, 2015. Executive Summary.</i></p>	<p>Resolution might require additional data capture.</p> <p>SC&amp;A comment: At the November 11, 2015 Work Group (WG) meeting, NIOSH indicated that they only sampled the dosimetry data for TAN and that much more remains (pp. 170, 176 of November 11, 2015 WG transcript).</p> <p>The only area that they made a concerted effort to try and get all of the dosimetry was associated with the Chemical Processing Plant (CPP), and that was just between 1963 and 1974.</p> <p>They also indicated that they do not intend to develop an external coworker model for the Idaho National Laboratory (INL) (p. 173 of November 11, 2015 WG transcript).</p> <p>The WG agreed that this is a lower priority issue compared to some of the other areas of concern (p. 177 of November 11, 2015 WG transcript).</p>

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A-2	<p>“For neutron dosimeters, the data appear to be spotty. If it can be assumed that neutron dosimeters were only assigned to individuals whom the radiation protection staff deemed at risk of neutron exposure, then the temporal gaps seen in the available neutron dosimetry data might indicate that there was no need for neutron monitoring because there was no source of neutron exposure potential. Investigation into the types of activities and experiments conducted during the periods of time for which no neutron dosimeters were found might be needed to determine if neutron exposure was or was not likely.”</p>	<p><i>Ibid.</i> (A1), Section 5.2.</p>	<p><i>Ibid.</i> (A1)</p>
A-3	<p>“Given the unique features of the aircraft nuclear propulsion systems [ANPs] tested at INEL [Idaho National Engineering Laboratory] and their equally unique mixtures of radionuclides that were released, SC&amp;A believes that “conventional” reactors and their modeled values may not be appropriate for deriving internal dose estimates to INEL workers.” Therefore, for spent nuclear fuel associated with ANP, use of ORAUT-OTIB-0054 is inappropriate for the following reasons:</p> <ul style="list-style-type: none"> <li>• “...highly enriched uranium fuel (enrichments in excess of 90%) would contain very little Pu-239 [plutonium-239] and other actinides related to U-238 neutron interactions. Hence, it is unlikely that a substantial portion of TAN irradiated fuel would contain mixes of actinides that resemble the default mixes employed in Tables 5-22 and 5-23 of the internal dosimetry TBD. We confirmed these concerns by performing a series of simplified ORIGEN runs. Hence, we believe that these matters could represent potential SEC issues.”</li> <li>• “Wafer-thin ribbons of UO<sub>2</sub> [uranium oxide] and absence of cladding ensured high release fraction by recoil and/or diffusion of many FPs [fission products]. Most notably are volatile radionuclides (iodine, cesium, etc.)”</li> <li>• “Release and depletion of FPs from fuel elements must further be assumed by the fact that for some IETs [Initial Engine Tests], intentional fuel failure (and unintentional fuel failure) resulted from temperatures exceeding 3,200°F.”</li> </ul>	<p><i>Ibid.</i> (A1), Section 4.0.</p> <p><i>Ibid.</i> (A1), Executive Summary.</p> <p>J. Mauro PowerPoint presentation at November 10, 2015 INL Work Group Meeting showing results of report SCA-TR-2015-SEC0074A.</p> <p><i>Ibid.</i></p>	<p>–</p> <p>–</p> <p>–</p>

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A-4	<p>“Independent analyses of airborne emissions associated with the major IETs, as performed by SC&amp;A under contract to CDC [Centers for Disease Control and Prevention], revealed that the DOE [Department of Energy] significantly underestimated the airborne emissions for the IETs with the largest airborne emission.” “Outdoor exposures associated with releases from the ANP need to consider the results of CDC’s investigations into these source terms.”</p>	<p><i>ibid.</i></p>	<p>SC&amp;A comment: At the November 11, 2015 WG meeting, NIOSH was tasked to prepare a white paper on IET #10.</p> <p>NIOSH indicated that they will not be prepared to discuss IET #10 at the March 1, 2016 WG meeting, as it has been delayed due to other priorities.</p>
<p><b>Issue B: Central Facilities Area (CFA) – Scope of Review: Evaluate available survey data for the CFA, both during operations and prior to demolition and dismantlement, to determine the actinide to Sr-90 and actinide to Cs-137 ratios and compare these ratios to the values in Tables 5-22 and 5-23 of the internal dosimetry TBD (ORAUT-TKBS-0007-5).</b></p>			
B-1	<p>“Analyses of the smear data and soil sample results...indicates at least general agreement in the magnitude of the maximum contamination ratios for uranium and plutonium given in Tables 5-22 and 5-23 of ORAUT-TKBS-0007-5... However, there are several limitations in the data used.”</p> <ol style="list-style-type: none"> <li>1. The CFA-669 Hot Laundry operated from 1950 until 1981. The survey data found were very limited and from 1954–1956, the period of early operations.</li> <li>2. The survey data are written given in units of counts per minute (cpm). While assumptions regarding the equipment and detection efficiencies can be made based on the time period and equipment used at that time, it may be more beneficial to use more recent and well documented survey information.</li> <li>3. The soil samples were collected during decontamination &amp; decommissioning (D&amp;D) operations from a trench and berm formed during the excavation of the 8-in contaminated sanitary sewer line on the north side of CFA-669. It may be more useful to use more sample results, particularly those obtained during the characterization survey, prior to D&amp;D.</li> </ol>	<p><i>Evaluation of Available Survey Data for the Central Facilities Area at Idaho National Laboratory, SCA-SEC-2015-0074-B, Rev. 0, draft, September 28, 2015. Section 4.0.</i></p>	<p>SC&amp;A comment: Data capture in January 2016 sought relevant information. The items recovered for the Site Research Database may provide some insight when available. — We still have the Seattle and return INL data captures coming up later in 2016.</p>

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<b>Issue C: Test Reactor Area (TRA) – Scope of Review: Does the methodology of ORAUT-OTIB-0054 (Fission and Activation Product Assignment for Internal Dose-Related Gross Beta and Gross Gamma Analyses) adequately model the reactor characteristics and operations of the Test Reactor Area (TRA)?</b>			
<b>C-1</b>	<p>“...The MTR [Materials Test Reactor]...ran for a period of time with plutonium rather than uranium fuel...It is not clear which, if any, of the nine OTIB-0054 cases...would adequately envelope this situation.”</p> <p>“The issue of whether OTIB-0054 adequately envelopes the MTR when fueled with plutonium merits further investigation and discussion.”</p>	<p><i>NIOSH SEC-00219 Test Reactor Area Modeling, SC&amp;A Report SCA-SEC-2015-0074-C, Revision 0, draft, September 28, 2015. Section 3.2</i></p>	<p>SC&amp;A comment: Discussed pp. 132–144, November 11, 2015 WG transcript.</p> <p>SC&amp;A tasked to develop a prioritized list of the 52 reactors at INL, to ascertain if OTIB-0054 methods are bounding and sufficiently accurate. That report will be delivered in March 2016.</p>
<b>Issue D: Chemical Processing Plant (CPP; 1963-1974) – Scope of Review: Evaluate if the revised SEC class definition may unintentionally exclude workers from the SEC class due to contemporaneous dosimetry requirements.</b>			
<b>D-1</b>	<p>“Observation 1: While the class definition provides the example of ‘at least one film badge,’ SC&amp;A has assumed that <i>any</i> evidence of monitoring during the latter SEC period (March 1, 1970–December 31, 1974) will satisfy the intended criteria.” [i.e., one badge, one area → one badge, multiple areas (March 1, 1970) → one badge, one area (December 1974)]</p>	<p>Evaluation of the Revised SEC Class Definition for the Idaho National Laboratory Chemical Processing Plant (1963–1974), SCA-SEC-2015-D, Revision 0, draft, September 28, 2015. Section 2.1.</p>	<p>SC&amp;A comment: All 6 observations related to this issue were discussed at the November 11, 2015 and January 15, 2016 WG meetings. Review of the remaining 18 cases in coordination with NIOSH is complete. Issue D will be the focal point of the March 1, 2016 WG meeting.</p>
<b>D-2</b>	<p>“Observation 2: SC&amp;A identified a single claim that contained in-vivo dosimetry related to CPP, but did not have related external dosimetry. It is recommended that this claim be included with the claims requiring additional data capture at INL.”</p>	<p><i>ibid.</i></p>	<p>–</p>
<b>D-3</b>	<p>“Observation 3: Clarification is warranted to establish how “temporary” and/or ‘visitor badges’ are utilized in the implementation of the class definition during the latter SEC period (3/1/1970–12/31/1974).”</p>	<p><i>ibid.</i></p>	<p>SC&amp;A comment: NIOSH clarified at the November 11, 2015 Work Group meeting that temporary and visitor badges and location</p>

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			cards are adequate if the 250 day requirement is met.
<b>D-4</b>	“Observation 4: Absent additional information to the contrary, dosimetry associated with ‘CADRE’ should be considered CPP for the purposes of determining SEC eligibility. Similar to the CPP dosimetry records, it is important to establish that ‘CADRE’ badging records have all been captured from INL.”	<i>Ibid.</i> Section 2.2.	SC&A comment: NIOSH clarified at the November 11, 2015 Work Group meeting that it will reach out to site personnel for clarification. To be discussed at the March 1, 2016 WG meeting.
<b>D-5</b>	“Observation 5: NIOSH should consider the additional claims identified by SC&A as candidates for upcoming data-capture efforts at INL to assure that all monitoring records are complete for these workers.”	<i>Ibid.</i> Section 3.0.	SC&A Comment: Supplemental dosimetry records were received from the site in December 2015. SC&A delivered the white paper: “Evaluation of Claims with Supplemental Dosimetry Requests.” This white paper was discussed at the January 2015 Work Group Teleconference (see Sub Issue DD, below, for noted observations).
<b>D-6</b>	“Observation 6: A review of the ten claimants NIOSH identified as requiring follow-up research and data capture at INL indicates a thorough search to identify potential workers who were exposed at the CPP for which the required dosimetry currently is not available. SC&A agrees with NIOSH’s assessment that these claimants warrant further investigation.”	<i>Ibid.</i> Section 4.0.	See response to Item D-5 and Sub issue DD.
<b>Sub Issue DD: Chemical Processing Plant (CPP; 1963–1974) – Evaluation of Claims with Supplemental Dosimetry Requests.</b>			
<b>DD-1</b>	“Observation 1: Five of the 18 claims contained a listing of a “box” and “record number” for the relevant claimant dosimetry records. In one of those five claims, it appears that an “area exposure report” related to the claimant could not be located. It should be noted that NIOSH has undertaken a comparison of monthly Health Physics (HP) reports versus the available dosimetry printouts, and NIOSH	Evaluation of Claims with Supplemental Dosimetry Records, SCA-2016-SEC-0074F, Revision 0, draft, January 12, 2016, Section 2.1.	SC&A Comment: NIOSH noted that the particular missing record was related to MTR and prior to the SEC period; this confirmed SC&A’s assertion stated in the white paper. On the issue of

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	concluded the records available (at least for CPP in the 1963–1970 timeframe) are complete for the purposes of SEC administration.”		missing records in general, NIOSH reaffirmed that they feel they have a complete set of CPP dosimetry for the purposes of SEC implementation. (INL WG Telecon, January 15, 2016, pp. 87–94)
<b>DD-2</b>	“Observation 2: SC&A identified evidence (specifically an in-vivo record) of a claimant entering CPP in 1966 that did not have associated external dosimetry for CPP.”	<i>Ibid.</i> Section 2.2.	SC&A Comment: Subsequent to this report and prior to the January 2016 WG teleconference, NIOSH identified a set of visitor badges associated with this claimant for MTR and the Special Power Excursion Reactor Test (SPERT), but no evidence of monitoring at CPP. It is NIOSH’s position that this in vivo record at CPP is likely a typo. (INL WG Telecon, January 15, 2016, p. 55)
<b>DD-3</b>	“Observation 3: Case #3 provides an example where internal monitoring indicates CPP during the latter SEC period (1970); however, there is no external monitoring at INL after 1960.”	<i>Ibid.</i> Section 2.3.	SC&A Comment: Subsequent to this report and prior to the January 2016 WG teleconference, NIOSH obtained visitor badges at CPP for this individual which correspond to the internal monitoring result identified in Observation 3. (INL WG Telecon, January 15, 2016, pp. 85–86)
<b>DD-4</b>	“Observation 6: The “annual dose summary” report for Case #6 indicates that the claimant was monitored from 1963 to 1966; however, individual dosimetry reports are not available to ascertain the exact work location during this time.”	<i>Ibid.</i> Section 2.6.	SC&A Comment: NIOSH indicated that they have searched all available temporary and film badge reports at CPP for this individual and did not locate any records. However, NIOSH also stated they have not searched through temporary and/or visitor

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			records at other INL areas where the EE may have been monitored but not captured in the DOE response. (INL WG Telecon, January 15, 2016, pp. 111–116)
<b>Issue E1: Fission and Activation Product (FAP) Bioassay Indicator Radionuclides – Scope of Review: Analyze FAP indicator ratios, actinide-to-FAP ratios, and special situations/bioassays.</b>			
<b>E1-1</b>	“FAP intakes assigned using NIOSH’s recommendations in ORAUT-OTIB-0054...based on Sr-90 [strontium-90] intake values are generally (but not always) equal to, or greater than, those derived from actual measured values.”	<i>SC&amp;A’s Evaluation of the NIOSH Evaluation Report Proposed Use of Fission-Activation Product Bioassay Indicator Radionuclides (in Conjunction with ORAUT-OTIB-0054 and ORAUT-TKBS-0007-5) for Assessment of Fission-Activation Product and Actinide Intakes at Idaho National Laboratory, SCA-SEC-2015-0074-E1, Revision 0, draft, October 26, 2015, Executive summary.</i>	<p>SC&amp;A comment: It needs to be determined if records of analyses of dissolver contents are available, preferably for a variety of INL reactor fuel elements and also fuel elements from off-site reactors.</p> <p>Data capture in January 2016 sought relevant information. The items recovered for the SRDB may provide some insight when available. -- We still have the Seattle and return INL data captures coming up later in 2016.</p> <p>SC&amp;A tasked at the November 11, 2015 WG meeting to update the Issue E1 report when the relevant data are obtained.</p>
<b>E1-2</b>	“The Cs-137 [cesium-137]/Sr-90 intakes are not always 1:1 as assumed in ORAUT-OTIB-0054...and ORAUT-TKBS-0017-5 ...; frequently, large variations in the ratio exist. This brings into question the validity of using an indicator radionuclide when deriving FAP and actinide intakes, because the assigned intakes/doses are dependent on the indicator radionuclide bioassayed at the time. This may be the most important result of this study, because a Cs-137/Sr-90 value of approximately 1:1 is one of the cornerstones for use of the ratio method at the INL.”	<i>ibid.</i>	<p>SC&amp;A comment: Further INL document research is needed to evaluate NIOSH’s recommended ratio values, especially for actinides and Cs-137/Sr-90.</p> <p>See response to E1-1.</p>

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E1-3	"Actinide intakes assigned using NIOSH's recommendation in ORAUT-TKBS-0017-5..., Table 5-22 based on Sr-90 intake values, or Table 5-23 based on Cs-137 intake values, are sometimes significantly less than those derived from actual measured values."	<i>Ibid.</i>	SC&A comment: Resolution is contingent on revised Issue E1 report.
E1-4	"It is difficult to evaluate when 'special' (situations where actinides were not tied to a fission product in a given ratio) bioassays were needed, if they were performed, and if they are indicated as such in the bioassay records."	<i>Ibid.</i>	<p>SC&amp;A comment: It needs to be determined if special or non-routine bioassays were associated with special exposure events...or, if instead, the terms were applied to the priority of processing over "routine" bioassays.</p> <p>Future data capture will seek to address these concerns.</p> <p>See response to E1-1.</p>
<p><b>Issue E2: Fission and Activation Product (FAP) Bioassay Worker Records – Scope of Review: Determine, through a semi-random sample of claimants, if sufficient workers' records containing FAP bioassay (in-vitro and in-vivo) results are available to assign intakes and resulting doses from FAP.</b></p>			
E2-1	Observation 1: SC&A believes that coworker models should be developed for the period of 1967–1970 for each relevant area under consideration.	<i>Evaluation of Internal Monitoring for Fission and Activation Products Among INR Claimants (1949–1970)</i> , SCA-SEC-2015-0074-E2, Revision 0, draft, October 26, 2015. Executive Summary.	<p>SC&amp;A comment: Issue E2 discussed on pp. 221–244 of the November 11, 2015 WG meeting transcript.</p> <p>Tasking from November 11, 2015 WG meeting: NIOSH will assess FAP coworker modeling requirements and feasibility for the applicable INL site areas and years.</p>

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E2-2	<p>“Observation 2: Based on SC&amp;A’s review of sampled claimants, it is not apparent that the lack of internal monitoring data is indicative of a lack of internal exposure potential. Given the uncertainty in establishing work areas, activities and ultimately exposure potential for claimants (particularly in the early years), it is recommended that coworker models be evaluated and developed for workers who were unmonitored, but likely should have been monitored during all periods for which such exposures are possible.”</p>	<p><i>ibid.</i></p>	<p>SC&amp;A comment: See response to E2-1.</p>
E2-3	<p>“...it appears there are credible situations where it would be appropriate and claimant favorable to assign coworker intakes of FAPs and actinides to account for unmonitored portions of the claimants’ work history. Many of these examples predate the period currently identified by NIOSH as requiring coworker evaluations (1967–1970).”</p>	<p>–</p>	<p>SC&amp;A comment: See response to E2-1.</p>