

**SC&A Pinellas Plant Work Group Update  
November 19, 2012, Teleconference meeting**

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Status Update of Technical Issues from the WG Meeting in October 13, 2011

**Background**

On October 13, 2011, a meeting of the Pinellas Work Group was held in Cincinnati, Ohio. The previous work group meeting had taken place in June 2009. In the interim, NIOSH had made significant revisions to their Pinellas Site Profile Technical Basis Documents (TBDs). These changes were initiated to resolve issues with the Pinellas Plant Site Profile that were documented in SCA-TR- TASK1-0015, Review of the NIOSH Site Profile for the Pinellas Plant Site, performed by SC&A in September 2006. The changes addressed 11 primary and 8 secondary issues identified by SC&A during the review. At the October 2011 WG meeting, NIOSH presented a summary of the changes to the TBDs. A significant number of additional changes were made to these TBDs to incorporate new information about the site and its practices and address issues that were identified by NIOSH. During the meeting SC&A stated its position on each of the proposed primary and secondary issue resolutions presented by NIOSH. For the majority of the issues, SC&A sought and received authorization from the Designated Federal Official (DFO) and Work Group to perform confirmatory reviews of the changes and document the results in the form of white papers or confirmatory memoranda, as indicated below.

SC&A was authorized to conduct confirmatory reviews of selected changes to the Pinellas Plant TBDs related to the primary and secondary issues documented in SCA-TR-TASK1-0015 TBDs. Key work activities and deliverables include:

1. *Review the documents listed in the table “Summary of Data Capture Searches for the Pinellas Plant” of TBD-1 Rev 1 for relevance to the ability to adequately assign radiation doses during the early years (pre-1980) at Pinellas. Deliverable will be a confirmatory memo*
2. *Review the Mound tritides white paper as it applies to Pinellas and prepare a formal response*
3. *Coordinate with Pete Darnell the revision of TBD-5, Rev. 1, Section 5.7.3, to remove guidance for individual dose reconstruction in the event of positive bioassay*
4. *Revisit any discussions that resulted from the SC&A white paper “Review of Pinellas Plutonium Bioassay Data, dated December 9, 2008.” Review bioassay data for confirmation of comprehensive null results. Deliverable will be a confirmatory memo*

5. *Review the performance characteristics identified by NIOSH and tabulated in TBD-6, Rev. 1, for dosimeters used in the post 1973 time period. Deliverable will be a confirmatory memo.*
6. *Review new D&D monitoring information for adequacy, following NIOSH action to identify and provide monitoring/ survey results and activity descriptions to support the position that D&D activities do not require additional dose assignment beyond what is already considered. Deliverable will be a confirmatory memo.*
7. *Review TBD- 3, Rev.1, when available, to confirm that the information presented in the Work Group meeting is included and that the new information addresses SC&A concerns. Likely just need a short confirmatory memo.*

### **Site Interviews**

In addition, SC&A sought and received authorization to conduct site interviews with Pinellas Plant workers for the purpose of resolving issues raised during the meeting by Working Group members, SC&A, and the petitioners.

1. Prepared and conducted Site Experts Interviews of former employees of Pinellas Plant between January 24 and January 26, 2012. Thirteen Site experts were interviewed.
2. Interviewers were Phil Schofield from the Board, John Stiver and Abe Zeitoun from SC&A, and Peter Darnell from NIOSH.
  - a. This activity was preceded by preparation of written questions to available interviewees and receiving their written responses. Interviewees included broad spectrum of labor categories and functions at the Plant.
3. Notes taken were reviewed by DOE Classification and redacted materials were sent back to SC&A.
4. Currently, SC&A is finalizing the notes to be returned to the interviewees for concurrence. This step will require DOE classification review.

### **SC&A's status update of outstanding technical issues**

**Issue # 1.** Review the documents listed in the table “Summary of Data Capture Searches for the Pinellas Plant” of TBD-1 Rev 1 for relevance to the ability to adequately assign radiation doses during the early years (pre-1980) at Pinellas.

Status: A draft SC&A response to this action item has been completed (Attachment 1). SC&A recognizes that NIOSH has expanded the site database and has been totally responsive in including a large number of documents with information relevant to the concerns of the finding. However, the update of the table in TBD-1 alone does not provide the assurance that the new information has confirmed the validity of the assumptions used in the Revision 0 of the TBDs. Based on our reviews, additional guidance is needed. Two alternatives may be considered towards resolution. The first is to request that NIOSH explicitly identify those documents that address this issue; in fact it would be appropriate for NIOSH to provide appropriate text

summarizing the relevant information, with references, that address this issue. The second alternative is for SC&A to review each revised document (TBD-3 through TBD-6) with the limited scope of verifying that the assignment of radiation doses during the early years of operation at the Pinellas Plant is well documented and claimant-favorable.

**Issue # 2.** Review the Mound tritides white paper as it applies to Pinellas and then prepare a formal response (overarching methodology).

Status: This is still ongoing and was a topic of inquiry for the January 2012 former worker interviews. The original conceptual model was delivered in “pieces” in October 2011 and formally in December 2011. Subsequent work group deliberations and white paper exchanges resulted in a refined, updated model that was discussed at the August 31, 2012 Mound WG meeting. That model was deemed scientifically sound and claimant favorable for use in Mound dose reconstructions. January interviews indicated that exposure to particulates from dismantled tube returns was a concern. SC&A owes the WG a confirmatory memorandum that evaluates the Pinellas model in light of the refined Mound model. Issues remain that may impact the use of this methodology at Pinellas.

**Issue # 3.** Coordinate with Pete Darnell the revision of TBD-5, Rev. 1, Section 5.7.3, to remove guidance for individual dose reconstruction in the event of positive bioassay.

Status: Revisions were implemented in Revision 2 of TBD-5, dated February 21, 2012. Issue closed.

**Issue # 4.** Revisit any discussions that resulted from the SC&A white paper “Review of Pinellas Plutonium Bioassay Data, dated December 9, 2008.” Review bioassay data for confirmation of comprehensive null results.

Status: This is still ongoing and was a topic of inquiry for the January 2012 former worker interviews. Based on our January 2012 interviews, it appears that monitoring was not comprehensive, but rather, was directed at those individuals with exposure potential (e.g., a subset of workers involved in destructive testing of RTGs is of particular interest because they had the highest exposure potential). A couple of interviewees alluded to destructive testing of RTGs that was conducted at the site and the associated monitoring and rad-safe practices. It is our understanding that new data and information for those personnel will be forthcoming.

**Issue # 5.** Review the performance characteristics identified by NIOSH and tabulated in TBD-6, Rev. 1, (Occupational External Dose) for dosimeters used in the post June 1974 time period.

Status: SC&A investigations are complete (Attachment 2). SC&A has examined Tables 6-9, 6-10 and 6-11 and portions of relevant references, including OTIBs, and the Mound site profile, as Mound dosimetry was utilized at the site during the period in question. Generally, SC&A believes that the assumptions in the revised tables under consideration are sound. Some exceptions are highlighted in Attachment 2.

**Issue # 6.** Prepare a memorandum outlining the deficiencies in the D&D discussion and methods. Review new D&D monitoring information for adequacy, following NIOSH action to identify and provide monitoring/ survey results and activity descriptions to support the position

that D&D activities do not require additional dose assignment beyond what is already considered.

Status: This is still ongoing and was a topic of inquiry for the January 2012 former worker interviews. Site interviews were completed. Bioassay of contractors was under Pinellas radsafe control – before/during/after D&D. Records were sent to DOE-AB in electronic and hard copy. The STAR Center management may have copies of the release surveys. We are awaiting a NIOSH determination on the D&D data.

**Issue # 7.** Review TBD- 3, Rev.1, when available, to confirm that the information presented in the Work Group meeting is included and that the new information addresses SC&A concerns.

Status: SC&A agrees with the NIOSH approach and believes it to be claimant favorable (Attachment 3). Recommend closure

# Attachment 1

## Action Item #1.

The following is SC&A's response to Action Item #1 in the Work Plan proposed by SC&A on October 20, 2011, following the Pinellas Work Group meeting on October 13, 2011.

The original Finding #1 "Reconstruction of Doses in the Absence of Early Health Physics, Industrial Hygiene, and Environmental Records" was expressed as follows:

*The absence of pre-1980s records brings into question the ability to adequately assign radiation doses during the early years at Pinellas. The improvements in radiological monitoring and bioassay methodology, instrumentation, and in health physics, industrial hygiene, and environmental control programs, contraindicate the use of 1980s documentation for determining radiation doses for the early years of plant operations. The assumptions incorporated into ORAU-TKBS-0029-4 (Rev 00) and ORAU-TKBS-0029-5 (Rev 00), given the absence of firm information, appear to be claimant favorable. However, the uncertainties associated with projections without documentary evidence may result in missing doses that may not be accounted for by the claimant-favorable assumptions indicated in the documents.*

During the Pinellas Work Group meeting of October 13, 2011, NIOSH offered the following resolution to the finding:

*The table titled "Summary of data capture searches for the Pinellas Plant" was updated to address Issue 1 in SC&A's issues matrix. Additions/updates were also made to this table to include some more recent data capture efforts.*

Consequently, SC&A was authorized to review the documents listed in the table "Summary of Data Capture Searches for the Pinellas Plant" of ORAUT-TKBS-0029-1 Rev 1 for relevance to the ability to adequately assign radiation doses during the early years (pre-1980) at Pinellas.

The table in ORAUT-TKBS-0029-1, Rev 1, (TBD-1) includes the data capture source and the general description of the documents captured. It includes a total of 941 documents. Among the more "relevant" documents, approximately 520 documents come from the National Archives and Records Administration (NARA) in Atlanta, 100 documents from DOE Albuquerque, 160 documents from internet web sites, 24 documents from the Federal Records Center in Atlanta, 23 documents from NIOSH, 20 documents from ORAUT, 11 documents from the Pinellas Plant, and 9 documents from an "Unknown" source. Approximately, another 80 documents come from various other sources.

The description of the documents indicates that a large number of the documents could be relevant to the resolution of the finding.

A large portion of documents in the list contain information on Pinellas Plant employees, dosimetry programs, and dosimetry data such as: employee listings; radiological monitoring information (e.g., urine samples, personal and environmental dosimetry); radiation exposure data; bioassay results; radiological monitoring; inventory of microfilmed records; NESHAPS data; personnel dosimetry and exposure data; radiological procedures; facts and sources for EEOICPA claimants; worker outreach meeting information; internal and external dosimetry 1993–1996; and site dose assessments.

The list includes an array of documents covering: personnel exposure (1950s–1990s); general site information; NESHAPS and stack sampling data; incident reports; radiological procedures; RTG program information; radiological final status reports; area film badge results; radiological incidents; alpha counting procedure; Landauer dosimetry data; plutonium bioassay test program; bioassay data and internal dosimetry data.

The list also includes reports and manuals such as: the Pinellas Environmental Baseline report; a Technical Safety Appraisal; the Tiger team assessment; ES&H Reports 1959–1962; Health & Safety plans; and a Radiological Control Manual.

SC&A recognizes that NIOSH has expanded the site database and has been totally responsive in including a large number of documents with information relevant to the concerns of the finding. However, the update of the table in TBD-1 alone does not provide the assurance that the new information has confirmed the validity of the assumptions used in the Revision 0 of the TBDs.

An overview of the reference lists for the revised TBDs indicates that over 150 documents were added to the reference lists of the most recent revision. This implies that a number of documents in the list were used in the revision to address SC&A issues or other internal to NIOSH comments. It is very likely that a number of these new references address the concern in Finding # 1.

Given the large number of new documents cited, it is impossible for SC&A to critically review those documents in a timely manner. We would like to request that NIOSH explicitly identify those documents that address this issue; in fact it would be appropriate for NIOSH to provide appropriate text summarizing the relevant information, with references, that address this issue. Alternatively, SC&A could review each revised document (TBD-3 through TBD-6) with the limited scope of verifying that the assignment of radiation doses during the early years of operation at the Pinellas Plant is well documented and claimant-favorable.

## Attachment 2

### Action Item #5.

The following is SC&A's response to Action Item #4 in the Work Plan proposed by SC&A on October 20, 2011, following the Pinellas Work Group meeting on October 13, 2011.

Action Item #5 was a result of the original Finding #5 "Problems with Personnel Dosimetry" documented in SCA-TR- TASK1-0015, Review of the NIOSH Site Profile for the Pinellas Plant Site, performed by SC&A in September 2006. Finding # 5 was expressed as follows:

*Section 6.2.2 of ORAUT-TKBS-0029-6 states the following:*

*"This analysis was unable to locate specific designs of the film dosimeters used for approximately the first 20 years (1957 to 1974) at the Pinellas Plant, and there is limited documentation that indicates there was an early relationship with Nuclear-Chicago".*

*Table 6-5 on page 16 of ORAUT-TKBS-0029-6 assigns a missed dose of 0.24 rem for beta/photons (monthly) for badges used during this time period. This assignment of missing dose evidently assumes that the badges used during this time period were equivalent to those provided by Nuclear-Chicago. Additional discussion is needed on the uncertainty associated with the assumed missing dose, given that the origin of the dosimetry is not clearly established.*

During the Pinellas Work Group meeting of October 13, 2011, NIOSH offered the following resolution to the finding:

*Changes were made to the Dosimetry Technology and Missed Dose sections to address SC&A Finding #5. Updated information on the film badge characteristics post-1974 is contained in Tables 6-9 through 6-11 of the revised TBD-6. Pre-1974 performance characteristics are not available, so NIOSH uses the maximizing approach in "A Standard Complex-Wide Methodology for Overestimating External Doses Measured with Film Badge Dosimeters" (ORAUT-OTIB-0010).*

Consequently, SC&A was authorized to review the performance characteristics identified by NIOSH and tabulated in TBD-6, Rev. 1, for dosimeters used in the post-June 1974 time period.

The three relevant tables were reviewed (6-9, 6-10 and 6-11) and portions of relevant references were examined, including OTIBs, and the Mound site profile, as Mound dosimetry was utilized at the site during the period in question. Generally, the assumptions in the revised tables under consideration are sound, except as noted in the observation below:

Original Table 6-5 in ORAUT-TKBS-0029-6 (9/15/2005) uses 0.02 rem as the MDL for photons for Landauer film dosimetry. Table 6-9 in the current version (04/28/2011) shows 0.01 rem for the LOD. No reason for the change is evident in the site profile document.

For film utilized in a high energy photon environment, 0.02 rem is more realistic and claimant favorable as the LOD. The issue of film emulsion response to high energy photons is well known and discussed in the ORAUT-OTIB-0010.

The issue was also spelled out in the INL site profile review of December, 2008 (Idaho National Laboratory (INL) Site Profile Review Update):

### ***[3.2 ISSUE 26: MINIMUM DETECTION LIMIT***

*The selection of 10 mrem as the MDL [minimum detection limit] for high energy gamma is questionable. Even for modern densitometers and film, it is a challenge to achieve this level, as a single density "click" can correspond to greater than 10 mrem for high-energy gamma radiation; this is not a problem, however, for intermediate and low-energy x-rays. Rather, one click of the densitometry system may correspond to 15 or 20 mrem for 660 keV or 1.2 MeV gammas, for example. If the claim is made that 10 mrem is a valid choice for the MDL, then supporting materials should be provided, such as film dose-to-density curves and densitometer calibration data. Other sites (e.g., Savannah River Site - SRS) have adopted 40 mrem as the high-energy gamma MDL for early film.]*

For doses for the "pre-1974 period", the tables in the revised Pinellas site profile show a generous 0.04 rem as the LOD for photons and electrons detected with photographic film. This is based on ORAUT-OTIB-0010. Thus, for non-Landauer film, a 40 mrem LOD is being recommended but 10 mrem for Landauer film. The revised tables do not specifically state why the lower 10 mrem LOD for Landauer film was chosen. Speculating, it might be based on a broad brush claim by Landauer of an LOD of 10 mrem in older dosimetry reports and client literature. However, for Landauer or any other film dosimeter from the era in question, 10 mrem was more correctly the LOD for lower energy photons. LOD is dependent on a host of issues including film emulsion age (background fog), processing, densitometer set up, calibration, etc. Thus although a 10 mrem high energy photon detection threshold might have been attainable on a "good day", it should not be adopted as the LOD for establishing missed dose.

**Based on the above, it is concluded that the photon LOD in Table 6-9 should be returned to the original 0.02 rem for Landauer beta/gamma film.**

**All other assumptions that were examined appear reasonable and claimant favorable.**



## Attachment 3

### Action Item #6.

#### Background

The following is SC&A's response to Action Item #6 in the Work Plan proposed by SC&A on October 20, 2011, following the Pinellas Work Group meeting on October 13, 2011.

Action Item #6 was a result of the original Findings No. 9, 10, and 11; Secondary Issue No. 1, and other issues and questions documented in SCA-TR- TASK1-0015, *Review of the NIOSH Site Profile for the Pinellas Plant Site*, performed by SC&A in September 2006. All issues were related to ORAUT-TKBS-0029-3 (TBD-3), *Occupational Medical Dose*. The issues were expressed as follows:

#### **Finding # 9:** The TBD Fails to Adequately Define and Assess Occupational Medical

##### Exposure

*The current guidelines, as presented in Kathren and Shockley (2005), go a long way in assuring that all occupational medical exposures are reasonably included in determining the overall dose estimations for claimants. Unfortunately, the interpretation, to date, by the contractor, ORAU, has not been applied conservatively to be claimant favorable. The Occupational Medical Dose TBD (Demopoulos 2006) assumes an interpretation that also has been considered and applied at other sites, such as the Mound Plant and Los Alamos National Laboratory (LANL), and Paducah. To this extent, the assumption that medical procedures are limited to only one preemployment chest x-ray and chest x-rays that are part of routine physical exams may substantially underestimate worker medical exposure when evaluating occupational medical exposure.*

#### **Finding #10:** Techniques and Protocols Increase Uncertainty of Dose Correction Factors Listed in the TBD

*Section 3.2 of the Occupational Medical Dose TBD fails to adequately describe all the information upon which to establish beam quality for x-ray units in use from 1957–1997. The TBD is also deficient in that little documentation exists to validate x-ray protocols, equipment maintenance, and upkeep records prior to 1972.*

#### **Finding # 11:** Frequency and Type of X-ray Exposure is Uncertain

*The Occupational Medical Dose TBD relies on a very limited review of archived medical records to establish frequency assumptions. The assumption of one chest radiograph (Posterior-Anterior view) every 3 to 5 years is not reasonably conservative, in that workers could essentially request an x-ray, or be subject to special screening exams. In addition, Section 3.2 of*

*the Occupational Medical Dose TBD does not provide documentation or references to support the assumption that only a limited group of workers received x-ray exams more frequently than every 5 years after 1974. In addition, Section 3.2 of the TBD states that photofluorography (PFG) units, although generally available up to the late 1950s at most DOE sites, were not documented as being used at the Pinellas Plant. The undocumented absence of PFG units at Pinellas clearly has significant dose implications to workers who may have been given much higher doses from PFG units.*

### **Secondary Issue 1: Additional Factors Contribute to Uncertainties Related to Occupational Medical Exposures**

*The Occupational Medical Dose TBD does not consider dose impacts due to less than optimal use of technology, such as using screens, grids, or bulky systems. The TBD does not consider these elements as potential contributions to uncertainty.*

*The TBD does consider the potential contribution to dose that may have resulted in less than optimal use of collimation at least prior to 1972, as stated in Section 3.3.2 of the TBD. Unresolved is the concern that the DCFs are derived from ICRP (1982), and therefore are not comparable, in terms of beam quality, which varies from unit to unit. These factors can contribute greatly to the dose to the chest and other organs; for the unit in other TBDs in operation prior to 1997, little or no documentation exists. NIOSH has indicated in other TBDs that it will continue to search for other available records to better define equipment use and beam quality, and include it as appropriate in an updated version of the TBD.*

*Uncertainty is defined in the TBD as being due to measurement error and variation in kilovoltage, tube current, timers, and the skin-to-surface distance (SSD). This approach is quite similar to the uncertainty analyses documented in other DOE site profiles. The conclusion in this TBD and others is that dose reconstructors for exposure prior to 1997 should use an uncertainty factor of +30%. SC&A believes the uncertainty correction factor of 2.0 being applied at other sites is more appropriate for use.*

*SC&A agrees that the TBD conservatively estimates these essential aspects of an uncertainty review. Unresolved is the contribution to uncertainty in dose, due to other errors introduced by lack of quality controls in processing equipment and lack of adherence to established Standard Operating Procedures. A reasonable estimate of these contributions to uncertainty would be an evaluation of retake rates per examination type. NIOSH should revisit the potential for significant retake rates and evaluate its potential effect on dose as part of future revisions of this TBD, especially as it relates to prior to 1972.*

*The Occupational Medical Dose TBD does not show that Pinellas applied dose minimization principles to reduce medical exposures. The document also does not assess or consider the likely exposure to workers who are referred to offsite medical facilities for follow-up. The TBD states that review of selected medical records and files did not reasonably show or match expected x-ray exam frequency and type of exam, as shown in Table 3.1.1. Little evidence exists to document the number of x-ray exams provided to the average worker, or for special exposure needs.*

During the Pinellas Work Group meeting of October 13, 2011, NIOSH offered the following resolutions to the findings:

*With respect to Findings 9 and 11, NIOSH responded that since the time the TBD was written, new information about the frequency of chest x-rays was obtained from the September 2, 2004 public outreach evening meeting. Pages 7 and 8 of the Final Meeting Minutes indicates that the frequency was generally annually before 1985 and after 1985, workers under the age of 40 were given x-rays every other year, then annually after turning 40. Fire fighters were given annual x-rays because of their increased inherent risk.*

*The Examination Frequencies Section of the TBD was revised to indicate that the lumbar spine and abdomen/KUB (kidneys, ureters, bladder) X-rays are considered to be occupational screening X-rays when they were performed in conjunction with a chest X-ray. The section also contains a stipulation to not assess the X-ray doses for any X-rays when the energy employee's records clearly indicate that the X-rays were performed for individual diagnostic reasons or for work-related injuries. In addition, the section now indicates to assign occupational medical doses based on the X-ray records when provided, which they typically are, and to assign the occupational medical doses based on the recommendations in OTIB-0006 when no records are provided.*

*With respect to Finding No. 10, NIOSH responded that the Equipment and Techniques Section of the TBD was revised. The table listing the types of medical X-ray equipment that were used (now Table 3-1) was updated based on new information that was found. All of the pre-1972 X-ray doses are still based on the information in the Technical Information Bulletin: Dose Reconstruction from Occupationally Related Medical X-Ray Procedures (OTIB-0006). However, a number of the PFG X-ray dose values were changed due to a revision of OTIB-0006. Because the types of medical X-ray equipment that were used for the periods of 1972–1987 and 1988–1997 are now different, the X-ray dose values for those periods have been revised.*

*With respect to Secondary Issue No.1 , NIOSH responded as follows:*

*The Uncertainty Section of the TBD was revised to address Secondary Issue 1. A list of the various uncertainty values for each source of uncertainty is now provided in this section along with the total propagated uncertainty that was estimated for the Pinellas Plant X-ray procedures.*

*An error in the applicable period for PFG X-rays was corrected to reflect the recommendations in OCAS-PER-004. The applicable period is now 1957–1959 versus 1957–1960.*

*Because only anterior-posterior (AP) exposures are performed for abdomen/KUB X-rays, the abdomen/KUB X-ray dose values for lateral (LAT) exposures were eliminated from the TBD.*

*Tables containing skin dose values for various skin locations on the body were added to the TBD as Attachment A.*

*A number of other significant changes were made to the Occupational Medical Dose TBD to better organize the information being presented, eliminate some information that served no purpose, and to make some of the terminology being used throughout the TBD consistent with other NIOSH/ORAUT documents.*

Consequently, SC&A reviewed TBD- 3, Rev.1, and confirmed that the information presented in the Work Group meeting was included and that the new information addresses SC&A concerns. **SC&A recommends closure.**