Pinellas Site Profile Review

Status Report and Action Items
Following the Work Group Meeting
Held on March 1, 2016

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Background

- Original Pinellas technical basis documents (TBDs) prepared in the 2005–2006 timeframe.
- SC&A Site Profile review completed September 2006 – 11 primary issues and 8 secondary issues were identified.
- Subsequently, 6 Work Group (WG) meetings and 1 set of worker interviews:
  - June 11, 2008 WG meeting
  - June 11, 2009 WG meeting
  - October 13, 2011 WG meeting
  - January 24–25, 2012 – Classified worker interviews – FBI building, Tampa Florida
  - November 19, 2012 WG teleconference meeting
  - February 11, 2016 WG teleconference meeting (stable metal tritide [SMT] model reviewed)
  - March 1, 2016 WG teleconference meeting (remaining issues closed out)
- 2011–2012, NIOSH made extensive revisions to their TBDs – most complete rewrites.

Site Profile Issues and Resolution – Primary Issue 1

Issue Description: Reconstruction of doses in the absence of early health physics, industrial hygiene, and environmental records. *The absence of pre-1980s records brings into question the ability to adequately assign radiation doses during the early years at Pinellas.*

- June 2009 WG: SC&A and NIOSH in basic agreement pending TBD updates. (Updates released in 2011.)
- October 2011 WG: SC&A is tasked with reviewing additional references captured by NIOSH and the effect on external coworker modeling.
- November 2012 WG:
  - SC&A concludes that the additional references are extensive and provide data from 1957–1995 (i.e., include pre-1980s data).
  - Claimant-favorable approach developed assigns the 95th percentile of all the data.
  - Issue closed by the WG.

Site Profile Issues and Resolution – Primary Issue 2

Issue Description: Potential doses from insoluble metal tritides (stable metal tritides [SMTs]) not sufficiently addressed.

- June 2009 WG: Issue was discussed and designated “in progress” based on concerns over dose reconstruction (DR) approach for special/insoluble tritium compounds (SMTs).
- April 2011: NIOSH updates internal TBD proposing new approach to insoluble tritium dose assignment.
- November 2012 WG: NIOSH to evaluate new model for consistency and applicability with established methods at the Mound Site.
- December 2015: Updated SMT model delivered by NIOSH (See file: “dc-pinellastrit-r0.pdf” on the DCAS website).

Site Profile Issues and Resolution – Primary Issue 2 (cont.)

Five Key Aspects of December 2015 SMT model:

1. **Resuspension factor:** increased from 1E-6 to 5E-5 per meter (same as Mound).
2. **The use of the highest tritium contamination measurement (1957–1973):** airborne contamination estimated based highest observed value in monthly health physics reports from 1957 to 1973. *(Note: Assumed level of SMT contamination level is 1 to 2 orders of magnitude higher than the assumed values at the Mound Site).*
3. **Technical adequacy of the method to detect tritium that is bound to particulate metal:** Contamination swipes utilize cotton ball that was rinsed with DI water (counting liquid) and then filtered prior to measurement by liquid scintillation counting. Particulate tritium could potentially be trapped in the cotton ball and not transfer to the counting liquid.
4. **The magnitude and the extent of potential for tritide contamination at Pinellas:** SMTs only handled in areas where tritium was handled, and all tritium workers were monitored via urinalysis. Model only applied to those with tritium bioassay (i.e., coworker intakes not applied to unmonitored workers).
5. **Choice of solubility type for the metal tritides present:** Assumes all SMT intakes are Type M or Type S depending on which is favorable to the individual claimant.

Site Profile Issues and Resolution – Primary Issue 2 (cont.)

SC&A White Paper Response (February 2016):

- Review contained 7 observations and 1 finding. *(Note: sole finding was withdrawn after NIOSH clarified that worker exposures are assigned for 2,600 hours/year.)*
- February 2016 WG:
  - Discussions focused mainly on the applicability of the sample method (NIOSH Item 3), and the documentation supporting prompt cleanup of spills and contamination that evidenced a strong health physics program (SC&A Observations 4–6).
  - SC&A and the WG concurred that the NIOSH model is sufficiently accurate and claimant favorable. **The WG accepted the SMT model and motioned to put Issue 2 into abeyance until the TBD is revised.**
  - A remaining SC&A concern pertains to the treatment of organically bound tritium (OBT). NIOSH responded that OBT behaves more like an insoluble particulate than tritiated water (HTO) and is subsumed in the SMT dose. The next TBD revision will include a discussion of how intakes of tritides, OBT, and HTO are addressed individually.

Site Profile Issues and Resolution – Primary Issue 3

Issue Description: Minimum detectable concentrations (MDCs) and uncertainties for plutonium (Pu) and bioassay measurements are inadequately addressed in the TBD.

- Potential exposure to Pu could not be ruled out early in the issues resolution process. Discussed at the June 2009 and October 2011 WG meetings as well as worker interviews.
- Became clear the only source of potential intake was from handling newly received triple encapsulated radio-thermal generators (RTGs).
  - Surface contamination did not exceed 200 dpm (the rejection level).
  - NIOSH calculations show that to receive even 1 mrem annual dose would require handling thousands of RTGs per day..
- **Therefore, no significant source of exposure to Pu-238 has been discovered.**
- Revision 2 of the internal TBD has removed all Pu discussion. **However, If evidence of a positive exposure is discovered, NIOSH will need to develop a DR methodology.**

Site Profile Issues and Resolution – Primary Issue 4

Issue Description: Assessment of personnel badging policy during early years needs further review.

- This was a concern early in the issues resolution process, when the Pinellas badging policy was not well understood.
- Discussed at the June 2009 WG meeting:
  - Possibility of cohort badging was a concern early in issues resolution process.
  - Later clarified that the health physics program monitored those with exposure potential and there was no cohort badging. *(Note: The current DCAS coworker model assigns the 95th percentile whole-body dose to all unmonitored workers and so obviates this issue.)*

Site Profile Issues and Resolution – Primary Issue 5

Issue Description: Problems with personnel dosimetry

- June 2009 WG: SC&A's main concern was that a claimant-favorable yet scientifically based limit of detection (LOD) for external dosimetry be applied.
- TBD Revised in 2011: Table 6-9 included additional LOD information.
- November 2012 WG: Sub-issue of 10 mrem LOD versus SC&A-recommended 20 mrem remains open. NIOSH was to look into the scientific basis supporting an LOD of 10 mrem.
- SC&A concerned that that while 10 mrem is probably acceptable for 30–250 keV photons, it might be too low for the higher energy gamma spectrum from an RTG source ("spectral hardening" of photon emissions due to triple encapsulation).
- February 2016 WG: Lengthy discussion – WG agreed to hold a technical call with a recognized expert in film badge dosimetry. That call took place on February 26, 2016.

Site Profile Issues and Resolution – Primary Issue 5 (cont.)

- For high-energy gammas, optical density (OD) was converted according to a step function (not Gaussian). The minimum increment on the densitometer corresponded to 6 mR (doses increase by 6, 12, 18…mR).
- The "minimum reportable dose" (M) of 10 mR not defined by a statistical basis; Landauer adopted the convention that doses less than 10 mR were not significant – so 9 mR or less was treated as 0, 10 to 14 treated as 10, 15 to 24 as 20, and so forth.
- DOELAP accreditation guidelines for lower limit of detection (LLD) based on Poisson statistics, such that Type 1 and 2 error rates (false positive and false negative, respectively) were both controlled at 5 percent. Film for high-energy exposure has a LLD of 12–14 mR; thus, 95% of time will get 10 or 20 when exposed to 12.
- Based on the foregoing, SC&A recommended that Issue 5 be closed. **At the March 1, 2016, WG meeting, the WG motioned to close Issue 5.**

Site Profile Issues and Resolution – Primary Issue 6

Issue Description: The decontamination and decommission (D&D) era of Pinellas operations is not sufficiently addressed.

- First discussed at June 2009 WG meeting.
- November 2012 WG: Subject Matter Expert (SME) from January 2012 interviews indicated that all the contract employees were monitored by Pinellas RadSafe before, during, and after the D&D operations. Issue remained open pending NIOSH receipt of confirmatory D&D monitoring records from Albuquerque.
- February 2016 WG: NIOSH has exhaustively captured 5,161 additional references, including the requested records from Albuquerque. Accordingly, the WG had placed this issue in abeyance until delivery of the Sandia National Laboratories (SNL) finding aid.
- March 2016 WG: SNL finding aid found not useful – NIOSH has likely exhausted available monitoring records for the period in question. That, in combination with the SME interview, provides a strong weight of evidence argument that DR is feasible during the D&D period.
- **The WG motioned to close Issue 6 at the March 2016 meeting.**

Site Profile Issues and Resolution – Primary Issue 7

Issue Description: Missing internal dose estimation methods for unmonitored workers, e.g., maintenance and support personnel, not provided.

- Discussed at the June 2009 WG meeting.
- Internal TBD update addresses SC&A's concerns:
  - NIOSH "whole-body dose" coworker model includes a tritium component in addition to neutron and external gamma dose assigned at the 95th percentile.
  - There is currently no documented plutonium exposure potential (Issue 3, above).
  - Secondary Issue 2 (below) regarding Ni-63 and C-14, addresses other aspects of Issue 7.

Site Profile Issues and Resolution – Primary Issue 8

Issue Description: Potential for missed dose for depleted uranium (DU)

- June 2009 WG: Issue was discussed.
- Cutting of DU beds took place at the GEXM facility in Milwaukee, Wisconsin, not at Pinellas. Therefore, there was no DU exposure potential at Pinellas.
- **The WG moved to close Issue 8.**

Site Profile Issues and Resolution – Primary Issues 9–11 and Secondary Issue 1

Issue Description: All primary issues and the secondary issue relate to occupational medical dose:

- Primary Issue 9: The TBD fails to adequately define and assess occupational medical exposure.
- Primary Issue 10: Techniques and protocols increase uncertainty of dose conversion factors (DCFs) listed in the TBD.
- Primary Issue 11: Frequency and type of x-ray exposure is uncertain.
- Secondary Issue 1: Additional factors contribute to uncertainties related to occupational medical exposures.

Site Profile Issues and Resolution – Primary Issues 9–11 and Secondary Issue 1 (cont.)

- June 2009 WG: Issue is discussed.
- Revision to occupational medical dose made after the October 2011 WG meeting.
- SC&A's subsequent focused review of the TBD revision satisfied our concerns regarding Issues 9–11 and Secondary Issue 1.
- 11/19/2012 WG meeting (p. 54**): <u>Formally closed Issues 9–11 and Secondary Issue 1</u>.**

Site Profile Issues and Resolution – Secondary Issues 2–8

Issues "Closed" based on resolution of the related primary issues.

- **Secondary Issue 2:** Inadequate descriptions for certain plant operations
  - Ni-63 and C-14 aspects in abeyance as of June 2009 pending addition of new information to the TBD (revised April 2011). Secondary Issue 2 and DU issue (Primary Issue 8) are no longer relevant and so are closed.
- **Secondary Issue 3:** Perimeter tritium monitoring stations
- **Secondary Issue 4:** Inadequacy of the external TBD to address uncertainty.
  - Secondary Issues 3 and 4 both put in abeyance in June 2008 pending additional information incorporated into environmental TBD revision (released July 2011).

Site Profile Issues and Resolution – Secondary Issues 2–8 (cont.)

- **Secondary Issue 5:** Rejection of plutonium bioassay results based on plutonium-238-to-plutonium-239 ratios, and non-detectable plutonium-239
- **Secondary Issue 6:** Plutonium solubility
  - Secondary Issues 5 and 6 were both completed with the disposition of the primary issue (See Primary Issue 3).
- **Secondary Issue 7:** Assumptions relative to unmonitored workers
  - This secondary issue was completed with the disposition of Primary Issues 4, 6, and 7.
- **Secondary Issue 8:** Assumptions relative to minimum detectable level adjustments to dosimetry for missed dose
  - Closed – language clarified in revision to external dose TBD (released August 2011).

Summary Conclusions

- SC&A and the Pinellas Work Group agree that all of the primary and secondary issues raised in SC&A's site profile review have been adequately addressed and resolved.
- Primary Issue 2 is in abeyance until NIOSH delivers a revision of the internal dose TBD.
- The Work Group recommends closure on remaining issues.

Questions?