DPSPU 74-302

ENVIRONMENTAL MONITORING AT THE SAVANNAH RIVER PLANT

ANNUAL REPORT - 1973

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Health Physics Section
Savannah River Plant
E. I. du Pont de Nemours and Company
Aiken, South Carolina 29801

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INTRODUCTION

This report summarizes results obtained from the environmental monitoring program at the Savannah River Plant (SRP) during 1973. A brief discussion of plant releases to the environment and radioactivity detected in the environment is presented in the following text and tables. The appendix contains tables of results from environmental samples analyses, sensitivities of laboratory analyses, and maps of sampling locations.

Additional information pertaining to SRP releases of radioactive materials and their dispersion in the environment during 1973 may be obtained from "1973 Releases of Radioactivity at the Savannah River Plant," DPSP 74-25-1, and "Environmental Monitoring in the Vincinity of the Savannah River Plant," DPSPU 74-30-1.

ENVIRONMENTAL MONITORING

Fallout

A reduction in general fallout from weapons tests began in late 1972 and extended throughout 1973. Some increase normally occurs each spring as a result of the mixing of the stratosphere with the troposphere; this increase, however, was not as evident during 1973 as in the past. The monthly average concentrations of filterable beta activity (0.02 to 0.04 pCi/m^3) were as low as have ever been measured in this area for this length of time (October 1972 through December 1973). The average filterable beta concentration in air decreased from 0.09 pCi/m^3 during 1972 to 0.03 pCi/m^3 during 1973.

With two exceptions, all concentrations of gamma-emitting radionuclides from fallout during 1973 were less than the sensitivity of analyses. Radionuclides (primarily ^{140}Ba-^{140}La) of nonplant origin were detected on a high volume air filter during a 24-hour period ending July 10. Trace amounts of ^{95}Zr-^{95}Nb were also detected throughout the fourth quarter of 1973. The presence of these radionuclides is attributed to the June 1973 nuclear detonation by the People's Republic of China (Radiation Data and Reports, Vol 14, No. 11, November 1973).

Food

During the summer and fall of 1973, sixty samples of farm produce representing four food categories (grain, fruit, poultry and leafy vegetables) were collected from 14 localities near the plantsite and within a 25-mile radius. Samples of local beef were also collected near Aiken and Allendale, South Carolina. All samples were analyzed by gamma spectrometry for gamma-emitting radionuclides, radiochemically for ^{90}Sr and alpha emitters (uranium and plutonium), and liquid scintillation counting for tritium. SRP contributions to the radioactivity (excluding tritium) in farm produce were so low that they were indistinguishable from fallout. Results of ^{90}Sr were about the same as in the 1972 samples with the highest concentration again in collards (2.4 pCi/g). Tritium concentrations in food were similar to those found in rainwater, with a maximum (10 pCi/ml) in samples collected near the plant.

Drinking Water

There was no evidence that SRP contributes alpha or nonvolatile beta activity to drinking water supplies onplant or to public water supplies of 14 surrounding towns. Very low levels of tritium are found in drinking water of several surrounding towns that use surface water (maximum of 570 pCi/ℓ). Concentrations of tritium in water from deep wells are near or less than the sensitivity of the analyses (300 pCi/ℓ).

The Beaufort-Jasper Water Authority operates a treatment facility to furnish drinking water, partially obtained from the Savannah River, to most of Beaufort County, South Carolina. Water is supplied through a canal from the river at a location about 90 miles below the Savannah River Plant. A water treatment plant at Port Wentworth, Georgia supplies water to a business-industrial complex near Savannah, Georgia. The higher tritium results at Beaufort-Jasper (4200 pCi/ℓ) and Port Wentworth (5800 pCi/ℓ) reflect SRP releases of tritium to the river.

Special Gamma Radiation Survey

A special environmental radiation monitoring program was initiated during 1973 to measure background radiation at many more locations in the plant environs. Seventy-nine monitoring stations were selected at one-mile intervals along the plant perimeter, supplemented with ten additional sites at locations where streams intersect the plant boundary. Forty-three monitoring stations, including seven at stream crossings, were located at one-mile intervals along intraplant roads that encompass the operating areas. Exposure rates at the 79 perimeter stations averaged 0.17 mR/day (62 mR/year) for the three quarterly cycles monitored. The exposure rate at the various stations ranged from 0.12 mR/day to 0.24 mR/day. Quarterly measurements at each monitoring point were relatively stable with an observed variance of only about 10%. Data obtained at these stations are characteristic of those observed at the routine plant perimeter and 25-mile radius stations for the past several years.

Similar values were obtained with the TLD monitors located along the inner perimeter that encompasses the operating areas. Average exposure rates were 12% higher than those measured along the plant perimeter. Radiation levels were higher at stream crossings with maximum levels observed along Steel Creek. Readings observed along Steel Creek are shown in the following table. Station locations are shown in the figure on page 10.

Each monitor has five TLD's: three LiF extruded ribbons and two CaF_2 crystals. One of the three LiF dosimeters is positioned behind a paper filter to provide an energy independent measure of the total dose; the other two are behind an aluminum filter that is approximately equivalent to 2 cm of soft tissue. The CaF_2 dosimeters are positioned behind a silver filter and a plastic filter – the first to measure dose from photons with energies above 100 keV and the latter to detect lower energy photons.

Independent gamma radiation measurements obtained at each station with the shielded LiF and CaF_2 dosimeters agreed with each other within 10%.

This special radiation survey will be continued during 1974 to better define normal variations at individual stations. The data will also provide information needed to determine any future effects of plant operations.

GAMMA RADIATION ALONG STEEL CREEK, mR/DAY

Station	West, 100 ft	West Bank	Stream Bed	East Bank	East, 100 ft
1	0.26	3.37	3.14	3.94	0.30
2	.26	0.47	1.43	1.48	.21
3	.24	0.39	1.75	0.79	.29
4	.21	0.54	0.82	.34	.21
5	.28	1.09	1.45	.84	.20
6	.20	0.37	0.56	.43	.31
7	.49	0.66	1.27	.47	.29
8	.32	0.82	0.43	.40	.30
9	0.23	0.61	0.32	0.34	0.33

Special Monitoring of Vegetation for Tritium

The concentration of tritium in free water from three families of vascular plants collected at distances up to 8 miles in four directions from the Separations Areas stacks during 1973 can be described by a power function equation (Works Technical November monthly report). Pine needles, oak leaves, and grass samples were collected during June, July, and August at one-mile intervals in a north, east, south, and west direction from H Area. Free water was obtained from each sample by freeze-dry techniques and analyzed for tritium content. As expected, the concentration generally decreases with distance from H Area; concentrations of tritium in plants however, would also be influenced by reactor area atmospheric releases.

The highest concentrations of tritium in plants were not found in a consistent direction from the H-Area stack, presumably reflecting a combination of stack releases, wind direction, and rainfall. In June the maximum concentrations were north of H Area; in July east of H Area; and in August, generally uniform in all directions but slightly higher toward the northwest. A similar pattern was evident among the samples each month. A maximum concentration of 290 pCi/ml was observed in pine needles in June. Average concentrations versus distance of all samples are shown in the following table. Tritium concentrations ranged from <1 pCi/ml to 7 pCi/ml in eleven control samples collected each month at distances from 25 to 100 miles.

TRITIUM IN PLANTS
(Pine, Oak and Grasses)

Distance from H Area, mi	Average pCi/ml
1	82
2	31
3	16
4	15
5	11
6	8
7	9
8	4

Burial Ground Vegetation

Analyses of vegetation samples from inside the burial ground fence showed a maximum concentration of 250,000 pCi/g of $^{89,90}Sr$ along a backfilled trench where radioactive vegetation was found in 1965. This activity was attributed to buried separations process equipment because of the distribution of radioactivity in the soil. Vegetation samples in other parts of the burial grounds showed 2300 to 90,000 pCi/g of $^{89,90}Sr$. The maximum concentration of ^{137}Cs was 2200 pCi/g and alpha 21 pCi/g.

Vegetation collected monthly from 13 stations at the burial ground fence show only slight contamination when compared with average results of other locations (F and H Areas, Plant perimeter, and 25-mile radius) indicating good contamination control.

241-F and -H Tank Farm Wells

Installation of new monitoring wells extending around the periphery of the high level waste tank farms in F and H Area began in July. Routine sampling of 13 wells in F Area and 15 in H Area was started by the yearend. This series of wells, 14 in F Area and 17 in H Area, will be completed in early 1974. Well data and locations of the completed and uncompleted wells are shown in the Appendices.

Well number 7, near tank 3 in F Area, showed the maximum nonvolatile beta concentration of 330 pCi/ℓ in the initial sample collected in October. This activity (primarily ^{106}Ru) increased to 960 pCi/ℓ by December. The source of the activity is being investigated but has not been determined.

Migration of Radioactivity from Seepage Basins

Separations Areas. Continuous flow-recorders and samplers in Four Mile Creek, which measure activity contributed by the F- and H-Area seepage basin systems, showed the following totals for 1973: ^{90}Sr, 1.606 Ci from F Area and no detectable migration of ^{90}Sr from H Area; tritium, 4158 Ci from F Area and 6811 Ci from H Area. Cesium-137 from seepage basins is obscured by the desorption of ^{137}Cs from the stream bed.

Strontium-90, cesium-137, and tritium in Four Mile Creek during 1973 are shown in the following table. Ground water from H basin 1 enters Four Mile Creek between sampling locations 2 and 3, from H basin 4 between locations 3 and 4, and from F basins between locations 6 and 7 (see map on page 7).

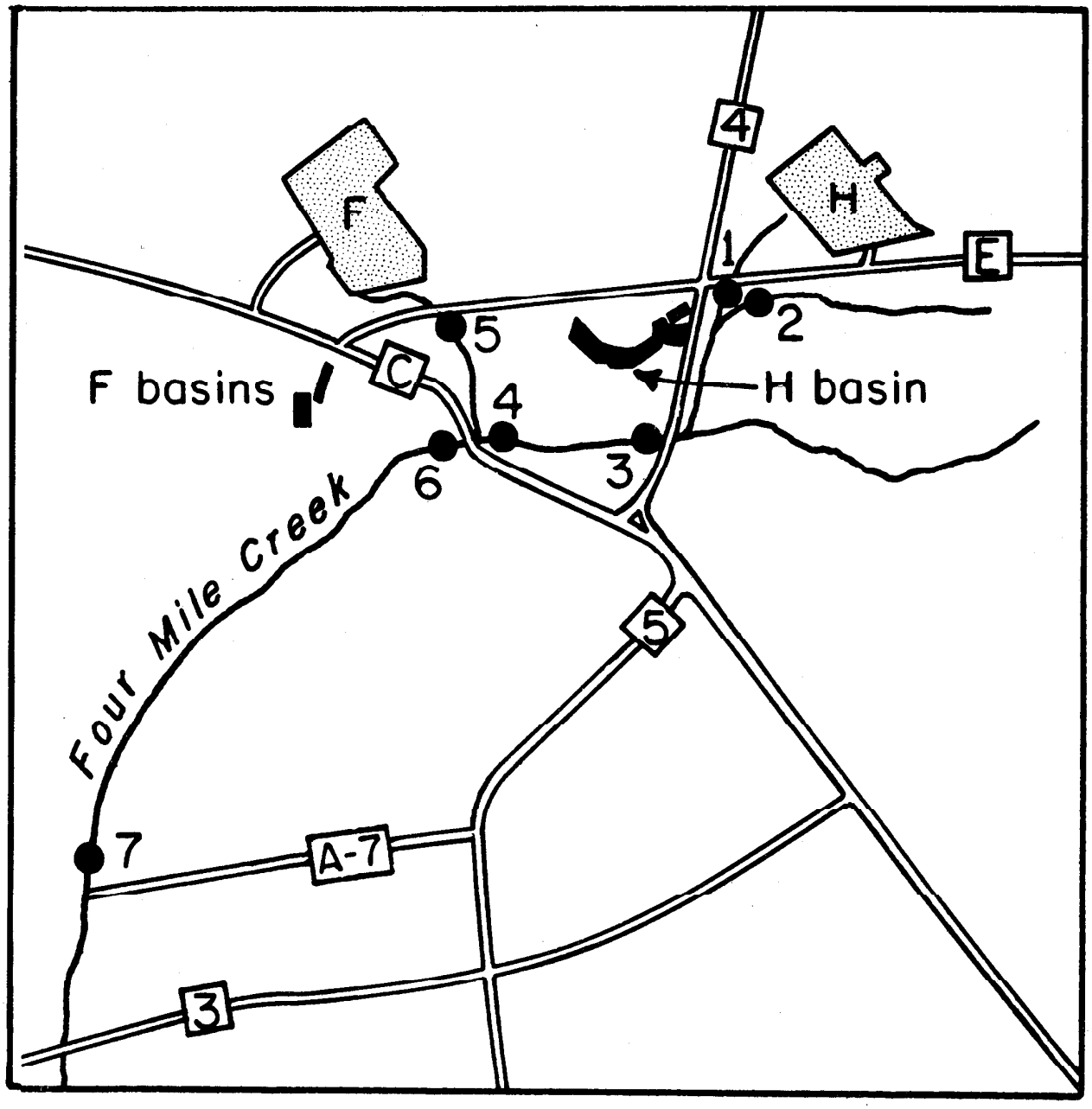
Between 1954 and 1973, the F seepage basins received ~22.6 Ci of ^{90}Sr, and the H basins ~26.5 Ci. The lower apparent migration of ^{90}Sr from the H basins to Four Mile Creek is attributed to retention by less sandy soil.

RADIOACTIVITY IN FOUR MILE CREEK DURING 1973, Ci

Location (figure below)	Tritium	^{90}Sr	^{137}Cs[a]
1 H Area effluent at Road E	131	0.031	0.017
2 Cooling tower effluent below H-Area retention basin	21	0.008	0.308
3 0.5-mile downstream from Road 4	918	0.107	0.646
4 Above entry of F-Area effluent	6,963	0.036	0.354
5 F-Area effluent at Road F	33	0.018	0.042
6 Below F-Area effluent at Road C	8,111	0.156	0.615
7 Downstream at Road A-7	12,269	1.762	0.447

[a] Desorption from stream bed.

K-Reactor Area. Migration of tritium from the K-Containment basin to Pen Branch totaled 16,794 Ci during 1973. This migration is measured by analysis of water from Indian Grave Branch which flows into Pen Branch.



SAMPLE LOCATIONS IN FOUR MILE CREEK

Soil Monitoring

Fifty onplant and seven offplant soil samples were collected and analyzed for radioactivity during 1973. Results showed the approximate fallout deposition as follows – plutonium 2 mCi/km^2, cesium 90 mCi/km^2 and strontium 75 mCi/km^2. These values are well within the range reported for this latitude in the United States.[1] SRP operations showed no influence on ^{137}Cs and ^{90}Sr fallout levels and very little on fallout plutonium levels. Only in samples collected within a 2 km radius of the separations areas was plant contributed plutonium observed.

Elevated plutonium values were found directly outside the F- and H-Area fences. No samples were collected inside the area fences. In F-Area soils the ^{239}Pu values ranged from 3.2 mCi/km^2 to 37.4 mCi/km^2, and ^{238}Pu ranged from 0.23 mCi/km^2 to 22.2 mCi/km^2. In H-Area soils, with the exception of one sample, the ^{239}Pu values ranged from 1.99 mCi/km^2 to 46.4 mCi/km^2, and ^{238}Pu from 0.59 mCi/km^2 to 6.9 mCi/km^2. One soil sample near H Area showed high values of 535 mCi/km^2 of ^{239}Pu and 91 mCi/km^2 of ^{238}Pu. Cesium-137 deposition was also elevated at this location (225 mCi/km^2). Moving away from the immediate separations areas, deposition values for both ^{238}Pu and ^{239}Pu rapidly returned to fallout levels.

Soil samples from noncultivated areas were first collected at four locations along the plant perimeter (representing each quadrant) and at three locations up to 100 miles from the plant to determine the vertical distribution of deposited radioactivity. At each site a total of 10 soil cores, 30-cm deep, was taken in a straight line 30 cm apart. Each soil core was divided into increments of 0 to 5 cm, 5 to 15 cm, 15 to 22.5 cm, and 22.5 to 30 cm and composited by increment from each location for radioanalysis. Results of this profile study showed that most of the cesium (approximately 90%) and plutonium (approximately 80%) are confined to the top 5-cm depth while ^{90}Sr was more evenly distributed to a greater depth. Approximately 90% of the plutonium is found within the top 15 cm; however, only ^{239}Pu can be detected at this depth. Essentially no ^{238}Pu was detected below a depth of 5 cm.

The only variation in analyses of the additional 50 onplant soils was sample depth. Because of the negligible radioactivity found at greater depths only the 0 to 15 cm portion of the sample was analyzed.

Special Monitoring in Streams and River

Steel Creek. Monitoring of Steel Creek water, vegetation and biological specimens continued to show some decrease in ^{137}Cs content. Maximum concentrations of ^{137}Cs in the Steel Creek environs were observed after all reactor cooling water discharges to Steel Creek ceased when the L-Area reactor was shut down in February 1968. The entire heat exchanger effluent from P Area is diverted to Par Pond. The maximum concentrations of ^{137}Cs detected in stream water (3600 pCi/l) and algae (2800 pCi/g) were observed in 1968 and in fish flesh (3500 pCi/g) in 1969; the 1973 maximum concentrations were 31 pCi/l in water, 90 pCi/g in algae, and 130 pCi/g in fish.

Average concentrations of ^{137}Cs in vegetation collected at ten sampling locations are shown in the following summary. The vegetation sampled was growing either in stream water or on portions of the old creek bed now exposed by the reduced water flow. The sampling locations which were established along Steel Creek in 1970 are shown on page 10.

Cesium-137 was detected in all Steek Creek vegetation (153 samples). Cobalt-60 was detected in 25% of the samples and ^{65}Zn in 10%. Concentrations of ^{60}Co and ^{65}Zn averaged about 18% and 7%, respectively, of the ^{137}Cs levels.

[1] Hardy, E. P., et al, NATURE, Vol 241, February 16, 1973, pp 444-445.
Radiation Health Data and Reports, Vol 14, No. 12, December 1973.
Health and Safety Laboratory (HASL-250) March, 1972.

^{137}Cs IN STEEL CREEK VEGETATION

Sample Point	1970 Max	1970 Avg	1971 Max	1971 Avg	1972 Max	1972 Avg	1973 Max	1973 Avg
0	1800	604	970	310	380	150	900	210
1	8500	2200	1600	360	160	20	1550	340
2	5700	1000	4800	890	750	150	320	120
3	3300	1300	2500	660	800	450	850	360
4	680	220	5670	1100	800	340	610	280
5	4900	1960	1500	510	820	360	420	210
6	3900	1100	2700	1100	1530	770	830	220
7	3700	1600	2000	660	760	290	530	240
8	2500	1100	1300	570	1100	460	480	190
9	1000	260	540	160	1500	380	550	210
Average		1130		630		340		240

Lower Three Runs Creek. A comprehensive radiological survey of the Lower Three Runs corridor was made during January through May. Gamma dose rates were determined using thermoluminescent dosimeters (TLD) and one-inch NaI (Tl) scintillometer. Samples for laboratory analyses (including soil cores, leaf stems, saw timber chips, and stream water) were selected from a 10-meter square area at each of eleven stations that showed ^{137}Cs deposits in the flood plain soil during a 1971 survey (refer to DPSP 71-1-10). The stations surveyed along Lower Three Runs began at Par Pond and extended to above 400 meters from the mouth of the creek (main channel) as shown on page 10. Individual data obtained from the survey are presented in the Works Technical monthly report for June 1973.

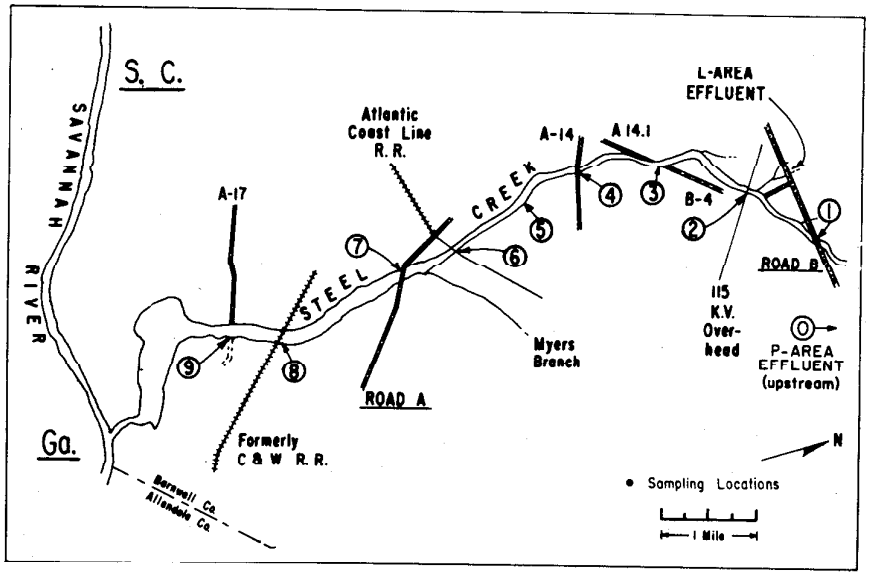
TLD measurements were made 3 feet and 20 feet above ground level extending from the stream bank out ot distances of 600 feet. Dosimeters were suspended in trees to obtain the 20-foot readings. Control measurements were taken on Upper Three Runs for comparison. Dose rates at all locations on Lower Three Runs averaged 0.34 mR/day compared to 0.22 mR/day on Upper Three Runs. Gamma dose rates were measured with an FS-11 scintillation counter at 36 points within a 10-meter square area of each station and on a line from the stream to high ground. Average readings in the 10 m^2 areas ranged from 10 μR/hr (location 1) to 61 μR/hr (location 6) with a maximum individual reading of 98 μR/hr (location 3). Control or background gamma radiation dose rates offplant range from 6 to 8 μR/hr.

Five top soil cores (9-cm depth and 8-cm diameter) were taken at two-meter intervals at each location for plutonium, cesium, and mercury analyses. Low, but elevated plutonium values were found at several locations and will be evaluated further. The soil data are summarized in the following table and compared with control locations offplant.

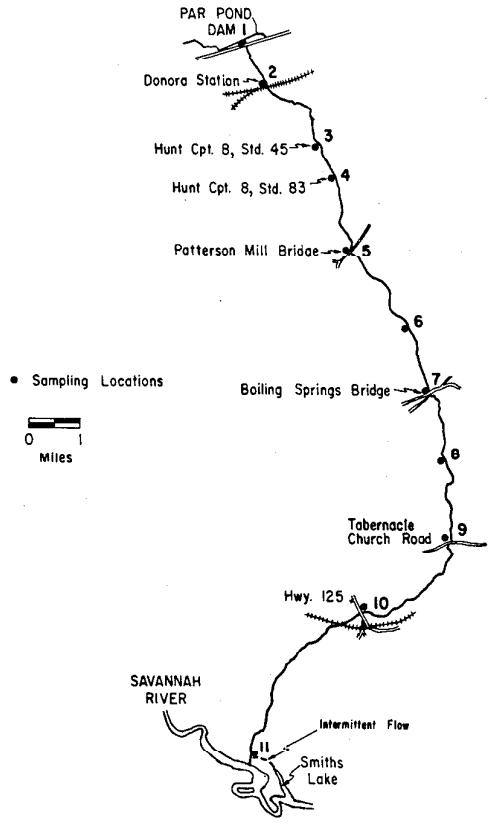
	Lower Three Runs Creek (range)	Offplant[a] (range)
^{238}Pu, mCi/km^2	0.068 - 0.594	0.060 - 0.238
^{239}Pu, mCi/km^2	1.512 - 6.278	1.574 - 1.803
^{137}Cs, mCi/km^2	2,430 - 22,950	100 - 120
Hg, μg/g	<0.03	no analysis

[a] Clinton, SC, and Athens and Savannah, GA.

Tritium in free water of leaf stems and saw timber ranged from 1 to 40 pCi/ml and ^{137}Cs in saw timber from 1 to 22 pCi/g. Alpha emitters in leaf stems ranged from <0.04 to 0.35 pCi/g.



STEEL CREEK SURVEY STATIONS



LOWER THREE RUNS SURVEY STATIONS

Savannah River. Radionuclides of plant origin in transit in river water downstream from the plant (Highway 301) were cesium-137 (0.22 Ci), strontium-90 (1.90 Ci), and tritium (61,080 Ci). The concentrations of cesium-137, strontium-90, and tritium in river water represented <0.001%, 0.17%, and 0.22% of their respective concentration guides. The concentrations of alpha and nonvolatile beta shown in the appendices represent the radioactivity associated with dissolved and suspended solids. The activity in the filtered suspended solids of river water was similar to that in the dissolved solids, near or below the levels of detection.

Terrestrial Animals

Concentrations of ^{137}Cs in 1158 deer and 12 hogs killed during the 1973 hunts were determined with a portable, single-channel scintillation instrument before release of the animals to the hunters. The estimated ^{137}Cs content was verified by gamma spectrometric analysis of muscle tissue from 20 deer. The average ^{137}Cs concentration in deer was 6 pCi/g with a maximum of 31 pCi/g. The maximum concentration of ^{137}Cs in hogs was 5 pCi/g. These results are within the range of concentrations found in deer in similar terrain in the southeastern United States and are attributed primarily to fallout from nuclear weapons testing.[1]

Over 50 terrestrial animals other than deer and hogs were trapped onplant for radioanalyses. Maximum concentrations of ^{137}Cs were found in rats; 310 pCi/g in a rat collected about 100 yards from the H-Area retention basin (381-3H) near Four Mile Creek, and 190 pCi/g in a rat collected on Steel Creek between Road A and Road B. Rabbits from the burial ground showed the highest concentrations of $^{89,90}Sr$ in the bone (19,000 pCi/g maximum); concentrations of $^{89,90}Sr$ in other animals did not exceed 30 pCi/g.

Radioactivity in Aquatic Specimens

A decrease in the maximum concentrations of ^{137}Cs when compared with 1972 results, was observed in fish from Steel Creek at Road A (89 to 57 pCi/g) and Four Mile Creek at Road 3 (280 to 95 pCi/g). Savannah River fish contained very low concentrations of ^{137}Cs; 0.3 pCi/g in fish adjacent to the plant compared to 0.5 pCi/g during 1972.

Concentrations of ^{137}Cs in algae collected from Lower Three Runs Creek at Patterson's Mill during 1973 was essentially the same as that found during 1972 (140 pCi/g in 1972, 120 pCi/g in 1973). Average ^{137}Cs concentration in Steel Creek algae (2 miles below Road A) decreased from 220 pCi/g in 1972 to 29 pCi/g in 1973.

Water Quality – Streams and River

A sampling program was initiated in June 1973 to determine water quality at 10 additional locations on plant streams. The new locations on plant streams are described in DPST-73-328. The samples are analyzed for alkalinity, suspended solids, volatile solids, total dissolved solids, total solids, ammonia, chloride, nitrite, nitrate, pH, manganese, sulfate, phosphorus, aluminum, calcium, sodium, total iron, lead and mercury. Measurements of dissolved oxygen and temperature were made at the sample location at the time of collection. These data along with that for other stream and river water are presented in the tables of this report. Analyses of stream water collected from Upper Three Runs Creek at Road A, Steel Creek mouth, Four Mile Creek mouth, and Beaver Dam Creek have been made since 1971-72. Water quality analyses of river water have been made since 1959.

[1] Jenkins, J. H., and J. R. Monroe, "An Evaluation of the Factors Involved in Bioaccumulation of Gamma-Emitting Radionuclides in White-Tail Deer." Fourth Technical Progress Report, School of Forest Resources, University of Georgia, Athens, Georgia. November 1, 1972.

Comparison of water quality analyses of Savannah River water one mile upstream from SRP and eight miles below SRP (Highway 301) show no significant difference in quality. All water quality data of stream and river water obtained to date are summarized in the Works Technical monthly report for June 1973.

Environmental Mercury Analyses

In June 1973, a routine mercury monitoring program for water and sediments was initiated. Water samples analyzed in May included four burial ground wells (No. 2, 4, 7, and 9), three Four Mile Creek samples (at Roads E, 4, and C) and one H-Area seepage basin well (No. 4). All results were <2 μg Hg/ℓ. Sediment samples were collected from the Savannah River upstream and downstream of the plant and from the following plant stream locations: Upper Three Runs Creek at Road A, Four Mile Creek at Roads, E, 4, and C, Lower Three Runs Creek at Patterson's Mill, and at the mouth of Beaver Dam Dreek (400-D effluent), Four Mile Creek and Steel Creek. All samples showed <0.03 μg Hg/g.

Mercury analyses of fish flesh from the river and plant effluent streams were started in July 1971. Initially samples were analyzed quarterly; however, during 1973 fish samples were analyzed semiannually by species composites bream, bass, and catfish. The maximum concentration (4.9 μg Hg/g) was measured in bass collected from Cassels Pond. The maximum concentration in fish in 1972 was 1.4 μg/g of flesh in bass from Steel Creek; the maximum in stream fish in 1971 was 2.9 μg/g of flesh in a bass from Steel Creek.

SUMMARY OF RELEASES

Radioactivity releases from Plant operations in 1973 continue to show overall reductions. These reductions demonstrate the continuation of the long-term Plant policy to constrain releases of radioactivity.

The most significant reduction was in reactor areas liquid releases which showed a 50% decrease for all radionuclides except tritium. Tritium releases showed a 50% increase in both reactor and separations areas causing a 35% increase in the plant-contributed transport of tritium measured in the Savannah River (45,000 Ci in 1972, 61,000 in 1973).

SUMMARY

	To Atmosphere				To Streams				To Seepage Basins			
	1970	1971	1972	1973	1970	1971	1972	1973	1970	1971	1972	1973
Alpha, mCi	48	38	29	29	700	710	480	260	3400	1800	940	850
Nonvolatile beta, Ci	2	6	8	3	96	44	5	4	230	85	100	97
Radioiodine, Ci	34	27	3	2	2	2	1	<1	9	3	3	3
Tritium, kCi	470	590	780	550	37	37	39	52	58	36	47	66

Mercury releases to the F- and H-Area seepage basins in 1973 also decreased 27% (64 pounds in 1972, 47 pounds in 1973).

SENSITIVITY AND STANDARD DEVIATIONS OF LABORATORY ANALYSES

The sensitivity of laboratory analyses (table below) refers to the minimum amount of radioactivity that can be detected by the radiochemical analytical technique in use. It is based on statistical counting error (90% confidence level) and is influenced by sample size, counter efficiency, and counter background. No self-absorption corrections have been applied to alpha and nonvolatile beta results. Standard deviations, calculated from spike recovery values, are applicable to the average values given in this report.

Analysis	Sample	Sensitivity	Spike Value
Alpha	Water	0.22 ± 0.05 pCi/ℓ	45 pCi/ℓ
	Vegetation	0.11 ± 0.02 pCi/g	-
	Air	0.04 ± 0.01 × 10^{-2} pCi/m^3	-
Beta	Water	4.2 ± 0.3 pCi/ℓ	-
	Vegetation	2.1 ± 0.2 pCi/g	-
	Biological specimens	2.0 ± 0.1 pCi/g[a]	-
	Air	0.6 ± 0.04 × 10^{-2} pCi/m^3	-
TIOA extraction (U + Pu)	Water	0.28 ± 0.06 pCi/ℓ	45 pCi/ℓ
	Vegetation	0.03 ± 0.01 pCi/g	4.5 pCi/g
Radioiodine	Water	9.3 ± 0.7 pCi/ℓ	300 pCi/ℓ
	Vegetation	0.2 ± 0.01 pCi/g	-
	Air	1.8 ± 0.2 × 10^{-2} pCi/m^3	-
	Milk	1.0 ± 0.5 pCi/ℓ	200 pCi/ℓ
Tritium	Water	300 ± 20 pCi/ℓ	2500 × 10^3 pCi/ℓ
	Air	10 pCi/m^3[b]	
Radiocesium	Water	5.0 ± 0.3 pCi/ℓ	600 pCi/ℓ
	Milk	20.0 ± 10.0 pCi/ℓ	-
	Soil	0.04 pCi/g	
Radiostrontium	Water	8.0 ± 0.6 pCi/ℓ	230 pCi/ℓ
Strontium-90	Water	0.1 ± 0.1 pCi/ℓ	230 pCi/ℓ
	Milk	1.0 ± 0.1 pCi/ℓ	47 pCi/ℓ
	Soil	1.0 ± 0.1 × 10^{-3} pCi/g	
Plutonium-238	Soil	8.0 ± 1.9 × 10^{-4} pCi/g	
Plutonium-239	Soil	4.0 ± 1.0 × 10^{-4} pCi/g	

[a] Approximate average; sample size varied.
[b] Approximate average; varied with absolute humidity.

DETAILED MONITORING RESULTS

Survey data were averaged for 1973: "Max" refers to the greatest concentration observed in a single sample collected during the year.

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TABLE 1. RADIOACTIVITY IN AIR,[a] pCi/m^3

(See figure 1)

Location	Alpha (Multiply by 10^{-2}) Max	Alpha (Multiply by 10^{-2}) Avg	Filterable Beta Max	Filterable Beta Avg	Radioiodine Max	Radioiodine Avg	Tritium Max	Tritium Avg
On Plant								
200-F Area	0.28	0.09	0.33	0.06	0.36	ND	1,360	470
200-H Area	0.17	0.08	0.46	0.07	ND	ND	14,540	1940
700-A Area	0.31	0.09	0.06	0.04	ND	ND	420	150
Par Pond Dam[c]	0.14	0.07	0.05	0.03	ND	ND	590	150
Dunbarton Fire Tower	0.38	0.08	0.06	0.03	ND	ND	490	190
Average		0.08		0.05				580
Plant Perimeter								
Talatha Gate	0.25	0.08	0.05	0.03	-	-	290	120
Williston Gate	0.17	0.07	0.08	0.03	-	-	370	140
Barnwell Gate[c]	0.12	0.06	0.05	0.03	-	-	520	150
Pattersons Mill[c]	0.76	0.26	0.04	0.02	-	-	230	120
Allendale Gate[c]	0.12	0.06	0.06	0.03	-	-	250	70
400-D	0.23	0.09	0.05	0.03	-	-	450	230
Jackson	0.20	0.09	0.05	0.03	-	-	300	110
Green Pond	0.19	0.08	0.06	0.02	-	-	320	110
Average		0.10		0.03				130
25 Mile Radius								
Aiken Airport	0.23	0.08	0.07	0.03	-	-	200	40
Aiken State Park	0.20	0.07	0.05	0.03	-	-	120	40
Williston	0.24	0.09	0.06	0.03	-	-	120	50
Barnwell	0.26	0.09	0.05	0.03	-	-	220	50
Allendale	0.17	0.08	0.05	0.03	-	-	70	30
Highway 301	0.14	0.07	0.09	0.03	-	-	90	30
Sadis	0.34	0.08	0.06	0.03	-	-	110	40
Waynesboro	0.16	0.08	0.05	0.03	-	-	110	50
Bush Field	0.20	0.10	0.05	0.03	-	-	120	50
Langley	0.16	0.10	0.05	0.03	-	-	180	50
Average		0.08		0.03				40
100 Mile Radius								
Greenville	0.18	0.08	0.04	0.03	ND	ND	50	60
Columbia	0.26	0.10	0.04	0.03	ND	ND	110	50
Savannah	0.18	0.07	0.05	0.03	ND	ND	50	30
Macon	0.18	0.08	0.08	0.03	ND	ND	30	30
Average		0.08		0.03				40

	^{7}Be	^{89,90}Sr	^{95}Zr-^{95}Nb	^{103,106}Ru	^{137}Cs	^{144}Ce
F and H Areas	0.12	0.002	0.01	ND	0.05	ND
Plant perimeter[b]	0.13	0.001	0.01	ND	ND	ND
25-mile radius[b]	0.12	0.001	0.01	ND	ND	ND
100-mile radius	0.11	0.001	0.01	ND	ND	ND

[a] Weekly analyses for alpha, beta, radioiodine and tritium. Monthly analyses of composite of filters for gamma emitters and ^{89,90}Sr.

[b] Tritium values determined from atmospheric moisture.

[c] See figure 1.

ND Less than sensitivity of analysis.

- No analysis (analyzed when ^{131}I is detected at Plant perimeter locations).

TABLE 2. RADIOACTIVITY DEPOSITED,[a] nCi/m^2

(See figure 1)

Location	Alpha	^{7}Be	^{89}Sr	^{90}Sr	^{95}Zr-^{95}Nb	^{103,106}Ru	^{131}I	^{137}Cs	^{140}Ba-^{140}La	^{141,144}Ce	^{239}Np
On Plant											
200-F Area	0.10	28.0	<1.1	2.2	<0.7	<3.6	<1.6	6.8	ND	<2.6	ND
200-H Area	0.10	17.3	<0.6	0.6	<0.5	<3.6	<1.5	2.5	ND	<2.3	ND
700-A Area	0.08	37.0	<0.5	0.5	<0.6	<2.2	<3.0	<0.4	ND	<2.2	ND
Par Pond Dam[b]	0.01	6.6	<0.1	0.1	<0.2	<0.9	<0.4	<0.2	ND	<1.0	ND
Dunbarton Fire Tower	0.04	27.6	<0.4	0.4	<0.4	<2.9	<1.3	<0.5	ND	<2.6	ND
Average	0.07	23.3	<0.5	0.8	<0.5	<2.6	<1.6	2.1	ND	<2.2	ND
Plant Perimeter											
Talatha Gate	0.06	25.0	<0.6	0.3	<0.5	<3.4	<1.3	<0.6	ND	<3.0	ND
Williston Gate	0.06	27.1	<0.6	0.6	<0.5	<2.4	<0.9	<0.3	ND	<2.0	ND
Barnwell Gate	0.01	9.2	<0.1	0.1	<0.2	<1.0	<0.6	<0.3	ND	<1.0	ND
Pattersons Mill[c]	0.01	0.4	<0.1	<0.1	<0.1	<0.5	<0.3	<0.1	ND	<0.4	ND
Allendale Gate	0.01	2.9	<0.2	0.1	<0.2	<1.7	<0.6	<0.2	ND	<1.0	ND
400-D	0.05	26.7	<0.4	0.4	<0.4	<3.2	<1.7	<0.5	ND	<2.4	ND
Jackson	0.04	25.9	<0.7	0.7	<0.5	<3.2	<0.9	<0.5	ND	<2.1	ND
Green Pond	0.05	20.0	<0.3	0.3	<0.5	<3.0	<1.6	<0.4	ND	<2.4	ND
Average	0.04	19.3	0.4	0.3	<0.4	<2.3	<1.0	<0.3	ND	<1.8	ND
25 Mile Radius											
Aiken Airport	0.08	22.7	<0.4	0.6	<0.4	<3.0	<1.4	<0.5	ND	<2.2	ND
Aiken State Park	0.03	19.8	<0.4	0.6	<0.5	<3.2	<1.4	<0.4	ND	<2.2	ND
Williston	0.02	15.1	<0.6	0.4	<0.4	<3.9	<1.6	<0.4	ND	<2.3	ND
Barnwell	0.06	14.8	<0.2	0.4	<0.7	<2.9	<2.0	<0.4	ND	<2.6	ND
Allendale	0.04	17.8	<0.3	0.3	<0.7	<2.8	<1.7	<0.4	ND	<3.4	ND
Highway 301	0.03	12.4	<0.4	0.4	<0.4	<2.8	<1.6	<0.4	ND	<2.3	ND
Sardis	0.10	8.2	<0.3	0.2	<0.5	<2.7	<1.5	<0.6	ND	<2.2	ND
Waynesboro	0.03	17.7	<0.6	0.6	<0.4	<3.1	<1.5	<0.4	ND	<2.3	ND
Bush Field	0.03	8.1	<0.2	0.2	<0.4	<2.2	<1.3	<0.4	ND	<2.1	ND
Langley	0.06	19.9	<0.5	0.7	<0.6	<3.1	<1.3	<0.5	ND	<2.6	ND
Average	0.05	15.7	<0.4	0.4	<0.5	<3.0	<1.5	<0.4	ND	<2.4	ND

[a] Monthly analysis
[b] Analyses started 5/73
[c] Analyses started 10/73
ND Less than sensitivity of analysis.

TABLE 3. RADIOACTIVITY IN AGRICULTURAL PRODUCTS, pCi/g

(See figure 2)

Food	No. of Samples	Alpha		Tritium[a]		^{90}Sr		^{95}Zr-^{95}Nb		^{137}Cs		^{141,144}Ce	
		Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg
Collards	14	0.010	0.016	-	-	2.45	0.56	ND	ND	0.37	0.06	ND	ND
Plums	14	0.240	0.010	10	4	0.05	0.02	ND	ND	0.11	ND	ND	ND
Oats, wheat, and rye	14	0.120	0.007	6	3	0.29	0.10	ND	ND	0.11	ND	ND	ND
Corn	7	0.003	0.002	10	6	0.08	0.03	ND	ND	0.16	0.04	ND	ND
Chicken	4	0.008	0.003	3	2	0.22	0.09	ND	ND	ND	ND	ND	ND
Beef	4	0.003	ND	8	3	0.03	0.02	ND	ND	0.04	0.03	ND	ND
Sensitivity of analysis		0.002		1.0		0.02		0.02		0.02		0.06	

[a] pCi/mℓ of free water.
ND Less than sensitivity of analysis.

TABLE 4. RADIOACTIVITY IN VEGETATION,[a] pCi/g

(See figures 3 & 4)

Location	Alpha		^{7}Be		^{95}Zr-^{95}Nb		$^{103,106}Ru$		^{131}I		^{137}Cs		$^{141,144}Ce$	
	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg
F & H (4 locations, 1 mile distant)	1.1	0.2	24.1	8.9	2.8	0.8	6.4	2.2	0.4	ND	8.0	2.6	6.5	2.2
Burial grounds (13 locations)	1.7	0.3	26.0	5.5	5.2	ND	14.5	ND	1.0	ND	25.0	1.5	5.6	ND
Plant perimeter (7 locations)	0.8	0.2	16.5	7.3	0.6	ND	ND	ND	ND	ND	5.0	1.5	3.8	ND
25-mile radius (7 locations)	0.9	0.1	14.7	5.6	ND	ND	ND	ND	ND	ND	1.9	0.5	ND	ND

[a] Monthly analyses
ND Less than sensitivity of analysis.

TABLE 5. RADIOACTIVITY IN MILK,[a] pCi/ℓ

(See figure 1)

	Tritium		^{90}Sr		^{131}I		^{137}Cs	
	Max	Avg	Max	Avg	Max	Avg	Max	Avg
Small Dairy								
North Augusta	2900	1600	10.0	6.9	ND	ND	48	12
Waynesboro	2000	650	7.8	5.7	ND	ND	34	10
Major Distributor[b]	3200	780	11.8	7.8	ND	ND	32	12

[a] Biweekly analysis for radioiodine and tritium - quarterly for ^{90}Sr and monthly for ^{137}Cs.
[b] Milk produced in the general area, but sold to major distributors - locations not shown.
ND Less than sensitivity of analysis.

TABLE 6. RADIOACTIVITY IN PLANT DRINKING WATER,[a] pCi/ℓ

(See figure 5)

Location	Alpha		Nonvolatile Beta		Tritium	
	May	Nov	May	Nov	May	Nov
200-F Area	4.5	3.6	26	4	ND	ND
200-H Area	5.4	3.5	71	7	440	ND
3/700 Area	1.7	0.6	ND	ND	510	-
400-D Area	0.2	ND	ND	5	ND	850
CMX-TNX	0.4	0.3	5	6	ND	ND
Pumphouse 681-1G	0.8	ND	ND	ND	ND	ND
Pumphouse 681 3G	0.5	ND	ND	ND	340	ND
100-P Area	0.7	0.6	ND	4	480	800
100-K Area	ND	0.2	ND	ND	480	1160
100-C Area	ND	0.4	ND	ND	400	1160
Par Pond — Pumphouse	0.2	0.3	ND	ND	380	ND
TC Area	3.3	1.1	ND	ND	300	ND
Classification Yards	0.6	0.5	ND	4	ND	360
Central Shops	0.5	1.1	ND	ND	340	1780
Jackson Gate	1.7	1.8	5	ND	ND	310
Talatha Gate	2.2	3.1	4	6	1630	1650
Williston Gate	0.3	-	ND	-	ND	-
Barnwell Gate	2.5	2.5	ND	10	310	ND
Allendale Gate	ND	0.3	ND	6	ND	670
Robbins Station	0.4	0.5	ND	ND	300	ND
Donora Station Well	0.2	0.2	ND	ND	380	-
Forestry Station	3.6	2.2	10	ND	600	490
Firing Range	2.1	2.3	ND	ND	1150	1780
Thermal Effects Lab	ND	ND	ND	1	300	360

[a] Semiannual analyses.
ND Less than sensitivity of analysis.
- No analysis.

TABLE 7. RADIOACTIVITY IN PUBLIC DRINKING WATER,[a] pCi/ℓ

(See figure 1)

Location	Source of Water	Alpha		Nonvolatile Beta		Tritium	
		April	Oct	April	Oct	April	Oct
Aiken	Stream & well	1.1	0.8	3	6	ND	410
Allendale	Deep well	1.4	0.4	7	ND	ND	ND
Augusta	River	0.3	0.3	ND	ND	ND	ND
Barnwell	Deep well	ND	0.2	ND	ND	ND	ND
Bath	Deep well	0.4	0.4	ND	ND	ND	ND
Blackville	Deep well	ND	0.6	ND	ND	ND	ND
Clearwater	Lake	ND	0.4	ND	ND	ND	570
Jackson	Deep well	3.7	3.7	9	ND	ND	ND
Langley	Deep well	0.5	1.2	ND	ND	ND	ND
New Ellenton	Deep well	0.4	2.2	ND	ND	ND	ND
North Augusta	River	ND	0.5	ND	ND	ND	ND
Sardis	Deep well	ND	ND	ND	ND	ND	ND
Waynesboro	Stream	ND	0.2	ND	ND	ND	410
Williston	Deep well	1.6	0.6	ND	ND	ND	ND
Beaufort Water Plant[b]	Partially River					4160	
Savannah Water Plant[b]	Partially River					5800	

[a] Semiannual analyses.
[b] Average of monthly analyses.
ND Less than sensitivity of analysis.

TABLE 8. GAMMA RADIATION[a]

(See figure 1)

At Air Monitoring Stations					Four Corners of Operating Areas (average)				
	Dose Rate, mR/24 Hours			Average Annual		Dose Rate, mR/24 hours			Average Annual
Location	Max	Min	Avg	Dose, mR	Area	Max	Min	Avg	Dose, mR
Onplant									
200-F Area	0.91	0.86	0.88	321	200-F	2.42	0.19	0.95	347
200-H Area	.64	.46	.54	197	200-H	1.84	.20	.66	241
200-A Area	.32	.30	.31	113	100-P	0.31	.21	.26	95
Par Pond Dam	.25	.24	.25	91	100-K	.96	.11	.42	153
Dunbarton Fire Tower	0.25	0.22	.24	88	100-C	0.28	0.17	0.23	84
Average			0.44	162					
Plant Perimeter									
Talatha Gate	0.20	0.18	0.19	69					
Williston Gate	.19	.17	.18	66					
Barnwell Gate	.18	.18	.18	66					
Pattersons Mill	.16	.16	.16	58					
Allendale Gate	.14	.13	.13	47					
400-D	.19	.18	.19	69					
Jackson	.21	.19	.20	73					
Green Pond	0.19	0.16	.17	62					
Average			0.18	64					
25-Mile Radius									
Aiken Airport	0.20	0.18	0.19	69					
Aiken State Park	.16	.14	.15	55					
Williston	.20	.17	.19	69					
Barnwell	.21	.18	.20	73					
Allendale	.20	.15	.18	66					
Highway 301	.25	.17	.22	80					
Sardis	.21	.20	.20	73					
Waynesboro	.17	.15	.16	58					
Bush Field	.23	.20	.21	77					
Langley	0.20	0.17	.18	66					
Average			0.19	69					
100-Mile Radius									
Greenville[b]			0.29	106					
Columbia[b]			.19	69					
Savannah[b]			.16	58					
Macon[b]			.19	69					
Average			0.21	76					

[a] Monthly measurements with thermoluminescent dosimeters (TLD's).
[b] One quarterly measurement.

TABLE 9. RADIOACTIVITY IN PLANT STREAM WATER,[a]

(See figure 5.)

Location	Alpha, pCi/ℓ		Nonvolatile Beta, pCi/ℓ		Tritium pCi/mℓ		Radiocesium, pCi/ℓ		$^{89,90}Sr$, pCi/ℓ		^{90}Sr, pCi/ℓ	
	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg
Tims Branch												
2 700 Area effluent	33	10	24	9	12	ND						
2A Downstream of 700-Area Seepage Basins	46	13	45	9	11	ND						
3 300 Area effluent	3200	750	3000	1200								
5 Road C	6.3	2.0	16	6								
Upper Three Runs												
2 F-Area storm sewer	460	42	590	88								
3 Road C	5.4	1.0	12	7								
4 Road A	1.4	0.6	14	ND	36	4	8	ND				
400-D effluent	1.1	0.3	20	5	4300	400						
Four Mile Creek												
1B H-Area below Cooling Tower effluent	7.3	1.8	380	240	43	15	550	260	28	8		
1C H-Area effluent	120	15.7	230	72	7300	220	55	<30	160	22		
2 Road 4	4.9	1.6	99	53	540	100	100	41	25	10		
2B Upstream of F-Area effluent	3.8	1.3	180	60	1500	730	190	42	30	8		
3 F-Area effluent	14.1	3.2	330	74	41	12	150	33	31	6		
4 Downstream of F and H Areas at Road C	8.7	3.1	580	98	1600	640	250	42	24	10		
7A Road A-7	5.1	1.5	280	130	960	630	59	30	160	86		
6 Road A	0.9	0.2	38	8	170	54	9	ND	7	2	4.7	2.9
Pen Branch												
3 Road A	0.9	0.2	26	7	630	110	28	ND	200	6	1.8	0.7
Steel Creek												
5 2-miles below Road A	0.7	0.2	43	16	2200	300	31	14	8	ND	2.5	1.7
6 Mouth	0.5	0.1	17	4	120	40	20	ND	ND	ND	2.0	1.1
Par Pond												
2 Pumphouse	1.1	0.2	31	16	53	34	27	14	10	ND		
3 P-Area cooling water	0.9	0.3	30	14	58	42						
Lower Three Runs												
1 Lower Three runs Tributary[b]	6.5	2.6	15	7	8	ND						
1A Road B	0.9	0.2	20	12	43	34						
2 Patterson's Mill	1.3	0.2	29	10	38	17	44	9	10	ND		
3 Road A	1.0	0.2	18	6	29	8	19	ND	ND	ND	2.2	1.4

[a] Weekly analysis.
[b] Weekly grab sample.
ND Less than sensitivity of analysis.

TABLE 10. RADIOACTIVITY IN RIVER WATER,[a]

(See figure 5.)

Location	Alpha, pCi/ℓ		Nonvolatile Beta, pCi/ℓ		Tritium, pCi/mℓ	
	Max	Avg	Max	Avg	Max	Avg
Savannah River						
2R Dissolved	0.6	0.2	9	<4	1.21	0.43[b]
2R Suspended	.5	.2	10	<4	-	-
4R	.4	.2	11	<4	46.84	10.64[b]
8R	.5	<0.2	13	<4	-	-
9R	.7	.2	10	<4	-	-
10R Dissolved	0.5	<0.2	8	<4	10.91	6.62[b]
10R Suspended	1.1	.2	8	<4	-	-
Edisto River (Control)	1.9	0.6	38	4	1.26	0.53[b]

[a] Weekly analysis.
[b] Monthly composite of weekly raw water samples. Sensitive method; increased volume and counting time, sensitivity 0.3 pCi/mℓ.
- No analysis.

TABLE 11. RADIONUCLIDES IN SAVANNAH RIVER WATER, pCi/ℓ

(See figure 5.)

Radionuclide	Sensitivity of Analysis	1 Mile Upstream from Upper Three Runs Creek 2R (control)	8 Miles Downstream from Lower Three Runs Creek at Highway 301 10R	% of CG at Highway 301
^{3}H	300	430	6600	0.22
^{35}S	5.0	ND	ND	<0.01
^{51}Cr	4.3	ND	ND	<0.001
^{54}Mn	0.4	ND	ND	<0.0004
^{60}Co	1.4	ND	ND	<0.005
^{65}Zn	1.1	ND	ND	<0.001
^{89}Sr	0.3	ND	0.2	0.007
^{90}Sr	0.01	0.4	0.5	0.17
^{95}Zr-^{95}Nb	0.5	ND	ND	<0.001
$^{103,106}Ru$	3.2	ND	ND	<0.03
^{131}I	0.2	ND	ND	<0.07
^{137}Cs	<0.01	ND	0.02	<0.001
^{140}Ba-^{140}La	1.6	ND	ND	<0.01
$^{141,144}Ce$	2.5	ND	ND	<0.02
^{239}Np	2.2	ND	ND	<0.002

ND = Less than sensitivity of analysis.

TABLE 12. TRITIUM IN TRANSPORT IN STREAMS AND SAVANNAH RIVER WATER, Ci/yr

(See figure 5.)

Location	Tritium
Four Mile Creek	16,800
Pen Branch	17,400
Steel Creek	15,500
Lower Three Runs	2,100
Total →	51,800
River control	5,600
River downstream from plant (Highway 301)	66,700
Apparent plant contribution at Highway 301	61,100

TABLE 13. RADIOACTIVITY IN SEEPAGE BASIN WATER,[a] pCi/mℓ

(See figures 6 & 7.)

Basin	Alpha		Nonvolatile Beta		Radioiodine		Tritium (Multiply by 10^3)		^{106}Ru		^{51}Cr	
	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg
200-F												
1	2.8	1.5	970	310	96	9	120	74	480	130	-	-
2	2.8	1.2	380	160	24	3	120	50	200	78	-	-
3	2.4	1.1	225	110	1	<1	59	34	110	59	-	-
200-H												
1	3.3	0.3	1800	410	37	12	220	110	770	98	480	120
2	0.3	0.2	420	210	19	4	170	95	65	24	124	56
3	<0.1	<0.1	10	7	<1	<1	4	2	2	<1	1	<1
4	0.3	0.1	290	150	12	2	120	76	30	19	91	29
700-A												
1	210.0	35.6	230	36	-	-	2.8	1.4	-	-	-	-
300-A	0.08	0.02	0.46	0.07	-	-	-	-	-	-	-	-
TNX												
1	3.25	1.32	5.5	2.6	-	-	0.04	0.01	-	-	-	-

Basin	$^{58,60}Co$		$^{89,90}Sr$		^{95}Zr-^{95}Nb		^{103}Ru		^{125}Sb		$^{134,137}Cs$		$^{141,144}Ce$	
	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg	Max	Avg
200-F														
1	16	<2	10	2	130	55	140	30	14	2	53	23	5	<4
2	5	<2	8	2	30	12	48	16	4	1	32	18	6	<3
3	3	<1	8	2	15	5	21	7	1	<1	24	17	3	<2
200-H														
1	22	6	47	16	110	33	130	29	11	3	57	28	300	54
2	6	3	19	10	18	7	20	9	3	2	31	23	49	15
3	<1	<1	1	1	3	2	<1	<1	<1	<1	3	2	<1	<1
4	6	2	13	6	7	2	15	5	2	22	20	16	29	6

[a] Monthly analysis.
- No analysis.

TABLE 14. RADIOACTIVITY IN R-AREA SEEPAGE BASIN WELLS,[a] pCi/ℓ

(See figure 8.)

Well	Alpha Max	Alpha Avg	Nonvolatile Beta Max	Nonvolatile Beta Avg
A-7	0.3	0.2	8	6
A-8	1.0	0.8	7	5
A-9	0.7	0.5	11	8
A-10	0.8	0.4	21	18
B-7	2.0	1.0	36	16
C-3	0.4	0.2	47	38
C-4	0.5	0.5	11	10
C-5	0.8	0.6	130	79
C-6	1.0	0.4	24	19
C-7	0.8	0.6	34	25
D-1	1.0	0.6	100	26
D-2	0.8	0.4	260	210
D-2B	2.5	1.7	400	130
D-2C	2.8	1.7	5,400	2,700
D-3	0.5	0.4	15	9
E-1	3.7	1.8	490	220
E-1B	3.9	1.9	160	46
E-1C	1.9	1.2	220	43
E-2	3.2	1.4	140	42
E-3	3.5	1.7	89	52
E-4	4.3	2.2	4,400	1,600
E-4B	4.1	2.4	4,400	2,700
E-4C	4.0	2.6	9,700	5,000
E-5	3.3	2.1	250	130
E-6	3.5	2.4	22,000	13,000
E-7	1.8	0.9	19	12
E-8	2.5	1.6	73	26
E-9	2.0	0.7	130	36
E-10	1.7	1.3	52	22
E-11	3.9	2.2	800	490
E-12	6.9	2.1	810	760
E-13	4.8	2.1	440	250

[a] Monthly analysis on B-7 and D-1 through E-13; other wells during Jul, Aug, and Sept.

TABLE 15. RADIOACTIVITY IN ZW, BURIAL GROUND, AND Z WELLS

(See figures 9 & 10.)

Well	Alpha, pCi/ℓ Max	Alpha, pCi/ℓ Avg	Nonvolatile Beta, pCi/ℓ Max	Nonvolatile Beta, pCi/ℓ Avg	Tritium, pCi/mℓ Max	Tritium, pCi/mℓ Avg
ZW[a]						
1	-	2.1	-	7	30	26
2	-	0.8	-	ND	180	140
3	-	0.9	-	ND	18	16
4	-	1.2	-	10	27	26
5	-	1.3	-	6	160	95
6	-	1.1	-	5	36	34
7	-	0.5		ND	99	80
8	-	0.2	-	ND	15	14
9	-	0.7	-	6	160	150
10	-	1.4	-	ND	46	44
Burial Ground[b]						
1	0.7	0.4	6	4	82	60
2	0.7	0.4	7	ND	210	140
3	1.6	1.3	20	10	170	93
4	1.0	0.8	5	4	350	200
6	0.6	0.3	14	8	91	70
7	1.2	0.5	14	8	124	56
9	0.9	0.7	20	6	100	77
12	3.1	1.5	14	10	210	84
18	1.4	0.9	12	6	58	46
24[c]	26.0	10.6	1100	510	54	47
25	5.0	3.7	18	15	50	44

Tritium in Groundwater,[a] pCi/ml

Z Well	March	Z Well	March	Z Well	March
1	19	11	110	15	47
2	22	12	8	17	12
3	340	13	21	18	18
4	-	14	-	19	16
8	340			20	9

[a] March analysis. March and August analyses of ZW wells for tritium.
[b] Quarterly analysis.
[c] Contaminated temporary well.
-No analysis.
ND Less than sensivitity of the analysis.

TABLE 16. RADIOACTIVITY IN 200-AREAS SEEPAGE BASIN WELLS,[a]

(See figures 6 & 7)

Well	Alpha, pCi/ℓ Maximum	Alpha, pCi/ℓ Average	Nonvolatile Beta, pCi/ℓ Maximum	Nonvolatile Beta, pCi/ℓ Average	Tritium, pCi/mℓ Maximum	Tritium, pCi/mℓ Average
F Area						
1	7500	1200	630,000	320,000	200,000	57,000
2	9200	3300	560,000	190,000	120,000	56,000
4	1000	630	27,000	23,000	36,000	32,000
9	1	1	30	21	27,000	25,000
10	760	760	28,000	28,000	14,000	14,000
14	48	37	9,400	6,000	20,000	19,000
15	4	3	97	85	760	450
16	68	47	3,700	2,300	42,000	21,000
17	2	2	40	24	78	52
18	4	2	62	35	45	36
19	4	3	68	48	53	38
23	2	1	48	28	220	150
24	3	2	39	20	68	58
25	4	3	82	51	69	67
H Area						
1	<25	<22	<450	<440	1,600	860
2	4	3	44	41	15,000	14,000
4	4	3	1,300	560	3,000	1,200
6	3	2	3,400	2,500	38,000	35,000
7	3	2	28	16	240	210
8	1	1	130	85	9,100	8,600
9	5	4	160	140	6,800	6,500
10	1	1	15	8	9,400	9,100
11	1	1	120	50	180	150
12	1	1	138	58	11,000	7,400
13	1	1	9	5	250	110
14	2	1	57	29	3,600	3,100
15	3	2	7	5	670	270
16	2	1	10	7	66	63
17	2	1	12	10	89	82
18	3	2	24	19	130	130
19	1	1	12	9	3,100	2,700
BG-10					37,000	34,000

[a] Monthly analysis on wells F1, F2, and H12.
All other wells analyzed in Jul, Aug, and Sept.

TABLE 17. RADIOACTIVITY IN 241-F TANK FARM WELLS[a]

(See figure 11.)

		Alpha, pCi/ℓ Max	Alpha, pCi/ℓ Avg	Nonvolatile Beta, pCi/ℓ Max	Nonvolatile Beta, pCi/ℓ Avg	Tritium, pCi/mℓ Max	Tritium, pCi/mℓ Avg
FTF	1	3.34	2.19	32	16	77	40
	2[b]	1.19	1.09	5	4	1	1
	3[c]	1.09	0.80	30	27	7	6
	4	1.83	1.18	21	12	21	16
	5	2.58	1.22	17	9	84	39
	7[c]	0.46	0.33	959	577	75	54
	8	3.09	1.94	31	18	46	22
	9	6.80	1.93	90	35	54	41
	10	6.49	5.12	45	21	23	18
	11	13.04	9.43	70	33	40	25
	12[b]	11.71	6.15	109	109	35	35
	13[d]	0.07	0.07	13	13	13	13
	14[d]	5.94	5.94	8	8	18	18

[a] Monthly analyses beginning 7/73.
[b] Includes only two analyses.
[c] Includes only three analyses.
[d] Includes only one analysis.

TABLE 18. RADIOACTIVITY IN 241-H TANK FARM WELLS,[a]

(See figure 12.)

		Alpha, pCi/ℓ Max	Alpha, pCi/ℓ Avg	Nonvolatile Beta, pCi/ℓ Max	Nonvolatile Beta, pCi/ℓ Avg	Tritium, pCi/mℓ Max	Tritium, pCi/mℓ Avg
HPM	1	2.28	1.66	41	28	-	-
	2	1.57	1.16	41	36	-	-
	3[b]	2.52	1.15	2041	166	-	-
	4	4.82	1.58	189	88	-	-
	6	2.04	0.93	504	339	-	-
	7	2.20	1.55	76	26	-	-
	8	1.32	0.80	44	21	-	-
	9	1.76	1.26	66	20	-	-
	10	1.76	0.88	103	32	-	-
	11	2.64	1.20	363	23	-	-
	12	3.84	1.40	594	39	-	-
HP	1	1.72	0.90	310	139	75	45
	5[b]	1.47	1.09	546	297	122	62
	8	2.04	1.02	1970	776	124	83
241-H Lower Tank Farm		3.08	0.82	192	16	90	50
HTF	1[c]	0.33	0.30	4	2	109	109
	2[c]	0.54	0.47	3	2	18	18
	3[c]	0.26	0.26	6	4	36	36
	4[c]	0.59	0.37	8	5	67	67
	5[d]	1.19	1.19	3	3	56	56
	6[d]	1.19	1.19	7	7	17	17
	7[c]	2.31	2.05	44	33	2	2
	8[e]	0.40	0.34	24	24	-	-
	9[e]	5.68	1.69	25	15	18	16
	10[e]	0.57	0.46	28	21	4	3
	11[e]	0.69	0.56	36	15	7	7
	12[d]	1.20	0.63	5	5	14	14
	13[d]	0.73	0.73	4	4	15	15
	14[d]	0.86	0.86	<1	<1	21	21
	15[d]	1.12	1.12	8	8	216	216

[a] Monthly analyses Jan — April, quarterly July — Dec.
[b] Monthly analyses Jan — April, weekly July — Dec.
[c] Includes only 2 analyses.
[d] Includes only 1 analysis.
[e] Includes 5 analyses.

TABLE 19. RADIOACTIVITY IN SOIL
(see figure 13)

Plant Perimeter	Depth, cm	Concentration, pCi/g ^{239}Pu Sensitivity of Analysis: 0.0008	Concentration, pCi/g ^{238}Pu Sensitivity of Analysis: 0.0006	Concentration, pCi/g ^{137}Cs Sensitivity of Analysis: 0.04	Concentration, pCi/g ^{90}Sr Sensitivity of Analysis: 0.001	Deposition, mCi/km^2 ^{239}Pu	Deposition, mCi/km^2 ^{238}Pu	Deposition, mCi/km^2 ^{137}Cs	Deposition, mCi/km^2 ^{90}Sr
NW quadrant	0 - 5	0.0163	0.0015	1.10	0.371	1.22	0.11	82.5	27.8
	5 - 15	0.0026	0.0007	ND	0.016	0.39	0.10	<3.0	2.4
	15 - 22.5	ND	ND	ND	0.015	<0.04	<0.04	<2.0	1.8
	22.5 - 30	ND	ND	ND	0.013	<0.08	<0.08	<2.0	1.4
	30 - 60	NA	NA	NA	0.006	NA	NA	<9.0	2.6
NE quadrant	0 - 5	0.0132	0.0011	0.90	0.385	0.99	0.08	67.5	28.9
	5 - 15	0.0025	ND	ND	0.038	0.38	<0.06	<3.0	5.8
	15 - 22.5	ND	ND	ND	0.058	<0.06	<0.06	<2.0	6.5
	22.5 - 30	ND	ND	ND	0.017	<0.06	<0.04	<2.0	1.9
	30 - 60	NA	NA	NA	0.016	NA	NA	<9.0	7.0
SE quadrant	0 - 5	0.0140	0.0009	0.76	0.282	1.05	0.07	57.0	21.1
	5 - 15	0.0027	ND	ND	0.127	0.40	<0.06	5.7	19.1
	15 - 22.5	ND	ND	ND	0.074	<0.06	<0.06	<2.0	8.2
	22.5 - 30	ND	ND	ND	0.033	<0.03	<0.02	<2.0	3.8
	30 - 60	NA	NA	NA	0.029	NA	NA	9.0	13.0
SW quadrant	0 - 5	0.0129	0.0009	0.80	0.221	0.96	0.07	60.0	16.6
	5 - 15	0.0021	ND	0.05	0.188	0.32	<0.06	7.5	28.2
	15 - 22.5	ND	ND	ND	0.056	<0.06	<0.06	<2.0	6.4
	22.5 - 30	ND	ND	ND	0.039	<0.09	<0.08	<2.0	4.4
	30 - 60	NA	NA	NA	0.012	NA	NA	<9.0	4.9
Distant Locations (~ 100 mi)									
Clinton, S. C.	0 - 5	0.0175	0.0011	1.30	NA	1.31	0.08	97.5	NA
	5 - 15	0.0023	ND	0.11	NA	0.34	<0.04	16.0	NA
	15 - 22.5	0.0014	ND	ND	NA	0.16	<0.02	<2.0	NA
	22.5 - 30	ND	ND	ND	NA	<0.09	<0.07	<2.0	NA
	30 - 60	NA	NA	NA	NA	NA	NA	<9.0	
Athens, Ga.	0 - 5	0.0141	0.0028	1.10	0.143	1.06	0.21	82.5	10.7
	5 - 15	0.0044	ND	0.16	0.290	0.66	<0.06	24.0	43.6
	15 - 22.5	ND	ND	ND	0.500	<0.08	<0.06	<2.0	56.2
	22.5 - 30	ND	ND	ND	0.096	<0.11	<0.09	<2.0	10.8
	30 - 60	NA	NA	NA	0.012	NA	NA	<9.0	5.3
Savannah, Ga.	0 - 5	0.0171	0.0007	1.10	1.014	1.28	0.05	82.5	76.0
	5 - 15	0.0028	ND	0.09	0.156	0.42	<0.06	14.0	23.4
	15 - 22.5	ND	ND	ND	0.102	<0.08	<0.06	<2.0	11.4
	22.5 - 30	ND	ND	ND	0.013	<0.08	<0.04	<2.0	1.4
	30 - 60	NA	NA	NA	0.002	NA	NA	<9.0	0.9
Six Additional Plant Perimeter Locations									
NW quadrant 36	0 - 15	0.0091	ND	0.44	0.062	2.08	<0.251	99.0	13.9
NE quadrant 37	(All	0.0107	ND	0.41	0.082	2.45	<0.626	92.2	19.8
SE quadrant 47	Locations)	0.0080	ND	0.38	0.925	1.83	<0.183	85.5	208.1
SE quadrant 48		0.0083	ND	0.41	0.680	1.90	<0.183	92.2	153.0
SW quadrant 49		0.0094	ND	0.31	0.173	2.15	<0.343	67.5	38.9
SW quadrant 50		0.0081	ND	0.32	0.665	1.85	<0.251	72.0	149.6
On Plant									
1	0 - 15	0.0370	0.0466	0.39	0.320	8.46	10.6	87.8	72.0
2	(All	0.0313	0.0010	0.37	0.458	7.16	0.23	83.2	103.5
3	Locations)	0.0642	0.0137	0.38	0.138	14.7	3.13	85.5	31.0
4		0.0899	0.0234	0.37	0.134	20.6	5.35	83.2	30.2
5		2.34	0.398	1.00	0.324	535.0	91.0	225.0	72.9
6		0.203	0.0302	0.41	0.612	46.4	6.90	92.2	137.7
7		0.0336	0.0029	0.47	0.570	7.68	0.66	105.8	128.2
8		0.0087	0.0033	0.37	0.206	1.99	0.75	83.2	46.4
9		0.0339	0.0030	0.50	0.288	7.75	0.69	112.5	64.8
10		0.0375	0.0072	0.50	0.048	8.57	22.2	112.5	10.8
11		0.1148	0.0068	0.31	0.118	26.2	1.55	69.8	26.6
12		0.1636	0.0072	0.38	0.308	37.4	1.64	85.5	69.3
13		0.0532	0.0040	0.40	0.057	12.2	0.91	90.0	12.8
14		0.0140	0.0028	0.25	0.162	3.2	0.64	56.2	36.4
15		0.0936	ND	0.55	0.388	21.4	0.71	123.8	87.3
16		0.0289	0.0048	0.32	0.140	6.61	1.10	72.0	31.5
17		0.0159	0.0026	0.33	NA	3.63	0.59	74.2	NA
18		0.0205	0.0044	0.37	0.144	4.69	1.00	83.2	32.4
19		0.0117	ND	0.45	0.262	2.67	<0.48	101.2	59.0
20		0.0078	0.0008	0.39	0.212	1.78	0.18	87.8	47.7
21		0.0125	ND	0.33	0.166	2.86	<0.41	74.2	37.4
22		0.0114	0.0008	0.25	0.173	2.61	0.18	56.2	38.9
23		0.0095	0.0008	0.34	0.247	2.17	0.18	76.5	55.6
24		0.0103	ND	0.35	0.052	2.35	<0.21	78.8	11.7
25		0.0086	0.0011	0.33	0.302	1.96	0.25	74.2	68.0
26		0.0097	ND	0.41	0.522	2.22	<0.27	92.2	117.4
27		0.0090	0.0007	0.46	0.398	2.06	0.16	103.5	89.6
28		0.0091	ND	0.27	0.191	2.08	<0.25	60.8	43.0
29		0.0087	ND	0.40	0.193	1.99	<0.23	90.0	43.4
30		0.0070	ND	0.44	0.134	1.60	<0.21	99.0	30.2
31		0.0083	ND	0.40	0.164	1.90	<0.23	90.0	36.9
32		0.0055	ND	0.29	0.197	1.26	<0.14	65.2	44.3
33		0.0095	ND	0.39	0.164	2.17	<0.16	87.8	36.9
34		0.0068	ND	0.40	0.286	1.55	<0.14	90.0	64.4
35		0.0084	ND	0.29	0.226	1.92	<0.34	65.2	50.8
38		0.0101	ND	0.42	0.148	2.31	<0.41	94.8	33.3
39		0.0082	ND	0.39	0.087	1.87	<0.32	87.8	19.6
40		0.0071	0.0007	0.30	0.216	1.62	0.16	67.5	48.6
41		0.0058	0.0005	0.30	0.737	1.32	0.11	67.5	165.8
42		0.0131	0.0022	0.39	0.480	2.99	<0.53	87.8	108.0
43		0.0107	ND	0.35	0.714	2.45	<0.57	78.8	160.6
44		0.0080	0.0007	0.41	1.116	1.83	<0.18	92.2	251.1
45		0.0069	ND	0.23	0.168	1.58	<0.25	51.8	37.8
46		0.0069	0.0040	0.34	0.500	1.58	0.91	76.5	112.5

ND - Less than sensitivity of analysis.

NA - No analysis.

TABLE 20. RADIOACTIVITY IN FISH FROM EFFLUENT STREAMS AND THE SAVANNAH RIVER, PCi/g (Wet Weight)

(See figure 5.)

Location	Species[c]	Number of Fish	$^{89,90}Sr$[a] Bone Max	$^{89,90}Sr$[a] Bone Avg	^{137}Cs[b] Whole Fish Max	^{137}Cs[b] Whole Fish Avg
Streams						
Par Pond	Bream	62			16	15
	Catfish	0			-	-
	Bass	74			31	26
	Composite		48	26		
Lower Three Runs (Patterson's Mill)	Bream	60			17	7
	Catfish	21			17	12
	Bass	1			-	13
	Composite		10	5		
Steel Creek (Road A)	Bream	65			65	26
	Catfish	40			97	40
	Bass	29			130	57
	Composite		49	27		
Steel Creek (mouth)	Bream	82			16	1
	Catfish	39			8	2
	Bass	3			7	3
	Composite		20	10		
Four Mile Creek (Road 3)	Bream	76			92	26
	Catfish	6			77	69
	Bass	3			85	65
	Composite		690	290		
Cassels' Pond (Four Mile Creek, 3-mi below Road A)	Bream	134			48	4
	Catfish	12			2	1
	Bass	31			3	1
	Composite		77	29		
River						
2R	Bream	63			1.6	ND
	Catfish	51			0.5	ND
	Bass	0			-	-
	Composite		14	6		
8R	Bream	26			1.5	ND
	Catfish	56			2.5	ND
	Bass	0			-	-
	Composite		18	8		
10R	Bream	57			0.3	ND
	Catfish	60			4.0	ND
	Bass	1			-	0.2
	Composite		9	5		
Clarks Hill (control)	Bream	24			ND	ND
	Catfish	23			ND	ND
	Bass	8			0.3	ND
	Composite		20	7		

[a] Monthly composite of bone from all species.

[b] Individual whole fish except Par Pond fish which were composited monthly for analyses.

[c] Bream — Shellcracker, bluegill, and redbreast (Lempomis).
Catfish — predominantly yellow cat (Ictalurus).
Bass — predominantly large mouth (Micropterus).

- No sample or analysis.

ND Less than sensitivity of analysis (~0.2 pCi/g ^{137}Cs).

TABLE 21. RADIOACTIVITY IN ALGAE FROM EFFLUENT STREAMS
pCi/g (Dry Weight)

(See figure 5.)

Location	Number of Samples[a]	$^{89,90}Sr$ Max	$^{89,90}Sr$ Avg	^{137}Cs Max	^{137}Cs Avg	^{60}Co Max	^{60}Co Avg
Par Pond	12	4	1	1200	110	ND	ND
Streams							
Lower Three Runs (Patterson's Mill)	12	14	3	430	140	18	ND
Steel Creek (2-mi downstream from Road A)	8	8	3	90	29	ND	ND

[a] Monthly composites.
ND Less than sensitivity of analysis.

TABLE 22. MERCURY IN FISH FROM EFFLUENT STREAMS AND THE SAVANNAH RIVER[a]

Location	No. of Fish Assayed: Bream	Catfish	Bass	Composite Mercury Content µg Hg/g Flesh (Wet Weight): Bream	Catfish	Bass
River						
Clark Hill (control)	24	23	8	0.22	0.10	1.10
2R	63	51	-	0.58	0.33	-
8R	26	56	-	0.68	0.38	-
10R	57	80	1	0.22	0.47	2.84
Streams						
Upper Three Runs (control)	-	9	1	-	0.36	1.11
Four Mile Creek (Cassels' Pond)	134	-	31	0.63	-	4.86
Four Mile Creek (Road 3)	76	-	3	0.73	-	1.38
Steel Creek (Road A)	65	40	29	0.70	0.58	3.64
Steel Creek (mouth)	82	39	3	0.28	0.50	2.71
Lower Three Runs (Patterson's Mill)	60	21	1	0.24	1.31	1.34

[a] Semi-annual composite of each species.
- No sample or analysis.

TABLE 23. RADIOACTIVITY IN TERRESTRIAL ANIMALS & WATERFOWL,
pCi/g (Wet Weight)

Species	Number of Samples	$^{89,90}Sr$ in Bond Max	$^{89,90}Sr$ in Bond Avg	^{137}Cs in Flesh Max	^{137}Cs in Flesh Avg
Beaver	1	-	20	-	110
Deer	1158	23	14	31	6
Hog	12	-	-	5	2
Grey Fox	4	8	6	4	3
Opossum	16	10	6	15	6
Squirrel	1	-	29	-	4
Rabbit	4	19,000	5700	63	18
Raccoon	6	10	4	3	2
Rat	21	-	-	310	45
Coot (Par Pond)	13	9	4	100	29
Duck (Par Pond)	10	14	6	80	18
Duck (Steel Creek, Road B)	2	23	16	30	25
(Steel Creek, Road A)	5	27	10	110	67
(Steel Creek, Swamp)	2	8	8	1.5	1

- No sample or analysis.
ND Less than sensitivity of analysis.

TABLE 24. FECAL COLIFORM BACTERIA IN THE SAVANNAH RIVER AND PLANT STREAMS,[a] COUNT/100 mℓ

(See figure 5.)

	Max	Min	Geometric Mean
River Above Plant	4,200	50	1,140
River Below Plant	1,450	10	460
Upper Three Runs at Road F	1,470	0	60
Upper Three Runs at Road A	210	0	60
Beaver Dam Creek near swamp	1,980	0	470
Four Mile at Road A	1,700	0	80
Pen Branch at Road A	1,470	0	90
Steel Creek at Road A	2,300	10	170
Lower Three Runs at Road A	900	0	100
Lower Three Runs at Tabernacle Church Road	2,320	0	60
Central Shops Lagoon	122,500	640	17,973

[a] Weekly analyses

TABLE 25. WATER QUALITY — SAVANNAH RIVER[a]

(See figure 5.)

	Above Plant — 2R			Pump House 681-5G[b]			Below Plant — 10R		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Ph	7.4	6.0		7.1	6.8		7.0	6.0	
Alkalinity, mg/ℓ $CaCo_3$	25	9	15	19	14	16	26	10	13
Biochemical Oxygen Demand, mg/ℓ	3.7	0.5	1.6	1.3	0.3	0.8	4.0	0.4	1.5
Color, APHA units	-	-	-	120	10	55	-	-	-
Conductivity, umhos	82	42	60	75	48	60	81	43	60
Dissolved Oxygen, mg/ℓ	12.8	6.2	9.1	-	-	-	11.4	6.4	8.2
Hardness, mg/ℓ	45	7	20	14	10	13	47	7	19
Lignin, mg/ℓ	<1	<1	<1	-	-	-	2	<1	<1
Nitrite, mg/ℓ	0.21	<0.02	0.05	-	-	-	0.2	<0.02	>0.05
Nitrate, mg/ℓ	1.78	0.09	0.60	0.30[c]	0.02[c]	0.20[c]	0.10	0.09	0.50
Total Phosphate, mg/ℓ	1.7	<0.1	0.5	0.1	0.1	0.10	0.9	<0.1	0.4
Surfactant, mg/ℓ	0.04	<0.02	<0.02	-	-	-	0.05	<0.02	<0.02
Temperature, °C	26.0	7.0	18.3	25	8	17.9	26	8	18.7
Suspended Solids, mg/ℓ	41	6	16	81	5	20	34	6	15
Total Dissolved Solids, mg/ℓ	85	19	42	68	25	56	63	17	40
Volatile Solids, mg/ℓ	57	13	26	-	-	-	43	15	23
Fixed Residue, mg/ℓ	30	0	18	-	-	-	34	0	17
Turbidity, mg/ℓ	-	-	-	46	5	22	-	-	-
Aluminum, mg/ℓ	4	<0.1	1.3	-	-	-	3	<0.1	1.1
Ammonia, mg/ℓ	1.00	0.06	0.22	0.24	<0.02	0.10	0.80	0.06	0.17
Calcium, mg/ℓ	4.0	1.2	2.7	4.9	2.2	3.3	4.0	1.4	2.8
Total Organic Carbon, mg/ℓ	-	-	-	7	2	4.1	-	-	-
Chloride, mg/ℓ	11.2	2.5	5.2	7.6	4.0	5.3	10.0	2.5	4.8
Total Iron, mg/ℓ	3.0	<0.1	1.2	2.9	0.3	1.2	3.0	<0.1	0.9
Magnesium, mg/ℓ	-	-	-	1.3	1.0	1.1	-	-	-
Manganese, mg/ℓ	-	-	-	0.90	0.05	0.18	-	-	-
Mercury, mg/ℓ	<0.005	<0.002	<0.002	-	-	-	<0.005	<0.002	<0.002
Potassium, mg/ℓ	-	-	-	2.2	1.1	1.5	-	-	-
Sodium, mg/ℓ	12.0	2.5	7.2	8.1	4.4	6.3	10.8	3.6	6.9
Sulfate, mg/ℓ	7.7	<2.0	3.4	6.0	3.0	4.3	5.8	<2	3.1
Sulfide, mg/ℓ	3.6	<0.1	<0.1	-	-	-	1.5	<0.1	<0.1

[a] Monthly analyses.
[b] Analyzed by Georgia Department of Natural Resources.
[c] Combined nitrite nitrate.
- No analysis.

TABLE 26. WATER QUALITY — PLANT STREAMS (MOUTH)

(See figure 5.)

	Upper Three Runs Creek (Raod A)			Beaver Dam Creek (Mouth)			Four Mile Creek (Mouth)			Steel Creek (Mouth)		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Ph	6.7	5.6		8.4	6.0		7.4	6.0		7.1	6.1	
Aluminum, mg/ℓ	0.6	<0.5	0.3	4.0	<0.5	1.3	4.0	0.1	1.1	3.0	<0.1	0.5
Calcium, mg/ℓ	4.0	<0.1	1.6	4.0	1.3	2.3	4.0	0.1	2.6	4.0	0.3	2.3
Chloride, mg/ℓ	5.5	0.1	2.6	11.2	2.5	5.2	6.2	2.5	4.4	11.2	2.0	4.5
Total Iron, mg/ℓ	3.0	<0.1	0.6	3.0	5.2	1.2	3.0	0.1	1.1	2.0	<0.1	0.7
Mercury, mg/ℓ	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium, mg/ℓ	3.4	1.0	2.1	10.4	4.2	7.1	10.8	3.8	6.9	9.2	3.6	6.7
Sulfate, mg/ℓ	4.6	0.4	2.1	7.1	1.2	3.8	5.3	1.4	3.1	10.4	0.3	3.2
Sulfide, mg/ℓ	2.9	<0.1	1.0	3.1	<0.1	1.1	2.1	<0.1	0.7	2.4	<0.1	0.8

TABLE 27. PLANT STREAMS — WATER QUALITY
(See figure 5.)

	Tims Branch Near Upper Three Runs Creek			Four Mile Creek at Road A-7			Steel Creek at Road A		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Temperature °C	23.0	16.0	19.9	25.0	14.0	21.2	26.5	14.0	21.5
pH (Range)	6.1	7.9		7.5	5.9		7.8	6.4	
Alkalinity mg/l $CaCO_2$	23	13	17	17.5	8.3	11.7	21.0	17.5	19.2
Dis Oxygen mg/l O_2	9.4	5.1	7.4	9.1	5.3	6.5	10.9	7.3	8.8
Suspended Solids mg/l	17	<1	8	24	<1	10	19	<1	7
Volatile Solids mg/l	24	10	18	33	21	28	27	16	19
Total Dis Solids mg/l	40	28	37	63	49	56	57	37	46
Total Solids mg/l	50	35	42	65	59	62	59	48	53
Manganese mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminum mg/l Al	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ammonia mg/l NH_4	0.017	<0.001	0.008	0.015	0.001	0.007	0.015	0.001	0.006
Calcium mg/l Ca	3.19	1.21	2.05	4.52	1.55	2.79	6.37	2.07	4.74
Mercury mg/l Hg	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sodium mg/l Na	6.80	1.40	6.04	10.39	6.80	8.56	3.98	3.03	3.28
Total Iron mg/l Fe	1.11	<0.10	0.42	0.76	<0.10	0.29	0.72	0.20	0.37
Lead mg/l Pb	0.005	<0.001	0.002	0.017	0.002	0.006	0.005	0.001	0.003
Chloride mg/l Cl	3.1	1.8	2.7	3.5	1.7	3.0	4.5	3.5	4.0
Nitrite mg/l N	0.003	<0.001	0.002	0.006	<0.001	0.003	0.003	<0.001	0.002
Nitrate mg/l N	2.52	0.20	0.76	12.30	1.92	4.65	0.084	<0.001	0.026
Sulfate mg/l SO_4	2.0	0.6	1.4	7.3	1.9	4.5	2.5	<1.0	2.0
Orthophosphate mg/l PO_4	0.061	0.018	0.032	0.035	0.006	0.014	0.023	0.005	0.010
Total Phosphate mg/l PO_4	0.111	0.025	0.064	0.065	0.014	0.034	0.065	0.018	0.030

	Upper Three Runs Creek at Highway 278			Upper Three Runs Creek at Thermal Effects Lab			Upper Three Runs Creek at Road A		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Temperature °C	21	14	18	22.5	12.5	18.6	24.0	14.5	20.6
pH (Range)	7.1	5		5.6	7.6		7.4	5.7	
Alkalinity mg/l $CaCO_2$	7.0	1.0	3.0	1.5	3.5	4.1	6.0	2.0	3.8
Dis Oxygen mg/l O_2	9.0	7.3	8.2	9.7	5.7	7.9	9.2	7.5	6.8
Suspended Solids mg/l	21	1	8	17	1	10	29	8	17
Volatile Solids mg/l	22	10	13	30	6	16	27	14	19
Total Dis Solids mg/l	25	12	19	31	14	24	34	22	27
Total Solids mg/l	42	18	25	46	17	28	54	31	38
Manganese mg/l	0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Aluminum mg/l Al	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ammonia mg/l NH_4	0.034	0.002	0.010	0.015	0.002	0.007	0.015	0.002	0.008
Calcium mg/l Ca	0.26	<0.10	0.21	1.05	0.51	0.82	2.00	0.10	0.96
Mercury mg/l Hg	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sodium mg/l Na	1.50	1.10	1.28	1.40	1.20	1.30	1.53	1.07	1.39
Total Iron mg/l Fe	0.29	<0.10	0.18	0.46	<0.10	0.28	0.66	<0.10	0.31
Lead mg/l Pb	0.006	0.002	0.003	0.0290	<0.001	0.007	0.009	0.002	0.004
Chloride mg/l Cl	1.6	2.3	1.9	2.5	1.9	2.2	2.4	1.8	2.2
Nitrite mg/l N	0.002	0.001	0.001	0.003	<0.001	0.002	0.003	<0.001	0.001
Nitrate mg/l N	0.38	0.12	0.19	0.520	<0.001	0.109	0.110	<0.001	0.039
Sulfate mg/l SO_4	2.0	1.6	1.2	2.0	<1.0	1.5	2.6	<1.0	1.8
Orthophosphate mg/l PO_4	0.013	0.001	0.008	0.015	0.005	0.011	0.120	0.005	0.033
Total Phosphate mg/l PO_4	0.070	0.014	0.032	0.060	0.019	0.035	0.055	0.029	0.041

	Beaver Dam Creek Near Swamp			Savannah River at 681-3G			Lower Three Runs Creek Below Par Pond Dam			Lower Three Runs Creek At Patterson's Mill		
	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg
Temperature °C	41.0	24.5	38.5	26.0	17.0	22.3	31	16	23.5	26.0	12.5	20.2
pH (Range)	8.2	6.5		7.5	6.5		7.8	6.4		7.8	6.8	
Alkalinity mg/l $CaCO_2$	19.5	13.5	16.7	19.0	14.0	16.9	24.5	5.0	17.4	45.0	27.5	36.1
Dis Oxygen mg/l O_2	7.9	4.4	6.1	8.5	5.0	7.4	8.9	5.0	7.1	8.1	5.9	7.3
Suspended Solids mg/l	42	7	23	26	5	16	18	<1	7	37	3	15
Volatile Solids mg/l	32	12	21	29	10	21	29	19	22	35	19	25
Total Dis Solids mg/l	54	48	52	54	45	48	52	21	37	70	53	59
Total Solids mg/l	88	56	70	79	56	65	58	39	52	88	61	73
Manganese mg/l	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.19	<0.01	0.04	0.01	<0.01	<0.01
Aluminum mg/l Al	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Ammonia mg/l NH_4	0.130	0.003	0.031	0.060	0.001	0.023	0.051	0.006	0.021	0.015	0.002	0.007
Calcium mg/l Ca	2.69	1.48	2.21	2.82	1.51	2.32	6.79	0.99	3.88	16.3	7.22	10.53
Mercury mg/l Hg	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Sodium mg/l Na	7.86	3.45	6.15	8.40	5.64	6.67	5.60	1.60	4.46	4.30	2.00	2.85
Total Iron mg/l Fe	0.29	<0.10	0.17	<0.10	<0.10	<0.10	0.38	<0.10	0.21	0.38	<0.10	0.18
Lead mg/l Pb	0.003	0.002	0.002	0.006	0.001	0.004	0.007	0.002	0.004	0.013	0.001	0.004
Chloride mg/l Cl	6.4	5.0	5.6	6.3	5.0	5.5	6.0	2.4	4.8	5.0	2.8	3.9
Nitrite mg/l N	0.290	0.001	0.058	0.320	<0.001	0.120	0.020	<0.001	0.005	0.080	<0.001	0.014
Nitrate mg/l N	1.51	0.02	0.37	2.06	0.01	0.50	0.32	<0.01	0.08	0.070	<0.001	0.017
Sulfate mg/l SO_4	9.9	3.7	6.0	5.5	3.7	4.7	3.7	<1.0	2.8	3.2	1.6	2.2
Orthophosphate mg/l PO_4	0.140	0.024	0.065	0.080	0.036	0.060	0.027	0.003	0.013	0.130	0.005	0.031
Total Phosphate mg/l PO_4	0.220	0.040	0.104	0.160	0.060	0.093	0.059	0.14	0.026	0.160	0.016	0.023

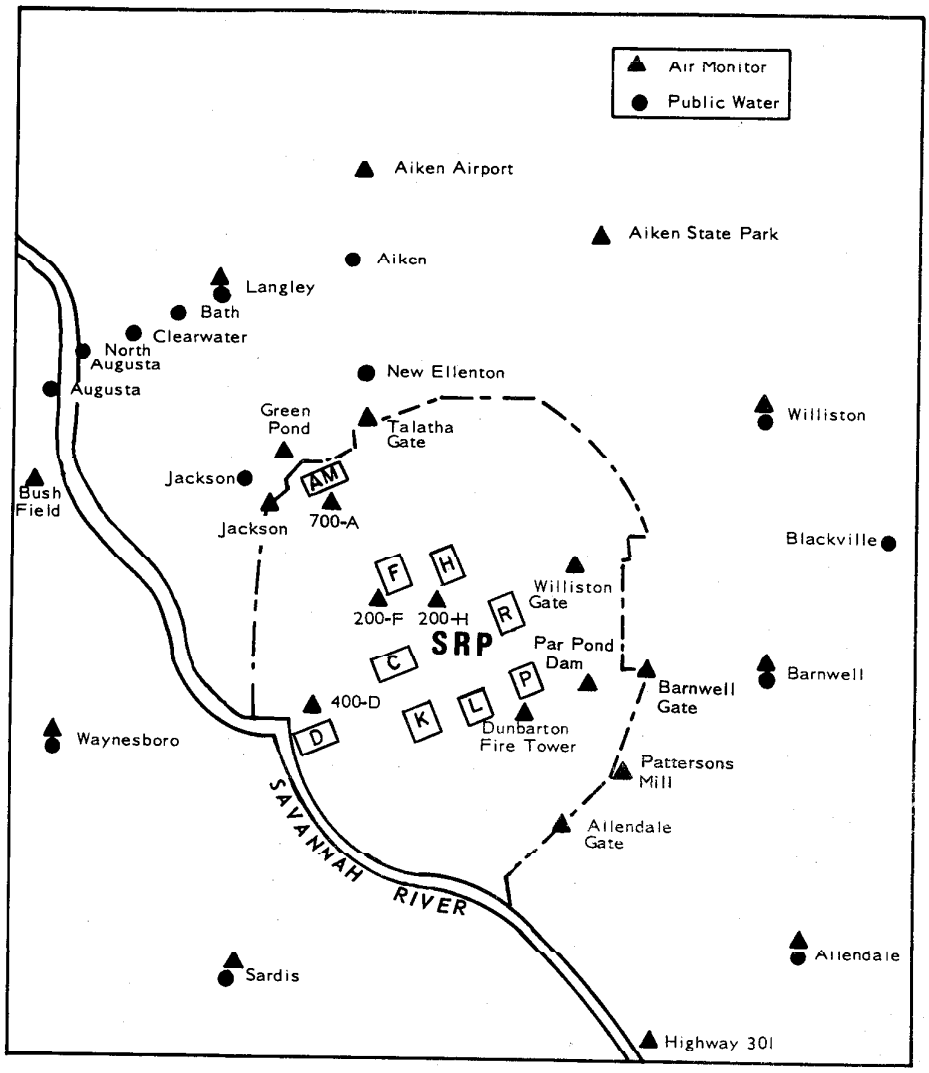


FIGURE 1. CONTINUOUS AIR MONITORING STATIONS AND PUBLIC WATER SAMPLE LOCATIONS

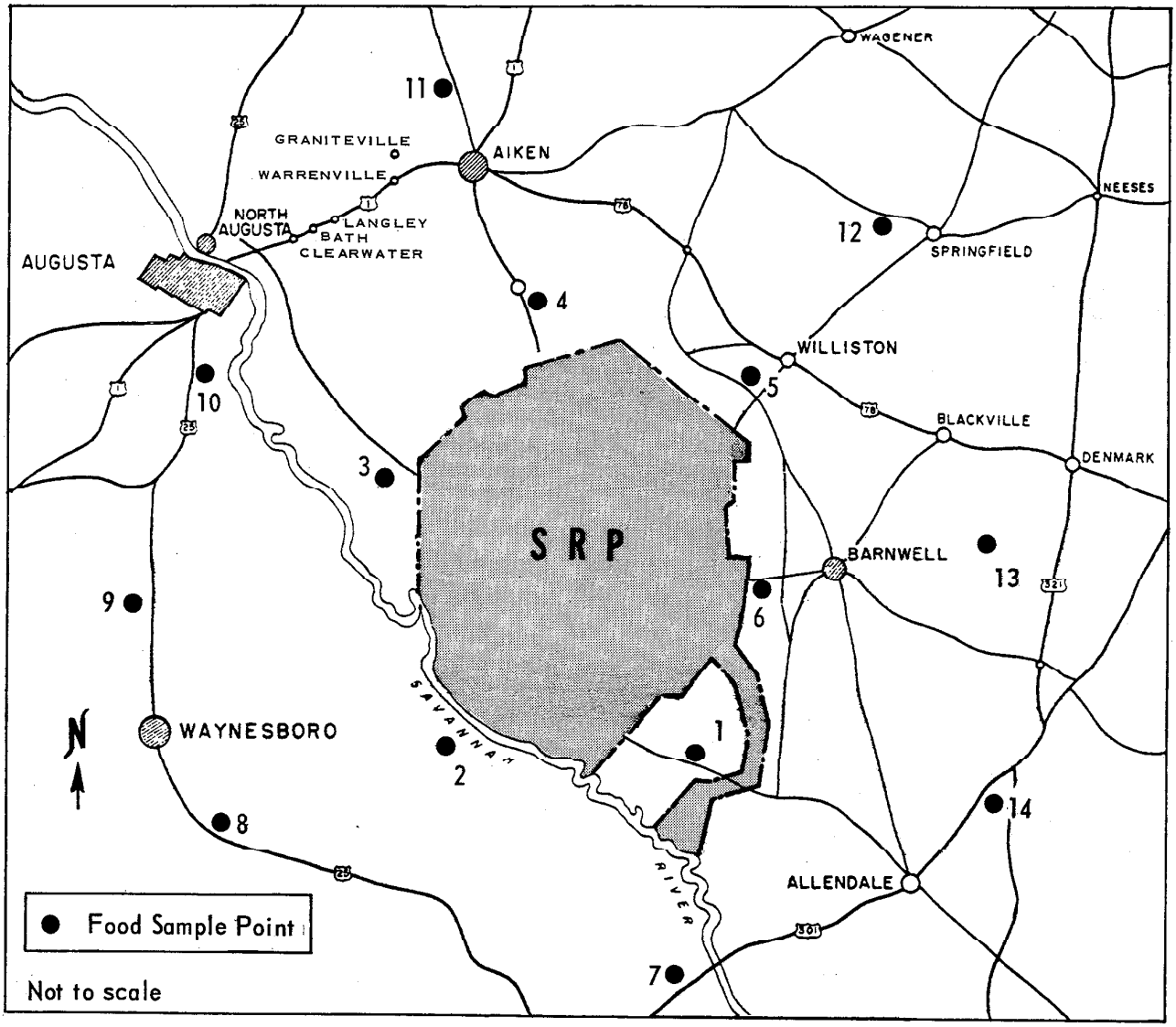


FIGURE 2. AGRICULTURAL PRODUCTS SAMPLE LOCATIONS

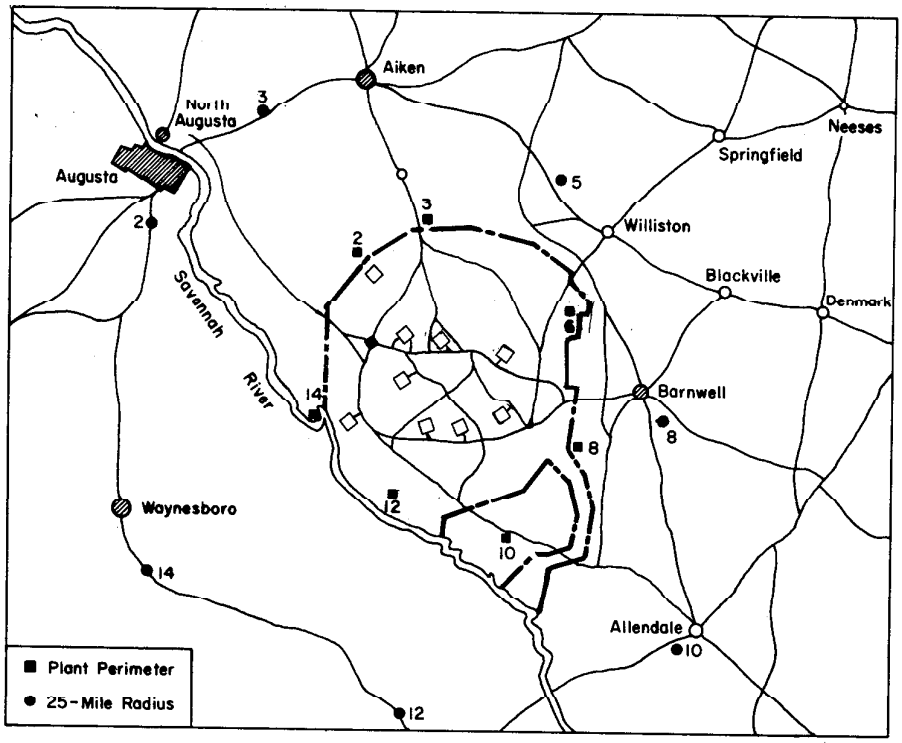
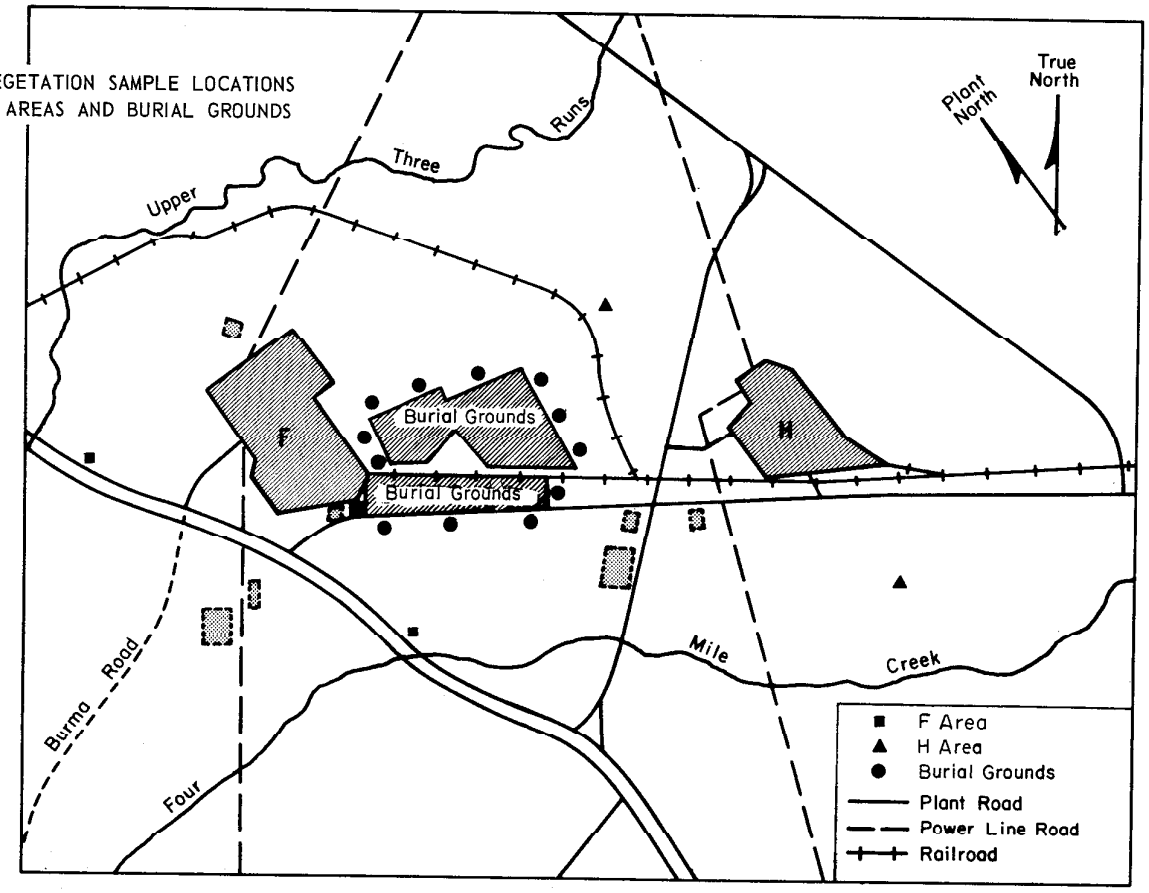


FIGURE 3. VEGETATION SAMPLE LOCATIONS (Plant Perimeter and 25-Mile Radius)

FIGURE 4. VEGETATION SAMPLE LOCATIONS IN F AND H AREAS AND BURIAL GROUNDS



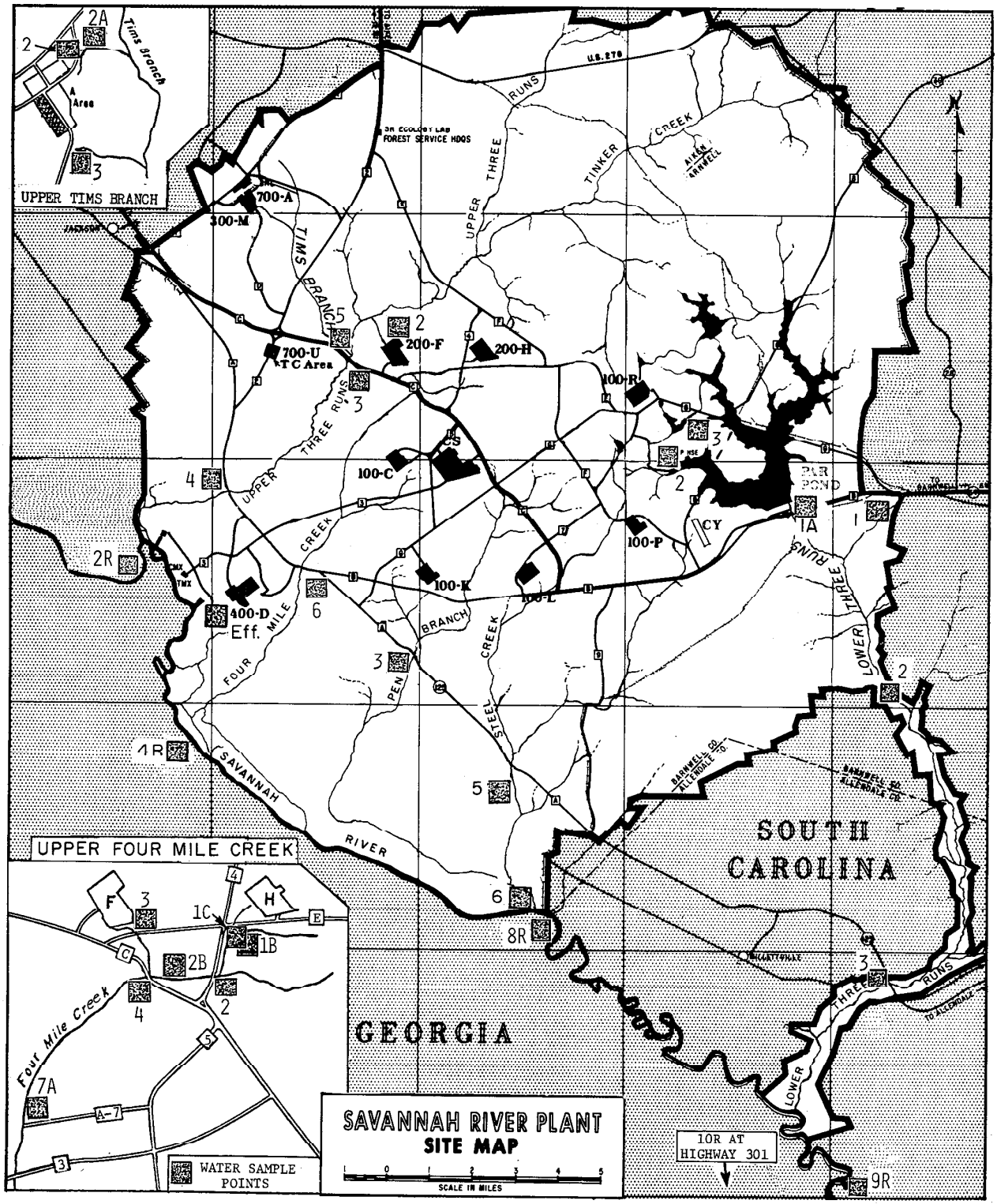


FIGURE 5. STREAM AND RIVER SAMPLE POINTS

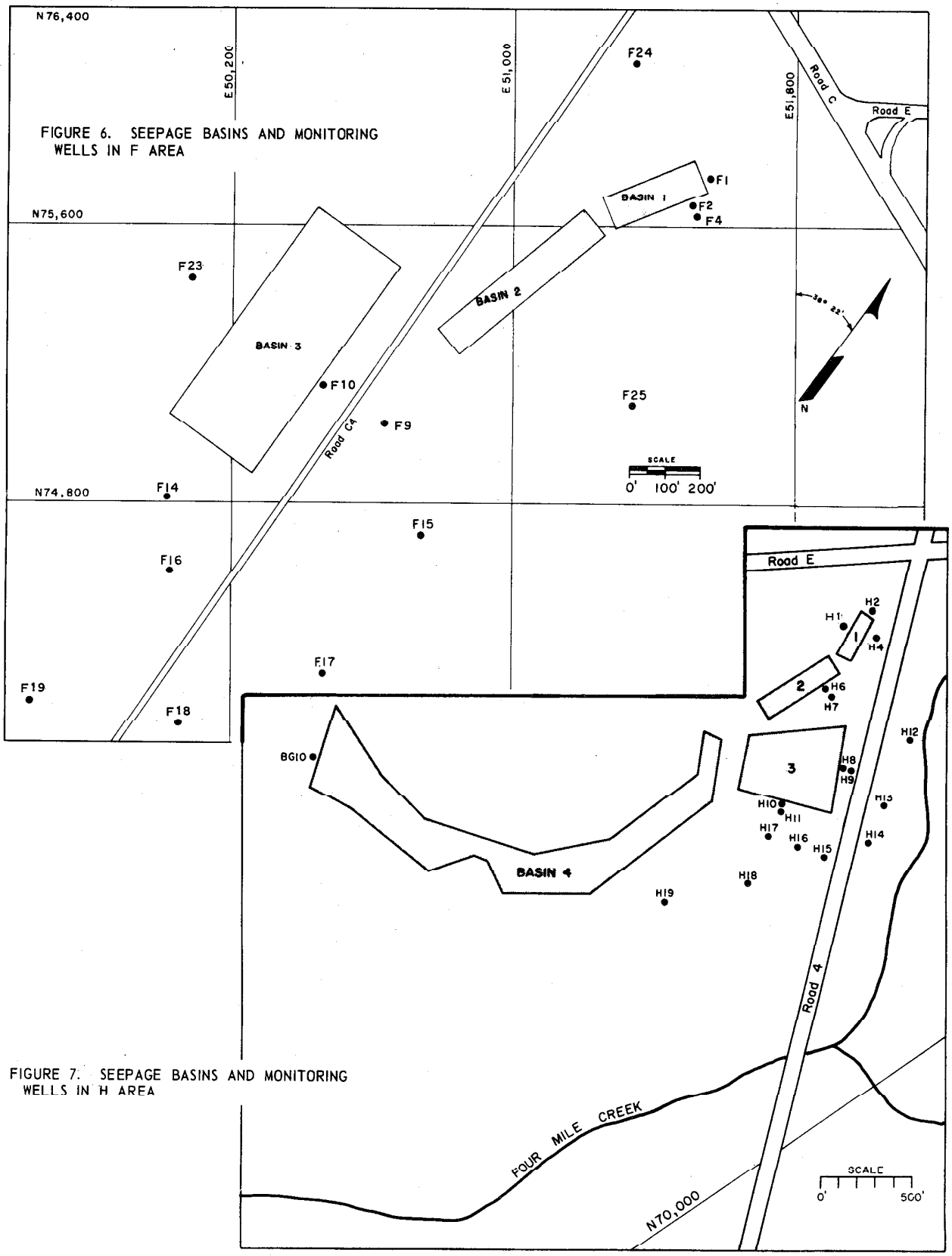


FIGURE 6. SEEPAGE BASINS AND MONITORING WELLS IN F AREA

FIGURE 7. SEEPAGE BASINS AND MONITORING WELLS IN H AREA

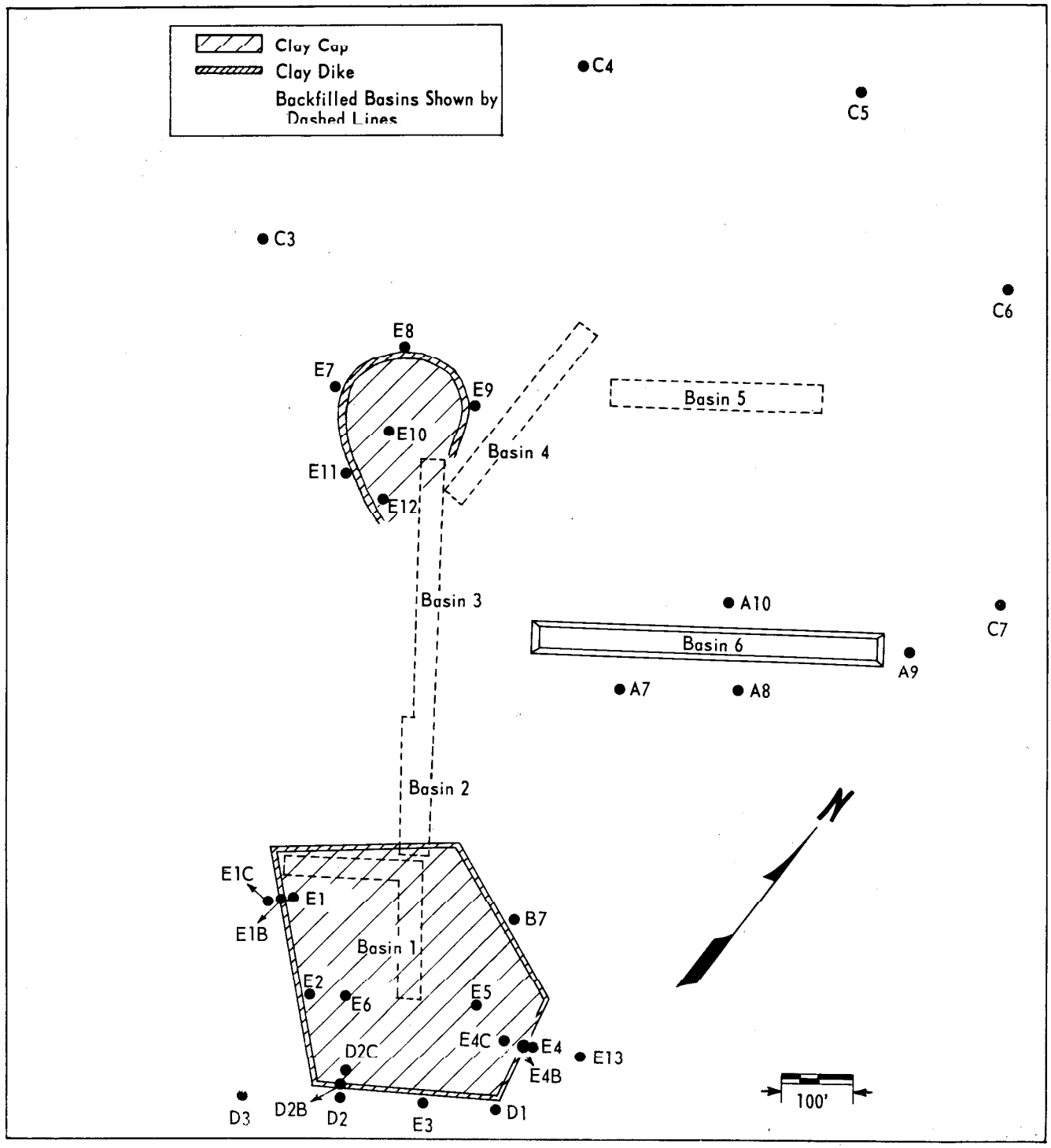


FIGURE 8. R-AREA SEEPAGE BASIN WELLS

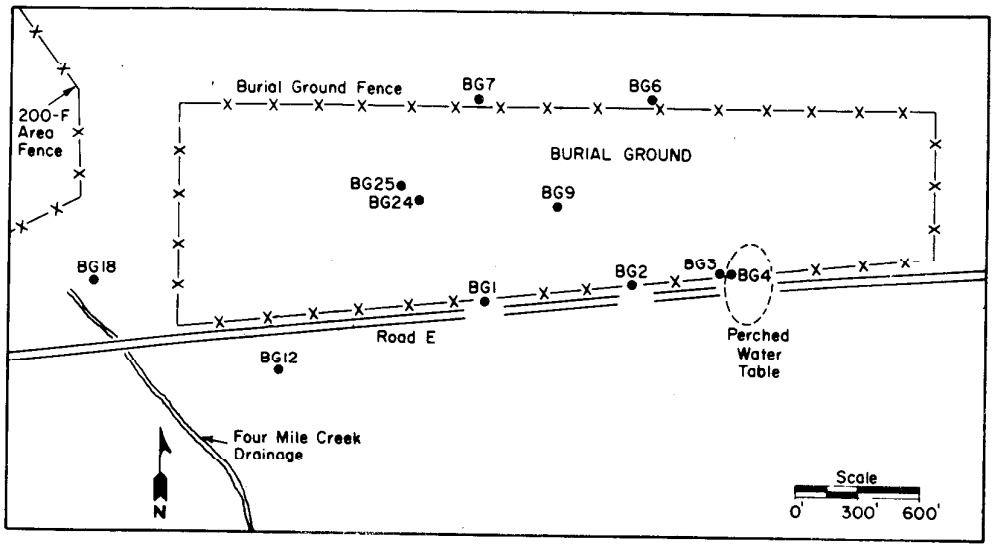


FIGURE 9. BURIAL GROUND WELLS

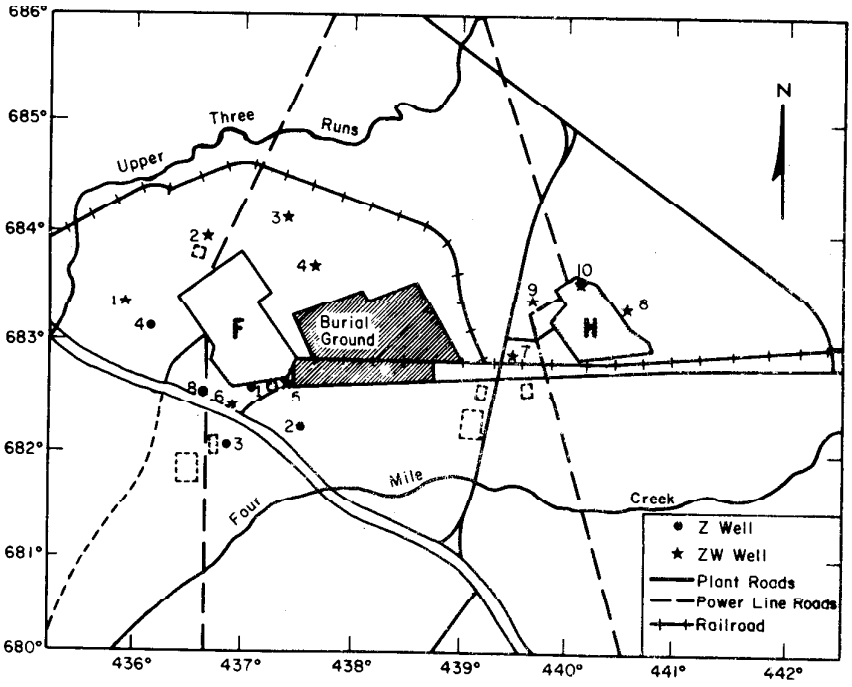


FIGURE 10. Z AND ZW WELLS

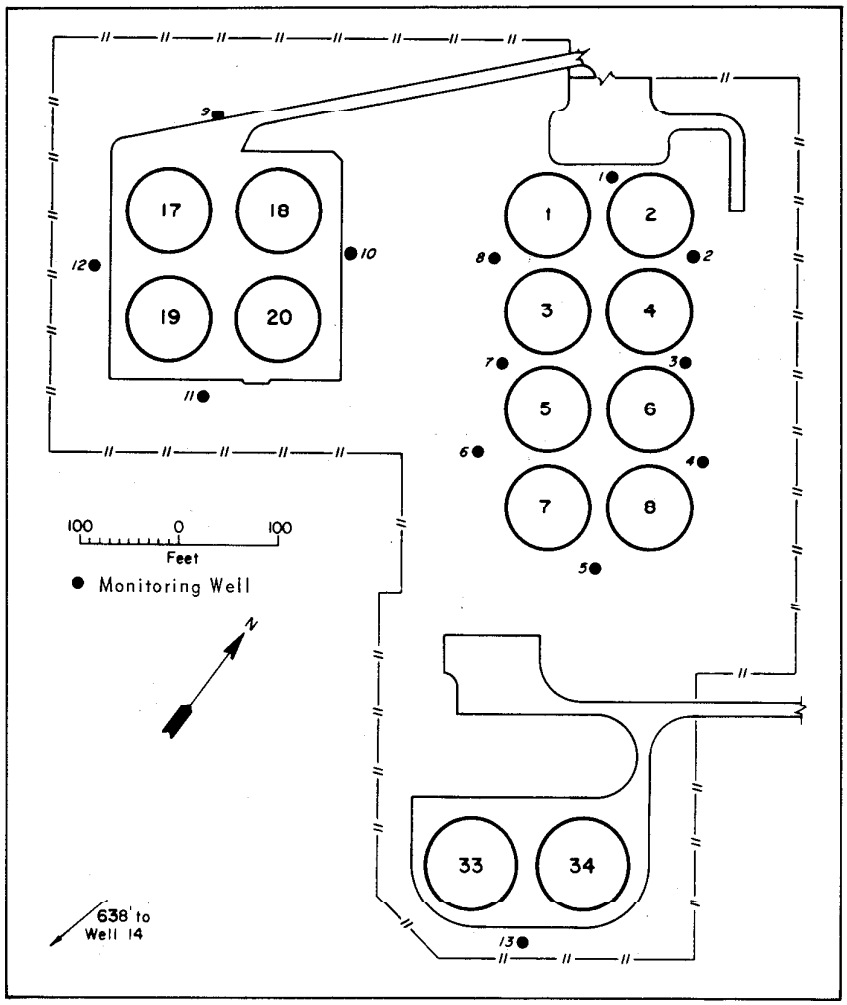


FIGURE 11. F-AREA TANK FARM GROUND WATER MONITORING WELLS

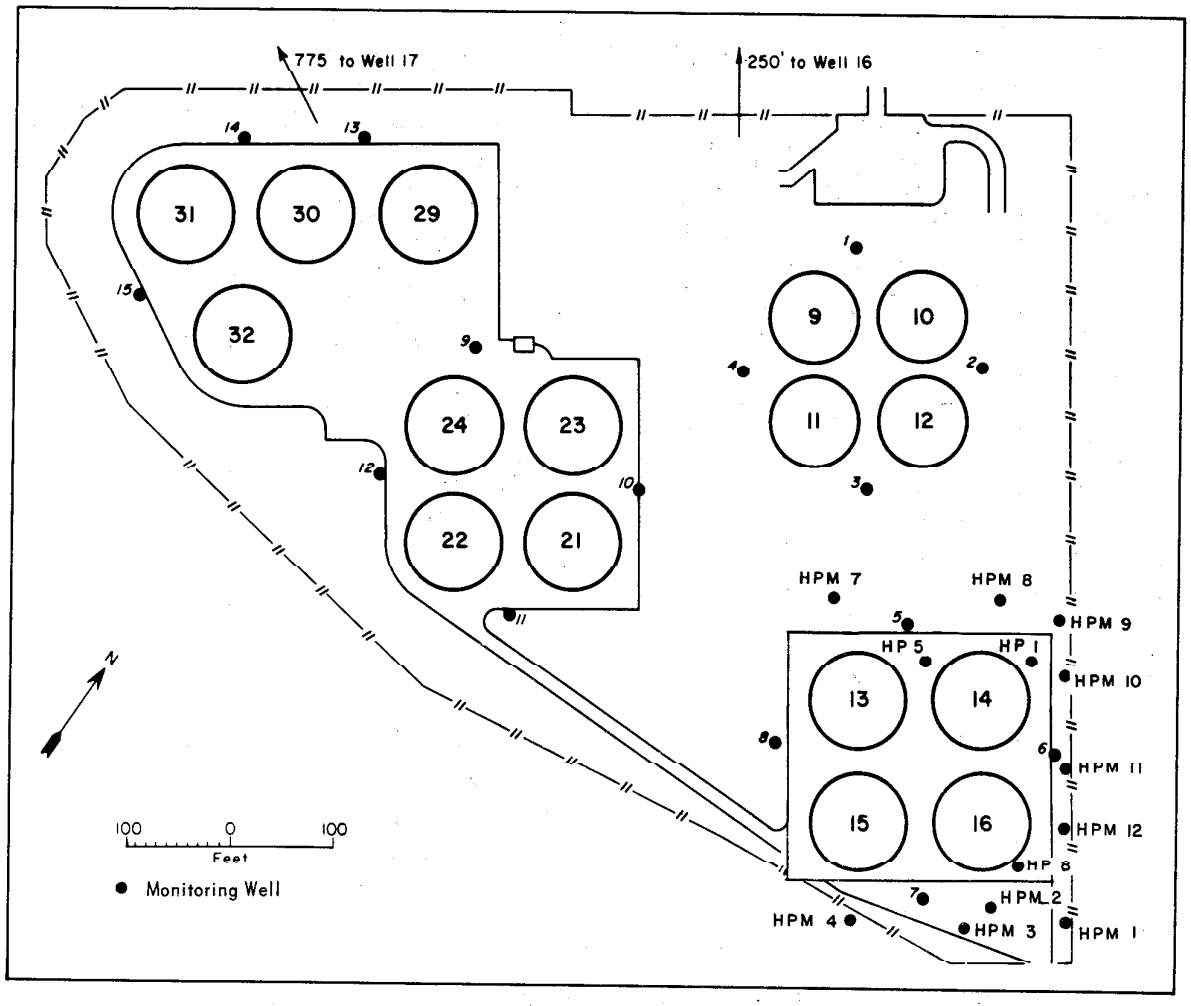


FIGURE 12. H-AREA TANK FARM GROUND WATER MONITORING WELLS

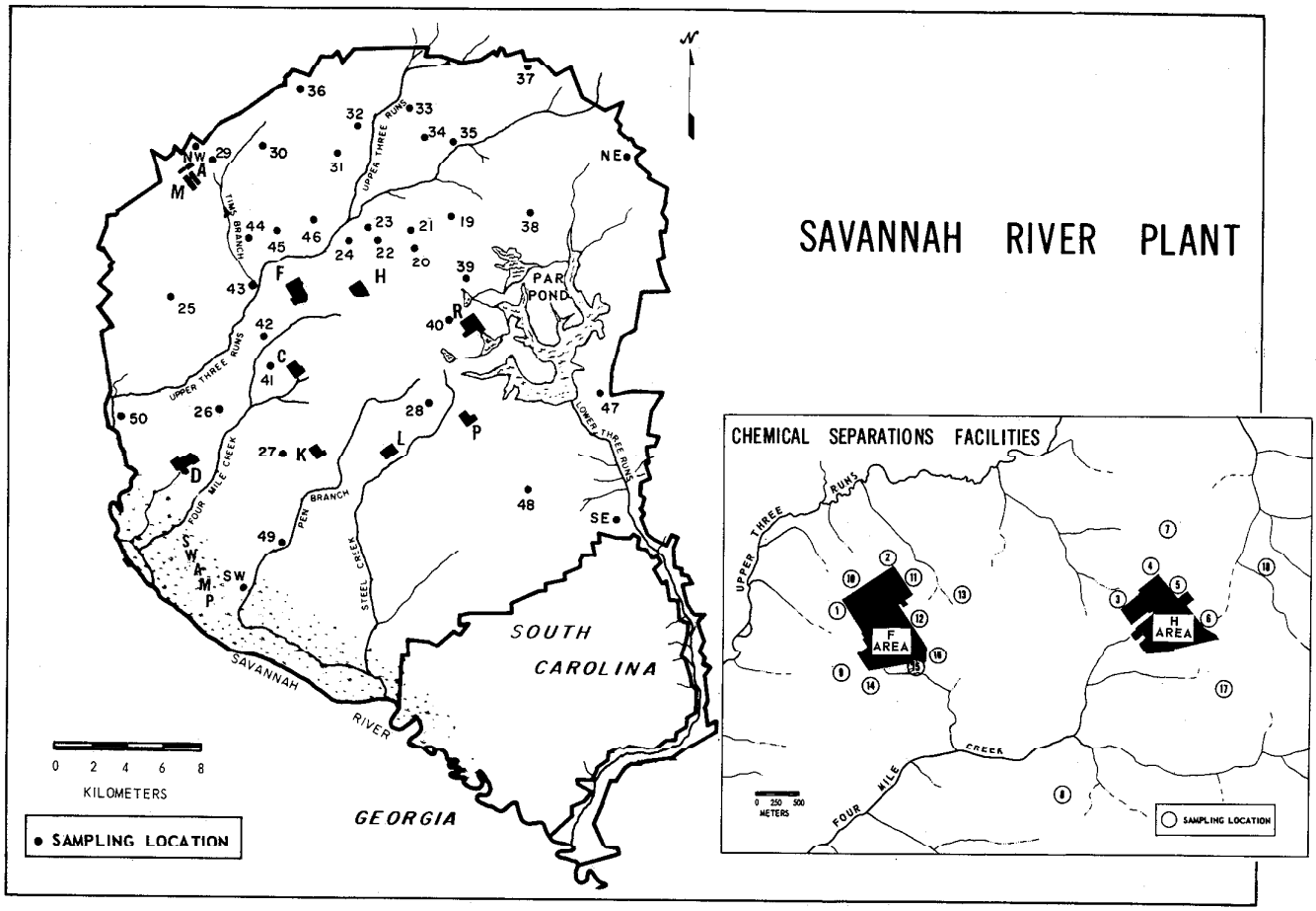


FIGURE 13. SOIL SAMPLE LOCATIONS

SRS BOX TRACKING INPUT SCREEN LWB19940321I2

Box Number: V-176 Classified Box Y/N ? N

Bldg: Location: N04-01-06

Reviewer: LWB Review Date: 3/15/94 Date Range: / / to / /

Box Opened Y/N ? Y Shipping No.:

Subject: INFORMATION ONLY

Contains useful information Y/N ?

SRS RECORD INPUT SCREEN

RAC #: Bldg: 773-52A Location: N04-01-06

Box No.: V-176 Reviewer: LWB Review Date: 3/15/94

Document Date: 691 173 74 / / Author: C. ASHLEY & C.C. ZEIGLER

SYR

Report/Journal: DPSPU-74-302

Title: Environmental Monitoring at The Savannah River Plant (annual Report)

Orig. Org.: Health Physics Category: 3 Approx. Pgs.: 57

Radionuclides Chemicals Keywords Scan # Was Classified Y/N ?

Comments:

[ ] AIR MONITORING
[ ] BURIAL GROUND
[ ] CONSTRUCTION REPORT
[X] DOSES
[ ] DRAWINGS
[ ] ECOLOGY
[ ] FOODSTUFF MONITORING
[ ] GROUNDWATER MONITORING
[ ] HP/IH REPORT
[ ] HYDROLOGY
[ ] MAINTENANCE
[ ] MATERIAL ACCOUNTABILITY
[ ] METEOROLOGY
[X] MONITORING
[ ] NONROUTINE EVENTS
[ ] ORIGINAL DATA
[ ] PHOTOGRAPHS
[ ] PROCEDURES
[ ] PROCESS DESCRIPTION
[ ] PUBLIC COMMENTS
[ ] PURCHASE ORDERS
[ ] SAVANNAH RIVER
[ ] SEDIMENT MONITORING
[ ] SEEPAGE BASINS
[ ] SITE SURVEYS
[ ] SOIL MONITORING
[ ] STACK RELEASES
[ ] TLD
[ ] WATER MONITORING

CHEMICALS CHECKLIST

[ ] Cd
[ ] Cn
[ ] Pb
[ ] Hg
[ ] Ni
[ ] NO3
[ ] SO4
[ ] VOC
[ ] TTCE
[ ] TCE
[ ] DCM
[ ] CHEM12
[ ] CHEM13
[ ] CHEM14
[ ] CHEM15
[ ] CHEM16
[ ] CHEM17
[ ] CHEM18
[ ] CHEM19
[ ] CHEM20

RADIONUCLIDES CHECKLIST

[ ] Ce-144
[ ] Cs-137
[ ] I-129
[ ] I-131
[ ] Kr-85
[ ] Pu-238
[ ] Pu-239/240
[ ] Pu
[ ] Ru-106
[ ] Sr-89/90
[ ] H-3
[ ] Zr-95

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