

# **Los Alamos SEC Petition Review**

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**LANL Work Group**

**Advisory Board on Radiation and Worker Health**

**Santa Fe, NM**

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## Work Group Review: Overview

- **May 29, 2008: SEC petition 00109 qualified**  
*Service support workers who worked in any operational Technical Areas with a history of radioactive material use at the Los Alamos National Laboratory from January 1, 1976 through December 31, 2005.*
- **January 22, 2009: NIOSH evaluation report (ER) issued**  
*NIOSH found no part of the class under evaluation for which it cannot estimate radiation doses with sufficient accuracy.*
- **April 2010: SC&A review of evaluation report**
- **Work Group meetings (4): Apr and Nov 2010, May 2011, May 2012**
- **Various onsite visits, worker interviews, data capture**

## Other Los Alamos SEC petition evaluations

- **SEC-00061 (Aug 2006):** *All employees...associated with radioactive lanthanum (RaLa) operations...from September 1, 1944, through July 18, 1963...* SEC class designated 11/9/06.
- **SEC-00051 (Feb 2007):** *All employees...working in operational Technical Areas with a history of radioactive material...from March 15, 1943 through December 31, 1975...* SEC class designated 6/22/07.
- **SEC-00170 (Apr 2010):** *All employees...who worked...from March 15, 1943 through December 31, 1975.* SEC class designated 7/13/10.
- **SEC-00109 :** All service workers ..who worked in any operational Technical Area with radioactive materials ..from January 1, 1976 to December 31, 2005. Open / Active Petition.

## Work Group SEC Issues

1. Capability to monitor and measure Mixed Activation and Mixed Fission Products by 1976 – **Open**
2. DR approach for exotic radionuclides -- **Open**
3. Completeness and reliability of *in vitro* and *in vivo* data, and adequacy of NIOSH coworker model – **Open**
4. DR approach for neutron exposures – **Closed**
5. DR approach for workers beside LAMPF/LANSCE retention pond/beam stop – **Open (pending DR demonstration)**
6. DR approach for Special Tritium Compounds -- **Open**
7. Issues related to unmonitored exposure of support service personnel – **Open (pending clarification)**
8. Petitioner issues (firing sites, Cerro Grande fire, etc.) -- **Open**

## Petitioner SEC issues

- Exotic radionuclide exposures at firing sites
- Badge access to radiological areas – **Closed**
- Occupational Health Reports reliance on worker “self-reporting”
- Issues related to occupational environmental model cited
- Doses received by support personnel responding to Cerro Grande fire
- Similarity between LANL and NTS operations re: “campaign-based” activities

# SEC Issue 1: Capability to monitor and measure Mixed Activation (MAPs) and Mixed Fission Products (MFPs) by 1976

## Description of Issue:

- Inability to dose reconstruct MAPs and MFPs figured prominently in SEC decision for 1943-1975.
- NIOSH concludes that by 1976, *in vivo* counting methods well-established and data is available for bounding intakes of MAPs and MFPs.
  - Proposed to use Cs-137 to estimate uptakes of MAPs and MFPs
  - NIOSH modifies approach based on SC&A's findings
- NIOSH proposes Be-7 for MAPs
  - Using intake ratios based on air emission measurements
  - SC&A agrees with method, but questions availability of source data, as well as the use of air emissions data (how representative of actual workplace MAP ratios?).
  - NIOSH recently performed onsite data capture for applicable documentation and data.

## MAPs: Work Group review/actions

- WG found need for NIOSH to better define its model for using Be-7 *in vivo* data for MAP exposures.
- NIOSH actions: Proposed DR model needs to address the following:
  - Availability and sufficiency of Be-7 bioassay data, post-1975
  - Rationale for ratios from air emissions data and why ratios would be bounding for all MAP nuclides and forms, over time.
  - Type of emissions monitoring (continuous or integrated)
  - Criteria for inclusion in *in vivo* program and whether it changed over time
  - Remaining questions regarding “hold up” of MAP air emissions
  - Availability of other workplace data to support model

## Mixed Fission Products (MFPs): Work Group review/actions

### Issue Status, MFPs:

- SC&A concerned about NIOSH proposed use of Cs-137 based reactor ratios (from OTIB) for non-reactor nuclear facilities.
- NIOSH agrees and sought additional onsite data to support use of Cs-137 ratios at CMR, but was unable to locate useable data.
- NIOSH observes, however, that it has located considerable operational documentation that supports its premise that LANL exercised a “robust” health physics program during the period in question and that “appropriate” bioassay methods were available during that time.
- SC&A finds this response inadequate because its basis is largely program reliability.

## MFPs: Work Group review/actions

- WG found need for NIOSH to define and support its model for using Cs-137 *in vivo* data (within OTIB-062 coworker model) for MFP exposures.
- NIOSH actions: Provide consideration of following issues:
  - Demonstrate that intakes derived from Cs-137 are bounding of all MFPs
  - Criteria for inclusion in *in vivo* monitoring program and whether it changed over time
  - Demonstrate that different types of exposure scenarios for MFP exposure in CMR, TA-48, and TA-50, can be bounded using this approach.

## SEC Issue 2: DR approach for exotic radionuclides

### Description of Issue:

- NIOSH's ER indicates that "exotic" radionuclides (e.g., Np, Cm, Ac) were handled, controlled, and monitored in a manner equivalent to that of the primary actinides, e.g., plutonium, uranium, and americium.
- NIOSH concludes that site-wide bioassay data for these primaries can be used to estimate intakes for missing exotics in coworker approach.

SC&A questions whether:

- Ratios of exotic to primaries are known, constant, operationally equivalent
- Ratios representative given exotic "campaigns" vs. routine usage of primaries
- Data adequate to determine time, duration, conditions of exposure

## Exotics: Work Group review/actions

- At its May 14, 2012, meeting, WG found that NIOSH should provide additional supporting information for its proposed model.
- NIOSH actions:
  - NIOSH should document approach for using uranium and plutonium data to bound all exotic radionuclides (for bio-assayed and unmonitored workers)
  - Review LANL technical basis document for internal dosimetry
  - Review reports on topic identified by petitioner
  - Ensure that approach addresses all “exotics”

## **SEC Issue 3: Completeness and reliability of *in vitro* and *in vivo* data, and adequacy of NIOSH coworker model**

### **Description of Issue:**

- NIOSH developed OTIB-0062 applying coworker data for Pu-239, Pu-238, uranium, tritium, and Cs-137, in some cases substituting for unavailable dose data for MAPs, MFPs, and exotic radionuclides.
- SC&A has remaining concerns with MFP, MAP and exotic coworker models

## Coworker model: Work Group review/actions

### Issue Status:

- NIOSH received updated *in vivo* database with additional results, but not significant increase in total Cs-137 data;
- NIOSH assumes that where no Cs-137 data reported, exposure was below MDA.
- NIOSH indicates that considerable operational documentation suggests “robustness” of LANL health physics monitoring program to ensure workers who should have been monitored, were monitored, for time period in question.
- SC&A finds this response inadequate because it is largely based on program reliability.
- Remaining actions on coworker models for MAPs, MFPs, and exotics are dependent on NIOSH responses on SEC issues 1 and 2.

## SEC Issue 4: DR approach for neutron exposures

### Description of Issue:

- NIOSH proposes the use of neutron-to-photon dose ratios to bound neutron dose prior to 1980 (after 1980, recorded neutron doses are considered to be sufficiently accurate, relying on a combination of TLD and NTA film data).
- NIOSH indicates that area-specific neutron correction factors (NCFs) used at LANL can be employed in DR to bound neutron doses for workers in specific facilities.
- SC&A questions whether the proposed n/p values listed in the TBD would bound neutron doses for 1976-1979, questioning the 1) representativeness of n/p values; 2) accuracy of measured neutron doses; and 3) reliability of NTA film data given fading phenomenon.

### Issue Status:

NIOSH validated that operational changes were not significant for 1976-1979, compared with 1980-1982, permitting NIOSH to back-extrapolate neutron data. Further analysis of historic neutron measurements and data capture at LAMPF shows proposed n/p values are bounding. ***WG closed issue on May 14, 2012.***

# SEC Issue 5: DR approach for workers adjacent to LAMPF/LANSCE retention pond/beam stop

## Description of Issue:

- Former maintenance workers at LAMPF/LANSCE claim their work location adjacent to Target Area-A beam stop and near retention pond exposed them to both external and internal radiation.
- Issue not addressed in ER.
- Worker badging found adequate for limited external radiation outside of beam stop. However, presence of tritium in retention pond may have led to an inhalation dose due to immersion in airborne vapor.

## Issue Status:

NIOSH obtained concentration data for retention pond for time period in question.

## WG action:

NIOSH to estimate bounding tritium dose from pond to nearby workers.

## **SEC Issue 6: DR approach for Special Tritium Compounds**

### **Description of Issue:**

NIOSH acknowledges in ER that LANL handled STCs and organically bound tritium compounds and that DR can be accomplished applying OTIB-066. SC&A questions whether insoluble STCs have been adequately characterized and that DR can be accomplished using available site-specific data.

### **Issue Status:**

NIOSH reviewed two classified examples of STC activities and found no basis for altering its conclusion regarding dose reconstructability. SC&A reiterated need to conduct source-term characterization and ascertain exposure potential.

### **WG Action:**

NIOSH will follow-up on characterizing source terms, the potential for exposure, and who would be assigned dose applying OTIB-066.

# **SEC Issue 7: Issues related to unmonitored exposure of support service personnel**

## **Description of Issue:**

Based on SC&A interviews, it is apparent that routine bio-assaying of security guards, firefighters, and other support service workers, was limited and in some cases, discontinued during the 1990s. Given the broad, site-wide access for these workers, and the uncertainty regarding their exposure potentials, it is not clear how NIOSH will dose reconstruct with sufficient accuracy.

## **Issue Status:**

NIOSH's ER provision applies the coworker dose distribution based on OTIB-062, as well as substitute actinides for "exotics," for all support workers who were not bio-assayed. Resolution of this issue links to Issues 1-3.

## **WG Action:**

NIOSH to explain drop-off in bioassay data over time and whether justified from radiological standpoint.

## SEC Issue 8: Petitioner Issues

### **Description of Issue:**

Petitioners have identified what they consider SEC issues or questions as part of petition or during WG meetings. These include discrepancies or inconsistencies in the ER, exotic radionuclide exposures at the firing sites, badge access to radiological areas, application of NIOSH's occupational environmental model, and radiological exposure to firefighters from the Cerro Grande fire.

### **Issue Status:**

NIOSH committed to address all petitioner issues; including:

- NIOSH will address exotics at the firing sites based on ER approach; however, WG concerned whether coworker model will bound potential exposures.
- NIOSH will not use badge access to determine dose.
- NIOSH has reviewed re-suspension issue for Cerro Grande, and has issued white paper; however, WG concerned about power loss and filter clogging issues affecting reported sampling results.
- NIOSH believes that even though LANL has often had "campaign-based" work like NTS, significant differences exist between the two sites; LANL had more robust HP program during time period.

## Petitioner Issues: Work Group review/actions

**Work Group concluded more follow-up needed for following petitioner issues:**

- **Firing site:** NIOSH will demonstrate that coworker model will bound potential exposures from re-suspension in firing site and other “release points.”
- **Cerro Grande fire:** SC&A will review NIOSH white paper.
- NIOSH will check petitioner report to assure a response has been provided to all other issues.