

# **Mound SEC Petition Review**

**Josie Beach, Chair**

**Paul Ziemer, Brad Clawson, Phil Schofield**

**Mound Work Group**

**Advisory Board on Radiation and Worker Health**

**Santa Fe, NM**

**June 18-21, 2012**

## Work Group Review: Overview

- **October 3, 2007: SEC petition 00090 qualified**  
*All employees...who worked in all areas within the boundaries at the Mound Plant from February 1949 – present.*
- **December 20, 2007: NIOSH evaluation report (ER) issued**  
*NIOSH cannot estimate internal Ra-Ac-Th exposures from the arrival of K-65 sludge in October 1949 through February 28, 1959...*
- **July 30, 2010: SEC class added for radon exposures**  
*All employees...who had at least one tritium bioassay sample and worked at the Mound Plant...from March 1, 1959 through March 5, 1980...*
- **Work Group meetings (10):** Apr, July, Oct 2008; May 2009; Jan, May, July 2010; Nov 2011; and Apr, June 2012.
- **Various onsite visits, technical sessions, worker interviews, data capture**

# Work Group SEC Issues

## DR approach for:

- Data adequacy of, internal exposure sources for which an exposure potential – **Closed** (issues #1-4, 7-8, 11-13)
- Pu-240, 241, 242 – **Closed** (issue #5)
- Indoor radon in R and SW – **Closed** (issue #2; *SEC class added*)
- Tritium and stable metal tritides – **Open** (issue #6)
- High-fired Pu-238 – **Closed** (issue #9)
- D&D era bioassay – **Closed** (issue #10)
- Neutron doses – **Closed** (issues #14/15)
- Beta/low energy photon exposures – **Closed** (Issue 16)

## Work Group SEC Issues (cont'd)

- Monitored workers were most highly exposed – **Closed** (Issue 17)
- Adequacy and completeness of external dose data – **Closed** (Issues 18/19)
- Ambient environmental internal dose contribution – **Closed** (Issue 20)
- Concerns regarding 1991 Ac-227 urine samples – **Closed** (Issue 21)

# Data adequacy and completeness for internal exposure sources

## **Description of Issue:**

NIOSH concludes that where radionuclide-specific bioassay is lacking, either available gross alpha data can be applied, an alternate DR approach can be used, or an exposure potential requiring routine monitoring is not evident. WG questioned: 1) Can lack of bioassay data be rationalized on basis that either radionuclide form or handling precluded exposure? 2) Is use of gross alpha monitoring suitable surrogate for radionuclide-specific bioassay?

## **Issue Status:**

NIOSH and SC&A turned to the King and Meyer reports for historic background on exposure potential and available bioassay techniques. SC&A provided analysis of data adequacy and completeness, which highlighted gaps in bioassay data for identified Mound source terms over extended periods. WG found impasse over being able to prove routine exposures took place and accepted NIOSH's position in the ER regarding dose reconstructability.

## **WG action:**

WG closed overall issue (although a front-end time period "extension" of existing SEC remains to address polonium in 1949, as do various "site profile" issues).

## DR approach for Pu-240, 241, 242

### **Description of Issue:**

Whether available Pu-239 monitoring data can substitute for Pu-240 and Pu-241 data that is lacking.

### **Issue Status:**

SC&A questioned whether availability of data and whether DR approach would be bounding given operational history. NIOSH demonstrated that Pu-239 based ratios could be used to estimate intakes for other isotopes.

### **WG action:**

Closed issue.

# DR approach for Indoor radon in Building R and SW

## Description of Issue:

ER concluded that available radon air concentration data for 1979-2000 could be used to derive indoor radon levels. WG questioned whether elevated radon levels were limited to SW and whether very limited measurements prior to 1980 provided valid basis for DR. A confounding issue was Rn-222 not sole exposure source; Rn-220 and Rn-219 also present.

## Issue Status:

- NIOSH found it could not dose reconstruct the various Rn isotopes with sufficient accuracy. Recommended SEC status under CFR 83.14; approved July 30, 2010.
- Missing tritium logbooks for 1972, 1975-1976; may lead to 83.14 SEC consideration by NIOSH.

# DR approach for tritium and stable metal tritides

## Description of Issue:

- NIOSH ER assumes tritium uptakes from tritiated water and does not include exposures to other tritium compounds. NIOSH response is to revise TBD to include conditions for applying OTIB-066 for STCs. NIOSH position is that hafnium tritide is the insoluble STC of concern; that historic exposure was limited to a “very small, discrete group of workers known to NIOSH...by name,” and that OTIB-066 provides a bounding dose estimation model.
- However, WG concluded that support workers had potential STC exposure, as well. NIOSH developed contamination swipe-based dose model in response; concluded that STCs “did not present any internal dose to [support] workers, theoretically and physically.”
- WG questioned NIOSH’s proposed model because it applies to exposure potential vs. dose reconstruction; also raised uncertainties, data gaps.
- NIOSH agrees STCs need to be dose reconstructed, will address data gaps and uncertainties, identify applicable worker categories.

## Stable metal tritides (cont'd)

### **Issue Status:**

NIOSH action to revisit proposed model.

### **WG action:**

Will review modified NIOSH dose reconstruction model at next WG meeting.

## DR approach for high-fired Pu-238

### **Description of Issue:**

ER report does not address relative insolubility of high-fired Pu-238 at Mound.

### **Issue Status:**

NIOSH agrees that exposures to “special solubility types” of Pu-238 did occur; proposes “Type L” excretion model to bound doses. WG found that this model may not be truly bounding for all solubility types, proposes a “Type J” model, which NIOSH agrees to make available to dose reconstructors.

### **WG action:**

Closed. Becomes site profile issue.

## **DR approach for D&D era bioassay**

### **Description of Issue:**

ER indicates that NIOSH would continue to investigate whether mismatch existed between bioassay requirements and exposure potential constitutes SEC issue.

### **Issue Status:**

SC&A found evidence that bioassays may not have been performed adequately and dose distribution for D&D workers may not be bounded by coworker model proposed. NIOSH provided data and documentation to show that termination bioassays for D&D workers at Mound was relatively high and data is sufficiently accurate for DR purposes.

### **WG action:**

Closed.

# DR approach for neutron doses

## **Description of Issue:**

ER indicates neutron energy reported at Mound (4.5 MeV) readily monitored by NTA film; wide availability of photon measurements makes use of n/p ratios possible to provide bounding dose estimates. NIOSH concludes NTA film sensitivity to low energy neutrons and track fading not SEC issues. SC&A questions extent to which NTA film energy dependence and fading issues undercut dose reconstruction with sufficient accuracy.

## **Issue Status:**

- NIOSH proposes correction factors to compensate and later proposes application of generalized “MCNP” model to determine doses below NTA energy threshold (0.5 MeV)
- WG concerned over lack of site specific data for MCNP model and whether conversion factors (CFs) accurate for Mound.
- Based on additional NIOSH analysis, WG agreed with MCNP-based CFs and was ultimately satisfied with NIOSH’s proposed resolution of NTA track fading issues.

## **WG action:**

Closed, with remaining site profile issues.

# DR approach for beta/low energy photon exposures

## **Description of Issue:**

ER assumes design of T-Building processing areas “controlled” beta dose rates to significant extent; site therefore did not record beta dose. NIOSH notes that most Pu-238 processing took place after non-penetrating doses monitored; therefore, doses available for “most exposed workers.” SC&A found that it has not been technically demonstrated that sufficiently accurate dosimetric methods in place to measure and record workers’ shallow doses, or to create coworker database in 1949-1978.

## **Issue Status:**

Following exchanges of analyses between NIOSH and SC&A, NIOSH recommends assigning shallow dose as function of ratio of photon doses for certain workers for certain periods.

## **WG action:**

Closed, with remaining site profile issues.

## Other SEC Issues

- **Monitored workers were most highly exposed – Closed**  
While formal policies lacking, no evidence that badging or bioassay policies were not enforced effectively.
- **Adequacy and completeness of external dose data – Closed**  
While no verification had been conducted, SC&A's sampling analysis did not find any SEC-level problems.
- **Ambient environmental internal dose contribution – Closed**  
Responding to WG concerns regarding site-wide ambient contamination, NIOSH offered to revise statement in TBD.
- **Concerns regarding 1991 Ac-227 urine samples – Closed**  
NIOSH investigated reconstruction significance of bioassay program failure leading to Price-Anderson Act violation; WG ultimately agreed with NIOSH resolution of DR issues.

## **Mound Work Group – Next Steps**

- Review completed NIOSH tritide DR model at next WG meeting
- Review “baseline” site profile matrix; begin review