SRS Citizen's Advisory Board

Recommendation No. 75

January 26, 1999

Interim Corrective Measures Southwest Plume From Old Radioactive Waste Burial Ground

Background:

Several issues bear on this recommendation. The following paragraphs briefly describe those issues.

The Old Radioactive Waste Burial Ground (ORWBG) is a 76-acre landfill near the center of SRS. It was used from 1952 until 1974 and contains low-level radioactive and mixed waste from SRS, other DOE sites, and the Department of Defense. The ORWBG is on the south side of the E-Area groundwater divide. A contaminated groundwater plume attributed primarily to the ORWBG (known as the Southwest Plume), flow south-southwest towards Four Mile Branch (4MB). Its principal contaminants of concern are tritium, trichloroethylene, and tetrachloroethylene (volatile organic compounds or VOCs). The groundwater travel time to 4MB was estimated (assuming homogenous geology) as 45 years (Ref.1). However, tritiated water reached 4MB much sooner.

Tritium may have first reached 4MB in the late 1960's (Ref. 2). The SRS Environmental Reports (Ref. 3) indicate that some of this tritium was from the H-Area seepage basins and from the ORWBG. The Old Radioactive Waste Burial Ground (ORWBG) tritium first outcropped into the Old F-Area Effluent Ditch (OFED), which runs along the west side of E-Area. OFED is a natural drainage ditch that received treated process water and stormwater from F-Area. The first tritium reaching OFED was probably from tritium-containing material buried in 1957 near the southwest corner of ORWBG (Ref. 4). Outcropping into OFED was enhanced by erosion in the 1970's. Tritium was confirmed in OFED in September 1978 (Ref. 4). In 1978-1979 an Engineered Ditch (ED) was constructed to catch the F-Area runoff, and the eroding part of OFED was filled with packed dirt. This erosion control measure reduced the outcropping into OFED for a time. Since then the tritium has again outcropped in the OFED, below the area filled with the packed dirt. The OFED and ED drain into 4MB which flows into the Savannah River swamp and then into the Savannah River through a natural break in the levee. Tritium (and VOCs) also is outcropping at a groundwater seepline in the lower part of the OFED close to 4MB.

Tritium concentrations at the seep line are currently 20,000 – 70,000 pCi/ml. Tritium concentrations in the water in the OFED just before it drains into 4MB are considerably lower and have steadily decreased (annual mean of 2740 pCi/ml in 1992; 1170 pCi/ml in 1997 (Ref. 5)). Annual average tritium concentrations in 4MB before it enters the Savannah River swamp are lower still and also have steadily decreased (480 pCi/ml in 1989 to 216 pCi/ml in 1997 (Ref. 5)). Releases are thought to be decreasing (Ref. 2&3). Concentrations in 4MB at this sampling location include all liquid tritium leaving H-, and F-Areas and the ORWBG, whether directly from releases to streams or through groundwater outcrops. The tritium concentrations in the groundwater and 4MB are above the annual average drinking water standard (DWS) of 20 pCi/ml and consequently exceed South Carolina water classification standards. However all sources of tritium to the Savannah River, (SRS, fallout and natural tritium) result in a concentration of only about 1 pCi/ml at the downstream public drinking water plants (Ref. 3). If a person drank two liters of this water a day for 365 days he would get a dose of about 0.2 mrem. As this is very small compared to the average annual dose from natural sources of radiation (300 mrem per year), the

incremental risk to the public from tritium in the Savannah River is minimal. Trichloroethylene and tetrachloroethylene in the groundwater are concentrated at one point in the groundwater plume, near the ORWBG but maximum concentrations of VOCs measured in the OFED seep line have been slightly above their DWS.

An Interim Remedial Action at the ORWBG completed in February 1998, added a soil cover over the ORWBG. It is 2 to 8 feet thick and sloped to enhance runoff. It is designed to slow groundwater movement by removing excess surface water and by providing a low permiability soil cover. This should provide more time for the tritium plume to decay before outcropping (meaning there will be less tritium at the seepline). No data are yet available to judge the performance of this added soil cover.

EPA and DHEC have adopted the annual average public drinking water standards (DWS) as the maximum concentration limit (MCL) for groundwater. The concentrations of tritium, trichloroethylene and tetrachloroethylene in the groundwater at the seep line exceed their respective MCLs. Therefore, EPA and DHEC requested an Interim Corrective Measures now for the Southwest Plume before implementing a Final Corrective Measures that is scheduled to begin in 2 to 3 years.

A CAB recommendation in November 1998 (Ref. 6) created a public focus group to work with the SRS and regulators during selection of the Interim and Final Corrective Measures. Additionally, the CAB requested that an Independent Scientific Peer Review (ISPR) be conducted on the plume and proposed actions by Dr. Joel Massmann, University of Washington.

Five Interim Corrective Measure alternatives to address the MCL exceedances at the seepline were developed by SRS and reviewed with DHEC on November 19, 1998. Their costs estmates ranged from approximately $0.5 to $4.0 million. Qualitative estimates of effectiveness were given and DOE, EPA and DHEC agreed to implement a reasonable action quickly.

On December 2, 1998, the least expensive and quickest-to-implement alternative for the Interim Corrective Measures was tentatively chosen by the three agencies. On December 8, 1998, this Corrective Measure was presented to the Environmental Remediation and Waste Management subcommittee of the CAB. This remedy is described in Ref. 7 and consists of five actions:

1. Surface drainage enhancements to remove ponding water from the area of the Southwest Plume to reduce recharge to the groundwater.
2. Surface water management
    - Investigate the feasibility of further reducing infiltration into the ground from a sedimentation basin constructed as part of the recent ORWBG low permeability soil cover.
    - Investigate the feasibility of further reducing recharge to the groundwater from a small pond behind the cofferdam on the ED.
    - Investigate the feasibility of restricting flow in the OFED, which is caused by the groundwater outcropping. This might be accomplished by backfilling with packed soil (as was done for the upper part of OFED in 1978-79) or by the installation of one or two small dams. The small dams would provide detention time during filling and flow restriction by the increased hydraulic head over the seep.
3. Install airlift recirculation wells over the concentrations of volatile organic compounds
4. Install access controls and signs to warn of elevated tritium levels in the seep areas
5. Enhance the monitoring program for the groundwater, seep area and stream

Tritium greatly exceeds the groundwater maximum concentration limit (MCL) (20pCi/ml) at the seepline (20,000 – 70,000 pCi/ml). However, concentrations in the drinking water drawn from the Savannah River are only about 5% of the MCL/DWS (1 pCi/ml). Because tritium concentrations in

drinking water are 5% of the DWS (which is the same as the MCL), it is the opinion of the SRS CAB that the tritium outcrops at 4MB are not adversely affecting public health or the health of any individual as long as SRS remains under institutional control.

Information on the risk reduction that would be realized by implementing any of the alternative interim Corrective Measures, including the no-action alternative is being developed.

The SRS Citizens Advisory Board is concerned that groundwater remedies are being selected by the agencies without quantitative evaluations of their effectiveness. This concern is shared by our ISPR (see Ref. 8). Phase 1 of the F and H-Areas pump-and-treat operation has been in place for 3 years and should have provided guidance by now, but data are not yet available to evaluate its effectiveness.

The CAB is pleased that the three agencies are considering less intrusive remedial methods for this groundwater contamination than the customary approach of "pump-and-treat," which is very expensive and has not been proven effective in similar situations. However, the CAB questions the need for any remedial actions at the 4MB seep at this time.

- Tritium concentrations in 4MB are declining
- Tritium concentrations in the Savannah River also are declining
- Tritium concentrations at the public water system intakes are about 5% of drinking water standards

The tritium concentrations in drinking water from the Savannah River are already significantly below levels considered protective of public health. We recognize that the concentrations on SRS at 4MB are well above drinking water standards but the public has no access to this water. No one has in the past or is now drinking water from 4MB or the ditches draining to it. SRS land use plan prohibits public access to this water. A Final Corrective Measure is scheduled to begin about 2002, so there is no possibility that someone will drink this water before initiation of the Final Corrective Measure.

Recommendation:

The CAB commends the three agencies for considering passive Corrective Measures for this contaminated groundwater. However, the SRS Citizens Advisory Board does not consider the full Interim Corrective Measure necessary. We do support the proposed good management practices (surface drainage enhancements, posting of signs and restricting access, and increasing the monitoring program).

We will reconsider and possibly support surface water management and recirculation wells provided:

1. SRS, EPA-Region IV and SCDHEC present to the CAB the data and their rationale they used to determine that some action was necessary to protect public health and safety.
2. SRS present to the CAB groundwater modelling results and other quantitative information that demonstrates that the proposed Corrective Measures will decrease tritium concentrations at the seepline by a significant amount.

In addition the SRS Citizens Advisory Board recommends that the three agencies:

1. Reach agreement on the Interim Corrective Measure before May 1999, on specific, realistic goals for tritium concentrations in 4MB and trichloroethylene and tetrachloroethylene in the groundwater. The public focus group should be involved in the

discussions. The agreement should be presented at the May CAB meeting for its review by the Board.
2. Present information to the Board that will allow the Board to ascertain that the selected Interim Corrective Measures will complement the Final Corrective Measures.
3. Increase the opportunity to involve the public very early, before decisions are made on significant Interim and Final Corrective Measures at SRS.
4. Provide quantitative information to the public on the effectiveness of all alternatives being considered for any groundwater or operable unit action, including the no-action alternative, before selecting an action.

References:

1. Communication of November 16, 1998, from Jim Cook to the Public Focus Group: Groundwater travel time.
2. McNamee, Ed, December 8, 1998, presentation to the Citizens Advisory Board ER/WM Subcommittee, Mixed Waste Management Facility Groundwater: Interim Measures Plan for the Burial Ground Complex Southwest Plume
3. Savannah River Site Environmental Report for 1997, Reports WSRC-TR-97-00322, 00323 and 00324.
4. Albenesius, E. L. And J. W. Fenimore, Tritium Migration from the Burial Ground to Four Mile Creek - Reappraisal of Flow Paths and Travel Times, DuPont Report DPST 79-265, February 15, 1979.
5. Bob Lorenz, Personal Correspondence, Summaries of past SRS environmental monitoring data, February 14, 1999.
6. Recommendation 71, Closure of the Old Radioactive Waste Burial Ground, adopted November 17, 1998.
7. Westinghouse Savannah River Company, December 1998, Interim Measures Plan for Mixed Waste Management Facility (MWMF) Groundwater Southwest Plume (U), Report WSRC-RP-98-4222, Revision 0
8. Massmann, Joel, January 14, 1999, Comments Related to Interim Measures for the Southwest Groundwater Plume at the Mixed Waste Management Facility, prepared for the Savannah River Citizen's Advisory Board

---

Minority Report

Recommendation 75
Interim Corrective Measures for the Southwest Plume from the Old Radioactive Waste Burial Ground

We, the minority, feel that the purpose of the Savannah River Site Citizens Advisory Board is to set priorities on cleanup, not to determine whether the environmental regulations now in effect are correct or should be changed. We believe that when it comes to clean-up of Savannah River Site (SRS), we should be doing everything possible, especially if the actions are endorsed by the Department of Energy (DOE) and the SC DHEC as the five Interim Corrective Measures at issue in this motion are. We do not believe that we should be recommending less corrective measures of cleanup when it comes to public health and safety. Further, implementation of these corrective measures will go a long way in gaining more respect and trust from a still skeptical public and would ensure DOE, stakeholders and the regulatory agencies will continue to work together on all future endeavors.

SRS water samples are only samples and all too often have represented false negatives. Further, even assuming the samples are correct, SRS interpretations of past samples have been erroneous in the past (see below).

Interpretations of samples are often misleading or simply incorrect. Therefore, the following examples were chosen as relevant to releases from the old burial ground: (the first is a quote from ERDA-1537 (p. III-19))

Interpretation 1 (ERDA-1537, p. III-19): "Perimeter Wells (located around the burial ground): In 19 years of monitoring, levels of radioactivity in these wells have been within natural background fluctuations. No migration of radioactivity is indicated in these data."

Interpretation 2 (ERDA-1537, p. III-20): "This well (a well inside of the burial ground) contains beta-gamma radioactivity at about 15 times the background level. The rate of lateral movement of the nuclides in the ground water is about one-fiftieth of the rate of water movement (less than1 foot per year). Thus, the radioactivity will decay to background levels within a distance of 100 ft from the well." (note: strontium-90 is a beta emitter; cesium-137 is a beta-gamma emitter; iodine-129 is a beta-gamma emitter; see appendix, p. L-19);

Contradictory Samples (Environmental Report for 1997): thousands of curies of tritium are migrating from the burial ground (p. 77), with concentrations exceeding drinking water standards by 1 or more orders of magnitude (p. 91); migration in elevated quantities also includes hydrocarbons (p. 165), cesium-137 (p. 78), and iodine-129 (p. 78);

Interpretation 3 (DOE/SR-WM-80-1, "Savannah River Waste Management Program Plan", 1980, p. 233): " Later that year (i.e., 1978), a tritium outcrop from the burial ground was measured in the effluent stream from F Area to Four Mile Creek. This outcrop resulted from 25 years of erosion of the effluent stream, causing the stream bed to fall below the ground water table. Plans are in progress to repair the eroded ditch. An engineered trench from F Area to replace the effluent stream is under construction. This trench was designed to avoid any future erosion problems that could result in tritium releases to plant streams. After repair of the effluent steam, tritium in ground water from the burial ground will be decayed to insignificant levels before reaching a natural outcrop in Four Mile Creek. Ground water flow paths from the northern perimeter of 643-7G are of sufficient length to allow decay of tritium before the ground water outcrops in Upper Three Runs Creek."

Contradictory Samples (Environmental Report for 1997): in addition to the above, note that (p. 77) "The measured migration from the north side of SWDF (i.e., the burial ground) and the General Separations Area into Upper Three Runs was 267 Ci, a 63-percent from the 1996 total of 164 Ci."

Interpretation 4 (ERDA 1537, p. III-29): health dose-to-human calculations for tritium, which has a half-life of 12.5 years and is a beta emitter, are based on the length of time tritium stays in the body. At SRS, these calculations assume that the body-residence time is about 12 days, based on ICRP recommendations; SRS noted that NRCP recommendations use 10 days; thus, SRS claims that its calculations are "more-conservative" (p. III-28); Contrasting interpretation: a less well-studied secondary vector through the body has a residence time of 300 days; in that tritium is a heavy hydrogen atom, tritium can enter the DNA chain; the health consequences of this effect are controversial and represent

In summary, we cast a dissenting vote on the motion concerning the Interim Corrective Measures for the Southwest Plume because we think the information inadequate. We think questions such as: How has the level of contamination affected people? What kind of health problems has the contamination caused? Do the people involved want to risk the chance of contacting other health problems for two more years? very important to the motion. We think that if one more person

becomes ill because of the contamination, and the Interim Corrective Measure could have prevented that person from becoming ill; we (the Board) would have committed a grave error. This would be a grave error, especially if we could have voted for a clean up, and we did not.

Living downstream of SRS and as SRS CAB members, the area public would be incensed to discover that its watchdog committee rejected a unified Agency Plan for interim treatment of a dangerous tritium plume until final corrective measures are developed and applied in 2002. Those of us dissenting believe that we are representing our communities and their wishes of thorough clean-up of contamination on SRS. Most of us live downstream and choose to vote on the SRS-CAB motions to represent our community's top priority – its health.

Mary Elfner, Savannah, Ga.
Bill Adams, Hilton Head, S.C.
Brendolyn Jenkins, Elko, S.C.
Jimmy Mackey, Beaufort, S.C.
Lola Richardson, Augusta, Ga.
Ed Tant, N. Charleston, S.C.
Becky Witter, Savannah, Ga.

Agency Responses

Department of Energy-SR

SCDHEC

U.S. Environmental Protection Agency