Mound SEC Issues – for SEC Petition SEC-00090
Starting Date for SEC Petition: 1 February 1949; Ending Date: 17 August 2007 ("Present")

This matrix contains an issues tracking list for the Mound Special Exposure Cohort (SEC) Petition covering the period March 1, 1959, to August 17, 2007, for use by the Advisory Board Work Group (WG) for the Mound SEC. It is based on an assessment of the following:

- The NIOSH Evaluation Report (ER) dated December 19, 2007
- The Mound SEC Petition SEC-00090
- A review of Site Research Database (SRDB) documents
- SC&A's Site Profile Review
- Work Group meetings of April 1, July 14, and October 27, 2008; and May 27–28, 2009; and January 5–6 and July 27, 2010
- Joint interviews of April 6, 2010
- Secure NIOSH/SC&A working sessions held in Germantown, Maryland, June 30, 2009, and April 7, 2010

ABWRH Recommended Class Definition	All employees of the Department of Energy (DOE), its predecessor agencies, and DOE contractors and subcontractors, who worked in any areas at the Mound site for a number of days aggregating at least 250 days from October 1, 1949, through February 28, 1959, or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

No.	Issue	NIOSH ER position (SC&A reading)	STATUS (SC&A summary)	Work Group Status	Current Action Assigned to
1	Exposure to radium, actinium, and thorium starting ***March 1, 1959***.	1. Dose reconstruction (DR) not feasible for Ra-Ac-Th from October 1, 1949–February 28, 1959; Decontamination and Decommissioning (D&D) of building where operation took place completed in February 1959. Thorium-230 bioassay was available from March 1956 onward. These data, supplemented by air activity measurements and process information, can be used to assign a maximizing or best-estimate dose. Bioassay data for Th-232 is available from August 1955 through November 1959 (small number available from 1951–1954), as well as approximately 170 samples for Th-232 are available in 1960 and 1967, and 25 urine samples from the years 1972, 1978, and 1979. These data are used to assign a missed dose, as well as dose from potential uptakes. Bioassay data are supplemented by process data.	After considerable discussion during the first Work Group (WG) meeting (April 1, 2008) regarding the presence of residual Ac contamination in Cotter Concentrates in the 1960s, it was acknowledged, at least for issue #1, that while there is likely little to be concerned about, there may have been some residual Ac material beyond 1959 that would have been a potential exposure source. For issue #3, SC&A conceded that Am-241 seemed to be covered, but that Cm-244 and Np-227 did not have any bioassay data; but again, it is likely these consisted of very small quantities that would have affected few individuals. For issue #4, SC&A noted that in mapping uranium-233 and -234 from the King report to the ER, SC&A found lack of coverage with respect to how DR would be accomplished given paucity of bioassay data. NIOSH agreed that specific data are lacking, but that gross alpha monitoring data could be used to derive exposure to uranium (but not to delineate specific isotopes). The discussion for issue #5 addressed whether monitoring data for Pu-239 would envelope trace isotopes such as Pu-240 and 241; however, NIOSH was able to demonstrate that ratios could be used for the other Pu isotopes to enable DR [this issue was closed at a subsequent WG meeting]. SC&A questioned the use of Pu as a marker for estimating exposure to fission and activation products (issue #7); NIOSH responded that a specific analysis approach would be made available. For issue #8, NIOSH acknowledged that a number of radionuclides are cited in the King document for which bioassay data are not available, but that there are a number of issues that need to be addressed before one can conclude that DR is not feasible, e.g., quantities involved, dosimetric significance. SC&A notes that this is an issue of historic R&D, not simply of the D&D era. NIOSH concludes that it will need to "get[s] its arms" around what these radionuclides really meant in terms of historic significance at Mound. At the July 14, 2008, WG meeting, NIOSH introduced its "roadmap" approach (detailed matrix chart) for linking the King and Meyer reports to availability of bioassay data and monitoring technology. The chart columns include Mound locations, program/process, time frame, radionuclides, quantity, material characteristics, bioassay method, exposed individuals, and reference. From this mapping, it was apparent to SC&A that gross alpha was the technique of choice in the early years, which, itself, is a broader concern under issue #12 (internal dose data adequacy). It was emphasized that the "roadmap" was a work in progress; a "final" refinement was provided in October 2008, but no further discussion took place at that time.	**Issue 5 closed.** **NIOSH response to SC&A June 2010 white paper received August 2011.**	**<u>SC&A</u>: SC&A review NIOSH white paper.**
3	Exposure to transuranium radionuclides (Am-241, Cm-244, Am-243, Np-237) other than plutonium	3. Limited bioassay data exist for Am-241 and Cm-244. These data are used for missed dose assignment and assessment of positive uptakes where bioassay so indicates. These data may be supplemented with process data to estimate a bounding dose.			
4	Exposure to U-232, U-233, U-234, U-235, U-236, and U-238	4. Existing bioassay results are used to assign missed dose, as well as potential dose, from intakes suggested by positive results. Maximum or best-estimate doses can be determined.			

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5	Concentrations of Pu-240, Pu-241, and Pu-242 in plutonium product	5. ER indicates that Pu-240, Pu-241, and Pu-242 are not dosimetrically significant and can be discounted.	At the May 2009, WG meeting, a final roadmap compilation was presented, but lack of time did not permit full discussion by the WG. However, in subsequent discussions between NIOSH and the WG, it was clarified by NIOSH that it never intended for the roadmap to be a definitive answer to the issue of where and when an exposure potential may have existed for specific radionuclides—it was merely a representation of what was contained in the King and Meyer reports of historic Mound source terms. At the January 2010 WG meeting, following an extensive discussion regarding the status of the "roadmap" and radionuclide exposure potential, SC&A agreed to provide examples of situations at Mound where an exposure potential is indicated, even though no corresponding bioassay measurement is available. It was also agreed that the WG would address Issues 1, 3, 4, 8, 11, 12, and 13, as a single composite SEC issue dealing with internal dose reconstructability. SC&A subsequently issued "Mound Internal Dosimetry Data Adequacy and Completeness" in June 2010. Prior to the issuance of that white paper, a memo was forwarded to the WG from SC&A outlining its concerns regarding how "exposure potential" was being defined by NIOSH and requesting that the Advisory Board review its treatment from a policy standpoint. At the Board's request, a discussion of how "exposure potential" is addressed (in the context of Mound, Pantex, and LANL) was held at the ABRWH meeting in Santa Fe on November 17, 2010; NIOSH's presentation acknowledged the need for a "quantitative" basis for determining exposure potential vs. subjective programmatic considerations. At the July 27, 2010, WG meeting, little discussion took place, given the just submitted (June 2010) SC&A white paper. However, the WG Chair requested that SC&A identify any SEC issues that were not answered completely by that white paper. The resulting report, "Mound Internal Data Adequacy and Completeness Issue Status Report," was issued to the WG and NIOSH in October 2010. The WG also requested a NIOSH review of SC&A's June 2010 white paper. NIOSH's response, in the form of an August 2011 NIOSH white paper, addressed 111 specific issues. SC&A is currently reviewing this response.		
7	Fission and activation products	7. Progress reports contain detailed descriptions of the process, along with chemical composition and radioassay results. Bioassay was performed for individuals using plutonium as an indicator element. Bioassay results and progress reports can be used to determine a maximum dose. In the case of strontium separation activities, process description data can be used to reconstruct dose.			
8	Other radionuclides (Pa-231, La-140, Ba-140, Ca-45, Fe-59, Co-60, Zn-65, Sc-46, Hg-203, Ag-110m, Bi-210, Cs-137, Xe-131, Kr-85, I-131, etc.)	8. NIOSH states in their ER, Section 7.2.4, that they "both demonstrated that employees with the greatest potential for internal intake were monitored, and determined that the available bioassay data can be used to reconstruct or bound potential internal radiation doses for those employees, with the exception of those workers who may have been exposed to Ac-227, Th-230, and Th-232, uranium, and stable metal tritides..." (a) Limited bioassay data exist for Pa-231 beginning in 1955, and these data are used for missed dose assignment and assessment of positive uptakes. These data may be supplemented with process data to estimate a bounding dose. TBD recommends using an minimum detectable activity (MDA) of 0.3 dpm for all exposures that			

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		occurred from 1954 to August 1955, when bioassay began. (b) Limited numbers of personnel were exposed to exotic radionuclides, and only limited amounts of material were handled. From technical and published reports, process data such as proportions of exotic radionuclides in process material can be determined and a maximum dose estimated.			
2	Indoor Rn-219, Rn-220, and Rn-222 airborne concentrations in SW and other buildings	ER concludes that available radon air concentration data collected from 1979–2000 can be used to derive the WLM values, as provided in Table 7-2 of the ER. The WLMs are assumed to be median values of a lognormal distribution with a geometric standard deviation of 3.0. For periods outside of radium and thorium processing, and Pa and Ac separation, for which air concentrations are not available, doses may be estimated based on the measured air concentrations and scaled backed based on available source term data from process information. Missed doses are calculated based on the background concentration of 0.5 pCi/liter.	SC&A questioned whether elevated radon levels were limited to SW process areas, and whether the very limited measurements prior to 1980 provided a valid basis to estimate an upper bound dose for radon, given the expected variability due to location, operations, and meteorological conditions. A confounding issue is that Rn-222 was not the sole source of radon exposure (i.e., Rn-220 and Rn-219 were also present in appreciable quantities). In response, NIOSH indicated in WG discussions that it had identified additional radon monitoring data and would provide its analysis when completed. That analysis was provided in a white paper to the WG on March 12, 2009. In this white paper, "Review of Mound Site Radon Doses Prior to 1979," a new methodology is proposed for estimating maximum levels of WLM to the respiratory tract for individuals exposed to radon progeny enhanced above background levels in R and SW Buildings at Mound during the period 1949–1979 (encompassing the already approved SEC period of 1949–1959). The new methodology would substitute for that of the current site profile, with a new table (Table 7) of WLM dose values by year for R and SW Buildings. Doses from Rn-220 and Rn-219 are assigned using the WLM-to-dose conversion factors in OCAS-TIB-0011. Key assumptions for this new approach include: (1) Radon doses from early (1954–1955) Old Cave measurements involving the "poorly-contained radium-actinium process" are assumed to bound any later radon to which workers were potentially exposed (i.e., end of cave operations to initial air concentration measurement). Highest average radon progeny dose values for three radium-actinium buildings used. (2) Sampling of tunnel gases conducted on October 12, 1979 in SW-19 is basis for assumed relative concentrations of three radon isotopes (Rn-222, -220, -219) of interest in SW Building (3) All individuals routinely assigned to	**Original SEC class approved by Board at its May 2010 meeting. WG to review additional NIOSH research conducted to clarify the class definition, as provided in "NIOSH Evaluation of Radon Issues at the Mound Laboratory" (October 2011).**	**N/A**

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			the R and SW buildings assumed to have been exposed to the maximum radon doses listed in the proposed Table 7. (4) Employment in R and SW buildings will be assumed for former workers having bioassay records for radiological work in these areas, and the presence of measured external doses (predicated on Mound requirement for workers assigned to process areas to have routine external and internal dose monitoring. At the May 2009 WG meeting, SC&A questioned whether the use of prior year radon data from a pre-D&D cave facility can be applied under existing "surrogate data" guidelines (those of the Board and NIOSH). NIOSH eventually agreed with the concern and the Board subsequently voted to recommend inclusion of all workers who either (1) have at least one tritium bioassay and worked at the Mound Plant from March 1, 1959, through March 5, 1980; or (2) worked in the R and/or SW Buildings at the Mound Plant for that same period (letter to HHS Secretary Sebelius, June 11, 2010).		
6	Interpretation of tritium bioassay data and exposure to stable metal tritides	Most of the tritium exposure at Mound was assumed to be related to uptake of tritiated water (HTO), which was effectively monitored. Tritium dose assessments were reliably measured starting in 1957. The internal TBD applies a correction factor to doses from MESH (multiple radionuclides and tritium dose data), so they will reflect the current model. The quantity and quality of available tritium urinalysis results are sufficient for estimating maximum dose or precisely estimating doses.	SC&A, in the SEC issues matrix provided to the WG on February 26, 2008, notes that, "The ER assumes tritium uptakes are from tritiated water and does not include a discussion on potential for exposure to other tritium compounds." It further observes that "there are no bioassay data from 1947–1956, although tritium was handled during that period." In its July 5, 2008, response to the issues matrix, NIOSH indicates that "as long as records are available for tritium bioassay, doses can be bounded regardless of the form of the material (tritides, HTO, etc.)." It further notes that various Mound databases contain 242,135 individual tritium bioassay records and quotes Meyer "that the program with the longest longevity at Mound is the tritium program." With respect to STCs, NIOSH indicates that "the technical basis document will be revised to include conditions for applying the STC technical information bulletin [OTIB-0066, which applies OTIB-0011]." A WG meeting held on July 14, 2008, did not address this matrix issue, but it was acknowledged in other discussions that how OTIB-0066 is to be applied is not yet clearly defined (it had not been applied to any individual DRs to that point in time) and that "case-specific information suggesting potential exposure is not common." A special technical meeting was held on this issue in a secure location on July 15, 2008, to address this issue. It was agreed by the WG members present (Clawson, Presley), NIOSH and SC&A, that a further "roadmap" review of STCs was warranted, as well as a NIOSH demonstration of how dose estimation would actually be accomplished on an individual worker basis (based, in part, on a list of implementation questions provided to NIOSH by SC&A).	**NIOSH proposal (10/14/11) for use of swipe samples before the WG for consideration.**	**SC&A to review NIOSH proposal and technical basis.**

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			Although STCs were not discussed at the WG's October 24, 2008, meeting, SC&A provided the Advisory Board a review of OTIB-0066 on November 25, 2008, that makes a series of findings (provided as excerpts below): • The types of STCs, the quantities handled, the time periods of potential exposures, and the physical behavior of the tritium compounds in the environment must be known to effectively develop and apply OTIB-0066. • OTIB-0066 does not ensure that resultant doses are based on adequate monitoring data. OTIB-0066 provides no guidance on how to distinguish between intakes of STCs, elemental tritium, and/or tritiated water which occurred simultaneously or overlapped at Mound. Among SC&A's recommendations was that "Characterization of the potential tritium exposure at a facility including STCs…is critical to the application of models in OTIB-0066 and must be documented more fully. Claimant favorable assumptions cannot be made in the absence of this information." On April 23, 2009, SC&A issued a white paper, *Response to Modeling of Intakes for Special Tritium Compounds*, that conveyed the key review and findings made for the November 25, 2008, OTIB-0066 review to the Mound WG for consideration. On June 30, 2009, and again, on April 7, 2010, secure meetings were held at DOE Germantown to discuss site-specific issues. Based on this information, at its July 27, 2010 meeting, the WG considered forwarding the tritides issue to the full Advisory Board for a vote, but held off pending additional research by NIOSH regarding the feasibility of using tritium swipe data for DR purposes for support workers in the period 1980 forward (including the D&D phase). Another key aspect of that review is whether those workers with exposure potential can be identified. That white paper was provided to the WG and SC&A on October 14, 2011.		
9	Evaluation of high-fired Pu-238 and uranium.	None cited in ER. Site profile indicates that Pu-238 compounds are more soluble than Pu-239, due to greater specific activity and, therefore, a more energetic alpha recoil for Pu-238.	The Evaluation Report (ER) was silent on the issue of relative insolubility of high-fired Pu-238 at Mound. SC&A noted that this phenomenon was found at Los Alamos from an incident involving radioisotope thermoelectric generators (RTGs) similar to those produced for a number of years at Mound. SC&A also noted that, at Rocky Flats for that SEC, NIOSH developed a special DR bounding model to determine internal dose due to similarly insoluble high-fired Pu-239.	**Issue 9 closed at 7/27/10 WG meeting.**	

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			NIOSH responded in its July 3, 2008, white paper (LaBone and Brackett), that the LANL experience (documented in James et al.), is not the same as that observed for high-fired Pu-238 at Mound, as determined in its review of 896 urinalysis cases. And, that in any case, a bounding solubility-based model can be developed based on this available urinalysis data. SC&A, in its October 17, 2008, white paper, noted that Wood and Sheehan (1971) had established this phenomenon existed, based on their review of uptakes of Pu-238 during an incident at Mound in 1960, and that it was indicative of highly insoluble ceramic Pu-238. SC&A identified several Pu-238 urine excretion plots for individual Mound workers where it appears plausible that their intakes involved this highly insoluble Pu-238, bringing into question the assertion in NIOSH's previous white paper that there are no clear urinary excretion patterns similar to those identified from the LANL incident. Finally, SC&A concluded that while agreeing "conceptually" that a model can be developed for dose estimation, the realistic application of such a model to specific Mound cases would need to be demonstrated, given a number of implementation issues that were identified. One such issue, particle size, was discussed at length (by Paul Ziemer) during the October 27, 2008, WG meeting, because it would clearly influence any model application. NIOSH acknowledged in its responding January 30, 2009, white paper that exposures to special solubility types of Pu-238 did occur at Mound and proposed for "Type L" Pu-238 at Mound, a dissolution model to describe Pu-238 urinary excretion patterns based on the five Mound intake cases reported by Wood and Sheehan (1971). NIOSH also noted that (1) because the urinary excretion rate can be relatively low immediately after an inhalation intake, this can result in an intake not being confirmed if urinalysis is used to confirm the intake and no other samples are taken; and (2) because standard practice for a positive urine result without a known intake date is to follow the ICRP recommendation to use the midpoint between the positive result and the last "less than" result, this would lead to inconsistent results (some high, some low) depending upon the solubility class assumed (e.g., Type M vs. Type S; Type J vs. Type L). NIOSH then proceeded to illustrate how it would address the two questions. Their proposed approach is to apply their "Type L" dissolution model as a bounding one for Mound workers exposed to special solubility type Pu-238.		

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			SC&A, in a responding white paper of April 2009, concluded that "NIOSH has not yet demonstrated the feasibility of a bounding model to be used in DR for Mound workers exposed to special solubility type Pu-238 in urine for several months after an event…[nor] that claimant favorable doses can be calculated for monitored workers, and that results lower than detection limits can be interpreted correctly or in a claimant-favorable way." Finally, while agreeing "conceptually" that a bounding model can be developed, SC&A again reiterated that the realistic application of that model to specific Mound cases needs to be demonstrated ("proof of principle") such that the SEC test of "sufficient accuracy" can be met. This paper was backed up by urine excretion plots of [**redacted**] Mound workers involved in Pu-238 exposure incidents in the mid-1960s, which resembled the patterns found for the [**redacted**] workers addressed in Wood and Sheehan. These plots show that NIOSH's proposed Type L model is not bounding for these results, which may be due to the presence of multiple absorption types that are not bounded by NIOSH's proposed model. Finally, the use of gross alpha measurements prior to 1966 may confound identifying urine excretion patterns for Pu-238 due to the presence of other alpha emitters (although NIOSH contended during the October 2008 WG meeting that for Pu-238 operations, this factor would be negligible). A technical conference call was held between the WG, NIOSH, and SC&A on June 19, 2009, and another SC&A white paper based on that call was provided to the WG and NIOSH in July 2009. Following additional review by NIOSH and a commitment to make dose reconstructors aware of available solubility-based excretion models (i.e., "Type J"), the WG closed this issue as an SEC issue.		
10	D&D era bioassay	NIOSH to continue to investigate whether mismatch between bioassay requirement and exposure potential constitutes SEC issue.	SC&A indicated in its SEC issue matrix that: *Evidence exists of worker exposure to residual contamination from sources generated during the life of the plant, particularly during D&D activities, for which bioassay has not been performed or (in the case of Ac-227) performed adequately. Lapel sampling and DAC-hour tracking were used as a primary means of tracking internal dose, rather than through routine bioassay. Samplers were assigned randomly to a group of D&D workers and may not have represented the most exposed individual. Reliance on cohort lapel air sampling without the benefit of routine bioassay may lead to missed intakes.*	**NIOSH has provided a white paper responsive to the issue of whether lack of termination bioassays would hamper dose reconstructability for D&D workers.**	**SC&A to review NIOSH white paper.**

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			This issue had been deferred during the course of Advisory Board WG review awaiting NIOSH's further investigation regarding Price Anderson issues. The WG has since requested that SC&A further elaborate on its concerns regarding the ER's treatment (or lack thereof) of the D&D era from the standpoint of dose reconstructability. SC&A subsequently provided a three-page memo on June 17, 2009, to the WG outlining its concerns. In response to SC&A's memorandum, NIOSH issued a white paper, *NIOSH Evaluation of Termination Bioassay Compliance During Decontamination and Decommissioning of the Mound Laboratory* (April 2010).		
11	Adequacy of internal dose records [Petitioner Issue]	NIOSH found that the available monitoring records, process descriptions, and source term data available are sufficient to complete DR for the proposed class, with the exception of Ac-227, Th-228, and Ra-226 from February 1, 1949 through August 17, 2007.	SC&A provided the following SEC issue matrix summary: *Historic methods for interpretation of bioassay data are unclear, because of the absence of units, lack of specification of isotopes, lack of information on the age and chemical form of elements, and cumbersome mathematics used in the derivation of the results. The effectiveness of early radiobioassay methods is questionable, because of issues such as chemical recovery, ability to detect radionuclides in urine, sampling frequency, interferences from other radionuclides, and chemical solubility. Specific examples of questionable effectiveness of early radiobioassay at Mound include the following:* *(a) The low recovery for polonium urinalysis (average of about 10%) and reduced recoveries in samples with higher activities* *(b) Thorium urinalysis data for insoluble forms of thorium have been shown to be ineffective in detecting thorium uptakes prior to the implementation of chest counting and/or a routine fecal sampling program* *(c) Use of surrogate radionuclides such as thorium and radium for determination of Pa-231 in urine, with an absence of thorium and radium in the source material* *(d) Uncertainties in the counting method applied to bioassay samples (e.g., gross alpha, gross beta)* *(e) Development of uncertainties for internal dose in the absence of bioassay uncertainty values*	**Combined with other internal dose adequacy and completeness issues (see above)**	**N/A**

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			NIOSH has developed a coworker model for assignment of missed plutonium and polonium dose. The coworker model is based on the assumption that bioassay data are sufficiently accurate to be used in assigning dose to unmonitored workers; however, the basis for this assumption has not been sufficiently substantiated in light of identified limitations associated with early bioassay data documentation and effectiveness. SC&A provided two white papers, *Mound Internal Dosimetry Data Adequacy* and *Mound Internal Dosimetry Data Quality Assurance*, to the WG and NIOSH in April 2009 that addressed these and other issues. This issue was discussed at the May 27, 2009, WG meeting. NIOSH issued its white paper, *NIOSH Evaluation of Data Adequacy and Completeness Issues at the Mound Laboratory*, in November 2009. At the January 6, 2010, WG meeting, this issue was combined with the other issues (#1, 3, 4, 8, 12, and 13) above, and SC&A issued *Mound Internal Dosimetry Data Adequacy and Completeness* in June 2010.		
12/13	Internal dosimetry data completeness	NIOSH found that the available monitoring records, process descriptions, and source term data available are sufficient to complete DR for the proposed class, with the exception of Ac-227, Th-228, and Ra-226 from February 1, 1949, through August 17, 2007. Monitoring records have undergone extensive QA. (a) Forty-three of the 458 boxes were returned to Mound to support the pre-1989 DR effort, because it was believed bioassay data were contained in them. The record copies were imaged and indexed. Documents were copied to hard	Mound has both primary and secondary sources of internal monitoring data. Electronic databases include PURECON (for primarily Pu), PORECON (for Po), and MESH. Verification of 'other radionuclide' inclusion in available electronic databases is necessary, particularly for those workers with doses <20 rem who were not covered in the Pre-1989 Dose Assessment Project. Data from other radionuclides, urinalysis laboratory logbooks, tritium urinalysis data, 24-hour Sample Urinalysis Weekly Reports, and the "J.B. Blackbinder" should be compared against electronic records proposed for use in DR and the coworker model. Validation is needed that radionuclide data other than plutonium and polonium for the entire period of operation are available in databases and individual exposure records. Some evaluation of the availability of tritium urinalysis data in the electronic and hardcopy individual exposure records should be completed. If data integrity and completeness cannot be demonstrated, then DR with sufficient accuracy will be in question. (a) The petition raises the issue of Mound Plant Employee Health Records being removed from Mound and buried in Los Alamos, New Mexico, without the knowledge or permission of the Department of Labor, because they were contaminated (SEC 2007). A total of 458 boxes containing contaminated classified records were shipped to LANL for imaging. Forty-three of these boxes were retrieved; however, the criteria for selection of these boxes are not explained in the ER. In addition to	**Combined with other internal dose adequacy and completeness issues (see above)**	**N/A**

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		drives and CDs. One set was sent to National Nuclear Security Administration (NNSA) and the other to the Office of Scientific and Technical Information (OSTI) in 2003. (b) The 1,639 potentially contaminated laboratory notebooks were electronically imaged into a searchable classified records database. The images became the official record, and the contaminated notebooks were buried in Nevada. The electronically imaged records replaced the buried logbooks.	personnel monitoring records, this collection included records relevant to environmental monitoring, field radiological control measurements, incidents, and special health physics issues. The remaining 415 boxes were not imaged, and approval was given for destruction of these records. Some verification that the pertinent records were retrieved from the 458 boxes should be conducted as part of data completeness review. (b) The ER indicates the logbooks were imaged; however, there is no indication that these records were reviewed for their pertinence to the SEC petition and DR. Some verification should be conducted that appropriately complete imaging of these logbooks was done as part of data completeness review. SC&A provided white two papers, *Mound Internal Dosimetry Data Adequacy* and *Mound Internal Dosimetry Data Quality Assurance*, to the WG and NIOSH in April 2009 that addressed these and other issues. This issue was discussed at the May 27, 2009, WG meeting. NIOSH issued its white paper, *NIOSH Evaluation of Data Adequacy and Completeness Issues at the Mound Laboratory*, in November 2009. At the January 6, 2010, WG meeting, this issue was combined with the other issues (#1, 3, 4, 8, and 11) above, and SC&A issued *Mound Internal Dosimetry Data Adequacy and Completeness* in June 2010.		
14/15	Neutron doses from polonium, plutonium and other radionuclides	ER indicates neutron energy reported at approximately 4.5 MeV, which is reliably monitored by NTA film. Wide availability of photon measurements makes determination of n/p ratios possible to provide bounding dose estimates. Unmonitored neutron doses may be bounded using n to p ratios based on Mound data. NIOSH has considerable Mound NTA processing data, providing another option to validate claimant favorability of calculated neutron dose (PuF_4 source calibration most similar to neutron spectra in Mound plutonium facilities). NIOSH concludes that NTA film sensitivity to low energy neutrons and track fading are not	Neutron exposures at Mound occurred over a number of years (1949–1990s) under various conditions. There were different source types (PoBe, plutonium), a range of moderators and thicknesses (plastic, Benelex), and a number of building locations (R, SM, PP, etc.) involved. NTA film was used for neutron dosimetry from 1949–1977 and TLDs used after 1977. The 0.5 MeV threshold, decreased response below 1 MeV, and track fading of NTA film presents issues when using the neutron dose of record for DR. Previously, SC&A has brought up some of these issues concerning the sources/conditions used for calibration compared to the potential radiation fields the workers may have been exposed to, the resulting response of the dosimeters, the dose of record, and any neutron to photon (N:P) dose ratio values or coworker dose data that may be derived from the recorded data. In response to these issues and WG meetings of July and October 2008, NIOSH provided a white paper, *Neutron Dose Reconstruction at Mound*, dated March 18, 2009. In this white paper, NIOSH recommends applying correction factors (CFs) to the dose of record to compensate for the portion of the neutron dose not recorded because of the characteristics of NTA film. NIOSH proposes that the dose of record can be made claimant	**Review completed. WG decision pending.**	

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		SEC issues.	favorable for individual DR and N:P values can be derived, with maximum neutron exposure conditions determined, using the dose of records and appropriate CFs. In addition, NIOSH constructed coworker neutron dose data using categorically recorded dose data for certain years. A technical conference call was held between the WG, NIOSH, and SC&A regarding these issues and notes summarizing the call were placed by NIOSH on the O-Drive. During the May 27–28, 2009, WG meeting, SC&A indicated that while some of these adjustments proposed by NIOSH in its white paper are clearly in the context of site profile issues, others have SEC significance. For example, the use of a generalized model (MCNP) to determine dose below 0.5 MeV (NTA threshold of response) in the absence of both Mound-specific neutron energy spectra measurement data and workplace geometry characteristics may not be plausible in that there is no way to demonstrate that such a model would bound conditions and doses at Mound (in fact, there is evidence for at least one Mound facility, the PP facility, that a correction factor of 2.0 should be applied, rather than the 1.56 calculated by MCNP). The issue is that the model is not based on any site-specific data and has not been compared with any such data for validation purposes. While OCAS-IG-004 provides for the use of surrogate data in the absence of facility data; in this case, a presumption of physical plant similarities has guided the application of a generalized model based on measurements at other DOE facilities without sufficient validation. Also, a neutron dose coworker model (photon or neutron-based) has not yet proven useable and verified against sample comparisons with doses of record. On December 9, 2009, NIOSH issued a slightly revised version of their white paper concerning neutron DR at Mound. At the WG's request (1/5–6/10 mtg.), NIOSH extended its MCNP sensitivity analysis calculations for neutron exposure using up to 12 inches of shielding and provided a response regarding impact on resulting MCNP-based dose calculations. In its subsequent review, SC&A concluded that while the MCNP model can be used to assess upper bounds to the potential doses not registered by NTA film at Mound, the use of NIOSH's adjustment factors, ranging from 1.04–2.5, as listed in Table 4-3 of NIOSH's December 9, 2009, white paper (which include threshold, track fading and angular correction factors) are not sufficiently accurate to bound neutron exposures at Mound. Additionally, some of the correction factors for the coworker neutron dose data and the calculated N:P values were derived from the results of this MCNP model. The derived N:P values to be used for		

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			unmonitored workers vary widely from year to year, and the coworker neutron dose data from NTA film readings were based mainly on the assignment of missed dose, which is a function of exchange/reporting cycle, rather than on actual measured individual doses. At the July 27, 2010, WG meeting, SC&A and NIOSH discussed its remaining issues, including use of MCNP-based calculations and accuracy of adjustment factors (particularly NTA fading). On December 7, 2010, NIOSH provided a response to SC&A's issues on the NTA fading issue and MCNP-based calculations. On January 20, 2011, SC&A provided the WG and NIOSH with a memo titled, *Comments on NIOSH Evaluation on NTA Neutron Film Fading at Mound*. In that review, SC&A found that the issue of MCNP-based CFs was largely resolved, but that the energy dependence of track fading in the NTA film with humidity and temperature effects were not adequately addressed. In response, NIOSH issued its white paper, *NIOSH Evaluation of Current Status of Neutron Issues at the Mound Laboratory* (March 2011). That report addressed the three remaining action items from the WG: (1) NIOSH to respond to SC&A's concerns regarding MCNP, specifically comparing the respective SC&A and NIOSH MCNP analyses to determine the reasons for the difference in results; (2) respond to WG questions on NTA film track fading; and (3) review the NTA data for 1951–1960. In its October 2011 response, SC&A found agreement with NIOSH's response on Issue 1 (MCNP-based calculations); agreement on Issue 2 (but SC&A noted that while the Mound TBD-6, page 30 recommends these fading values be applied for NTA film for the period 1949–1976, NIOSH's Mound neutron evaluation white papers of March 18, 2009, and December 9, 2009, both recommend 9%/wk fading CF); and agreement for Issue 3, in that there is a means to mitigate SC&A's remaining concern, i.e., that the lack of badge cycle data is needed to use the neutron dose data already available. (NIOSH lists matched neutron-photon doses for each year for 1949–1977 in Table 4-4, page 21, of their December 9, 2009, white paper. These individual NTA recorded neutron doses could be used to create a coworker database, instead of using the categorical data presently recommended by NIOSH. The number of matched neutron-photon pair data in Table 4-4 appears sufficient to provide reasonable neutron dose statistics for coworker purposes.) Therefore, SC&A believes there are no remaining SEC issues.		
16	Beta/low-energy photon exposures from Po processing, Pu-238, and other radionuclides	ER assumes design of T-Building processing areas "controlled" beta dose rates to significant extent; site therefore did not record beta dose.	In its original matrix issues, SC&A responded that processing of Po was not the only source of shallow doses. Shallow dose estimation should encompass all areas, not just T-Building. Plutonium, with its low-energy photons, was introduced to the site around 1956; however, shallow doses	**Issue 16 closed at 1/5–6/10 WG mtg.**	

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		NIOSH is confident it can bound dose, if necessary, ***using n to p ratios***. Most [Pu-238] processing took place after non-penetrating doses from beta and low-energy gamma radiation began to be monitored; therefore, doses are available for "most exposed workers." Electron doses can be estimated more precisely than maximum doses in most years at Mound; however, for years when open-window doses were not read or recorded, sufficient information is available to estimate maximum doses to the organs for which shallow dose is calculated. Therefore, NIOSH can bound the dose with sufficient accuracy.	were not routinely recorded until about 1968, and there were problems with readings as late as 1977 using TLDs, and perhaps later, as no beta calibration was performed before 1979. It has not been technically demonstrated that sufficiently accurate dosimetric methods were in place to measure and record workers' shallow doses, or to create a coworker database, to allow adequate shallow DR during the period 1949–1978 for shallow tissues. This is especially applicable to the period 1949–1967, when no sufficient shallow dose records existed, and operating/exposure conditions would have been sufficiently different than when reliable coworker data were likely available for much later periods, 1980s and 1990s. This would preclude establishing upper bounds or coworker doses for previous workers. NIOSH, in its written response, explains the absence of beta dose data in MESH by stating that either none were detected or that they were below "tolerance" levels. NIOSH suggests that in early days, lower energy gammas would have been evident to the personnel processing badges as a darker region on developed film and, at any rate, a study done by Meyer using TLDs in 1978 can be used to back extrapolate to the plutonium and polonium era (with the additional proviso that relatively few workers would be compensated for the associated cancers). NIOSH has indicated that after Mound stopped receiving irradiated slugs from Hanford there was not an issue with beta exposure. SC&A, in its response at the working group meeting, noted that this issue can be segregated into improper or no calibration for beta dose, and a large gap in the recording of beta dose in the dosimetry records. There was no dosimeter calibration for the beta component of the film badge before 1979. When they finally started doing calibrations, Mound initially failed to obtain the correct dose. In fact, the beta exposure was not recorded in the record from 1950–late 1970s. There is also a low energy gamma component which will show up as open window dose. There was a general policy to read these if the film looked dark. Even though they may have read this component, there was not an appropriate calibration. NIOSH observed, in response, that in any case, skin cancer would be the most common cancer linked to shallow dose and this is not an SEC relevant cancer. NIOSH acknowledged that there is a gap in recorded and calibrated beta doses prior to 1978, but that an inferred upper bound estimate can be made based on gamma dose recorded.		

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			The working group requested that NIOSH provide claimant case information for cases of skin, breast, lip, and other cancers for which low energy photon and beta exposure may contribute for 1949 (post-SEC period) forward. NIOSH provided 108 cases involving skin cancers in October 2008. SC&A analyzed 18 of the 108 claimant cases and found that when shallow dose was assigned from the dose of record (4 cases out of 18), it was assigned without any adjustment factors. In March 2009, NIOSH provided its white paper, *Review of Mound Site Shallow Doses Prior to 1991*, in response to SC&A's original finding that Mound workers' dose of records may be incomplete or inaccurate for shallow doses. In this white paper, NIOSH provided an outline of the potential operations/programs (along with their approximate time periods) that could result in shallow dose exposures; Mound's dosimetry capabilities during certain periods; and recommended adjustments to, and accounting for, shallow doses during these operation/program periods. NIOSH recommends assigning shallow doses as a function of a ratio of photon recorded doses for certain workers for certain periods. SC&A's review of the March 2009 white paper concluded that, for the most part, NIOSH's approach provides a tractable means to assign shallow doses to Mound workers who may have been exposed to low-energy and/or beta radiation for the period 1949–1978. SC&A's concerns were in the vein of technical issues that were of "site profile" character that do not affect dose reconstructability. The most significant of these comments is the need to extend NIOSH's approach from 1979 until DOELAP accreditation was in place to ensure adequate shallow dose estimation was being accomplished. On September 9, 2009, NIOSH issued a white paper, *NIOSH Evaluation of Shallow Dose Questions at the Mound Laboratory*, to further address SC&A's concerns. A summary of NIOSH's proposed shallow DR procedures was listed in Table 1 of that report. Recommendations in Table 1 of NIOSH's September 2009 white paper extend the time period covered in Table 4 of the March 2009 white paper up to the DOELAP accreditation in June 1991, which was the period of concern previously expressed by SC&A. At the January 5–6, 2010, WG meeting, this issue was closed.		
17	Monitored workers were the most highly exposed workers	Since all workers entering radiation-controlled areas were required to wear a dosimeter, it is certain that those receiving the highest dose were	SC&A responded in its February 2008 SEC issue matrix that "neither [the TBD] nor the ER provides any detailed criteria for badging workers for betas, photons, and neutrons;" only the assertion that the most highly exposed were badged. The criteria or guidance that were used to	**Issue 17 closed at 5/27–28/09 WG meeting.**	

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		monitored. Because the workers who were monitored were the most highly exposed, as well as those most likely to be exposed at all, all worker doses may be bounded by assignment of a proportional dose from neutrons, as described in *Neutron Dose*, Section 7.3.4.3.	determine who was badged and for what type of exposure, facility, and time, needs to be determined to assess if workers were appropriately badged to allow adequate DR, and if that data can be used to create a coworker database that is sufficiently accurate to be used for unmonitored workers. The possibility that there was "cohort badging" can be ruled out only after a specific investigation on that topic. NIOSH, in its July 5, 2008, written response, notes that Mound historic exposure records are extensive and no evidence exists for cohort badging, and in any case, that would not preclude development of a coworker model. However, in the July 14, 2008, WG meeting, SC&A noted that NIOSH did not locate any documented badging policy (NIOSH did point to policy-related documents and memorandums from Meyer as indicative of the existence of such a policy). SC&A also commented that it had not found any documented evidence of a systemic problem in this area; neither has it located documented evidence of a formal, written and enforced policy governing badging requirements at Mound. Of particular concern would be unbadged exposure of workers who had site-wide duties that included radiological areas or those that may have occupied ostensibly non-radiological buildings that may have had legacy contamination. SC&A indicated to the WG that it would defer further comments on this issue until it had an opportunity to review additional onsite records (an onsite data capture was scheduled for the month of August 2008). As a follow-up to this discussion, the WG chair also requested that SC&A provide a review of any Mound ostensibly "non-radiological" buildings that may have contained sources of radiation exposure to which non-badged personnel may have exposed. In response to this last request, SC&A provided a white paper on August 6, 2008, regarding "Buildings 48, 89, M and DS at Mound." SC&A found that workers in Buildings 48, 89, and M handled radioactive materials and may have also been exposed to legacy contamination. The DS-Building was built atop the T-Building, which processed significant amounts of radionuclides (notably, large quantities and contamination levels of tritium), and deserved special attention. SC&A recommended that, "NIOSH should undertake an assessment to determine: (a) potential exposure pathways during the operations of T and DS Buildings; and (b) if data is sufficient to enable radiation dose reconstruction for workers who might have been exposed in buildings 48, 89, M, and DS."		

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			In the ensuing discussion at the October 27, 2008, WG meeting, NIOSH indicated that it was withholding its response until it could review all applicable references (SC&A has provided several such references that were cited in the August 6th white paper). NIOSH also commented that it is unclear why these particular buildings would be considered non-radiological buildings, since it was apparent, at least from the Wayne King report, that they handled some radiation sources over time; and even if they had not, it would not follow that workers would not have been badged because they may not have exceeded the dose criteria for such badging (100 mrem TEDE at the time). It was commented that the apparently high activity levels may not necessarily have equated to radiological conditions requiring external radiation badging, given that tritium was largely a bioassay issue. There was also some question as to whether SC&A had reviewed the latest version of the Wayne King report that contained some information regarding radiological sources in DS Building. As indicated at the May 28, 2009, WG meeting, without any documentation identified to date, SC&A believes there is no way to establish how workers at Mound were badged for external radiation exposure in the early years. NIOSH claims that since all workers entering radiation-controlled areas were required to wear a dosimeter, it is "certain" that those receiving the highest dose were monitored. However, SC&A has questioned such "certainty" as unfounded, since there is no corroborating information. SC&A's initial attempt to "test" this thesis by reviewing four ostensibly non-radiological buildings at Mound to determine if any radiation exposure sources may have existed to which non-badged personnel may have been exposed, was countered by NIOSH as not demonstrating anything, because radionuclides such as tritium are of internal dose concern and it would not necessarily follow that badging would be needed. SC&A interviews with former Mound workers tend to corroborate NIOSH's contention that all workers entering radiation areas were to be badged (and bioassayed). Despite the absence of formal policies or other documentation, there have been no complaints or issues presented from the workforce indicating inadequate badging.		
18/19	Adequacy and completeness of external dose records	As discussed in Section 6.1, annual measured doses are available for all monitored employees. Records of radiation exposures from personnel dosimeters are available from the	SC&A observed that there had been no verification that the MESH database contained sufficiently adequate and accurate dose data for performing DR. There were dose records available on the MESH database; however, SC&A had not been able to locate documentation that validated this data for use in DR. Neither the Mound TBDs nor NIOSH's	**Issues 18/19 closed at 5/28–29/09 mtg.**	

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		beginning of operations, and for all years of the proposed class time period. The MESH database serves as the primary electronic repository for these records.	ER provided details concerning the control of data as it was transferred between the various record systems to ensure data accuracy (data integrity), and that all the data were transferred from all records (data completeness). If data integrity and completeness, cannot be demonstrated, then adequate DR cannot achieved for that period. This issue was briefly discussed during the 1 April 2008 WG meeting. In May 2008, SC&A analyzed 22 Mound cases concerning dose data adequacy, completeness/integrity. It should be emphasized that this study was based on a very limited sample. In fact, only about 5% of the claims were analyzed, 22 out of 447, and this was limited to a period when there were some original data. The handwritten, original data only started in the 1950s and go to the 1960s. In the 1960s, there were some handwritten summaries of yearly exposures up through 1968. And after that, there are no original data to compare it to and so this is based strictly on the 1950s and 1960s. These handwritten data that were available for these 22 cases were compared to the dose values found in the MESH database on the O-drive. The summary results were as follows: Data adequacy – In this limited sampling, it was found that workers that should have had doses recorded had doses recorded for the most part. There were some gaps, but no long periods when a worker should have had a dose of record, but did not. Data completeness and integrity – For the 22 cases analyzed that had handwritten data, no significant errors were found in the transfer of the data; this analysis was limited to just the originals found in the 1950s and 1960s, compared to the MESH database. There were no originals for the 1970s and 1980s that could be compared to the MESH database. SC&A did not find from this very limited sample anything that indicated that there was a problem with the transfer and recording of the data from the old system to the new. However, SC&A did find that the MESH database put zeros in when zeros were read, it put positive values when there were positive values, but it also put zeros in when there was no monitoring. The original, handwritten cards might have a dash or a blank for a cycle, but the MESH database automatically put zeros in. This applies to shallow as well as deep dose entries. Additionally, SC&A found that in the MESH database, the ***low gamma*** column and the ***neutron*** column are reversed. A check of several		

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			DR cases already performed by NIOSH shows that the dose reconstructor used the correct dose values from these two columns. In this limited sampling of 22 cases, SC&A did not find anything that would point to a serious problem with data adequacy, or completeness/integrity for external DR.		
20	Ambient Environmental Internal Radiation Dose Contribution	The ER states that "Mound did not generally experience significant site-wide ambient contamination, and there was less concern about the potential for internal dose related to ambient working conditions."	In the March 17, 2008 issue matrix, SC&A indicated that it "disagrees with this ER statement in light of the contaminated canal, thousands of leaking storage drums, a couple of thorium-contaminated soil locations on site, leaking waste lines, elevated radon emitted from radium and thorium operations and storage sites, and statements by interviewees regarding stacks that were inadequately monitored." SC&A went on to note that "petitioners raised several issues related to potential exposure to legacy contamination in non-radiological areas" and "given that the officially estimated source terms for air emissions at other DOE sites have been shown to be incorrect in the past…the validity of the environmental air emissions source term cannot be assumed *a priori;* it needs to be established by actual analysis of historic monitoring protocols and practices." At the April 1, 2008, meeting, SC&A noted that this was a secondary issue, one that was included because of objections to the way it was worded in the ER; that it was likely leaning toward a site profile issue as a function of how NIOSH is addressing contributions from historic contamination issues. NIOSH indicated at the meeting that they "wouldn't be opposed to removing [the] statement [that Mound] didn't experience site-wide ambient contamination." An ORAU team staff member went on to explain that they would take a "maximum value" for ambient contamination and assign that. SC&A, for its part, indicated that it would provide some examples for past DOE air emissions that have been shown to be incorrect. NIOSH responded in its July 5, 2008, item-by-item response that "none of [SC&A's] examples of localized contamination is relevant to NIOSH's conclusion about site-wide contamination." In general, NIOSH indicated that in none of the examples raised were workers routinely exposed to the contamination in question. NIOSH also did not accept the assertion that there have been instances where the validity of the environmental air emissions source term has been in question without further details. At the May 2009 WG meeting, SC&A again notes that this was listed as a secondary SEC issue, pending clarification by NIOSH regarding its	**Issue 20 closed at 5/28–29/09 meeting.**	

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			wording in the ER. That clarification was provided at the July 14, 2008, WG meeting. SC&A recommended WG acceptance of NIOSH's practice of a "maximum value" being derived for Mound's occupational environmental ambient dose, while at the same time accepting NIOSH's offer to remove its statement that Mound did not experience site-wide ambient contamination.		
21	Concerns regarding the 1991 Ac-227 urine samples	Samples not analyzed for number of years; also QA issues found. Subject of PAA violation and actions. ***NIOSH investigation for dose reconstruction significance ongoing.***	In its ER, NIOSH indicated that during interviews with former Mound workers, "a concern was raised regarding Ac-227 urine bioassay samples collected from employees involved in the "1991 R-Building Corridor 5 D&D job." The root of the concern is that these samples were not analyzed for a number of years and there were quality assurance problems with them, all of which resulted in Price Anderson Act violations. At the time of the ER, NIOSH decided it would continue to investigate this issue for its impact on DR. At the July 14, 2008, WG meeting, NIOSH presented a white paper on the subject ("Draft Summary of PAAA Actions for the Mound Site") that provided a brief description of each of three DOE enforcement actions, relevant dosimetry details, Mound's subsequent response, and any SEC implications. It also provided a chronology of Ac-227 problems, as an attachment. Issues addressed in these enforcement actions involved the administration of the Mound Plant's bioassay program, and methodologies for determining and assigning internal dose to workers, including MDAs not being current, decision levels (DLs) not being used, and some workers not receiving bioassay analyses as required by Radiation Work Permits (RWPs). Failure to submit bioassay samples involved approximately 20 RWPs and 108 workers. During this July WG meeting, the WG raised several issues regarding NIOSH's interpretation of its ability to reconstruct the doses of affected workers for two of the RWPs in question. SC&A indicated that it could not provide a definitive review of these issues without doing its own sampling review of the RWPs to ascertain whether after-the-fact bioassay sampling could be used for dose estimation purposes. NIOSH indicated that the issues associated with the miscalculation of the DL and the use of the minimum detectable concentration did not constitute an SEC issue. NIOSH also indicated that they had not found the list of individuals who were cited in the PAAA report; however, they were able to identify all individuals who had signed in on the RWPs. In any case, NIOSH noted that it has an internal coworker model for Mound that addresses unmonitored dose.	**Issue 21 closed at the 1/5–6/10 meeting.**	

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			Based on the presentation and comments at the July 14th meeting, the WG assigned the following actions: (1) NIOSH to identify the individuals who entered WD Building the day of the filter work who were not directly involved in the filter change. (2) NIOSH to provide the RWP table names from which they obtained data for the two RWPs reviewed. (3) NIOSH to verify that individuals on the RWPs did have follow-up samples. (4) SC&A to propose a sampling regime for working group consideration and upon approval, proceed to evaluate issues associated with dose estimation for individuals involved with the RWPs in question. In addition to the above, NIOSH indicated it would review all 20 RWPs and compare them to the radionuclide "road map" being compiled for Mound operations. A follow-up document was provided by NIOSH on August 21, 2008, that addressed action items 2 and 3 above. From January 1, 1997 to May 15, 1997, at least 76 workers signed in on an RWP roster associated with at least one of [19] RWPs and did not submit required bioassay samples; however, no list of the 76 workers cited in the PAAA documentation was located. Therefore, NIOSH reviewed the bioassay records of all workers who signed in on one of the 19 RWPs. MESH data indicate that all but 11 workers submitted the required bioassay by the end of 1997 and that over 96% of the required bioassays were submitted. RWP table names were provided in response to action item 2. An SC&A white paper was submitted on October 17, 2008, in response to SC&A's action item. SC&A further evaluated the bioassay history of the 11 individuals above. SC&A observed that the NIOSH white paper did not propose how the dose for those not submitting bioassay samples after the last entry or in a timely manner will be determined. The self-assessment conducted by Mound only included selected RWPs from late 1996 and early 1997; the extent of this issue for other time periods and RWPs is unknown, particularly for early periods. This raises a broader issue of the adequacy of internal monitoring data, which may have SEC		

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			implications (addressed in matrix issue #11). A detailed matrix was provided (as an attachment) that indicates SC&A's position on each of 24 relevant PAAA issues as they pertain to NIOSH's analysis provided in its white paper and follow-on document. In terms of concerns regarding the 1st enforcement action involving application of MDAs and DLs, SC&A concurred with NIOSH's conclusion that an assumption of an MDA over a DL for a calculation of missed dose would result in a higher dose, which is claimant favorable. For the 2nd enforcement action, SC&A concurred with NIOSH's conclusion that bioassay program issues (e.g., inadequate sample turnaround times, delays in receipt of samples by outside vendors, delays in certification, etc.) do not constitute an SEC issue, as long as samples were not invalidated as a result of delays. However, the WG requested that NIOSH identify the individuals who entered the WD building the day of the filter work in question. For the 3rd enforcement action, where RWPs failed to include all radioisotopes of concern, SC&A agreed with NIOSH that bioassay samples submitted after the event permitted DR. SC&A also concurred with NIOSH that other identified irregularities (e.g., delayed turnaround times associated with a new computer query system, incomplete treatment of an un-reviewed safety question) are not SEC issues. SC&A noted that two unresolved issues remained pending additional information from NIOSH: (1) A remaining NIOSH action is to identify the individuals who entered the WD building the day of the filter work in question. (2) NIOSH's white paper indicated that additional work is ongoing to determine the identity of 15 individuals who had unanalyzed bioassay samples in 2000 (subsequent Ac-227 samples were submitted by 4 of the 15). During the October 27, 2008, WG meeting, NIOSH indicated that an additional action item had been prepared entitled, *An Analysis of the Other Workers Who Entered the WD Building When its Ventilation was Shut Down and It Was Not Posted for Full-Face Respirator Use as Required (Potter 2008)*. (It was acknowledged that it had not yet been issued to the WG, but was later issued on October 30, 2008). A briefing on this document indicated that NIOSH had identified [**redacted**] workers who had signed in on RWP number LW-015-098, with [**redacted**] of		

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			[redacted] not having any results above the decisional level. All individuals identified submitted plutonium, thorium, and americium bioassay within 4 months after the completion of the filter change job. The individuals not directly involved in the filter change, but entering the building on the day of the filter change, submitted the appropriate bioassay to cover the identified radionuclides on the filter change RWP. As such, SC&A agrees that this issue does not preclude DR. Also discussed during the WG meeting was the status of NIOSH's review of the 15 unanalyzed Ac-227 samples discovered in 2000. NIOSH noted that 11 of the 15 did not have samples collected after the date of the samples found stored at Mound; of the four that did, they have been unable find the identity of the individuals involved. NIOSH is also planning to further verify matches between actinium bioassays in MESH to the actual workers who gave the urinalysis samples (it was noted how difficult this was turning out to be). In a subsequent inquiry to NIOSH on this issue, they responded on December 23, 2008, that while "numerous attempts to identify the individuals involved were made, including document reviews, database queries, interviews with former Mound workers, …" they had not conclusively matched the samples taken with the event, itself, and accordingly, with the individuals involved, although the circumstantial evidence appears persuasive (i.e., these individuals meet the same criteria as the 11 who had no samples subsequent to the sample date on items in the refrigerator. In its April 2, 2009, white paper, SC&A raised the following "bottom-line" questions with respect to the feasibility of DR that need to be addressed: (1) *How will dose reconstruction be completed for individuals who entered under RWPs without appropriate tritium bioassay and did not submit a post-job tritium bioassay sample in a timely manner?* (2) *How will dose reconstruction be completed for individuals who entered under RWPs without appropriate plutonium, thorium, uranium, radium, actinium, and/or americium bioassay samples that did not have a follow-up sample to those discovered in 1995?*		

No.	Issue	NIOSH ER position (SC&A reading)	STATUS (SC&A summary)	Work Group Status	Current Action Assigned to
			(3) *How will dose reconstruction be completed for the 11 individuals who submitted Ac-227 bioassay samples that did not have a follow-up sample to those discovered in 1995?* In NIOSH's September 2009 response, NIOSH adequately answered these remaining questions, and the WG closed the issue (while clarifying that some remaining questions would be addressed under the still open Data Adequacy and Completeness issue) at its January 2010 meeting.		