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TENNESSEE VALLEY AUTHORITY

Preoperational

Bellefonte
50-438

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DIVISION OF OCCUPATIONAL HEALTH AND SAFETY

RH-80-9-BL1

ENVIRONMENTAL RADIOACTIVITY LEVELS
BELLEFONTE NUCLEAR PLANT
ANNUAL REPORT
1979

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MILLS,L.M. Tennessee Valley Authority
RECIP.NAME RECIPIENT AFFILIATION
DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards "Environ Radioactivity Levels - Bellefonte Nuclear Plant - Annual Rept - 1979." Rept presents results obtained from preoperational environ radiological monitoring program.

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	Yes	No
Noted	✓	
Applicable to RAB	✓	
RAB action needed		✓ Not now.

File? (Where) Environmental Rpts Discard

Comments: Preoperational Environmental Radiological Monitoring Program. Started in August 1975. This is first full year of operation. Looks like good program but would need to study to be sure.

Signed: W. W. Mente

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TENNESSEE VALLEY AUTHORITY

CHATTANOOGA, TENNESSEE 37401

400 Chestnut Street Tower II

January 22, 1981

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Denton:

In the Matter of the Application of	)	Docket Nos. 50-438
Tennessee Valley Authority	)	50-439

Enclosed for your information are 20 copies of the report,

"Environmental Radioactivity Levels - Bellefonte Nuclear Plant - Annual Report - 1979."

This report presents the results obtained from TVA's preoperational environmental radiological monitoring program during 1979.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills by RLS

L. M. Mills, Manager
Nuclear Regulation and Safety

Enclosure (20)
cc (Enclosure):
See pages 2 & 3

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ENVIRONMENTAL RADIOACTIVITY LEVELS

BELLEFONTE NUCLEAR PLANT

ANNUAL REPORT

1979

Introduction

The Bellefonte Nuclear Plant (BLN), being constructed by the Tennessee Valley Authority, is located in Jackson County, Alabama, on a peninsula bounded on the west by Town Creek embayment and on the east by Guntersville Reservoir at Tennessee River Mile (TRM) 391.5. See Figure 1. The site is approximately 6 miles (10 kilometers) northeast of Scottsboro, Alabama. The plant will consist of two pressurized water reactors; each unit is rated at 3,620 MWt and 1,271 MWe. Fuel load in unit 1 is scheduled for March 1983.

A preoperational environmental radiological monitoring program was implemented in August 1978. This program has the objective of establishing a baseline of data on the distribution of natural and manmade radioactivity in the environment near the plant site. This report presents the results obtained from that program during 1979.

Field staffs in the Division of Occupational Health and Safety, the Division of Water Resources, and the Data Services Branch carried out the sampling program outlined in Table 1. Sampling locations are shown in Figures 2 and 3 and Table 2 describes the locations of the atmospheric and terrestrial monitoring stations. All the radiochemical and instrumental analyses were conducted in a central laboratory at Muscle Shoals, Alabama. Alpha and beta analyses were performed on Beckman Low Beta II and Beckman Wide Beta II low-background proportional counters. Two Nuclear Data Model 100 multichannel analyzer systems employing sodium iodide, NaI(Tℓ) detectors and one Nuclear Data Model 4420 in conjunction with Germanium, Ge(Li), detection systems were used to analyze the samples for specific gamma-emitting radionuclides. Samples of water, vegetation, air particulates, food crops, and charcoal (specific analysis for ^{131}I) are routinely counted with NaI(Tℓ) detection systems. If significant concentrations of radioisotopes are identified, or if there is a reasonable expectation of increased radioactivity levels (such as during periods of increased fallout), these samples are counted on the Ge(Li) system. Identification of gamma-emitting radionuclides in all other types of samples is routinely performed by analysis on the Ge(Li) system. A TVA fabricated beta-gamma coincidence counting system is utilized for the determination of ^{131}I concentration in milk.

Data were entered in computer storage for processing specific to the analysis conducted. A computer, employing an ALPHA-M least-squares code, was used to solve multimatrix problems associated with estimating the activities of the gamma-emitting nuclides analyzed by NaI(Tℓ). The data obtained by Ge(Li) detectors were resolved by the ND-4420 software.

The detection capabilities for environmental sample analysis given as the nominal lower limits of detection (LLD) are listed in Table 3. Samples processed by NaI(Tℓ) gamma spectroscopy were analyzed for 13 specific gamma-emitting radionuclides and radionuclide combinations.* For these analyses, radionuclide combinations such as ^{103,106}Ru and ^{95}Zr-Nb are analyzed as one radionuclide. All photopeaks found in Ge(Li) spectra were identified and quantified. Many of the isotopes identified by Ge(Li) spectral analysis are naturally occurring or naturally produced radioisotopes, such as ^{7}Be, ^{40}K, ^{212}Bi, ^{214}Bi, ^{212}Pb, ^{214}Pb, ^{226}Ra, etc. LLD's for the analysis of the radionuclides listed below* are given in Table 3B. LLD's for additional radionuclides identified by Ge(Li) analysis were calculated for each analysis and nominal values are listed in the appropriate data tables. In the instance where an LLD has not been established, an LLD value of zero was assumed. A notation in a table of "___ values <LLD" for an isotope with no established LLD does not imply a value less than 0; rather it indicates that the isotope was not identified in that specific group of samples. For each sample type, only the radionuclides for which values greater than the LLD were reported are listed in the data tables.

TVA's Radioanalytical Laboratory participates in the Environmental Radioactivity Laboratory Intercomparison Studies Program conducted by EPA-Las Vegas. This program provides periodic cross-check samples of the type and radionuclide composition normally analyzed in an environmental monitoring program. Routine sample handling and analysis procedures were employed in the evaluation of these samples. Gamma spectral analyses were performed on NaI detectors. The results received during calendar year 1979 are shown in Table 4. The $\pm 3\sigma$ limits are corrected for triplicate determinations.

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*The following radionuclides and radionuclide combinations are quantified by the ALPHA-M least-squares computer code: ^{141,144}Ce; ^{51}Cr; ^{131}I; ^{103,106}Ru; ^{134}Cs; ^{137}Cs; ^{95}Zr-Nb; ^{58}Co; ^{54}Mn; ^{65}Zn; ^{60}Co; ^{40}K; and ^{140}Ba-La.

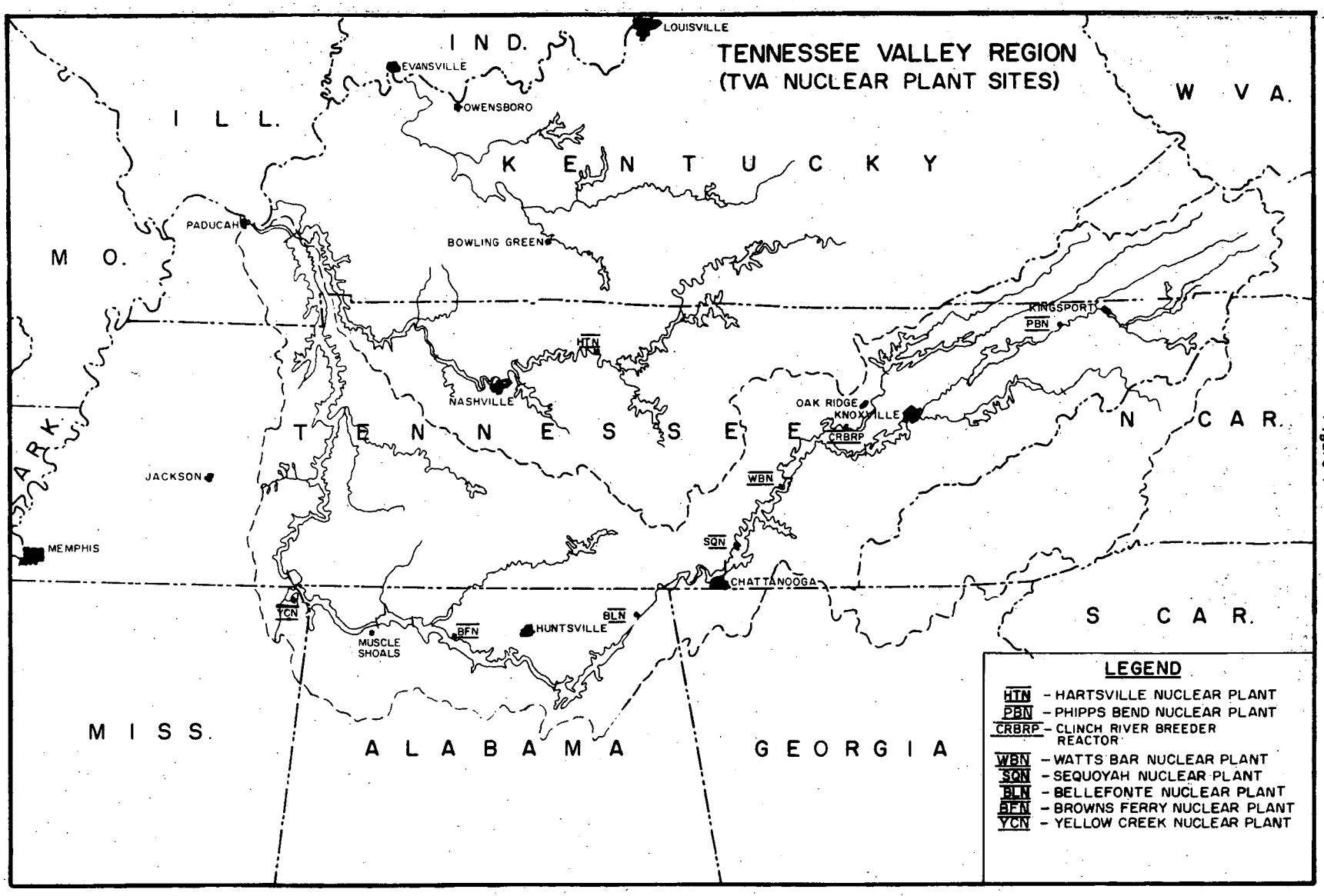

TENNESSEE VALLEY REGION
(TVA NUCLEAR PLANT SITES)
IND.
ILL.
KENTUCKY
W VA.
MO.
ARK.
TENNESSEE
N CAR.
S CAR.
MISS.
ALABAMA
GEORGIA
LOUISVILLE
EVANSVILLE
OWENSBORO
PADUCAH
BOWLING GREEN
NASHVILLE
HTN
KINGSPORT
PBN
OAK RIDGE
KNOXVILLE
CRBRP
WBN
SQN
CHATTANOOGA
JACKSON
MEMPHIS
YCN
MUSCLE SHOALS
BFN
HUNTSVILLE
BLN
LEGEND
HTN - HARTSVILLE NUCLEAR PLANT
PBN - PHIPPS BEND NUCLEAR PLANT
CRBRP - CLINCH RIVER BREEDER REACTOR
WBN - WATTS BAR NUCLEAR PLANT
SQN - SEQUOYAH NUCLEAR PLANT
BLN - BELLEFONTE NUCLEAR PLANT
BFN - BROWNS FERRY NUCLEAR PLANT
YCN - YELLOW CREEK NUCLEAR PLANT

Figure 1

Table 1

ENVIRONMENTAL RADIOACTIVITY SAMPLING SCHEDULE
BELLEFONTE NUCLEAR PLANT

Station Location	Air Filter	Charcoal Filter	Rain-water	Heavy Particle Fallout	Vegetation	Milk	Well Water	Public Water	Fish
Site SW	W	W	M	M	Q				
Site NE	W	W	M	M	Q				
Scottsboro	W	W	M	M	Q			M	
Hollywood	W	W	M	M	Q			M	
Fackler	W	W	M	M	Q				
Stevenson	W	W	M	M	Q				
Pisgah	W	W	M	M	Q				
Section	W	W	M	M	Q				
Lim Rock	W	W	M	M	Q				
Rainsville	W	W	M	M	Q				
Farm S					Q	M			
Farm G					Q	M			
Farm H					Q	M			
Farm D							M		
Well A							M		
Onsite Wells (6)							M		
Sand Mountain Water & Fire Protection Authority								M	
Widows Creek Steam Plant								M	
Wheeler Reservoir									S*
Guntersville Reservoir									S*
Nickajack Reservoir									S**

W - Weekly M - Monthly Q - Quarterly S - Semiannually
*Samples collected as a part of the Browns Ferry Nuclear Plant monitoring program.
**Samples collected as a part of the Sequoyah Nuclear Plant monitoring program.

Table 2

Atmospheric and Terrestrial Monitoring Stations Locations
Bellefonte Nuclear Plant

Sample Station	Approximate Distance and Direction from Plant
LM - 1 BL	3/4 mile SW (1-1/4 kilometers)
LM - 2 BL	1 mile NE (1-1/2 kilometers)
PM - 1 BL (Scottsboro)	5-3/4 miles WSW (9-1/4 kilometers)
PM - 2 BL (Hollywood)	2 miles WNW (3-1/4 kilometers)
PM - 3 BL (Fackler)	5-1/4 miles N (8-1/2 kilometers)
PM - 4 BL (Stevenson)	11 miles NNE (17-3/4 kilometers)
PM - 5 BL (Pisgah)	4 miles ESE (6-1/2 kilometers)
PM - 6 BL (Section)	9 miles SSW (14-1/2 kilometers)
RM - 1 BL (Lim Rock)	18 miles W (29 kilometers)
RM - 2 BL (Rainsville)	14-1/2 miles SSE (23-1/3 kilometers)
Farm S	5 miles SW (8 kilometers)
Farm G	2-1/2 miles NNE (4 kilometers)
Farm H	1 mile NW (1-2/3 kilometers)

Table 3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

A. Specific Analyses

NOMINAL LOWER LIMIT OF DETECTION (LLD)*

	Air Particulates pCi/m^3	Charcoal pCi/m^3	Fallout mCi/km^2	Water pCi/l	Vegetation and grain pCi/g, dry	Soil and Sediment pCi/g, dry	Fish, clam flesh, plankton, pCi/g, dry	Clam shells pCi/g, dry	Foods, meat, poultry, pCi/kg, wet	Milk pCi/l
Total α			-	0.4	0.01				1.5	
Gross α	0.005			2.0	0.05	0.35	0.1	0.7		
Gross β	0.01		0.05	2.4	0.20	0.70	0.1	0.7	25	
^{3}H				330						0.5
^{131}I		0.01								10
^{89}Sr	0.005			10	0.25	1.5	0.5	5.0	40	2
^{90}Sr	0.001			2	0.05	0.3	0.1	1.0	8	

*All LLD values for isotopic separations are calculated by the method developed by Pasternack and Harley as described in HASL-300. Factors such as sample size, decay time, chemical yield, and counting efficiency may vary for a given sample; these variations may change the LLD value for the given sample. The assumption is made that all samples are analyzed within one week of the collection date. Conversion factors: 1 pCi = 3.7×10^{-2} Bq; 1 mCi = 3.7×10^{7} Bq.

Table 3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

B. Gamma Analyses

NOMINAL LOWER LIMIT OF DETECTION (LLD)

	Air particulates pCi/m³		Water and milk pCi/l		Vegetation and grain pCi/g, dry		Soil and sediment pCi/g, dry		Fish pCi/g, dry		Clam flesh and plankton pCi/g, dry		Clam shells pCi/g, dry		Foods, (tomatoes potatoes, etc.) pCi/kg, wet		Meat and poultry pCi/kg, wet	
	NaI*	Ge(Li)**	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)	NaI	Ge(Li)
$^{141,144}Ce$	0.03		38		0.55		0.35		0.35				0.35		38		90	
^{144}Ce		0.02		33		0.22		0.06		0.06	0.35			0.06		33		40
^{51}Cr	0.07	0.03	60	44	1.10	0.47	0.60	0.10	0.60	0.10	0.56		0.60	0.10	60	44	200	90
^{131}I	0.01	0.01	15	8	0.35	0.09	0.20	0.02	0.20	0.02	0.07		0.20	0.02	15	8	50	20
$^{103,106}Ru$	0.04		40		0.65		0.45		0.45				0.45		40		150	
^{106}Ru		0.03		40		0.51		0.11		0.11	0.74			0.11		40		90
^{134}Cs	0.01	0.02	10	26	0.20	0.33	0.12	0.08	0.12	0.08	0.48		0.12	0.08	10	26	40	50
^{137}Cs	0.01	0.01	10	5	0.20	0.06	0.12	0.02	0.12	0.02	0.08		0.12	0.02	10	5	40	15
^{95}Zr-Nb	0.01		10		0.20		0.12		0.12				0.12		10		40	
^{95}Zr		0.01		10		0.11		0.03		0.03	0.15			0.03		10		20
^{95}Nb		0.01		5		0.05		0.01		0.01	0.07			0.01		5		15
^{58}Co	0.02	0.01	15	5	0.23	0.05	0.20	0.01	0.20	0.01	0.07		0.20	0.01	15	5	55	15
^{54}Mn	0.02	0.01	10	5	0.20	0.05	0.15	0.01	0.15	0.01	0.08		0.15	0.01	10	5	40	15
^{65}Zn	0.02	0.01	15	9	0.25	0.11	0.23	0.02	0.23	0.02	0.17		0.23	0.02	15	9	70	20
^{60}Co	0.01	0.01	10	5	0.17	0.06	0.11	0.01	0.11	0.01	0.08		0.11	0.01	10	5	30	15
^{40}K	0.10		150		2.50		0.90		0.90				0.90		150		400	
^{140}Ba-La	0.02		15		0.68		0.15		0.15				0.15		15		50	
^{140}Ba		0.02		25		0.34		0.07		0.07	0.30			0.07		25		50
^{140}La		0.01		7		0.08		0.02		0.02	0.10			0.02		7		15

*The NaI(Tl) LLD values are calculated by the method developed by Pasternack and Harley as described in HASL-300 and Nucl. Instr. Methods 91, 533-40 (1971). These LLD values are expected to vary depending on the activities of the components in the samples. These figures do not represent the LLD values achievable on a given sample. Water is counted in a 3.5-L Marinelli beaker. Vegetation, fish, soil, and sediment are counted in a 1-pint container as dry weight. The average dry weight is 120 grams for vegetation and 400-500 grams for soil sediment and fish. Meat and poultry are counted in a 1-pint container as dry weight, then corrected to wet weight using an average moisture content of 70%. Average dry weight is 250 grams. Air particulates are counted in a well crystal. The counting system consists of a multichannel analyzer and either a 4" x 4" solid or 4" x 5" well NaI(Tl) crystal. The counting time is 4000 seconds. All calculations are performed by the least-squares computer program ALPHA-M. The assumption is made that all samples are analyzed within one week of the collection date.

**The Ge(Li) LLD values are calculated by the method developed by Pasternack and Harley as described in HASL-300. These LLD values are expected to vary depending on the activities of the components in the samples. These figures do not represent the LLD values achievable on given samples. Water is counted in either a 0.5-L or 3.5-L Marinelli beaker. Solid samples such as soil, sediment, and clam shells are counted in a 0.5-L Marinelli beaker as dry weight. The average dry weight is 400-500 grams. Air filters and very small volume samples are counted in petrie dishes centered on the detector endcap. The counting system consists of a ND-4420 multichannel analyzer and either a 25%, 14%, 16%, or 29% Ge(Li) detector. The counting time is normally 8 hours. All spectral analysis is performed using the software provided with the ND-4420. The assumption is made that all samples are analyzed within one week of the collection date.

Conversion factor: 1 pCi = 3.7×10^{-2} Bq.

Table 4

Results Obtained in Interlaboratory Comparison Program

A. Air Filter (pCi/filter)

Date	Gross Alpha EPA value (±3σ)	Gross Alpha TVA Avg.	Gross Beta EPA value (±3σ)	Gross Beta TVA Avg.	Strontium-90 EPA value (±3σ)	Strontium-90 TVA Avg.	Cesium-137 EPA value (±3σ)	Cesium-137 TVA Avg.
1/79	5 ± 9	4	18 ± 9	20	6 ± 2.7	6	6 ± 9	7
3/79	14 ± 9	14	63 ± 9	64	21 ± 2.7	17	21 ± 9	18
6/79	9 ± 9	9	30 ± 9	31	10 ± 2.7	9	10 ± 9	9
10/79	10 ± 9	10	31 ± 9	33	10 ± 2.7	10	12 ± 9	11

B. Water (pCi/l)

Date	Gross Alpha EPA value (±3σ)	Gross Alpha TVA Avg.	Gross Beta EPA value (±3σ)	Gross Beta TVA Avg.	Strontium-89 EPA value (±3σ)	Strontium-89 TVA Avg.	Strontium-90 EPA value (±3σ)	Strontium-90 TVA Avg.	Tritium EPA value (±3σ)	Tritium TVA Avg.	Iodine-131* EPA value (±3σ)	Iodine-131* TVA Avg.
11/78	11 ± 9	12	26 ± 9	27								
12/78									2030±400	2100		
1/79	6 ± 9	7	16 ± 9	17	14 ± 9	14	6 ± 2.7	6				
2/79									1280±570	1260		
3/79	10 ± 9	10	16 ± 9	18								
4/79									2270±400	2270	40 ± 7	40
5/79	18 ± 9	15	22 ± 9	22	23 ± 9	24	30 ± 2.7	26				
6/79									1540±580	1590		
7/79	9 ± 9	11	12 ± 9	13								
8/79									1480±580	1300	26 ± 9	26
9/79	5 ± 9	8	40 ± 9	43	3 ± 9	4	28 ± 2.7	25				
10/79									1560±640	1400		

*Specific analysis for ^{131}I to test the procedures used for the analysis of ^{131}I in milk.

Table 4 (Contd)

Results Obtained in Interlaboratory Comparison Program

C. Gamma-Emitting Radionuclides in Water (pCi/l)

Date	^{51}Cr		^{60}Co		^{65}Zn		^{106}Ru		^{134}Cs		^{137}Cs	
	EPA value (±3σ)	TVA Avg.	EPA value (±3σ)	TVA Avg.	EPA value (±3σ)	TVA Avg.	EPA value (±3σ)	TVA Avg.	EPA value (±3σ)	TVA Avg.	EPA value (±3σ)	TVA Avg.
10/78	117 ± 10	150	23 ± 9	24	82 ± 9	78	46 ± 9	42	25 ± 9	29	125 ± 10	120
2/79	0 ± 9	0	9 ± 9	9	21 ± 9	25	0 ± 9	0	6 ± 9	6	12 ± 9	12
6/79	0 ± 9	0	47 ± 9	48	0 ± 9	0	0 ± 9	0	71 ± 9	72	0 ± 9	0
10/79	113 ± 10	108	6 ± 9	7	0 ± 9	0	0 ± 9	0	7 ± 9	9	11 ± 9	11

D. Tritium in Urine (pCi/l)

Date	EPA value (±3σ)	TVA avg.
12/78	2,150 ± 400	2330
3/79	3,300 ± 600	2350
6/79	1,610 ± 580	1590
9/79	13,200 ± 710	13350

Table 4 (Contd)

Results Obtained in Interlaboratory Comparison Program

E. Milk (pCi/l)

Date	^{89}Sr EPA value (±3σ)	^{89}Sr TVA Avg.	^{90}Sr EPA value (±3σ)	^{90}Sr TVA Avg.	^{131}I EPA value (±3σ)	^{131}I TVA Avg.	^{137}Cs EPA value (±3σ)	^{137}Cs TVA Avg.	^{140}Be EPA value (±3σ)	^{140}Be TVA Avg.	^{40}K EPA value (±3σ)	^{40}K TVA Avg.
1/79	33 ± 9	33	19 ± 2.7	21	105 ± 10	110	49 ± 9	48	0 ± 9	2	1560±135	1520
4/79	38 ± 9	38	54 ± 5.2	61	96 ± 9	95	154 ± 14	150	0 ± 9	0	1560±135	1450
7/79	5 ± 9	5	11 ± 2.7	13	17 ± 9	21	12 ± 9	11	0 ± 9	0	1630±145	1570
10/79	25 ± 9	25	17 ± 3.5	22	637 ± 55	636	49 ± 9	45	0 ± 9	0	1470±125	1490

F. Food (pCi/kg wet weight)

3/79	48 ± 9	53	22 ± 2.7	27	90 ± 9	91	74 ± 9	73	0 ± 9	0	2700±235	2810
7/79	8 ± 9	12	3 ± 1.1	7	18 ± 9	16	33 ± 9	35	0 ± 9	0	2650±225	3000
11/79	Results not received at this time											

Atmospheric Monitoring

The atmospheric monitoring network is divided into three subgroups. Two local air monitors are located within the plant boundary. Six perimeter air monitors are located at distances out to 9 miles (14.5 kilometers) from the plant in the towns of Scottsboro, Hollywood, Fackler, Stevenson, Pisgah, and Section. The remote air monitors are located at distances out to 18 miles (29 kilometers) from the plant in the Lim Rock community and the town of Rainsville. See Table 2 and Figures 2 and 3.

At each monitor, air is continuously pulled through a Hollingsworth and Vose HV-70 particulate filter at a regulated flow of 3 ft^3/min (0.085 m^3/min). In series with, but downstream of, the particulate filter, is a charcoal filter used to collect iodine. Each monitor has a collection tray and storage container to collect rainwater on a continuous basis, and a horizontal platform covered with gummed acetate to catch and hold heavy particle fallout. Thermoluminescent dosimeters are used to record gamma radiation levels at each remote and perimeter station and at on-site locations as indicated in Figure 3.

Each of the local and perimeter air monitors is fitted with a GM tube that continuously scans the particulate filter. The disintegration rate of the atmospheric radioactivity is continuously recorded at each station.

Air filters are collected weekly and analyzed for gross beta activity. During this period five samples were collected over a 2-week period, nine samples were not collected because of equipment malfunction, and two samples were lost. No analyses are performed until 3 days after sample collection. The samples are composited monthly for analysis of specific gamma-emitting radionuclides and quarterly for ^{89}Sr, ^{90}Sr analysis. The results are presented in Table 6.

With reference to Table 5, which contains the maximum permissible concentrations (MPC) recommended by 10 CFR 20 for nonoccupational exposure, it is seen that the maximum beta concentration is 0.07 percent MPC.

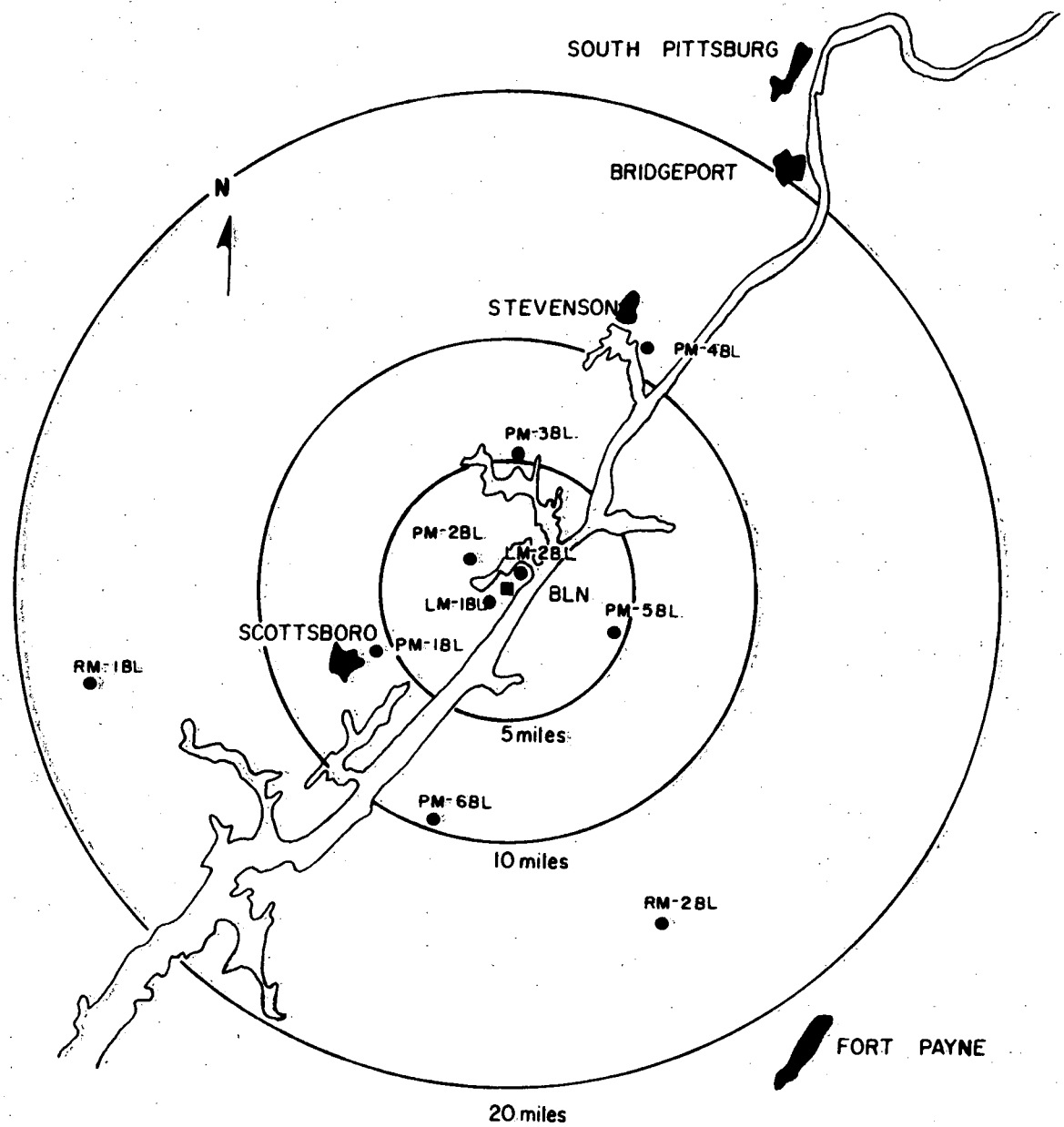
Rainwater is collected and analyzed for specific gamma-emitting isotopes. A gamma scan is performed on a 3.5-liter monthly sample. The results are shown in Table 7.

The gummed acetate that is used to collect heavy particle fallout is changed monthly. The sample is ashed and counted for gross beta activity. The results are given in Table 8.

Charcoal filters are collected weekly and analyzed for radioiodine. During this period, nine samples were not collected because of equipment malfunction and two samples were lost. The filter is counted in a single channel analyzer system. The data are shown in Table 9, where the highest value reported is 0.05 percent MPC for ^{131}I.

Figure 2

BELLEFONTE NUCLEAR PLANT ATMOSPHERIC AND TERRESTRIAL MONITORING NETWORK



NOTE: THE FOLLOWING SAMPLES ARE COLLECTED FROM EACH STATION:

AIR PARTICULATES	RAINWATER
RADIOIODINE	SOIL
HEAVY PARTICLE FALLOUT	VEGETATION

8-4-1977

Figure 3

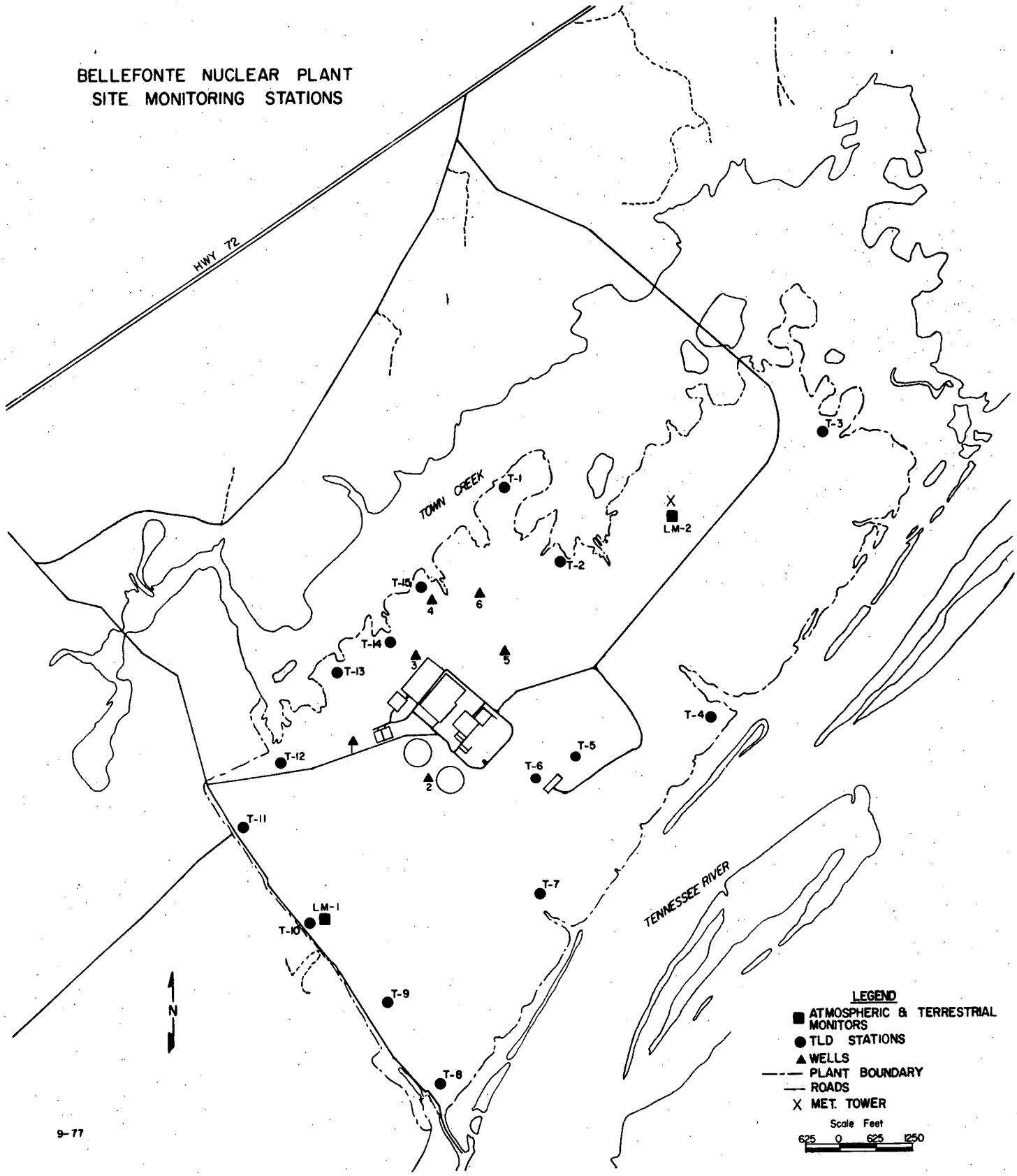

BELLEFONTE NUCLEAR PLANT
SITE MONITORING STATIONS
HWY 72
TOWN CREEK
TENNESSEE RIVER
T-1
T-2
T-3
T-4
T-5
T-6
T-7
T-8
T-9
T-10
T-11
T-12
T-13
T-14
T-15
LM-1
LM-2
2
3
4
5
6
N
LEGEND
ATMOSPHERIC & TERRESTRIAL MONITORS
TLD STATIONS
WELLS
PLANT BOUNDARY
ROADS
MET. TOWER
Scale Feet
625 0 625 1250
9-77

Table 5

MAXIMUM PERMISSABLE CONCENTRATIONS

FOR NONOCCUPATIONAL EXPOSURE

	MPC	
	In Water pCi/l*	In Air pCi/m^3*
Alpha	30	
Nonvolatile beta	3,000	100
Tritium	3,000,000	200,000
^{137}Cs	20,000	500
^{103,106}Ru	10,000	200
^{144}Ce	10,000	200
^{95}Zr-^{95}Nb	60,000	1,000
^{140}Ba-^{140}La	20,000	1,000
^{131}I	300	100
^{65}Zn	100,000	2,000
^{54}Mn	100,000	1,000
^{60}Co	30,000	300
^{89}Sr	3,000	300
^{90}Sr	300	30
^{51}Cr	2,000,000	80,000
^{134}Cs	9,000	400
^{58}Co	90,000	2,000

*1 pCi = 3.7 x 10^{-2} Bq.

TABLE 6

RADIOACTIVITY IN AIR FILTER

PCI/M(3) - 0.037 BQ/M(3)

NAME OF FACILITY BELLEFONTE — DOCKET NO. 50-366

LOCATION OF FACILITY JACKSON, ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN: NAME, DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA 504	0.010	0.03(400/ 402) 0.01- 0.07	LM2 BL ENV DATA 1.0 MILE NE	0.03(49/ 50) 0.02- 0.05	0.03(102/ 102) 0.01- 0.07	
GAMMA (NAI) 115						
CE-141,144	0.030	0.04(3/ 92) 0.03- 0.05	PM4 STEVENSON,AL 11.0 MILES NNE	0.05(1/ 11) 0.05- 0.05	0.04(1/ 23) 0.04- 0.04	
BA-140,LA-140	0.020	0.02(5/ 92) 0.02- 0.03	PM4 STEVENSON,AL 11.0 MILES NNE	0.03(1/ 11) 0.03- 0.03	0.02(1/ 23) 0.02- 0.02	
I-131	0.010	0.02(8/ 92) 0.01- 0.02	PM5 PISGAH,AL 4.3 MILES ESE	0.02(1/ 11) 0.02- 0.02	0.02(3/ 23) 0.01- 0.02	
BE-7	NOT ESTAB	0.10(91/ 92) 0.02- 0.18	PM6 SECTION,AL 9.2 MILES SSW	0.11(11/ 11) 0.02- 0.18	0.10(22/ 23) 0.03- 0.16	
GAMMA (GELI) 15						
K-40	NOT ESTAB	0.11(5/ 12) 0.07- 0.17	PM6 SECTION,AL 9.2 MILES SSW	0.14(2/ 2) 0.12- 0.17	0.09(3/ 3) 0.04- 0.14	
BI-214	0.020	0.07(3/ 12) 0.02- 0.13	LM1 BL SOUTHWEST 0.8 MILE SW	0.08(2/ 3) 0.02- 0.13	0.03(2/ 3) 0.02- 0.03	
PB-214	0.020	0.06(2/ 12) 0.03- 0.09	LM1 BL SOUTHWEST 0.8 MILE SW	0.09(1/ 3) 0.09- 0.09	0.02(2/ 3) 0.02- 0.03	
PB-212	NOT ESTAB	0.04(2/ 12) 0.01- 0.07	LM1 BL SOUTHWEST 0.8 MILE SW	0.07(1/ 3) 0.07- 0.07	3 VALUES <LLD	
BE-7	0.050	0.08(7/ 12) 0.05- 0.12	PM5 PISGAH,AL 4.3 MILES ESE	0.12(1/ 2) 0.12- 0.12	0.07(3/ 3) 0.06- 0.08	
TL-208	NOT ESTAB	0.01(3/ 12) 0.00- 0.03	LM1 BL SOUTHWEST 0.8 MILE SW	0.03(1/ 3) 0.03- 0.03	3 VALUES <LLD	
AC-228	NOT ESTAB	0.01(1/ 12) 0.01- 0.01	PM2 HOLLYWOOD,AL 1.8 MILES WNW	0.01(1/ 1) 0.01- 0.01	3 VALUES <LLD	
SR 89 40	0.005	32 VALUES <LLD ANALYSIS PERFORMED			8 VALUES <LLD	
SR 90 40	0.001	0.00(4/ 32)[c] 0.00- 0.00	PM4 STEVENSON,AL 11.0 MILES NNE	0.00(1/ 4)[d] 0.00- 0.00	0.00(2/ 8)[e] 0.00- 0.00	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).
c. 0.002 (4/32)
0.001 - 0.002
d. 0.002 (1/4)
0.002 - 0.002
e. 0.001 (2/8)
0.001 - 0.001

TABLE 7

RADIOACTIVITY IN RAINWATER

PCI/L = 0.037 BQ/L

NAME OF FACILITY BELLEFONTE — DOCKET NO. BH-80-9-BL1
LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE	CONTROL LOCATIONS MEAN (F)[b] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA (NAI) 113						
BA-140,LA-140	15.000	16.60(2/ 91)	PM4 STEVENSON,AL	17.00(1/ 13)	22 VALUES <LLD	
		16.20- 17.00	11.0 MILES NNE	17.00- 17.00		
I-131	15.000	20.17(3/ 91)	LM1 BL SOUTHWEST	23.70(1/ 12)	31.00(3/ 22)	
		17.30- 23.70	0.8 MILE SW	23.70- 23.70	28.70- 35.30	
BE-7	NOT ESTAB	47.26(49/ 91)	PM4 STEVENSON,AL	61.84(5/ 13)	42.81(15/ 22)	
		15.40- 113.60	11.0 MILES NNE	38.50- 89.60	11.90- 89.20	
GAMMA (GELI) 17						
K-40	NOT ESTAB	68.63(5/ 13)	LM2 BL ENV DATA	99.43(1/ 2)	105.20(1/ 4)	
		43.82- 99.43	1.0 MILE NE	99.43- 99.43	105.20- 105.20	
BI-214	NOT ESTAB	12.12(6/ 13)	PM1 SCOTTSBORO,A	25.50(1/ 1)	13.60(2/ 4)	
		1.44- 25.50	5.6 MILES WSW	25.50- 25.50	12.09- 15.10	
PB-214	NOT ESTAB	15.13(4/ 13)	PM1 SCOTTSBORO,A	24.06(1/ 1)	9.77(1/ 4)	
		4.78- 24.06	5.6 MILES WSW	24.06- 24.06	9.77- 9.77	
PB-212	NOT ESTAB	8.73(4/ 13)	PM1 SCOTTSBORO,A	17.70(1/ 1)	4 VALUES <LLD	
		3.94- 17.70	5.6 MILES WSW	17.70- 17.70		
BE-7	NOT ESTAB	46.26(1/ 13)	LM2 BL ENV DATA	46.26(1/ 2)	4 VALUES <LLD	
		46.26- 46.26	1.0 MILE NE	46.26- 46.26		

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 8

RADIOACTIVITY IN HEAVY PARTICLE FALLOUT

MCI/KM(2) = 37000000.00 BQ/KM(2)

NAME OF FACILITY BELLEFONTE — DOCKET NO. BH-80-9-BL1

LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA	0.050	0.21(104/ 104)	LM1 BL SOUTHWEST	0.25(13/ 13)	0.16(25/ 26)	
130		0.05- 0.67	0.8 MILE SW	0.11- 0.60	0.06- 0.49	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 9

RADIOACTIVITY IN CHARCOAL FILTERS

PCI/M(3) - 0.037 BQ/M(3)

NAME OF FACILITY BELLEFONTE DOCKET NO. 50-366
LOCATION OF FACILITY JACKSON ALABAMA REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
IODINE IN AIR	0.010	0.02(70/ 407)	PM5 PISGAH,AL	0.03(8/ 49)	0.02(19/ 102)	
509		0.01- 0.05	4.3 MILES ESE	0.01- 0.04	0.01- 0.03	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Terrestrial Monitoring

Milk

Although there are no commercial dairy farms within 5 miles of the plant site, milk was collected, when available, from 1-3 farms producing milk for private consumption (See Table 2). During this period milk was unavailable on eleven occasions. Raw milk was analyzed monthly for ^{131}I, gamma-emitting radionuclide, and for radiostrontium. The results are shown in Table 10.

As was noted in the previous report, the levels of ^{90}Sr in milk samples from these farms remain up to six times the levels found in milk from commercial dairy farms in other areas. Samples of feed and water supplied to the animals were analyzed in an effort to determine the source of the strontium. Analysis of dried hay samples indicated levels of ^{90}Sr slightly higher than those encountered in routine vegetation samples. The results are included with the data obtained from the analysis of the routine vegetation samples (Table 11). Analysis of pond water indicated no significant strontium activity.

This phenomenon was also observed during preoperation monitoring at Sequoyah Nuclear Plant at a farm where only 1-2 cows were being milked for private consumption of the milk. It is postulated that the feeding practices of these small farmers differ from that of the larger dairy farmers to the extent that fallout from atmospheric nuclear weapons testing may be more concentrated in these instances.

Vegetation

Vegetation samples were collected quarterly from the farms from which milk was collected and from the vicinity of each atmospheric monitoring station and analyzed for gamma-emitting radionuclides. Approximately 1-2 kilograms of grass was broken or cut at ground level and returned for analysis. Efforts were made to sample vegetation that was representative of the pasturage where cattle graze. Table 11 gives the results obtained from the laboratory analyses. As mentioned above, the table also contains the results from the analysis of animal feed samples.

Soil

Soil samples were collected semiannually near each monitoring station to provide an indication of any long-term buildup of radioactivity in the environment. An auger or "cookie cutter" type sampler was used to obtain samples of the top two inches (5 cm) of soil. These samples were analyzed for gross beta activity, gama-emitting radionuclides, and for strontium-89 and -90. The results are given in Table 12.

Ground Water

Well water was obtained monthly from the two farms in the area and from six onsite wells. All samples were analyzed for gamma-emitting radionuclides and a quarterly composite was analyzed for tritium. The results are shown in Table 13. During this period, three samples were not taken because of broken equipment and two samples were not collected because the stations were inaccessible.

Public Water

Potable water supplies taken from the Tennessee River in the vicinity of Bellefonte Nuclear Plant are sampled and analyzed for gross beta, gamma-emitting radionuclides, $^{89,90}Sr$, and tritium. The results, shown in Table 14, indicate that the maximum beta concentration is 0.28 percent MPC.

Environmental Gamma Radiation Levels

Thermoluminescent dosimeters (TLD's) are placed at fifteen stations around the plant near the site boundary (see Figure 3) and at the perimeter and remote monitors to determine the gamma exposure rates at these locations. The TLD's are normally changed every 3 months. The quarterly gamma radiation levels determined from these TLD's are given in Table 15. It should be noted that, even though the plant has not achieved criticality, the average radiation levels onsite are generally 4-6 mR/quarter higher than the levels offsite. This may be attributable to natural variations in environmental radiation levels, earth moving activities onsite, the mass of concrete employed in the construction of the plant, or other influences.

Poultry and Food Crops

Food crops and poultry raised in the vicinity of Bellefonte Nuclear Plant are sampled annually as they become available during the growing season. During this sampling period samples of corn, green beans, potatoes, tomatoes, and poultry were collected and analyzed for specific gamma-emitting radionuclides. The results are given in Tables 16 and 17.

TABLE 10

RADIOACTIVITY IN MILK

PCI/L - 0.037 BQ/L

NAME OF FACILITY BELLEFONTE DOCKET NO. 50-366

LOCATION OF FACILITY JACKSON ALABAMA REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA (NAI)						
27						
CS-137	10.000	12.81(9/ 27)	GAMBLE FARM	13.27(3/ 8)		
		10.70- 15.30	2.6 MILES NNE	11.90- 15.30		
K-40	150.000	1205.70(27/ 27)	HASS FARM	1229.01(8/ 8)		
		828.20- 1408.00	1.0 MILE NW	1158.50- 1301.50		
IODINE IN MILK	0.500	28 VALUES <LLD			0 VALUES <LLD	
28		ANALYSIS PERFORMED				
GAMMA (GELI)						
1						
CS-137	5.000	24.31(1/ 1)	GAMBLE FARM	24.31(1/ 1)		
		24.31- 24.31	2.6 MILES NNE	24.31- 24.31		
K-40	NOT ESTAB	1502.00(1/ 1)	GAMBLE FARM	1502.00(1/ 1)		
		1502.00- 1502.00	2.6 MILES NNE	1502.00- 1502.00		
SR 89	10.000	28 VALUES <LLD			0 VALUES <LLD	
28		ANALYSIS PERFORMED				
SR 90	2.000	20.32(28/ 28)	GAMBLE FARM	24.84(9/ 9)		
28		5.71- 35.95	2.6 MILES NNE	18.99- 35.95		

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 11

RADIOACTIVITY IN VEGETATION

PCI/G = 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY BELLEFONTE — DOCKET NO. BH-80-2-BL1

LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA	0.200	33.08(1/ 1)	GAMBLE FARM	33.08(1/ 1)		
1		33.08- 33.08	2.6 MILES NNE	33.08- 33.08		
GAMMA (GELI)						
54						
CE-144	0.220	0.85(14/ 46)	PM2 HOLLYWOOD,AL	1.26(1/ 4)	0.76(2/ 8)	
		0.25- 1.27	1.8 MILES WNW	1.26- 1.26	0.61- 0.91	
CS-137	0.060	0.22(18/ 46)	LM2 BL ENV DATA	0.35(1/ 4)	0.17(5/ 8)	
		0.06- 0.37	1.0 MILE NE	0.35- 0.35	0.12- 0.26	
K-40	NOT ESTAB	13.36(46/ 46)	HASS FARM	19.35(4/ 4)	10.81(8/ 8)	
		2.78- 32.31	1.0 MILE NW	6.43- 32.31	3.94- 21.23	
BI-214	0.100	0.42(37/ 46)	LM2 BL ENV DATA	0.49(3/ 4)	0.48(8/ 8)	
		0.12- 1.43	1.0 MILE NE	0.29- 0.75	0.13- 1.06	
PB-214	NOT ESTAB	0.30(32/ 46)	HASS FARM	0.37(3/ 4)	0.33(7/ 8)	
		0.07- 0.80	1.0 MILE NW	0.13- 0.80	0.13- 0.52	
PB-212	NOT ESTAB	0.16(27/ 46)	HASS FARM	0.26(2/ 4)	0.19(5/ 8)	
		0.03- 0.34	1.0 MILE NW	0.18- 0.34	0.11- 0.31	
BE-7	NOT ESTAB	10.04(44/ 46)	PM4 STEVENSON,AL	12.50(4/ 4)	11.92(8/ 8)	
		0.85- 25.10	11.0 MILES NNE	4.16- 25.10	5.65- 24.26	
TL-208	NOT ESTAB	0.08(11/ 46)	PM2 HOLLYWOOD,AL	0.11(1/ 4)	0.09(3/ 8)	
		0.04- 0.11	1.8 MILES WNW	0.11- 0.11	0.07- 0.12	
AC-228	NOT ESTAB	0.34(9/ 46)	PM3 FACKLER,AL	0.51(2/ 4)	0.19(2/ 8)	
		0.19- 0.55	5.2 MILES N	0.46- 0.55	0.04- 0.34	
SR 89	0.250	6 VALUES <LLD			0 VALUES <LLD	
6		ANALYSIS PERFORMED				
SR 90	0.050	0.44(5/ 6)	SISK FARM	0.58(2/ 3)		
6		0.22- 0.58	4.9 MILES SW	0.57- 0.58		

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 12

RADIOACTIVITY IN SOIL

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY BELLEFONTE — DOCKET NO. BU-80-9-8L1

LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE	CONTROL LOCATIONS MEAN (F)[b] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA (GELI)						
20						
CE-144	0.060	0.13(1/ 16)	PM5 PISGAH,AL	0.13(1/ 2)	0.07(1/ 4)	
		0.13- 0.13	4.3 MILES ESE	0.13- 0.13	0.07- 0.07	
CS-137	0.020	0.36(16/ 16)	PM4 STEVENSON,AL	0.60(2/ 2)	0.19(4/ 4)	
		0.05- 0.90	11.0 MILES NNE	0.36- 0.83	0.12- 0.33	
K-40	0.250	4.31(16/ 16)	LM1 BL SOUTHWEST	10.33(2/ 2)	3.15(4/ 4)	
		1.12- 10.87	0.8 MILE SW	9.78- 10.87	2.68- 3.50	
BI-214	0.050	0.89(16/ 16)	LM2 BL ENV DATA	1.07(2/ 2)	0.55(4/ 4)	
		0.55- 1.21	1.0 MILE NE	0.94- 1.21	0.44- 0.72	
BI-212	0.100	0.62(16/ 16)	LM1 BL SOUTHWEST	0.99(2/ 2)	0.37(4/ 4)	
		0.20- 1.08	0.8 MILE SW	0.91- 1.08	0.35- 0.40	
PB-214	0.050	0.94(16/ 16)	LM2 BL ENV DATA	1.12(2/ 2)	0.57(4/ 4)	
		0.60- 1.29	1.0 MILE NE	1.00- 1.24	0.45- 0.76	
PB-212	NOT ESTAB	0.97(16/ 16)	LM1 BL SOUTHWEST	1.41(2/ 2)	0.60(4/ 4)	
		0.34- 1.86	0.8 MILE SW	1.37- 1.46	0.43- 0.75	
RA-226	0.050	0.89(16/ 16)	LM2 BL ENV DATA	1.07(2/ 2)	0.55(4/ 4)	
		0.55- 1.21	1.0 MILE NE	0.94- 1.21	0.44- 0.72	
RA-223	NOT ESTAB	0.35(8/ 16)	LM1 BL SOUTHWEST	0.44(2/ 2)	0.20(1/ 4)	
		0.18- 0.49	0.8 MILE SW	0.41- 0.47	0.20- 0.20	
BE-7	0.160	16 VALUES <LLD			0.30(2/ 4)	
					0.21- 0.38	
TL-208	0.020	0.33(16/ 16)	LM1 BL SOUTHWEST	0.47(2/ 2)	0.20(4/ 4)	
		0.12- 0.55	0.8 MILE SW	0.45- 0.48	0.15- 0.25	
AC-228	0.060	0.98(16/ 16)	LM1 BL SOUTHWEST	1.48(2/ 2)	0.62(4/ 4)	
		0.35- 1.64	0.8 MILE SW	1.36- 1.59	0.51- 0.74	
PA-234M	NOT ESTAB	1.82(1/ 16)	PM4 STEVENSON,AL	1.82(1/ 2)	4 VALUES <LLD	
		1.82- 1.82	11.0 MILES NNE	1.82- 1.82		
PA-228	NOT ESTAB	0.04(2/ 16)	LM1 BL SOUTHWEST	0.05(1/ 2)	4 VALUES <LLD	
		0.03- 0.05	0.8 MILE SW	0.05- 0.05		
SR 89	1.500	16 VALUES <LLD			4 VALUES <LLD	
20		ANALYSIS PERFORMED				
SR 90	0.300	0.35(4/ 16)	PM2 HOLLYWOOD,AL	0.39(1/ 2)	4 VALUES <LLD	
20		0.30- 0.39	1.8 MILES WNW	0.39- 0.39		

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 13

RADIOACTIVITY IN WELL WATER

PCI/L - 0.037 BQ/L

NAME OF FACILITY BELLEFONTE — DOCKET NO. RH-80-9-BL1
LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD)	ALL INDICATOR LOCATIONS MEAN (F) RANGE	LOCATION WITH HIGHEST ANNUAL MEAN: NAME DISTANCE AND DIRECTION	MEAN (F) RANGE	CONTROL LOCATIONS MEAN (F) RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS *
GAMMA (NAI)						
93		68 VALUES <LLD ANALYSIS PERFORMED			25 VALUES <LLD	
GAMMA (GELI)						
6						
K-40	NOT ESTAB	71.09(4/ 5) 34.20- 124.00	WELL #5 ONSITE NNE	124.00(1/ 1) 124.00- 124.00	1 VALUES <LLD	
BI-214	NOT ESTAB	30.85(3/ 5) 20.61- 37.57	WELL #5 ONSITE NNE	37.57(1/ 1) 37.57- 37.57	1 VALUES <LLD	
PB-214	NOT ESTAB	18.18(3/ 5) 14.81- 20.58	WELL #1 ONSITE W	20.58(1/ 1) 20.58- 20.58	1 VALUES <LLD	
PB-212	NOT ESTAB	15.13(4/ 5) 2.86- 25.03	WELL #5 ONSITE NNE	25.03(1/ 1) 25.03- 25.03	1 VALUES <LLD	
TL-208	NOT ESTAB	10.15(1/ 5) 10.15- 10.15	WELL #1 ONSITE W	10.15(1/ 1) 10.15- 10.15	1 VALUES <LLD	
TRITIUM	330.000	24 VALUES <LLD			567.00(1/ 8) 567.00- 567.00	
32						

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 14

RADIOACTIVITY IN PUBLIC WATER SUPPLY

PCI/L - 0.037 BQ/L

NAME OF FACILITY BELLEFONTE — DOCKET NO. BH-80-9-BL1

LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE	CONTROL LOCATIONS MEAN (F)[b] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS BETA	2.400	3.79(7/ 38)	SCOTTSBORO,AL	8.26(1/ 12)	2.97(3/ 13)	
51		2.41- 8.26	TRM 385.8	8.26- 8.26	2.58- 3.40	
GAMMA (NAI)						
51						
BA-140,LA-140	15.000	19.00(1/ 38)	HOLLYWOOD,AL	19.00(1/ 12)	13 VALUES <LLD	
		19.00- 19.00	3.4 MILES WNW	19.00- 19.00		
I-131	15.000	15.70(1/ 38)	SCOTTSBORO,AL	15.70(1/ 13)	13 VALUES <LLD	
		15.70- 15.70	TRM 385.8	15.70- 15.70		
GAMMA (GELI)						
1						
BI-214	NOT ESTAB	2.79(1/ 1)	HOLLYWOOD,AL	2.79(1/ 1)		
		2.79- 2.79	3.4 MILES WNW	2.79- 2.79		
PB-214	NOT ESTAB	10.28(1/ 1)	HOLLYWOOD,AL	10.28(1/ 1)		
		10.28- 10.28	3.4 MILES WNW	10.28- 10.28		
PB-212	NOT ESTAB	6.12(1/ 1)	HOLLYWOOD,AL	6.12(1/ 1)		
		6.12- 6.12	3.4 MILES WNW	6.12- 6.12		
SR 89	10.000	12 VALUES <LLD			4 VALUES <LLD	
16		ANALYSIS PERFORMED				
SR 90	2.000	2.72(1/ 12)	SCOTTSBORO,AL	2.72(1/ 4)	4 VALUES <LLD	
16		2.72- 2.72	TRM 385.8	2.72- 2.72		
TRITIUM	330.000	444.67(3/ 12)	SAND MT. WFPA	501.00(1/ 4)	566.00(1/ 4)	
16		345.00- 501.00	TRM 382.1	501.00- 501.00	566.00- 566.00	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.

b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Table 15

ENVIRONMENTAL GAMMA RADIATION LEVELS

Monitoring Period	Location	Environmental Gamma Radiation Levels	
		μR/Hour	mR/Quarter[a]
February-March 1979	On-Site (14)[b]		
	Maximum	13.1	28.6
	Minimum	8.0	17.6
	Average[c]	9.6±2.6	21.0±5.8
	Off-Site (8)		
	Maximum	10.9	23.8
	Minimum	6.3	13.8
	Average	7.7±2.9	16.8±6.4
April-July 1979	On-Site (15)		
	Maximum	14.9	32.6
	Minimum	7.5	16.4
	Average	10.0±4.1	21.8±9.0
	Off-Site (8)		
	Maximum	8.3	18.2
	Minimum	5.0	11.0
	Average	7.2±2.2	15.8±4.8
August-September 1979	On-Site (15)		
	Maximum	14.6	31.9
	Minimum	5.3	11.6
	Average	7.6±4.6	16.7±10.1
	Off-Site (8)		
	Maximum	5.7	12.4
	Minimum	4.4	9.7
	Average	5.0±1.0	10.9±2.1
October-December 1979	On-Site (15)		
	Maximum	14.2	31.1
	Minimum	8.6	18.8
	Average	10.3±2.8	22.5±6.2
	Off-Site (8)		
	Maximum	9.2	20.2
	Minimum	6.8	14.8
	Average	8.1±1.6	17.8±3.6

a. Data normalized to one quarter (2190 hours)
b. Number of stations (normally 3 TLD's at each station)
c. All averages reported ±2σ

TABLE 16

RADIOACTIVITY IN FOOD CROPS

PCI/KG - 0.037 BQ/KG (WET WEIGHT)

NAME OF FACILITY BELLEFONTE
LOCATION OF FACILITY JACKSON ALABAMA

DOCKET NO. BE-80-2-BL1
REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
RADIOACTIVITY IN CORN						
GAMMA (GELI)						
K-40	NOT ESTAB	1976.00(1/ 1) 1976.00- 1976.00	PM2 HOLLYWOOD,AL 1.8 MILES WNW	1976.00(1/ 1) 1976.00- 1976.00	2225.00(1/ 1) 2225.00- 2225.00	
BI-214	NOT ESTAB	1 VALUES <LLD			9.36(1/ 1) 9.36- 9.36	
RADIOACTIVITY IN GREEN BEANS						
GAMMA (GELI)						
K-40	NOT ESTAB	2211.00(1/ 1) 2211.00- 2211.00	2 MILES WNW	2211.00(1/ 1) 2211.00- 2211.00	1984.00(1/ 1) 1984.00- 1984.00	
BI-214	NOT ESTAB	10.97(1/ 1) 10.97- 10.97	2 MILES WNW	10.97(1/ 1) 10.97- 10.97	1 VALUES <LLD	
PB-212	NOT ESTAB	15.29(1/ 1) 15.29- 15.29	2 MILES WNW	15.29(1/ 1) 15.29- 15.29	7.81(1/ 1) 7.81- 7.81	
RADIOACTIVITY IN POTATOES						
GAMMA (GELI)						
K-40	NOT ESTAB	4284.00(1/ 1) 4284.00- 4284.00	2 MILES WNW	4284.00(1/ 1) 4284.00- 4284.00	4036.00(1/ 1) 4036.00- 4036.00	
RADIOACTIVITY IN TOMATOES						
GAMMA (GELI)						
K-40	NOT ESTAB	2664.00(1/ 1) 2664.00- 2664.00	PM2 HOLLYWOOD,AL 1.8 MILES WNW	2664.00(1/ 1) 2664.00- 2664.00	2546.00(2/ 2) 2513.00- 2579.00	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 17

RADIOACTIVITY IN POULTRY

PCI/KG - 0.037 BQ/KG (WET WEIGHT)

NAME OF FACILITY BELLEFONTE — DOCKET NO. BH-80-9-BL1

LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION (LLD)[a]	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN[b] NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GAMMA (GELI)						
K-40	NOT ESTAB	2063.03(2/ 2)	SISK FARM	2493.00(1/ 1)		
		1633.06- 2493.00	4.9 MILES SW	2493.00- 2493.00		
BI-214	NOT ESTAB	51.28(2/ 2)	SISK FARM	52.19(1/ 1)		
		50.38- 52.19	4.9 MILES SW	52.19- 52.19		
PB-214	NOT ESTAB	36.67(2/ 2)	PM1 SCOTTSBORO,A	36.97(1/ 1)		
		36.37- 36.97	5.6 MILES WSW	36.97- 36.97		
PB-212	NOT ESTAB	24.43(2/ 2)	SISK FARM	27.76(1/ 1)		
		21.09- 27.76	4.9 MILES SW	27.76- 27.76		
TL-208	NOT ESTAB	5.40(1/ 2)	PM1 SCOTTSBORO,A	5.40(1/ 1)		
		5.40- 5.40	5.6 MILES WSW	5.40- 5.40		

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Reservoir Monitoring

The reservoir monitoring program for Bellefonte Nuclear Plant is scheduled to be implemented in mid-1981, approximately two years prior to the projected fuel loading date. The program will include the collection and analysis of samples of surface water, sediment, Asiatic clams, plankton, aquatic macrophytes, and fish.

Radiological monitoring for fish is accomplished by analyses of composite samples of adult fish taken from each of three contiguous reservoirs--the reservoir on which the plant is located and the reservoirs immediately upstream and downstream. No permanent sampling stations are established within each reservoir; this reflects the movement of fish species within reservoirs as determined by TVA data from the Brown Ferry Nuclear Plant preoperational monitoring program. Sufficient fish are collected in each reservoir to yield 250-300 grams oven-dry material for analytical purposes. The composite samples contain approximately the same quantity of flesh from each fish. For each composite, a subsample of material is drawn for analysis.

Because of the location of Bellefonte Nuclear Plant, the reservoirs scheduled to be sampled are already being sampled in the Browns Ferry and Sequoyah Nuclear Plants' monitoring programs. Samples of white crappie and smallmouth buffalo are taken semiannually from Guntersville and Wheeler Reservoirs and analyzed for gamma-emitting radionuclides as a part of the Browns Ferry Nuclear Plant monitoring program. In the Sequoyah Nuclear Plant monitoring program, samples of white crappie, smallmouth buffalo, and channel catfish are taken semi-annually from Nickajack Reservoir and analyzed for gross alpha, gross beta, and gamma-emitting radionuclides. In addition, ^{89}Sr and ^{90}Sr concentrations are determined in smallmouth buffalo samples taken from Nickajack Reservoir. The data from the analysis of these samples are included herein in Tables 18, 19, 20, and 21.

TABLE 18

RADIOACTIVITY IN WHITE CRAPPIE (FLESH)

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY BELLEFONTE — DOCKET NO. BB-80-9-BL1
LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA 2	0.100	0 VALUES <LLD ANALYSIS PERFORMED			2 VALUES <LLD	
GROSS BETA 6	0.100	36.66(4/ 4) 30.38- 42.42	WHEELER RES TRM 275-349	39.21(2/ 2) 36.00- 42.42	27.97(2/ 2) 24.10- 31.83	
GAMMA (GELI) 6						
CS-137	0.020	0.16(4/ 4) 0.07- 0.28	GUNTERSVILLE RES TRM 349-425	0.20(2/ 2) 0.13- 0.28	0.09(2/ 2) 0.05- 0.14	
K-40	NOT ESTAB	18.84(4/ 4) 17.42- 20.82	WHEELER RES TRM 275-349	19.96(2/ 2) 19.10- 20.82	15.54(2/ 2) 12.10- 18.97	
BI-214	0.020	0.19(4/ 4) 0.10- 0.27	GUNTERSVILLE RES TRM 349-425	0.23(2/ 2) 0.19- 0.27	0.28(1/ 2) 0.28- 0.28	
PB-214	NOT ESTAB	0.11(4/ 4) 0.06- 0.16	WHEELER RES TRM 275-349	0.11(2/ 2) 0.06- 0.16	0.13(1/ 2) 0.13- 0.13	
PB-212	NOT ESTAB	0.07(2/ 4) 0.02- 0.11	GUNTERSVILLE RES TRM 349-425	0.11(1/ 2) 0.11- 0.11	0.06(1/ 2) 0.06- 0.06	
SR 89 2	0.500	0 VALUES <LLD ANALYSIS PERFORMED			2 VALUES <LLD	
SR 90 2	0.100	0 VALUES <LLD ANALYSIS PERFORMED			2 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 19

RADIOACTIVITY IN SMALLMOUTH BUFFALO (FLESH)

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY BELLEFONTE — DOCKET NO. BU-80-9-BL1

LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA 2	0.100	0 VALUES <LLD ANALYSIS PERFORMED			2 VALUES <LLD	
GROSS BETA 6	0.100	48.95(4/ 4) 26.79- 95.99	GUNTERSVILLE RES TRM 349-425	61.39(2/ 2) 26.79- 95.99	18.62(2/ 2) 12.86- 24.37	
GAMMA (GELI) 6						
CS-137	0.020	0.07(4/ 4) 0.04- 0.10	GUNTERSVILLE RES TRM 349-425	0.09(2/ 2) 0.07- 0.10	0.03(1/ 2) 0.03- 0.03	
K-40	NOT ESTAB	14.21(4/ 4) 11.37- 19.36	WHEELER RES TRM 275-349	16.51(2/ 2) 13.65- 19.36	9.34(2/ 2) 8.64- 10.03	
BI-214	0.020	0.23(4/ 4) 0.14- 0.32	WHEELER RES TRM 275-349	0.23(2/ 2) 0.14- 0.32	0.38(1/ 2) 0.38- 0.38	
PB-214	NOT ESTAB	0.17(4/ 4) 0.12- 0.25	GUNTERSVILLE RES TRM 349-425	0.20(2/ 2) 0.15- 0.25	0.17(1/ 2) 0.17- 0.17	
PB-212	NOT ESTAB	0.09(3/ 4) 0.07- 0.12	GUNTERSVILLE RES TRM 349-425	0.12(1/ 2) 0.12- 0.12	0.23(1/ 2) 0.23- 0.23	
TL-208	0.020	0.04(2/ 4) 0.03- 0.05	GUNTERSVILLE RES TRM 349-425	0.04(2/ 2) 0.03- 0.05	0.07(1/ 2) 0.07- 0.07	
SR 89 2	0.500	0 VALUES <LLD ANALYSIS PERFORMED			2 VALUES <LLD	
SR 90 2	0.100	0 VALUES <LLD ANALYSIS PERFORMED			2 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 20

RADIOACTIVITY IN SMALLMOUTH BUFFALO (WHOLE)

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY BELLEFONTE — DOCKET NO. BE-80-9-BL1
LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN: NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA 2	0.100				0.11(1/ 2) 0.11- 0.11	
GROSS BETA 6	0.100	17.86(4/ 4) 7.36- 30.23	WHEELER RES TRM 275-349	18.80(2/ 2) 7.36- 30.23	18.18(2/ 2) 17.94- 18.41	
GAMMA (GELI) 6						
CS-137	0.020	0.05(3/ 4) 0.03- 0.06	WHEELER RES TRM 275-349	0.06(1/ 2) 0.06- 0.06	0.04(2/ 2) 0.04- 0.04	
K-40	NOT ESTAB	9.61(4/ 4) 7.84- 13.86	WHEELER RES TRM 275-349	10.85(2/ 2) 7.84- 13.86	8.08(2/ 2) 6.78- 9.38	
BI-214	0.020	0.19(4/ 4) 0.08- 0.36	WHEELER RES TRM 275-349	0.22(2/ 2) 0.08- 0.36	0.20(2/ 2) 0.15- 0.26	
PB-214	NOT ESTAB	0.11(4/ 4) 0.06- 0.21	WHEELER RES TRM 275-349	0.13(2/ 2) 0.06- 0.21	0.14(2/ 2) 0.10- 0.19	
PB-212	NOT ESTAB	0.10(4/ 4) 0.04- 0.24	WHEELER RES TRM 275-349	0.16(2/ 2) 0.08- 0.24	0.07(1/ 2) 0.07- 0.07	
TL-208	0.020	4 VALUES <LLD			0.03(2/ 2) 0.02- 0.03	
AC-228	0.060	0.10(1/ 4) 0.10- 0.10	WHEELER RES TRM 275-349	0.10(1/ 2) 0.10- 0.10	2 VALUES <LLD	
SR 89 2	0.500	0 VALUES <LLD ANALYSIS PERFORMED			2 VALUES <LLD	
SR 90 2	0.100				0.26(2/ 2) 0.11- 0.40	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

TABLE 21

RADIOACTIVITY IN CHANNEL CATFISH (FLESH)

PCI/G - 0.037 BQ/G (DRY WEIGHT)

NAME OF FACILITY BELLEFONTE — DOCKET NO. BH-80-9-BL1
LOCATION OF FACILITY JACKSON ALABAMA — REPORTING PERIOD 1979

TYPE AND TOTAL NUMBER OF ANALYSIS PERFORMED	LOWER LIMIT OF DETECTION[a] (LLD)	ALL INDICATOR LOCATIONS MEAN (F)[b] RANGE[b]	LOCATION WITH HIGHEST ANNUAL MEAN NAME DISTANCE AND DIRECTION	MEAN (F)[b] RANGE[b]	CONTROL LOCATIONS MEAN (F)[b] RANGE[b]	NUMBER OF NONROUTINE REPORTED MEASUREMENTS
GROSS ALPHA 2	0.100	0 VALUES <LLD ANALYSIS PERFORMED			2 VALUES <LLD	
GROSS BETA 2	0.100				20.79(2/ 2) 15.72- 25.85	
GAMMA (GELI) 2						
CS-137	0.020				0.05(2/ 2) 0.03- 0.08	
K-40	NOT ESTAB				11.65(2/ 2) 9.68- 13.61	
BI-214	0.020				0.20(2/ 2) 0.14- 0.26	
PB-214	NOT ESTAB				0.14(2/ 2) 0.11- 0.18	
SR 89 2	0.500	0 VALUES <LLD ANALYSIS PERFORMED			2 VALUES <LLD	
SR 90 2	0.100	0 VALUES <LLD ANALYSIS PERFORMED			2 VALUES <LLD	

a. Nominal Lower Limit of Detection (LLD) as described in Table 3.
b. Mean and range based upon detectable measurements only. Fraction of detectable measurements of specified locations is indicated in parentheses (F).

Quality Control

A quality control program has been established with the Alabama Department of Public Health Radiological Laboratory and the Eastern Environmental Radiation Facility, Environmental Protection Agency, Montgomery, Alabama. Samples of air, water, milk, fish, and soil collected around nuclear plants are forwarded to these laboratories for analysis, and results are exchanged for comparison.

Conclusions

Since Bellefonte Nuclear Plant has not achieved criticality, there has been no contribution of radioactivity from the plant to the environment. The levels of radioactivity being reported in this document are due to natural background radiation, nuclear weapons testing, or other nuclear operations in the area.