Summary of Six Document Reviews Approved by the Subcommittee for Procedure Reviews

Kathleen Behling, SC&A, Inc.

Advisory Board on Radiation and Worker Health

August 26–27, 2026

Subcommittee for Procedure Reviews (SPR)-approved documents

- OCAS-TIB-011, rev. 1, “Lung Dose Conversion Factor for Thoron WLM” (WLM is working level months) (“TIB-011”)
- ORAUT-RPRT-0084, rev. 00, “Two-Count Filter Method for Measurement of Thoron Progeny in Air” (“RPRT-0084”)
- ORAUT-RPRT-0097, rev. 00, “Breathing Zone to General Area Air Concentration Ratios in Small Workrooms” (“RPRT-0097”)
- ORAUT-OTIB-0093, rev. 00, “Conversion of Committed Effective Dose to Annual Organ Dose” (“OTIB-0093”)
- ORAUT-RPRT-0071, rev. 00, “External Dose Coworker Methodology” (“RPRT-0071”)
- DCAS-PER-093, rev. 0, “Texas City Chemicals, TBD Rev. 01” (TBD is technical basis document) (“PER-093”)

OCAS-TIB-011, rev. 1

- Title: “Lung Dose Conversion Factor for Thoron WLM”
- Revision 1 issued April 15, 2005
- Current version (revision 05) of the technical information bulletin (TIB) has been retitled, “Dose Conversion Factors for WLM”
- Presents a method for converting thoron progeny exposure expressed in units of working level (WL) to lung dose rate

OCAS-TIB-011 overview

Purpose

Provides the basis for deriving conversion factor to estimate lung dose from thoron (radon (Rn)-220). The usual Rn-222 models are not applicable due to significant differences in decay product characteristics.

International Commission on Radiological Protection (ICRP) Publication 66 lung model

Uses the ICRP Publication 66 lung model—which divides the lung into multiple regions and tracks particle movement and absorption—to calculate how thoron decay products deliver dose to the lung.

SC&A's review of TIB-011

- Reviewed as part of the second set of procedures:
  - Revision 0 issued June 2006
  - Revision 1 issued August 2007
- SC&A identified two findings
- Findings were discussed and resolved at the May 20, 2008, SPR meeting

OCAS-TIB-011 finding 1

Finding date	Finding description	National Institute for Occupational Safety and Health (NIOSH) response	Finding resolution
6/8/2006	NIOSH should clarify how it derived the dose values in TIB-011 Table 1, "Dose per WLM inhaled for various degrees of Equilibrium," as SC&A could not reproduce the results using the assumptions provided.	**12/17/2007.** During the evaluation of this finding and revising TIB-011 to include progeny of Rn-219, NIOSH identified mathematical errors that cause the values in table 1 to be erroneously high. NIOSH will revise the document, correcting the table 1 values, and will provide the supporting calculations.	**5/20/2008.** SC&A received the spreadsheets used to develop TIB-011, reviewed the data, replicated all calculations, and confirmed that the document is accurate. Based on SC&A's review, SPR closed the finding.

OCAS-TIB-011 finding 2

Finding date	Finding description	NIOSH response	Finding resolution
6/8/2006	SC&A disagrees with the statement that lead (Pb)-212 produces less lung dose per unit activity than bismuth (Bi)-212, noting that for particle sizes of 0.25 micrometer (μm) and 0.0015 μm, the lung dose per becquerel (Bq) of Pb-212 is roughly four times higher than that of Bi-212.	**12/17/2007.** NIOSH removed the statement that was challenged by SC&A, as well as provided the calculations used to derive the table 1 values.	**5/20/2008.** Based on NIOSH's response and SC&A's review of the data, SPR closed the finding.

Discussion of OCAS-TIB-011

ORAUT-RPRT-0084, rev. 00

- Title: “Two-Count Filter Method for Measurement of Thoron Progeny in Air”
- Revision 00 issued March 27, 2017
- Evaluates a method to calculate internal dose to the lungs from inhalation of thoron
- SC&A submitted review of report February 7, 2024
- Review identified zero findings or observations

ORAUT-RPRT-0084 purpose

Purpose of RPRT-0084

- Provide a process for deriving an equation to calculate the concentration of long-term thoron progeny using a two-count filter method

Why thoron matters

- Thoron (Rn-220) is a short-lived alpha-emitting gas from the thorium-232 decay chain, but its progeny live longer and contribute most of the dose

Key radionuclides

- Thoron decay chain (simplified):

  Rn-220 → Pb-212 → Bi-212 → (polonium-212 / thallium-208)

- **Pb-212** — 10.64 hours (major contributor)
- **Bi-212** — 60.6 minutes (alpha and beta emitter)
- Other daughters have very short half-lives, contributing very little dose

RPRT-0084 approach in deriving an equation for the two-count filter method

Forward problem approach

- Start with known air concentrations: Pb-212, Bi-212, long-lived alpha emitter
- Air sampler runs collect radionuclides on filter
- Measure alpha activity at 6 hours (A6) and 24 hours (A24) after shutdown
- Output: Benchmark alpha counts (A6 and A24)

Reverse problem approach

- Use measured total alpha activity on the filter at A6 and A24
- Plug into the derived equation
- Result: calculated Pb-212 air concentration
- If result matches forward input, method is validated

RPRT-0084 reverse problem approach equation

$$C_{pb} = \left[\frac{\lambda_{bi} - \lambda_{pb}}{\lambda_{bi}}\right]\left[\frac{A_{24} - A_6}{e^{-\lambda_{pb}24} - e^{-\lambda_{pb}6}}\right]\left[\frac{\lambda_{pb}}{F\left(1 - e^{-\lambda_{pb}T}\right)}\right]$$

Where:

- C_{pb} is Pb-212 concentration in air
- λ_{bi} is decay constant for Bi-212
- λ_{pb} is decay constant for Pb-212
- A_{24} is alpha activity measured at 24 hours
- A_6 is alpha activity measured at 6 hours
- F is flow rate of the air sampler
- T is time duration the sampler was running
- $e^{-\lambda_{pb}24}$ is the fraction of Pb-212 remaining after 24 hours due to radioactive decay
- $e^{-\lambda_{pb}6}$ is the fraction of Pb-212 remaining after 6 hours due to radioactive decay
- $e^{-\lambda_{pb}T}$ is the fraction of Pb-212 remaining after time T due to radioactive decay

Summary of SC&A's review of RPRT-0084

Overall assessment

Approach used to develop the sampling plan is reasonable and technically correct

Method validation

Forward and reverse problem methods are acceptable and produce consistent results

Sensitivity and variables

SC&A's report included discussion on how changes in parameters may affect results

Documentation quality

No issues identified that affect the readability or application of the method

Discussion of ORAUT-RPRT-0084

ORAUT-RPRT-0097, rev. 00

- Title: “Breathing Zone to General Area Air Concentration Ratios in Small Workrooms”
- Revision 00 issued March 29, 2021
- Report approach:
  - Reviews data from five air-sampling studies conducted in small workrooms
  - Evaluated breathing zone (BZ) and general area (GA) air concentrations
- Data used to assess inhalation intakes of workers with no bioassay data
- SC&A submitted review of report October 16, 2023
- Review identified two findings

RPRT-0097 overview

- BZ air concentrations represent what workers inhale directly
- GA air concentrations reflect the overall room conditions
- Ideally, air concentrations would be uniform at all locations, resulting in a BZ:GA ratio of 1
- Airborne radioactive material is rarely evenly mixed, so BZ:GA ratios often differ from 1
- Because conditions vary widely, BZ:GA ratios must be evaluated case-by-case

RPRT-0097 parameters within the scope of this report that affect BZ:GA

Parameters affecting the level of mixing of an aerosol

- Room size (in terms of room area)
- Aerosol particle distribution
- Room ventilation ratio
- Room complexity

Parameters affecting the BZ:GA ratio distribution

- Sampler location and radioactive aerosol release point locations
- Low-number concentrations of dominant aerosol particles in a workroom (Note: NIOSH does not recommend using air sample data from workrooms known to have this parameter for developing BZ:GA ratios)

RPRT-0097 methodology

- Evaluated air-sampling data from five small workrooms (190–1,130 square feet)
- Focused on respirable aerosol particles up to 10.5 µm (only particles 20 µm contribute to worker inhalation intakes)
- Considered two worker-location scenarios to develop BZ:GA ratio distributions
- Applied lognormal models using regression on order statistics to calculate geometric mean and geometric standard deviation

RPRT-0097 worker location scenarios

Scenario 1

- Worker and release point are always at the same location
- Represents acute, worst-case exposures and produces the highest BZ:GA ratios

Scenario 2

- Worker location varies throughout the room, representing typical multi-workstation environments
- Generally producing lower, more representative BZ:GA ratios for assessing chronic exposure scenarios

RPRT-0097 statistical analysis

- Combined datasets using Monte Carlo simulations for BZ location scenarios 1 and 2
- Further subdivided scenario 1 into open versus obstructed workspaces
- Calculated combined BZ:GA ratio distributions for each scenario to understand their impact on BZ:GA ratios

Combined BZ:GA ratio distributions evaluated by NIOSH

Scenario for aerosols	BZ:GA ratio geometric mean	BZ:GA ratio geometric standard deviation
Scenario 1 – open workspaces	1.39	3.27
Scenario 1 – obstructed workspaces	12.0	4.11
Scenario 1 – open and obstructed workspaces	2.95	5.03
Scenario 2 – open and obstructed workspaces	1.08	4.02

RPRT-0097 BZ:GA ratio application

- When justified, the appropriate BZ:GA ratio is selected based on whether the exposure scenario aligns with:
  - Scenario 1: acute, same-location exposures
  - Scenario 2: typical, variable-location exposures
- The selected ratio is applied to GA air-sample results to estimate equivalent BZ air concentrations in a radiological workspace

RPRT-0097 conclusions about scenario 1

- **Open workspaces:** BZ:GA ratios show no major difference when the room is mostly open
- **Obstructed workspaces:** Ratios are much higher when the room has many obstructions
- **Combined data:** Differences between open versus obstructed spaces are significant, so using ratios from obstructed rooms alone may be more appropriate

RPRT-0097 conclusions about scenario 2

Room type

- Open rooms: similar BZ:GA ratios
- Obstructed rooms: similar BZ:GA ratios

Adjustments needed?

- None—scenario 2 ratios are stable across room types

Ventilation impact

- Air-change rates (6–90/hour) had no meaningful effect on ratios

SC&A's review of RPRT-0097

What SC&A evaluated

- Sampling approach
- Worker-location scenarios
- Statistical methods
- Documentation clarity

Key conclusions

- Approach is reasonable and technically sound
- Scenarios appropriately support BZ:GA adjustments
- Statistical methods are acceptable
- No documentation issues affecting use

SC&A's review of RPRT-0097 – Application

What SC&A found

- Overall methods for developing BZ:GA ratios were technically sound
- Two observations identified related to how the report is applied:
  - Scenario selection
  - Documentation of judgments

ORAUT-RPRT-0097 observation 1

Finding date	Finding description	NIOSH response	Finding resolution
10/16/2023	Dose reconstructors may lack enough data to choose the correct scenario. Guidance needed to ensure claimant-favorable choices when data are limited. **11/16/2023.** SC&A requested that a review of RPRT-0097 implementation be conducted under Argonne National Laboratory-West (ANL-W)/Idaho National Laboratory (INL) Work Group (WG)	**11/16/2023.** NIOSH noted in three sections of the report that the choice of ratio must be justified on a case-by-case basis.	**11/16/2023.** SPR closed the observation based on NIOSH's response.

ORAUT-RPRT-0097 observation 1 follow-up

Finding date	Finding description	NIOSH response	Finding resolution
10/16/2023	**3/14/2024.** SC&A noted that the revision of the ANL-W TBD uses RPRT-0097 and requested a focused review of how the TBD implements the report.	**3/14/2024.** NIOSH recommended that the ANL-W/INL WG conduct the RPRT-0097 review so as not to duplicate effort.	**3/14/2024.** SPR agreed that the ANL-W/INL WG should evaluate the implementation, and that review is currently underway.

ORAUT-RPRT-0097 observation 2

Finding date	Finding description	NIOSH response	Finding resolution
10/16/2023	Professional judgment is required in applying the report. Clear documentation standards are needed for transparency.	**11/16/2023.** The report requires users to justify and document their decisions, with guidance in relevant TBDs and TIBs. Professional judgment should be explained when used, though this report is rarely used in dose reconstruction (DR) and is typically incorporated in site-specific TBDs.	**11/16/2023.** SPR agreed with NIOSH response and closed the observation.

Discussion of ORAUT-RPRT-0097

ORAUT-OTIB-0093, rev. 00

- Title: “Conversion of Committed Effective Dose to Annual Organ Dose”
- Revision 00 issued October 16, 2023
- SC&A’s review issued May 23, 2024
- SC&A had no findings or observations

ORAUT-OTIB-0093 background

- Beginning in 1996, Title 10 of the *Code of Federal Regulations* (10 CFR) Part 835 required U.S. Department of Energy (DOE) sites to evaluate internal dose for workers likely to receive 0.1 rem (a unit of radiation dose), or more committed effective dose equivalent (CEDE) in a year
- Later updates aligned terminology with ICRP Publication 68, changing CEDE to committed effective dose (CED), which is risk-weighted dose to tissues over 50 years after intake

ORAUT-OTIB-0093 purpose and scope

- Document provides guidance for converting a CED to annual organ doses, which is necessary for DR at DOE and Atomic Weapons Employer facilities.
- Addresses the need to estimate internal radiation doses for unmonitored workers by assigning a bounding estimate (typically 100 millirem (mrem) CED per year of potential exposure).

ORAUT-OTIB-0093 method for conversion

- Direct conversion from CED to annual organ dose is not possible due to the complexity of dose relationships.
- To estimate annual organ doses for an unmonitored worker at a DOE site:
  - Determine the intake quantity of a radionuclide that would result in a 100-mrem CED, using ICRP Publication 68 dose conversion factors (DCFs).
  - Calculate annual organ doses from this intake using radionuclide-specific DCFs.
- The formula for intake is:

  Intake (Bq) = 0.001 sievert (Sv) / DCF (Sv/Bq)
  - DCFs are sourced from ICRP Publication 119 (for most radionuclides)
  - Approach cannot be used for special metal tritides, insoluble plutonium (Pu)-238, and super slow (super S) plutonium

ORAUT-OTIB-0093 example data

- Table 2-1 of OTIB-0093 shows how a 100-mrem CED from Pu-239 intake results in different organ doses depending on the material type (Type M (moderate absorption rate) or Type S (slow absorption rate)). For example:
  - Bone surface dose = 3,100 mrem (Type M) or 1,100 mrem (Type S)
  - Liver dose = 660 mrem (Type M) or 230 mrem (Type S)
- This demonstrates the variability in organ doses for the same CED, emphasizing the need for radionuclide- and material-specific calculations.

SC&A review and conclusions

Methodology check

SC&A confirmed NIOSH's approach for converting CED to annual organ doses is reasonable and aligns with current ICRP guidance.

Independent verification

SC&A reproduced the doses in table 2-1, validating the example calculations for Pu-239 (Types M and S).

Use of alternative guidance

SC&A agreed that, for radionuclides not covered in ICRP Publication 119, alternate NIOSH documents should be used.

Site-specific priority

SC&A supports OTIB-0093's direction that site-specific information takes precedence, including co-exposure models or exposure matrices.

SC&A had no findings or observations.

Discussion of ORAUT-OTIB-0093

ORAUT-RPRT-0071, rev. 00

- Title: External Dose Coworker Methodology
- Issued July 2, 2015
- Report purpose: Outlines methodologies for handling censored external dose data using multiple imputation (MI) (a statistical technique used to handle missing data) and limit of detection over 2 (LOD/2) substitution techniques when developing external co-exposure models
- SC&A review: September 29, 2023
- SC&A identified 10 observations
- SC&A presented its report to the SPR at the March 14, 2024, meeting and further discussed at the January 29, 2026, and June 5, 2026, meetings

Overview of ORAUT-RPRT-0071

- Describes an MI method for filling in censored—less than the limit of detection (LOD)—readings
- Current method: one-half of LOD
- Distribution of observed uncensored data is used to predict the distribution of the censored results
- Imputed values are random draws from the lognormal distribution replicated multiple times
- An annual average imputed value is determined
  - Combined with uncensored measurements in further analyses
- Procedure described has two components
  - Imputation method: MI
  - Probability model underlying the imputations

Summary of SC&A review of RPRT-0071

- MI justifiable and likely improves on LOD/2
- MI generally regarded as state-of-the-art for imputation
  - Can reduce bias
  - Allows for measurement of estimator uncertainty
- Application of lognormal probability model can be problematic in some situations
  - Lognormal assumption should be validated case-by-case
- SC&A views MI positively but believes there are several topics to be explored further
- Led to 10 observations

ORAUT-RPRT-0071 observation 1

Finding date	Finding description	NIOSH response	Finding resolution
9/29/2023	RPRT-0071 does not include estimates of uncertainty. This could help understand downstream uncertainty in co-exposure and probability of causation (POC) models	**1/28/2026.** NIOSH agrees that MI can estimate uncertainty, but RPRT-0071 notes that the co-exposure model does not use parameter variance. The report's purpose was simply to compare MI with LOD/2 substitution, which does not account for uncertainty.	**1/28/2026.** SPR asked SC&A to review the response and provide a follow-up at the next meeting. **6/2/2026.** SC&A prepared a follow-up response addressing all observations, which will be presented as the final slide for RPRT-0071.

ORAUT-RPRT-0071 observation 2

Finding date	Finding description	NIOSH response	Finding resolution
9/29/2023	RPRT-0071 should expand its exploration of mixture models. Mixture models could be combined with MI to develop better inferences.	**1/28/2026.** NIOSH notes that it addressed measurement-error concerns in its response to observation 10. Mixture models are outside the scope of RPRT-0071, but ORAUT-RPRT-0110 discusses mixture distributions.	**1/28/2026.** SPR asked SC&A to review the response and provide a follow-up at the next meeting. **6/2/2026.** SC&A prepared a follow-up response addressing all observations, which will be presented as the final slide for RPRT-0071.

ORAUT-RPRT-0071 observation 3

Finding date	Finding description	NIOSH response	Finding resolution
9/29/2023	Determine the appropriate statistical distribution to use for censored readings in each case individually. Report focuses only on lognormal. Misspecification of underlying model will undermine imputations.	**1/28/2026.** NIOSH concurs. A lognormal distribution is usually appropriate, but the statistician can (and will) consider other distributions if necessary.	**1/28/2026.** SPR asked SC&A to review the response and provide a follow-up at the next meeting. **6/2/2026.** SC&A prepared a follow-up response addressing all observations, which will be presented as the final slide for RPRT-0071.

ORAUT-RPRT-0071 observation 4

Finding date	Finding description	NIOSH response	Finding resolution
9/29/2023	The need to account for relationships between dose and covariates (e.g., occupation) should be considered. May be cases where covariate information is more important than underlying statistical distribution.	**1/28/2026.** The RPRT-0071 dataset includes only dates, worker IDs, and doses, so covariates are generally unavailable. Statisticians may use covariates when such information exists.	**1/28/2026.** SPR asked SC&A to review the response and provide a follow-up at the next meeting. **6/2/2026.** SC&A prepared a follow-up response addressing all observations, which will be presented as the final slide for RPRT-0071.

ORAUT-RPRT-0071 observation 5

Finding date	Finding description	NIOSH response	Finding resolution
9/29/2023	NIOSH does not provide adequate information on how the RPRT-0071 table 1-1, “Table of dosimeter results for a worker,” doses were reconstructed.	**1/28/2026.** The raw data were not provided, but the cycle-specific recalculated values <LOD are not used in the regression on order statistics, so the imputation model is unaffected.	**1/28/2026.** SPR asked SC&A to review the response and provide a follow-up at the next meeting. **6/2/2026.** SC&A prepared a follow-up response addressing all observations, which will be presented as the final slide for RPRT-0071.

ORAUT-RPRT-0071 observation 6

Finding date	Finding description	NIOSH response	Finding resolution
9/29/2023	RPRT-0071 would benefit from a disclaimer in the discussion of linear imputation. SC&A's concern is that the document user may conclude this is a legitimate model.	**1/28/2026.** NIOSH agrees the linear imputation method is inappropriate and was included only as an illustration and transition from LOD/2 substitution. It is no longer used, and a disclaimer may be added in a future revision. Statisticians who perform MI are aware that the linear imputation method is not appropriate.	**1/28/2026.** SPR asked SC&A to review the response and provide a follow-up at the next meeting. **6/2/2026.** SC&A prepared a follow-up response addressing all observations, which will be presented as the final slide for RPRT-0071.

ORAUT-RPRT-0071 observation 7

Finding date	Finding description	NIOSH response	Finding resolution
9/29/2023	RPRT-0071 should address clustering. The dataset includes 3,736 observations from 732 workers—about 5 per worker—so the data are clustered by worker. If intracluster correlation is meaningful, the distribution fitting should be adjusted.	**1/28/2026.** RPRT-0071 focuses on comparing MI with LOD/2 substitution, so clustering and stratification are outside its scope. These issues will be handled separately by statisticians and health physicists on a case-by-case basis.	**1/28/2026.** SPR asked SC&A to review the response and provide a follow-up at the next meeting. **6/2/2026.** SC&A prepared a follow-up response addressing all observations, which will be presented as the final slide for RPRT-0071.

ORAUT-RPRT-0071 observation 8

Finding date	Finding description	NIOSH response	Finding resolution
9/29/2023	RPRT-0071 should provide advice about fitting data that are not lognormal.	**1/28/2026.** RPRT-0071 focuses on comparing MI with LOD/2 substitution, so broader exploratory analyses are outside its scope. If the data are not lognormal, the statistician may select whatever distribution is most appropriate.	**1/28/2026.** SPR asked SC&A to review the response and provide a follow-up at the next meeting. **6/2/2026.** SC&A prepared a follow-up response addressing all observations, which will be presented as the final slide for RPRT-0071.

ORAUT-RPRT-0071 observation 9

Finding date	Finding description	NIOSH response	Finding resolution
9/29/2023	RPRT-0071, Section 3.0, "Imputation Models and Multiple Imputation," should expand its discussion of population subsets.	**1/28/2026.** RPRT-0071 focuses on comparing MI with LOD/2 substitution. NIOSH agrees covariates or stratification can be useful, but this dataset lacked the information needed, and those analyses are beyond the scope of the report.	**1/28/2026.** SPR asked SC&A to review the response and provide a follow-up at the next meeting. **6/2/2026.** SC&A prepared a follow-up response addressing all observations, which will be presented as the final slide for RPRT-0071.

ORAUT-RPRT-0071 observation 10

Finding date	Finding description	NIOSH response	Finding resolution
9/29/2023	RPRT-0071 does not acknowledge positive measurement error.	**1/28/2026.** NIOSH disagrees with observation 10's interpretation. Measurement error occurs in all measurements, so doses below or above the LOD may not reflect true values. However, the nonpositive results in this dataset stem from blank subtraction rather than measurement error, making the observation immaterial.	**1/28/2026.** SPR asked SC&A to review the response and provide a follow-up at the next meeting. **6/2/2026.** SC&A prepared a follow-up response addressing all observations, which will be presented as the final slide for RPRT-0071.

SC&A's follow-up to NIOSH responses on ORAUT-RPRT-0071 observations

Finding date	Finding description	SC&A response	Finding resolution
9/29/2023	Previously stated observations 1–10.	**6/5/2026.** SC&A finds NIOSH's response addresses the technical concerns, provided statisticians applying RPRT-0071 are aware of SC&A's recommendations. SC&A recommends continued monitoring of this observation by the Advisory Board on Radiation and Worker Health during implementation.	**6/5/2026.** Based on SC&A's response, the SPR closed all observations.

Discussion of ORAUT-RPRT-0071

DCAS-PER-093, rev. 0

- Title: “Texas City Chemicals, TBD Rev. 01”
- Issued June 3, 2021
- Program evaluation report (PER) addresses the impact of issuing revision 01 of the TBD for Texas City Chemicals (TCC), DCAS-TKBS-0011, on previously completed cases
- Revision that could potentially increase doses:
  - Method used to calculate ingestion intakes during the residual period resulted in an increase in ingestion doses from October 1, 1955, through 1977

TCC timeline

Energy Employees Occupational Illness Compensation Program Act of 2000 Covered Period:

- Atomic Weapons Employer operational period and Special Exposure Cohort (SEC) period:
  - October 5, 1953, through September 1955
- Residual contamination period:
  - October 1955 through 1977

SC&A's Subtasks 1–3 review of PER-093

- Review issued May 5, 2022
- SC&A's Subtasks 1–3 review identified no findings or observations
- SC&A presented review to the SPR at its September 29, 2022, meeting

Subtask 1: Identify the circumstances that necessitated the need for PER-093

Document issue date	Document
January 18, 2008	SEC-00088 petition evaluation report (ER), rev. 0
July 18, 2008	SC&A's draft review of SEC-00088 ER
October 19, 2010	SEC-00088 ER, rev. 1
November 17, 2010	SEC granted for Petition SEC-00088
November 2, 2017	DCAS-TKBS-0011, rev. 00
May 18, 2018	SC&A's draft review of DCAS-TKBS-0011, rev. 00
April 27, 2020	DCAS-TKBS-0011, rev. 01
September 21, 2020	SC&A's draft review of DCAS-TKBS-0011, rev. 01

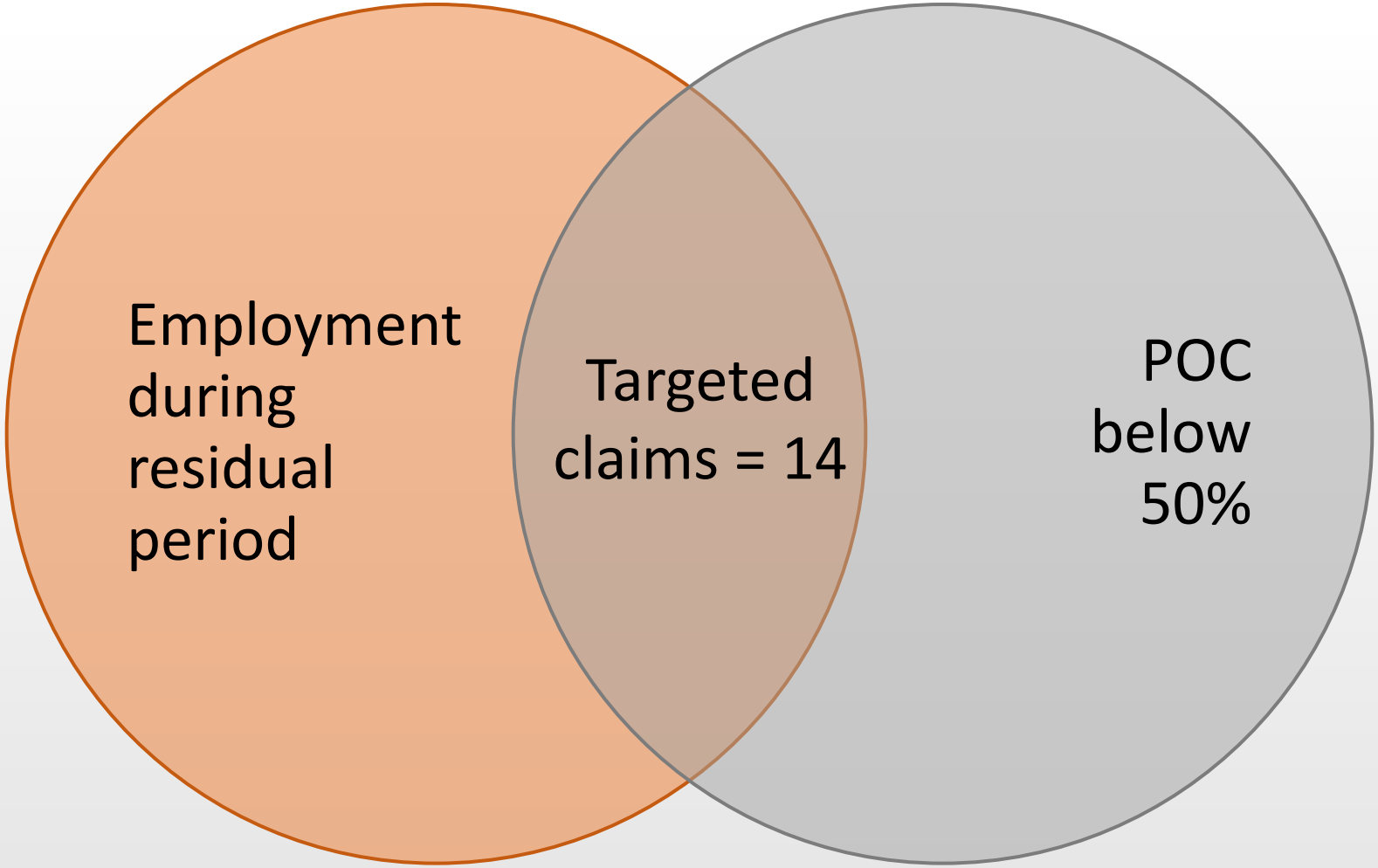
SC&A's review of Subtask 1

- SC&A reviewed each document leading up to changes in revision 01 of the TCC site profile
- SC&A agrees with NIOSH that these changes and their impacts on TCC worker doses mandate the need for DCAS-PER-093
- SC&A had no findings or observations under Subtask 1

SC&A's review of Subtask 2: Assess NIOSH's specific methods for corrective action

- Revision 01 of the TCC TBD updates residual ingestion intake rates by assuming that the initial residual ingestion rate matches the ingestion rate used during uranium recovery operations (October 1, 1955–1977).
- The ingestion rate is then gradually reduced using the depletion factors in ORAUT-OTIB-0070, rev. 01.
- SC&A previously reviewed ORAUT-OTIB-0070, and the Advisory Board on Radiation and Worker Health has extensively evaluated the depletion factors.
- SC&A identified no findings or observations under Subtask 2.

Subtask 3: Evaluate the PER's stated approach for identifying the universe of potentially affected claims



SC&A

NIOSH's evaluation of impacted claims

- 14 claims reevaluated
  - 13 claims had new POC below 45%
  - 1 claim had a POC between 45% and 50%
  - None found to increase POC above 50%
- No claims requested back from the U.S. Department of Labor
- SC&A agrees that all potentially impacted claims were captured by selecting all uncompensated cases with employment during the residual period
- SC&A has no findings or observations under Subtask 3

SC&A's selection criteria for Subtask 4 case reviews

- SC&A recommended a single case from the 14 impacted cases be selected for review
- In September 2022, the SPR agreed with SC&A's recommendation and tasked SC&A to review one case

SC&A's Subtask 4 review

- SC&A submitted its Subtask 4 review on January 30, 2023
- The review identified **four findings and one observation**
- SC&A presented the results to the SPR at the March 14, 2024, meeting

Case details

- Energy employee employed at TCC during a portion of the operational and residual years
- Short TCC employment length
- Energy employee worked throughout the plant
- No monitoring history
- Multiple cancers

Finding 1: Background information

The dates in table 7-11 changed between the issuance of the SEC ER and the issuance of TCC TBD rev. 00 (renumbered table 11).

Document detail	ER rev. 1	TCC TBD rev. 00
Table number in document	7-11	11
Start of residual period doses	**April 1, 1955**	**October 1, 1955**
Operations period photon dose (rem/day)	0.00060	0.00060
Residual period photon dose (roentgen/day)	0.00016	0.00016

Finding 1: Impact of issue

- Longer operations period results in larger dose
- The PER's broad selection criteria caught most cases impacted by this change
- However, if a case was completed before November 2, 2017 (TCC TBD rev. 00 issued) with employment that ended between April 1, 1955, and October 1, 1955, the PER selection criteria would miss this case
  - Unlikely 6 months of external dose would have a significant impact on a case
  - NIOSH should explore and verify this to be true

DCAS-PER-093 finding 1 response and resolution

NIOSH response

3/23/2024. NIOSH agreed and searched the NIOSH Office of Compensation Analysis and Support claims tracking system to identify potentially impacted claims.

Seven claims found:

- Three compensated under SEC
- Three did not have covered employment during appropriate dates in 1955
- One case reworked with POC <25%

Finding resolution

3/23/2024. Based on NIOSH's response, the SPR closed the finding.

Comparison of original and reworked case

Dose categories	Percent change in dose assigned in rework
External	<10%
Medical x-ray	No change
Internal	<10%
Total	<10%
Cancer-specific POC	10–25%
Final POC	~10%

Internal dose

Original

- Used inhalation and ingestion intake values in table 7-7 of the TCC SEC ER, rev. 01
- Chronic annual dose (CAD) tool used to assign doses

Reworked

- Used inhalation and ingestion intake values in tables 7, 8, and 9 of the TCC TBD, rev. 01
- CAD used to assign doses
  - Internal dose increased by <10%

DCAS-PER-093 finding 2

Finding date	Finding description	NIOSH response	Finding resolution
1/30/2023	SC&A found that NIOSH assigned an intake of **34.9 picocuries per day (pCi/day)** of uranium (U)-238, Th-230, U-234, radium (Ra)-226, Pb-210, and Po-210 from April,1 1954, through September 30, 1955. Table 7 of the TCC TBD lists this inhalation intake as **39.4 pCi/day**.	**3/23/2024.** NIOSH agreed and reworked the DR. The reworked internal DR resulted in a POC of 45.47%, as detailed in the NIOSH response memo.	**3/23/2024.** Based on NIOSH's response, the SPR closed the finding.

DCAS-PER-093 finding 3

Finding date	Finding description	NIOSH response	Finding resolution
1/30/2023	NIOSH did not assign an ingestion intake of **0.021 pCi/day Th-232, Ra-228, and Th-228** during the period from April 1, 1954, through September 30, 1955, as specified in table 7 of the TCC TBD. SC&A believes this would underestimate dose by under 0.001 rem.	**3/23/2024.** NIOSH agrees and reworked the DR. The reworked internal DR resulted in a POC of 45.47%, as detailed in the NIOSH response memo.	**3/23/2024.** Based on NIOSH's response, the SPR closed the finding.

DCAS-PER-093 finding 4

Finding date	Finding description	NIOSH response	Finding resolution
1/30/2023	NIOSH did not assign an ingestion intake of **0.307 pCi/day Ra-226** during the period from October 1, 1955, through December 31, 1955, as specified in table 7 of the TCC TBD. SC&A believes this would underestimate dose by under 0.001 rem.	**3/23/2024.** NIOSH agrees and reworked the DR. The reworked internal DR resulted in a POC of 45.47%, as detailed in the NIOSH response memo.	**3/23/2024.** Based on NIOSH's response, the SPR closed the finding.

DCAS-PER-093 observation 1

Finding date	Finding description	NIOSH response	Finding resolution
1/30/2023	SC&A found that Web CAD does not include TCC inhalation and ingestion defaults in its dropdown menu, requiring dose reconstructors to enter all values manually. Prepopulated defaults would help prevent data-entry errors.	**3/23/2024.** NIOSH is aware of this condition and concurs with the assessment that this could lead to errors in the internal DRs. Due to the number of claims processed for the site and availability of resources, NIOSH plans to address this in the future as additional resources become available.	**3/23/2024.** Based on NIOSH's response, the SPR closed the finding.

Discussion of DCAS-PER-093