Draft

ADVISORY BOARD ON
RADIATION AND WORKER HEALTH

National Institute for Occupational Safety and Health

EVALUATION OF SAVANNAH RIVER SITE SUBCONTRACTOR BIOASSAY DATA COMPLETENESS

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SC&A, INC.: ***Technical Support for the Advisory Board on Radiation and Worker Health Review of NIOSH Dose Reconstruction Program***

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ABBREVIATIONS AND ACRONYMS

ABRWH	Advisory Board on Radiation and Worker Health
Am	americium
bio.	bioassay
bios.	bioassays
BM	boilermaker
BSRC	Bechtel Savannah River Company
BSRI	Bechtel Savannah River, Inc.
Carp.	carpenter
CEDE	committed effective dose equivalent
Constr.	construction
Cont.	contamination
CTW	construction trade worker
Dept.	department
DOE	U.S. Department of Energy
DOE-SR	U.S. Department of Energy at Savannah River
EDWS	Electronic Document Workflow (Records) System
Elect.	electrician
Eng.	engineer
ER	evaluation report
EU	enriched uranium
Exp.	exposure
Fiche	microfiche
FP	fission product
H-3	tritium
HPRED	Health Protection Radiation Exposure Database
HPAREH	Health Protection Annual Radiation Exposure History
Ind.	indeterminate
MDA	minimum detectable activity
MFP	mixed fission products
µCi/L	microcurie per liter
MK	MK Contractors, LLC

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mult.	multiple
mrem	millirem
NIOSH	National Institute for Occupational Safety and Health
NOCTS	NIOSH/OCAS Claims Tracking System
NOV	Notice of Violation
NTS	Noncompliance Tracking System (U.S. Department of Energy)
OCAS	Office of Compensation and Analysis and Support
ORAU	Oak Ridge Associated Universities
ORAUT	Oak Ridge Associated Universities Team
OTIB	ORAUT technical information bulletin
Pipe.	pipefitter
PR	Payroll
Pu	plutonium
QC	quality control
RC	radiological control
RCOs	Radiological Control Operations
RSL	Radiation Survey Logsheet
RWP	Radiation Work Permit
SEC	Special Exposure Cohort
Sr	strontium
SRL	Savannah River Laboratory
SRS	Savannah River Site
SRWP	Standing Radiation Work Permit
SRDB	Site Research Database
SSN	social security number
SWP	Safe Work Permit
Transp.	transportation
U	uranium
WBC	whole-body count
WSRC	Westinghouse Savannah River Company

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EXECUTIVE SUMMARY

SC&A conducted a broad-based sampling review of bioassay data completeness for subcontractor construction trade workers (CTWs) at the Savannah River Site (SRS) as tasked by the Advisory Board on Radiation and Worker Health (ABRWH) following the Savannah River Work Group meeting in September 2016. Validation and verification of the completeness of available monitoring data are an integral part of dose reconstruction, particularly where reliance on coworker models is necessary. This review (and a similar one recently completed by the National Institute for Occupational Safety and Health [NIOSH] for work at the SRS high-level caves in Building 773-A for 1979–1986[1]) was prompted by a 2013 interview with a former SRS [redacted] who indicated that subcontractor dose records were maintained separately in "company files" and were later migrated into the electronic database, raising questions regarding the completeness of that SRS database relied upon by NIOSH for dose reconstruction.

SC&A performed sampling using SRS Radiation Work Permits (RWPs) for individual subcontractor CTWs as a means to ascertain whether corresponding job-specific bioassay results could be found in the SRS bioassay records (either hardcopy, microfiche, or electronic). RWPs were identified through a keyword search conducted using the Electronic Document Workflow (Records) System at SRS for the period 1972–1995, across a range of some 20 SRS facilities and operations. RWPs were identified for 1982–1995, with most identified in the 1989–1995 time period (coinciding with the early years of Westinghouse's tenure as operating contractor at SRS). From these RWPs, 360 subcontractor CTWs were initially identified by random selection, 324 identified as being subcontractors with specific job dates, and 306 selected for a bioassay record verification (the 18 not selected lacked verifiable subcontractor status or lacked RWP job dates and were, therefore, excluded).

From this sampling, SC&A found that 34% (105/306) of the subcontractor CTWs lacked job-specific urinalysis records for the corresponding RWP job requirement date, given a 30-day "grace" period for any results.[2] This result improved to 20% (62/306) if a 90-day grace period is applied. Excluding RWP entries without an explicit bioassay requirement,[3] these results are 29% (57/197) and 16% (31/197), respectively. It was also found that 1.5% (5/324) of subcontractor CTWs who signed in on these job-specific RWPs could not be found by SRS in either its electronic or hardcopy databases.

In the course of its review, SC&A also established that a chronic history of wide noncompliance with job-specific bioassay requirements existed at SRS, resulting in a Departmental Notice of Violation being levied in 1998. The U.S. Department of Energy's Office of Enforcement noted a

[1] That review was completed and issued on June 27, 2017 (NIOSH 2017), too late to be addressed in this SC&A review.

[2] A match was indicated regardless of whether the nuclides being targeted in the respective RWP and bioassay records actually corresponded. As explained later in this report, this was necessitated by the widely varying formats and contents of RWPs, Safe Work Permits, and Standing Radiation Work Permit signup sheets at the time, where actual radiological hazard or radionuclides of concern were not often clearly specified.

[3] RWP forms at SRS during this timeframe did not uniformly include a bioassay checkoff feature; a deficiency that was identified and corrected in 1998. However, almost all RWPs and job tasks reviewed entailed some followup monitoring, and no difference was found in bioassay coverage. For that reason, SC&A has included data for both cases.

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worker non-participation rate of 79% for required job-specific bioassays during a selected 3-month period of review in 1997. This was preceded by similar findings during a Westinghouse Savannah River Company (WSRC) self-assessment in 1995, and a program compliance review during the Tiger Team assessment in 1990.

While there has been some discussion of what would constitute reasonable "success" criteria for sampled completeness of subcontractor CTW bioassay records, these results and compliance history indicate a dysfunctional job-specific bioassay program at SRS whose results are manifestly incomplete for at least the period 1989–1998[4] and should not be relied upon for coworker model development.

[4] While the NOV focused on documented noncompliance over a 2-year period, 1995–1997, that documentation was bookended in 1995 and 1997 by sampling self-assessments conducted by WSRC. Given the persistent nature of noncompliance by both workers and managers, there should be no doubt that these deficiencies predated the first self-assessment in 1995 and were due to a workplace culture of non-accountability to the job-specific bioassay program, a condition found by the 1990 Tiger Team, as well. This is consistent with the results of SC&A's sampling review for 1982–1995.

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1.0 INTRODUCTION AND BACKGROUND

The evaluation report (ER) for the Special Exposure Cohort (SEC) number 00103, *SEC Petition Evaluation Report Petition SEC-00103*, Revision 0 (NIOSH 2008), was issued on November 14, 2008, for "*all construction workers who worked in any area at the Savannah River Site (SRS) during the period January 1, 1950 through December 31, 2007*." Three addendums have since been added. In Addendum 1, the National Institute for Occupational Safety and Health (NIOSH) "*determined that it has sufficient personal monitoring data, source term information, and workplace monitoring data for thorium to allow adequate bounding of the total potential internal exposures at the site during this time period*" (NIOSH 2010, page 31). In Addendum 2 (NIOSH 2011), NIOSH defined an SEC class for January 1, 1953, through December 31, 1957, for designated employees who were involved with fabrication and testing of reactor fuel components containing thorium and chemical separation of thorium waste in process canyons. In Addendum 3 (NIOSH 2012), the feasibility of reconstructing doses received from thorium exposure from October 1, 1972, through December 31, 2007 (previously reserved for further consideration in Addendum 2), was further evaluated.

In this report, SC&A reports on the results of a sampling review of bioassay data completeness for SRS subcontractor CTWs that was tasked by the Advisory Board on Radiation and Worker Health (ABRWH) in September 2016 following the SRS Work Group meeting.

Validation and verification of the completeness of available monitoring data are integral parts of dose reconstruction, particularly where reliance on coworker models is necessary. As noted in NIOSH's *Draft Criteria for the Evaluation and Use of Coworker Datasets*, Revision 4 (NIOSH 2015, page 5), "*the amount of available monitoring data must be evaluated to determine if there are sufficient measurements to ensure that the data are either bounding or representative of the exposure potential for each job/exposure category of the facility.*" This also typically includes a review of electronic data against a representative sample of original data for transcription verification.

In the course of a 2013 interview (and re-interview in 2014) with a former SRS [redacted], the issue of data completeness for subcontractor construction trade workers (CTWs) was given added urgency. The interviewee indicated among other recollections, that the dose "*data for subcontractors* [other than DuPont Construction group] *were maintained by company file, not by individual*," and that these records should have been migrated to the two SRS electronic databases, Health Protection Radiation Exposure Database (HPRED) and Health Protection Annual Radiation Exposure History (HPAREH), by the mid to late 1980s. He also noted that "*there were few independent subcontractors prior to 1983, except those that came through DuPont Construction, but these were treated more as "employees*" for monitoring and recordkeeping purposes. Finally, he said that he believed that "*all records are in the Health Physics records and there are not any missing records*" ([redacted] 2013/2014, pages 3–4). SC&A's concern is, and has been, whether NIOSH can validate that subcontractor dose records—more specifically, those for subcontractor CTWs—are, in fact, complete at SRS and fully reflected in the SRS electronic radiological databases to support dose reconstruction, particularly for the more transient and short-term, smaller subcontractors.

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As noted in the February 5, 2014, Savannah River Work Group meeting summary notes (ABRWH 2014), the overarching question is a dual one:

1) *How complete (company names, personal identifiers, dates) were the company files in terms of various tiers of subcontractors, particularly beyond the 1980s when considerably more work was outsourced? and,*

2) *Was all of the relevant information migrated to the SRS databases* [and] *being used by NIOSH for dose reconstruction?*

Several approaches have already been considered and pursued by NIOSH for validation, including a comparison using NIOSH/OCAS Claims Tracking System (NOCTS) data, and one using the U.S. Department of Labor and Center to Protect Worker Rights subcontractor database, both to ascertain the identity of subcontractor companies and their employees for purposes of comparing with the SRS electronic radiological databases, HPRED and HPAREH. Neither were found to support validation adequately. NIOSH proposed and has since completed an evaluation of some 3,000 pages of construction job plans identified for the high-level caves in Building 773-A for 1979–1986, randomly selecting 110 subcontractors for followup assessment (NIOSH 2017).

Following an SRS Work Group meeting of September 26, 2016, SC&A was tasked with expanding the scope and timeframe of NIOSH's Building 773-A sampling review to encompass a broader time period and set of SRS facilities to improve the representativeness of any results achieved.

2.0 SRS SUBCONTRACTOR DATA

2.1 SRS SUBCONTRACTOR WORKER CATEGORIZATION

CTWs at SRS were deployed across the entire SRS and represented a broad range of crafts, including carpenters, boilermakers, pipefitters, construction workers, and painters, to name a few. They performed both radiological and non-radiological work and were subject to the same policies and procedures as were the prime contractor employees. During the DuPont operating contract (prior to April 1989), workers were classified according to payroll or "Roll" numbers that corresponded to the nature of their work and employment status. At SRS, Roll 1 were DuPont salaried workers, e.g., scientists, engineers, and the technical staff. Roll 2 constituted local DuPont hourly employees, composed of both CTW and non-CTW workers. CTWs employed by subcontractors such as Miller-Dunn Electric, North Brothers, and B.F. Shaw Company were assigned to Roll 4 and some to Roll 5, and they were also assigned a craft code (e.g., craft code 25 for pipefitters). As more CTW jobs were outsourced under subcontracts, Roll 6 was used as a category to encompass those workers. After 1989 and the advent of the Westinghouse operating contract, the use of roll numbers (at least for Radiation Work Permits [RWPs] and Safe Work Permits [SWPs] sign-ins) became secondary to social security numbers (SSNs). However, roll numbers carried over to the Electronic Document Workflow (Records) System (EDWS) and Pro-Rad electronic dosimetry recordkeeping system and can be found on individual bioassay records. This proved important in SC&A's completeness sampling in that subcontractor status could be verified by either roll number or company name in these records.

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In terms of monitoring, SRS procedures required that the health physics program provide the same level of job planning and monitoring to construction, maintenance, and other CTW-related functions, as it did with operation and production tasks (DuPont 1959–1971). Routine monitoring programs were prescribed for prime contractor workers (DuPont and Westinghouse Savannah River Corporation [WSRC], which included Roll 2 CTWs), and job-specific monitoring was specified by specific job plans, including construction job plans and RWPs. As noted in ORAUT-OTIB-0081, *Internal Coworker Dosimetry Data for the Savannah River Site*, Revision 03 (NIOSH 2016, pages 17, 19):

> *Both of these types of monitoring programs can be considered to be variations in routine, representative sampling. For workers normally present in an area (i.e., non-CTWs and Roll 2 CTWs), the monitoring is specified on an annual basis in the bioassay control procedures. For workers intermittently present in an area (i.e., some CTWs), the monitoring was based on the job plan. For the duration of the job plan and the duration of the exposure potential, the required monitoring was specified. The key point is that in both instances monitoring was based on exposure potential rather than being driven by incidents. In either case, if an incident did occur, incident-driven sampling would have been performed.*

While CTWs were present both as Roll 2 (prime) workers, and Rolls 4, 5, and 6 (subcontractor) workers at SRS, and both groups were subject to job-specific bioassay monitoring, it is clear that the intermittent nature of work by the subcontractor CTWs made job-specific bioassays predominant for them.

2.2 SAMPLING APPROACH

SC&A modeled aspects of its approach after that of NIOSH's recently completed review of Building 773-A, with several scoping differences. First, the time frame was expanded to 1972–1995, with an emphasis on 1989–1995, which represents the post-DuPont era of SRS management that involved a large influx of outside subcontractors (who, for example, were involved in K Reactor restart and environmental restoration and cleanup). Second, the SRS facilities involved were expanded from one (the high-level caves in 773-A) to some 20 facilities and areas, including F and H Canyons, K Reactor, tank farms, and 321-M. Finally, the review scope encompassed all SRS RWPs and SWPs that included CTWs that could be identified through record searches.

Similar to using construction job plans as a means to identify CTWs performing radiological jobs, SC&A sought to search for and locate SWPs and RWPs for 1972–1995, as well as any additional construction job plans (beyond those found by NIOSH for 773-A). Based on a previously inventoried data capture by NIOSH, SC&A also added Radiation Survey Logsheets (RSLs) as a potential source of subcontractor CTW identification. These search parameters were contained in a data capture request that was forwarded to the U.S. Department of Energy (DOE) management at SRS on December 5, 2016 (attached as Appendix A).

An online search via SRS's EDWS was conducted using keywords, resulting in SWPs, RWPs, RSLs, and Standing Radiation Work Permits (SRWPs) signup sheets for 1982–1995 being identified (it was apparent from search results that permits for earlier years and other operations

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were not available in EDWS, although they may reside in other record archives yet to be identified). There was a wide difference between the various permits in terms of the degree of job requirements detailed, numbers of workers assigned, and whether bioassay was required. For some RWP forms, bioassay was required upon "end of shift," while others required bioassay without specifying timing, and still others did not provide for such specification explicitly. In the last case, it has become clear from corrective actions required in the aftermath of a DOE Notice of Violation (NOV) (to be discussed later) that RWP forms at SRS did not uniformly include a bioassay sample program checkoff despite such job-specific monitoring being required, and conducted both by procedure and practice. SC&A made a clear distinction between CTWs for whom the permit required bioassay (whether at the "end of shift" or more generally) versus those CTWs for whom the permit had no such specification; given this ambiguity, both sets of data are provided in this report.

Some of these permits, particularly the signup sheets in 1994 and 1995, contained thousands of names, necessitating a random sampling approach. For these voluminous permits, CTWs (as identified by trade) were randomly selected by sampling each file subset (marked as p001, p002, etc.) of the permit, taking, for example, the first 10 CTWs starting on page 1 for p001, the first 10 CTWs on page 200 of p002, the first 10 CTWs on page 300 of p003, and so on. For some SRWP signup sheets, the lack of CTWs for a number of jobs necessitated just capturing the first 40–50 CTWs, in order. The permits typically provided for sign-in by the workers, who added their roll numbers or (after 1989) their SSNs, and often their craft (and craft two-digit number) and department. Illegible or partially legible names and SSNs were common in the RWPs; these were avoided in the SC&A sampling although some degree of interpretation and verification was necessary in name spellings and SSNs.

Some of the EDWS references had few or no online permits that could be referenced for CTW names and identifiers; instead, they cited reference numbers for document boxes maintained at SRS. These were requested for physical access during scheduled onsite data captures (which took place on February 13–16 and February 27–March 2, 2017). Likewise, additional sources of RWP records were identified by SRS and were reviewed on site at the SRS Records Center. This hardcopy documentation was captured and scanned, with CTW names and identifiers included in the overall roster for completeness review. In total, through its EDWS online search and onsite documentation review, SC&A identified 13 RWPs and SWRP signup sheets for the years 1972–1995, with a total of 324 subcontractor CTWs identified and verified from an initial sample of 360 RWP entries.[5]

The RWPs sampled included subcontractor CTWs for 1976 and 1981 ([redacted]), 1982, 1985–1987, and 1989–1995 (while RWPs were identified after 1995, these were not sampled given the number of entries available for the six earlier years). SRS operations and facilities encompassed included FB-Line, K Area (including K Reactor), C Area, 321-M, 690N, and 105L—some 20 facilities and operational areas. Subcontractor companies included Bechtel, MK Construction, Raytheon, Miller and Dunn, North Brothers, and EBASCO, some of whom further subcontracted with lower tier subcontractors. CTW crafts included construction, pipefitters, electricians,

[5] The higher total listing of 360 CTWs had been identified in the initial sorting following the final onsite review; however, that listing included entries that proved to be prime contractors or had unclear or missing roll numbers; these entries were excluded.

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painters, carpenters, laborers, boilermakers, millwrights, riggers, sheet metal workers, transportation (drivers), and quality control personnel.

3.0 SC&A'S ANALYSIS OF DATA

3.1 COMPLETENESS REVIEW

Approximately 360 CTW names and identifiers were derived from the EDWS search; these were posted to a secure drive on the SRS intranet by SC&A. Where available in electronic form, these names and identifiers were then matched with corresponding bioassay records by SRS via the EDWS or Pro-Rad[6] online records systems. For dosimetry records available in hard file or microfiche form, SC&A performed the matching during the two onsite data capture visits.

A number of names were dropped during an initial screening because they were (1) not subcontractors (by virtue of Roll number, company name, job title, or lack of any identifier), (2) duplicates of other entries (the same CTWs often show up on different RWPs), or (3) not fully legible or complete in terms of name or identifiers.

An initial working matrix was prepared for each subfile, with each CTW name provided with corresponding trade (or job), reference source (box number, RWP number), subcontractor affiliation, bioassay requirement (urinalyses dates), records source (fiche, EDWS, hard file), and any notes or comments. Corresponding bioassay documentation was located by matching CTW names and identifiers through Pro-Rad searches by SRS, or by physical searches of microfiche and hardcopy folders in the SRS Dosimetry Office by SC&A. These compilations of summary CTW names, RWPs, and bioassay information were scanned by accompanying Oak Ridge Associated Universities (ORAU) personnel and reviewed for classification clearance by SRS. Once cleared, they were forwarded to ORAU and NIOSH for uploading into the Site Research Database (SRDB).

Based on an initial scan of results, 29 entries were found to be either missing (i.e., not found in the SRS electronic and hardcopy records system) or lacking any bioassay information. These CTW names subsequently were returned to the SRS Dosimetry Office for re-verification. This second review consisted of correcting names and identifiers, such as SSNs, by (1) cross-checking identifiers across available reference sources, (2) searching using permutations of names and SSNs, and (3) searching with full or corrected names. It should be emphasized that RWP entries were handwritten, sometimes barely legible, and missing full names, letters, and correct numbers. Between SRS and SC&A, all but five of the outstanding entries were ultimately identified with correct names and identifiers, from which corresponding bioassay records could be matched. A final screening removed any entries for which a clear RWP job date was lacking. The final listing had 306 subcontractor CTWs subject to job-specific bioassay comparison.

[6] EDWS, The Electronic Document Workflow (Records) System, provides for electronic storage and indexing of legacy hardcopy records, including safety and health, individual exposure records, medical, and human resource data. Pro-Rad is a database system whose purpose is to manage, monitor, and record occupational radiation exposure data for present and former DOE, NNSA, and contractor employees. This system replaced the HPRED system in 2004.

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Once the CTW compilations were available in the SRDB, SC&A commenced its bioassay review process. This involved matching the prescribed RWP job date with any corresponding urinalyses of record, either within 30 days or 90 days, respectively. The basis for this consideration is to provide indices of bioassay compliance or responsiveness, with 30 and 90 days used as measures of responsiveness to an RWP end-of-job bioassay requirement. For tritium urinalyses, such responsiveness would be essential for adequate dose assessments; for plutonium or uranium urinalyses, this would be considerably less so. This is not to draw a broad program judgment of SRS dose assessment or technical adequacy, but to provide an overall indicator of both monitoring program compliance and record completeness.

This comparison does not take into consideration whether the 30- or 90-day bioassay "match" also would match the principal radionuclides of concern for the RWP. SC&A found that the RWPs, SWPs, and SRWP signup sheets were in various formats, with and without bioassay checkoffs, and were often missing any indication of the workplace radiological hazard and radionuclides involved. The only information common across all RWP formats is name, craft or roll number, facility or area, and job date. Therefore, a 30- or 90-day bioassay following a specified job date is considered a match, albeit in some cases the bioassay being accredited may have been performed for a different reason and would have targeted a different radionuclide or sets of radionuclides than that for the RWP in question. This circumstance would lead to some understating, in this analysis, of actual "mismatches" between RWPs and job-specific bioassays.

The bioassay completeness review addressed two sets of RWP entries: (1) those with a prescribed RWP bioassay requirement with a specific job date on the SRS form, and (2) those without an explicit bioassay checkoff on the SRS form, but whose job activity clearly warranted and required job-specific bioassay[7] (as noted earlier, SRS permit forms did not uniformly include such a checkoff despite procedures and actual practices that included bioassays—this was the subject of an enforcement-related corrective action that took place in 1998 that served to revise SRS permit forms to include such a bioassay checkoff). This comparison review is provided in Appendix B as a table derived from SC&A's worksheet with all names and identifiers removed.

3.2 QUALITY CHECK ON DATA

In addition to initial reviews by both SC&A and SRS to identify CTWs with no or incomplete records, SC&A also cross-checked all CTW entries where bioassays by RWP date were found to be initially missing. Any CTW entries with incomplete or missing bioassays that were suspected of lacking records due to the initial search, screening, or scanning process were referred back to SRS for an additional bioassay records search. Several screenings were also conducted to identify duplicate entries; when found, these were only retained if the worker in question had RWPs in different years, but deleted otherwise.

Although SC&A initially considered a statistical basis for its sampling review, it was determined at an early stage that, given the relatively small number of RWPs identified, coupled with the practical constraints of how many CTW entries could be ultimately searched, processed, and

[7] This was a subjective professional judgment exercised by SC&A based on the nature of the work (e.g., CTW activities in tritium-contaminated K Reactor areas) and comparability to other job-specific RWPs; this comparison is provided for additional perspective in light of the RWP omissions cited earlier.

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cleared by SRS, the scope of review could be no more than about 300 subcontractor CTWs sampled over the 14 years reviewed (1982–1995, with no RWPs identified for 1983, 1984, and 1988, and one entry each in 1976 and 1981). It is also clear that additional RWPs for other facilities for the same and additional years likely exist but are not searchable in EDWS or by other means at this time. Likewise, for 1994–1995, where SRWP signup sheets containing thousands of CTW entries were employed, there are clearly many subcontractor CTWs who were left out of the random sampling of those sheets. Therefore, the "denominator" of total subcontractor CTWs, or those with RWP bioassay requirements, for each year and in other years, is not known and is not available to inform a statistical derivation of sample size.

It should be noted that the dearth of RWPs and other CTW records prior to 1990 may be influenced by what was reported in worker interviews to have been a sitewide destruction of subcontractor records that took place at the time of DuPont's departure as operating contractor in 1989. From these interviews, it was reported that:

> *There were all kinds of records destroyed from the offices of subcontractors after they left the plant. In 1989, the subcontractors started leaving the job as their contracts expired. The personnel were transferred to BSRC [Bechtel Savannah River Company]. The crafts were transferred at various times starting in September 1989. In 1989, the electricians changed from Miller Dunn to BSRC. In the early 1990s, the* [pipe] *fitters changed to Bechtel. Some time in the early 1990s, crews of 6-8 laborers went around to the office buildings that the general contractors had left. It was the records in their offices that were destroyed…. They shredded all kinds of records (e.g., monitoring records, time cards) after the subcontractors left the plant.* [SC&A 2011, page 31]

While the missing pre-1989 CTW records, particularly RWPs, may reside at the operating facilities themselves, the preceding suggests that they may also have been discarded during the transition between operating contractors in the 1989–1990 timeframe. In any case, there were apparently few outside subcontractors (other than working through DuPont Construction) before the mid-1980s, as noted by [redacted] in his interview ([redacted] 2013/2014).

3.3 RESULTS

Within the intent of this review to sample the degree of completeness for a diverse cohort of subcontractor CTWs over a range of job types, facilities, and time periods for radiological work at SRS, SC&A had two primary objectives:

1. Sample the extent to which individual subcontractor CTW records can be located by SRS in its dosimetry record system.
2. Sample the extent to which bioassay records for these individuals corresponding to a RWP-related job task can be located by SRS.

For the first objective, care was taken to use every opportunity with SRS to obtain accurate and complete names and identifiers. For the second objective, it is understood that an explicit "end of shift" or job date is the strongest indicator of a followup bioassay requirement. However, in light of serious discrepancies in the SRS permit forms (i.e., no bioassay checkoffs provided) and in the

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job-specific bioassay program itself (to be discussed later), SC&A decided to provide results, as well, for subcontractor CTWs whose RWP forms lacked such a checkoff. It is also understood that the 30- and 90-day bioassay criteria are "indicators" of RWP compliance and bioassay records completeness, and that later bioassays for potential exposure to longer-lived nuclides such as plutonium and neptunium would be relevant to dose assessment but problematic for subcontractor CTWs, given the intermittent nature of their work on site and common lack of compliance with termination bioassays.

As summarized from the working spreadsheet reflected in Appendix B, the following results were found from the completeness review of subcontractor CTW bioassay records.

1. **Missing dosimetry records**: 5/324 (1.5%)

   Subcontractor CTWs for whom no dosimetry records could be located by SRS after reverification through multiple searches and additional identity comparisons (e.g., applying permutations of name and SSN identifiers). It is still possible that a record may exist under a full name or correct SSN, but that is not readily determinable.

2. **Missing bioassay results (urinalyses only):**

   Total subcontractor CTW entries for RWPs containing job-specific radiological requirements but not necessarily an explicit bioassay checkoff requirement (albeit bioassay required by procedure).

   30 days post-RWP job requirement: 105/306 (34% missing or 66% "success" rate)

   90 days post-RWP job requirement: 62/306 (20% missing or 80% success rate)

   Subcontractor CTW entries for RWPs containing an explicit bioassay requirement by job date or at "end of shift." These were deemed unambiguous regarding the job-specific bioassay requirement. The lower denominator below represents the number of entries with job-specific bioassay requirements cited on their RWP forms.

   30 days post-RWP job requirement: 57/197 (29% missing or 71% success rate)

   90 days post-RWP job requirement: 31/197 (16% missing or 84% success rate)

   Those CTWs with incomplete bioassay records that were deemed suspect (as an artifact of the search process, copying, or scanning) were returned to SRS for reverification.

   In terms of target radionuclides for the job-specific bioassays conducted,[8] the following results are based on the 243 bioassay results for those subcontractor CTWs who had recorded bioassay (urinalyses) in either 30 or 90 days (i.e., excluding those from the 306 total entries that did not have a followup bioassay within 90 days of the RWP job date).

   - **Tritium:** 181 (75% of targeted bioassay samples of 248 total)

[8] As noted earlier, not necessarily the RWP-stipulated radionuclides of concern, given that this information is not always clear in the RWPs examined.

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- **Plutonium (Pu-238 and Pu-239):** 49 (20%)
- **Enriched uranium (EU) and EU/strontium-90 (Sr-90)/fission product (FP):** 13 (5%)

This distribution corresponds to the facilities and operations in which the CTWs worked, with tritium bioassays being typically required for K and P production reactor areas, and plutonium and FP bioassays being required of CTWs working in and around the HB and FB Lines. The predominance of tritium bioassay requirements is reflective (at least, in part) of the extensive outsourcing of CTW work in support of K Reactor restart. K Reactor was then a key source of tritium production for the weapons complex and was in standby (beginning in 1989) for extensive upgrades to meet more stringent nuclear safety requirements. Given the years of tritium production operations, residual tritium contamination existed in work areas in and around the reactor, necessitating bioassay for workers in those areas.

Beyond the question of completeness is the importance of timely radiological monitoring. While the majority of SRS workers were on routine bioassay monitoring, a substantial number of subcontractor CTWs were on job-specific bioassays for shorter-lived radionuclides such as tritium. Tritium was one of the major radionuclides present with a relatively short biological half-life (approximately 10 days) at SRS. Tritium bioassays should be performed within the time interval of 2–20 hours after intake for best bioassay results. Because of tritium's biological half-life of 10 days, the maximum delay time for a useful tritium bioassay would be approximately 30 days after intake (at which time, approximately 1/8 the original intake would be present). If the minimum detectable activity (MDA) is 0.5 microcurie per liter (µCi/L), and the conversion factor is 2.77 millirem per hour (mrem/hr) per µCi/L, the minimum detectable committed effective dose equivalent (CEDE) would be approximately 10 mrem from a bioassay taken 30 days after the intake; i.e., a worker would have to receive a CEDE of 10 mrem for the tritium concentration in the urine to be detectable by a tritium bioassay taken 30 days after intake. SC&A's analysis of the sampled SRS CTW subcontractor bioassay data found that 90% (162 out of 181) of workers who had tritium bioassays, and were listed on an RWP that required a bioassay, had recorded tritium bioassay results within 30 days of the RWP job date.

In the context of the completeness of subcontractor CTW dosimetry records at SRS, SC&A found, in absolute terms, that a small number ([redacted]) of the 360 subcontractor CTWs identified for 1982–1995 lacked dosimetry records. However, a significantly larger number (20–34%) lacked followup bioassays as required by job-related RWPs. Without a comparison with prime contractor workers, it is not possible to determine if these rates are better or worse than the non-CTW worker population at SRS for those years.

3.4 CHRONIC BIOSSAY COMPLIANCE PROBLEM AT SRS

It is worth noting that the lack of worker adherence to job-specific bioassay requirements was a chronic problem at SRS for all workers and was the subject of an NOV and civil penalty in 1998, under DOE's Price-Anderson nuclear safety enforcement program. The operating contractor, WSRC, was cited for "*deficient work processes with respect to full worker adherence to established WSRC bioassay requirements*" (DOE 1998a). DOE's Office of Enforcement and Investigation found that:

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> *Specifically, workers and their management routinely failed, over a period of approximately two years, to ensure that job-specific bioassay samples were submitted for analysis as required by WSRC internal procedures. DOE-SR identified bioassay sample submittal deficiencies for the job-specific portion of the bioassay program to WSRC as early as November 1995…. In spite of* [these] *completed corrective actions that included numerous revisions to bioassay and work control procedures and worker retraining, worker participation in the job-specific bioassay program continued to decline. These violations occurred because WSRC did not have a process in place to determine whether corrective actions had been effective in remedying identified deficiencies. As a consequence, the job-specific bioassay non-participation level rose to* ***79 percent in the second quarter of 1997*** [emphasis added]. [DOE 1998a].

This NOV originated in a self-assessment conducted by WSRC in May 1997, subsequent to its initial findings in 1995, following enforcement actions taken by DOE that year at Mound Laboratory for a similar lack of adherence to job-specific bioassays.[9] The intent was to determine if similar problems existed with the bioassay program at SRS (Augusta Chronicle 1998). WSRC conducted its earlier, limited sampling of facilities using job-specific RWPs requiring bioassay samples and found that:

> *Of the 3,200 bioassay requirements reviewed, 95 percent of the workers were covered by the routine bioassay program and had submitted bioassay samples as required. However, of the 5% of the workers requested to submit job-specific bioassay samples, only 33%* [non-participation rate of 67%] *were provided. A separate review also found that the Bioassay Laboratory was only notified by the Radiological Control Operations (RCOs) of about 33% of the samples that were actually submitted for analysis.* [DOE/NTS 1997]

Regarding the above two surveys conducted at SRS, it should be noted that the latter self-assessment that was conducted in May 1997 (33% compliance) was a limited sampling of facilities that used job-specific RWPs, whereas the follow-on survey conducted in September 1997 for the second quarter of 1997 (21% compliance) was a full assessment covering all facilities that used either standing or job-specific RWPs requiring bioassay submittal.[10]

It is clear that the problem of worker and management adherence to job-specific bioassay requirements was a persistent one, as far back as to the 1990 Tiger Team assessment. In that assessment, SRS was cited for noncompliance with DOE Order 5480.11, in part, because "*the mechanism for follow-up and collection of delinquent bioassay samples is not working*" and that

[9] On October 21, 1997, DOE had issued a Severity Level 1 NOV, with civil penalty, against EG&G, Inc., the operating contractor of Mound Laboratory, for "*failure to adequately assure that the Mound Plant's Bioassay Program for workers was implemented in accordance with the contractor's own established procedures*." (DOE 1998b). The NOV indicated that for FY1997, it was determined that approximately 108 workers performing radiological work activities under the control of at least 20 different RWPs had failed to submit job-specific bioassays. These deficiencies were known as early as 1995.

[10] On this basis, it is not clear whether the non-participation level "rose" to 79% or whether this non-participation rate, in actuality, provided a more accurate representation of the status quo given its full scope encompassing all SRS operations. It remains the only review identified that was of full scope, not a limited sample.

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"*not all positive bioassay results are investigated and many investigations are incomplete because of the problem with delinquent bioassay samples*" (DOE 1990). Corrective actions tied to the Tiger Team assessment in 1990, and later WSRC findings in 1995 and 1997 proved inadequate to change the workplace culture and accountability to bioassay participation.

The enforcement program's corrective program was initiated at SRS in late 1997 and completed (or closed) on December 28, 1998, with the following key corrective actions taken (partial listing) (DOE/NTS 1998):

- [Revise WSRC procedure to] *establish requirements for a RCO* [Radiological Control Operations] *job-specific bioassay log.*
- [Revise WSRC procedure] *to include the requirement to identify workers who have signed-in on an RWP but do not participate in the required routine sample program specified on the RWP and to verify the Job-Specific Bioassay Sample Log contains an entry for each identified worker.*
- [Revise WSRC procedure] *for RWP sign-in sheet, to include bioassay sample program check-off.*
- [Revise WSRC electronic forms] *to include a T-30 bioassay sample program check-off.*
- *Develop and complete training on the bioassay sampling program for* [radiological control] *inspectors and RC supervisors.*
- *Develop and incorporate changes to the radiation worker training program to increase the worker's awareness of bioassay sampling program requirements.*
- *Develop performance-based lines of inquiry to be used to determine the effectiveness of actions taken to correct deficiencies in the job-specific bioassay sampling program and incorporate them into the Safety & Health Operations department self-assessment plan.*

From a review of the DOE Noncompliance Tracking System (NTS) for 1999 and beyond, there are no reports of further issues (at least from the compliance standpoint) with the job-specific bioassay program.

3.5 ACCEPTABLE COMPLIANCE RATE

In terms of the implications to dose reconstruction, or more specifically, coworker model development, of non-adherence to job-specific bioassay requirements or related indicators of bioassay records completeness, the question of a "success metric" for completeness has arisen.

During the September 26, 2016, meeting of the SRS Work Group, there was a discussion of the question of what would constitute such a "success metric." In that discussion, NIOSH provided the following perspective on this question:

> [DR. TAULBEE:] *Bioassay is a little more questionable* [than external dosimetry or badging] *from that standpoint* [of completeness]. *The reason that it's*

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> *questionable is because even today the construction trades worker, especially a subcontractor, finishes the job and is given a urinalysis kit to leave a 24-hour urine sample in, and they may or may not return that to the site.* [ABRWH 2016, page 21]

In terms of an actual metric of success for application to a dataset for coworker development, NIOSH contemplated a metric of a 75% urinalysis rate of recorded results within a year (or alternatively, half a year) of the job-specific RWP requirement as being reasonable, as follows (ABRWH 2016, pages 21–23):

> [DR. TAULBEE:] *I'd consider success if we're greater than 75 percent, considering that these could have been a onetime job and, you know, you can ask somebody to leave a 24-hour urine sample and give them all the materials, but if they don't send it back, there's nothing really the site can do, or anybody can do, even today, other than restrict them on their next job coming into the site.*
>
> *So I don't expect a hundred percent on that one, but I do think that -- I do anticipate that we will have a fairly reasonable success rate.*
>
> *And if we do, of, say, 75 percent, then I feel the coworker model would be valid because the people who would not be leaving their sample would probably be -- I can't see why they would be just the high jobs. I would think that they would be the more at random.*
>
> *So, you know, a coworker model should cover those workers' intake potential. And so, that's what we're considering from this standpoint.*
>
> *CHAIRMAN CLAWSON: So, Tim, let me interrupt for just one second.*
>
> *DR. TAULBEE: Sure.*
>
> *CHAIRMAN CLAWSON: So, with this paperwork, your feeling is, is that there should be a bioassay tied to each one of these permits or--*
>
> *DR. TAULBEE: No, within that year. By the way they were doing the monitoring, it was quarterly with the maximum frequency, unless there was an incident or something like that.*
>
> *So if we don't have an indication of an incident or something along those lines for these workers, but they were wearing a respirator doing this type of work, I would expect to see, within a year of that work, a bioassay sample for that work.*
>
> *Because some of them, even though they were subcontractors, they were not -- they were going from one job to the other, to the next, to the next, and we see many of the same names within this group.*
>
> *So it wasn't a dedicated group completely, but they did tend to use many of the same workers. So I don't expect it to be at the end of each job plan. But if we*

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> *don't have, you know, a bioassay within that year or half a year or something like that, then, yeah, I would consider that a miss.*

While SC&A appreciates the utility of a metric of this kind, it presumes that there is a functional job-specific RWP program whose bioassay requirements are followed by workers and enforced by management through accountable procedures and oversight. From WSRC's own self-assessments beginning in 1995, extending to DOE's NOV in 1998, it is clear that there was little adherence to and enforcement of job-specific bioassay requirements from the beginning of WSRC's tenure in 1989 through to a complete overhaul of procedures, tracking, and management of bioassay followup requirements in 1997–1998, as part of a corrective action program to satisfy the NOV. SC&A's sampling result of 20–34% (or alternately, 15–28% of those with explicit requirements) of missing bioassays contrasts with the 67% missing bioassays due to non-participation cited in the NOV and the 79% missing bioassay rate cited by WSRC in 1997 (2nd quarter).

As this last figure—79% missing bioassays for RWP-based, job-specific bioassays— is the only one that was not a limited sample, but an actual full assessment covering all SRS facilities that used either standing RWPs or job-specific RWPs requiring submittal of bioassay samples, it is the most authoritative one to date. Given the clear workplace cultural impediments to making corrective actions for this problem, it is also clear that this condition was a persistent one as far back as the late 1980s.

Section 2.2 of NIOSH's *Draft Criteria for the Evaluation and Use of Coworker Datasets* (NIOSH 2015) states:

> *Once the measurement techniques have been found to be technically acceptable, the amount of available monitoring data must be evaluated to determine if there are sufficient measurements to ensure that the data are either bounding or representative of the exposure potential for each job/exposure category at the facility. This analysis should look, not only at the total amount of data that are available, but also consider any temporal trends in data availability. A useful technique to establish this is to conduct a gap analysis. That is, the available monitoring data should be reviewed against the number and types of workers that were involved in radiological activities over time at the facility.*

And further:

> *Facilities with the potential for internal and/or external exposure to a large percentage of the workforce would require many more samples than one in which the potential for exposure was limited to just a few workers.*

Based on these criteria, there are the dual questions of whether there are "sufficient measurements" that (1) could bound all of the specific jobs or exposure categories involving CTWs at the site or (2) be representative of the exposure potential for each CTW job or exposure category at SRS. And finally, how many samples would be necessary given the relatively large percentage of CTWs having an exposure potential in RWP-prescribed jobs (essentially 100% having exposure potential by definition).

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A response to the first question is essentially subjective. However, by the sheer scope and magnitude of the missing bioassay measurements over an indeterminate but extended period of years,[11] it is not feasible to account for all of the RWP-driven jobs for which CTWs had radiological exposure potential, by relying on either production worker routine bioassays or what limited job-specific bioassays were submitted. For these, a bias would exist in the type of radiological work non-CTWs versus CTWs performed, with CTW work being assigned across the site, typically intermittent and transient in nature, involving different radioactive sources, operations, and controls. There is also evidently a temporal trend in the available data, as greater reliance on subcontractor CTWs occurred toward the end of the 1980s, as well as expanded use of RWPs and RWP-driven bioassays under the new operating contractor (WSRC) beginning in 1989.

A response to the second question ties to the first. It does not appear feasible that site-wide measurements or the relatively small fraction of submitted job-specific bioassays would be representative of the spectrum of jobs or exposure categories involving CTWs at the site. This would essentially be an attempt to apply non-CTW routine bioassays to bound exposure potential for CTWs performing specific crafts-related jobs. This would entail that CTW exposure potential could be assessed by job categories and found to be enveloped by that of non-CTWs, a comparison that is undercut by almost 80% of the job-specific bioassay measurements being missing for CTWs (it is also not clear if the non-CTW internal dosimetry database has been similarly validated and verified for completeness). For subcontractor CTWs, this disparity would be even greater given the intermittent nature of their onsite work, which would entail predominantly RWP-driven, job-specific bioassay monitoring.

For the final consideration, sampling size, it is clear that a relatively large measurement sample would be necessary to encompass the broad range of facilities, long time periods, and CTW job activities at SRS. This is clearly illustrated by the difference in results achieved by WSRC in its own self-assessments of job-specific bioassay compliance, where a limited sampling of job-specific RWPs at some facilities at a single point in time found 67% noncompliance, whereas a full sampling of all job-specific RWPs at all SRS facilities over a full quarter found 79% noncompliance.

4.0 SUMMARY AND CONCLUSION

From the September 26, 2016, Work Group discussion, a “success” metric of 75% of CTWs sampled for bioassays was offered by NIOSH as illustrative of how much agreement would be needed to support coworker development. However, putting aside the actual merits of such a proposed criterion, none of the surveys taken by either SC&A (66–72% submitted at 30 days, 1989–1995, RWP limited sample) or WSRC (33% submitted for May 1997, RWP limited sample, and 21% submitted for 2nd quarter 1997, full RWP assessment) satisfy even that relaxed

[11] While the time period cited by the NOV is 1995–1997, this 2-year period is circumscribed by the two self-assessments that bookend it. It is clear from the WSRC self-assessments and NOV, and supported by 1990 Tiger Team findings, that non-adherence by workers and management to these requirements were persistent, long-standing, and apparently were imbedded in the workplace safety culture. With formal job-specific RWPs being introduced on a wide scale by WSRC beginning in 1989, this condition (lack of compliance with attendant bioassays) is likely to have begun then. This seems to be confirmed by the program deficiency noted by the Tiger Team assessment in 1990.

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metric. Beyond their importance to radiological control, the body of data represented by job-specific bioassays, if complete and representative, would provide internal dose assessment data from which a credible CTW-specific dose distribution could be derived. Without these data, there would be no means to assess and record dose for those who changed jobs or subsequently left the site, as is typical of subcontractor CTWs. If one were to accept the proposed NIOSH "success metric" at face value, a coworker model for CTWs would not be supportable using any dataset that included job-specific bioassays.

For CTWs at Savannah River, it is clear from both internal contractor assessments and DOE enforcement actions that accountability to and support by workers and management of the job-specific bioassay program was lacking for an indeterminate number of years before 1998. With almost 80% of bioassays not submitted by the operating contractor's own assessment, it is not feasible to know what exposure potential existed and internal dose resulted for CTWs performing specific radiological jobs at SRS before effective corrective actions were compelled in 1998 by enforcement action. As these were job-specific and RWP-prescribed, these jobs would have involved a potential for potential intake of tritium, plutonium, uranium, neptunium, mixed FPs, and other significant SRS source terms. While an argument can be made that the longer-lived radionuclides would have been detected in later *in vivo* or *in vitro* bioassays, this does not consider that, for CTWs, their intermittent work at the site may have precluded such later assessments. Likewise, for exposure to shorter-lived radionuclides such as tritium and mixed FPs, delays of months before a subsequent urinalysis may preclude effective dose assessment. Finally, while termination bioassays were not sampled in this review, reliance on these need to be approached with caution as they have historically experienced low compliance by workers, particularly subcontractor CTWs, at many DOE sites.

SC&A concludes that the bioassay dataset for CTW subcontractors, specifically, and CTWs, generally, is demonstrably incomplete for 1989–1998 (and likely before that time period) and does not satisfy the criteria set forth in NIOSH's *Draft Criteria for the Evaluation and Use of Coworker Datasets* (NIOSH 2015). SC&A recommends that the Work Group discuss the implications of these findings with NIOSH and determine whether NIOSH has any available monitoring data or bounding approach that could ameliorate this fundamental data gap.

5.0 REFERENCES

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APPENDIX A: DATA CAPTURE REQUEST

December 7, 2016

Dr. Jack R. Craig, Jr., Manager
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Mr. Douglas Dearolph, Manager
National Nuclear Security Administration
Savannah River Site Office
P.O. Box A, Road 1A
Aiken, South Carolina 29802

Subject: Savannah River Site Onsite Research in Support of the Advisory Board on Radiation and Worker Health

Dear Sirs:

Under the Energy Employees Occupational Illness and Compensation Program Act of 2000 (EEOICPA), the Advisory Board on Radiation and Worker Health (Advisory Board or ABRWH) has been given the statutory responsibility, as guided by Executive Order 13179, to:

> *provide advice to the Secretary, HHS* [Health and Human Services] *on (1) the development of guidelines to assess the likelihood that an individual with cancer sustained the cancer in the performance of duty at a DOE* [U.S. Department of Energy] *or Atomic Weapons Employer (AWE) facility, and methods for arriving at and providing reasonable estimates of the radiation doses received by individuals applying for assistance under this program for whom there are inadequate records of radiation exposure; (2) the scientific validity and quality of dose reconstruction efforts performed for this program; and (3) upon request by the Secretary, HHS, whether there is a class of employees at any DOE or AWE facility who were exposed to radiation but for whom it is not feasible to estimate their radiation dose, and on whether there is reasonable likelihood that such radiation dose may have endangered the health of members of the class.*

Pursuant to item (3) above, the Advisory Board is currently reviewing a "Special Exposure Cohort" evaluation conducted by the National Institute of Occupational Safety and Health (NIOSH) in response to a Petition (#00103) submitted by qualified Savannah River Site (SRS) former employees under EEOICPA. This ongoing review is focused on SRS radiation dose records and whether there is adequate and complete information upon which to base dose reconstructions under EEOICPA. In support of the Advisory Board, SC&A, Inc. has been tasked with the conduct of onsite research and information-gathering at SRS, as outlined in the attached "Data Capture Plan."

The attached plan for SRS references a recent keyword search of SRS's Savannah River Nuclear Solution (SRNS) Electronic Document Workflow (Records) System and provides a list of resulting document boxes

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requested for review, as well as a requested further review by SRS of any additional sources of information about safe work permits or radiological work permits for 1980–2000 from which subcontractor participation can be identified. Lists of identified subcontractor workers will then be compared with available radiological records to ascertain the completeness of those records for this category of workers. This review has already been initiated for one SRS facility by NIOSH staff; this review will serve to expand the scope of that review. Again, the purpose of this review is to ascertain the completeness of historic radiological records to support dose reconstruction under the EEOICPA program.

This search will be closely coordinated with William Ahlers, DOE-Savannah River Operations Office (DOE-SR), our point of contact (POC) for this review, as well as with Greg Lewis, Office of Environment, Health, Safety and Security (EHSS), at DOE headquarters, who will coordinate with SRS on resource and access questions. Once both DOE-SR staff and records control personnel have had the opportunity to review the attached list of relevant boxes, SC&A will work with the site POC to confirm the dates of the onsite visit necessary for firsthand review. From a preliminary scheduling standpoint, an onsite visit during the second week of January has been identified as preferred.

As in the past, we will closely coordinate any and all security considerations for this visit, including appropriate handling of sensitive information, with SRS POCs and will conform to all requirements and procedures. This visit will be accomplished in conjunction with a three-person NIOSH team who will accompany two SC&A personnel (including myself), and provide logistical support, such as onsite secure scanning of documents.

Your staff can directly coordinate this request and review with the Advisory Board, and with me at [redacted] or IIJ5@cdc.gov, if you have any questions.

Best regards,

[signed]

Joseph Fitzgerald
SC&A Team

Cc: James Melius, Chair, ABRWH
Greg Lewis, DOE/EHSS
Stu Hinnefeld, NIOSH/DCAS
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Data Capture Plan

Data Capture Strategy for
Savannah River Site Special Exposure Cohort/Evaluation Report 00103,
December 7, 2016

General Considerations:

Data will be protected as required by U.S. Department of Energy (DOE) classification review and previously described policies.

All documents should be provided with Privacy Act of 1974 (5 U.S.C. § 552a) information included and marked with appropriate classification.

Data captured by SC&A, Inc. will be made available to SC&A and the National Institute for Occupational Safety and Health (NIOSH) and, after appropriate internal review, will be scanned on site, if feasible, and forwarded to NIOSH for uploading into the Dose Reconstruction Project's Site Research Database.

Data Capture Points of Contact:

Advisory Board on Radiation and Worker Health (ABRWH), SC&A, NIOSH, and Oak Ridge Associated Universities (ORAU) Team:

- ABRWH: Bradley Clawson, Work Group Chair, [redacted], cke4@cdc.gov (alt: Bradley.Clawson@icp.doe.gov)
- SC&A: Joe Fitzgerald, [redacted], IIJ5@cdc.gov (alt: jf@saliantinc.com); John Stiver (ijg3@cdc.gov)
- NIOSH: Tim Taulbee, tgt4@cdc.gov

DOE contacts who should be included in all correspondence for this data capture activity:

- DOE Savannah River Site (SRS)/National Nuclear Security Administration: William G. Ahlers, William.Ahlers@srs.doe.gov
- DOE Headquarters: Greg Lewis, [redacted], Gregory.lewis@eh.doe.gov

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DATA CAPTURE ACTIVITY (SEC-00103)

Objective:

The objective of this data capture is to request the document boxes listed in Attachment 1 by their location numbers, as identified through keyword searches of the Savannah River Nuclear Solution Electronic Document Workflow (Records) System (EDWS) focused on construction and support work in the 1980s and 1990s (and to a smaller extent, 1972–1980) for which subcontractor participation can be identified. The keyword searches address job-relevant records such as safe work permits, construction job plans, and radiological survey logs for which subcontractor names, identifiers, and facility can be more likely found. In addition, assistance is being requested in locating any additional records pertaining to listings of identified subcontractors performing radiological work at SRS, as could be found in safe work permits and radiological work permits, construction job plans, or similar operational roster records. Once sufficient subcontractors have been identified by name and/or employee number, and as time permits, this information will be compared to corresponding information on individual bioassay records (recorded on bioassay cards, which may also have been microfiched).

Purpose:

The purpose of this request is to obtain additional historic information to support the ABRWH, a statutory-based independent organization whose mission is to review NIOSH's dose reconstruction program, with its review of a NIOSH evaluation report regarding Special Exposure Cohort (SEC) 00103.

Request Date:

December 6, 2016

Data Needs Description:

1. 1972–2000: Safe work permits and radiological work permits for SRS facilities, specifically, the box numbers cited in the attached list (Attachment 1). (Note that only 11 boxes were identified through EDWS searches and from what NIOSH has already identified, while many radiological work permit "summaries" were found on EDWS – are there additional records or repositories of actual safe work permits and radiological work permits on site that can be reviewed?).

2. 1980–2000: Radiological survey logs, as cited in Attachment 1.

3. Assistance is being requested in locating any additional records for 1980–2000 pertaining to listings of identified subcontractors performing radiological work at SRS, as could be found in safe work permits and radiological work permits, construction job plans, or similar operational roster records (see #1 above).

4. Access to former SRS employee "Bioassay Cards," i.e., individual bioassay data filed by person (based on interviews, these have been converted to microfiche). These have been recently accessed by ORAU personnel acting on behalf of NIOSH. SC&A will need to match identifiers between the subcontractors identified via operational records and corresponding bioassay records.

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Data Capture Plan: Attachment 1

SRS DATA CAPTURE: SC&A ONSITE REVIEW

1972–1990, Safe or Rad Work Permits (NIOSH Master Box List)

M270-11784-HPK13-RTAS

M270-11784-HPK8-RTAS

M270-11784-HPK9-RTAS

M270-9185-296-RTAS

M270-8816-25-RTAS

1990–2000, Safe or Rad Work Permits (EDWS)

QR111-2982-2000-001-RTAS

QH113-0593-93-017-RTAS

QH128-1059-93-005-RTAS

FE5300-2000-99-017-RTAS

QR710-2907-99-011-RTAS

SN0000-2453-97-012-RTAS

1980–1991, Radiological Survey Logs (NIOSH Master Box List)

M270-10615-88-RTAS

M270-10615-91-RTAS

M270-10615-90-RTAS

M270-10643-2-RTAS

M270-10644-2-RTAS

M270-10705-29-RTAS

M270-10888-1-RTAS

M270-10888-2-RTAS

M270-10837-12-RTAS

M270-10841-2-RTAS

M270-10853-3-RTAS

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M270-10874-327-RTAS

M270-10874-328-RTAS

M270-10874-329-RTAS

M270-10874-330-RTAS

M270-10874-331-RTAS

M270-10874-332-RTAS

M270-10874-333-RTAS

M270-10885-HPM1-RTAS

M270-10896-002-RTAS

M270-10965-1-RTAS

M270-11094-1-RTAS

M270-11117-72-RTAS

M270-11127-7-RTAS

M270-11128-HPFB10-RTAS

M270-11128-HPFB11-RTAS

M270-11136-W7227-RTAS

M270-11194-HPHWM6-RTAS

M270-11194-HPHWM7-RTAS

M270-11194-HPHWM8-RTAS

M270-11199-HPP-1-RTAS

M270-11202-HPFL#1-RTAS

M270-11202-HPFL#2-RTAS

M270-11370-2-RTAS

M270-11370-4-RTAS

M270-11372-HPFMF1-RTAS

M270-11372-HPFMF2-RTAS

M270-11372-HPFMF4-RTAS

M270-11372-HPFMF5-RTAS

M270-11372-HPFMF6-RTAS

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M270-11372-HPFMF7-RTAS

M270-11567-3-RTAS

M270-11567-4-RTAS

M270-11719-1-RTAS

M270-11784-HPK14-RTAS

M270-11784-HPK1-RTAS

M270-11784-HPK6-RTAS

M270-11784-HPK7-RTAS

M270-11788-1-RTAS

M270-11790-1-RTAS

M270-11927-HPFB8-RTAS

M270-11932-HPF1-RTAS

1990–2000, Radiological Survey Logs (EDWS)

QR111-2982-2000-002-RTAS

QR111-2982-2000-003-RTAS

WB4300-3210-2004-011-RTAS

SF1120-1381-94-004-RTAS

M270-9273-27-RTAS

M270-9438-57-RTAS

M270-9667-296-RTAS

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APPENDIX B: [REDACTED IN FULL]

[Appendix B is withheld in its entirety to prevent the disclosure of Privacy Act-protected information.]

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