Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B

Use of this form and disclosure of Social Security Number are voluntary. Failure to use this form or disclose this number will not result in the denial of any right, benefit, or privilege to which you may be entitled.

General Instructions on Completing this Form *(complete instructions are available in a separate packet)*:

Except for signatures, please **PRINT** all information clearly and neatly on the form.

Please read each of Parts A — G in this form and complete the parts appropriate to you. If there is more than one petitioner, then each petitioner should complete those sections of parts A – C of the form that apply to them. Additional copies of the first two pages of this form are provided at the end of the form for this purpose. A maximum of three petitioners is allowed.

11-19-07P01:30 RCVD

If you need more space to provide additional information, use the continuation page provided at the end of the form and attach the completed continuation page(s) to Form B.

If you have questions about the use of this form, please call the following NIOSH toll-free phone number and request to speak to someone in the Office of Compensation Analysis and Support about an SEC petition: **1-800-356-4674.**

If you are:	☐ A Labor Organization,	Start at D	on Page 3
	☒ An Energy Employee (current or former),	Start at C	on Page 2
	☐ A Survivor (of a former Energy Employee),	Start at B	on Page 2
	☐ A Representative (of a current or former Energy Employee),	Start at A	on Page 1

A Representative Information — Complete Section A if you are authorized by an Employee or Survivor(s) to petition on behalf of a class.

A.1 **Are you a contact person for an organization?** ☐ Yes (Go to A.2) ☐ No (Go to A.3)

A.2 **Organization Information:**

Name of Organization

Position of Contact Person

A.3 **Name of Petition Representative:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

A.4 **Address:**

Street Apt # P.O. Box

City State Zip Code

A.5 **Telephone Number:** ( ) -

A.6 **Email Address:**

A.7 ☐ Check the box at left to indicate you have attached to the back of this form written authorization to petition by the survivor(s) or employee(s) indicated in Parts B or C of this form. An authorization

If you are representing a Survivor, go to Part B; if you are representing an Employee, go to Part C.

Name or Social Security Number of First Petitioner: [redacted]

B Survivor Information — Complete Section B if you are a Survivor or representing a Survivor.

B.1 **Name of Survivor:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

B.2 **Social Security Number of Survivor:**

B.3 **Address of Survivor:**

Street Apt # P.O. Box

City State Zip Code

B.4 **Telephone Number of Survivor:** ( ) -

B.5 **Email Address of Survivor:**

B.6 **Relationship to Employee:** ☐ Spouse ☐ Son/Daughter ☐ Parent ☐ Grandparent ☐ Grandchild

Go to Part C.

C Employee Information — Complete Section C UNLESS you are a labor organization.

C.1 **Name of Employee:** [redacted]

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.2 **Former Name of Employee** (e.g., maiden name/legal name change/other):

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.3 **Social Security Number of Employee:** [redacted]

C.4 **Address of Employee** (if living): [redacted]

Street Apt # P.O. Box

City State Zip Code

C.5 **Telephone Number of Employee:** [redacted]

C.6 **Email Address of Employee:**

C.7 **Employment Information Related to Petition:**

C.7a Employee Number (if known): ELECTRICIAN

C.7b Dates of Employment: Start 1952 End 1995

C.7c Employer Name: MANY ON ALL PARTS OF SITE

C.7d Work Site Location: This petition is filed on behalf of all workers who have submitted

C.7e Supervisor's Name: notarized affidavits attached hereto in section F.1.

Go to Part E.

D Labor Organization Information — Complete Section D ONLY if you are a labor organization.

D.1 **Labor Organization Information:**

_____
Name of Organization

_____
Position of Contact Person

D.2 **Name of Petition Representative:**

_____

D.3 **Address of Petition Representative:**

_____
Street Apt # P.O. Box

_____
City State Zip Code

D.4 **Telephone Number of Petition Representative:** (____) ____-_____

D.5 **Email Address of Petition Representative:** _____

D.6 **Period during which labor organization represented employees covered by this petition** (please attach documentation): Start _____ End _____

D.7 **Identity of other labor organizations that may represent or have represented this class of employees** (if known):

_____

Go to Part E.

E Proposed Definition of Employee Class Covered by Petition — Complete Section E.

E.1 **Name of DOE or AWE Facility:** Savannah River Site

E.2 **Locations at the Facility relevant to this petition:**

All areas.

E.3 **List job titles and/or job duties of employees included in the class. In addition, you can list by name any individuals other than petitioners identified on this form who you believe should be included in this class:**

Construction Workers and all other workers

E.4 **Employment Dates relevant to this petition:**

Start 1950 End present

Start _____ End _____

Start _____ End _____

E.5 **Is the petition based on one or more unmonitored, unrecorded, or inadequately monitored or recorded exposure incidents?:** ☒ Yes ☐ No

If yes, provide the date(s) of the incident(s) and a complete description (attach additional pages as necessary):

Workers who had extensive employment experience from all phases of the SRS site operation met with the NIOSH team that put together the SRS site profile on November 11, 2003. Never once in the preparation of the site profile had anyone at NIOSH consulted with the unions that worked at the site. This is confirmed in the minutes from the August 19, 2003 Advisory Board on Radiation and Worker Health.

The November 11, 2003 comments from the President of the August Building and Construction Trades Council are attached. His opening comments point up the fact that members are dismayed because claims are being denied because dose reconstructions can't fairly be done on construction workers. As a follow up to this meeting Dr. Knut Ringen presented specific comments to the Board on December 9, 2003 on the deficiencies of the SRS site profile.

Four years later NIOSH still has not addressed the deficiencies that were identified in 2003. If NIOSH has not been able to fix these deficiencies in four years, there is no reason to believe it will ever fix them. These workers deserve closure and an SEC is the only way to accomplish that.

Go to Part F.

F Basis for Proposing that Records and Information are Inadequate for Individual Dose — Complete Section F.

Complete **at least one** of the following entries in this section by checking the appropriate box and providing the required information related to the selection. You are not required to complete more than one entry.

F.1 ☒ I/We have attached either documents or statements provided by affidavit that indicate that radiation exposures and radiation doses potentially incurred by members of the proposed class, that relate to this petition, were not monitored, either through personal monitoring or through area monitoring.

(Attach documents and/or affidavits to the back of the petition form.)

Describe as completely as possible, to the extent it might be unclear, how the attached documentation and/or affidavit(s) indicate that potential radiation exposures were not monitored.

See attached

F.2 ☐ I/ We have attached either documents or statements provided by affidavit that indicate that radiation monitoring records for members of the proposed class have been lost, falsified, or destroyed; or that there is no information regarding monitoring, source, source term, or process from the site where the employees worked.

(Attach documents and/or affidavits to the back of the petition form.)

Describe as completely as possible, to the extent it might be unclear, how the attached documentation and/or affidavit(s) indicate that radiation monitoring records for members of the proposed class have been lost, altered illegally, or destroyed.

Part F is continued on the following page.

F.3 ☐ I/We have attached a report from a health physicist or other individual with expertise in radiation dose reconstruction documenting the limitations of existing DOE or AWE records on radiation exposures at the facility, as relevant to the petition. The report specifies the basis for believing these documented limitations might prevent the completion of dose reconstructions for members of the class under 42 CFR Part 82 and related NIOSH technical implementation guidelines.

(Attach report to the back of the petition form.)

F.4 ☐ I/We have attached a scientific or technical report, issued by a government agency of the Executive Branch of Government or the General Accounting Office, the Nuclear Regulatory Commission, or the Defense Nuclear Facilities Safety Board, or published in a peer-reviewed journal, that identifies dosimetry and related information that are unavailable (due to either a lack of monitoring or the destruction or loss of records) for estimating the radiation doses of employees covered by the petition.

(Attach report to the back of the petition form.)

Go to Part G.

G Signature of Person(s) Submitting this Petition — Complete Section G.

All Petitioners should sign and date the petition. A maximum of three persons may sign the petition.

[redacted]
Signature

11-05-07
Date

11-13-07
Date

11-05-07
Date

Notice: Any person who knowingly makes any false statement, misrepresentation, concealment of fact or any other act of fraud to obtain compensation as provided under EEOICPA or who knowingly accepts compensation to which that person is not entitled is subject to civil or administrative remedies as well as felony criminal prosecution and may, under appropriate criminal provisions, be punished by a fine or imprisonment or both. I affirm that the information provided on this form is accurate and true.

Send this form to:

SEC Petition
Office of Compensation Analysis and Support
NIOSH
4676 Columbia Parkway, MS-C-47
Cincinnati, OH 45226

If there are additional petitioners, they must complete the Appendix Forms for additional petitioners. The Appendix forms are located at the end of this document.

Name or Social Security Number of First Petitioner: [redacted]

F.1 Basis for Proposing that records and information are inadequate for individual dose.

Since the inception of the EEOICP, the building trades have asked NIOSH to come up with a unique approach to construction worker dose reconstructions that will take into account the unique employment patterns and unreliable dose monitoring. To date, NIOSH has failed to do so.

In 2005, a study was performed by the Center To Protect Workers' Rights which has been provided to NIOSH compared 2,335 construction trades workers who had been employed at the SRS site and who had participated in the Former Worker Medical Screening Program for the SRS site to the radiation dose records data set for the SRS site (known as HPAREA). A significant number of SRS construction trades workers have either no deep dose or all recorded "zero" doses in HPAREH. Based on HPAREH data base of radiation monitoring records from SRS, it appears that underlying dose data are deficient for 50-90% of the construction workers employed at SRS. NIOSH has not explained how it can complete dose reconstructions in light of this deficiency.

On May 10 2003 NIOSH issued a site profile document for the SRS site which aimed to provide methods for dose reconstruction where individual worker monitoring records were deficient. Construction Trades Workers who had extensive employment experience from all phases of the SRS site operation met with NIOSH in Augusta on November 11, and identified deficiencies in the site profile document as it related to construction workers in a number of areas. The concerns were also presented to the NIOSH Board on Radiation and Worker Health on December 9, 2003, to make sure there is a record of them at NIOSH. The opening comments from the Building Trades November 11th meeting are attached as are the comments made to the Advisory Board on December 9, 2003. The SRS site profile was revised a number of times in 2004 and 2005, but none of these modifications included the concerns raised by the building trades.

There is no recent evidence to suggest that there is any reason to have confidence in the dose reconstructions performed by NIOSH. In a Congressional hearing on October 23, Mr. Shelby Hallmark of the Department of Labor testified that in 2007 DOL had returned 2,811 dose reconstruction cases for re-work due to deficiencies identified in the work that NIOSH had performed. After re-working these cases, 385 case which had been denied were approved. In other words, 14% had been wrong the first time around. Further, Mr. Hallmark stated that DOL would soon send another 4,400 cases back to NISOH and in addition to that 5,000 more. This means that DOL will have sent back half of the dose reconstruction cases completed.

We conclude that in the six years that have elapsed since this program was started, NIOSH does not have a valid method to perform dose reconstructions for construction trades workers, and has not acted to rectify the deficiencies identified in the underlying knowledge base for the SRS site.

Therefore, we believe that dose reconstructions on SRS construction workers can not be performed with the reliability intended by the Act, and therefore, the construction workers employed at the SRS site should be included in the SEC.

MY NAME IS [redacted]

I AM A MEMBER OF [redacted]

IN [redacted]

I WORKED FOR BECHTEL AT SRS [redacted]

DURING THIS TIME I REPAIRED SMALL ELECTRICAL TOOLS IN CENTRAL SHOPS FOR THE INTIRE SITE. ON ONE OCCASION 4 ELECTRICANS BROUGHT A TRUCK LOAD OF TOOLS TO BE REPARIED THEY WERE UNLOADING THEM ONTO A PALLET TO BE BROUGHT INTO SHOP. ONE OF THE MEN CAME INTO SHOP AND ASKED ME TO COME OUTSIDE AND SHOW THEM WHERE TO PUT TOOLS. WHEN I WENT OUTSIDE I SAW THAT THE TOOLS WERE MARKED WITH PAINT AS TOOLS THAT HAD BEEN IN RADIATION AREAS AND WERE NOT SUPPOSED TO BE REMOVED FROM RADIATION ZONE I AT ONCE TOLD MEN TO STOP HANDLING TOOLS AS THEY CAME OUT OF RZ AREAS THEY SAID THEY WERE NOT TOLD THIS AND WERE TOLD TO BRING TO CENTRAL SHOPS FOR REPAIR

I CALLED H. P. AND H.P. TECH. CAME & CHECKED MEN + TOOLS TOOLS WERE FOUND TO BE HOT & COMMINATED MEN WENT TO H. P. OFFICE FOR CLEAN UP. TOOLS WERE COVERED WITH PLASTIC BAGS AND LATER SENT TO BURIAL GROUNDS

[redacted]

Nora D. Zimmerman

Notary Public, Richmond County, GA
My Commission Expires April 21, 2009

STATE OF SOUTH CAROLINA)
)
COUNTY OF COLLETON)

AFFIDAVIT OF [redacted]

NOW COMES [redacted] who, after being duly sworn, deposes and says as follows:

I am the widow of [redacted], a former employee in Operations at the Savannah River Site. [redacted] was initially hired into DuPont Patrol but was reassigned when Wackenhut took over the security of the site. He worked in B Line Production and various areas on site until his final work assignment in E & I. [redacted] was employed at the Savannah River Site from March of [redacted] I can recall several instances, early on when [redacted] would mention that there had been some type of accident/release on site. There were also reports of the same on the local news channels. Once, family members from over 100 miles away called to see if we were okay, because they were informed on their local channels that there had been some type of incident/release. Furthermore, [redacted] described to me having to "dress out" in what he referred to as "2 pair and a hog head" in certain areas where he worked. He also referred to "glove boxes" and "counters". I do recall him wearing a dosimetry badge during the end of his employment. Immediately, upon his death, I was contacted by a Savannah River Site representative who came to my parent's home where my daughter and I were staying and collected his dosimetry badge and identification badge. I don't recall him wearing the dosimetry badge continuously during his employment, especially early on when he worked in Patrol, where he had access to all areas of the Site. This may account in someway for the missing doses used in his Dose Reconstruction. Additionally, he was at the Navel Fuels facility in the mid-eighty's, from the time they broke ground until it was shut down, never having produced any product. He was there with other Operations employees as well as the construction crew. I

am not sure if this facility was newly built, but I do recall there being some issue as to possible asbestos exposure which would indicate that they were constructing this or at least part of this facility within existing buildings.

I filed a claim on behalf of my deceased husband on [redacted] 2003. He passed away in [redacted] 1992, at the age of [redacted] with lung cancer. He was diagnosed with Adenocarcinoma of the lung with bone and liver metastases on [redacted] 1992 and died on [redacted] 1992, leaving behind myself and our then three year old daughter. I received a Notice of Final Decision dated November 5, 2004 with their findings indicating that they were *only* 34.35% responsible for the death of my husband based on the Dose Reconstruction in place at that time, thus denying our claim. I then requested, by letter dated November 29, 2004, that [redacted] case be reviewed based on revisions being made to the EEOICPA and research that I came across. While conducting my own research to better understand what happened to my late husband as well as my attempt to understand the claims process and Dose Reconstruction, I consulted individuals in the medical and research community to try and find the answers that I was not getting from NIOSH, the Department of Energy or anyone else connected with the EEOICPA.

My experience with the claim process and dealing with the staff associated with NIOSH has been difficult at best. During telephone interviews, they were not very knowledgeable of the process, or able to clearly explain anything except for the seemingly scripted responses that they would give you, over and over. No matter what questions I asked of them or what information I requested, they rattled off their "canned responses". They failed to keep the claimants properly informed as to where you were in the claim process until they came to the conclusion that you didn't qualify then things really sped up. Once they provided me with the 34.35% of probability, they were quick to move on having me sign off on the matter. I was told that if I didn't follow

didn't follow their instructions and strict deadlines put in place at that point, the claim would not be considered any further.

After receiving no helpful assistance from their staff, I then began my own work on the claim. At the encouragement of others familiar with the EEOICP, I contacted elected officials within my state; however, not one of them even bothered to acknowledge my request for assistance. Feeling completely frustrated, I ran across transcripts from the recent hearings held in Congress, thus leading me to more helpful information, people and organizations. The general consensus coming out of these hearings seems to be, that there are serious problems with this program, but no one seems to be moving any closer to resolving the process. This leads to more meetings; possible reconfiguration of the Dose Reconstruction equation and/or data used in the same. More information leads to more problems. Problems such as: what *is* the proper equation for Dose Reconstruction; are there actual records available to properly evaluate an employee's exposure; are those records accurate; are all contaminates carcinogens, chemicals, places and levels of exposure, etc. being considered? How can they possibly expect to decide a claimant's fate with such limited or inaccurate data? Records of employees were kept hidden under the mantle of "National Security." No one had access to anything, much like the predicament we are in now. The questionable data being used, provided it exists at all, is only serving to punctuate the questionable practices of this program and those entrusted in its administration.

In short, this process, while touted as "claimant favorable" is anything but; claimants do not stand a chance without a serious overhaul of the Act and its administration. The Government has admitted that they were aware of the dangers that existed for workers at these facilities, yet they knowing withheld this information from the workers and exposed them nonetheless. They have admitted what they did, but for some reason have created this elaborate program to see to it

that few ever see any benefits. The EEOICPA was implemented to take care of the workers and the families that they left behind. It appears that the government is trying to avoid accepting responsibility for their actions and in the process, they are taking away the claimants dignity, sending a clear message that the employees that worked for America at these facilities really do not matter and neither do the ones that they left behind. And thus, leaving claimants without any hope they may have had in this program or the members of Congress.

The awards that Congress and NOISH clearly insist on making claimants jump through hoops for now are needed to care for the employees and those they left behind; which is a direct result of a willful act on the part of the Government, one which they admit to, but do not seem prepared to accept responsibility for or willing to suffer any consequences thereof.

This affidavit was given freely and voluntarily.

FURTHER AFFIANT SAYETH NAUGHT.

[redacted]

November 13, 2007
Dated

SWORN to before me this 13
day of November, 2007.

Notary Public for South Carolina
My Commission Expires:
Feb. 5, 2017

My Commission Expires
February 5, 2017
Notary Public
South Carolina

[redacted]

incident location: 221-H - Room 410 South

I was working in Rm 410 South with one coworker buddy ([redacted]). Operators were working in Rm 410 packaging plutonium into shipping containers. During this time operations personnel opened "barn doors" to bridge crane.

Health Physics inspector [redacted] came running into room in full respiratory protection and screamed "Get the Hell Out!"

My working buddy and myself evacuated the building. We learned that there was an air reversal when crane barn door was opened. Resulting in plutonium being drawn from glove boxes in 410 North and spreading air-borne into 410 South.

Operators in 410 North were in respiratory protection. Myself and [redacted] had not been trained in use of respirators, nor did we have any.

After incident was contained, we were given nasal smears, by Health Physics operator [redacted]. At this time he was advised that it "had it" in one nostril

Health Physics [redacted] insisted on recording events in his daily log book. Health Physics Supervisor [redacted] WAS ADAMANT that NO entries be made, because it would "LOOK BAD" for his shift.

I received no follow-up harassment.

Several months later HP inspector [redacted] log book, containing this incident, was removed from his locked desk during time he was away from work for military training.

Working buddy - [redacted] now is still on the site AND works for WSRC

HP TECHNICIAN [redacted] is Retired and lives in [redacted]

HP TECHNICIAN [redacted] is retired and lives in [redacted]

[redacted]

August 22, 2007

Notary Public, Richmond County, GA
My Commission Expires April 21, 2009

8/22/07

8/9/07

This incident happened around 1983, or 1984. The people involved were [redacted] and [redacted] and myself, [redacted] for Construction Electrical, and [redacted] on HP or Radcon.

Radcon office for 221-H B-line was in the hallway on 3rd level of the building. [redacted] were in [redacted] crew. They were drilling a hole through the concrete in the hallway in order to have a route to run their conduit. I was sitting at Radcons desk talking to [redacted] RCO, to arrange coverage for my crew to relocate conduit in another hallway in order for a door way to be cut into the new elevator shaft that was being built for the new B-line facility on the 5th & 6th level. [redacted] were using a rotoary hammer drill while [redacted] and myself were talking. All of a sudden the room CAM (Constant Air Monitor) alarmed. Immediately, [redacted] + I held our breath and left the room, as did [redacted] and [redacted]

What happened was [redacted] was drilling the hole just a few inches from an expansion joint,

and when the drill bit passed through the wall to the other side, a big hunk of concrete and tar from the expansion joint broke out. The air borne material came from the expansion joint. (Over the years there had been leaks in Rm. 410 south. This leakage had been flowing down the expansion joint)

We all reported to Radcon on the 1st level of 221-H. There they gave ~~us~~ us nose smears and found contamination. All of us were instructed to flush our noses with a saline type solution to wash other contamination out of our nostrils. We were taken to ~~3and700~~ 300 and 700 area where we met with the Doctor. He explained that we had had an uptake, determined by a chest count. He explained the Kedotion theory to us. We had to sign a consent form that was completely voluntary if we decided to go through the Kedotion process, which we all did. We all had to ~~used~~ use Urine sample bottles and a bucket for our feces for approximately 1 week + bring all of this back to work on a daily basis. I had been kept on a yearly chest count program until my retirement on March 29, 2007.

Mona J. Zimmerman

Notary

Notary Public, Richmond County, GA
My Commission Expires April 21, 2009

[redacted]

July 19, 2007

[redacted]

I, [redacted] worked at Savannah River Site, as an Operating Engineer out of [redacted] from [redacted]. I have concerns about incidents that took place during these years of employment. Some of the incidents took place on H area tank farm. I feel we were not kept safe and records could not have been kept due to the circumstances.

. (1) I was dressed out in white protective clothing and was given a pencil or dosimeter. As soon as I put the pencil on it went off scale. I called HP and he asked if I had dropped or bumped it. I told him no. HP took the pencil and said he would bring me another one. He never came back but I was told to go on and work and they would check me when I came out. 1988-1992.

(2) Working on H tank farm each day when leaving area for the day we would place our TLD badges on a board in front of the area by the guard gate. On several different times I would come into work at H tank farm and my TLD badge would be gone from the board as well as everyone else's badge would be gone. We were told that radioactive tanker trucks had passed through the gates and leaked radioactive materials on to the road and all TLD badges were wiped out and we would be given new TLD badges later on in the day. Sometimes we would not get the new badges until a day later.1988-1992

[redacted]

Participants signature

Notary Public

Notary Public, Richmond County, GA
My Commission Expires April 21, 2009

[redacted]

I was an employee at the Savannah River Plant, during the years of [redacted] As a "C" operator in the 221F, 221H buildings.

I was working around very dangerous materials, while most of my work was de-contamination or cleaning we were not told of which chemicals was involved, Just do your job & keep your mouth shute. All waste was marked as "High Radiation."

I worked in the cleaning & Repairing of used mask. I believe while repairing used mask I must have inhaled chemicals while repairing and adjusting.

while Removing plastic covers from a hot Railroad car, a lot of spilled water on the plastic, completely wet my work clothes. Their was no Health Phijics or supervision

AT The job site. As Usual most jobs were done without supervisors or health physics personal. and no records were recorded.

I worked on shift work. having rotation hours each week. day shift was always Full of Supervisors, except (SAT. or Sun.).

On shift work of odd hours, only A Few People were working, with many hours not seeing Any one. [redacted] we did not have badges to wear. We were used to not having badges so the work continued as usual.

I don't remember Anyone ever discussing my body count of radiation, but while Trying To get Composation Through The 2000 "sickness Programg", while I had To prove my sickness To Niosh. I received very Little Records. Niosh And To use "guess records."

However S.R.P. did send me A copy OF My Urine Test

which showed results of many chemicals that are cancer causing. In 1986 I had colan cancer almost losing my life.

Also in the urine Test, was a positive showing of "plutonium" which is the most toxic chemical and sure death. I'm still here but have a lot of sickness. I discussed this with a representive from Niosh. he very abruptly asked me how I received this information that I was not suppose to "know this". This is a sure cover up. I wonder how many others has "Plutonin" in their body.

Why was I not told by S.R.P. doctors about the dangerous chemicals in my body before being un-employed.

Niosh only gave me a possible 37% of 100% of my sickness.

This report was made to the best of remembrance and Truthe. I will be glad to share many more instances that happened if needed.

[redacted]

July 31, 2007

Notary Public, Richmond County, GA
My Commission Expires April 21, 2009

Notary

Date 7-10-07

1) [redacted]

2) Boiler makers

3) Worked @ SRS [redacted]

3) unsure

4) While working outside of the fab shop @ 700-A I cut old beryllium containers (aluminum cylinders) with a arc-welding machine, and stacking the cut containers onto pallets. I [redacted] asked if there was any chance of exposure and if it were harmful, I was told that the [redacted] material was not harmful and that there was no reason to be concerned. So, I cut up several pallets of these containers. Shortley after I heard of alot of radiation exposure cases and at first chance left SRS. At my medical screening they told me that my [redacted] lung function was that of an 80 year old person. I am only 35 years old and can't even keep up with my dad.

[redacted]

SC Driver

Julie B. Atwood
Notary Public, Columbia County, Georgia
My Commission Expires 6-02-09

P.S. The only protection I had while cutting the containers was a welding mask and gloves.

P.S. I have also had alot of joint problems knees, elbows, hands

[redacted]

I WAS A Member 470 Locked
I worked for Bolt Eng. in the Pierd From
1995 to 2004 we handled Cross ties.
from the time of [redacted] Befor
They started to monetor cross ties
Started to check all cross ties
After they found F. Area tie Pit
to be Contaminted. they found ties
that were Contaminted all along the main
Line, and Sper lines out side the Areas
and were they found ties that were Creped
up. we then Had to dress out to handle
the. putten them in PLASTic and Send them
to Burial ground.

[redacted]

Nona J Zimmerman

NONA J. Zimmerman,
Notary
7-31-07

Notary Public, Richmond County, GA
My Commission Expires April 21, 2009

July 17, 2007

To whom it may concern;

When I was working at the Savannah River Plant in the late 60's and during the 70's, I worked in the 221F Area. There was times I was contaminated in the change rooms from clothing that was supposed to be clean to dress out and go in the regulated area that was detected by monitors going in.

There was times it was detected as being contaminated in the change room. This happened from time to times to several people.

There has been times that we worked in places that they said was OK to go in & work. Then they would find out through monitoring later there was contamination there. and we would have to go out. This was in the late 70's and early 80's.

There was times in 221F in the hot canyon area working on the overhead crane in plastic suits they would tell us it was O.K. to go in we would have to hold our breaths to breathe.

Signature: [redacted]

[redacted]

Nona J Zimmerman
Notary

Notary Public, Richmond County, GA
My Commission Expires April 21, 2009
NONA J. Zimmerman

[redacted]

[redacted]

I worked at SRS [redacted] off and on. Approx.5 years of this was away from the site. I worked in all of the 100 areas,TNX,400D, 3/700 area, H,F,H Tank farm and F Tank farm.

Laborers had filled a water can from a barrel used to catch leaking water from a heat exchanger on -20 level in one of the 100 areas. This water was then used to spray drilling area to lessen the dust generated. The barrel had not been roped off and everyone was contaminated.

In 200H in a supposedly clean area, I was found to be contaminated as I monitored out of the area. My pants and shoes were taken from me.

Self reading dosimeters would read off scale and they would be checked . They always came back as negative for exposure.

The cords on the hand monitors would set the alarms off. RCO always blamed faulty cords and not contamination.

[redacted] Date: 7-19-07

Julie B. Attwood 7-19-07
Notary Public

Notary Public, Columbia County, Georgia
My Commission Expires 6-02-09

[redacted]

[redacted]

IN 1985 & 1986 I WAS Night Supt for Dupont Const, My Office WAS IN FRONT OF the W-F Bldg, WE had a problem With the DOSEMETERS & [redacted] that WERE Left IN the Racks AT the Ovens, Shacks, the Monitors Would be Set AT "0" AT the End of the Shift, the Next morning they Would have a Reading. Like 50 or more IN the Rack, WE Found Out that the Night Shift Would have the Big [redacted] by the Shacks, ALSO the Work being done IN the Bldg. - X-Raying the Jumpers & Ect. Counsel the Badges & Pieces to Read up

[redacted]

7/17/07

Julie B Arnwood
Notary Public

Notary Public, Columbia County, Georgia
My Commission Expires 6-02-09

July 18, 2007

My name is [redacted] I am writing these events in support of a special cohort for Construction Workers at Savannah River Site. I had worked at the site for approximately eleven years [redacted]

During my tenure at the site I was a party to events that in my opinion are quite questionable. There are three that readily come to mind and are listed below.

While working on the Uranium Solidification Project in the 200 H-Area Canyon I along with other construction workers worked around floor drains that were not identified. During the course of our conduit installations we sat on the waste drain piping, laid across waste drain piping. It was not until days later that HP informed us these floor drains were extremely radioactive and it would be in our best interest to keep our distance and time to a minimum.

Another instance that comes to mind is during my tenure in H-Area while working in the 221-H Canyon Facility, expansion joints in the floors and walls were not identified as being radioactive. Work was performed in the general vicinity of these joint for years. We would even lie on clean laundry bags on top of the expansion joints during times of release drills, shelter drills, etc. sometimes these would last for hours. It was not until the mid to late 90's that these expansion joints were identified with RAD Postings on each.

While working in the F-Area Tank Farm, I along with other Construction employees were directed by my foreman [redacted] to wait in the old Operations Maintenance Shop located in the hole of the Tank Farm, these waits were sometimes for hours and days on end. After days and weeks of this, I inquired as to why Operations was not longer housed in that building and was told because the so called background radiation was too high. At that point I began to lose time at work because I refused to wait in a building that was not adequate to house operations personnel.

Events such as these often more than not are a daily occurrence at SRS for construction employees.

I along with other Construction Employees were amazed to see our personal Annual Dose Rate reports as recorded by HP. These reports always reflected no exposure or exposure that was considered negligible. We all considered these Reports to be a standing joke.

If I can be of any further assistance please feel free to contact me.

[redacted]

NOTORY PUBLIC

Julie B Norwood

Public, Columbia County, Georgia
My Commission Expires 6-02-09

August 7, 2007

[redacted]

[redacted]

[redacted]

When working on tank tops at F Area & H-Area when your worked on tanks for a Couple of Hours your Geiger would go to 600 when you went to H/P they would recalibrated and say you probley bumped it off Scale and send you back on tank top in short I feel that me & My Employees got more Radiation than was Recorded

I have had four Skin Cancers removed and I feel it is from Working at SRS

[redacted]

Notary Public, Richmond County, GA
My Commission Expires April 21, 2009

Public Burden Statement

Public reporting burden for this collection of information is estimated to average 300 minutes per response, including time for reviewing instructions, gathering the information needed, and completing the form. If you have any comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, send them to CDC Reports Clearance Officer, 1600 Clifton Road, MS-E-11, Atlanta GA, 30333; ATTN:PRA 0920-0639. Do not send the completed petition form to this address. Completed petitions are to be submitted to NIOSH at the address provided in these instructions. Persons are not required to respond to the information collected on this form unless it displays a currently valid OMB number.

Privacy Act Advisement

In accordance with the Privacy Act of 1974, as amended (5 U.S.C. § 552a), you are hereby notified of the following:

The Energy Employees Occupational Illness Compensation Program Act (42 U.S.C. §§ 7384-7385) (EEOICPA) authorizes the President to designate additional classes of employees to be included in the Special Exposure Cohort (SEC). EEOICPA authorizes HHS to implement its responsibilities with the assistance of the National Institute for Occupational Safety (NIOSH), an Institute of the Centers for Disease Control and Prevention. Information obtained by NIOSH in connection with petitions for including additional classes of employees in the SEC will be used to evaluate the petition and report findings to the Advisory Board on Radiation and Worker Health and HHS.

Records containing identifiable information become part of an existing NIOSH system of records under the Privacy Act, 09-20-147 "Occupational Health Epidemiological Studies and EEOICPA Program Records. HHS/CDC/NIOSH." These records are treated in a confidential manner, unless otherwise compelled by law. Disclosures that NIOSH may need to make for the processing of your petition or other purposes are listed below.

NIOSH may need to disclose personal identifying information to: (a) the Department of Energy, other federal agencies, other government or private entities and to private sector employers to permit these entities to retrieve records required by NIOSH; (b) identified witnesses as designated by NIOSH so that these individuals can provide information to assist with the evaluation of SEC petitions; (c) contractors assisting NIOSH; (d) collaborating researchers, under certain limited circumstances to conduct further investigations; (e) Federal, state and local agencies for law enforcement purposes; and (f) a Member of Congress or a Congressional staff member in response to a verified inquiry.

This notice applies to all forms and informational requests that you may receive from NIOSH in connection with the evaluation of an SEC petition.

Use of the NIOSH petition forms (A and B) is voluntary but your provision of information required by these forms is mandatory for the consideration of a petition, as specified under 42 CFR Part 83. Petitions that fail to provide required information may not be considered by HHS.

Name or Social Security Number of First Petitioner: [redacted]

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Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B **Appendix — Petitioner 2**

Use of this form and disclosure of Social Security Number are voluntary. Failure to use this form or disclose this number will not result in the denial of any right, benefit, or privilege to which you may be entitled.

Use this Appendix for Petitioner 2.

This appendix form is to be used as needed. Petitioner 2, or his or her representative, should complete the parts applicable to him or her.

Refer to the General Instructions on completing petitioner information for Parts A, B, or C.

If you need more space to provide additional information, use the continuation page provided at the end of the form and attach the completed continuation page(s) to Form B.

Except for signatures, please **PRINT** all information clearly and neatly on the form.

If you are:	☐ An Energy Employee (current or former),	Start at C
	☒ A Survivor (of a former Energy Employee),	Start at B
	☐ A Representative (of a current or former Energy Employee),	Start at A

A Representative Information — Complete Section A if you are authorized by an Employee or Survivor(s) to petition on behalf of a class.

A.1 **Are you a contact person for an organization?** ☐ Yes (Go to A.2) ☐ No (Go to A.3)

A.2 **Organization Information:**

Name of Organization

Position of Contact Person

A.3 **Name of Petition Representative:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

A.4 **Address:**

Street Apt # P.O. Box

City State Zip Code

A.5 **Telephone Number:** ( ) -

A.6 **Email Address:**

A.7 ☐ Check the box at left to indicate you have attached to the back of this form written authorization to petition by the survivor(s) or employee(s) indicated in Parts B or C of this form. An authorization form for this purpose is provided.

If you are representing a Survivor, go to Part B; if you are representing an Employee, go to Part C.

Name or Social Security Number of First Petitioner: [redacted]

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B

Appendix — Petitioner 2

B Survivor Information — Complete Section B if you are a Survivor or representing a Survivor.

B.1 **Name of Survivor:** [redacted]
First Name Middle Initial Last Name

B.2 **Social Security Number of Survivor:** [redacted]

B.3 **Address of Survivor:** [redacted]
Street Apt # P.O. Box

City State Zip Code

B.4 **Telephone Number of Survivor:** [redacted]

B.5 **Email Address of Survivor:** [redacted]

B.6 **Relationship to Employee:** ☒ Spouse ☐ Son/Daughter ☐ Parent ☐ Grandparent ☐ Grandchild

Go to Part C.

C Employee Information — Complete Section C.

C.1 **Name of Employee:**
Mr./Mrs./Ms. First Name Middle Initial Last Name

C.2 **Former Name of Employee** (e.g., maiden name/legal name change/other):
Mr./Mrs./Ms. First Name Middle Initial Last Name

C.3 **Social Security Number of Employee:** _____

C.4 **Address of Employee** (if living):
Street Apt # P.O. Box

City State Zip Code

C.5 **Telephone Number of Employee:** (____) ____-_____

C.6 **Email Address of Employee:** _____

C.7 **Employment Information Related to Petition:**

C.7a Employee Number (if known): _____

C.7b Dates of Employment: Start _____ End _____

C.7c Employer Name: _____

C.7d Work Site Location: _____

_____

C.7e Supervisor's Name: _____

Sign Part G of the original petition.

Name or Social Security Number of First Petitioner: _____

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B

Appendix — Petitioner 3

Use of this form and disclosure of Social Security Number are voluntary. Failure to use this form or disclose this number will not result in the denial of any right, benefit, or privilege to which you may be entitled.

Use this Appendix for Petitioner 3.

This appendix form is to be used as needed. Petitioner 3, or his or her representative, should complete the parts applicable to him or her.

Refer to the General Instructions on completing petitioner information for Parts A, B, or C.

If you need more space to provide additional information, use the continuation page provided at the end of the form and attach the completed continuation page(s) to Form B.

Except for signatures, please **PRINT** all information clearly and neatly on the form.

If you are:	☒ An Energy Employee (current or former),	Start at C
	☐ A Survivor (of a former Energy Employee),	Start at B
	☐ A Representative (of a current or former Energy Employee),	Start at A

A Representative Information — Complete Section A if you are authorized by an Employee or Survivor(s) to petition on behalf of a class.

A.1 **Are you a contact person for an organization?** ☐ Yes (Go to A.2) ☐ No (Go to A.3)

A.2 **Organization Information:**

_____
Name of Organization

_____
Position of Contact Person

A.3 **Name of Petition Representative:**

_____
Mr./Mrs./Ms. First Name Middle Initial Last Name

A.4 **Address:**

_____
Street Apt # P.O. Box

_____
City State Zip Code

A.5 **Telephone Number:** (_____) _____

A.6 **Email Address:** _____

A.7 ☐ Check the box at left to indicate you have attached to the back of this form written authorization to petition by the survivor(s) or employee(s) indicated in Parts B or C of this form. An authorization form for this purpose is provided.

If you are representing a Survivor, go to Part B; if you are representing an Employee, go to Part C.

Name or Social Security Number of First Petitioner: [redacted]

Special Exposure Cohort Petition
under the Energy Employees Occupational Illness Compensation Act

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention
National Institute for Occupational Safety and Health

OMB Number: 0920-0639 Expires: 05/31/2007

Special Exposure Cohort Petition — Form B **Appendix — Petitioner 3**

B Survivor Information — Complete Section B if you are a Survivor or representing a Survivor.

B.1 **Name of Survivor:**

Mr./Mrs./Ms. First Name Middle Initial Last Name

B.2 **Social Security Number of Survivor:** _____

B.3 **Address of Survivor:**

Street Apt # P.O. Box

City State Zip Code

B.4 **Telephone Number of Survivor:** ( ) -

B.5 **Email Address of Survivor:** _____

B.6 **Relationship to Employee:** ❑ Spouse ❑ Son/Daughter ❑ Parent ❑ Grandparent ❑ Grandchild

Go to Part C.

C Employee Information — Complete Section C.

C.1 **Name of Employee:** [redacted]

[redacted] First Name Middle Initial Last Name

C.2 **Former Name of Employee** (e.g., maiden name/legal name change/other):

Mr./Mrs./Ms. First Name Middle Initial Last Name

C.3 **Social Security Number of Employee:** [redacted]

C.4 **Address of Employee** (if living): [redacted]

Street Apt # P.O. Box

[redacted]

City State Zip Code

C.5 **Telephone Number of Employee:** [redacted]

C.6 **Email Address of Employee:** _____

C.7 **Employment Information Related to Petition:**

C.7a Employee Number (if known): _____

C.7b Dates of Employment: Start 1961 End 1964

C.7c Employer Name: E. I. DuPont

C.7d Work Site Location: 221 H - 221 F

C.7e Supervisor's Name: ?

Sign Part G of the original petition.

Name or Social Security Number of First Petitioner: [redacted]

Augusta Building and Construction Trades Council, SEC petition

Supporting documentation/attachments

Attachment 1 NIOSH/Union SRS site profile document meeting, November 11, 2003, Introductory comments by [redacted]

Attachment 2 Statement to NIOSH Board on Radiation and Worker Health, December 9, 2003 [redacted]

Attachment 3 Final Report (including slides), CPWR-NIOSH meeting on variance in construction worker radiation exposure monitoring

Attachment 4 Kitsap Sun news article, Monday, May 14, 2007, Suffering in the Shadows, by [redacted]

Attachment 1

NIOSH/Union SRS Site Profile Document Meeting
November 11, 2003

Introductory Comments by Tommy Yarbrough

Good morning. I am Tommy Yarbrough, and I am the President of the Augusta Building and Construction Trades Council that has jurisdiction over the Savannah River Site. Welcome to Augusta. With us are leaders of the many trades who are members of our Council and who represent construction workers on the SRS site.

Before we all introduce ourselves, I would like to make a couple of comments.

Thank you for coming here today to discuss with us the site profile document you have prepared. I know this is holiday for the Federal government, and I apologize for disrupting it for you. But it is a working day down here, and it was not easy to schedule this meeting.

We know you have a difficult task. We have always supported NIOSH, and we always will support NIOSH. Without NIOSH, workers all over the world would still be in the dark about many of the hazardous conditions we have faced. Because of NIOSH, millions and millions of worker lives have been saved. And of course, you are headquartered here in Georgia, even if it is Atlanta, so we have to support you for that if nothing else.

Having said that, we believe that it is better for us to let you know when we have a disagreement such as the present approach measuring worker exposures at these sites. I assume you came here to get substantive feedback on your hard work, and we intend to give you that to the extent we can.

Let me say right now our members are not very happy, and therefore we are not very happy. Workers and their survivors have filed 2,500 claims so far against the SRS site. Of those, 1,500 are awaiting processing at NIOSH. Only 75 claims have been approved and this is now 3 years after the law was passed. If this had been a large public meeting, even with the high degree of civility that still prevails in this part of the country, you would not come

from such a meeting unscathed. I assume you realize that. What I hope we will get from this meeting is a sense of what we can do together, to get this program on track.

Obviously, those of us who are union leaders don't have the technical expertise to review in detail the document you have prepared. Our concerns will mainly focus on the fairness of the process you have followed in developing this document, because that is what our members will ask us. Is this document unbiased? Is the approach you are taking fair to claimants, particularly the construction workers employed by subcontractors that we represent. All we ask for is fairness.

Because we are not experts we asked two types experts to join us here today to come help us out:

- First, some of our members who know the SRS site intimately by having worked there.
- Second, some technical experts who know the difference between a rad and rem.

What is foremost in my mind is a lesson we learned when we started the medical screening program many years ago. When we started it, our experts told us we should screen for beryllium exposure. The whole SRS DOE and Contractor leadership got up in arms about this, saying it was totally unnecessary because there was no way that any of our members could have been exposed to beryllium. We prevailed, and among the 20 workers who went trough the screening program first, two tested positive on the LPT test.

That got us into a bit of a dialogue with the SRS staff. It turned out that maybe some beryllium had been used out there. It also turned out that while they had done a lot of industrial hygiene characterization of the facility, they had not investigated for beryllium dust above ceiling tiles, in the rafters, behind wall board, or under sub-floors or in crawlspaces. In short, they basically had not taken into account the kind of work that our members do.

Tasks such as building, repair, renovation, maintenance, retrofitting, demolition, and decommissioning, had not entered their mental framework, even with the so-called integrated safety management system.

I hope that is not the case with your work. But here is what I am curious about: if the facility staff has not understood our work, how could they determine whether or not we had significant exposures? And now, if they could not, how can you? This is what I want to be assured of at the end of this meeting: that we don't see a repeat of the beryllium experience. That is what I will be looking for in what you tell us. I want to come from this meeting and look our members in the eyes and say, NIOSH is being fair to us.

Now, I suggest we go around the room and introduce ourselves: names, who we are, any concerns or issues we want placed on the table. Once we have introduced ourselves, the floor will be yours.

SAVANNAH RIVER SITE (SRS)
BUILDING TRADES MEDICAL SCREENING PROGRAM

SUMMARY OF RADIATION EXPOSURE DATA ANALYSES

ALL WORKERS INTERVIEWED BY MARCH 31, 2005

PRESENTED TO NIOSH JULY 2005

METHODS

Savannah River Site (SRS) Building Trades Worker Data Linkage

For the SRS site, we linked the data on participants in our programs medical monitoring programs to currently available annual external and internal dose information contained in the HPAREA database through 1998. Mr. Mel Chew provided these data. The HPAREA electronic database includes workers employed at SRS from 1979 onward. Workers who were hired at SRS in early years of operation and who terminated prior to 1979 are not contained in HPAREA.

All SRS workers in the Buildings Trades Medical Screening Program database through March 31, 2005 were abstracted. In order to match the time periods covered by HPAREA, the SRS cohort was restricted to 2787 workers first hired at SRS after 1979 and before 1998. Zenith Administrators used worker social security numbers to link SRS Building Trades Medical Screening participants to the HPAREA data. Detailed information on the trade of workers while at SRS, periods of SRS employment, buildings worked in while at SRS, information on reported radiation exposure events, and frequency of urine monitoring for radiation were abstracted.

Descriptive and Multivariate Analyses

NIOSH has outlined procedures that they plan to follow for reconstruction of external radiation dose in their August 2002 document entitled "External Dose Reconstruction Implementation Guideline". We used this document as an initial guide in the analyses of our data. For each SRS worker interviewed as of March 31, 2005, we first did an initial assessment to define characteristics of workers with and without any HPAREA dose record. The objective of these analyses was to investigate demographic and/or work history parameters identifying workers without any record of radiation exposure in the HPAREA database.

The HPAREA data file provides annual dose values in MREM, thus workers may have multiple HPAREA records. HPAREA doses are categorized as Deep Dose, Eye Dose, Neutron Dose and Shallow Doses. A lifetime dose in each dose category was generated for each worker with at least one HPAREA record by summing the dose values for all years. For these analyses, each category of HPAREA reported external radiation exposure category was analyzed separately and not combined into a single summary measure of external dose. Separate analyses by HPAREA radiation category were conducted in order to observe any radiation dose patterns that might be missed using a summary measure.

For each category of external radiation exposure, univariate summary statistics were generated describing the mean, median and range of recorded worker doses as well as measures of dispersion. Histograms were generated in order to visualize the distribution of doses by radiation category.

We next conducted detailed analyses of recorded deep dose radiation exposures for SRS workers having any record in the HPAREA external dose file. We concentrated our detailed analyses on deep external radiation dose as this category of exposure is most closely tied to the NIOSH program for determining if a worker's cancer is attributed to DOE radiation exposure for

purposes of compensation. Lifetime cumulative deep radiation dose in the HPAREA data was stratified by duration of SRS work, time periods of work, and trade.

NIOSH has suggested several approaches for dose reconstruction when monitoring data are missing or considered inadequate ["External Dose Reconstruction Implementation Guideline", Rev 1, August 2002}. These include use of co-worker data, area monitoring data, and source term data. Since most building trades workers have worked in numerous SRS buildings and their work history in each building is largely unknown, use of area monitoring and/or source term data for radiation dose estimation will be problematic and not be feasible for the majority of building trades workers. In order to address the feasibility of using 'co-worker' data for dose reconstruction, we conducted detailed analyses of our worker history data linked with the HPAREA data. We first explored the variability and distribution of radiation doses using stratified analyses with univariate summary statistics as well as graphics data analyses. These analyses helped to identify trends in deep radiation doses and covariates most likely to predict lifetime does in multivariate models.

We then explored the use of multivariate statistical models to predict deep dose radiation exposures for workers based on the work history interview data. The independent variables in these models consisted of the work history information including DOE site work duration, calendar time periods of site work, trade, periods of work in radiation buildings, frequency of urine monitoring for radiation, and frequency of worker reported exposure incidents. The dependent variable in these models was the HPAREA recorded cumulative deep dose in MREM. All independent variables except duration of SRS site work were entered into the models as categorical variables using reference cell coding methods. Coding of trade for the models used deviation from the mean coding in order to compare each trade with the overall mean for all trades. The model was fit without an intercept parameter in order to account for the a priori assumption of zero DOE work related deep dose when all model parameters were set to their null values. Model fit and predictive value of the models was evaluated using regression diagnostics and analyses of variance for model parameters. The SAS regression procedure and associated diagnostics were used for these analyses.

RESULTS

Overall and Stratified Analyses

Of the 2787 SRS workers included in these analyses, only 2335(83.8%) were found to have any record of annual radiation exposure in the HPAREA data. An additional 101(3.6%) workers were found to having matching records in HPAREA; however, all annual external deep doses recorded for these workers were zero. Of 2787 SRS workers only 66 (2.4%) had an internal radiation uptake record in HPAREA.

Figure 1 provides a distribution of annual mean deep dose values in HPAREA for workers with at least on matching record. Also shown in this Figure are the upper 95% confidence intervals for the yearly mean external deep dose. Figure 1 demonstrates very large differences in the mean values and the upper 95% confidence intervals, especially for time periods prior to about

1979. Figure 2 provides a summary of mean external deep dose values by trade as well as upper 95% confidence intervals and demonstrates some extreme differences by trade.

A summary of mean, median, and maximum recorded doses by category of exposure for the 2335 workers with HPAREA data is provided in Table 2. The frequency distribution for each category of exposure was highly skewed, with some workers having extreme values.

A comparison of workers with and without a dose in the HPAREA file is shown in Table 3. Among workers employed at SRS for < 5 years, 35.42% were found not to have a dose record in the HPAREA database and an additional 7.67% had all deep dose values recorded as zero. Even among workers with more than 20 years of SRS work, 2.72% had no dose record in HPAREA. No discernable trend in the pattern of missing exposure records by decade of first SRS employment is evident in Table 3, although the percent with no HPAREA record or all zero recorded external deep dose values was found to be higher for workers first employed in 1990 or latter. Among trades with 5 or more workers, the highest proportion of workers without a HPAREA radiation dose was found for machinist, where 42.11% of workers had no record in HPAREA.

Descriptive analyses of annual deep values by trade for the 2335 workers with an HPAREA record are presented in Table 4. Workers in the 'Other' category were found to have the highest mean external deep dose, followed by pipe fitters, boilermakers, welders, and laborers. For each trade, the upper 95% confidence interval was generally three or more times the mean, thus substantial variability was present within each trade.

Annual deep dose values in HPAREA were summed to generate cumulative doses for workers found to have a match in HPAREA. Figure 3 provides a histogram of these cumulative deep dose values. While most values were found to be less than 6000 MREM, values in excess of 36,000 MREM were recorded.

Multivariate Analyses of Deep External Radiation Dose

Initial analyses of the deep radiation dose consisted of exploring the contributions of each independent variable collectively to the prediction of external deep dose and analyses of regression residuals. The dependent variable in the initial model was cumulative deep dose and an examination of residuals suggested a violation of the homescedasticity assumption for linear regression, consistent with the observed skewed distribution of deep dose values. The model was then fit using a log transformation of the deep dose values with regression diagnostics demonstrating a much better fit. Collinearity analysis for the model regression parameters indicated only moderate degree of collinearity based a review of Eigenvalues and the condition index for model parameters. These analyses also found each of the work history parameter categories to be a reasonable predictor of deep dose ($p<0.1$); therefore, all parameters were retained in the final model.

Multivariate parameter estimates and confidence intervals are presented in Table 5. Years of SRS work, trade, number of radiation hazard buildings reported to have worked in, and frequency of urine tests for radiation monitoring were reasonably strong predictors of cumulative

deep dose. Worker reported frequency of work stoppage due to a radiation hazard also was predictive, especially for workers reporting 30 or more events.

Figure 4 provides a plot of observed and predicted log deep dose values from the statistical model. While a reasonable trend and correlation was observed, several areas with outliers is evident. This Figure shows several workers who had all recorded zero deep dose values to have predicted deep dose values in excess of 1000 MREM. The statistical model did not predict a zero value for any worker; however, as shown in Table 1, 101 workers actually had all recorded zero deep dose values in HPAREA.

Monte Carlo Estimates of Individual Deep Doses

In order to further evaluate the predictive value of co-worker data in estimating radiation deep doses for individual workers without dose data, the multivariate regression coefficients and the covariance estimates for regression model coefficients were used in a series of Monte Carlo simulations. These simulations used the regression coefficient point estimates and the regression covariance matrix as inputs to generate multivariate normal estimates of the regression coefficients. A random number generator was used to seed 5000 estimates of the regression coefficients, which were applied to covariate values for hypothetical workers. The output from these simulations consisted of 5000 estimates of the predicted deep radiation dose for hypothetical workers with assigned values of the independent variables included in the regression models.

Figure 5 shows the Monte Carlo simulation results for a hypothetical pipefitter employed at SRS for 10 years and experiencing the model maximums for all parameters except years of work at SRS. While the model predicted an average cumulative deep dose of 1335.04 MREM for a pipefitter at SRS for 10 years, the model also predicted values in excess of 9500 MREM. A similar simulation for a pipefitter at SRS for 10 years but with minimum values all other parameters resulted in a mean predicted deep dose of 8.33 MREM. Consistent with the observed and predicted data shown in Figure 9, the Monte Carlo simulations show the regression models to be predictive but with a wide margin of variability.

DISCUSSION AND CONCLUSIONS

These analyses have shown that approximately 13% of SRS building trades workers have no matching data in the HPAREA data file despite having been employed at SRS for many years. In addition, of the workers with at least one matching record in the HPAREA file, 3.6% had all of their deep radiation doses recorded as zero. Multivariate regression models were developed to explore the predictive value of 'co-worker data' with regard to HPAREA cumulative deep dose. While the models predicted deep dose exposures, the predictions were accompanied by a high degree of variability. None of the regression models predicted these building trades workers to have no records in HPAREA or all zero values for deep dose. These analyses bring into question the accuracy associated with using co-worker data to predict radiation doses for workers with no radiation exposure records or inadequate records.

Our analyses are subject to the limitations of the HPAREA data. We cannot be sure that workers with an HPAREA record and included in our analyses have all of their annual radiation exposures recorded in HPAREA. We are not aware of any control checks to assure that all available exposure data for workers have been incorporated into HPAREA. Several observations from our data suggest that HPAREA may be less than completed. Our analyses have shown a large proportion of building trades workers had no HPAREA exposure data despite having worked in a building trade at SRS for many. Additionally, even for workers with data in HPAREA, we observed individual workers with irregular annual deep patterns. An example of a record for a long term SRS bricklayer is presented in Table 7. This worker has both years with no HPAREA data and years where the deep dose for the entire year is recorded as zero. These results are consistent with our previous analyses of worker interview data through 2002 (Table 6), which found that a large proportion of SRS building trades workers reported periods of work at SRS when no radiation badge was worn. Lastly, we found that many workers with no HPAREA deep dose record or with all zero values in their HPAREA record reported periods of work in buildings with radiation hazards and/or specific radiation exposure events. Figure 6 shows that while workers without an HPAREA dose record or with all deep dose values recorded as zero, many of these workers reported having worked in multiple buildings where radiation hazards were known to have existed.

Finally, the completeness of HRAREA is called into question by the observation that many workers without HPAREA data or with all deep doses values recorded as zeros reported specific radiation exposures incidences during their interviews. We have provided a summary of these responses (unedited) in Appendix I.

TABLE 1:

SUMMARY OF HPAREA DEEP DOSE MATCH BY WORKER

SRS HPAREA Deep Dose Records	Frequency	Percent
No Deep Dose in HPAREA	351	12.6
At Least One Deep Dose >Zero	2335	83.8
All Zero Deep Dose Values	101	3.6

TABLE 2:

SUMMARY OF HPAREA DOSE BY CATEGORY
WORKERS WITH ONE OR MORE HPAREA RECORDS

HPAREA Cumulative Dose (MREM)	Mean	Std Dev	Median	Maximum
Deep Dose	817	2163	215	36055
Eye Dose	95	198	26	3562
Neutron Dose	190	452	35	5895
Shallow Dose	1292	4359	345	123840

TABLE 3:

SRS BUILDING TRADES MEDICAL SCREENING PROGRAM COMPARISON OF WORKERS WITH AND WITHOUT ANY HPAREA RECORD ALL WORKERS INTERVIEWED BY MARCH 31, 2005

Demographic Parameter	Percent without a HPAREA Dose Record	Percent with a HPAREA Dose Record	Percent with All Zero HPAREA Deep Doses	Number of Workers Interviewed
Duration of SRS Work				
<5 Years	35.42	56.91	7.67	782
5-9Years	7.21	90.00	2.79	680
10-19 Years	1.52	96.42	2.06	922
20+ Years	2.72	96.54	0.74	405
Decade of First SRS Work				
1950-1959	15.30	80.33	4.37	183
1960-1969	12.33	87.67	0.00	73
1970-1979	6.73	92.02	1.25	639
1980-1989	13.03	83.38	3.59	1727
1990+	27.71	58.43	13.86	166
Usual SRS Trade				
Asbestos Workers	9.43	84.91	5.66	53
Boilermakers	18.18	78.41	3.41	88
Bricklayer	0.00	100.00	0.00	5
Carpenters	11.73	86.03	2.23	179
Cement Masons	21.74	78.26	0.00	23
Electricians	19.15	75.60	5.25	705
Insulator	7.69	92.31	0.00	39
Ironworkers	11.97	85.47	2.56	117
Laborer	10.05	86.93	3.02	398
Machinists	42.11	52.63	5.26	19
Millwrights	6.00	90.00	4.00	50
Operating Engineer	7.75	85.27	6.98	129
Other	37.50	52.50	10.00	40
Painters	5.77	90.38	3.85	104
Pile Driver	0.00	100.00	0.00	1
Pipe Fitter	8.66	89.18	2.16	462
Plumber Steamfitters	0.00	100.00	0.00	15
Security	3.14	94.34	2.52	159
Sheetmetal Workers	13.21	84.91	1.89	106
Surveyor	22.22	77.78	0.00	9
Teamster	8.97	87.18	3.85	78
Welders	20.00	80.00	0.00	10

TABLE 4:

SRS BUILDING TRADES MEDICAL SCREENING PROGRAM
ANNUAL DEEP DOSE SUMMARY BY TRADE
ALL WORKERS INTERVIEWED BY MARCH 31, 2005

Usual Trade	Number Values	Mean	Median	Std. Dev.	Upper 95% CI of Mean
Asbestos Workers	501	88	25	157	380
Boilermakers	809	106	35	173	485
Bricklayer	36	27	10	51	160
Carpenters	1647	98	25	210	405
Cement Masons	185	98	30	215	375
Electricians	4044	57	10	126	265
Insulator	296	79	20	136	415
Ironworkers	1082	88	20	276	360
Laborer	3585	101	24	228	500
Machinists	68	23	10	45	130
Millwrights	457	66	20	134	345
Operating Engineer	1227	36	10	117	125
Other	213	234	25	537	1815
Painters	1025	77	25	162	330
Pipe Fitter	4389	165	30	337	875
Plumber Steamfitters	134	95	10	188	510
Security	1716	13	0	79	45
Sheetmetal Workers	908	68	20	166	237
Surveyor	118	105	45	167	525
Teamster	661	23	5	74	70
Welders	73	111	26	242	475

TABLE 5:

SRS BUILDING TRADES MEDICAL SCREENING PROGRAM
MULTIPLE REGRESSION PARAMETER ESTIMATES FOR HPAREA CUMULATIVE DEEP DOSE
ALL WORKERS INTERVIEWED BY MARCH 31, 2005

Model Variable	Variable Description	Parameter Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Limits	
DOEYears	Years of SRS Work	0.13	0.004	29.21	<.0001	0.12	0.14
trade1	Asbestos Workers	0.99	0.219	4.52	<.0001	0.56	1.42
trade2	Boilermakers	0.82	0.184	4.47	<.0001	0.46	1.18
trade3	Bricklayer	0.04	0.715	0.06	0.95	-1.36	1.45
trade4	Carpenters	0.29	0.134	2.14	0.03	0.02	0.55
trade5	Cement Masons	0.84	0.353	2.37	0.02	0.14	1.53
trade6	Electricians	0.01	0.091	0.10	0.92	-0.17	0.19
trade7	Other	-0.60	0.267	-2.26	0.02	-1.13	-0.08
trade8	Insulator	1.20	0.254	4.71	<.0001	0.70	1.70
trade9	Ironworkers	0.18	0.161	1.12	0.26	-0.14	0.50
trade10	Laborer	0.33	0.101	3.23	0.00	0.13	0.53
trade11	Machinists	-3.65	0.462	-7.89	<.0001	-4.55	-2.74
trade12	Millwrights	0.18	0.222	0.82	0.41	-0.25	0.62
trade13	Operating Engineer	-0.66	0.151	-4.34	<.0001	-0.95	-0.36
trade14	Painters	0.51	0.165	3.10	0.00	0.19	0.83
trade15	Security	-1.82	0.136	-13.37	<.0001	-2.09	-1.56
trade16	Pipe Fitter	0.83	0.098	8.49	<.0001	0.64	1.02
trade17	Plumber Steamfitters	-0.46	0.376	-1.22	0.22	-1.20	0.28
trade18	Sheetmetal Workers	0.31	0.168	1.85	0.06	-0.02	0.64
trade19	Teamster	-0.30	0.186	-1.61	0.11	-0.66	0.06
radstop1	Stopped due to Radiation Hazard = 1-5	0.11	0.092	1.16	0.24	-0.07	0.29
radstop2	Stopped due to Radiation Hazard = 6-30	-0.05	0.236	-0.23	0.82	-0.52	0.41
radstop3	Stopped due to Radiation Hazard Numerous	0.25	0.075	3.36	0.00	0.11	0.40
radbldg1	Radiation Buildings Worked = 1-4	2.50	0.117	21.39	<.0001	2.27	2.73
radbldg2	Radiation Buildings Worked = 4-5	2.93	0.125	23.46	<.0001	2.69	3.18
radbldg3	Radiation Buildings Worked >5	3.38	0.252	13.42	<.0001	2.89	3.88
urine1	Urine Tests = 1-5	0.13	0.144	0.91	0.36	-0.15	0.41
urine2	Urine Tests = 5-25	0.32	0.235	1.36	0.18	-0.14	0.78
urine3	Urine Tests Too Numerous	0.73	0.099	7.40	<.0001	0.54	0.93

Model Variable	Variable Description	Parameter Estimate	Standard Error	t Value	Pr > |t|	95% Confidence Limits	
radinc1	Abnormal Radiation Exposure Incidents =1	0.27	0.099	2.70	0.01	0.07	0.46
radinc2	Abnormal Radiation Exposure Incidents =2	0.15	0.275	0.55	0.58	-0.39	0.69
radinc3	Abnormal Radiation Exposure Incidents >=3	0.49	0.619	0.79	0.43	-0.72	1.70

NOTES: DOE work years is a continuous variable in the regression model. Reference cell coding was used for all categorical variables except trade where deviation from the mean coding is used. For reference cell coding, the lowest category (e.g. zero abnormal radiation exposure incidents, zero urine test, etc.) was used as the reference cell. For deviation from the mean coding, all trade variables were –1 for welders.

TABLE 6:

SAVANNAH RIVER BUILDING TRADES MEDICAL SCREENING PROGRAM

WORKER REPORTED PERIODS OF NO RADIATION MONITORING BY DURATION OF SAVANNAH RIVER WORK AND USUAL TRADE

ALL WORKERS INTERVIEWED BY DECEMBER 31, 2002

Years of SRS Work or Usual Trade	Number of Workers Reporting Non-Monitored Periods	Percent of All Workers Interviewed
Years of Work		
<5 years	326	69.7%
5-9years	358	67.0%
10-14 years	274	69.4%
15-19 years	183	61.2%
20-24 years	105	68.6%
25-29 years	45	66.2%
30+ years	51	75.0%
Usual Trade		
Asbestos Workers	22	53.7%
Boilermakers	59	81.9%
Bricklayer	3	60.0%
Carpenters	103	68.7%
Cement Masons	7	36.8%
Electricians	332	67.9%
Insulator	22	78.6%
Ironworkers	43	63.2%
Laborer	161	52.3%
Machinists	14	100.0%
Millwrights	28	70.0%
Operating Engineer	61	61.6%
Other	11	78.6%
Painters	59	75.6%
Pipe Fitter	302	76.5%
Plumber Steamfitters	8	100.0%
Security	3	42.9%
Sheetmetal Workers	53	75.7%
Surveyor	2	100.0%
Teamster	41	60.3%
Welders	8	80.0%

TABLE 7:

EXAMPLE OF ZERO AND MISSING DOSE

SRS BRICKLAYER 25 YEARS AT SITE

Year	Deep Dose MREM
1976	160
1977	10
1978	25
1979	40
1980	0
1981	0
1982	50
1983	30
1984	
1985	
1986	
1987	5
1988	0
1989	
1990	15
1991	0
1992	10
1993	0
1994	0
1995	21
1996	0
1997	0
1998	0
1999	0

TABLE 8:

SAVANNAH RIVER BUILDING TRADES MEDICAL SCREENING PROGRAM

WORKER REPORTED EXPOSURE INCIDENTS INVOLVING RADIATION

EVENTS FOR WORKERS WITH NO HPAREA DATA OR ALL DEEP DOSE VALUES OF ZERO

Trade	Year First At SRS	Year Last at SRS	Worker Incident Description (Unedited)
Electricians	1986	1992	Was exposed to tritium in a airborne release.can't remember which area.
Laborer	1995	1998	Would set the monitors off and HP would make the participant go back through the monitor and would say either radon gas and would wait till dissipate or monitor would need recalibrating.
Electricians	1991	2002	Set monitor off when exiting, boot was contaminated and HP cleaned it up and let him go . The next morning when monitoring in to work the alarm went off again and it was his boot . Participant was concerned that he had taken contamination home with him. HP told him it was just radon. Other times a hand would get contaminated and HP would wash and check out ok. Other times contamination would get on him and wased and would check out ok.This happened several times on H tank Farm.
Pipe Fitter	1979	1981	He had worked in there for a long time then all of a sudden one day they were told to start dressing out . He believe that it could have been tritium.
Carpenters	1984	2003	Exposed to plutonium in 772-F while working in basement and was exposed from ducts and fans; was dressed out in full suit and hog head. Had to do urine samples about a week and whole body count.
Asbestos Workers	1988	1990	Went through an area where tritium had been released, did not know at the time of exposure. Later all other workers were checked for tritium uptake and Foreman advised participant not to get checked,
Electricians	1989	1991	Had an uptake of tritium.
Electricians	1986	1992	Set off monitors at the burial ground many times and was told it was radon gas.
Pipe Fitter	1951	1987	Was sent into this building to do a job. The Foreman came over and told them to come out until they got ok from HP. They went back in there about a week later. They had plutonium stored in this building.
Pipe Fitter	1975	1991	Got tritium uptakes in the 100 areas. Got uptakes about 3 or 4 times HP would pulled out of the building and do red label bioassay samples.

Trade	Year First At SRS	Year Last at SRS	Worker Incident Description (Unedited)
Electricians	1950	1990	Was exposed to tritium, HP monitored him, they took his clothes and shoes. HP did not do anything to check him out . He went home at the end of the shift. He cannot remember the year but he was in 105-K between 1956 and 1963. His partner has passed away in later years. He believes his death could have been related to his exposures at SRS.
Electricians	1986	1997	Outside the lab in S-area, running conduit behind the lab. Everyday they would get radon gas in their hair or their hard hats and on their clothes. HP would take them and sit them in front of a fan . They were told this would get rid of the radon.The attitude of the HP was lax.
Electricians	1984	1984	Uranium spill on floor which was supposed to be paints.
Pipe Fitter	1960	1989	Tritium uptake,
Electricians	1983	1984	Alarm sounded and had to evacuate while doing work next to an active plutonium line. Working night shift and was not told to dress out but did wear tld and dosimeter.Installing lines. Had a squamous,basil cell carcinoma cancer removed from the chest cavity 3 years ago.Participant believes could be reason for cancer. After alarm sounded and evacuation was told to go back into the building to work.
Electricians	1952	1995	minus 20 level tritium water was on floor and participant was told not to step in.
Carpenters	1990	1991	Radon gas and had to wait until disspated.

FIGURE 1:

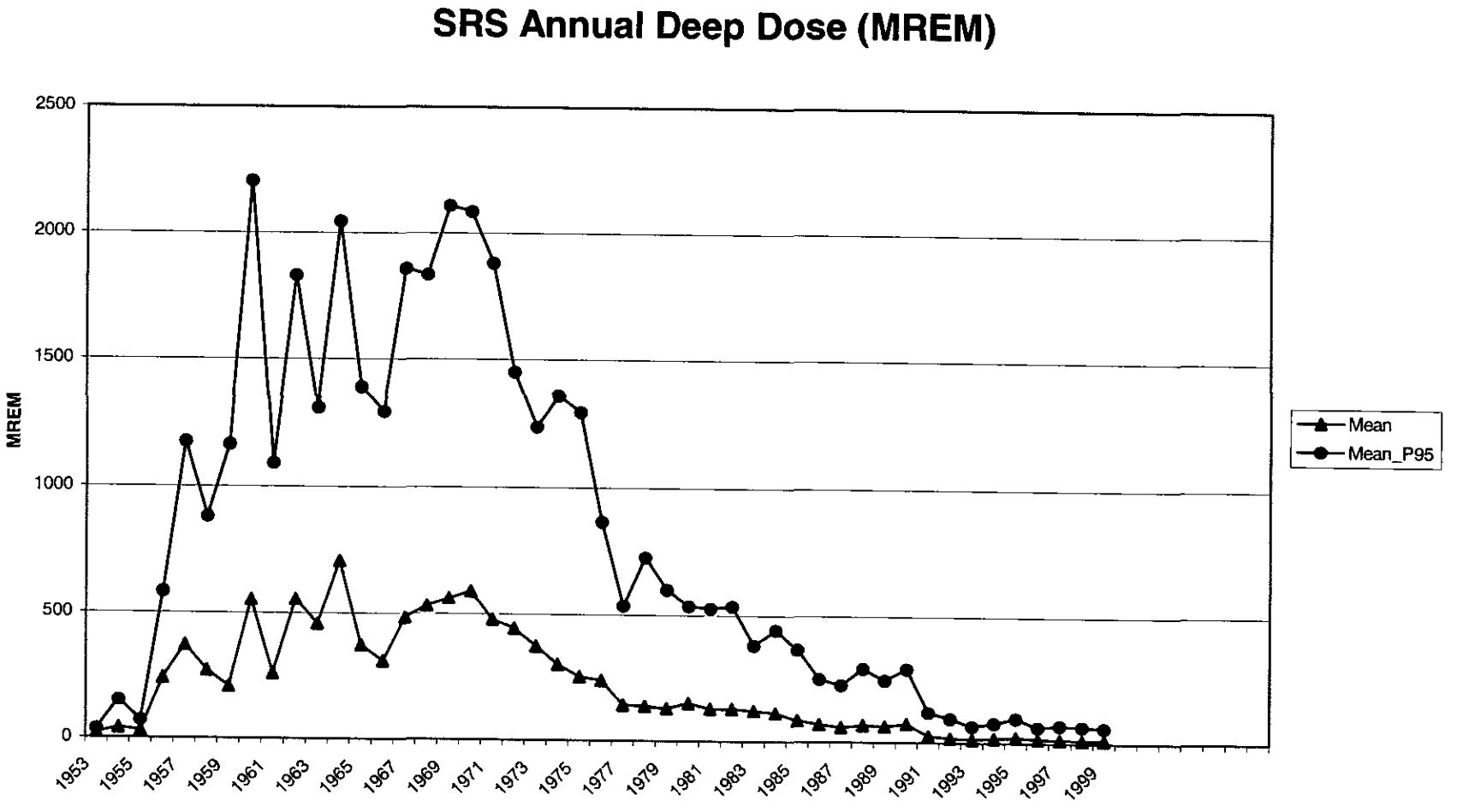

SRS Annual Deep Dose (MREM)
MREM
2500
2000
1500
1000
500
0
1953
1955
1957
1959
1961
1963
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
Mean
Mean_P95

FIGURE 2:

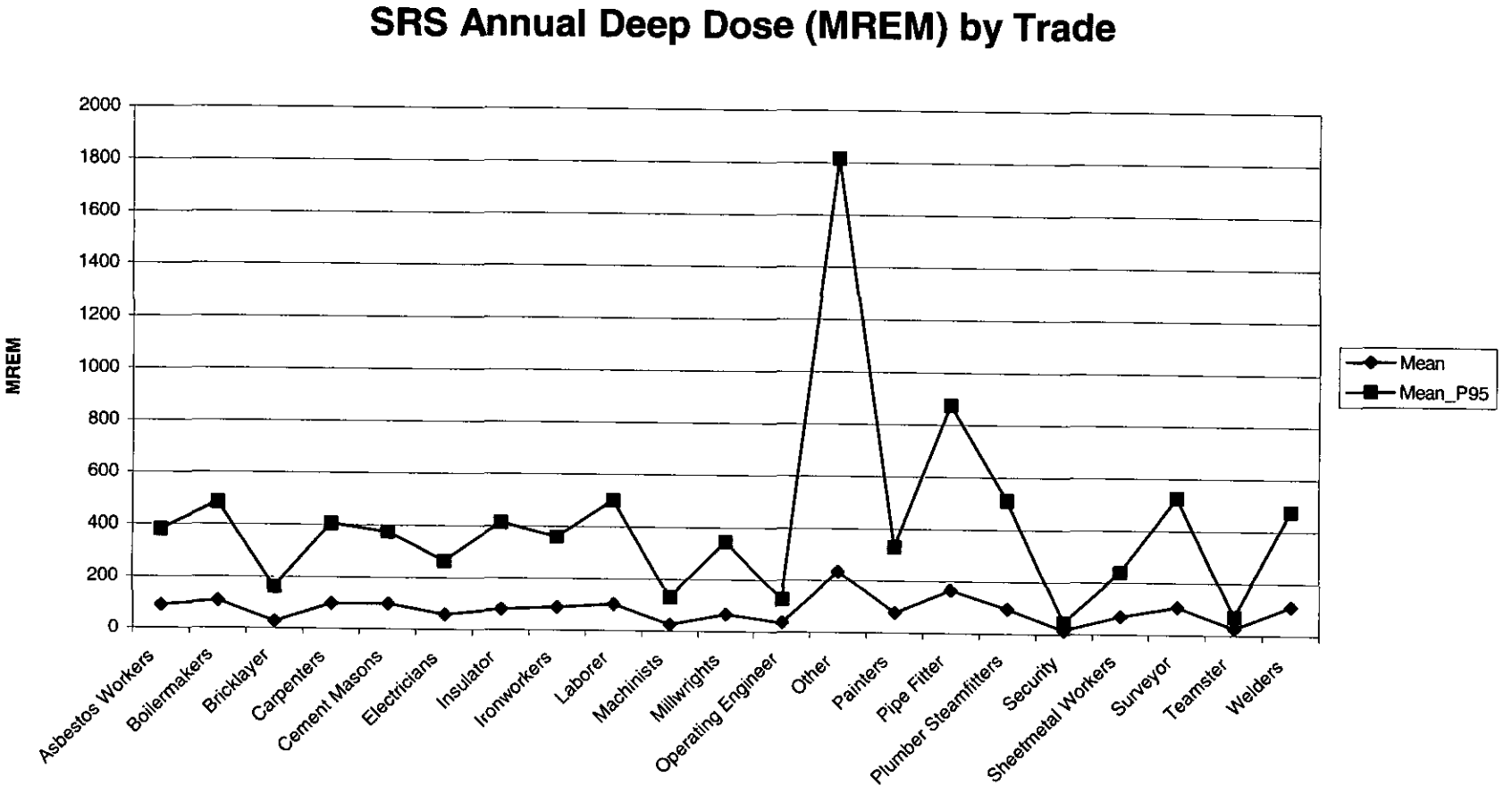

SRS Annual Deep Dose (MREM) by Trade
MREM
2000
1800
1600
1400
1200
1000
800
600
400
200
0
Asbestos Workers
Boilermakers
Bricklayer
Carpenters
Cement Masons
Electricians
Insulator
Ironworkers
Laborer
Machinists
Millwrights
Operating Engineer
Other
Painters
Pipe Fitter
Plumber Steamfitters
Security
Sheetmetal Workers
Surveyor
Teamster
Welders
Mean
Mean_P95

FIGURE 3:

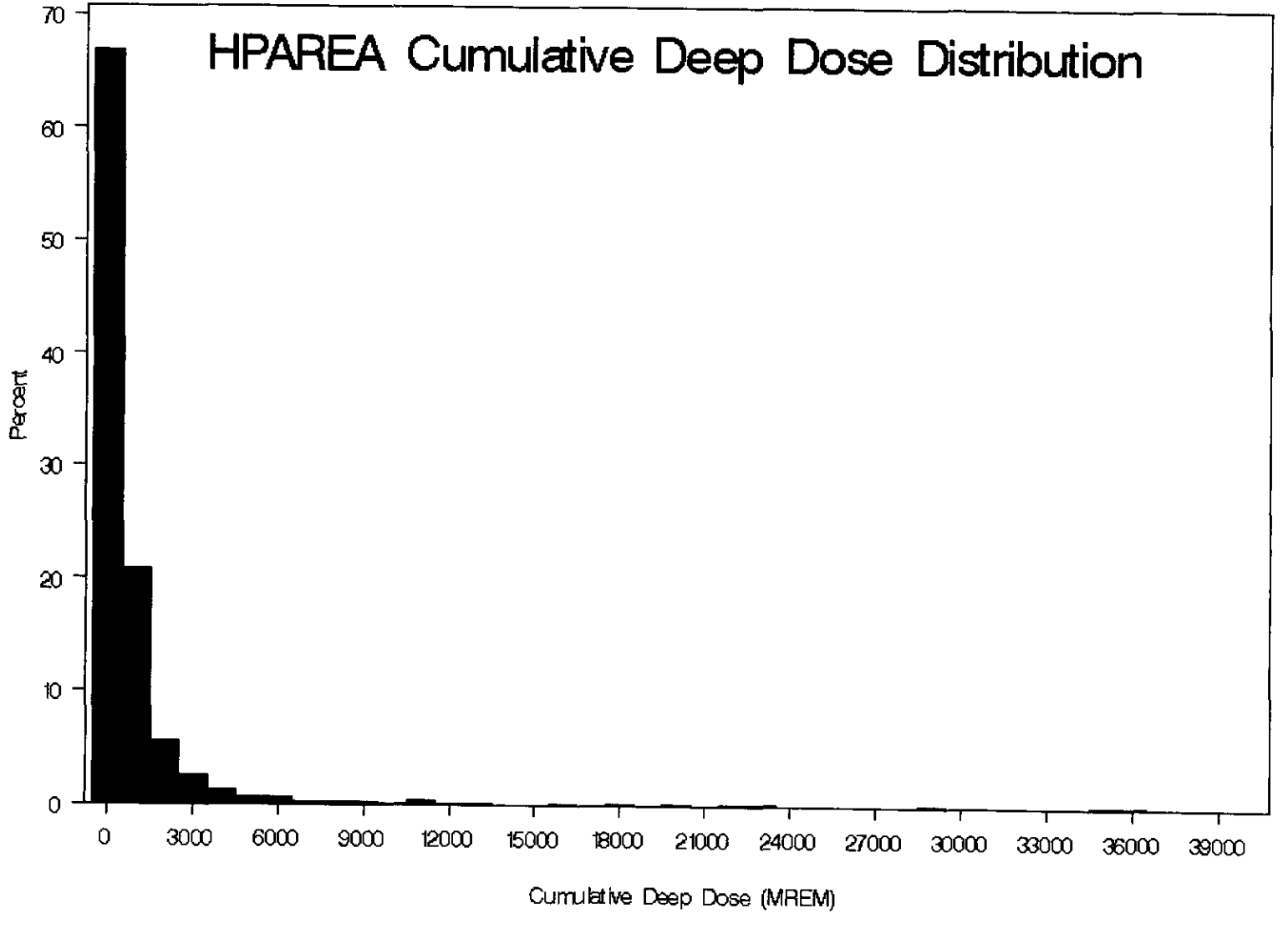

HPAREA Cumulative Deep Dose Distribution
Percent
70
60
50
40
30
20
10
0
0
3000
6000
9000
12000
15000
18000
21000
24000
27000
30000
33000
36000
39000
Cumulative Deep Dose (MREM)

FIGURE 4:

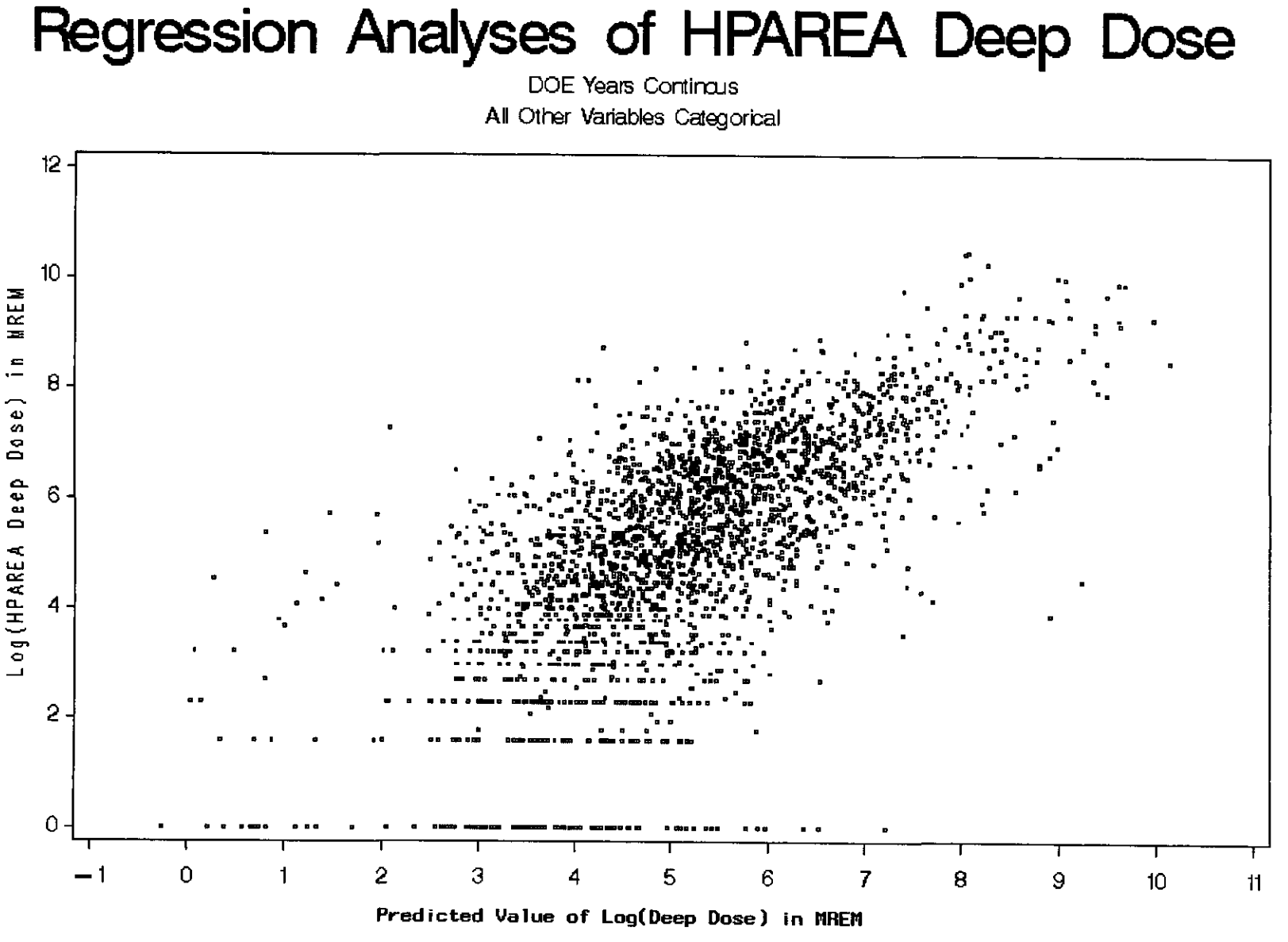

Regression Analyses of HPAREA Deep Dose
DOE Years Continous
All Other Variables Categorical
Log(HPAREA Deep Dose) in MREM
Predicted Value of Log(Deep Dose) in MREM
12
10
8
6
4
2
0
-1
0
1
2
3
4
5
6
7
8
9
10
11

FIGURE 5:

Monte Carlo Deep Dose Simulation Using Regression Parameter Estimates and Covariances SRS HPAREA Data Regression Model

Input: Trade = Pipefitter; SRS Work Duration = 10 Years;
Model Max for Radiation Buildings Worked, Urine Test Frequency, Work Stop Frequency Due to Radiation Hazard, and Radiation Exposure Incidents

Model Outputs:

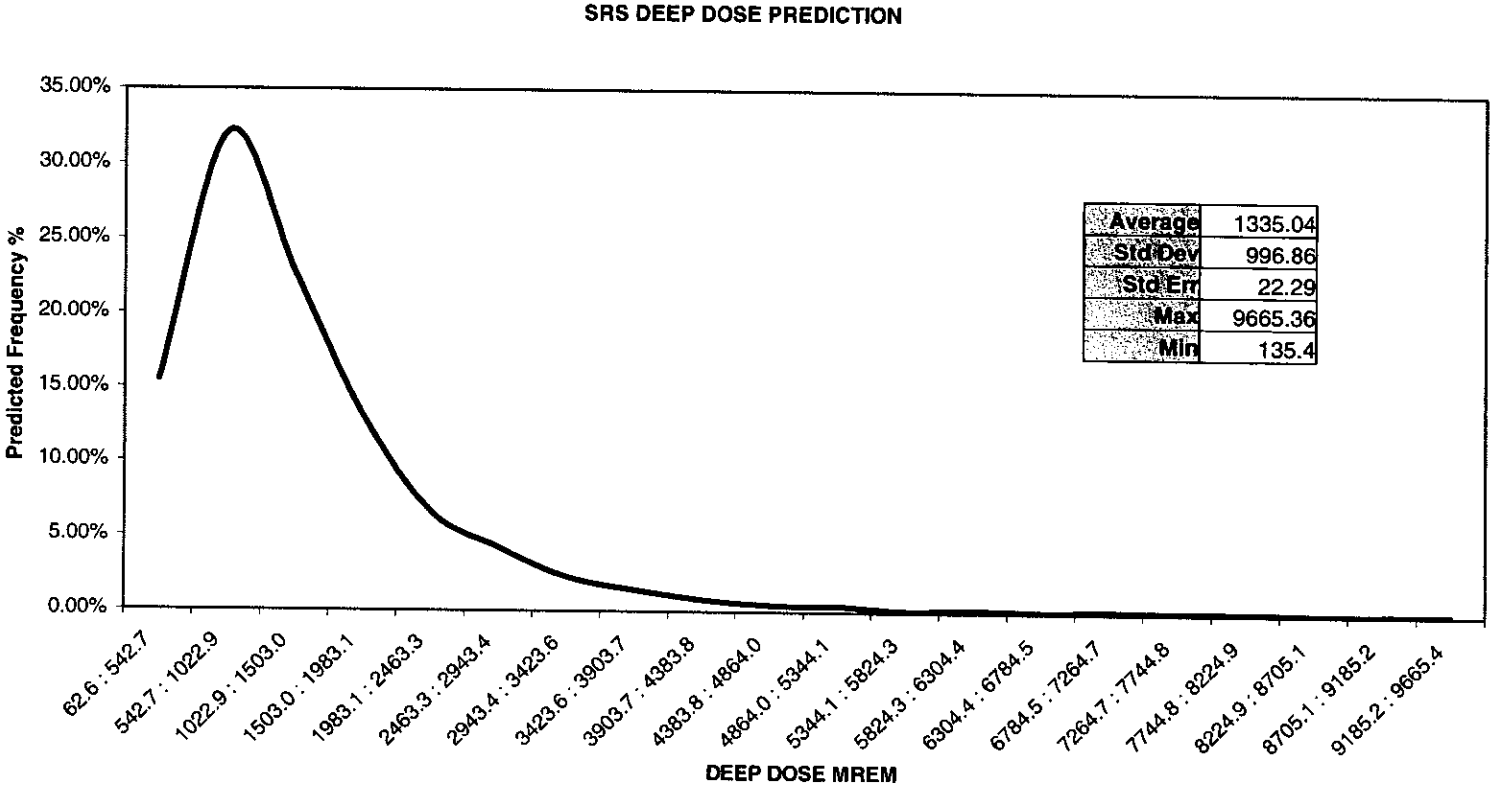
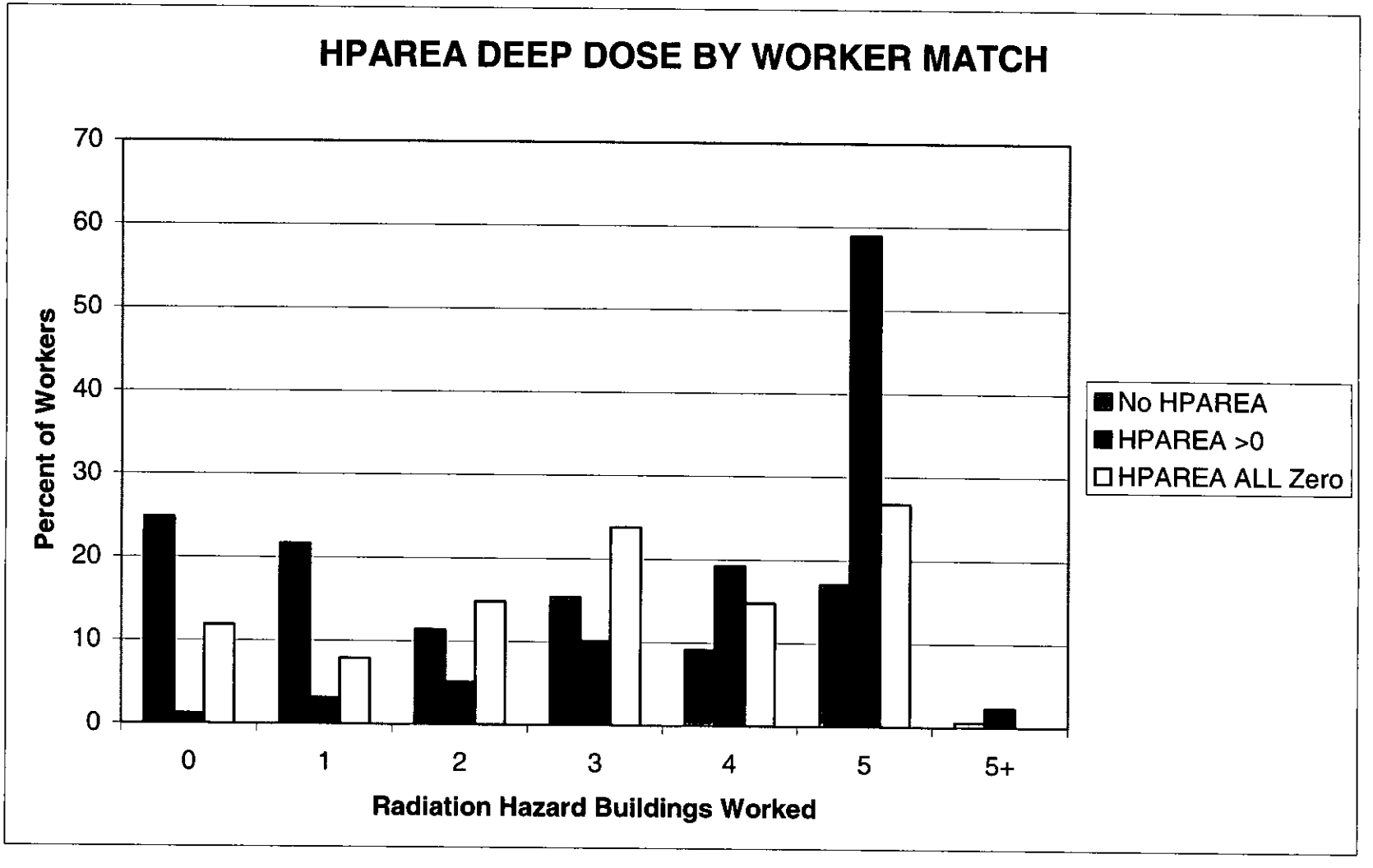


FIGURE 6:


HPAREA DEEP DOSE BY WORKER MATCH
Percent of Workers
70
60
50
40
30
20
10
0
0
1
2
3
4
5
5+
Radiation Hazard Buildings Worked
No HPAREA
HPAREA >0
HPAREA ALL Zero

Attachment 2

Statement to NIOSH Board on Radiation and Worker Health[1]
Las Vegas, December 9, 2003
By
Knut Ringen, Dr.P.H.
Science Advisor
The Center to Protect Workers' Rights

My name is Knut Ringen. Thank you for giving me time here today.

Disclosures

I am science advisor to the Center To Protect Workers' Rights (CPWR.)

CPWR is the non-profit research and development corporation of the Building and Construction Trades Department, AFL-CIO.

It has the following significant relationships to this issue:

- It has been a major partner of NIOSH in the development of construction safety and health research, demonstration and practice programs for the past 13 years.
- It has a contract with NIOSH/OCAS to develop improved characterization of radiation exposure for construction workers.
- It is responsible for or involved in DOE-funded medical screening programs for former construction workers at Hanford, Savannah River, Oak Ridge, Portsmouth, Paducah and Amchitka.
- The DOL has contracted with CPWR to help with employment verification for construction claimants under EEOICPA. DOE cannot verify employment for close to 20% of construction workers, let alone radiation dose.

I am not an expert in radiation, radiation health monitoring or radiation biology. My comments apply specifically to construction trades claimants only and may or may not apply to other types of claimants. Construction workers are different from most other workers:

--They are employed intermittently

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[1] This is a slightly edited version incorporating some issues discussed during the presentation or in response to questions.

--They work in uncharacterized environments
--They work in uncontrolled working conditions with little or no monitoring.

In addition, construction workers have a large stake in EEOICPA.

There have been many more construction workers than production workers at the DOE sites.

--59,000 at risk for radiation exposure at Hanford
--37,000 at SRS
--30,000 at Oak Ridge

Almost half of all EEOICPA claimants are construction workers or their survivors.

Problems with the NIOSH Approach

Let me say from the start that we did not agree with NIOSH's interpretation of the law and its plans for dose reconstruction, and we conveyed that in meetings with Larry Elliot in the summer of 2000, and have done so in comments on the rules that NIOSH put out. We did not think this approach would work for our members and we see scant evidence of it working so far.

At the same time, we are grateful that NIOSH is finally beginning to process cases. But it is important to recognize that one cannot draw conclusions from the 1,000 cases processed so far. These are the "easy" cases; the ones that are obviously covered or not covered. We are more concerned with the 30-40 percent of cases where there are no valid radiation dose data and where claimants have difficulty recalling work history with sufficient detail to enable NIOSH to make reliable estimates of dose in the absence of monitoring data.

These claimants face special problems that can be linked to two fundamental flaws in the design of this program:

- While the original Dose Reconstruction Rule, under which the program operates, is fairly specific where NIOSH can rely on a complete history of radiation dose monitoring, that is not the case for claimants with incomplete monitoring records. These claimants face

a rule that is grossly lacking in specification.[2] The lack of clear specifications has had two major effects:

- Because defined benchmarks are lacking, it may be difficult, and maybe impossible, to make an objective determination about the completeness of dose reconstructions.
- It places an unreasonable burden on claimants to document their exposures and to verify the completeness of the dose reconstruction reports.

- The administrative structure which relies on contractors with historic ties to DOE is so rife with potential for conflict of interest that it has eroded confidence in NIOSH's objectivity. Two effects arise from this structure:

  - Even though policies and procedures to prevent conflict of interest have been developed, there is evidence that they are not adequate.
  - As a result NIOSH has very low credibility among the claimants.

Savannah River Site Profile

I want to put this in context by using the Savannah River Site Profile as the example. The SRS site history was issued in the summer of 2003 although we did not know about until your meeting in August.[3] By the way, how many of you have read the SRS site profile document?[4]

My comments will reflect a meeting on November 11 in Augusta GA, when Dr. Jim Neton and some of the NIOSH contractors came to review their SRS site profile document with our local unions. We appreciate their willingness to accommodate our schedule even though this was a Federal holiday.

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[2] 42 CFR Part 82. Methods for Radiation Dose Reconstruction 67 FR 22314, §82.16-§82.17.

[3] The verbatim transcript of the Meeting of the Advisory Board on Radiation and Worker Health held at The Westin Cincinnati, 21 East Fifth Street, Cincinnati, Ohio, on August 19, 2003, p 140 indicates that NIOSH had not approached any union organization for assistance or comments on the site Profile document, because it considered the workers at SRS to be largely non-union.

[4] Only one Board member, Mark Griffon, responded affirmatively.

It was a very good meeting, indeed the best meeting we have had with NIOSH on its dose reconstruction efforts. That does not mean we approve of the site profile, and certainly, the ultimate judgment on the meeting will depend on the changes that NIOSH makes to the profile based on the feed back it got. Dr. Neton and colleagues were very open and were received very well. From our side, the following participated:

- The leaders of all 18 unions with members on the SRS site.
- Roughly one dozen workers who have had long tenures on the SRS site, and who together span the entire history of the site.
- Three technical experts. In addition to myself, Dr. James Platner, Associate Director for Science, CPWR, who has a background in radiation biology, and Donald Elisburg, CPWR legal advisor, who is an attorney and at one time Assistant Secretary of Labor with jurisdiction for all Federal workers' compensation programs.

Following the meeting our affiliates asked me to convey some thoughts to you.

We appreciate the complexity of trying to characterize 50 years of history in a very complex set of facilities where at times there have been upwards of 10,000 workers employed. To our way of thinking, the real test of this document is this: does it provide a summary of events that is fair to all claimants? We don't think so.

Although we can't be sure of this, we think it's an important document. Our impression is that it has been prepared pursuant to the Dose Reconstruction rule, to "evaluate both internal and external dosimetry data for unmonitored and monitored workers (sounds like everyone) and serve as a supplement to, or substitute for, individual monitoring data (sounds like everything) [emphasis added]"

When we reviewed this document, we became very concerned for five basic reasons:

1. There is no methodology.
   a. NIOSH has not issued a rule to govern the procedure of completing these site profiles,
   b. Nor does the report include an acceptable description of the methods and documentation used. As a result, there is no way

to scientifically replicate this report. We know it was done by an ORAU contractor team that talked to lots of SRS site personnel, without specifying, why with whom or when.[5] This gives us little comfort.

c. The contractor has developed a methodology for extrapolating maximum dose from source terms, which is used to estimate exposure from airborne and re-suspended exposures. This methodology is listed in the bibliography, but it is an unpublished report.

2. <u>There seem to be significant omissions</u>. Here are some omissions that we found in our review:

a. We have 83 significant site history documents in our files that are not referenced.

b. We looked at the radionuclides (e.g., source terms) for one area. NIOSH lists 32 core radionuclides ("source terms") common to the reactors used at SRS. We have identified at least 10 additional radionuclides.

c. There is no description of deficiencies in radiation monitoring programs. In the 2,000 or so interviews we have performed with SRS construction workers, there is extensive reporting of widespread problems in this area. Also, there is no reference to findings by the 1990 Tiger team investigation of monitoring practice deficiencies, or the 1999 DOE hearings where many workers testified to such problems.

d. There seems to be no consideration of radiation incidents or accidents. We have identified approximately 76 accidents over the history of this site.

e. The document seems skewed towards production workers who work in one area or facility for a long time. Throughout the document, there is no apparent awareness that construction workers may have very different exposure patterns from production workers. Participants at the meeting told NIOSH how they worked in all areas of the site regularly or periodically. They also noted that the model used to estimate maximum dose from resuspended radiation based on source term information apparently has not considered something as

[5] This finding does not support statements made by site profile team members to the Board on Radiation and Worker Health, in which they "were pretty sure" that specific references to contacts with SRS staff were included. See the verbatim transcript of the Meeting of the Advisory Board on Radiation and Worker Health held at The Westin Cincinnati, 21 East Fifth Street, Cincinnati, Ohio, on August 19, 2003, p 141

simple as digging in that dirt, or working in excavated work areas, which construction workers commonly do.

3. There appears to be conflict of interest if the policy on conflict of interest that has been adopted for dose reconstruction is applied to staff working on the site profiles. Dr. Eugene Rollins is listed on the ORAU website as a key person working on this Report. He apparently also developed the model to estimate maximum dose from source terms. His conflict of interest statement (ORAUT Form 6) lists previous work at SRS, including 6 years in human health risk assessment and one year in shift supervisor in health physics radiation monitoring.
4. There seems to be conflict with the Rule. According to the introduction to the Site Profile, it was developed pursuant to the Dose Reconstruction Rule. That Rule, however, allows for only one kind of adjustment for "life-style" risk factors, which is for smoking in lung cancer[6] (and which we have objected to.) Nevertheless, in the SRS Site Profile, there is another somewhat curious adjustment for people eating wild game taken from vicinity of the SRS site.[7] According to the Site Profile, if *both* ^{137}CS *and* other radiation products are present, then, and only then, can the dose reconstructors include the radiation from ^{137}CS without making adjustments for "mean body burdens of ^{137}CS." It notes that this approach should be considered "claimant-favorable." We disagree. We think it is illegal under the rule.
5. There is no independent review. There should have been two independent reviews before this and other site profile reports are put into use:
   a. A review of the underlying methodologies, including in this case the unpublished source term extrapolation method.
   b. A review of the document itself.

Following our meeting in Augusta, we agreed to make available to NIOSH the documentation we have. I don't know why they did not come to us

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[6] NIOSH considered adjustments for other risk factors in the Final Rule on the Guideline for Dose Reconstruction and concluded, "It is not scientifically supportable or feasible to adjust NIOSH–IREP risk models for the multitude of occupational and community exposures. 67 FR 22301, May 2, 2002.

[7] "If the record clearly indicates that the worker was a consumer of meat from wild game harvested on the mid-to-southern Atlantic seaboard extending into the Appalachian Mountains, ^{137}Cs results in whole body counts can be disregarded unless there is also an indication of intake of other fission/activation products or ^{90}Sr in a urine sample." SRS Technical Basis Document, p. 78.

while they were developing the report. It seems they did not hesitate to meet with DOE site personnel. This one-sidedness does nothing to dispel the sense, held broadly, that NIOSH is not above board in its work.

We have good reason to be distrustful of documentation provided by DOE officials, and SRS site personnel specifically. Prof. Eula Bingham, who works with the CPWR consortium that conducts medical screening programs for DOE workers, reported to the Board during a public comments session at the August 19 Meeting in Cincinnati on our dismal interactions with the SRS staff concerning beryllium exposures. We find it reasonable to suspect that any information provided for radiation exposures could be equally misleading.[8]

Recommendations

This leads me to make one point about the claimants, once again, since they are what this is all about. After NIOSH placed its site profile document on its website, it invited comment on it, which one can only discover by reading the web site. Apart from this being after the horse has left the barn, since the document was already approved and issued, it clearly places the burden on claimants to show deficiencies. That points to what seems to be a very unfair balancing act:

- On the one hand are the site profile documents. These are very complex documents, presumably with far-reaching significance, presented pretty much as final by NIOSH when it puts them on its website. NIOSH has major in-house expertise plus lots of contract support, in all some 300 people working on this.
- On the other side are the claimants. They are by definition either workers with cancer, and therefore mostly old and frail, or their survivors, who are often elderly spouses. They have no support. Our limited technical review of the SRS document took approximately 70 hours of professional personnel time. Without such technical assistance, claimants will not be in a position to review these, and all the other technical documents that are sprouting like mushrooms on the OCAS web site. In addition, the meeting in Augusta consumed approximately 176 hours of total time for claimant representatives, not

[8] See the verbatim transcript of the Meeting of the Advisory Board on Radiation and Worker Health held at The Westin Cincinnati, 21 East Fifth Street, Cincinnati, Ohio, on August 19, 2003, p 275-276.

counting travel time. In addition, written comments still need to be drafted for submission to the site profile docket on the OCAS web site. That's a lot to ask of people. They need help.

This is not the only area where NIOSH places an undue burden on claimants. Our members tell us they can't follow the interviews that are performed by phone, and NIOSH interviewers say the same ting. It is unreasonable to expect these old folks to recall a life-time of information about radiation exposures, protective practices, and radiation monitoring. Even more difficult are the interviews where the claimant is a survivor, since they know nothing of such exposures. I am told a typical interview with a survivor lasts 10-12 minutes and consists mostly of "I don't know" answers to NIOSH questions. Clearly, these folks need help.

Therefore, I ask this Board to consider three actions:

- Require NIOSH to issue a replicable method for the preparation of site profiles that includes validation of the information received from the site personnel.
- Require independent review of the site profiles before they are issued, and include on these reviews not just experts in dose reconstruction, but also people who understand working conditions.
- Encourage NIOSH to provide claimants who need it or want it, with independent assistance in their interactions with NIOSH. NIOSH aims to be claimant-favorable—in fact in this site profile document the phrase "claimant-favorable" is sprinkled liberally—but it fails to provide the weakest of claimants what they most need, an independent, knowledgeable and forceful advocate.

Finally, I respectfully suggest that you make three changes in your meeting procedures to become more "claimant-favorable":

- Hold the meetings in locations where many claimants reside. When you met in Charleston, S.C., you were a 3-4 hours drive from the Aiken-Augusta area where most SRS workers live. You can't expect old and frail people to travel that far, and none showed up.
- Send a notice to all claimants in your files who live within a vicinity of 50-80 miles from the location where you plan to meet. A notice

posted in the Federal Register or on the web site is not accessible to any normal human being. By itself it will not generate participation.[9]

- Hold a session for public comment in the evening. We have found that a meeting held during the day does not attract worker participation. The reason for this is two-fold: the claimants are either too old or frail to travel on their own, and therefore rely on family members to take them, or they are survivors who are family members. In either case, they are prevented from attending because they work during the day.

Thank you for your time and attention.

[9] At least on the first day, there were no Nevada Test site workers at the Advisory Board meeting in Las Vegas.

Attachment 3

CPWR-NIOSH MEETING ON VARIANCE IN CONSTRUCTION WORKER RADIATION EXPOSURE MONITORING

The Center to Protect Workers' Rights
Silver Spring Maryland 20910
July 27, 2005

This meeting was convened as required by Task no. 2 under contract no. 200-2002-00433 between the National Institute for Occupational Safety and Health (NIOSH) and The Center to Protect Workers' Rights (CPWR).

The agenda, outline of key issues, and list of participants are in Attachments 1-3. Participants included on one side experts in construction worker exposure measurement and on the other hand experts in radiation dose monitoring. The aim was to see if a consensus could be agreed to between these two groups on a very complex issue.

The meeting focused on the following three key questions

1. Are the models that NIOSH has proposed to estimate radiation exposure, where exposure monitoring data are missing or lacking, appropriate for construction workers?
2. Is the variance, as we know it, in exposure dose measurements for construction workers greater than the variance incorporated into NIOSH models for estimated radiation dose.
3. If NIOSH models should be amended for construction workers in light of what we know about variance in construction exposure measurements, how should this be done?

SECTION 1: SUMMARY OF INFORMATION PRESENTED

The Current NIOSH Model

Dr. James Neton, NIOSH, started out by briefly explaining NIOSH's role under EEOICPA, and noted that it was very difficult to reconstruct radiation dose for construction workers because of frequently missing monitoring data and very intermittent and variable employment.

He then went on to suggest that, for internal dose reconstruction, the meeting focus on NIOSH's model to estimate internal dose from ambient air monitoring, as defined in OTIB 0018.[1] OTIB 0018 is applied to facilities that had "rigorous" air monitoring programs in "areas of risk," for any worker employed in such facility in 1953 or later. Although this model was not intended to be applied for respiratory tract organs or the thyroid, NIOSH is considering adapting OTIB 0018 for use in the reconstruction of internal doses for construction workers. The modified version

[1] ORAU Team Dose Reconstruction Project for NIOSH. *Internal Dose Overestimates for Facilities with Air Sampling Programs.* ORAUT-OTIB-0018, 3/18/2005.

would allow for the reconstruction of doses to the respiratory tract and the thyroid gland. It applies the following basic assumptions:

- Chronic intakes were for 40 hours per week, 2,000 hours per year.
- Breathing rate was 1.2 m^3/hr averaged over an 8-hour day.
- Maximum allowable concentration (MAC) or Annual Limit of Intakes (ALIs) were assumed for all alpha and beta emitters.
- Dose uncertainty distribution is considered to be lognormal with a GSD = 3.

After extensive discussion it was agreed that three key issues needed to be considered to determine whether this model was valid for construction workers:

- Is the breathing rate valid since construction workers perform heavy work.
- Is the ALI intake rate valid since construction workers seem to have more episodic and very high peak, short-term exposures?
- Is the dose uncertainty distribution valid given that construction workers experience extreme variability between individual personal dose measurements?

What We Know about Dose Variance For Construction Workers

Pam Susi described the joint CPWR-NIOSH program to assess exposures in construction,[2] and provided examples of the wide range of exposures found on worksites for identical work tasks:

Table 1: Examples of Exposure Measurement Ranges by Task

Work Task Measured	Exposure range (mg/m^3)
Avon Lake Boilermakers, 2004 Manganese During Welding	0.006 -0.146
Hot work 1995-96, total particulate	<1.0200 -37.2900
Hot work 1995-96, manganese	0.0005 –1.3105
Abrasive blasting (Hematite), 2002	0.52-25.66
Abrasive blasting (Coal slag), 2004	20.42 – 90.11
Abrasive blasting (Steel grit), 2004	0.89 – 57.5

Dr. Stephen Rappaport described the main sources of variance in exposure for construction workers as:

- Exposure varies *among sites* or locations within a large facility
  - Different sources, environmental conditions, controls, etc.
- Exposure varies *between workers* at a given site
  - Different jobs, activities, locations within sites, equipment, etc.
- Exposure varies *within workers* over time
  - Changes in site characteristics, assay error, etc.

[2] Susi, P.; Goldberg, M.; Barnes, P.; Stafford, E.; The Use of a Task-Based Exposure Assessment Model (T-Beam) for Assessment of Metal Fume Exposures During Welding and Thermal Cutting. Applied Occupational and Environmental Hygiene Vol. 15 (1): 26–38, 2000

He then described the *One-Way Random Effects Model* which is commonly used to model construction worker exposure variance. Applying this model to exposure measurements to manganese (Mn) during welding from a previous study[3] to describe the dose uncertainty for the following scenarios:

Table 2: Variance in Mn Exposures During Welding

Source of Variance	GSD
Among sites	N/A
Between workers	2.65
Within workers	2.65
All sources combined	***4.34***

Other participants presented uncertainty estimates from other studies of exposures, as summarized in table 3.

Table 3: Examples of Uncertainty

Investigator	Exposure Measured	GSD
Woskie[4]	Silica during highway construction	1.5-5.7
Goldberg[5]	Lead during bridge rehab, task-specific	1.5-12.7
Goldberg[5]	Lead during bridge rehab, multi-task	3.5-5.6

Dr. Robert Herrick reported on a large retrospective exposure study of asphalt paving workers[6] to determine how well a model of exposure risk scenarios defined by industry experts predicted actual monitored exposures. The study found that the model predicted about 40 percent of the variability encountered in actual exposures. Given that work tasks included in this study were much more uniform than general construction work tasks, it seems unlikely that any model for predicting exposures for general construction will achieve a higher predictive value than what Herrick presented.

The Magnitude of Unmonitored Construction Workers

The meeting had two conflicting reports on the extent to which construction workers were monitored on DOE sites:

- Buck Cameron together with Mel Chew, performed interviews with workers from many trades at Savannah River and Hanford. The workers they interviewed indicated that construction workers had been monitored regularly when they worked in "radiation areas." They also noted that these workers could not ascertain whether the area they worked in was a radiation area. When comparing the number of trades workers reported

[3] Rappaport, MS; Weaver, M; Taylor, D; Kupper, L.; Susi, P.; *Application of Mixed Models to Assess Exposures Monitored by Construction Workers During Hot Processes*. Ann. Occup. Hyg., Vol. 43, No 7, pp. 457-469, 1999
[4] Woskie, S. R.; Kalil, A. J.; Bello, D., Virji, M.A. *Exposures to Quartz, Diesel, dust and Welding Fumes in Heavy and Highway Construction.* American Industrial Hygiene Association Journal ,Vol. 63 (4): 447 - 457, 2002.
[5] Goldberg M, Levin SM, Doucette JT, et al. A Task-Based Approach to Assessing Lead Exposure Among Iron Workers Engaged in Bridge Rehabilitiation. Am J Indus Med 31:310-318, 1997.
[6] Burstyn, I. et al. Estimating Exposures in the Asphalt Industry for an International Epidemiological Cohort Study of Cancer Risk. Am J Indus Med 43:3–17, 2003.

to be on site with the number included in the HPAREH electronic radiation data base at SRS, it appears that the data base only included 30% or less of the construction workers on the site.

- Dr. Eula Bingham reported on her review of worker interviews conducted as part of the Former Worker Medical Screening programs at Portsmouth and Paducah. Only 40% said they were continuously monitored from the time got their first badge, and most of the remaining workers interviewed said they were never monitored.

Findings From Evaluation of Site Radiation Data Bases

Dr. John Dement reported on his evaluation of two electronic data sets of summary radiation monitoring data: The Rex data base at Hanford, and the HPAREH data base at Savannah River. He cautioned that both data sets were unaudited, and therefore the results are preliminary. He matched these data sets with participants from the DOE Former Construction Worker Medical Screening programs for each site, using Social Security numbers. The numbers of workers included in the match were 2,074 for Hanford and 2,787 for SRS. Analysis was limited to monitoring for deep dose. The HPAREH data set includes annual cumulative dose while REX includes total (life time) cumulative dose. Major findings:

- At SRS, 83.8% of workers had deep dose measures greater than zero. However, in reviewing monitoring history for individual workers, there are many years with no recorded doses. If this is the result of not being monitoring or monitoring results not being recorded, or simply not working on the site in those years is impossible to tell from the data file. Only 2.4% had a record of internal uptake.
- At Hanford 16% had no monitoring record, and the likelihood of being in the data set increased by duration of employment on the site (longer, more likely) and time period of employment (more recent, more likely). Median and mean life-time cumulative deep doses were 1,880 mrem and 4,799 mrem.
- At SRS, median and mean life time cumulative deep doses were 215 mrem and 817 mrem.

Dr. Dement also presented data on a predictive model that included the most likely exposure scenarios, and found that when applied to individual workers and to the whole screening population at both Hanford and SRS that it was predictive but with high degree of variability and uncertainty.

Mel Chew presented a detailed comparison of annual monitoring data from construction workers compared to all other personnel at SRS. The data are summarized in Fig. 1(annual mean deep dose) and Fig. 2 (annual 95 percentile deep dose). Both figures show exposure levels that are in close concordance:

Fig 1: Annual Deep Dose, SRS

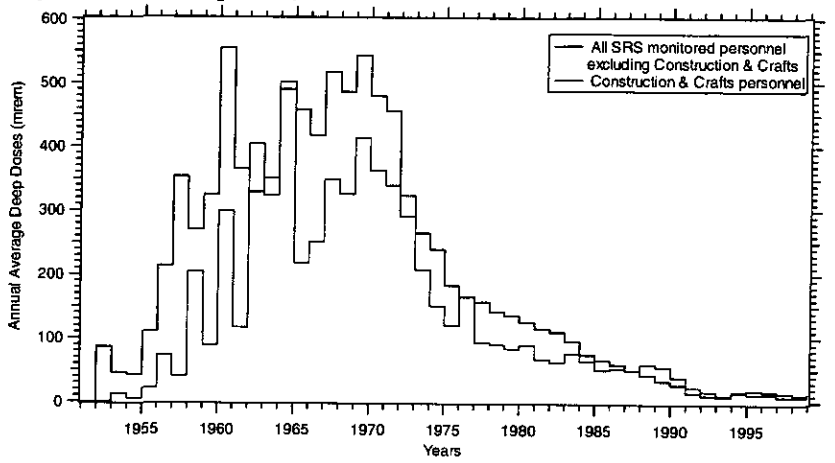
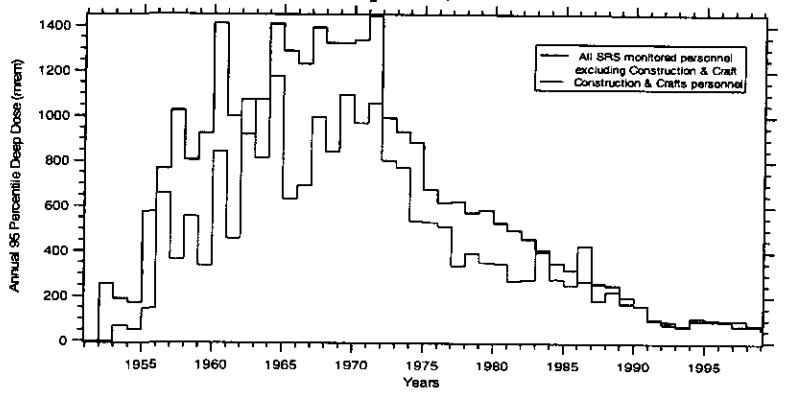
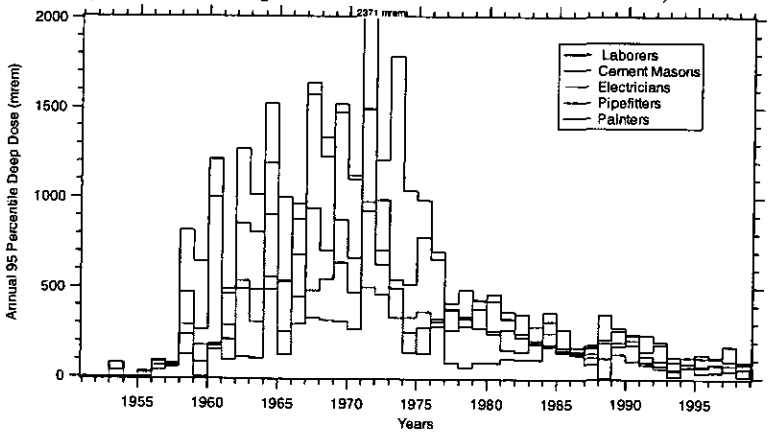


Fig 2: Annual 95 Percentile Deep Dose, SRS



In addition fig. 3, on annual dose for selected trades led to a discussion of the need to disaggregate trades to better incorporate specific exposure scenarios into dose reconstruction for each trade. For instance, it was noted that the high doses for cement masons during the late-60s and early 70s could be due to exposures during construction of a second story addition to a facility in the F-Canyon.

Fig 3: Annual 95 percentile Dose for Selected Trades, SRS



SECTION 2: CONCLUSIONS

ISSUE 1: Are the models that NIOSH has proposed to estimate radiation exposure where exposure monitoring data are missing or lacking appropriate for construction workers?

There appeared to be consensus on three important points:

1. It was agreed that the external radiation exposure monitoring data presented appear to indicate a reasonable concordance between the exposure patterns experienced by the construction worker population and the non-construction worker population. Therefore, it is possible that models that infer external radiation dose premised on general site exposure patterns can be applied to construction workers under certain circumstances.
2. It was also agreed that the exclusion of respiratory tract cancers from OTIB 0018 needs to be reconsidered for construction workers.
3. It was also agreed that the use of a single breathing and deposition rate for all workers in OTIB 0018 required further investigation and that the breathing rate for construction workers could be higher than the default rate presented in ICRP 66. Dr. James Platner agreed to investigate this issue further. (See Report in Attachment 4)

This consensus was premised on a number of caveats:

- Data from Hanford and SRS may not be sufficient to draw general conclusions that apply to the DOE complex as a whole.
- The data sets from Hanford and SRS had three critical limitations that lead to great uncertainty about the validity of the conclusions drawn from them:
  - The external exposure data sets were obtained from third parties, and no attempts were made to perform an audit of their content. They may or may not be complete or accurate.
  - There were "holes" in the data for some individuals and it is not clear if this was because data were missing or if it represented gaps in employment.
  - The data were summary data and thus were cumulative over a year (SRS) or life time (Hanford); this has an "averaging" effect which fails to document high peak exposure episodes, which may be more typical for construction workers that for other workers.

Further, there was some uncertainty about how OTIB 0018 would be applied in two respects:

- The proposal to assign a dose equal to the maximum allowable dose for each day in year where no dose monitoring data exists appears to be favorable to the worker. However, if dose is assigned based on maximum measured environmental air measurement, it is less likely to be favorable to construction workers because they are more likely to working more remotely from the source of the air monitoring, and also more likely to be working outdoors where such monitoring has much less validity.
- The fact that OTIB 0018 does ***not*** currently apply to respiratory tract cancers and that NIOSH has not explained why it is applicable to all other cancers but not to these types of cancers puts the validity of the model into question. This concern is exacerbated by

the fact that NIOSH has not yet proposed an alternative model for respiratory tract cancers.

ISSUE 2: Is the variance, as we know it, in exposure dose measurements for construction workers greater than the variance incorporated into NIOSH models for estimated radiation dose?

The consensus was strong that the bracketing of NIOSH's estimates of internal dose using a GSD of 3 for all workers is not valid for construction workers, and that a more valid model of uncertainty for construction workers would apply a GSD of approximately 4.25 (range 4-4.5). Dr. James Neton estimated that this could be accounted for by assigning an exposure value of 1.2 times the ALI per day for each year in which the construction worker has no valid exposure monitoring records. This statement was based on the fact that, if one applies a GSD of 4.5 to an air concentration of 0.1 times the maximum allowable air concentration (MAC), the 95th percentile air sample value would be equal to 1.2 times the MAC. He agreed that prior to the use of such a value, NIOSH would develop a detailed explanation for the bounding nature of this value.

ISSUE 3: If NIOSH models should be amended for construction workers in light of what we know about variance in construction exposure measurements, how should this be done?

It was agreed that the model developed by NIOSH in OTIB 0018, with the modifications recommended below, could be applied with reasonable validity provided that there is a sufficient DOE-facility-specific data base to support it. Therefore, it was recommended that an initial application be planned for Savannah River and Hanford, to include the following:

- An audit of data quality should be made to determine if the summary radiation data based on the electronic data base provided for this meeting is valid. Such an audit would require a comparison of the electronic record with the individual (usually paper) dose records and work history of a representative sample of workers.
- An evaluation of the radiation monitoring data at the remaining covered facilities should be made to identify other facilities where the model might apply.

Further, before being implemented for construction workers at any facility, OTIB 0018 should be amended to incorporate the following recommended changes.

1. Before OTIB 0018 can be applied to any DOE site, NIOSH must demonstrate that it is generalizable to such sites, and it must delineate more clearly the conditions under which it cannot be applied with scientific validity. It was suggested that for DOE facilities or populations where the model cannot be applied, NIOSH should develop a rule to recommend referral to the Special Exposure Cohort to expedite claims processing.
2. If OTIB 0018 is valid for some cancer sites, then it should be valid for all cancer sites, and therefore respiratory tract cancers should be included.
3. For application to construction workers, the following changes should made to the model:

a. Because construction workers on average work 5% more than the general working population,[7] the number of hours with chronic exposures should be adjusted to **42 hours** per week and **2,100** hours per year.
b. Because construction workers have more heavy exertion, the breathing rate should be adjusted to **1.7 m^3/hour** averaged over an 8-hour day. Further, additional adjustments, to be recommended by NIOSH, should be made to allow for the greater relative rate of deposition measured during heavy exertion.[8]
c. Because uncertainty caused by variance is greater for exposure measurements for construction workers, NIOSH should apply a GSD of **4.25**.

[7] See attachment 4 for documentation.
[8] See attachment 4 for documentation.

ATTACHMENT 1

CPWR-NIOSH MEETING ON VARIANCE IN EXPOSURE MONITORING

July 27, 2005

Agenda

Note: "BTW" = Building Trades Workers

TBEAM= Task-Based Exposure Assessment Model

9:00 am	Welcome	Jim Platner, Chair
9:00-10:00	The Problem	
	Why NIOSH Needs Input on BTW Dose Reconstruction	Jim Neton
	What Site Profile Documents Cover	Judson Kenoyer
	OTIB 0018: Is it Valid for BTW	
	--Overview	Jim Neton
	--CPWR concerns	Jim Platner
10:00-10:30	Overview of Variance	
	The Statistics of Log Normally Distributed Data	Steve Rappaport
	Overview of the Literature on BTW Exposure	Steve Rappaport
10:30-10:50	Experience from T-BEAM and Variability Between Trades and Sites	Pam Susi/Steve Rappaport
10:50-11:10	Exposure Variability and Factors Influencing Lead and Silica Exposure in Construction	Mark Goldberg/Susan Woskie
11:10-11:30	Retrospective Exposure Reconstruction - Application to Construction	Bob Herrick
11:30-12:30	What We Know About BTW Radiation Monitoring at DOE Facilities	
	Worker Interviews at SRS and Hanford	Buck Cameron/Mel Chew
	Hanford and SRS Data Linkage	John Dement
	SRS HPAREH Data	Mel Chew
	Portsmouth and Paducah Screening Interviews	Eula Bingham/Carol Rice
12:30	Lunch	
1:00-2:00	Developing a Valid Model for Estimating Building Trades Radiation Exposure Variability	Jim Neton
	The Current NIOSH Uncertainty Model	
	--Is the GSD of 3 a Valid Estimate of Uncertainty for BTW?	
	--What are the implications of Expanding the GSD?	
2:00-4:00	Establishing Consensus on BTW Radiation Variance and Uncertainty	Jim Platner
	--Poorly defined and highly variable tasks	
	--Sources of exposure determined by task	
	--Intermittent peak exposures likely	
	--Lack of "uniform" subpopulations	
	--Individual variation: exertion/methods	
	--Data gaps: missing people/partial data	
4 pm	Adjourn	

Attachment 2
Key Issues for Consideration
Characterizing the variability of ionizing radiation exposures received by building trades workers at Department of Energy nuclear sites.

The total radiation dose that nuclear site workers receive includes job task related external and internal dose as well as doses from employment related x-rays and environmental exposures. Reasonable, if inexact, dose estimates of the latter two parameters may usually be applied to any one who worked on a site during a given era. It is much more difficult to estimate job task related exposures where monitoring records are incomplete or unreliable. This is particularly true in the case of building trades workers who performed a very broad range of tasks under non-standard conditions in numerous and varied areas. Trades workers typically performed diverse tasks throughout a site. Some workers, however, might spend most or all of their work time in one area or performing a limited range of tasks.

Radiation monitoring data bases at both the Hanford and Savannah River sites contain annual doses. The number of trades' persons who worked at each site, and for whom there should be monitoring records, appears to be significantly greater than the number of records available in the electronic files. When reliable and complete individual documentation is not available, it is necessary to attempt to estimate both the mean and the geometric standard deviation of the exposure. The estimation of building trades workers radiation dose requires a recognition of both the uncertainty resulting from the absence of complete exposure and source monitoring records and the innate variability of building trade exposures.

To assist NIOSH in its task of reconstructing building trade workers radiation doses CPWR will convene an expert group to develop a consensus view on the appropriate geometric standard deviation to use in their exposure model. To accomplish this objective several questions must be answered sequentially.

1. *Is it possible* to estimate the variability of the external and/or internal radiation dose received by a building trade worker by analogy to the known variability of non-radiation exposures of workers doing similar work? Radiation doses from external sources may require a different analysis from internal doses due to uptakes of radioactive contamination.
2. What characteristics of a job task would be required to confidently use the exposure variability of that task as a surrogate for radiation dose variability for nuclear site building trades tasks?
3. Which job tasks conform to, or approximate, the required characteristics for surrogates? Surrogate tasks may be from other than construction trades.
4. What data bases or summary data are available to determine the variability of exposures related to those tasks?
5. From a meta analysis of available and applicable data, what are reasonable bounds for the variability of radiation doses received by DOE nuclear site building trade employees?
6. For annualized data, how should the heterogeneity of source radiation level, tasks performed within a trade, and the frequency of performing those tasks in radiation zone by individual trades people be reflected in the variability determination?

Attachment 3
List of Participants

Name	Affiliation
Eula Bingham, Ph.D.	Professor, U Cincinnati
Buck Cameron, MPH. CIH	Industrial Hygienist, CPWR
Mel Chew	Construction Task Member, ORAU/OCAS
Diane Coats	Health Physicist, OWCP, DOL
John Dement, Ph.D., C.I.H	Professor, Duke Medical Center
Donald Elisburg, J.D.	Policy Advisor, CPWR
Miles Fisher	Research Assistant, CPWR
Mark Goldberg, Ph.D., C.I.H.	Professor, CUNY Hunter College
Robert Herrick, Ph.D., C.I.H.	Professor, Harvard University SPH
Judson Kenoyer, M.S., C.I.H.	Construction Task Mgr., ORAU/OCAS
James Kotsch	Health Physicist, OWCP, DOL
James Neton, Ph.D.	Science Director, OCAS/NIOSH
Jim Platner, Ph.D., C.I.H.	Associate Director, CPWR
Stephen Rappaport, Ph.D., C.I.H.	Professor, UNC
Carol Rice, Ph.D., C.I.H.	Professor, U Cincinnati
Knut Ringen, Dr.P.H.	Science Advisor, CPWR
Pam Susi, M.P.H., C.I.H.	Program Dir, CPWR
Susan Woskie, Ph.D., C.I.H.	Professor, U.Mass/Lowell

ATTACHMENT 4

WHAT IS THE BEST ESTIMATE OF THE DAILY VENTILATION RATE FOR CONSTRUCTION WORKERS?

James Platner, Ph.D., CIH
Associate Director for Science and Technology
The Center To Protect Workers' Rights
July 28, 2005

Higher average daily ventilation rate for construction workers

For the calculation of internal dose, the reference man (i.e., "typical person") used in ICRP 66 assumes an average working day composed of 5.5 hours of light exercise (mean breathing rate of 1.5 m^3/hour) and 2.5 hours of rest-sitting (mean breathing rate of 0.54 m^3/hour), for an average of 1.20 m^3/hour.[9] This underestimates the exertion level typical of construction work. This value also assumes a mix of men and women in the workforce (on average women have lower daily ventilation rates)[10,11], while the typical construction workforce has fewer than 2% women in production jobs and this percentage was even lower in the earlier years. Roy and Courtay[12] and others have characterized work activities and breathing parameters for the purpose of respiratory tract dosimetry. A heavy work (male only) category for construction and mining is based on daily activity logs and surveys from several large population studies. An appropriate daily ventilation rate for the work load of production construction workers would be:

7 Hours light work
1 Hour of heavy work

For a total of 13.5 m^3/day for an 8 hour day (**1.7 m^3/hour**)[13] for construction workers.

Undefined daily work hours and work load

While there is concern that some workers may have regularly worked longer than 8 hours per day, particularly in remote sites, this is probably best handled on an individual case basis. On average, the US construction workforce works 5% more hours per year than the national workforce.[14] There are also jobs where workers may have regularly exceeded 1 hour per day of

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[9] ICRP. Human Respiratory Tract Model for Radiological Protection. International Commission on Radiological Protection (ICRP) Publication 66. (1994) Annals of the ICRP 24(1-3): p.101.
[10] ICRP. Reverence Man. Anatomical, Physiological and Metabolic Characteristics. Publication 23 (Oxford: Pergamon Press) (1975).
[11] M. Roy and C. Courtay, Daily Activities and Breathing Parameters for Use in Respiratory Tract Dosimetry, Radiation Protection Dosimetry, 35(3): 179-186, 1991.
[12] Ibid.
[13] Ibid p. 185
[14] CPWR. The Construction Chartbook 3rd Edition. (2002) The Center to Protect Workers' Rights. Silver Spring, MD http://www.cpwr.com/pdfs/pubs/chartbook_02/page%2027.pdf

heavy work, however since this is unlikely to regularly exceed 2 hours per day it is perhaps best managed on an individual case basis.

Higher ventilation rate may increase deposition

There is also evidence that the percentage of airborne particles deposited in the respiratory tract increases with increasing minute volume. In exercising hamsters (Harbison and Brain)[15], the deposition of a 0.4-μm ^{99m}Tc-labeled aerosol increased as their oxygen consumption increased. Exercising animals consumed twice as much oxygen as sedentary animals did but they retained 2.5 to 3 times as many particles in their lungs. In humans who are exercising vigorously, minute volumes can exceed 120 liters/min, greatly increasing the amount of aerosol inspired. Muir[16] found that the percentage of particles deposited increased linearly with tidal volume and decreased with the square root of breathing frequency.[17] For very small particles, similar to construction and demolition exposures such as fumes from welding and torch cutting operations, the total number of deposited particles has been observed to increase more than 4.5-fold during exercise compared to at rest, because of the combined increase in deposition fraction and minute ventilation.[18] Although inadequate data is available on construction tasks to estimate such effects, these concerns should justify the use of parameters that lead to dose estimates at the high end of the reconstructed exposure distribution.

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[15] Harbison, M. L., and J. D. Brain. 1983. Effects of exercise on particle deposition in Syrian golden hamsters. Am. Rev. Respir. Dis. 128:904-908.

[16] Davies, C. N., ed. 1967. Aerosol Science. New York: Academic Press.

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Radiation Exposure Analyses

Hanford & Savannah River Construction Workers

July 27, 2005

Construction Worker Work History Interviews

Major Data Elements – Work History

- Contractors
- Crafts/Trades
  - Work duration at Hanford
  - Total work duration in Trade
- Materials/Agents
  - Scale of exposure frequency (0-5)
- Work Tasks Performed
  - Scale of task frequency (0-5)
- Work Tasks Performed by Others Nearby (Bystander Exposures)
  - Scale of task frequency (0-5)
- Buildings or Work Areas
  - Work in selected beryllium buildings
  - List 5 most hazardous buildings with list of known hazards
  - Work in Critical Buildings (e.g. Be or other hazards)
- Exposure Incidents in buildings
- Additional Questions about Certain Exposures (e.g. mercury, radiation, noise, etc.)

Building Trades Occupational & Exposure History

Work History Frequency Scale
Tasks, Materials, and Bystander Exposures

Scale	Short Description	Extended Description
5	Regularly	Daily or most days per week
4	Often	2-3 days per week
3	Sometimes	1-2 days per week
2	Rarely	Few times per month
1	Hardly Ever	Once per month or less
0	Not Exposed	Not Exposed

Tasks and Associated Exposures

Task Description	Asbestos	Silica	Welding	Beryllium	Solvents	Lead	Cadmium	Chromium	Mercury	Radiation	Noise
Spray fireproofing or insulation	Yes	Yes									Yes
Asbestos gasket or packing work	Yes										
Machine graphite blocks		Yes									
Build or dismantle steel structures			Yes			Yes					Yes
Operate equipment in radiation contaminated building or area										Yes	
Install, repair, or dismantle radiation contaminated equipment										Yes	

Materials and Associated Exposures

Material Description	Asbestos	Silica	Welding	Beryllium	Solvents	Lead	Cadmium	Chromium	Mercury	Radiation	Noise
Epoxy paints					Yes						
Blasting sand		Yes									
Lead paints					Yes	Yes					
Cement / Concrete		Yes									
Toluene					Yes						
Insulation	Yes										
Welding fumes			Yes					Yes			Yes
Diatomaceous earth		Yes									
Asbestos (Amosite, Chrysotile)	Yes										
Radionuclides										Yes	

Building Related Work Activities

Example of Worker Reported History

Building	Construction	Maintenance	Renovation	Demolition	D & D	First Year	Last Year	Worker Reported Hazards
0105-N	1	0	0	0	0	1973	1974	radiation, noise, chlorine gas, asbestos, galvanized pipe, galvanized fumes, lead, lead paints, ametcoat, coal tar / petroleum (bitumens), mercury, cement, concrete, graphite, insulation, beryllium tools

Building Related Work Activities

Example of Worker Reported Exposure Incident
SRS Worker With No HPAREA RECORD

Incident Date	Incident Location	Incident Description
1970's	H & F Tank Farms	Worked on both tank farms over the whole time and never wore any type of TLD or radiation monitoring instrument. HP would sometimes put the badges on some people but not all the time.

Hanford and SRS

Radiation Dose Data

Radiation Exposure Data Sources

- Hanford – REX
  - Operational since 1944
  - Cumulative radiation dose by employer and occupation
  - Data provided by University of Washington
  - Matched to Hanford construction workers participating in the screening program as of December 2002 (N=2074)
- SRS – HPAREA
  - Includes workers employed from 1979 onward. Workers in 1979 have doses annual prior to 1979 recorded.
  - Annual exposures and cumulative exposures.
  - Data through 1998 provided by Mel Chew
  - Matched to SRS construction workers participating in screening program as of March 2005 (N=2787)

Radiation Exposure Database Issues

- REX – Only cumulative exposures by contractor and not annual doses
- HPAREA – Workers who terminated before 1979 are not included
- Construction workers with no data in REX or HPAREA?
- How to treat missing data?
  - Missing years?
  - Is a missing value actually a "0" exposure?

SRS Workers- Deep Dose in HPAREA

SRS HPAREA Deep Dose Records	Frequency	Percent
No Deep Dose	351	12.59
Deep Dose >Zero	2335	83.78
All Zero Deep Dose	101	3.62

SRS Workers- No Deep Dose in HPAREA
(N=351 – 12.59% of Workers)

Usual Trade	Number	Avg Years at SRS	Range of Year First at SRS	Range of Year Last at SRS
Asbestos Workers	5	2.74	1970--1992	1986--1992
Boilermakers	16	3.53	1969--1997	1979--2001
Carpenters	21	6.25	1951--1997	1979--2003
Cement Masons	5	1.96	1955--1986	1985--1988
Electricians	135	3.11	1950--1995	1979--2004
Insulator	3	1.80	1975--1989	1988--1996
Ironworkers	14	3.57	1951--1987	1980--2002
Laborer	40	4.41	1952--1996	1979--2004
Machinists	8	1.51	1981--1992	1983--2001
Millwrights	3	1.50	1981--1987	1982--1991
Operating Engineer	10	6.10	1951--1996	1985--2004
Other	15	3.75	1976--1995	1984--2003
Painters	6	2.97	1973--1998	1979--2004
Pipe Fitter	40	3.72	1952--1995	1979--2004
Security	5	6.35	1968--1995	1989--2005
Sheetmetal Workers	14	4.84	1952--1993	1980--2003
Surveyor	2	4.50	1979--1995	1982--2003
Teamster	7	3.14	1977--1990	1982--1995
Welders	2	2.00	1978--1987	1987--1994

Example of Zero and Missing Dose
SRS Bricklayer 25 Years at Site

Year	Deep Dose MREM
1976	160
1977	10
1978	25
1979	40
1980	0
1981	0
1982	50
1983	30
1984	
1985	
1986	
1987	5
1988	0
1989	
1990	15
1991	0
1992	10
1993	0
1994	0
1995	21
1996	0
1997	0
1998	0
1999	0

SRS Workers – Internal Uptake Data

- Of 2787 SRS worker only 66 (2.4%) had a internal uptake record
- Among trades, the % with a record ranged from 0-10%.
  - Welders, sheetmetal workers and pipefitters were more likely to have a record.

Hanford REX

Radiation Data Analyses

Hanford REX Dose Records

Duration of Hanford Work	Number (%) without a REX Dose Record
< 5 Years	236 (31.1%)
5-9 Years	63 (15.3%)
10-19 Years	24 (4.8%)
20+ Years	12 (3.0%)

Hanford REX Dose Records

Decade of First Hanford Work	Number (%) without a REX Dose Record
1940-1949	66 (26.0%)
1950-1959	46 (18.9%)
1960-1969	29 (10.6%)
1970-1979	123 (13.8%)
1980-1989	35 (12.1%)
1990+	36 (29.0%)

Hanford REX Dose Records

Trades with 10 or More Workers

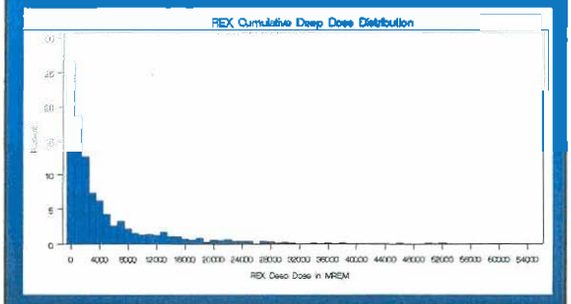
Usual Hanford Trade	Number (%) without a REX Dose Record
Asbestos Workers	2 (5.4%)
Boilermakers	8 (13.1%)
Carpenters	65 (37.4%)
Cement Masons	5 (25.05%)
Electricians	32 (11.7%)
Insulator	0 (0.0%)
Ironworkers	37 (23.1%)
Laborer	40 (17.4%)
Machinists	0 (0.0%)
Millwrights	8 (8.8%)
Operating Engineer	43 (2.1%)
Painters	10 (16.1%)
Pipe Fitter	47 (9.4%)
Plumber/Steamfitters	10 (7.0%)
Sheetmetal Workers	12 (15.0%)
Teamster	13 (19.7%)

Hanford REX Dose Records

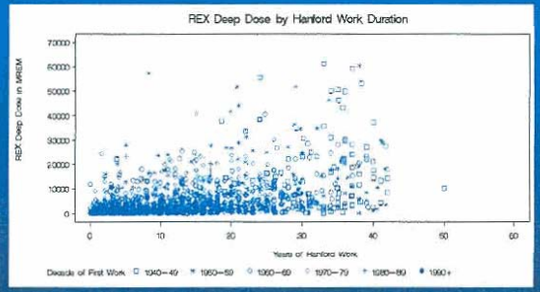
Dose by Category

REX Dose Category	REX Cumulative Dose in MREMS			
	Mean	Std.Dev.	Median	Maximum
Deep Dose	4799	7796	1880	61080
Eye Dose	64	398	0	10656
Neutron Dose	90	525	0	11990
Ring Dose	1062	3428	0	59930
Shallow Dose	5745	9166	2230	73070
X-ray Dose	27	236	0	5540

Hanford REX Deep Dose



Hanford REX Deep Dose



Hanford REX Dose Analyses

Multiple Regression Log(Deep Dose) Predictors

- Years of Hanford work
  Usual trade
- Number of work times work stopped due to radiation hazard
- Number of 'radiation buildings' worked in.
- Number of urine tests for radiation
- Number of radiation incidents

Hanford REX Dose Analyses

Multiple Regression Log(Deep Dose) Predictors

Log(deep dose) = 0.10(DOEYears) + 5.09(trade1) + 4.66 (trade2) + 4.30 (trade3) + 3.24(trade4) + 2.32(trade5) + 3.69(trade6) + 3.68(trade7) + 4.94(trade9) + 4.33(trade10) + 2.26(trade11) + 5.31(trade12) + 2.29(trade13) + 3.88(trade14) -75.95(trade15) + 5.04(trade16) + 5.11(trade17) + 3.41(trade18) + 2.62(trade19) + 0.24(radstop1) + 0.74(radstop2) + 0.21(radstop3) + 1.35(radbldg1) + 1.29(radbldg2) + 1.64(radbldg3) + 0.24(urine1) + 0.78(urine2) + 0.18 (urine3) + 0.31(radinc1) + 0.33(radinc2) + 1.06(radinc3)

REX Multiple Regression Log(Deep Dose) Predictors

Model Parameter	Parameter Estimate	Parameter 95% CI	
Years of Hanford Work	0.10	0.09	0.11
Asbestos Workers	5.09	4.56	5.61
Boilermakers	4.66	4.05	5.27
Bricklayer	4.30	0.70	7.89
Carpenters	3.24	2.74	3.74
Cement Masons	2.32	1.32	3.32
Electricians	3.69	3.25	4.13
Elevator Constructor	3.68	0.08	7.28
Insulator	4.94	3.85	6.03
Ironworkers	4.33	3.94	4.93
Laborer	4.33	3.89	4.78
Machinists	2.26	1.14	3.39
Millwrights	5.31	4.76	5.85
Operating Engineer	2.29	1.80	2.78
Painters	3.88	3.25	4.52
Pipe Liner	5.04	4.64	5.44
Plumbs Steamfitters	5.11	4.63	5.60
Sheetmetal Workers	3.41	2.83	3.98
Teamster	2.62	2.03	3.22
Stopped due to Radiation Hazard = 1-5	0.24	0.02	0.48
Stopped due to Radiation Hazard = 6-30	0.74	0.06	1.42
Stopped due to Radiation Hazard_Numerous	0.21	-0.10	0.51
Radiation Buildings Worked = 1-5	1.35	0.97	1.73
Radiation Buildings Worked = 6-10	1.29	0.83	1.76
Radiation Buildings Worked >10	1.64	0.63	2.65
Urine Tests = 1-5	0.24	-0.06	0.53
Urine Tests = 5-25	0.78	-0.13	1.69
Urine Tests Too Numerous	0.18	-0.07	0.43
Abnormal Radiation Exposure Incidents =2	0.30	-0.08	0.52

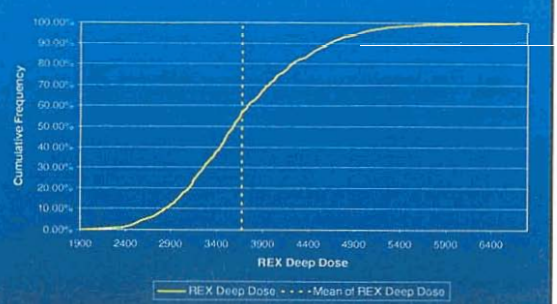
Monte Carlo Deep Dose Simulation

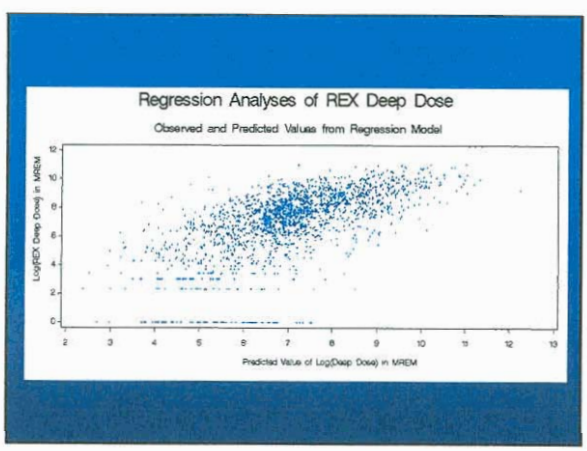
Hanford REX Data Regression Model

Input: Trade = Pipefitter; Hanford Work Duration = 10 Years; Radiation Buildings Worked In = 6-10; Urine Tested =1-5 times; Work Stop Frequency Due to Radiation Hazard = 1-5 times; Radiation Exposure Incidents = 1

Average	3647
Std Dev	689
Std Err	9.8
Max	6999
Min	1645

Monte Carlo Deep Dose Simulation

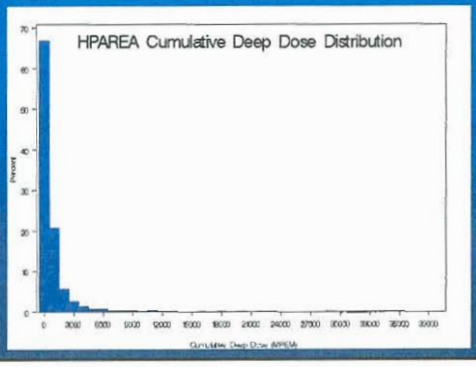


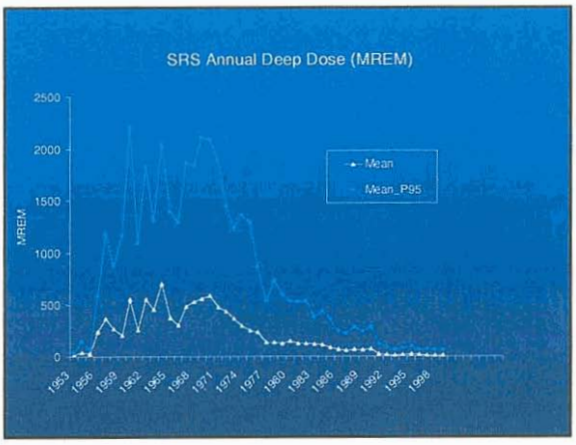


SRS HP AREA

Radiation Data Analyses

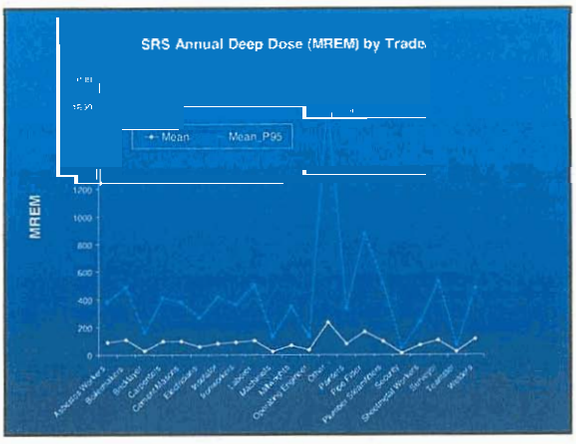
SRS HPAREA Data Summary





HPAREA ANNUAL DEEP DOSE by Trade

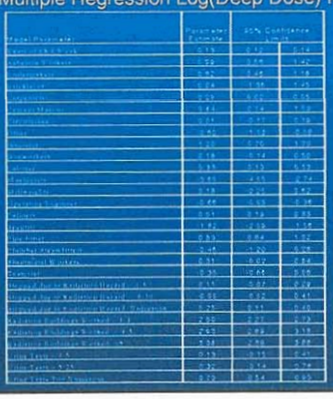
Usual Trade	Number Values	Mean	Median	Mean std	Mean P95
Asbestos Workers	501	88	25	157	380
Bricklayers	809	106	35	173	485
Builders	36	27	10	51	160
Carpenters	1647	98	25	210	405
Cement Masons	185	98	30	215	375
Electricians	3011	57	10	126	265
Inspector	206	79	20	136	415
Ironworkers	1082	88	20	276	360
Laborer	3385	101	24	228	500
Mechanics	68	23	10	45	130
Millwrights	457	66	20	134	345
Operating Engineer	1227	36	10	117	125
Other	213	231	25	537	1815
Painters	1025	77	25	162	330
Pipe Fitter	4384	165	30	337	875
Plumber Steamfitters	134	95	10	188	510
Security	1716	13	0	79	45
Sheetmetal Workers	908	68	20	166	237
Surveyor	118	105	45	167	525
Teamster	661	23	5	74	70
Welders	73	111	26	242	475



SRS HPAREA Dose Records
Dose (MREM) by Category

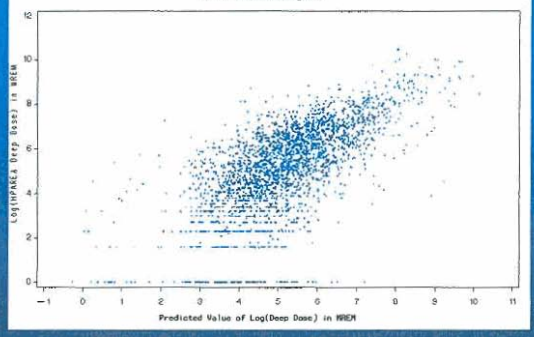
HPAREA Cumulative Dose (MREM)	Mean	Std Dev	Median	Maximum
Deep Dose	817	2163	215	36055
Eye Dose	95	198	26	3562
Neutron Dose	190	452	35	5895
Shallow Dose	1292	4359	345	123840

HPAREA Multiple Regression Log(Deep Dose) Predictors



Regression Analyses of HPAREA Deep Dose

DOE Years Continous
All Other Variables Categorical



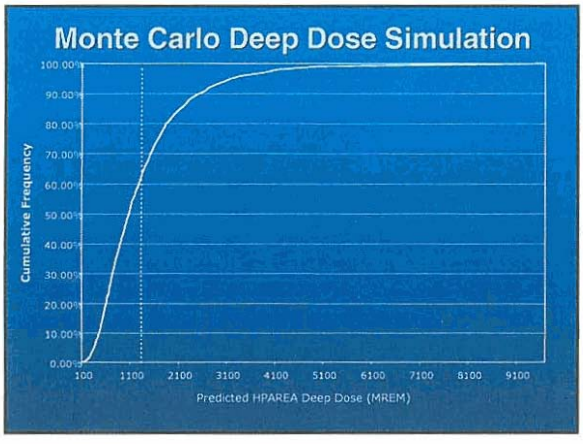
Monte Carlo Deep Dose Simulation

SRS HPAREA Data Regression Model

Input: Trade = Pipefitter; SRS Work Duration = 10 Years; Min and Max for Radiation Buildings Worked, Urine Test Frequency=Numerous,Work Stop Frequency Due to Radiation Hazard, and Radiation Exposure Incidents

	Pipefittter 10Yrs Min	Pipefitter 10 Yrs Max
Average	8.33	1335.04
Std Dev	0.91	996.86
Std Err	0.02	22.29
Max	11.92	9665.36
Min	5.80	135.14

Monte Carlo Deep Dose Simulation



SRS & Hanford Data

Conclusions

- Significant numbers of workers have either no deep dose or all recorded 'zero' doses in REX and HPAREA.
- Regression models predict deep dose but with a high degree of variability.
- Dose reconstructions using 'coworker' data need to take into account significant variability and uncertainty.

MICHAEL WILLIAMSON | THE WASHINGTON POST

Walter McKenzie, who worked at the Savannah River nuclear weapons plant near Aiken, S.C., blames radiation exposure at the facility for the 19 malignant tumors on his bladder.

Suffering in the Shadows

Of the 72,000 federal compensation claims filed by ill nuclear weapons plant workers, more than 60 percent have been denied.

BY MICHAEL ALISON CHANDLER AND JOBY WARRICK | THE WASHINGTON POST

WASHINGTON

Walter McKenzie's assignment toward the end of the Cold War was to mop up after mishaps at a nuclear weapons factory. With a crew of other laborers from rural Georgia, he swabbed away leaks and spills inside the secret buildings, until one day his body became so contaminated with radiation that alarms at the factory went off as he passed.

"They couldn't scrub the radiation off my skin — even after four showers," McKenzie, 52, recalled of his most terrifying day at the Savannah River nuclear weapons plant near Aiken, S.C. "They took my clothes, my watch and even my ring, and sent me home in rubber slippers and a jumpsuit."

Later, when doctors discovered the first of 19 malignant tumors on his bladder, McKenzie followed the same torturous path as thousands of nuclear weapons workers with cancer: He filed a claim for federal compensation. It was denied.

Unable to access secret government files, or even some of his own personnel records, McKenzie could not sufficiently prove that he was exposed to something that may have made him sick. Nor can most of the 104,000 other workers, retirees and family members who have sought help from a federal program intended to atone for decades of hazardous working conditions at scores of nuclear weapons facilities around the country.

Since its inception in 2000, the compensation program has cut more than 20,000 checks and given long-delayed recognition to workers whose illnesses were hidden costs of the Cold War's military buildup.

Yet, of the 72,000 cases processed, more than 60 percent have been denied. Thousands of other applicants have been waiting for years for an answer. Overall, only 21 percent of applicants have received checks.

Even as the nation continues to close and dismantle many nuclear weapons sites, a growing number of those who helped build the bombs are turning to lawyers and legislators to argue they are being treated unfairly.

SEE SHADOWS | A9

SHADOWS | Lost Records From Facilities Make Illnesses Hard to Prove

FROM A7

Many complain that the compensation process is slow, frustrating, even insulting. "You get exposed to something that's so bad you have to leave your clothes behind," McKenzie said, "then they try to tell you it's not their fault that you got sick."

Some evidence suggests the government has tried to limit payouts for budget reasons. Internal memos obtained by congressional investigators show the Bush administration chafing over the program's rising costs and fighting to block measures that would increase workers' chances of compensation.

But Labor Department officials who oversee the program say it has been successful, pointing to the large sums distributed: about $2.6 billion in payments in five years, far more than some early estimates. Missing or unreliable records and the murkiness of cancer science, the officials say, make it difficult to satisfy all the claimants.

"In a compensation program, you get benefits out to people who are eligible and you inevitably have to deal with the fact that some people are not eligible," said Shelby Hallmark, director of Labor's Office of Workers' Compensation Programs. "As for the assumption that the program is somehow trying to block people from getting compensation, nothing could be further from the truth."

David Michaels, a former Energy Department official who helped launch the program in the late 1990s, said it is designed to "bend over backward" to award compensation to deserving workers. "Most of the people who should be compensated are being compensated," said Michaels, now associate chairman of George Washington University's department of environmental and occupational health.

Still, Labor's management of the program has drawn bipartisan, and often fierce, criticism from members of

Under the Energy Employees Occupational Illness Compensation Program, the government agreed to provide $150,000 and medical benefits to claimants who developed certain diseases and cancers. Another part of the program covers those exposed to toxic chemicals.

posure to radiation at work. Under the act, the claim is denied if the probability is ruled to be less than 50 percent.

The complex task of coming up with such estimates through reconstructing the conditions inside secret plants as much as 60 years ago was assigned to the National Institute for Occupational Safety and Health, or NIOSH.

The estimates are based largely on personnel files and historical radiation measurements at the plants. But the records are often so incomplete and unreliable that it can be impossible to determine a worker's true exposure. Another obstacle is that records are becoming harder to track as plants are dismantled.

ROADBLOCKS AT EVERY TURN

The compensation program does provide a path for the government to help workers if records are lost or questionable. But critics say officials are reluctant to pursue it.

NIOSH and a White House-appointed panel on radiation exposure can recommend groups of workers from a particular site for a "special exposure cohort," making them automatically eligible for compensation if they suffer from leukemia, thyroid cancer or one of 20 other cancers.

So far, groups of workers from 18 sites have been added to the special exposure cohort, and petitions are pending for workers from a dozen other sites. The process can be difficult, as people who worked at the Rocky Flats nuclear weapons plant who

sites where workers tended to be white and represented by strong unions.

"Black workers in these plants were put in high-exposure areas without proper protection or monitoring," said Robert Warren, a lawyer who represents dozens of Savannah River workers. "They worked in some of the most dangerous places, but there are no records today to show that."

When it opened in 1951, the Savannah River nuclear complex was one of the first employers in South Carolina's rural midlands to offer blacks a shot at relatively good wages and benefits. But not all jobs at the plant were created equal.

The jobs offered to black workers in those days were often menial ones: cleaning spills, scraping paint, removing waste, sometimes in the most dangerous parts of the plant, said Wayne Knox, a radiation-safety expert who was a contractor at the Savannah River plant for nearly two decades. In the '50s and '60s, he said, workers often were kept in the dark about risks.

"Not just blacks, but also (white) people from poorer neighborhoods were put in a position where they had a lot of unnecessary exposures," said Knox, who now advises some families filing claims.

The sprawling, 300-square-mile site still contains one of the highest concentrations of radioactive waste of any weapons plant in the country, most of it in swimming-pool-size tanks. Special exposure cohort status has not been granted for the plant's workers; in a region that remains very poor, there are few advocates available to argue the

Congress.

Former Congressman John Hostettler, an Indiana Republican who chaired a House subcommittee overseeing the program, said at a hearing last December that Labor Department memos reflect a "culture of disdain" toward workers and raise questions about whether the department exceeded its authority by using "legalistic interpretations" to limit eligible workers.

"To the bean counters, I would remind you that these aren't normal beans you are counting," Hostettler said. "These funds are a small acknowledgment of the sacrifice by workers whose lives were put at risk to make this country safe."

FILES MIA

The compensation plan was unveiled in September 1999 by then-Energy Secretary Bill Richardson. "We're reversing the decades-old practice of opposing worker claims and moving forward to do the right thing," he said in 2000.

The shift was prompted in part by a drumbeat of reports about hazards at nuclear weapons plants, including articles in The Washington Post that showed how the government for years fought lawsuits from workers in Paducah, Ky., who were exposed to plutonium 100,000 times as radioactive as they were trained to handle.

Under the Energy Employees Occupational Illness Compensation Program, the government agreed to provide $150,000 and medical benefits to claimants who developed certain diseases and cancers. Another part of the program covers those exposed to toxic chemicals.

For each claim, government investigators review the evidence and decide whether a worker's illness was more likely than not caused by exposure. Those who applied for that status have learned.

On the rugged foothills outside Denver, there's little sign now of the sprawling plutonium facility that once employed as many as 7,000 people. The site was dismantled in a $7 billion, 10-year effort that ended in 2005 and is being turned into a wildlife refuge.

With the plant gone, many workers are struggling to recreate what happened in the 800-building complex that manufactured plutonium triggers for nuclear bombs. Thousands of fires were recorded in the plants' 40-year history, including one on Mother's Day 1969 that burned for several hours and released massive amounts of radioactive material.

Of the more than 5,100 Rocky Flats claims filed, about 1,400 have been approved. Many applicants who were denied blame missing or inadequate records and petitioned two years ago for special cohort status.

NIOSH officials recommended against the special status for Rocky Flats, reasoning that they could account for missing records by altering their models and overestimating exposures. Then, earlier this month, the radiation advisory board recommended the special cohort for a small number of workers: those employed from 1952 to 1958, when gaps in the record-keeping apparently were the largest.

NOT ALL JOBS WERE EQUAL

At South Carolina's Savannah River plant, workers may face longer odds than most. They lack the organization and lobbying advantages found at some larger workers' case in Washington.

McKenzie, the Savannah River laborer, was angered when government officials calculated the probability that his work caused his bladder cancer at only 28 percent. He became even angrier when he learned that the plant had been unable to locate many of his files — including records for the day he became so contaminated his clothes had to be destroyed. "There were whole months where the data is missing," he said.

McKenzie has asked a Labor Department appeals panel to reconsider the decision, while he struggles to pay hefty medical expenses that include regular visits to the urologist to see whether his cancer has returned. Having mostly given up hope for a government check, he now works a second job, cleaning up spills and leaks in private homes a few miles from the weapons plant.

"At first it looked like I had a good claim, but it didn't go anywhere," McKenzie said wearily. "A person doing it by himself has no wind."