
Working Draft

**ISSUES MATRIX FOR THE SAVANNAH RIVER SITE
SEC PETITION AND PETITION EVALUATION REPORT**

DECEMBER 2011 UPDATE

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INTRODUCTION

A draft issues matrix for the Savannah River Site (SRS) SEC Petition and Petition Evaluation Report (ER) was prepared in September 2009 (Privacy Act-cleared version, October 2010) pursuant to the Advisory Board of Radiation and Worker Health's charge to SC&A to review the SRS SEC Petition (Petition number SEC-00103) and its associated ER, published by NIOSH on November 14, 2008 (NIOSH 2008), and the request of the Chair of the Work Group, Mark Griffon, that a first draft of an SEC matrix be prepared.

The original September 2009 matrix (SC&A 2009a) was based on issues that were unresolved from the SC&A review of the SRS Site Profile, SC&A's preliminary review of NIOSH's ER (NIOSH 2010a), and SC&A's preliminary review of the petition that was performed prior to the publication of the NIOSH ER (SC&A 2009b). It also drew on interviews completed by SC&A up to that date as part of its SEC petition review. NIOSH published the first addendum to its ER in 2010 (NIOSH 2010b). SC&A prepared an update of the outstanding issues in November 2010 (SC&A 2010a) and a review of the first addendum in January 2011 (SC&A 2011a). NIOSH published a second addendum to its ER in August 2011 (NIOSH 2011). SC&A prepared a review of 10 claimant files (SC&A 2011e) to assess the completeness and adequacy of dosimetry records for the implementation of the inclusions of employees in the SEC recommended by NIOSH in NIOSH 2011.

This update of the SRS SEC Issues Matrix follows the vote of the Advisory Board during its December 7–8, 2011, meeting in Tampa, Florida, to recommend an SEC for all employees, subcontractors, and subcontractors who worked at SRS between January 1, 1953, and September 30, 1972, and otherwise met the employment duration qualifications. Both construction workers (CWs) and non-construction workers (NCWs) were included. The update is needed, since some of the issues have been rendered moot by the vote so far as consideration of dose reconstruction feasibility in the SEC context is concerned. Other issue reviews will be more limited in time (so far as the SEC is concerned). Priorities may need to be revisited in light of the Board vote. Old priorities (from February 2011) are not indicated in this version.

Note that the “relevance” of an issue as noted in the comment column refers only to SEC considerations and does not pre-judge the issue as a site profile issue for dose reconstruction for non-SEC cancers or its importance in terms of the possible magnitudes of doses received by workers. This matrix was prepared to provide a summary of SEC issues status.

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Matrix Issue No.	Issue Brief	ER Section No.	Issue Description	NIOSH Issue Status	SC&A review status	Comments
1	Thorium up to 1965	7.1.1.8	Thorium work was carried out in a number of areas and dose reconstruction methods need to be specified. NIOSH had reserved the issue for further research up to 1960 in the ER, but extended the date to 1965 when it published an addendum to the ER in April 2010.	NIOSH published Addendum 2 to its evaluation report in August 2011 (NIOSH 2011) recommending that workers with certain area and dosimetry codes who worked between Jan. 1, 1953, and Sept 30, 1972, be added to the SEC because of the infeasibility of thorium dose reconstruction in certain buildings in this period.	SC&A did an analysis of the completeness of area and dosimetry codes in the records of 10 claimants (not a random sample). (SC&A 2011e)	Resolved. Board recommended addition of all workers from Jan. 1, 1953, to Sept. 30, 1972 to the SEC. Includes CWs and NCWs.
2	Thorium, 1965 onwards	7.1.1.8	Thorium 1965 and after. No coworker model or specific approach to bounding dose was provided in the ER.	See above up to September 30, 1972. NIOSH is researching the thorium issue after that date.	SC&A has provided draft reports to the Board indicating some thorium work after Sept. 30, 1972.	Resolved up to Sept. 30, 1972. Open after that.
3	Recycled Uranium (RU)	7.1.1.2	This issue is in part a carry-over from the SC&A TBD review (SC&A 2005, p. 71). A timeline for the RU operations has not been published.	Some revised trace contaminant data were provided in July 2010 (NIOSH 2010b) using DOE RU publications and a 1984 SRS document as references. A start date of 1955 for RU was provided.	SC&A started a review of the NIOSH ratios and associated reference material. Report preparation was stopped pending resolution of issues related to ER addenda.	Relevant only after Sept. 30, 1972.

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4	Trivalent actinides Am, Cm, and Cf	7.1.1.5, 7.1.1.6, 7.1.1.7	Trivalent actinides: Am, Cm, and Cf. There are no data for Cm-244 until 1963 (ER Fig. 7-1). Data analysis and coworker models have not been provided for any period. Relevance of later data to earlier periods has not been established. Relationship between NCW and CW intakes for trivalent radionuclides in the period before monitoring began and after monitoring began has not been established. Where NIOSH proposes to use gross alpha data (e.g., for Cf-252, method for selecting workers for assigning dose and selecting the radionuclide) have not been scientifically established. The resulting dose estimates would need to be examined for validity and reasonableness. Californium-252 assignment would also need to be reviewed in relation to spontaneous fission-related organ doses (including neutrons from spontaneous fission after intake).	NIOSH proposes to use measured data or coworker models for estimating dose with sufficient accuracy (ER Sections 7.1.1.5 to 7.1.1.7). Since data were collected for all three trivalent radionuclides rather than each separately, NIOSH proposes to assign the result to Cf-252 as appropriate (ER, p. 51). NIOSH has not yet published its coworker model. NIOSH has specified an ICRP model for Cf-252 spontaneous fission.	SC&A awaits the coworker model and will review it when it is available. SC&A agrees with NIOSH regarding the ICRP model for Cf-252.	SC&A has not checked the ending date for these radionuclides. Now only relevant after Sept 30, 1972.
5	Np-237	7.1.1.4	Data analysis and coworker model not provided. Adequacy of data for coworker model not established. Applicability of back-extrapolation of data from 1960s and after to pre-1960 period not established.	NIOSH proposes to use data for the workers who were monitored to reconstruct their dose and a coworker model for the rest. Data available from 1960 onward in claimant database. NIOSH has not yet published its coworker model.	SC&A awaits the coworker model and will review it when it is available.	Now relevant only after Sept. 30, 1972.

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6	Fission and activation products	7.1.1.9	Validity of back-extrapolation of Sr-90 data has not been established. Adequacy of fission product monitoring data for coworker model has not been established. ER states that strontium radioisotope monitoring began in the "late 1950s." The proposed coworker model has not been published.	NIOSH has not yet published its coworker model.	SC&A awaits the coworker model and will review it when it is available.	Now relevant only after Sept. 30, 1972.
7	Co-60	7.1.1.10	Validity of use of fission product data prior to 1960 has not been established. Coworker model has not been published. ER does not address the issue of incidents. Individual bioassay data or coworker model based on claimant data will be used. Targets were encapsulated (comment in TBD matrix). The potential similarity of the irradiation of encapsulated sources is noted in the July 7, 2007, Work Group meeting notes.	NIOSH has not yet published its coworker model.	SC&A awaits the coworker model and will review it when it is available.	Now relevant only after Sept. 30, 1972.
8.	Po-210	7.1.1.11	The coworker model has not been published. Incidents are not addressed. Relationship of CW to NCW intakes has not been established.	NIOSH published a paper on Po-210 in January 2011 (ORAUT 2011). The Po-210 program at SRS ended in 1970.	No review needed.	Resolved by the Board SEC vote. Ending date may need to be checked.
9	Tritium	7.1.1.1	NIOSH has not demonstrated that the TBD approach of applying environmental doses to unmonitored workers (no badge, no bioassay) and reporting level to workers with external monitoring only is suitable for unmonitored CWs. NIOSH has not demonstrated that it has a bounding dose approach for tritium for CW.	NIOSH published a report on use of tritium data for CW exposure estimation in November 2010 (ORAUT 2010). NIOSH is preparing a second part of this report that specifically addresses CW vs. NCW exposure.	SC&A published a report that included tritium, comparing CW and NCW data in January 2010 (SC&A 2010b) and another in November (SC&A 2010c) using a larger tritium bioassay database provided by	Only the data from Oct. 1, 1972, onward will be evaluated. There have been tritium/tritides-related data capture visits and interviews (NIOSH and SC&A). SC&A tritium interview

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					NIOSH. Both indicate that CWs had higher bioassays than NCWs in some areas, some periods, and some job types. SC&A will produce a single review of NIOSH's tritium report when the second part is published.	summary has been merged with a prior summary of other issues. Combined summary is being sent to DOE for classification review.
10	Special tritium compounds for CWs		ER refers to ORAUT-OTIB-0066 for special tritium compound exposure. Relationship of CW to NCW exposure to special tritium compounds or some other means of bounding CW exposure to them needs to be established. OTIB-0066, which discusses a method to calculate doses due to exposure to special tritium compounds, is not specific to SRS and does not discuss dose reconstruction issues for such compounds specific to CWs.	The solubility of one – lanthanum-nickel hydride – is under investigation at SRS. NIOSH is completing a draft of its interview notes.	SC&A awaits the NIOSH approach to estimating tritide doses.	See above Issue 9 for interview status.
11	Exotic radionuclides	7.1.1.9 in part	About 150 radionuclides were produced at SRS, and targets were fabricated there (ORAUT 2006, p. 25). No analysis of the production processes is provided, nor are there any descriptions of incidents. The incident database is incomplete, which was one of SC&A's findings in its TBD review (see below). The lack of analysis may be parallel to the situation at Y-12, where a large number of isotopes were produced, with the difference that at Y-12, they were produced in accelerators, and at SRS, they were produced in reactors. No documentation of the encapsulation	NIOSH will respond to the SC&A report on exotic radionuclides. NIOSH will also sort out what other radionuclides were produced that are not in the SC&A report. NIOSH will specify dose reconstruction methods with due attention to the criteria for exotic radionuclides presented by Jim Neton to the Board during the November 2010	SC&A provided the Work Group with a report on exotic radionuclides in December 2010 (SC&A 2010d).	Only relevant after Sept 30, 1972.

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			processes is provided. The exceptions to the coverage of radionuclides by whole-body counting are not discussed. There is no discussion of whether any of the target materials were themselves radioactive.	Santa Fe Board meeting.		
12	Internal dose due to incidents	5.2.3, 7.3.6	The Special Hazards Investigations list is incomplete. In its Tank Farm Fault Tree Databank, the site acknowledged that many early tank farm area incidents were not recorded (until 1965). The ER states that there are incident records, including the Special Hazards Investigation files, and that NIOSH has data relating to incidents (ER, p. 29). No evidence of cover up of incidents was found, and NIOSH can bound dose in any case (ER p. 71).	NIOSH will respond to the SC&A report. NIOSH may follow up with workers interviewed by SC&A.	SC&A prepared a report on extent of and potential gaps in incident documentation in worker records to elaborate on its TBD review finding (SC&A 2011b).	Interviews also indicate that there were unrecorded incidents. Only relevant after Sept 30, 1972.
13	Overall CW to NCW internal dose relation	7.1	ER states that ORAUT-OTIB-0052 (ORAUT 2007) found NCW intakes “were generally higher than construction trades workers” (ER, p. 39). OTIB-0052 suggests a 1:1 ratio for CW to NCW intakes. SC&A analysis indicates that the assumption that NCW intakes (as indicated by bioassay data) would be generally higher than for CW is not generally valid. The adequacy of bioassay data for constructing coworker models needs to be examined for different periods, areas, radionuclides, and types of CWs.	NIOSH has produced an analysis of tritium data comparing CWs to all workers (including CWs) (ORAUT 2010). NIOSH is preparing a second part comparing CWs to NCWs. NIOSH is also revising OTIB-0052. NIOSH included both CWs and NCWs in its thorium SEC recommendation in the ER Addendum 2 (NIOSH 2011).	Besides the two reviews of CWs vs. NCWs (SC&A 2010b and SC&A 2010c), SC&A also produced a report evaluating the plutonium database used in OTIB-0052 (SC&A 2010e). SC&A also published a master interview summary as part of SC&A 2011b; this summary contains some discussion of CW vs. NCW matters. SC&A was to review NIOSH’s	CW vs. NCW resolved up to Sept 30, 1972, by Board vote of 8 Dec. 1972 since both CW and NCW were included in the SEC recommendation. Also issues 19 (tentatively) and 21 are closed. A considerable amount of work has been done by NIOSH and SC&A as indicated in the reports cited here.

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					revision of OTIB-0052 when it is published. SC&A will await instructions on this issue, given the December 8, 2011, Board vote on the SRS SEC to include CWs and NCWs.	The Work Group had directed tritium data as the current focus of this issue to be followed by uranium. This is still an outstanding issue for the period after Sept. 30, 1972. Issue may need re-assessment in light of the inclusion of both CWs and NCWs in the SEC up to Sept. 30, 1972.
14	Special Exposure Conditions	7.4.2	There are several areas of concern that can be described as “special exposure conditions,” including off-normal or unauthorized work practices, burning of spent tributyl phosphate in open pans in the early years (to 1971), and high exposure potential during certain authorized work practices, such as opening tank risers or cleanup of high-level waste leaks.	NIOSH has stated that it has air concentration data in the burning ground area, and that it will provide a dose reconstruction approach.	See comment column.	SC&A worker interviews done as part of the SEC investigation also indicate off-normal practices and high exposure potential during certain types of work, including in the Tank Farms. A master summary of SC&A’s interviews (excluding tritides) is in SC&A 2011b. The burning ground issue is no longer relevant, since open pan burning ended in

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						February 1972 (Conner et al. 2000, p. 1068 of the pdf file).
15	Construction worker job types		Worker intakes and coworker models may have to be built by CW job type in order to ensure that the models are bounding doses (or more accurate than bounding doses).			This issue is merged into Issue 13 above.
16	OTIB-0075 validity for SEC use – internal dose	7.1, 7.3.4, 7.4.2	The use of ORAUT-OTIB-0075, which asserts representativeness of claimant data for the whole worker population for SRS CW SEC is questionable.	NIOSH also produced a report on data with a significant fraction of “less-than” results that is general, but also applies to the SRS SEC. (ORAUT 2009).	SC&A did a review of OTIB-0075 (SC&A 2010b). SC&A also reviewed ORAUT 2009 (SC&A 2010f).	This issue is merged into Issue 13 above.
17	Early neutron dose to 1961	7.2.2.2	Fi. 7-3 of the ER (p. 65) shows no neutron monitoring data for the 200-F Area until about 1958, and generally less than 20 badges per cycle until 1962 (except for part of 1959). This was “one of the highest neutron-exposure areas at SRS,” according to the ER (p. 64). The entire early period will have to depend almost exclusively on area neutron and photon monitoring data. The relationship of the n/p ratio data to workers and their personnel neutron exposure experience will need to be established with essentially no reference to actual monitoring data. It is unclear whether there are any early neutron monitoring data for CWs.	NIOSH will use an approach based on n/p ratios. On Feb. 3, 2011, NIOSH reported no progress on this item, which has been pushed down the list of priorities due to many other action items. NIOSH will provide a date when this will be done. NIOSH stated it has the data to do dose reconstruction.		This issue is resolved by the Dec. 8, 2011, Board vote.

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18	Neutron dose 1962-1971	6.2 and 7.2.2	<p>ER acknowledges unmonitored dose at SRS due to neutrons, since monitoring was required only when area neutron dose rates were in excess of 1 mrem per hour. Neutron data are very sparse in general up to the mid-1960s, and sparse even after that. Representativeness of area monitoring for worker exposure and representativeness of available n/p data for all workers in the class needs to be assessed. Additionally, back extrapolation of post-1972 data was proposed in the TBD. It is unclear whether there will be back-extrapolation to demonstrate bounding dose; if there is, the validity of such back-extrapolation may need to be examined.</p> <p>Validity of assumption of low neutron doses in the reactor areas needs to be examined.</p> <p>Validity of implicit assumption that CW neutron doses were lower than NCWs needs to be examined in view of the higher bioassay results for some periods and radionuclides, including plutonium in some periods.</p>	NIOSH had stated that it has paired neutron and photon data and may issue a report in March 2011.		This issue is resolved by the Board vote of Dec. 8, 2011.
19	Test reactor neutron dose		Neither the ER nor the TBD analyzes the neutron dose at the Heavy Water Components Test Reactor. Issue of an incident was raised in a worker interview done by SC&A.	NIOSH is addressing neutron doses as part of issues 17 and 18 above.	SC&A research did not result in any specific information about this accident (such as date and accident description).	One SC&A interviewee indicated an incident took place at this reactor (crack in the core). No further information was available from the interviewee and no information on

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						such an incident was found in document research done by SC&A. As a result, this issue has been tentatively closed.
20	Tank Farm exposure geometry		NIOSH to estimate the geometry of exposure in special work situations, such as those described in the F and H Area Tank Farm Fault Tree Databank, and the frequency with which these corrections may need to be applied to external dose. While correction factors can, in principle, be calculated, it is not clear that a scientifically valid set of scenarios, including time worked and radiological conditions, can be constructed. NIOSH has not addressed this issue in the ER.	NIOSH is preparing a model for developing adjustment factors due to geometry of exposure in the tank farm.	SC&A will review the NIOSH report when it is published.	A more general issue of geometry, and specifically hand exposure, has been raised in worker interviews. NIOSH is preparing a tank farm geometry report. Work Group needs to address whether work beyond that is needed for SEC review. Open pan burning issue is not relevant, since it ended in Feb. 1972.
21	External exposure co-worker data adequacy for CW	7.2.1.3	ORAUT-OTIB-0052 is claimant favorable for a large majority of CWs. However, it is not claimant favorable for some categories. A bounding dose (or better) demonstration needs to be made for all CW job types.	A suitable adjustment has been made for all CWs. No further work is needed.	SC&A agrees that existing databases can be used for CW coworker external dose estimation with appropriate adjustment. This does not include issues 22 and 23, which do not concern coworker data adequacy.	

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					See SC&A review of OTIB-0052 (SC&A 2007).	
22	Badges not capturing dose		SC&A worker interviews suggest that workers kept their badges out of higher radiation areas in order not to exceed dose limits, or sometimes CWs would be in radiological situations without knowing it (one incident is described when workers were working with radioactive tools thought initially to be clean).	NIOSH will review the SC&A report.	SC&A prepared a report compiling worker issues relating to radiation dose as it was experienced compared to dose that was recorded. This includes Matrix Issue 23 (SC&A 2011c).	
23	External dose recording accuracy and completeness	7.3	Petitioners raised the issue of working conditions with high dose rates when badge dose may have been under-recorded or not recorded (such as weekend work) and/or pencil dosimeters were off-scale, or when there are zero doses in the record. An issue connected to this would be whether the HPAREH database reflects actual work experience. Petitioners also state that in some cases, workers thought they were working in clean areas that were then determined to be contaminated.	NIOSH will respond to the SC&A report.	SC&A 2011c covers both Matrix Issues 22 and 23.	This issue has been merged with Issue 22 above. SC&A prepared a single report on Matrix Issues 22 and 23.
24	Early monitoring data	Various	The ER has addressed lack of early monitoring data for many workers and radionuclides by a number of devices, including building coworker models, using reporting levels, using air monitoring data, and estimating neutron to photon ratios. While each of these needs to be assessed in its own right (as described in the issues listed above), an overall assessment of			This issue had been merged with other issues, but is no longer an SEC issue in view of the Board vote on Dec. 8, 2011.

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			early recordkeeping practices, adherence to procedures, and adequacy of data appears to be warranted.			
25	Environmental dose	None	Using dispersion modeling of stack source terms as described in the TBD and referred to in the ER (p. 72) is not appropriate for onsite SRS workers. For instance, thousands of gallons of solvents contaminated with fission products and plutonium were burned in the Burning Ground. Use of a Gaussian plume model is not appropriate here, especially for particles greater than half a micron. Furthermore, the resuspension factor does not appear to be claimant favorable and is not entirely appropriate for this class of problem. It may not be claimant favorable by three or four orders of magnitude. Even for stack releases, one potentially significant issue is the non-conservatism of the standard Gaussian model used in the TBD, where it pertains to “non-standardized” short-term releases occurring during stable atmospheric conditions.	See issue 14.		This issue has been merged with Issue 14. Now resolved since open-pan burning stopped in Feb. 1972. See comment for Issue 14 above.
26	Additional worker and worker representative issues		Worker and petitioner representatives raised various issues during Work Group meetings and comment periods.	NIOSH will respond to SC&A report.	SC&A compiled a report detailing the issues raised and categorized them, with an indication of where the issue was already covered by an existing matrix issue (SC&A 2011d).	

References

Conner et al. 2000. K.R. Conner, J. Leyba, A Preston, Workplan/RCRA Facility Investigation/Remedial Investigation Report for the Old Radioactive Waste Burial Ground 643-E, S01-S22- Volume I–Text and Volume II–Appendices, Westinghouse Savannah River Corporation, WSRC-RP-00127, Rev. 1.4. August 2000. On the web at <http://sti.srs.gov/fulltext/WSRC-RP-97-00127.pdf>

NIOSH 2008. SEC Petition Evaluation Report Petition SEC-00103, November 14, 2008.

NIOSH 2010a. SEC Petition Evaluation Report Petition SEC-00103, Addendum, April 28, 2010.

NIOSH 2010b. Timothy D. Taulbee, ABRWH SRS Workgroup NIOSH Action Item List: Responses and Status, NIOSH, National Institute for Occupational Safety and Health, Cincinnati, Ohio. July 19, 2010. On the O-Drive at O:\AB Document Review\SRS\DCAS Docs.

NIOSH 2011. SEC Petition Evaluation Report Petition SEC-00103, Addendum 2, August 9, 2011.

ORAUT 2006. *Savannah River Site: Technical Basis Document*, ORAUT-TKBS-0003, Revision 04-E, unpublished, Oak Ridge Associated Universities Team, Cincinnati, Ohio. November 6, 2006. On the O-Drive.

ORAUT 2007. *Parameters to Consider When Processing Claims for Construction Trade Workers*, ORAUT-OTIB-0052; Rev. 00 PC-1. Oak Ridge Associated Universities Team, Cincinnati, Ohio. January 16, 2007. SRDB Ref ID: 29978.

ORAUT 2009. *Analysis of Bioassay Data with a Significant Fraction of Less-Than Results*, ORAUT-RPRT-0044, Rev. 00-A, Oak Ridge Associated Universities Team, Cincinnati, Ohio. 2009.

ORAUT 2010. Thomas R. LaBone, *Discussion of Tritium Coworker Models at the Savannah River Site – Part 1*. ORAUT-RPRT-0049, Rev. 00, Oak Ridge Associated Universities Team, Cincinnati, Ohio. November 23, 2010.

ORAUT 2011. James Mahathy, *Feasibility of Reconstructing Doses Received from Potential Exposures to Polonium at Savannah River Site*. ORAUT-RPRT-0048, Oak Ridge Associated Universities Team, Cincinnati, Ohio. January 24, 2011.

SC&A 2005. *Review of the Site Profile for the Savannah River Site*, S. Cohen & Associates, Vienna, Virginia. March 21, 2005.

SC&A 2007. *Review of ORAUT-OTIB-0052, Parameters to Consider when Processing Claims for Construction Trade Workers*, Revision 1, S. Cohen & Associates, Vienna, Virginia. July 2007.

SC&A 2009a. *Issues Matrix for the Savannah River Site SEC Petition and Petition Evaluation Report*, S. Cohen & Associates, Vienna, Virginia. September 2009.

SC&A 2009b. *“Paper Study” Evaluation of Special Exposure Cohort (SEC) Petitions, SEC-00103 and SEC-00104, Related to Construction Workers’ Exposures at the Savannah River Site*. S. Cohen & Associates, Vienna, Virginia. March 2009

SC&A 2010a. Arjun Makhijani, memorandum to Savannah River Site Work Group (Chair – Mark Griffon). *Subject: Status of SC&A’s Action Item List from the May 5, 2010 Work Group meeting with Updates and Task List from the Nov. 10, 2010, Work Group meeting highlighted in yellow*. S. Cohen & Associates, Vienna, Virginia. November 18, 2010.

SC&A 2010b. *Review of ORAUT-0075: Use of Claimant Datasets for Coworker Modeling for Construction Workers at Savannah River Site*, S. Cohen & Associates, Vienna, Virginia. January 2010.

SC&A 2010c. Harry Chmelynski, *Comparison of Claimant Tritium Samples from Construction Trade Workers and Non-Construction Workers at Savannah River Site*. S. Cohen & Associates, Vienna, Virginia. November 2010.

SC&A 2010d. Arjun Makhijani, memorandum to Savannah River Site Work Group (Chair – Mark Griffon), *List of Exotic Radionuclides at Savannah River Site and Dose Reconstruction Issues Associated with Them in the Context of the Savannah River Site Construction Trade Workers Special Exposure Cohort Petition, Savannah River Site Matrix Issue 11, Exotic Radionuclides*. S. Cohen & Associates, Vienna, Virginia. December 10, 2010.

SC&A 2010e. *Comparison of ORAUT-OTIB-0052 Plutonium Data for Construction and Non-Construction Workers and the Implications for Coworker Models at Savannah River Site*. S. Cohen & Associates, Vienna, Virginia, April 2010.

SC&A 2010f. Joyce Lipsztein and Harry Chmelynski, *Draft Review of ORAUT-RPRT-0044: Analysis of Bioassay data with A Significant Fraction of Less-Than Results*, S. Cohen & Associates, Vienna, Virginia. November 2010

SC&A 2011a. Joyce Lipsztein, *SC&A Review of the NIOSH Addendum to the Savannah River Site Special Exposure Cohort (SEC-00103) Evaluation Report*. S. Cohen & Associates, Vienna, Virginia. January, 2011.

SC&A 2011b. Arjun Makhijani, *Incident Records at Savannah River Site: Discussion of the Special Exposure Cohort Issue Number 12 Related to Incidents*. S. Cohen & Associates, Vienna, Virginia. January, 2011.

SC&A 2011c. Arjun Makhijani, memorandum to Savannah River Site Work Group (Chair – Mark Griffon), *Subject: Matrix Issues 22 and 23 regarding Petitioner External Dose Issues*, S. Cohen & Associates, Vienna, Virginia. January 20, 2011

SC&A 2011d. Lynn Ayers and Kathryn Roberston-DeMers, “Review of the Worker Comments for the May 22, 2008, Savannah River Site (SRS) Worker Outreach Meeting and Petitioner Supporting Material,” S. Cohen & Associates, Vienna, Virginia. February 2011.

SC&A 2011e. Lynn Ayers, *Review of Some SRS Claimant Cases to Examine Badge and Area Codes for Adequacy in Thorium SEC Implementation*, S. Cohen & Associates, Vienna, Virginia. November 2011.