Blue Ridge Environmental Defense League

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Site and Radiological Assessment Branch
Division of Health Assessment and Consultations
Agency for Toxic Substances and Disease Registry/CDC
1600 Clifton Road, NE (MS-60)
Atlanta, Georgia 30333

Re: Public Health Assessment, Evaluation of Off-site Groundwater and Surface Water Contamination at the Savannah River Site (USDOE) Aiken, SC
EPA Facility ID: SC1890008989

Dear Ms. Isaacs:

On behalf of the Blue Ridge Environmental Defense League, I write to provide comments on the Agency for Toxic Substances and Disease Registry's draft public health assessment regarding the U.S. Department of Energy's Savannah River Site.

First, ATSDR has disregarded major pathways for hazardous and radioactive substances from the US Department of Energy's Savannah River Site. For example, trans-river water flow is not accounted for in the Agency's assessment of underground aquifers. Moreover, ATSDR improperly narrowed the focus of its investigation to groundwater and surface water impacts at SRS, omitting atmospheric deposition.

Second, the Agency has abrogated its responsibility to "take responsive action, and provide trustworthy health information to prevent and mitigate harmful exposures toxic substances and related disease." The Agency attempts to shift from itself the burden of protecting our most vulnerable population, infants under the age of one year.

ATSDR's actions are ethically questionable and medically inexcusable. Further, they are contrary to the requirements of its Congressional Justification. We believe ATSDR's final conclusions and recommendations must be amended to correct these omissions.

<u>Overview</u>

The Savannah River Site is one of the most contaminated radioactive sites on earth. In 1991, weapons manufacturing largely ended, but ongoing activities at SRS continue to pollute the air and water. New emissions of radioactive and hazardous compounds will add to the existing contamination. Pollution's impact on human health depends on the actual levels of contamination found in the surrounding soil, water and air: ambient levels. Also, the measurement of pollution in fish, dairy products and wild game provides an assessment of the pollutant's impact caused by bioaccumulation and ingestion.

Water Pollution

Since 1951 SRS has generated over 140 million gallons of highly radioactive liquid waste laced with a mixture of salts, acids, metals and solvents. [*Interim Salt Processing Strategy Planning Baseline,* Revision 0, Mahoney, MJ and d'Entremont PD, CBU-PED-2004-00027, August 27, 2004, Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site, DOE-WD-2005-001, February 28, 2005] Total potential volume of all the tanks combined was about 58 million gallons, but through the use of evaporators, 104 million gallons of this liquid waste was emitted into the air. Today 36.4 million gallons of liquid and solid wastes are stored in the SRS tank farm.

Contamination at SRS includes the radionuclides strontium-90, cesium-137, cobalt-60, and tritium; toxic solvents trichloroethylene and tetrachloroethylene; and heavy metals arsenic, cadmium, chromium, mercury, and lead. In addition, 262 radioactive and hazardous waste dumps used for liquids, solids, and ash have these poisons plus thorium, uranium, plutonium-238, and plutonium-239. Trenches in the sand hold 16 million cubic feet of solid low-level radioactive waste, and hundreds of thousands of cubic feet of transuranic waste are stored in temporary facilities. Radioactive emissions continue to the present time. The table below lists Westinghouse Savannah River Company Annual Reports, 2003, 2004, 2005 releases of radionuclides to water:

Radioactive Liquid Releases

Calendar Year	Curies
2003	4320
2004	2680
2005	2510

By far the greatest amount of radioactive liquid released was Tritium. Other water-borne radionuclides included Cesium-137, Iodine-129, Strontium-90, Technetium-99, Uranium-234/235/238, Plutonium-238/239, Americium-241 and Curium-244.

Trans-river Flow

SRS occupies 17 miles of riverbank on the Savannah River and is drained by five streams: Pen Branch, Steel Creek, Four Mile Branch, Upper Three Runs and Lower Three Runs. According to the DOE, SRS has 600 billion gallons of contaminated groundwater underlying about 8,300 acres (4% of the total 198,366 acres). [South Carolina Stewardship Program, Appx E] The threat to underground aquifers is great. Moreover, the contamination may not be limited to the South Carolina side of the river. The US geological Survey made extensive studies of the Central Savannah River Area and found that underground water flows into Georgia:

> Flow lines on potentiometric-surface maps of the confined Dublin and Midville aquifer systems suggest possible occurance [sic] of lateral trans-river flow for a short distance into Georgia prior to discharge into the Savannah River alluvial valley.
> [*Groundwater Levels, Predevelopment Groundwater Flow, and Stream Aquifer Relations in the Vicinity of the Savannah River Site, Georgia and South Carolina,* Clarke JS and

> West TW, US Geological Survey Water Resources Investigations Report 97-4197]

Yet ATSDR's simplified assessment of site hydrology leaves out this important feature which may confound estimates of exposure to the public. The draft PHA states:

> Groundwater moves beneath SRS in the permeable sand layers separated by the less permeable clay layers. The groundwater flows slowly with rates ranging from several inches to feet per year in the clay zones and from tens to several hundreds of feet per year in the sand zones. In general, it flows beneath the on-site waste sites toward the Savannah River, the Savannah River Swamp, and the on-site tributaries of the Savannah River, or migrates into the deeper aquifer systems (WSRC 2000, 2005). Figure 6 illustrates how groundwater travels toward streams and swamps on site and eventually into the Savannah River (WSRC 2000a). [PHA-SRS p. 24]

In 2004 the Georgia Department of Natural Resources issued a report on radioactive releases from SRS and other nuclear facilities potentially having adverse health impacts. The GDNR pointed to imminent public health threats from SRS saying:

> Although the reactors at SRS are no longer operating, millions of gallons of highly radioactive liquid waste and thousands of spent fuel elements still pose a significant, long-term environmental risk, which require continued monitoring. Future missions at SRS, including the disassembly and re-processing of plutonium pits and the recovery and recycling of excess plutonium and uranium for mixed-oxide reactor fuel, will also require continued vigilance for many years, due to the long-lived nature of the processed material and possible releases from accidents or reprocessing operations. [*Environmental Radiation Surveillance Report 2000-2002,* Georgia Department of Natural Resources Environmental Protection Division, , Published March 2004]

ATSDR must do a better job of assessing risks from ongoing activities at SRS.

Remedial Inaction

The Agency for Toxic Substances and Disease Registry is supposed to be the nation's public health agency for toxic substances. Under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), ATSDR's purpose is to provide useful health information and take action to prevent toxic chemical exposure and adverse health impacts.

However, the ATSDR's draft public health assessment on contamination at the Savannah River Site falls short of its mandate. Following a discussion of radium contaminated water supplies, the draft abandons education and action for the protection of infants. The draft PHA states:

> Using conservative assumptions for the amount of water consumed and daily exposure, ATSDR's evaluation shows that current exposures to the maximum annual average concentrations range from 12 to 170 millirem per year depending on the age of the person (EPA's Safe Drinking Water Standards are derived from an exposure of four millirem per year for this pathway). ATSDR scientists believe that past exposures would have been similar. The hypothetical maximum exposure rate is for an infant 0 to 12 months old that drinks formula and juice mixed with tap water only. Typically, children of this age will also drink other liquids not made from tap water, and their corresponding exposure dose would be less. [PHA-SRS, page 70]

No evidence is cited to support the contention that nursing infants will drink liquids other-than-tapwater. The PHA continues:

> However, precautions can easily be taken to prevent or minimize exposure. Radium can be removed by using water softeners. If persons are concerned about their tap water, they should have their water supply tested. Also, very young children should drink prepared formula, bottled juices, etc. [PHA-SRS, page 70]

Here the Agency relies upon pure supposition to place the responsibility for public health protection on the people whom it is charged with protecting. The PHA should call for comprehensive health education, epidemiology studies in the communities near SRS and provide clean water to these communities.

ATSDR Air Omissions

In the draft PHA the ATSDR explains its rationale for determining human exposure pathways. But without explanation the Agency summarily states that its focus was groundwater and surface water.

> ATSDR scientists evaluate site conditions to determine if people could have been or could be exposed to site-related contaminants. ATSDR identifies whether exposure to contaminated media (soil, water, air, or biota) has occurred, is occurring, or will occur through ingestion, dermal (skin) contact, or inhalation when evaluating exposure pathways. An exposure pathway could involve air, surface water, groundwater, soil, dust, or even plants and animals. ATSDR identifies an exposure pathway as completed or potential, or eliminates the pathway from further evaluation. Completed exposure pathways exist if all the elements of a human exposure pathway are present. A potential exposure pathway exists when one or more of the elements are missing but available information indicates possible human exposure. An incomplete exposure pathway exists when one or more of the elements are missing and available

information indicates that human exposure is unlikely to occur (ATSDR 2005a).

As previously noted, this PHA is focused on human exposure to groundwater and surface water. [PHA-SRS, p. 21] (emphasis added)

However, the amount of airborne radioactive pollution from SRS is greater than the liquid releases to streams and groundwater by at least an order of magnitude. SRS has over 5,000 air emission sources but conducts no surveillance of on-site non-radiological air quality. [Environmental Report for 2005, WSRC-TR-2006-00007] The WSRC Environmental Report issued annually details the radionuclide emissions from SRS, including atmospheric releases. The two basic categories of radionuclide air pollution are gases/vapors—Hydrogen-3, Carbon-14 Krypton-85 and Iodine-129/131—and particulates—Cesium-137, Technetium-99, Uranium-238, etc. The table below lists the gaseous and vaporous emissions since the closure of major weapons manufacturing activities.

Annual Airborne Radionuclide Emissions (Gases and vapors)

YEAR	Total Curies	H3 (Ci)
1992 [a]		156,000
1993 [a]		191,000
1994 [a]		160,000
1995 [a]		97,000
1996 [a]		55,300
1997 [a]		58,000
1998 [a]	99,700	82,700
1999 [a]		51,600
2000 [a]		44,800
2001 [b]	112,100	47,400
2002 [b]	78,800	47,300
2003 [b]	113,800	50,800
2004 [b]	61,300	61,300
2005 [b]	40,800	40,800
Total		1,144,000

a. Environmental Report for 2001, WSRC-TR-2001-00474
b. Environmental Report for 2005, WSRC-TR-2006-00007

Emissions of radionuclides include primarily H-3, C-14, K-85, and I-129/131/133. Additional radionuclide particulate emissions include Cs-137, Sr-89/90, Pu-241, and Tc-99. Hydrogen-3 (tritium) is typically the major radionuclide quantity emitted and is also considered to have the principal impact on human health. The radionuclides of concern during air releases are Iodine-131, Hydrogen-3 (tritium) and Argon-141; the most important pathways of ingestion for airborne contamination are through the eating of beef and milk. [*Executive Summary*, SRS Health Effects Subcommittee, Centers for Disease Control and Prevention, Dept of Health and Human Services, 25 August 2004]

Between 2000 and 2002, the Georgia Environmental Protection Department found radioactive tritium, hydrogen-3, many times above background levels within a 400 square mile area around the SRS reservation. The agency concluded that most of this pollution was the result of airborne radionuclides. For example, milk had up to 3 times the tritium expected; air, soil and water pollution was detected up to 5 times above background level; and vegetation was found to contain as much as 13 times the background level.[G*eorgia Environmental Radiation Surveillance Report 2000 – 2002,* Section D]

In 2003 The Radioactivist Campaign found evidence of radioactive releases into the environment which may have contaminated nearby residential areas. TRAC found Cs-137 in soil samples downwind from SRS as high as 174 picocuries/kg and downstream from SRS in vegetation as high as 1254 pCi/kg. The latter contamination was six times the EPA drinking water maximum of 200 pCi/kg. [*Under A Cloud*, Norm Buske, The Radioactivist Campaign, October 2003]

According to the Department of Energy's proposed salt waste processing plan, at least 3 million curies of waste is to be stored indefinitely at the Saltstone Disposal Facility at SRS. The plan encompasses the processing of the current waste volume via both the Interim Salt Process, to take place within this decade, and the higher-capacity Salt Waste Process, to commence in 2009. An additional 41.3 million gallons of salt waste would be generated at the SRS Defense Waste Processing Facility by 2020. This waste is to be stored in the F-Area and H-Area Tank Farms and sent to the Salt Waste Processing Facility. The processing of salt wastes involves the evaporation of water and volatile liquids from the high-level nuclear waste tanks. The DOE's salt waste plan includes the emission of 32.2 million gallons of radioactive liquid waste to the air over the next 15 years. [Draft Section 3116 Determination, Salt Waste Disposal, SRS, DOE-WD-2005-001]

Toxic air pollutants are non-radioactive compounds which are noxious, poisonous or carcinogenic. They include a variety of chlorinated compounds, heavy metals and reduced sulfur gases. The following tables list the toxic emissions and the criteria pollutants reported by Westinghouse Savannah River Company in 2002, 2003 and 2004. Though some toxic emissions are unchanged or decreased, for most compounds there have been huge increases and the total volatile organic compounds increased 500%.

Annual Emissions of Toxic Air Pollutants (Pounds) (n/d = no data)

Pollutant	**2002**	**2003**	**2004**
Acetaldehyde	538	268	10,580
Benzene	9,720	1,798	5,980
1,3 Butadiene	149	74	3,000
Carbon disulfide	3	9	328
Carbon tetrachloride	14	144	12,320
Chloroform	5,040	23,000	3,080
Chromium	<1	<1	3,700
Formaldehyde	1,336	742	24,400
Hexane	1,494	1,502	4,840
Hydrochloric acid	568	442	3,340
Hydrogen sulfide	12,100	12,420	n/d
Methanol	1,766	2,120	1,974
Methylene chloride	1,800	1,790	109,600
Nickel	132	137	2,560
Nitric acid	14,100	12,100	39,400
Ozone	n/d	n/d	10,160
Phosphoric acid	199	7,420	61

Sodium hydroxide	2,540	2,540	2,860
Styrene	5	4	4
Tetrachloroethylene	31,400	21,200	1,110,000
Toluene	8,420	8,260	15,780
1,1,1 Trichloroethane	22,000	19,300	9,880
Trichloroethylene (TCE)	11,840	9,300	312,000
Xylene	6,220	5,860	5,480

Criteria Air Pollutant Annual Emissions (pounds)

Air Pollutant	2002	2003	2004
Sulfur dioxide	1,116,000	1,072,000	4,300,000
Total suspended particulates	430,000	604,000	964,000
PM10	197,200	236,000	378,000
Carbon monoxide	2,440,000	4,580,000	1,964,000
Volatile organic compounds	159,800	186,600	1,088,000
Nitrogen dioxide	612,000	532,000	8,480,000
Lead	694	1,116	316
Hydrogen fluoride	252	228	278

Environmental Report for 2003, WSRC-TR-2004-00015
Environmental Report for 2004, WSRC-TR-2005-00005
Environmental Report for 2005, WSRC-TR-2006-00007

According to available information, air pollution at the Savannah River Site will continue to rise. The Georgia Department of Natural Resources stated:

> Another significant mission, which is currently underway, is the production of replacement tritium (H-3), which will be processed and extracted at SRS in the near future. This will likely result in increased airborne H-3 releases to the off-site environment starting around the end of 2004. [*Environmental Radiation Surveillance Report 2000-2002,* Georgia Department of Natural Resources Environmental Protection Division, , Published March 2004]

The ATSDR is on thin ice when it asserts there are no health concerns "as long as site activities and operations at SRS do not change." The PHA states:

> The estimated doses, ranging between 0.5 and 0.9 millirem, are less than ATSDR's health-based comparison value for drinking water of 4 millirems (0.04 millisieverts). Therefore, ATSDR concludes that the surface water releases of tritium and other radioactive contaminants did not pose a health concern since 1993; nor do these contaminants pose a current or future health concern as long as site activities and operations at SRS do not change. [PHA-SRS, p. 2]

If one considers air pollution, conditions at SRS already appears to be changing: for the worse. In order to produce a credible public health assessment, ATSDR must include the adverse impacts radioactive and hazardous air pollutants from SRS.

Additional Toxic Air Pollution Data

The Blue Ridge Environmental Defense League collected air samples at various points around the perimeter of SRS in 2004 and 2005. These tests detected actual ambient levels of a variety if volatile organic and reduced sulfur compounds in the air near SRS. Our results are listed in the table below. All concentrations are in micrograms per cubic meter (μ/m^3).

Actual Ambient Concentrations

Toxic air pollutant	μ /m^3
Sample # 040908-1	
Hydrogen sulfide	5.13
dimethyl disulfide	10.6
Toluene	8.8
Styrene	7
Sample # 040908-2	
Acetone	36
Sample # 050711-01	
Toluene	19
Styrene	5.5
Sample # 050711-02	
Carbon disulfide	8
Toluene	21
Sample # 050712-02	
carbon disulfide	6.1
Toluene	25

Sample numbers correspond to the points on the map on page 9. Our grab-sample tests were typically carried out during light, steady wind conditions at points close to but outside of the perimeter of the Savannah River Site. Wind direction at time of each test was downwind from SRS.

Conclusion

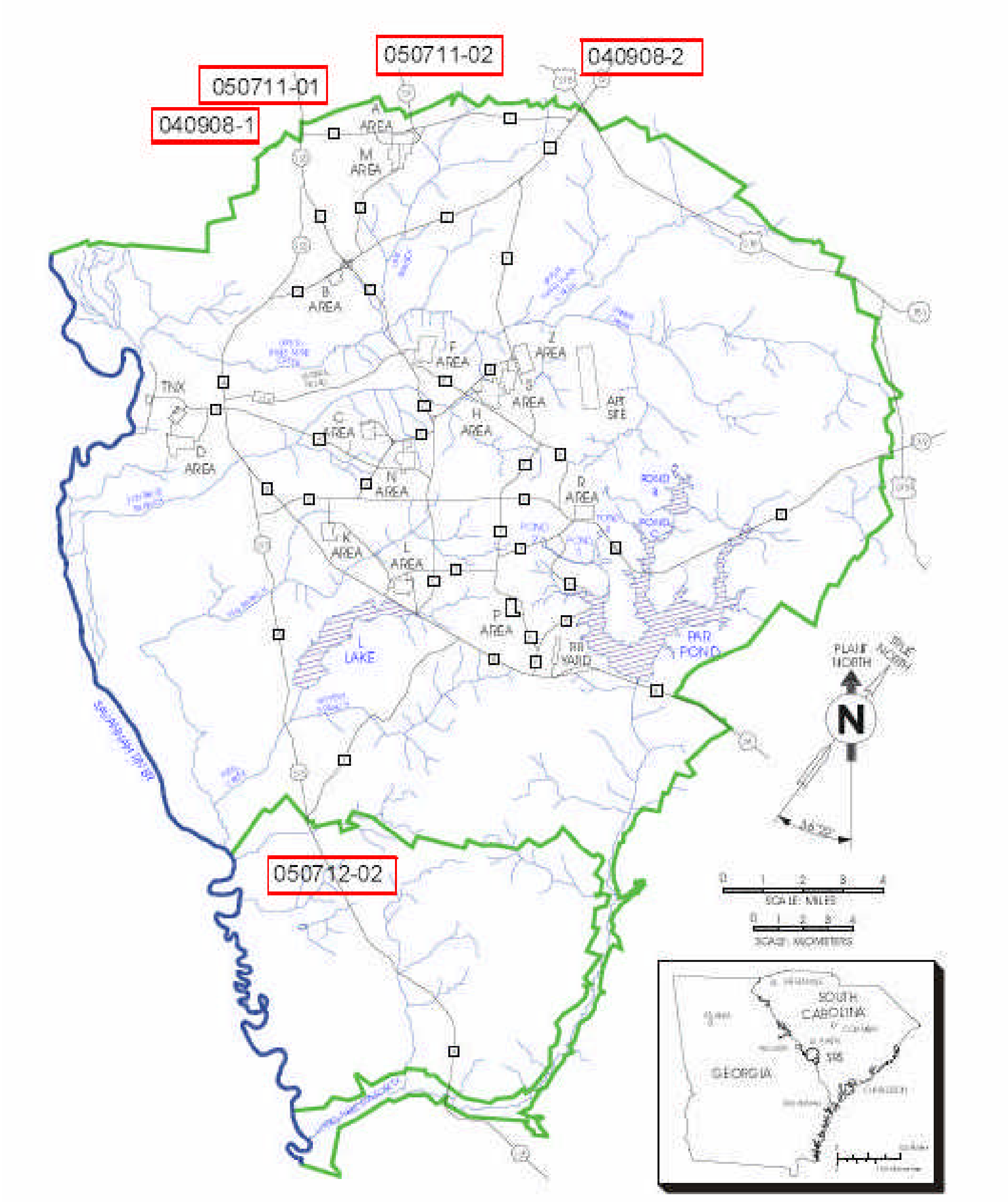
ATSDR must go back to the drawing board on its public health assessment and include a comprehensive review air pollution from SRS based on the CERCLA priority list of 275 hazardous substances.

Respectfully submitted,

Louis A. Zeller

CC: Carol Connell, Health Physicist

Map of SRS With Air Sample Test Sites



Grab Sample Dates, Times, Vicinity

Sample # 040908-1	September 8, 2004 11:42 AM	Jackson
Sample # 040908-2	September 8, 2004 1:49 PM	New Ellenton
Sample # 050711-01	July 11, 2005 5:43 PM	Jackson
Sample # 050711-02	July 11, 2005 6:23 PM	SSR 57
Sample # 050712-02	July 12, 2005 9:42 AM	Hattieville