

**Office of Compensation Analysis and Support**  
**Program Evaluation Plan**

Document Number: OCAS-PEP-012  
Effective Date: 3/29/2007  
Revision No. 0

**Evaluation of Highly Insoluble Plutonium Compounds**

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RECORD OF ISSUE/REVISIONS

ISSUE AUTHORIZATION DATE	EFFECTIVE DATE	REV. NO.	DESCRIPTION
3/29/2007	3/29/2007	0	New document to evaluate the affect of OTIB-0049, Highly Insoluble Plutonium Compounds on previously completed claims.

**1.0 Description**

In the first version of the Rocky Flats Plant (RFP) Internal TBD (Jan 2004), it was noted that highly insoluble forms of plutonium were generated during the Rocky Flats fires. In response to the need to assess claims with potential exposure to this material, ORAUT-OTIB-0049 was developed. ORAUT-OTIB-0049 delineates the methods for assessing potential exposure to highly insoluble forms of plutonium, not only from the RFP fires, but at other sites in the complex that may have worked with this material.

**2.0 Issue Evaluation**

The issuance of ORAUT-OTIB-0049 on February 6, 2007 provided guidance for assessing claims with potential exposure to highly insoluble forms of plutonium.

ORAUT-OTIB-0049 does not propose a new type of material for general modeling purposes or propose a new variation of the lung model. Rather, to account for the difference in organ doses, the TIB analysis developed empirical “dose adjustment factors” from selected cases from RFP and Hanford that exhibited Type Super S behavior following intakes of <sup>239</sup>Pu mixtures. For intakes calculated from urinary excretion data, a bounding analysis is implemented as an intake adjustment factor rather than a defined change in ICRP model parameters.

Due to the increased doses assigned to workers exposed to Type Super S plutonium, previously completed claims that were assigned plutonium doses at sites where this material is potentially available for exposure need to be reexamined to determine the impact (if any) on the dose assessment.

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### **3.0 Plan for Resolution or Corrective Action**

Parameters for inclusion:

1. Probability of Causation (PC) less than 50%
2. Assessment of plutonium in most recent Dose Reconstruction version.
3. Most recent version approved by OCAS on or prior to February 6, 2007 and presently not in process
4. Potential for highly insoluble form of plutonium possible at site.

Steps for determining included claims (database search portion):

1. Select only those claims with PC less than 50%
2. Assessment of plutonium in the most recent version of the dose reconstruction that may have applicability to OTIB-0049. The completed claims were electronically searched for the 5 following situations
  - a. Lung claims (not just lung cancers, but all claims where lung is organ of interest) and thoracic lymph nodes [LN(Th)] claims where OTIB-0018 was used as an overestimate. Only the lung and LN(Th) claims need to be examined since OTIB-0018 is based on air concentrations and only these organs must be adjusted per OTIB-0049.
  - b. Any claim that has an IMBA file for Pu-239. This will be accomplished by searching for IMBA files with “pu” in the title and removing those claims that only have IMBA runs for isotopes other than Pu-239.
  - c. Any claim where Chronic Annual Dose Workbook CADW was used with Pu-239 as an isotope of interest. This will include any claim where the environmental portion of the CADW tool includes Pu-239 in the dose assignment or plutonium was only assessed as part of a recycled uranium matrix. Although the environmental assignment of Pu-239 will only apply to lung and LN(Th) claims for OTIB-0049 dose adjustments for the same reason as OTIB-0018 (environmental intakes are based on resuspension and air monitoring), all CADW claims will be examined for this issue in a later step (the electronic search did not lend itself to this level of discrimination).
  - d. Any claim where a stand-alone internal environmental tool was used for lung and LN(Th) (to cover the timeframe before CADW was used). Only lung and LN(Th) are required for the same reason as for OTIB-0018.
  - e. Any claim with the text “plut” or “pu-” in the DR Report. This is a final “catch-all” to ensure any claims that may not have had all the supporting files moved to the AR folder are also captured. These claims will be compared to the claims from all previous criteria and any duplicates removed.
3. Select only claims approved by OCAS on or prior to February 6, 2007 and are not presently in process (due to reasons such as DOL-returned based on new cancer

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- diagnoses). The following Dose Reconstruction Tracking System (DRTS) statuses are removed:
- a. DR in Progress
  - b. DR Complete
  - c. PR in Progress
  - d. Peer Review Complete (Ready for OCAS)
  - e. OCAS Review in Progress
  - f. Returned from DOL – Comments Pending
  - g. Returned from DOL – Comments Received
4. Remove those claims where employment was only at sites where Type Super S plutonium material was not feasible. For example, OTIB-0049 will not apply to the gaseous diffusion sites since the only plutonium on-site was a minor constituent by mass in another matrix, such as in recycled uranium – see Attachment A for a list of sites where Type Super S has been determined to be considered and sites where it has been determined to be not applicable. The attachment is not meant to be a comprehensive list of sites where Type Super S should be considered or excluded, but rather a list with enough sites to categorize all the claims that have met the criteria defined above.

These criteria were used to generate the list of potentially affected claims (total = 3,451 claims).

The affects of OTIB-0049 can be quantified to the point of allowing an additional selection criteria based on the original Probability of Causation of the claim. The additional selection criteria are:

- a.  $PC \geq 20\%$  for claims with organs other than lung or LN(Th) based upon the correction factor of 4 derived in Att. C of ORAUT-OTIB-0049 and the discussion below on PC.

The PC selection criteria values are based on the fact that the dose estimate is used to determine the Excess Relative Risk (ERR). The Probability of Causation (PC) is determined directly from the ERR. The relationship is:

$$PC = [ERR/(1+ERR)]*100\%$$

From this equation it can be seen that an ERR of 1 is required to yield a PC of 50%. For a given scenario of time since exposure, age at diagnosis, type of cancer, type of radiation, etc., the ERR varies essentially linearly with dose. Therefore, it is possible to assess the change in PC on a particular case if the change in dose is known and it is the same for all sources of dose. This, of course, is not the case for the potential changes in dose due to the application of OTIB-0049 since only internal dose due to plutonium changed. Therefore, in the evaluation, the changes will be assessed as if all the doses

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increased by a factor of four. This will overestimate the magnitude of the change and produce a larger than necessary group of claims to evaluate further.

Based on the equation above, adjusting the ERR by a factor of 4, an original PC of 20% would now result in a PC of 50%. Thus, a lower selection criterion of 20% has been selected for claims without lung or LN(Th) as a target organ.

These criteria were used to reduce the list of potentially affected claims to 2,725.

The potentially affected claims can be further reduced with the following manual selection criteria:

1. Document those claims where CADW was used only for environmental intakes of plutonium for all organs other than the lung and LN(Th) or as part of a recycled uranium matrix. As discussed in steps 1c and 1d in the database search section, only the lung and LN(Th) claims for environmental intakes will need to be examined for potential dose impact of Type Super S Pu material.
2. Document those claims where none of the appropriate criteria are met, but the computer search could not be defined more narrowly without potentially screening out appropriate claims. This would include claims where the text “plut” or “pu-“ was in the DR Report, but no other Super S criteria are met, etc.

Evaluation of the remaining claims will start with those having the highest original POC. As these claims are completed, it is possible that a point will be reached in which it is clear no additional claims will reach a POC of 50%. If this occurs, that point will be documented in the Program Evaluation Report and the remaining claims will not be evaluated. It is likely that this will require different points for the different target organs and possibly other factors.

After the potential affected claims have been evaluated, a Program Evaluation Report (PER) will be written to summarize the results. As part of the report, claims that were not evaluated further due to the POC cut point will be reviewed to determine if they are also affected by another PER. The PER will contain additional analysis for these cases including additional evaluations if necessary.

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#### **4.0 References**

1. ORAUT (Oak Ridge Associated Universities Team), ORAUT-TKBS-0011-5, *Technical Basis Document for the Rocky Flats Plant – Occupational Internal Dose, Rev 00*, January 12, 2004.
2. ORAUT (Oak Ridge Associated Universities Team), ORAUT-OTIB-0049, *Estimating Doses for Plutonium Strongly Retained in the Lung, Rev 00*, February 6, 2007.
3. ORAUT (Oak Ridge Associated Universities Team), ORAUT-OTIB-0018, *Technical Information Bulletin: Internal Dose Overestimates for Facilities with Air Sampling Programs, Rev 01*, August 9, 2005.

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### Attachment A

Sites where Type Super S is to be considered or excluded for this PEP

**Consider Super S**

Albuquerque Operations Office  
Amchitka  
ANL-East  
ANL-West  
Area IV Santa Susana  
Battelle (King and/or W. Jefferson)  
Brookhaven  
Clarksville  
Conn. Aircraft Nuclear Eng. Lab  
General Atomics  
GE-Evendale (Ohio)  
GE-Vallecitos  
Hanford (PNNL)  
INEEL  
LANL  
LBNL  
LLNL  
Mound  
Nevada Site Office  
NTS  
NUMEC  
Pantex  
Peek Street  
Rocky Flats  
Salmon Nuclear  
SLAC  
Sandia National Lab (SNL)  
SNL-Livermore  
SPRU (Knolls)  
Savannah River Site  
Tonopah Test Site  
West Valley  
Westinghouse Nuclear Fuels Division  
W.R. Grace  
X-10 (ORNL)

**Exclude from Super S**

Allied Chemical (based on SEC)  
Armour Research Foundation  
Baker-Perkins  
Bethlehem Steel  
Bliss & Laughlin Steel  
BONUS Reactor  
Bridgeport Brass  
BWXT, Inc.  
Canoga Ave Facility  
Clinton Eng. Works  
Combustion Engineering  
De Soto  
Downey Facility  
Extrusion Plant (RMI)  
Fernald (FMPC)  
Harshaw  
Heppenstall Company  
Iowa Ordinance Plant  
Jessop Steel  
K-25  
Kansas City Plant  
Landis Machine Tool Company  
Mallinckrodt  
Medina  
Oak Ridge Hospital  
ORISE  
Paducah  
Pinellas  
Portsmouth  
Reed Rolled Thread Company  
S-50  
SAM Laboratories, Columbia University  
Seymour Specialty Wire  
Simonds Saw and Steel  
Superior Steel  
Torrington Company  
U.S. Steel Corporation  
Vitro Manufacturing  
Weldon Spring  
Westinghouse Atomic Power Devel. Plant  
Y-12