Rocky Flats Plant
Special Exposure Cohort (SEC)
Petition 00192 Follow-up Status

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Background

- SEC-00192 Evaluation Report (ER) was issued on September 5, 2012
- The ER was presented by NIOSH on September 18, 2012, at the Advisory Board meeting in Denver, CO
  - The recommendation was for no class to be added
- The Board made a determination at the meeting that additional review was required, including classified interviews and classified document review

Follow-up Efforts

- Additional Data Captures (classified and unclassified) – Los Alamos National Laboratory, Office of Scientific and Technical Information, Environmental Management Consolidated Business Center, and DOE-Legacy Management
- Secure Discussions
- Secure Interviews and other interviews (19)
- Additional dose reconstruction modeling

Post Evaluation Issues/White Papers

- Follow-up Efforts on SEC-00192 Rocky Flats Plant (RFP) Tritium Issues
- Evaluation of Petitioner Concerns about Data Falsification and/or Data Invalidation in RFP Building 123 Based on Worker Allegations
- U-233/Thorium Strikes – evaluation included in revised ER
- Neptunium – evaluation included in revised ER
- Other Thorium Activities – evaluation included in ER

White Paper - Tritium

- **Follow-up Efforts on SEC-00192 RFP Tritium Issues**
  - **Issued the report on 6-25-13**
    - **White paper concluded tritium dose reconstruction feasible**
  - **Provided to the work group on 6-26-13 and the petitioners on 7-3-13 (Authorized Derivative Classifier Review-ADC)**
  - **Presented to the work group and petitioners on 7-8-13 during the RFP work group meeting**
    - **Preliminary follow-up questions identified by the work group and Sanford Cohen and Associates (SC&A)**

White Paper – Data Falsification/ Data Invalidation

- White Paper: *Evaluation of Petitioner Concerns about Data Falsification an/or Data Invalidation in RFP Building 123 Based on Worker Allegations*
  - Issued the report on 6-25-13
  - Provided to the work group on 6-26-13 and the petitioners on 7-3-13 (ADC Review)
  - Presented to the work group and petitioners on 7-8-13 during the RFP work group meeting
    - Preliminary follow-up questions identified by the work group and SC&A

U-233/Thorium Strikes

- U-233/Thorium strikes was originally vetted under the SEC - 0030 evaluation
  - Re-opened under SEC-0192 after indications this may have occurred more than the two times (1965 and 1967) previously identified
- U-233 was being evaluated for its use in the weapons program
- Problems with U-233 was a contaminant U-232
  - U-232 progeny pose a significant external hazard
- A chemical process called a “Thorium strike” was used to remove the Th-228 and its progeny

U-233/Thorium Strikes—cont.

- During the deliberation of SEC-0030 the bounding Thorium dose was based on air sampling taken during the strike in 1965
- This strike was considered bounding because it had the highest concentration of U-232 of the two strikes
- No credit was taken for ventilation, hoods or time limits

U-233/Thorium Strikes—cont.

- Interviews and documents indicated additional strikes occurred other than the two previously evaluated
  - Were the potential exposures from other strikes bounded by the 1965 exposure analysis?
- Other questions came up based on recent addition of a class at Hanford based on inability to reconstruct doses to U-233, Neptunium, Thorium and Highly Enriched Uranium
  - Were the activities similar?
  - Were the material quantities similar?
  - How much monitoring data do we have in comparison?

U-233/Thorium Strikes—cont.

Reasons for believing 1965 Strike is still bounding for Thorium

- Most documents indicate the U-233 was to be processed or shipped off site prior to the 90 day period to prevent the hazard from the ingrowth and therefore a strike would not be required
- Documents indicate the concentration of U-232 did not exceed 8 ppm after 1965
- Although NIOSH determined the 1965 exposure was still bounding, it's not clear how this would be applied if additional strikes are assumed

U-233/Thorium Strikes—cont.

Determining U-233 exposures

- The quantity of U-233 on site at RFP varied from 1964 to the end of U-233 operations in 1983
- Estimates from available documents indicate quantities could have been from 1 kg up to 150 kg from 1965 through 1983
  - Highest quantities from 1965 through 1968
- Bioassay data for uranium exists and a uranium co-worker model exists for the period of concern

U-233/Thorium Strikes—cont.

Determining U-233 exposures

- Initial idea was to give a corrected uranium dose to all workers with uranium bioassay
  - Assumption based on all workers who worked on U-233 activities would have uranium bioassay
- A review was conducted to determine if any of the Operators (46) listed in logbook for U-233 operations were existing claimants in NOCTS
  - There were 18 of the 46 who are claimants
  - Of the 18 claimants, 17 had uranium bioassay. There was no clear reason why this claimant did not have bioassay.

U-233/Thorium Strikes—cont.

Determining U-233 exposures

- Indication not all workers working on U-233 operations had uranium bioassay
- Therefore, NIOSH would have to assume all workers could have been exposed and a correction factor for exposures to U-233/U-232 and progeny applied
  - Factor could vary significantly depending on mass based analysis or activity based
- DCAS management did not feel this was sufficiently accurate and the quantities, activities, and available monitoring were similar to a similar period at Hanford where DCAS determined dose reconstruction was not feasible

Neptunium

- General conclusion under SEC-0030 was Neptunium was used in small quantities for research type work and had limited exposure potential compared to Uranium and Thorium

- A determination was made to re-explore this exposure situation based on interviews and recent determination associated with Neptunium, U-233, and Thorium at Hanford

Neptunium

- Records indicate that Neptunium was processed at Rocky Flats as early as 1962 and inventories existed until 1988
- Neptunium was processed to produce pure Neptunium oxide, metal, and metal alloys
- Processes employed included dissolution, anion exchange, precipitation, filtration, calcination, conversion to fluoride, and reduction to metal

Neptunium—cont.

- Fabrication steps such as casting and rolling were performed to produce metal shapes and foils
- Neptunium was also recovered from residual materials including sand, slag, crucibles, casting skulls, and alloys
  - The residues were not only from Rocky Flats operations, but residues were sent from other sites
- Based on documents and inventories it appears most work with Neptunium was completed by the end of 1983

Neptunium—cont.

- Annual on site inventories were typically maintained around 1 kg
  - Does not address throughput
- Batches involving Neptunium typically did not exceed 300 grams
- Buildings having Neptunium inventories included 371, 559, 707, 771, 776, 777, 779, 779A, and 991

Neptunium—cont.

Neptunium Exposure

- Documents indicate some early work was conducted in open hoods, but most work was performed in glove boxes
- Based on NIOSH's review, Neptunium exposure potential existed at every processing step, including extraction and purification, hydrofluorination, reduction to metal, alloying, casting, and rolling

Neptunium—cont.

Personal Monitoring Data

- There are only two bioassay samples for Neptunium
- They were both taken in 1966
  - One "Below Significant Level" and the other 0.9 dpm/24hr
- Gross Alpha bioassay samples existed up until 1970s

Workplace Monitoring Data

- NIOSH has found no workplace monitoring records (e.g., air sample, surface contamination samples) specific to Neptunium

Neptunium—cont.

Feasibility Determination

- Can we use gross alpha samples as indicator for Neptunium?
  - NIOSH interviewed two former Rocky Flats Plant employees involved with the Radiological Controls program and the Bioassay lab
  - Interviews indicated that it would be questionable based on the chemistry whether you would see the Neptunium in the sample
  - Interviews indicated that the intent of co-precipitation process used after 1961 for “Gross Alpha” analysis was to focus the analysis on specific radionuclides typically Uranium and possibly plutonium

Neptunium—cont.

Feasibility Determination-cont.

- Little to no personal or area monitoring data
- Gross Alpha bioassay samples not a viable means for estimating Neptunium exposures
- Too many different types of activities including wet and dry processes to develop an exposure model
- Additionally, the source term varied in amount and chemical form

Neptunium—cont.

Feasibility Determination-cont.

- Quantities and activities associated with Neptunium at Rocky Flats are similar to Hanford during the same time period
- Based on this, NIOSH has concluded dose reconstruction is not feasible for Neptunium exposures

Other Thorium Issues

- In SEC-0030 evaluation the NIOSH position was that documents supported that Thorium quantities present at Rocky Flats were not in high enough quantities to contribute significantly to internal dose potential.

- As stated in NIOSH's original SEC-0030 evaluation, beginning in 1952, Thorium was used on site in quantities small enough that effluents were not routinely analyzed for Th. Thorium quantities varied from as little as none to as much as 238 kilograms (kg) in a given month. The principle use was fabrication of metal parts from natural Thorium metal (Th-232) and from various Thorium alloys. Thorium oxide might have been used as a mold-coating compound in limited experiments. Thorium compounds were used in analytical procedures.

Other Thorium Issues

- Most of the work associated with Thorium during the SEC-0030 evaluation was focused on specific activities that occurred in the 1960s
- Based on interviews and document review, NIOSH decided to re-evaluate the Thorium issue, especially for the earlier years

Other Thorium Issues

- NIOSH could not find any reports or documents that supported other activity occurring
- Changing Inventories in these early years supported that work with Thorium was occurring during this period
- Based on NIOSH's review of the NMMS database, no significant quantities of Thorium existed at Rocky Flats after 1971

Other Thorium Issues

Thorium Feasibility Determination

- NIOSH is still evaluating the early years of Thorium operations at Rocky Flats Plant

SEC-0192 Revised Evaluation Report

- **Current SEC classes from SEC-0030**
  - **April 1, 1952 through December 31, 1958:** Employees of DOE, its predecessor agencies, or DOE contractors or subcontractors who were monitored or should have been monitored for neutron exposures while working at the Rocky Flats Plant in Golden, Colorado, for a number of work days aggregating at least 250 work days from April 1, 1952, through December 31, 1958, …..
  - **January 1, 1959 through December 31, 1966:** Employees of DOE, its predecessor agencies, or DOE contractors or subcontractors who were monitored or should have been monitored for neutron exposures while working at the Rocky Flats Plant in Golden, Colorado, for a number of work days aggregating at least 250 work days from January 1, 1959, through December 31, 1966, ….

SEC-0192 Revised Evaluation Report

- Based on the inability to reconstruct U-233 and Neptunium, NIOSH will be recommending a class at the October Advisory Board meeting
- The parameters of that class recommendation have not been fully determined, but they will include the years previously discussed for U-233 and Neptunium operations