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ENVIRONMENTAL ASPECTS OF A TRITIUM OXIDE RELEASE FROM THE SAVANNAH RIVER SITE ON SEPTEMBER 2 AND 3, 1984 (U)

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EXECUTIVE SUMMARY

Tritium was released to the atmosphere from the Savannah River Plant during an incident on September 2 and 3, 1984 between 10 PM and 3 AM. During this five hour period, 43,800 Ci of tritium, principally in the form of the oxide (HTO), was released. An additional 14,000 Ci was released during subsequent cleanup operations between September 3 and 7. The total amount released from the incident was 57,800 Ci.

The maximum dose to a person at the plant boundary was estimated to be 1.6 mrem. A preliminary estimate during the incident was 7.0 mrem, but this value was reduced by more rigorous calculations using more complete weather data. The plant boundary dose of 1.6 mrem is 0.6 % of the average annual dose of 295 mrem due to natural causes in the area. The corresponding population dose was 46 person-rem.

The HTO cloud initially moved northward and passed near the towns of New Ellenton and Aiken, SC. Two hours after the release began, the wind shifted and carried the cloud toward Columbia, SC. The cloud moved northeast during the daytime on September 3 over the east-central portion of North Carolina.

Environmental sampling teams were dispatched by SRL, SRP, and SCDHEC (South Carolina Department of Health and Environmental Control). SRL collected air and vegetation samples and SRP collected vegetation, water, milk, and bioassay samples. SCDHEC collected vegetation, milk, and water samples. The highest activity of HTO measured in vegetation was 501 pCi/mL onsite, 2522 pCi/mL at the plant boundary, and 9859 pCi/mL offsite. These concentrations were approximately 100 times larger than normal values.

The largest offsite dose to an individual was 0.12 mrem as determined from a urine bioassay analysis of a sample collected 27 miles north of H-Area. This value is in reasonable agreement with the value calculated from SRL's emergency response model, 0.18 mrem.

INTRODUCTION

Tritium production is one of the major functions of the Savannah River Plant (SRP). Tritium is a radioactive isotope of hydrogen (H) with an atomic mass of 3 and a radiological half-life of 12.33 years. It is released into the atmosphere in small amounts from process leaks and ventilation air during normal SRP operations. It exists both as an elemental gas (HT) and as tritium oxide (HTO). In this report, HTO will be used to represent tritium in any of the possible oxide forms (HTO, DTO, and T_2O) and HT will be used for the elemental gaseous forms (HT, DT, and T_2). Both HT and HTO are odorless, tasteless, colorless and readily dispersed in air. They enter into the same chemical and biological reactions as hydrogen and water vapor, respectively.

Tritium is produced by irradiation of lithium targets in the SRP production reactors. After irradiation, the targets are sent to a tritium processing facility where the tritium is extracted, purified, and packaged. The tritium facility is in the center of the plant site, approximately 13 km (8 miles) from the nearest SRP boundary. Releases of tritium from the reactors and tritium-processing facilities to the atmosphere result from small leaks and infrequent exposure of normally closed systems to ventilation air. A brief discussion of routine SRP tritium releases in 1984 is given in Reference 1. Reference 2 summarizes tritium releases in 1982 and 1983. A more extensive review of SRP tritium processes is provided in Reference 3.

Between 10:00 PM on September 2 and 3:00 AM on September 3, 43,800 curies of tritium were inadvertently released from a tritium processing facility during equipment maintenance operations. Over 95% of the activity released was in the oxide form (HTO). This report describes the environmental effects of this release on the SRP site and offsite.

RELEASE DESCRIPTION

The incident occurred during routine equipment maintenance operations in a process hood. Highly tritiated water spilled from process equipment to the floor of the hood at 10:00 PM on September 2, 1984. A portion of the tritiated water evaporated into the hood exhaust air resulting in the release of 43,800 curies of tritium between 10:00 PM on September 2 and 3:00 AM on September 3. Additional smaller amounts of tritium continued to bleed out of the hood for several hours while cleanup efforts were underway. The total release of tritium associated with this incident amounted to 57,800 curies by the time cleanup efforts were completed late in the day on September 7, 1984.

The release was monitored continuously by Kanne chambers (ionization chambers through which a known fraction of stack air is pumped). A "forms" monitor installed on the sampling line indicated that most (> 95%) of the tritium released was HTO. This high oxide fraction was verified by air concentration measurements taken downwind of the release (to be discussed below).

METEOROLOGY ON SEPTEMBER 2–3, 1984

A region of high pressure extended over the southeastern United States through the evening of September 2 and morning of September 3, 1984. Skies were clear and no rain was reported anywhere in the southeast. The temperature at the time of the release was 24°C (75°F).

On the plant site, the space average mean (SAM) winds measured at the 60 m (200 ft) level were initially (10:15 AM) from the south (168°) at about 4.7 m/s (10.7 mph). The wind turned gradually during the night and by 3 AM was from the southwest (243°) at 4.5 m/s (10 MPH). The SAM winds continued from the west-southwest throughout the morning. By 11:30 AM the wind speed had decreased to 2.7 m/s (6 MPH).

The atmosphere was slightly stable (E Stability) during the night. Temperature profiles measured by sensors on the WJBF-TV tower indicated an initial ground level inversion. By 1:00 AM on September 3, the inversion had weakened and a shallow layer of instability formed at the surface. By 5:00 AM the ground level inversion redeveloped.

The surface weather map for September 3 at 8:00 AM is shown in Figure 1. Also shown on this figure are surface wind patterns for 11:00 PM on September 2. At 11:00 PM the surface winds were southerly at the SRP and southerwesterly in northern South Carolina. By 2:00 AM on September 3 the surface winds had shifted to the southwest over the SRP.

PLUME DISPERSION AND MOVEMENT

The movement of the HTO is shown in Figures 2 and 3. Figure 2 shows the size and movement of the cloud as calculated with PFPL, SRL's Gaussian puff/plume model, while Figure 3 shows corresponding results from 2DPUF, a sequential puff model. Figure 2 shows that the cloud moved northward during the first two hours, passing near the towns of New Ellenton and Aiken. Two hours after the release, the wind shift altered the cloud movement toward the northeast and Columbia, SC. The puff size is indicated with a circle whose radius is the "2 sigma-y" distance. This is the distance from the puff center to a point at which the concentration falls to 13% of its maximum. Figure 2 indicates a very narrow cloud with a 2 sigma-y width of 1/2 mile at New Ellenton and 2/3 mile at Aiken. In contrast, Figure 3 shows a much broader cloud, with 2 sigma-y widths of 3 miles at New Ellenton and 5 miles at Aiken.

The reason for the difference in cloud widths shown in Figures 2 and 3 is that PFPL is a trajectory model. This means that the entire released puff follows a single path. In contrast, 2DPUF breaks the release into a series of sequential puffs which follow different trajectories depending on the wind. Thus, 2DPUF spreads the released gas over a wider range in direction, with consequently lower centerline concentrations and doses. In the following sections, we will show that the sampling data support the cloud width predictions of 2DPUF rather than those of PFPL.

The cloud movement during the day of September 3 is shown on Figure 3. As a result of large daytime atmospheric turbulence, the concentration of tritium in the plume at ground level was decreasing rapidly toward background levels as the plume moved across North Carolina. Westerly winds aloft probably carried the elevated portion of the release off shore by the end of the day on September 3.

ENVIRONMENTAL SAMPLING

An extensive environmental monitoring program was initiated during and following the release. Measurements were taken by SRL, SRP, and SCDHEC.

The SRL samples were collected by the Environmental Technology Division and include air concentrations (Table 1) and vegetation samples (Table 2). The SRP samples were collected by the Health Protection Department and include vegetation samples (Table 3), samples from air monitoring stations (Table 4), milk samples (Table 5), and bioassay samples (Table 6). DHEC samples include milk, vegetation, and surface water samples (Tables 7, 8, and 9, respectively).

RELEASE CHARACTERISTICS AS INFERRED FROM SAMPLING DATA

Environmental samples are vital to provide an understanding of the nature and size of a release. They are used to confirm release data (amount, time, radionuclide, etc.) and also to verify model predictions. For example, the air concentration measurements (Table 1) verify that the release was mainly HTO rather than HT, since, except for the Trenton, SC measurements, the measured HTO fraction ranged from 93 to 99%. This value confirms the percent measured by the Forms Monitor (>95%) and is also consistent with the accident description.

The samples provide other information about the release, such as the approximate time of the release peak and the width of the HTO cloud. For example, Figure 4 compares the vegetation samples from Table 3 (Ref. No. 60–65) with the predictions of PFPL. This figure compares the observed width and predicted puffs for six release times (10:00 PM to 12:30 AM). The figure shows that the centerline of the observation coincides with the 11:30 PM puff. This suggests that most of the HTO was released between 11:00 PM and 1:00 AM with the majority near 11:30 PM. We also note that the observed "puff" is much broader than the predicted cloud. The observed cloud is wider than that predicted by PFPL because the wind direction change during the release dispersed the cloud over a broader angular width.

These conclusions are supported by additional vegetation measurements shown in Figure 5 (Ref. No. 108–120, Table 3). This figure also implies that the majority of HTO was released around 11:30 PM and that the observed HTO cloud is much broader than predicted by PFPL.

The data shown in Figures 4 and 5 can be used to infer the approximate distribution with time of the HTO release. This estimate is shown in Figure 6 for an assumed total release of 43,800 Ci. This distribution with time is consistent with both the vegetation data and the accident description (Section 1).

Figures 4 and 5 also show convincingly why PFPL underestimates the plume width and should overestimate the centerline dose.

VEGETATION SAMPLING

Vegetation samples (grass) were the media that contained the highest tritium concentrations. This is attributed to the large surface area of vegetation relative to other media, which allows a more rapid exchange of HTO with H2O present naturally in the plants. All vegetation samples were freeze dried to obtain samples of free water for analysis by liquid scintillation counting.

The maximum concentration observed in a vegetation sample (onsite or offsite) was 9859 pCi/ml (average of four samples) from samples collected four miles east of the intersection of South Carolina highway 302 and US 78 (east of Aiken, SC) (Table 3). The maximum onsite sample was 501 pCi/ml near H Area (Table 3), the maximum at the plant perimeter was 2522 pCi/ml (Table 3), and concentrations up to 237 pCi/ml were detected as far away as Blythewood, SC, 77 miles away from the point of release (Table 2). The measured concentration of 9859 pCi/ml was the highest ever recorded for an offsite vegetation sample.

An additional 100 vegetation, surface water, and milk samples were collected by the SCDHEC near the plant perimeter and in concentric loops out to about 40 miles from the release point. The SCDHEC samples included three vegetation samples collected in the Columbia, SC area a week after the release. Results of their analyses are shown in Table 7 (Reference 12) and compare favorably with SRP data obtained near the same locations.

Previous studies of the behavior of tritium in the environment indicate that HTO exhibits about a 3 day half-life in vegetation.[8] In this release, it was noted that the concentration of HTO decreased much more rapidly, in some cases decreasing by a factor of more than 100 in a 24 hour period. For example, the maximum concentration in grass (9859 pCi/ml of free water) was observed at a point four miles east of highway 302 on US 78 outside Aiken SC, in a sample collected before daylight of September 3 (Reference 62, Table 3). When the sample location was resampled the next day (after daylight) the observed concentration was 79 pCi/ml (Reference 554, Table 3). In another case, a sample team on Route F (Table 3, Reference 260) collected a grass sample in Batesburg which contained 78 pCi/ml free water in the morning of September 3. The same team was directed by radio to return to Batesburg that afternoon to collect additional samples. Those taken nearest Batesburg contained only 3-4 pCi/ml. On the plant perimeter run (Route C, Reference Nos. 101-122), samples were collected at one mile intervals in the morning showing concentrations ranging from 1331 pCi/ml to 2522 pCi/ml (References 112, 113 and 114). When resampled at 0.25 mile intervals in the afternoon, the concentration range was 29 pCi/ml to 71 pCi/ml (References 112A through 114C).

SCDHEC data reflects similar rapid concentration decreases. At New Holland, SC, a sample collected on September 3 contained 69 pCi/ml (Reference 15a, Table 7). The same location was resampled on September 4 and showed 2.9 pCi/ml (Reference 9b, Table 7). Grass collected before dawn on September 3 at the intersection of US 78 and SC 302 (Reference 2C, Table 7) contained 298 pCi/ml. Data reported for a sample collected at this location on September 4 contained 0.7 pCi/ml (Reference 10b, Table 7). The sample collected at the intersection of US 78 and County road 1304 (Reference 11a, Table 7), contained 235 pCi/ml on September 4 and 5 pCi/ml on September 9 (References 8b, Table 7).

The rapid decrease in concentration is due to both grass physiology and meteorological conditions. At the time of the release, the weather in the vicinity of SRP was warm and humid. The high temperature on Sunday, September 2 was 34°C (94°F) and the relative humidity was about 43%. The overnight low between September 2 and 3 was 21°C (69°F) and the relative humidity was 100%. The absolute humidity for the period was about 16 grams water/m3 air. A heavy dew had settled on the grass before the release and HTO in the passing plume readily exchanged with the H2O on the grass. The grass stomata were closed so there was little exchange between the dew on the outside of the leaves and the moisture inside the leaves. After daylight, the dew apparently evaporated rapidly before the stomata opened, carrying the deposited HTO away from the plants before the exchange could occur. Thus, samples collected in the early morning contained large amounts of HTO exchanged dew, whereas samples collected later in the day probably contained only the relatively uncontaminated plant moisture.

BIOASSAY RESULTS

Urine samples were collected from 73 people (primarily members of families of SRP employees) located in or near the predicted path of the release. The samples were analyzed for tritium. Results of the analyses and the corresponding dose commitments are summarized in Table 6. Tritium concentrations in urine ranged from <0.0005 μCi/1L to 0.0160 μCi/L. The maximum concentrations (0.0160 μCi/L) were found in urine samples collected near Montmorenci, SC, about 26.7 km (16.6 mile) from H-Area. This location is near the place where maximum vegetation concentrations were found.

The bioassay results for the September 2-3 release can be placed into perspective by comparing them with background samples taken from people living near the plant. During the period from January 4, 1984, to April 2, 1984, the Health Protection Department collected periodic urine samples from families of plant employees and analyzed them for HTO content. None of the samples were taken from SRP employees. The participants lived in the communities of Jackson, SC, Barnwell, SC, New Ellenton, SC, and Williston, SC. Results of the studies are summarized below.

Summary of Background Tritium Bioassay Analysis Results

Location	Range of Values μ Ci/L	Average μ Ci/L
New Ellenton	0.0011-0.0014	0.0012
Jackson	0.0009-0.0013	0.0012
Williston	0.0008-0.0030	0.0013
Barnwell	0.0009-0.0016	0.0011

Comparison of the ranges of values shown above with the bioassay results shown in Table 6 indicates that only a few people in the path of the September 2 release assimilated a measurable amount of HTO. The weather probably contributed to the relatively low observed doses to offsite persons (as compared to the calculated doses discussed in a later section of this report). Because the release occurred at night, and because the weather was warm and humid, most people sampled were inside closed houses and many had their air conditioners running during the release. Thus they were not exposed to the maximum HTO concentrations as the plume passed through their area.

DOSE ESTIMATES

The radiation hazard from tritium is due to a low energy beta particle (maximum energy = 0.0186 MeV, average energy = 0.006 MeV). This particle will penetrate only 0.013 cm of human tissue. Tritium in elemental form is relatively harmless because the weak beta particle is completely attenuated by the inert external skin layer (epidermis) and because only 0.004% of inhaled elemental tritium is converted to the oxide and retained in the body.[4]

Almost all of the oxide inhaled (water vapor) is absorbed in the lungs and enters the body water pool, and all body tissues are exposed. In addition, aproximately one half as much tritium oxide is absorbed through the skin as is absorbed in the lungs by inhalation.[5]

The biological half-life of tritium in the body is short[6] compared to most radionuclides. The International Commission on Radiological Protection recommends a value of 10 days[7] and this biological half-life is used for dosimetry calculations in this report.

Dose estimates were obtained with two dispersion codes, PFPL, a Gaussian puff/plume model, and 2DPUF, a sequential puff model. PFPL executes quickly and is used during the period immediately following a release. 2DPUF requires more computer resources and is used for post-release analysis.

Since the dispersion codes are run several times during and after a release with varying source terms and meteorological data, the dose estimate can vary. For the September 2-3 release, the maximum individual dose at the plant boundary calculated with PFPL varied between 7 mrem (2 hours after the release) to 3.6 mrem (final value). The maximum individual dose (at the plant boundary) calculated with 2DPUF was 1.6 mrem. These results are summarized below.

Dose Time	Model	Maximum Individual at Plant Boundary
12:00 AM, Sept. 3	PFPL	7.0 mrem
Sept. 3 (final)	PFPL	3.6 mrem
Sept. 3 (final)	2DPUF	1.6 mrem

The different dose estimates listed above can be easily understood. The initial estimate (from PFPL) was based on H Area winds and turbulence parameters. These turbulence parameters were about a factor of two smaller than the SAM (site-averaged) turbulence parameters. Since the SAM parameters are more representative than H Area data, the final estimate, calculated with SAM data was a factor of two less than the initial estimate (3.6 mrem vs. 7.0 mrem).

The best estimate of the maximum individual dose was 1.6 mrem. This value was obtained by assuming a continuous release of HTO over the first 5 hours of the release. The dose was calculated over the 24-hour period ending at 10:00 PM, September 3. As discussed above, the 2DPUF estimate is lower than the PFPL estimate because 2DPUF does not assume the entire release follows one path from the release point. Thus, it accounts for wind shifts during the release duration and, hence, usually yields a lower dose estimate. On the other hand, PFPL does not account for wind shifts during a release and disperses the material over a narrow range in direction. Thus, PFPL will tend to overestimate the dose, especially when the wind is shifting, as it was on September 2.

Individual doses calculated with 2DPUF were also derived and are shown in Figure 7. This figure shows isopleths of average individual doses. These doses can be compared with bioassay samples. The maximum offsite dose to an individual (0.12 mrem) was obtained in a urine sample 27 km north of H Area near Montmorenci, SC (Table 6, Reference 67). The corresponding dose calculated with 2DPUF was 0.18 mrem.

The population dose was also calculated with 2DPUF and found to be 46.4 person-rem. This value represents 0.084% of the 55,125 person-rem of natural background radiation dose to the population in the path of the release.

COMPARISON WITH OTHER RELEASES

The September 2–3 release is compared with other releases in Table 10. As can be seen from the table, the September 2 incident is the largest HTO release recorded from SRP, and resulted in the highest calculated doses both at the plant perimeter and to the general population. The calculated maximum individual dose of 1.6 mrem can be compared to a natural background radiation dose of 295 mrem in the vicinity of SRP.

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TABLE 1. Savannah River Laboratory Tritium Oxide and Gas Air Concentrations

Location	STARTING SAMPLING TIMES Clock	Elapsed (hours)	Range (miles)	HTO (pCi/ scm)	HT (pCi/ scm)	%HTO
Aiken, SC	01:12	3.20	20	88	6 T	93.64
Trenton, SC	01:31	3.52	36	82	44 M	64.94
Ward, SC	02:16	4.27	41	41	3 T	93.98
Batesburg, SC	02:31	4.52	44	3,519	261 M	93.11
378 & 413	03:51	5.85	53	1,656	57 T	96.67
113 & 378 (Lake Murray)	04:00	6.00	56	3,412	189 M	94.75
	04:35	6.58		2,077	56	97.37
I-26 at Irmo	05:20	7.33	64	2,745	151 T	94.79
	05:55	7.92		886	33	96.41
Rt 215, 5 mi N I-20	06:21	8.35	69	2,692	93 N	96.66
Blythewood, SC	07:23	9.38	77	15,871	171 N	98.93
34 & 196	08:29	10.48	84	4,837	371 N	92.88

TABLE 2. SRL Tritium Oxide Vegetation Samples

Ref. No.	Location	Vegetation pCi/mL H_2O
S2	Trenton, int. 191 & 75	3
S3	Ward, int. 193 & 45	17
S4	Batesburg, int. 178 & 1	153
S5	Union, US 378 & SC 413	153
S6	Lake Murray, 113 & 378	287
S7A	I-26 at Irmo	222
S7B	I-26 at Irmo	234
S8	Rt. 215, 5 mi. N at I-20	35
S9	Blythewood	237
S10	34 & 196	173

TABLE 3. SRS Tritium Oxide Vegetation Samples

Ref. No.	Location	Vegetation pCi/mL H_2O
ONSITE, 9/3/84		
351	200–H 614 Building	501 ± 10
352	200–H Entrance at Rd 4	63 ± 2
353	Rd 4, 1 Mile N of 200–H	362 ± 7
354	Rd F, 1 Mile N of Rd 4	25 ± 1
355	Rd F, 2 Miles N of Rd 4	7 ± 1
356	Rd F, 3 Miles N of Rd 4	5 ± 1
357	Rd F, 4 Miles N of Rd 4	4 ± 1
358	Rd F, 5 Miles N of Rd 4	3 ± 1
359	Rd F, 6 Miles N of Rd 4	3 ± 1
ROUTE A, 9/3/84		
00	Talatha Gate	16 ± 1
01	Johnson's Crossroads	12 ± 1
02	New Ellenton, St. Pauls Methodist Church	167 ± 5
03	New Ellenton, Buzhardt's Yard	481 ± 10
03W*	New Ellenton, Buzhardt's Yard	34 ± 2
04	New Ellenton, Masonic Lodge	262 ± 5
05	SC 19, 1 Mi. N of New Ellenton Light	1399 ± 39
06	SC 19, 2 Mi. N of New Ellenton Light	349 ± 10
07	SC 19, 3 Mi. N of New Ellenton Light	330 ± 7
08	SC 19, 4 Mi. N of New Ellenton Light	830 ± 17
09	SC 19, 5 Mi. N of New Ellenton Light	1911 ± 38
10	SC 19, 6 Mi. N of New Ellenton Light	119 ± 3
11	SC 19, 7 Mi. N of New Ellenton Light	10 ± 1
12	SC 19, 8 Mi. N of New Ellenton Light	7 ± 1
13	Bethany Cemetery, Aiken	147 ± 3
14	SC 19, 1 Mi. N of Aiken	55 ± 2
15	SC 19, 2 Mi. N of Aiken	4 ± 1
16	SC 19, 3 Mi. N of Aiken	3 ± 1
17	SC 19, 4 Mi. N of Aiken	28 ± 1
18	SC 19, 5 Mi. N of Aiken	1 ± 1
19	SC 19, 6 Mi. N of Aiken	1 ± 1
20	SC 19, 7 Mi. N of Aiken	1 ± 1
21	SC 19, 8 Mi. N of Aiken	2 ± 1
22	SC 19, Eureka City Limits	115 ± 2

*Water Sample

TABLE 3. SRS Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL H_2O
ROUTE B, 9/3/84		
51	SC 125 and Road 2–781	2 ± 1
52	Road 2–781, 2 Miles N of SC 125	2 ± 1
53	Road 65 and Road 781	2 ± 1
54	Road 65, 2 Miles N of Rd 781	53 ± 2
55	Road 65, 4 Miles N of Rd 781	2 ± 1
56	Road 65, 6 Miles N of Rd 781	2 ± 2
57	Road 65, 8 Miles N of Rd 781	1 ± 1
58	Road 65, 10 Miles N of Rd 781	6 ± 1
59	SC 302, 2 Miles N of Rd 65	379 ± 13
60	SC 302, 4 Miles N of Rd 65 (Int US 78)	303 ± 9
61	US 78, 2 Miles E of SC 302	2192 ± 62
62	US 78, 4 Miles E of SC 302	9859 ± 422
63	US 78, 6 Miles E of SC 302	4059 ± 81
64	US 78, 8 Miles E of SC 302	2226 ± 74
65	US 78, 10 Miles E of SC 302 (Windsor Limits)	1249 ± 25

TABLE 3. SRS Tritium Oxide Vegetation Samples (cont.)

Ref. No.	Location	Vegetation pCi/mL H_2O
ROUTE C, MORNING SAMPLES, 9/3/84		
101	SC 125 and Road 2-62 (Jackson)	46 ± 1
102	Road 62, 1 Mile N of SC 125	2 ± 1
103	Road 62, 2 Miles N of SC 125	17 ± 1
104	Road 62, 3 Miles N of SC 125	5 ± 1
105	Road 62, 4 Miles N of SC 125	3 ± 1
106	Road 62, 5 Miles N of SC 125	6 ± 1
107	Road 62 and US 278	9 ± 1
108	US 278 and Woodward Rd.	19 ± 1
109	US 278, 0.5 Miles E from Woodward Rd.	14 ± 1
110	US 278, 0.5 Miles W of SC 19	19 ± 1
111	US 278, 0.5 Miles E of SC 19	500 ± 10
112	US 278, 1 Miles E of SC 19	1331 ± 27
113	US 278, 2 Miles E of SC 19	2522 ± 50
114	US 278, 3 Miles E of SC 19	1380 ± 39
114W*	US 278, 3 Miles E of SC 19	2 ± 1
115	US 278, 4 Miles E of SC 19	168 ± 3
116	US 278, 5 Miles E of SC 19	198 ± 3
117	US 278, 6 Miles E of SC 19	110 ± 2
118	US 278, 7 Miles E of SC 19	406 ± 6
119	US 278, 8 Miles E of SC 19	881 ± 25
120	US 278, 9.1 Miles E of SC 19 (US 278 & SC 781)	978 ± 28
121W*	Puddle on rd to Hitchcock Mill Pond	4 ± 1
122W*	Plant Boundary on Sweetgum Study Rd	30 ± 2

*Water Samples

TABLE 3. SRS Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL H_2O
ROUTE C, AFTERNOON SAMPLES, 9/3/84		
109A	US 278, 0.25 Miles E of Woodward Rd.	132 ± 3
110A	US 278, 0.25 Miles E of SC 19	327 ± 7
111A	US 278, 0.75 Miles E of SC 19	22 ± 1
112A	US 278, 1.25 Miles E of SC 19	29 ± 2
112B	US 278, 1.50 Miles E of SC 19	68 ± 3
112C	US 278, 1.75 Miles E of SC 19	34 ± 1
113A	US 278, 2.25 Miles E of SC 19	64 ± 2
113B	US 278, 2.50 Miles E of SC 19	49 ± 1
113C	US 278, 2.75 Miles E of SC 19	54 ± 2
114A	US 278, 3.25 Miles E of SC 19	71 ± 2
114B	US 278, 3.50 Miles E of SC 19	49 ± 1
114C	US 278, 3.75 Miles E of SC 19	53 ± 2
115A	US 278, 4.25 Miles E of SC 19	16 ± 1
115B	US 278, 4.50 Miles E of SC 19	21 ± 1
115C	US 278, 4.75 Miles E of SC 19	16 ± 1
116A	US 278, 5.25 Miles E of SC 19	10 ± 1
116B	US 278, 5.50 Miles E of SC 19	13 ± 1
116C	US 278, 5.75 Miles E of SC 19	25 ± 1
117A	US 278, 6.25 Miles E of SC 19	9 ± 1
117B	US 278, 6.50 Miles E of SC 19	7 ± 1
117C	US 278, 6.75 Miles E of SC 19	7 ± 1
118A	US 278, 7.25 Miles E of SC 19	7 ± 1
118B	US 278, 7.50 Miles E of SC 19	14 ± 1

TABLE 3. SRS Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL H_2O
ROUTE D, 9/3/84		
157	US 25 & SC 19	3 ± 1
158	SC 19 & I-20	5 ± 1
159	I-20, 4 Miles E of SC 19	88 ± 2
160	I-20, 8 Miles E of SC 19 (Exit 29)	209 ± 4
161	I-20 at SC 39	352 ± 7
162	SC 39, 4 Miles E of I-20 (New Holland)	233 ± 5
163	SC 39, 4 Miles S of New Holland	197 ± 4
164	SC 39, Downtown Wagener	331 ± 7
165	SC 39, 4 Miles E of Wagener (Perry)	284 ± 6
166	SC 39, 8 Miles E of Wagener (Salley)	206 ± 4
167	SC 39, 12 Miles E of Wagener (Springfield)	152 ± 3
168	SC 39 & SC 4	70 ± 2
169	SC 4, 4 Miles S from SC 39	49 ± 2
170	SC 4 & US 321 (Neeses)	30 ± 1

TABLE 3. SRS Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL H_2O
201	SC 19 & Sc 191	1 ± 1
202	SC 191, 3.8 Miles at Edgefield Co. Line	1 ± 1
203	SC 191, 6.3 Miles at SC 121	1 ± 1
204	SC 121, 4.7 Miles at S41-190	4 ± 1
205	SC 121, 4.6 Miles at SC 193	1 ± 1
206	SC 121, 4.8 Miles at US 378	1 ± 1
207	US 378, 3.0 Miles at S41-136	1 ± 1
208	US 378, 3.5 Miles at S41-192	1 ± 1
209	US 378, 4.1 Miles at S41-44	1 ± 1
210	US 378, 3.7 Miles at SC 391	19 ± 1
211	US 378, 4.6 Miles at Old Lexington Rd.	36 ± 1
212	US 378, 1 Mile at Rocky Ridge Rd.	22 ± 1
213	US 378, 1.1 Miles at Highknoll Ct.	42 ± 1
214	US 378, 1.2 Miles at Priceville Rd.	54 ± 1
215	US 378, 1 Mile at Spoolwheel Rd.	151 ± 8
216	US 378, 1.0 Miles at Will Dent Rd.	46 ± 2
216W*	US 378, 1.0 Miles at Will Dent Rd.	44 ± 2
217	US 378, 1.4 Miles at Pine Point Rd.	56 ± 2
218	US 378, 1.2 Miles at Beechwoods Dr.	94 ± 2
219	US 378, 1.5 Miles at Firetower Rd.	59 ± 2
220	US 378, 1.2 Miles at Carolina Spring Rd.	98 ± 2
221	US 378, 1.4 Miles at Woodvine Dr.	78 ± 2
222	US 378, 0.1 Miles at US 1	80 ± 2
223	US 378, 5.6 Miles at Darby Ambrose Rd.	75 ± 2
224	US 378, 4.0 Miles at N. Hook Ave.	97 ± 2
225	US 21, 3.9 Miles at Long St.	82 ± 2
226	US 21, 4.3 Miles at Pine Ridge Dr.	34 ± 2
227	US 21, 3.6 Miles at Lexington/Calhoun Line	20 ± 2
228	US 21, 3.5 Miles at S9-41	30 ± 1
229	US 21, 5.5 Miles at Oakgrove Rd.	29 ± 1
230	US 21, 5.2 Miles at SC 6	40 ± 1
231	US 21, 5.7 Miles at S9-22	3 ± 1
232	US 21, 5.1 Miles at S38-1602	1 ± 1
233	US 21, 7.6 Miles at US 301 & SC 4	1 ± 1

*Water Sample

TABLE 3. SRS Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL H_2O
ROUTE F, MORNING SAMPLES, 9/3/84		
251	US 1 Aiken	127 ± 3
252	US 1, 3 Miles N of Aiken	129 ± 3
253	US 1, 6 Miles N of Aiken	256 ± 5
254	US 1, 9 Miles N of Aiken	208 ± 4
255	US 1, 12 Miles N of Aiken	165 ± 3
256	US 1, 15 Miles N of Aiken	172 ± 3
257	US 1, 18 Miles N of Aiken	89 ± 2
258	US 1, 21 Miles N of Aiken	75 ± 2
259	US 1, 24 Miles N of Aiken (Saluda Co. Line)	80 ± 2
260	US 1, 27 Miles N of Aiken (Batesburg)	78 ± 2
261	US 1, 30 Miles N of Aiken (Leesville)	87 ± 2
262	US 1, 33 Miles N of Aiken	80 ± 2
263	US 1, 36 Miles N of Aiken	156 ± 3
264	US 1, 39 Miles N of Aiken	129 ± 3
266	US 1, 43 Miles N of Aiken	208 ± 4
267	US 1, 45 Miles N of Aiken	208 ± 4
268	US 1, 47 Miles N of Aiken	162 ± 3
269	SC 6, 2 Miles N of US 1	202 ± 4
270	SC 6, 4 Miles N of US 1	117 ± 3
271	SC 6, 6 Miles N of US 1	46 ± 2
272	SC 60, 2 Miles N of SC 6 & SC 60	24 ± 1
ROUTE F, EVENING SAMPLES, 9/3/84		
273	US 178, 1 Mile E of US 1 (Toward Orangeburg)	3 ± 1
274	US 178, 2 Miles E of US 1	7 ± 1
275	US 178, 3 Miles E of US 1	6 ± 1
276	US 178, 4 Miles E of US 1	13 ± 1
277	US 178, 5 Miles E of US 1	29 ± 1
278	US 178, 1 Mile W of US 1 (Toward Saluda)	4 ± 1
279	US 178, 2 Miles W of US 1	6 ± 1
280	US 178, 3 Miles W of US 1	6 ± 1
281	US 178, 4 Miles W of US 1	1 ± 1
282	US 178, 5 Miles W of US 1	1 ± 1

TABLE 3. SRS Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL H_2O
ROUTE G, 9/3/84		
301	SC 781 & US 278	504 ± 10
302	US 278, 1 Mile E of SC 781	297 ± 6
303	US 278, 2 Miles E of SC 781	54 ± 2
304	US 278, 3 Miles E of SC 781	165 ± 3
305	US 278 at SC 39	31 ± 1
306	US 78 at Windsor City Limits (E)	17 ± 1
307	US 78, 1.5 Miles E of Windsor	173 ± 3
308	US 78, 3.0 Miles E of Windsor	484 ± 10
309	US 78, 4.5 Miles E of Windsor	279 ± 6
310	US 78, 6.0 Miles E of Windsor	257 ± 5
311	US 78, at Williston City Limit (W)	331 ± 7
312	US 78, at Williston City Limit (E)	140 ± 3
313	US 78, at Elko Town Limit (W)	23 ± 1
314	US 78, at Elko Town Limit (E)	20 ± 1
315	SC 4 & SC 3 (Springfield)	72 ± 2
316	SC 39, 2.5 Miles N Toward Salley	79 ± 2
317	SC 39, Salley City Limits	67 ± 2

TABLE 3. SRS Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL H_2O
SECOND DAY SAMPLES, 9/4/84		
401	SC 555 & I-77 (Near Blythwood)	11 ± 1
402	SC 555 and N Brickyard Road	5 ± 1
403	SC 555 and Marthan Road	6 ± 1
404	SC 555 and Jenkins Road	5 ± 1
405	SC 555 and US 21	2 ± 1
406	SC 555 at Blythwood Town Limit	8 ± 1
407	Blythwood Road and I-77	3 ± 1
408	Blythwood Road and Syrup Mill Road	4 ± 1
409	US 21 and S40-54	6 ± 1
410	S40-54 and S40-2455	5 ± 1
411	S40-54 and S40-1901	5 ± 1
412	US 21 and McLean Road	1 ± 1
413	US 21 and Old Gunter Road	3 ± 1
414	US 21 and S40-936	4 ± 1
415	US 21 and S20-46	3 ± 1
416	US 21 and S20-34	39 ± 1
417	S-34 and S20-159	3 ± 1
418	S-34 and S20-650	20 ± 1
419	S-34 and S20-46	3 ± 1
420	S-34 and S20-196	5 ± 1
421	S-34 at Kershaw and Fairfield County Line	4 ± 1
422	S-34 and Shiver's Green Road	3 ± 1
423	S-34 and Three Branches Road	10 ± 1
424	S-34 and Getty's Road	2 ± 1
425	S-34 and S28-944	14 ± 1
426	S-34 and S28-780	4 ± 1

TABLE 3. SRS Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL H_2O
SECOND DAY SAMPLES, 9/4/84		
500	SC 478, 3.00 Miles W of SC 19 (Aiken)	92 ± 2
501	SC 478, 2.75 Miles W of SC 19	5 ± 1
502	SC 478, 2.50 Miles W of SC 19	46 ± 2
503	SC 478, 2.25 Miles W of SC 19	1 ± 1
504	SC 478, 2.00 Miles W of SC 19	1 ± 1
505	SC 478, 1.75 Miles W of SC 19	1 ± 1
506	SC 478, 1.50 Miles W of SC 19	1 ± 1
507	SC 478, 1.25 Miles W of SC 19	38 ± 2
508	SC 478, 1.00 Miles W of SC 19	1 ± 1
509	SC 478, 0.75 Miles W of SC 19	1 ± 1
510	SC 478, 0.50 Miles W of SC 19	1 ± 1
511	SC 478, 0.25 Miles W of SC 19	2 ± 1
512	SC 478 and SC 19	4 ± 1
513	SC 302, 0.25 Miles E of SC 19	12 ± 1
514	SC 302, 0.50 Miles E of SC 19	2 ± 1
515	SC 302, 0.75 Miles E of SC 19	2 ± 1
516	SC 302, 1.00 Miles E of SC 19	7 ± 1
517	SC 302, 1.25 Miles E of SC 19	9 ± 1
518	SC 302, 1.50 Miles E of SC 19	1 ± 1
519	SC 302, 1.75 Miles E of SC 19	7 ± 1
520	SC 302, 2.00 Miles E of SC 19	22 ± 1
521	SC 302, 2.25 Miles E of SC 19	1 ± 1
522	SC 302, 2.50 Miles E of SC 19	7 ± 1
523	SC 302, 2.75 Miles E of SC 19	3 ± 1
524	SC 302, 3.0 Miles E of SC 19 (SC 302 & US 78)	15 ± 1
SECOND DAY SAMPLES, 9/4/84		
551	US 78, 1.0 Miles E of SC 302	10 ± 1
552	US 78, 2.0 Miles E of SC 302	26 ± 1
553	US 78, 3.0 Miles E of SC 302	32 ± 1
554	US 78, 4.0 Miles E of SC 302	79 ± 2
555	US 78, 5.0 Miles E of SC 302	30 ± 1
556	US 78, 6.0 Miles E of SC 302	26 ± 1

TABLE 3. SRS Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL H_2O
SECOND DAY SAMPLES, 9/4/84		
601	S2-65, 2.0 Miles N of S2-781	1 ± 1
602	S-65, 3.0 Miles N of S-781	5 ± 1
603	S-65, 4.0 Miles N of S-781	1 ± 1
604	S-65, 5.0 Miles N of S-781	1 ± 1
605	S-65, 6.0 Miles N of S-781	1 ± 1
606	S-65, 7.0 Miles N of S-781	1 ± 1
607	S-65, 8.0 Miles N of S-781	1 ± 1
608	S-65, 9.0 Miles N of S-781	32 ± 1
SECOND DAY SAMPLES, 9/4/84		
651	I-20 at Graniteville Exit (S2-105)	1 ± 1
652	I-20, 1 Mile E of S-105	1 ± 1
653	I-20, 2 Miles E of S-105	11 ± 1
654	I-20, 3 Miles E of S-105	11 ± 1
655	I-20, 4 Miles E of S-105	1 ± 1
656	I-20, 5 Miles E of S-105	1 ± 1
657	I-20, 6 Miles E of S-105	1 ± 1
658	I-20, 7 Miles E of S-105	1 ± 1
659	I-20, 8 Miles E of S-105	5 ± 1
660	I-20, 9 Miles E of S-105	8 ± 1
661	I-20, 11 Miles E of S-105	10 ± 1
662	I-20, 13 Miles E of S-105	1 ± 1
663	I-20, 15 Miles E of S-105	7 ± 1
664	I-20, 17 Miles E of S-105	10 ± 1
665	I-20, 19 Miles E of S-105 (Light Rain)	4 ± 1
666	I-20, 21 Miles E of S-105 (Light Rain)	20 ± 1
667	I-20, 23 Miles E of S-105 (Light Rain)	10 ± 1
668	I-20, 25 Miles E of S-105 (Light Rain)	7 ± 1
669	I-20, 26 Miles E of S-105 (I-20 & US 178)	14 ± 1

TABLE 4. SRS Tritium Oxide at Air Monitoring Stations

Location	Silica Gel pCi/mL H_2O	Rain Water pCi/mL
Springfield	12 ± 1	13 ± 1
Aiken State Park	33 ± 1	51 ± 1
Aiken Airport	77 ± 2	NS
Windsor Road	109 ± 2	62
200–H	339 ± 10	NS
Talatha Gate	17 ± 1	NS
East Talatha	873 ± 25	NS

NS = No Sample

TABLE 5. SRP Tritium Oxide Milk Samples

Ref No.	Location	Concentration pCi/mL
M-101	9/4 Dairy, Johnston, SC	1 ± 1
M-101	9/5 Dairy, Johnston, SC	1 ± 1
M-101	9/6 Dairy, Johnston, SC	< 1 ± 1
M-102	9/4 Dairy, Monetta, SC	8 ± 1
M-102	9/5 Dairy, Monetta, SC	6 ± 1
M-102	9/6 Dairy, Monetta, SC	5 ± 1
M-103	9/4 Dairy, 8 Miles North of Wagener	14 ± 1
M-103	9/5 Dairy, 8 Miles North of Wagener	12 ± 1
M-103	9/6 Dairy, 8 Miles North of Wagener	10 ± 1
M-104	9/3 Dairy, Eureka, SC	2 ± 1
M-104	9/4 Dairy, Eureka, SC	2 ± 1
M-105	9/5 Dairy, 5 Miles SW of Aiken, SC	2 ± 1
M-106	9/5 Goat, 2 Miles NE of Windsor	22 ± 1
M-106	9/6 Goat, 2 Miles NE of Windsor	17 ± 1
M-106	9/7 Goat, 2 Miles NE of Windsor	18 ± 1
M-107	9/5 Cow, 2 Miles SE of Windsor	21 ± 1
M-107	9/6 Cow, 2 Milew SE of Windsor	16 ± 1
M-108	9/5 Cow, 3 Miles S of Windsor	13 ± 1
M-108	9/7 Cow, 3 Miles S of Windsor	10 ± 1
M-109	9/5 Goat, Windsor	20 ± 1
M-109	9/6 Goat, Windsor	17 ± 1
M-110	9/5 Goat, NW of New Ellenton	2 ± 1
M-111	9/5 Goat, N New Ellenton	13 ± 1
M-112	9/5 Beef Cow, Windsor	47 ± 2
M-112	9/7 Beef Cow, Windsor	26 ± 1

TABLE 6. SRS Bioassay Analysis Results

Ref No.	Location	Concentration µCi/mL	Dose Commitment mrem
1	New Ellenton	0.0025	0.018
2	New Ellenton	0.0022	0.016
3	New Ellenton	0.0016	0.012
4	New Ellenton	0.0013	0.010
5	New Ellenton	0.0005	0.004
6	Aiken	0.0010	0.007
7	Aiken	0.0010	0.007
8	Aiken	0.0022	0.016
9	Aiken	0.0016	0.012
10	Aiken	0.0013	0.010
11	Aiken	0.0059	0.040*
12	Aiken	0.0009	0.007
13	Aiken	0.0010	0.007
14	Aiken	0.0012	0.009
15	Aiken	0.0011	0.008
16	Aiken	0.0008	0.006
17	Aiken	0.0008	0.006
18	New Ellenton	0.0015	0.011
19	New Ellenton	0.0012	0.00
20	New Ellenton	0.0021	0.016
21	New Ellenton	0.0022	0.016
22	New Ellenton	Insufficient Sample	
23	Johnston	0.0027	0.020
24	Johnston	0.0020	0.015
25	Johnston	0.0021	0.016
26	Batesburg	0.0019	0.014
27	Batesburg	0.0024	0.018
28	Batesburg	0.0026	0.019
29		0.0011	0.008
30	W. Columbia	0.0009	0.007
31	Johnston	0.0015	0.011
32	Batesburg	0.0006	0.004
33	Johnston	0.0007	0.005
34	Ridge Spring	0.0028	0.021
35	Ridge Spring	0.0015	0.011
36	Graniteville	0.0010	0.007
37	Graniteville	0.0014	0.010
38	Graniteville	0.0008	0.006
39	Aiken	0.0005	0.004

*Plant Employee, may reflect occupational exposure

TABLE 6. SRS Bioassay Analysis Results

Ref No.	Location	Concentration µCi/mL	Dose Commitment mrem
40	Aiken	0.0021	0.016
41	Aiken	0.0019	0.014
42	Aiken	0.0012	0.009
43	New Ellenton	0.0054	0.040
44	New Ellenton	0.0044	0.032
45	Monetta	0.0008	0.006
46	Montmorenci	0.0070	0.052
47	Montmorenci	0.0010	0.008
48	Montmorenci	0.0035	0.026
49	Pelion	0.0032	0.024
50	Ridge Spring	0.0006	0.004
51	Ridge Spring	0.0014	0.010
52	Ridge Spring	0.0033	0.024
53	Ridge Spring	0.0023	0.017
54	Ridge Spring	0.0028	0.021
55	Johnston	0.0006	0.004
56	Johnston	0.0005	0.004
57	Johnston	0.0007	0.005
58	Johnston	0.0011	0.008
59	New Ellenton	0.0015	0.011
60	New Ellenton	0.0014	0.010
61	New Ellenton	0.0019	0.014
62	Windsor	0.0034	0.025
63	Windsor	0.0035	0.026
64	Edgefield	0.0008	0.006
65	Windsor	Insufficient Sample	
66	Windsor	Insufficient Sample	
67	Montmorenci	0.0160	0.118
68	Lexington	0.0010	0.007
69	Lexington	0.0008	0.006
70	Wagener	0.0040	0.030
71	Wagener	0.0020	0.015
72	Lexington	0.0015	0.011
73	Pelion	0.0026	0.019

TABLE 7. SCDHEC Tritium Oxide Vegetation Samples

Ref No.	Location	Concentration pCi/mL
2:30 AM - 7:00 AM, 9/3/84		
01	US 1 and S2-895 (W. Aiken)	8.8
02	US 78 and SC 302 (E. Aiken)	298.0
03	I-20 and South Edisto River	98.0
04	SC 302 and South Edisto River	522.0
05	I-20 and SC 19	6.4
06	I-20 and S2-49	1415.0
07	I-20 and S2-253	4.2
08	SC 302 & S2-77	2963.0
09	I-20 & US 1	546.0
10	I-20 & S2-39	558.0
11	I-20 & S2-144	9.6
12	Warrenville	12.8
13	US 1 & S2-254	9.1
14	US 278 & S2-54	1390.0
15	US 278, 3 Miles W of Upper Three Runs	663.0
16	US 278, 1 Mile E of S6-62	72.0
17	US 278, 1 Mile W of Bates Cemetary	50.0
18	US 278 & SC 19	24.0
19	US 278, 2.3 Miles W of Upper Three Runs	2000.0
20	US 278, 2.1 Miles W of S2-54	168.0
21	US 278, 0.7 Miles SE of S2-62	12.9
22	US 278, 0.7 Miles W of S6-57	247.0
23	US 278 & S6-737	18.7
24	Barnwell Airport	10.7
25	Jackson	6.3
26	US 278, 1.4 Miles W of S2-54	129.0
27	US 278, 0.7 Miles W of Upper Three Runs	4990.0
28	US 278, 1.4 Miles W of Upper Three Runs	3120.0
29	Wagener	786.0
30	I-20 & S2-980	82.0
31	Belvedere	4.5
32	Clearwater	3.9
33	Kitchings Mill	5.7
34	I-20 North of Vaucluse	421.0

TABLE 7. SCDHEC Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL
2:30 AM - 7:00 AM, 9/3/84		
35	US 278 and S6-21	12.6
36	US 278 & Springfield Church	6.4
37	US 278 & Buck Creek	15.4
38	US 278 & SC 781	870.0
39	US 278 and Bates Cemeta	25.0
40	US 278 & S6-62	18.3
41	S2-62 & S2-57	5.4
42	US 278, 2.8 Miles W of S2-52	168.0
11:00 AM - 3:00 PM, 9/3/84		
01A	US 78 & S2-113	68.0
02A	S2-79 & S2-507	43.0
03A	SC 302 & S2-79	81.0
04A	SC 302, 0.8 Miles E of S2-1346	66.0
05A	SC 39 & Edisto River Bridge	46.0
06A	SC 39 & S6-188	117.0
07A	SC 39 & Silver Springs Church	127.0
08A	White Pond, SC	51.0
09A	Windsor, SC	50.0
10A	US 78 & S2-576	79.0
11A	US 78 & S2-1304	235.0
12A	SC 302 & S2-262	44.0
13A	S2-262 & S2-21	96.0
14A	SC 39 & SC 391	7.7
15A	New Holland, SC	69.0
16A	Monetta, SC	7.0

TABLE 7. SCDHEC Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/mL
10:00 AM - 2:00 PM, 9/4/84		
01B	US 78 & S2-1304	10.5
02B	US 78 & S2-53	6.0
03B	US 78 & S2-576	6.2
04B	I-20 & S2-49	2.4
05B	I-20 & SC 39	3.4
06B	Wagener, SC	3.4
07B	S2-77 & S2-21	6.8
08B	SC 302 & S2-1304	5.0
09B	New Holland, SC	2.9
10B	US 78 & SC 302	0.7
11B	White Pond, SC	6.8
12B	Montmorenci, SC	6.1
13B	SC 302 & S2-264	5.9
14B	Williston, SC	5.9
15B	Kitchings Mill, SC	4.5

TABLE 7. SCDHEC Tritium Oxide Vegetation Samples (cont.)

Ref No.	Location	Concentration pCi/ml
10:00 AM - 2:30 PM, 9/6/84		
01C	I-20 & SC 39	2.2
02C	Kitchings Mill, SC	2.9
03C	US 78 & S2-576	3.3
04C	SC 302 & S2-77	10.7
05C	White Pond, SC	4.8
06C	US 78 & SC 302	3.2
07C	Montmorenci, SC	3.1
08C	I-20 & S2-49	2.6
09C	New Holland, SC	3.4
10C	US 78 & S2-1304	5.4
11C	SC 302 & S2-262	7.9
12C	SC 302 Near Wagener, SC	2.3
9/10/84		
01D	J. Marion Sims Building	0.7
02D	State Park Health Laboratories	1.3
03D	I-26 & US 378	1.0

TABLE 8. SCDHEC Tritium Oxide Milk Samples

Location	Concentration pCi/mL
Dairy Outside Williston, 9/4/84, 1:00 PM	16
Dairy Outside Williston, 9/12/84	3

TABLE 9. SCDHEC Tritium Oxide Surface Water Samples

Location	Concentration pCi/mL
COLLECTED 9/3/84, 2:30 AM TO 7:00 AM	
South Edisto River at I-20	< 0.4
Shaws Creek at SC 302	3.0
South Edisto River at SC 302	1.2
Creek Under I-20 (North of Vaucluse, SC)	< 0.4
Clearwater, SC lake	1.6
Rosemary Creek at US 278	2.7
Buck Creek at US 278	0.5
Mill Pond at US 278 & S6-62	0.8
Upper Three Runs at US 278	1.2
COLLECTED 9/4/84, 11:00 AM	
Pond Near Edisto River & SC 302	1.8

TABLE 10. Comparison of September 2, 1984 Release to Other Releases

Release	Total Tritium Curies	Oxide (HTO) Curies	Maximum Dose mrem	Population Dose person-rem
05/04/74	479,000	960	0.018	8.0
12/31/75	182,000	1,000	0.014	0.2
03/27/81	33,000	32,700	0.3	4.0
07/16/83	56,000	600	0.04	0.6
03/23/84	7,500	5,258	0.17	2.2
09/02/84	43,800	43,800	1.6	46.4
03/27/85	19,400	19,400	0.07	8.0
05/29/86	5,900	5,600	0.03	
07/31/87	172,000	4,600	0.02	0.22

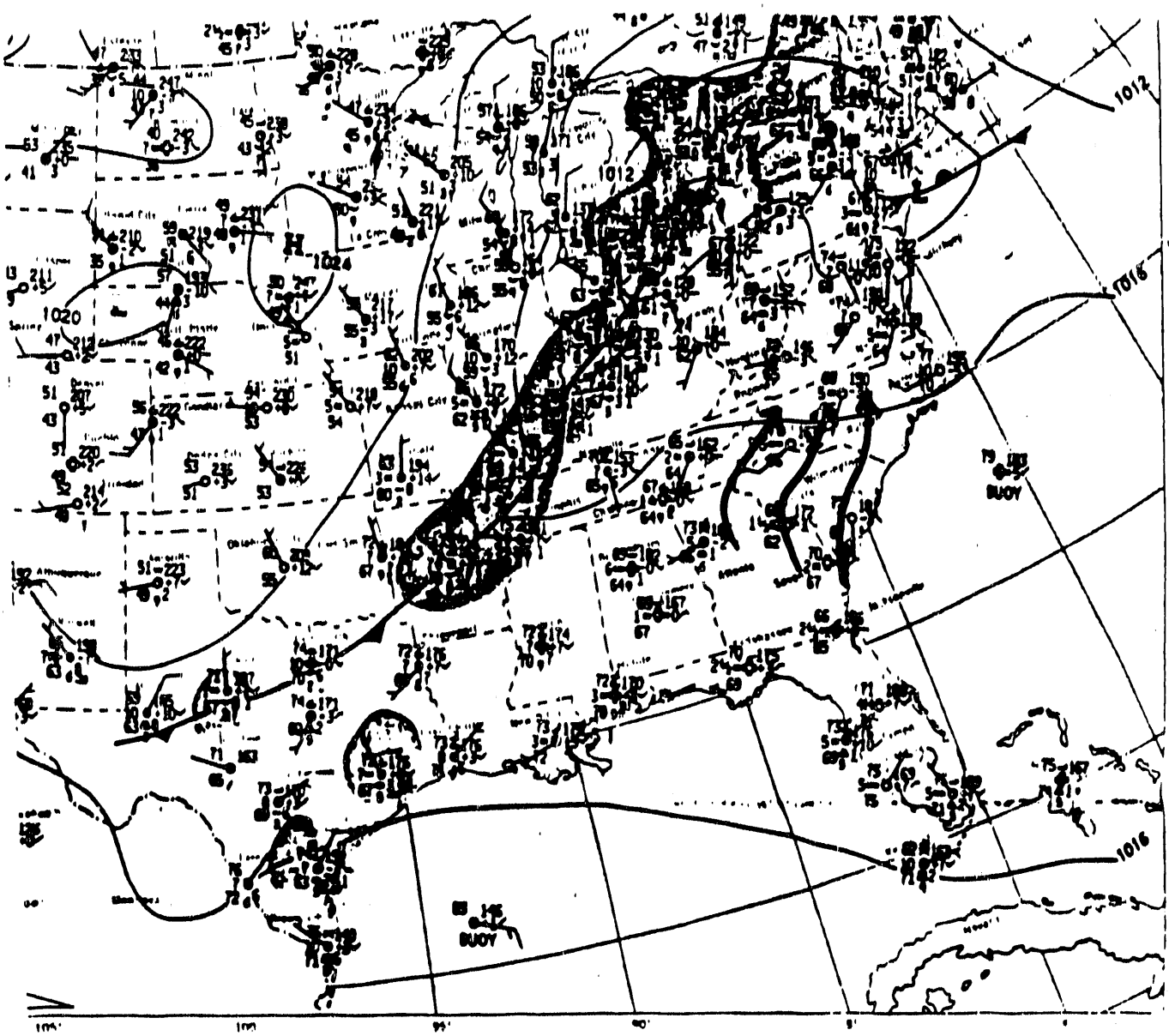

FIGURE 1. Surface weather map for 8:00 AM EDT on September 3, 1984. Trajectories of boundary layer winds at 11:00 PM on September 2 are also shown.

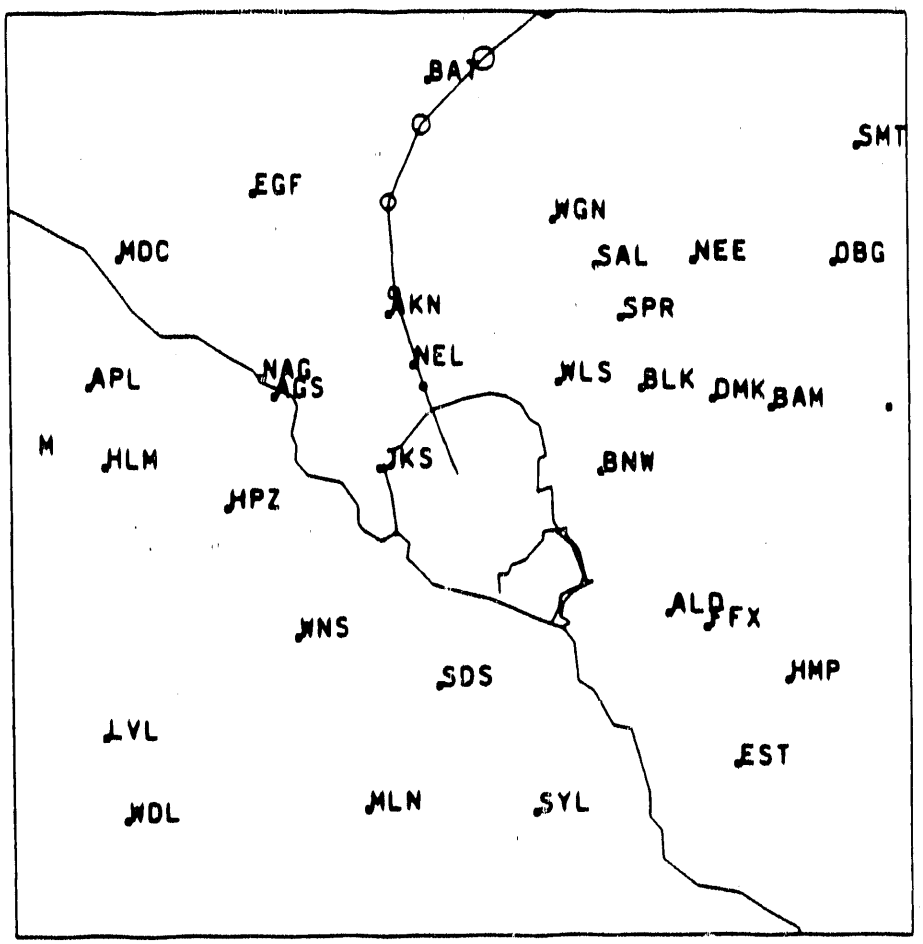

FIGURE 2. **Puff trajectory calculated by PFPL immediately following the release. The circles indicate the location of the puff every hour. The radius of the circle is the "2 sigma distance" (see text).**

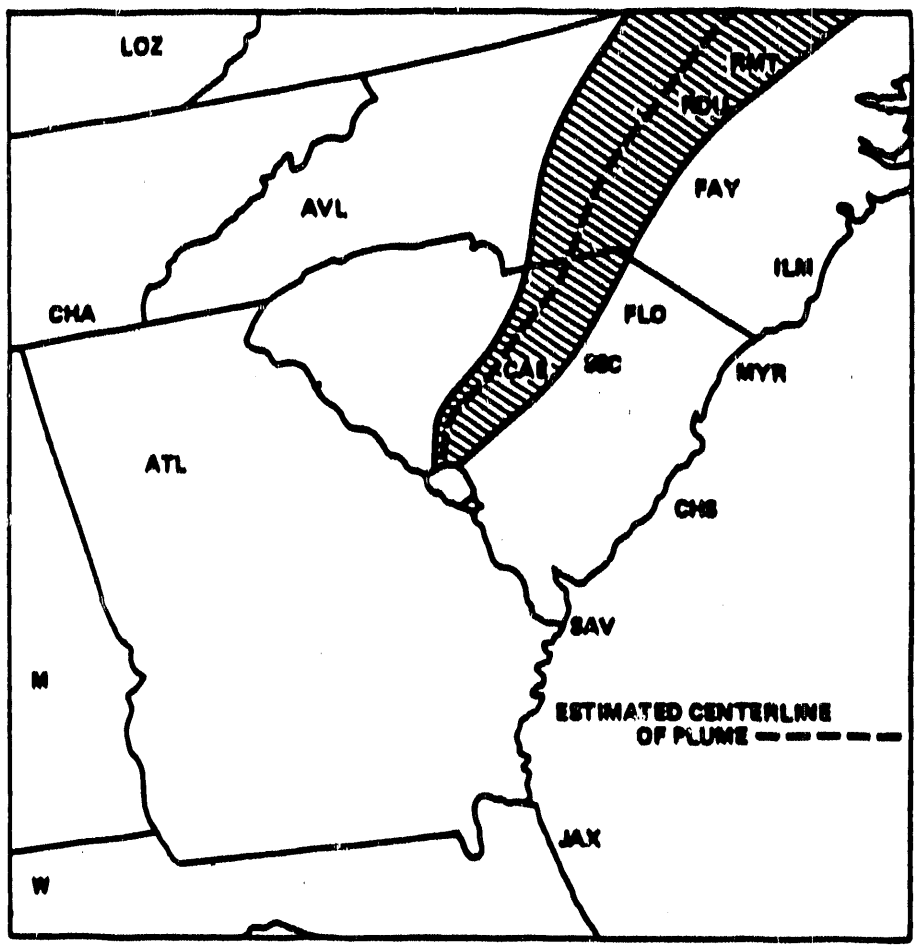

FIGURE 3. Plume trajectory calculated from 2DPUF.

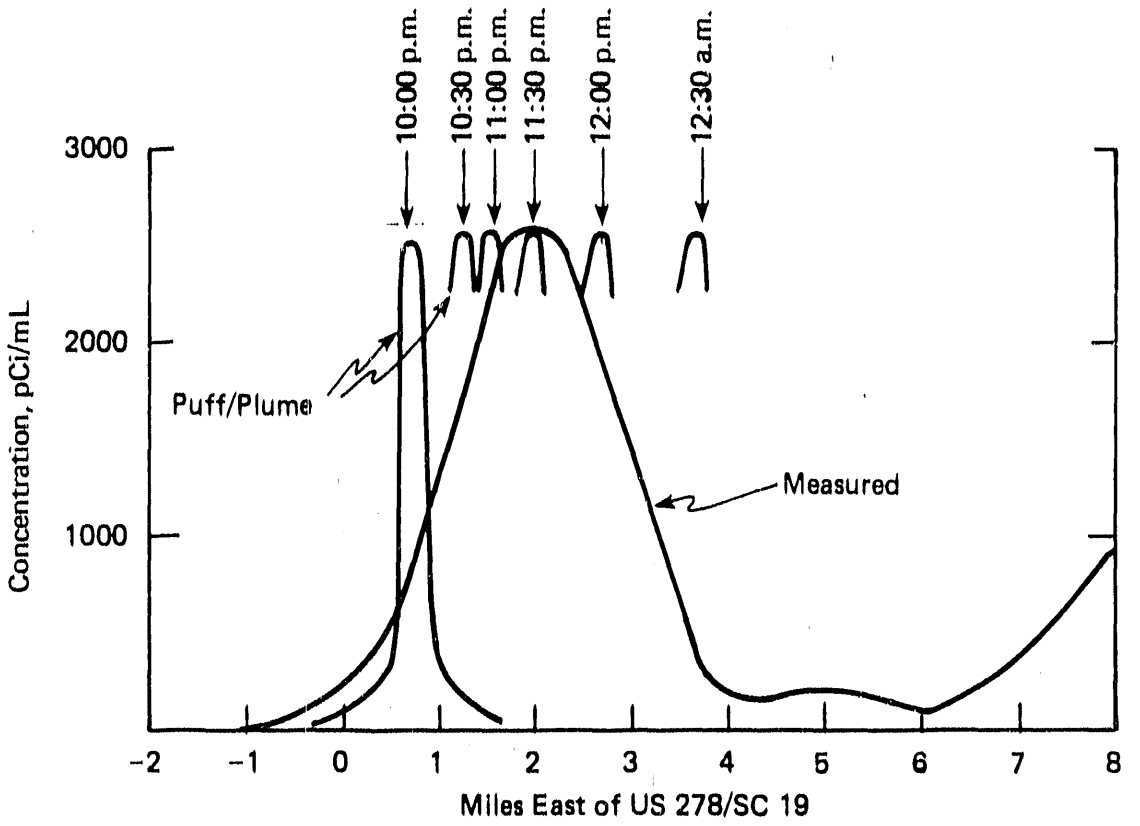

FIGURE 4. Concentrations across the plume at a distance of 6 miles north of the release point. The measured curve denotes vegetation samples, Reference numbers 111 to 119, Table 3. The curves labeled Puff/Plume are puff locations and widths calculated with the PFPL model with assumed releases at half-hour intervals between 10:00 PM and 12:30 AM. The model results have been scaled so that the maxima equal the measured maximum.

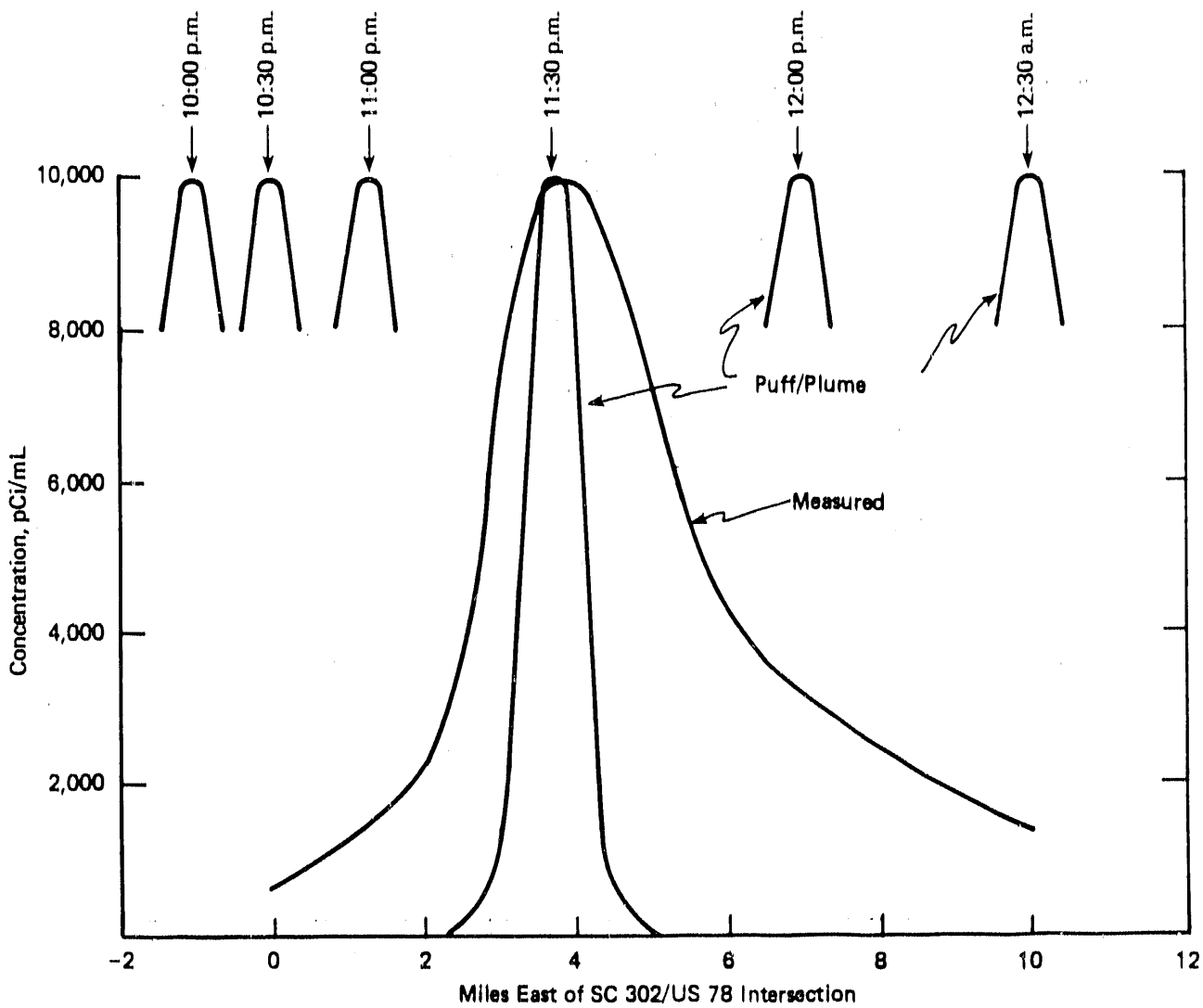

FIGURE 5. Concentrations across the plume at a distance of 15 miles north of the release point. The measured curve denotes vegetation samples, reference numbers 60–65. See caption of Figure 4 for explanation.

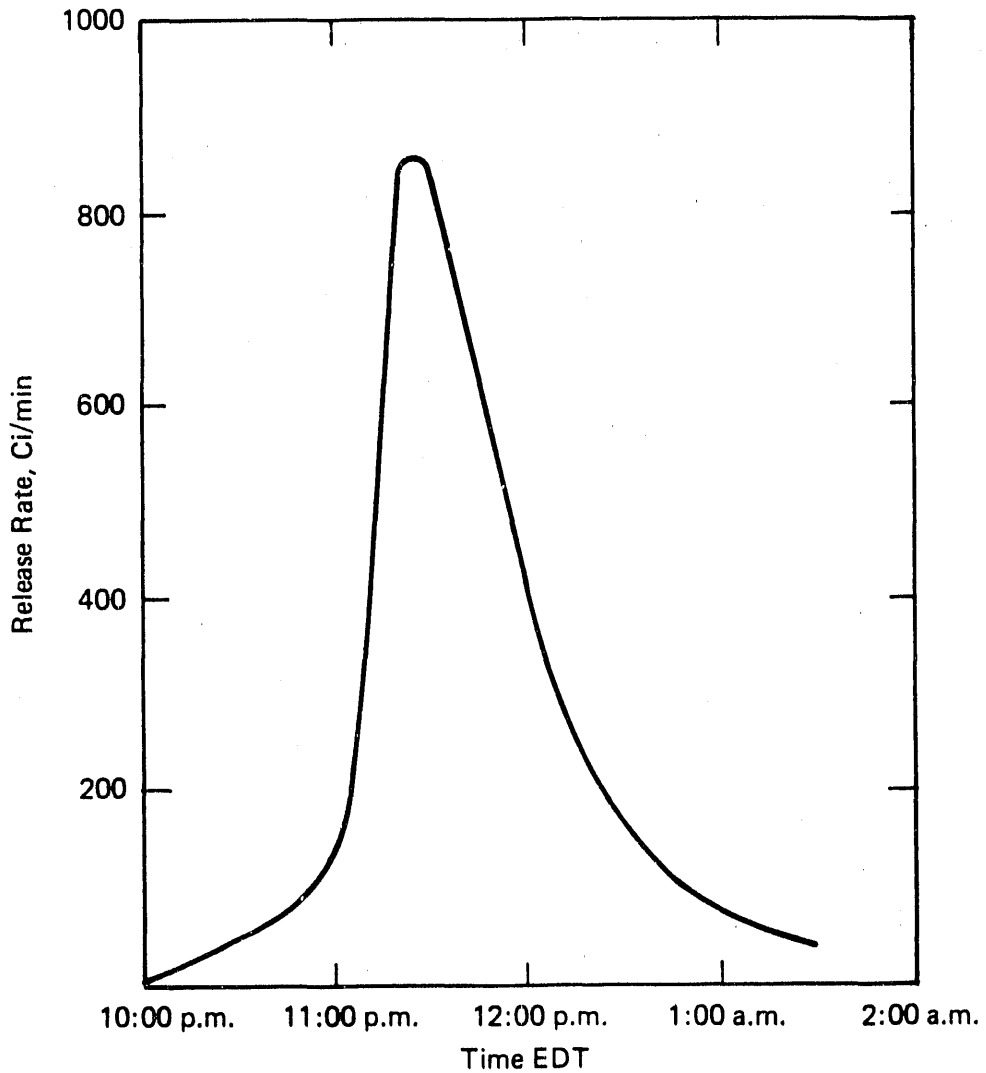

FIGURE 6. Estimated release rate as a function of time as inferred from vegetation samples, (see Figures 4 and 5). The curve has been scaled so that the total release equals 43,200 Ci.

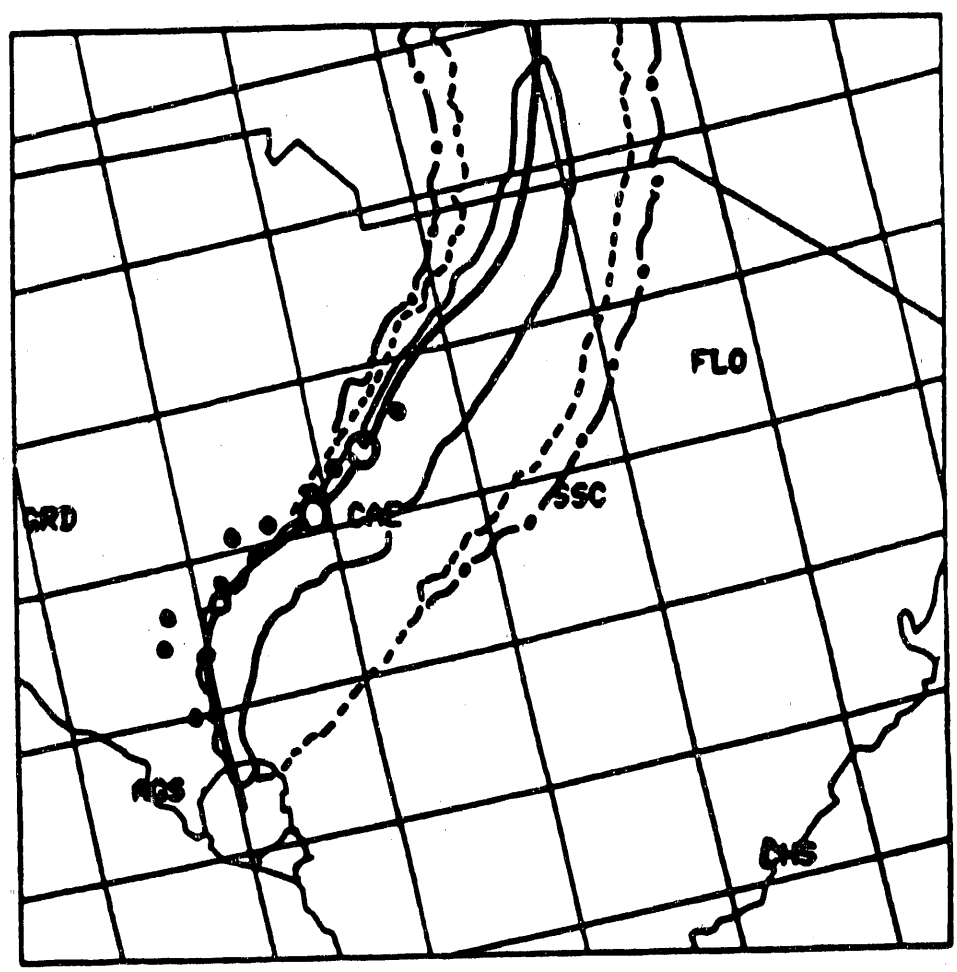

FIGURE 7. **Calculated average individual doses. The dose at the solid line is 0.16 mrem; at the dashed line, 0.016 mrem; and at the dashed–dot line, 0.0016 mrem. The dots identify locations where air samples were collected during the release.**

END

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