ALABAMA POWER COMPANY

ANNUAL ENVIRONMENTAL OPERATING REPORT

PART B: RADIOLOGICAL

JOSEPH M. FARLEY NUCLEAR PLANT

UNIT NO. 1

PERIOD ENDING DECEMBER 31, 1978

This annual report is submitted pursuant to paragraph 5.6.1 of the Environmental Technical Specifications, Appendix B, to Operating License No. NPF-2. This report summarizes the off-site radiological Environmental Monitoring program for the Joseph M. Farley Nuclear Plant, Unit 1, from January 1, 1978 through December 31, 1978.

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OPERATIONAL RADIOLOGICAL ENVIRONMENTAL PROGRAM

I. Introduction

The Joseph M. Farley Nuclear Plant, owned and operated by Alabama Power Company (APCo), located in Houston County, Alabama is approximately fifteen miles east of Dothan, Alabama on the west bank of the Chattahoochee River. Unit 1, a Westinghouse Electric Corporation Pressurized Water Reactor (PWR) with a rated power output of 760 megawatts electrical (MWe) achieved initial criticality at 12:35 p.m. on August 9, 1977. The unit was declared "commercial" on December 1, 1977 and with exception of short outages was operated continuously during 1978 at or close to full rated power.

The off-site operational radiological environmental monitoring program has the objective of assessing the radiological impact of the operation of the Farley Nuclear Plant (FNP) upon the surrounging region. It is conducted to verify projected or anticipated radioactivity concentrations and related public exposures from plant operations.

The sample collection and analysis schedule for the operational off-site radiological environmental monitoring program was implemented during May, 1977 and was continued during 1978. This program was designed to monitor any radioactivity contribution to the environs from the plant through either the airborne or waterborne pathways. The type of samples monitored, and number and type of sampling stations are shown in Table 1. Indicator sampling stations were located, where practical, at locations where detection of the radiological effects of the plant's operation was thought to be most likely, where the samples collected should provide a significant indication of potential dose to man, and where an adequate comparison of predicted radiological levels might be made with measured levels. The control stations were placed at locations where radiological levels were not expected to be significantly influenced by plant operation, i.e., at background locations. For some airborne radioactivity samples, community stations were located at the principal population centers between the indicator and the control stations (3-8 miles). These in normal operation could be used, if desired, as additional control stations, and alternatively, as indicator stations in the nearest population centers in the event of a major airborne release of radioactivity from the plant.

II. Radiological Sampling and Analysis

A detailed outline of the operational radiological sampling and analysis activities for the off-site environmental program is given in Table 2. The smaples were collected by APCo's technical staff except for the in situ Ge(Li) gamma-ray spectroscopy measurements of soil. The latter were made by staff members of the University of Georgia, Center for Applied Isotope Studies. All sample analyses were contracted to either the University of Georgia (U.Ga.) or the Eberline Instrument Corporation (EIC). Southeastern Facility. NOTE: EIC's Southeastern Facility was closed on March 31, 1978. After April 1, 1978 samples were sent to EIC's Midwestern Facility). The minimum detectable concentration (MDC), specified to the contractor laboratories

Table 1

SCOPE OF OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Principal Pathway	Type of Samples	Minimum Number of Sampling Stations[a] Indicator	Community	Control
Airborne	Airborne Particulates	4	3	3
	Airborne Iodine	3	1	1
	External Radiation	16	3	5
	Milk	1[b]	-	1
	Forage[c]	2	-	1
	Vegetables and Fruits	1	-	1
	Soil[d]	9	3	3
Waterborne	River Water	1	-	1
	River Vegetation	1	-	1
	River Benthos	1	-	1
	River Fish	1	-	1
	River Sediment	1	-	1
	Groundwater	1	-	1

[a]Additional stations may be added at discretion of licensee above the minimum commitment shown.

[b]If available

[c]Forage sampling *in lieu* of meat and poultry sampling.

[d]Semi Annual *In Situ* Gamma Measurements.

Table 2

OUTLINE OF OPERATIONAL RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Types of Samples and Sampling Locations (Distances Given in Miles)	Sampling and Collection Frequency	Type and Frequency of Analysis
AIRBORNE Particulates Indicator Stations: North Perimeter (N-0.8) River Intake Structure (ESE-0.8) South Perimeter (SSE-1.0) Plant Entrance - Nearest Residence (WSW-0.9) Community Stations: Columbia, Ala. (N-5) Great Southern Paper Co., Ga. (SSE-3) Ashford, Ala. (WSW-8) Control Stations: Blakely, Ga. (NE-15) Neals Landing, Fla. (SSE-18) Dothan, Ala. (W-18)	Continuous sampler operation with sample collection weekly or as required by dust loading of filters, whichever is more frequent.	Gross Beta - Weekly or after filter change. Gamma Isotopic - Quarterly site (by location) and for any single filter having gross beta activity that is greater than 10 times the mean of the control samples. Strontium-89,90 Analyses - Quarterly composite (by location).

Table 2 (Con't)

Type of Samples and Sampling Locations	Sampling and Collection Frequency	Type and Frequency of Analysis
Iodine		
Indicator Stations: North Perimeter (N-0.8) South Perimeter (SSE-1.0) Plant Entrance - Nearest Residence (WSW)-0.9	Continuous Sampler operation with charcoal canister collection weekly.	Iodine-131 - Weekly
Community Stations: Great Southern Paper Co., Ga. (SSE-3)		
Background Stations: Dothan, Ala. (W-18)		
External Radiation		
Indicator Stations: Sixteen stations, one in each meteorological sector, along the plant perimeter. (N-0.8, NNE-0.9, NE-1.0, ENE-0.9, E-0.8, ESE-0.8, SE-0.9, SSE-1.0, S-1.0, SSW-1.0, SW-0.9, WSW-0.9, W-0.8, WNW-0.8, NW-0.9, and NNW-0.9)	Each measurement location has two dosimeters (TLD's) side-by-side, one collected quarterly and one collected annually. Each dosimeter contains five individual TLD chips.	Read Gamma doses quarterly and annually.

Table 2 (Con't)

Types of Samples and Sampling Locations	Sampling and Collection Frequency	Type and Frequency of Analysis
Community Stations:		
Columbia, Ala. (N-5)		
Great Southern Paper Co., Ga. (SSE-3)		
Ashford, Ala. (WSW-8)		
Control Stations:		
Blakely, Ga. (NE-15)		
Georgia Rt. 39 (ENE-15)		
Neals Landing, Fla. (SSE-18)		
Ala. Rt. 52 (WSW-26)		
Dothan Ala. (W-18)		
Soil		
Indicator Stations:	Semi-annual in situ Ge(Li) gamma-ray spectroscopy measurements.	Gamma Isotopic - Semi-annually.
Nine stations along the plant perimeter. (N-0.8, NE-1.0, E-0.8, ESE-0.8, SSE-1.0, S-1.0, SW-0.9, WSW-0.9, and NNW-0.8		

Table 2 (Con't)

Type of Samples and Sampling Locations	Sampling and Collection Frequency	Type and Frequency of Analysis
Community Stations:		
Columbia, Ala. (N-5)		
Great Southern Paper Co., Ga. (SSE-3)		
Ashford, Ala. (WSW-8)		
Control Stations:		
Blakely, Ga. (NE-15)		
Neals Landing, Fla. (SSE-18)		
Dothan, Ala. (W-18)		
Milk		
Indicator Stations:	Semi-Monthly	Gamma Isotopic-Monthly
Early Co., Ga. (E-5)[a]		Strontium 89,90 Analyses-Monthly
Control Station:		Radioiodine analysis - Semi-Monthly, when animals are on pasture
Brooks-Silcox Dairy, Ashford, Ala. (WSW-10)		

(a) Milk was not available at this location after May, 1978.

Table 2 (Con't)

Type of Samples and Sampling Locations	Sampling and Collection Frequency	Type and Frequency of Analysis
Forage		
Indicator Stations:	Grab Sample Monthly (when available)	Gamma Isotopic-Monthly
North Perimeter (N-0.8 or NE-1.0)		
South Perimeter (SSE-1.0 or S-1.0)		
Control Station:		
Dothan Area (W-10 to 20)		
Vegetables and Fruits	Grab sample at harvest, except monthly for green leafy vegetables during growing season. (Principal food crops grown in plant vicinity).	Gamma Isotopic-Edible portion Radioiodine-Monthly on green leafy vegetables during growing season.
Indicator Station:		
Plant Vicinity (SW-1, W-1, NNE-2, or NNE-3)		
Control Station:		
Dothan Area (W-10+, WSW-10+, WNW-10+)		

Table 2 (Con't)

Type of Samples and Sampling Locations	Sampling and Collection Frequency	Type and Frequency of Analysis
WATERBORNE		
River Water	Composite taken with proportional semi-coninuous sampler, having a minimum sampling frequency of once each hour.	Gamma Isotopic - Monthly
Indicator Station:		Tritium - Quarterly Composite
Downstream of Plant discharge (~2 miles)		Strontium-89,90 - Quarterly Composite.
Control Station:		
Upstream of Andrews Lock and Dam (~3 miles above plant intake).		
Ground Water	Grab sample taken quarterly.	Gamma Isotopic - Quarterly
Indicator Station:		Tritium - Quarterly
Great Southern Paper Company Well (SSE-4)		
Control Station:		
King's Court Trailer Park Well (WSW-0.9)		

Table 2 (Con't)

Type of Samples and Sampling Locations	Sampling and Collection Frequency	Type and Frequency of Analysis
Indicator Station:	Grab sample taken semi-annually.	Gamma Isotopic - Semi-annually Strontium-89,90 - Semi-annually.
Downstream of plant discharge at first available location.		
Control Station:		
Upstream of Andrews Lock and Dam.		
River Fish	Grab sample taken semi-annually.	Gamma Isotopic - Edible Portion semi-annually
Indicator Station:		
Downstream of Plant discharge in vicinity of Smith's Bend (~2 miles)		
Control Station:		
Upstream of Andrews Lock and Dam.		
River Benthos	Grab sample taken semi-annually (Clams)	Gamma Isotopic - Semi-annually (Tissue)

Table 2 (Con't)

Type of Samples and Sampling Locations	Sampling and Collection Frequency	Type and Frequency of Analysis
Indicator Station:		
Downstream of Plant discharge at first available location.		Strontium-89,90 - Semi-annually (Tissue)
Control Station:		
Upstream of Andrews Lock and Dam.		
River Sediment	Grab sample taken semi-annually.	Gamma Isotopic - Semi-annually.
Indicator Station:		Strontium-90 - Semi-annually.
Downstream of Plant dischages at Smith's Bend (~2 miles)		
Control Station:		
Upstream of Andrews Lock and Dam.		

for the various samples and their respective analyses are given in Table 3.

A number of sampling problems were encountered during 1978 which are listed in Table 4. In January the Chattahoochee River water level reached flood stage which disrupted collection of water at the Andrews Lock and Dam and collection of air samples at the Plant River Intake Structure due to loss of electrical power. At the North Perimeter Air Sampling Station repeated pump failures resulted in several particulate and iodine samples having reduced volumes and for one week no samples were collected. After May an indicator milk sample was no longer available at Cedar Springs, Georgia resulting in this sampling location being dropped from the schedule. Other sampling deviations ranged from the technician failing to turn on the power to the air pump after filter change to missing TLD's, as listed in the table.

Probably the one event which influenced the analysis program more than any other was the decision by Eberline Instrument Corp. to close their Southeastern Facility on March 31, 1978 and to transfer the contract for analytical services to their Midwestern Facility. The net result was loss of samples and/or analytical data as listed in Table 5. The major causes appear to have been deficiencies in timely communications and transportation of samples. Positive steps have been taken to correct these deficiencies during 1979.

A. Airborne Particulates and Iodine

All of the airborne particulates and iodine monitoring stations shown in Figures 1 and 2 were equipped with Bell and Gossett vacuum pumps which operate continuously at a flow rate of about 0.04 m^3/min (1.5 ft^3/min). The particulates were collected on Gelman Metricel 50 mm filters. In series with, but downstream of the particulate filters, Gelman 50 mm activated charcoal cartridges (or equivalent) were used for collection of iodine. The latter were mounted horizontally to insure uniform airflow through the filter. The accumulative air flows were measured with Rockswell Gas Meters which were calibrated against a certified flow meter. Both the particulate filters and charcoal cartridges were collected weekly and were sent to U. Ga. for radioactivity analysis.

Gross beta radioactivity measurements were made on each air particulate filter using a Beckman Lowbeta II low background proportional counter. The filters from each station were composited and at the end of each quarter were analyzed for gamma emitters using a nine percent relative efficiency low background Ge(Li) detector (18% efficiency detector after May, 1978) and a Canberra 4096 channel computer-based multichannel analyzer (MCA). In addition, strontium-89, 90 were separated from the quarterly composite filters following the gamma-ray spectroscopy analyses and the beta activity measured using a Beckman Lowbeta II low background proportional counter. The single separation, dual count technique was used for the determination of the strontium-89 and strontium-90 present. Stable strontium carrier was added to each sample for determination of the radiochemical yield.

All the air monitoring station locations shown in Figures 1 and 2 have the capability of monitoring airborne iodine. However, weekly routine samples were collected only at the stations listed in Table 2. These were analyzed for iodine-131 by U. Ga. using a Canberra 1024

Table 3

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

Sample	Nominal Sample Size	MINIMUM DETECTABLE CONCENTRATION[a] (MDC)					
		Gross Beta	Gamma Isotopic	Radio-Strontium 89	Radio-Strontium 90	Radio-Iodine 131	Tritium
AIRBORNE:							
Particulates	400 m^3 per week	$1 \cdot 10^{-2}$ pCi/m	10^{-2}pCi/m^3isot.	$5 \cdot 10^{-3}$ pCi/m^3	10^{-3} pCi/m^3	----	----
Iodine	400 m^3 per week	----	----	----	----	$7 \cdot 10^{-2}$ pCi/m^3	----
Milk	10 l	----	25 pCi/l/isot.	10pCi/l	2pCi/l	0.5pCi/l	----
Forage	1 kg[b]	----	100 pCi/kg[b]/isot.	----	----	80pCi/kg[b]	----
Vegetables and Fruits	1 kg[b] (Edible)	----	100pCi/kg/[b] isot.	----	----	80pCi/kg[b]	
Soil	In Situ	----	200pCi/kg/isot.	----	200pCi/kg	----	----
WATERBORNE:							
River Water	4 l	----	25pCi/l/isot.	10pCi/l	2pCi/l	----	200pCi/l
Ground Water	4 l	----	25pCi/l/isot.	----	----	----	100pCi/l

Table 3 (Cont'd)

DETECTION CAPABILITIES FOR ENVIRONMENTAL SAMPLE ANALYSIS

Sample	Nominal Sample Size	MINIMUM DETECTABLE CONCENTRATION[a] (MDC)					
		Gross Beta	Gamma Isotopic	Radio-Strontium 89	Radio-Strontium 90	Radio-Iodine 131	Tritium
River Vegetation	1kg[b]	----	100pCi/kg[b]/isot.	5pCi/kg[b]	5pCi/kg[b]	----	----
River Fish	1kg[b] (Edible)	----	100pCi/kg[b]/isot.	----	----	----	----
River Benthos	0.5kg[b] Tissue	----	100pCi/kg[b]/isot.	10pCi/kg[b]	----	----	----
River Sediment	1kg	----	200pCi/kg /isot.	----	200pCi/kg	----	----

(a) Nominal Values Achievable in Practice at Normally Expected Environmental Radioactivity Concentrations. (Called Lower Limit of Detection (LLD) in 1977 Operational Report and ETS).
(b) Wet Weight.

TABLE 4

SAMPLING DEVIATIONS DURING 1978

Week Starting	Location and Nature of Deviation
1/9	Cedar Springs, Ga Milk Sampling Station: Milk Not Available Andrews Lock & Dam Water Sampling Station: Out of Service for One Day, Battery Not Charged Adequately
1/16	Silcox Dairy and Cedar Springs, Ga Milk Sampling Stations: Milk Samples were collected Andrews Lock & Dam Water Sampling Station: Pump Not Operable - Back-up Pump Also being Repaired
1/23	River Water Intake Structure Air Sampling Station: Loss of Power - Particulate Sample has Reduced Volume Blakely Air Sampling Station: Air Particulate Filter Damaged - Approximately one-half lost due to high wind. Andrews Lock & Dam Water Sampling Station: Sample was not collected for week - Due to high water.
1/30	River Water Intake Structure Air Sampling Station: Particulate Sample Not collected - Due to station loss of power from high water
2/6	River Water Intake Structure Air Sampling Station: Particulate sample had reduced volume - No power for part of week Ashford Air Sampling Station: No sample collected - Technician failed to turn pump on after filter change. Andrews Lock & Dam Water Sampling Station: Pump removed from service for repair.
3/13	North Perimeter Air Sampling Station: Pump failure - Reduced volume for particulate and iodine sample No green leafy vegetables were available.
4/10	North and South Perimeter Air Sampling Stations: Pump Failures - Reduced volume for particulate and iodine samples.
4/17	North Perimeter Air Sampling Station: Malfunction of pump - Slightly reduced volume for particulate and iodine samples.
4/24	River Intake Structure Air Sampling Station: Particulate Filter Lost during change - Due to high wind.
5/1	River Intake Structure Air Sampling Station: Temporary Loss of power - Slight reduction in particulate air sample volume.

TABLE 4 (Cont'd)

SAMPLING DEVIATIONS DURING 1978

Week Starting	Location and Nature of Deviation
5/8	
5/15	West Perimeter TLD Sampling Station (WNW): Quarterly TLD missing. Neals Landing, Fla. TLD Sampling Station: Annual TLD missing.
5/22	North Perimeter Air Sampling Station: Pump Failure - Slightly reduced air volume for particulate and iodine samples.
6/12	Cedar Springs, Ga. Milk Sampling Station: Milk no longer available from this location. North Perimeter Air Sampling Station: Pump failure - Reduced sample volume for particulate and iodine samples.
6/19	North Perimeter Air Sampling Station: Pump out of service for repair - No particulate or iodine sample.
6/26	East Perimeter TLD Sampling Station: Quarterly TLD missing.
7/3	Neals Landing, Fla. Air Sampling Station: Pump failure - Reduced volume for particulate sample.
7/17	Whatley Farm - Resampled watermellon due to loss of first mellon in shipment.
9/4	River Intake Structure Air Sampling Station: Particulate filter - Delay for one week in shipment due to omission.
9/11	Benthos (Clams) and aquatic vegetation samples for lst has of 1978 were reported as lost in transit.
9/25	North Perimeter Air Sampling Station: Pump failure - Low volume for particulate and iodine samples.

TABLE 5

ANALYTICAL DATA NOT REPORTED DURING 1978

Sample Date	Sample and Nature of Problem	Analytical Contractor
3/78	Milk - Gamma Spec and Radiostrontium Results were not Reported For Indicator Sample	EIC
4/78	Milk - Both Indicator and Control Samples Lost in Processing - No gamma Spec or radiostrontium results reported	EIC
8/78	Milk - Sample apparently lost in transit No iodine, gamma spec or radiostrontium results reported	EIC
7/78	Watermellon - Initial Indicator Sample and Replacement Lost in transit - No gamma spec results reported	UGA
5/78	Aquatic Vegetation - Both indicator and control samples apparently lost in transit - No gamma spec or radiostrontium results reported	EIC
5/78	Benthos (Clams) - Both indicator and control samples apparently lost in transit - No gamma spec or radiostrontium results reported	EIC

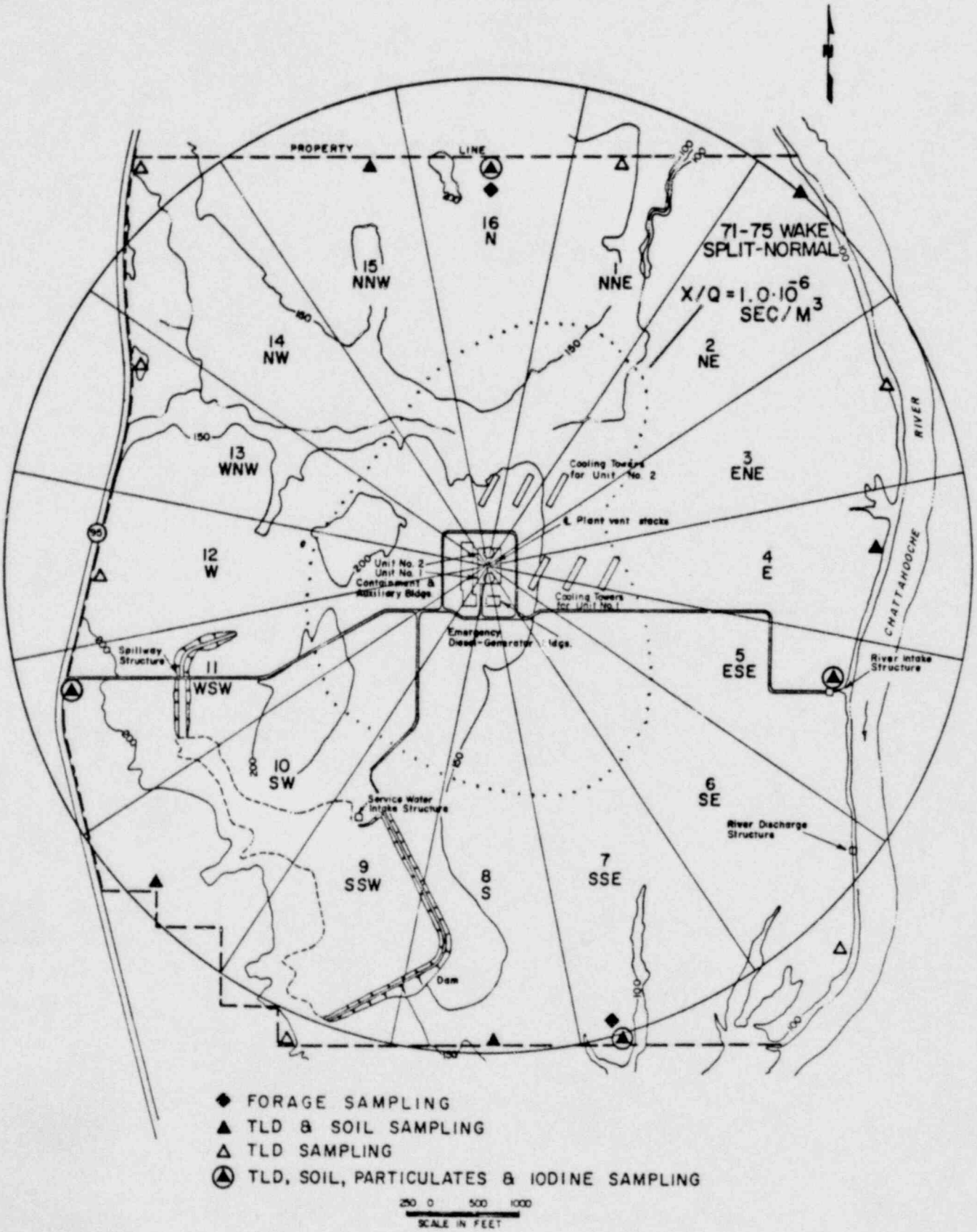


FIGURE 1. INDICATOR SAMPLING LOCATIONS FOR ENVIRONMENTAL RADIOACTIVITY AT THE FARLEY NUCLEAR PLANT.

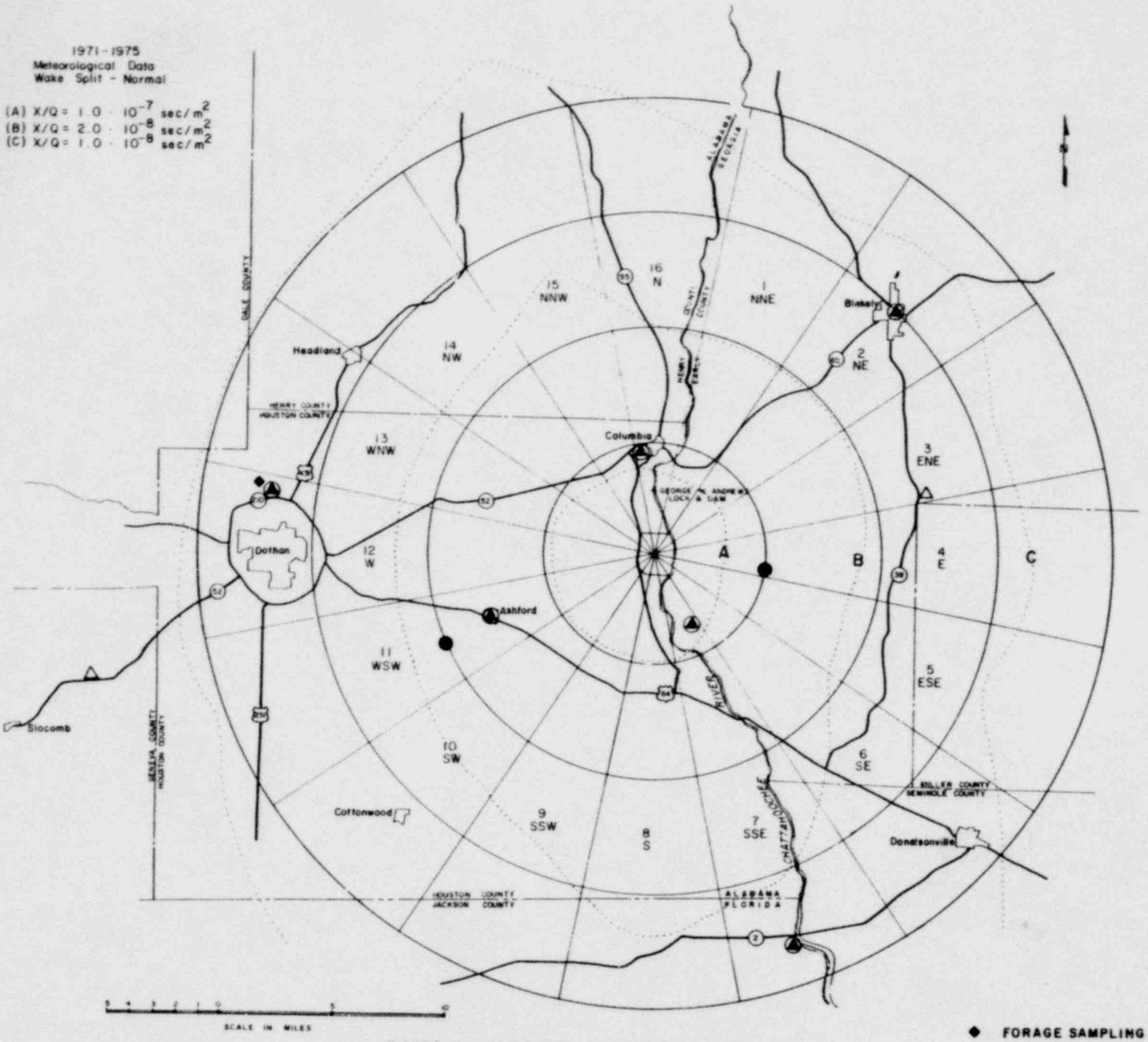


FIGURE 2. COMMUNITY AND CONTROL SAMPLING LOCATIONS FOR ENVIRONMENTAL RADIOACTIVITY IN THE FARLEY NUCLEAR PLANT AREA.

◆ FORAGE SAMPLING
△ TLD SAMPLING
TLD, SOIL, PARTICULATES AND IODINE SAMPLING
● MILK SAMPLING

channel MCA and a special counter designed and built by the U. Ga. for counting iodine-131 activity in charcoal cartridges, using two 1 x 3 NaI(Tl) detectors and matched photomultiplier tubes.

B. External Radiation

For the continuous measurement of environmental gamma radiation, natural LiF (TLD-100) chips were supplied and read by EIC. These LiF chips were pre-selected for environmental radiation monitoring to fall within a total dose range of ± 4 per cent relative to an exposure of 200-300 mR from a calibrated source. TLD packets each containing five ultrasonically cleaned and annealed LiF chips were supplied on both a quarterly and an annual basis. The chips were first sealed in opaque polyethylene to give a packet that was light-tight, weather-proof, and which had a low mass attenuation for radiation (approximately 50 mg/cm^2).

Two control TLD packets were shipped with each quarterly and annual batch of TLD's as an indicator of any unusual exposure during transit, and at the plant site prior to, or after field exposure. On the plant site, all TLD packets were kept in a lead safe with 2-inch walls except for those receiving field exposure or in the process of being exchanged. Control Packet No. 1 which had been received with the new batch of TLD's and Control Packet No. 2 received with the previous batch of TLD's were returned with the field exposed TLD's for a reading of their respective doses. The new Control Packet No. 2 remained in the safe until the next TLD exchange and the above procedure was repeated.

At each external radiation monitoring station, shown in Figures 1 and 2, two TLD packets, one changed and read quarterly and one changes and read annually, were exposed side-by-side on wooden stakes at a height of one meter above the ground. For the computation of the net field doses, a log of all exposure periods was maintained for each TLD packet.

C. Milk

Milk samples were collected semi-monthly at the two locations shown in Figure 2 and were analyzed by EIC for iodine-131, gamma emitters, and strontium-89, 90 in accordance with the schedule shown in Table 2. As a preservative during shipment, 1 ml of a 25 per cent (by weight) merthiolate (Thimerasol) solution and 4 ml of a 6N NaOH solution were added to each 2.5 gallon sample. (Samples of milk were not available at the indicator station in Early County, Georgia after May, 1978).

The iodine-131 concentration in each sample was determined by collection on anion exchange resin, elution with sodium hypochlorite, and precipitation as silver iodine for measurement of the beta activity with a Beckman Widebeta II or Lowbeta II low background proportional counter. Stable iodine carrier was added to each sample for determination of the radiochemical yield.

For each sampling station, once each month a 0.6 liter sample was evaporated to dryness at 100°C using a thin plastic film to retain the residue. The residues were then analyzed by EIC for gamma emitters using a 10 per cent relative efficiency low background Ge(Li) detector (either an 18 or 20% efficiency detector was used after March, 1978) and a computer based Nuclear Data 4096 channel MCA.

Also, once each month for each sampling station, a one or two liter aliquot of milk was taken for radiostrontium analysis. Following an EDTA separation of calcium, the single separation dual count technique, using a Beckman Widebeta II or Lowbeta II background proportional counter, was used for beta measurements. Following the second count, the in-growth of ythium-90 determined. Stable strontium and yttrium carriers were added, respectively, for determination of radiochemical yields. From these data, the strontium-90 and strontium-89 concentrations were calculated.

D. Vegetation

1. Forage

Once each month, forage was collected from indicator grass plots located near the air monitoring stations at the plant site perimeter in sectors 9 (SSE) and 16 (N), and from a control grass plot located near the air monitoring station in Dothan, After drying and pulverizing the samples were analyzed by U. Ga. for gamma emitters using a 9 per cent relative efficiency low background Ge(Li) detector (18% efficiency detector after May, 1978) and a Canberra 4096 channel computer based MCA.

2. Vegetables and Fruits

a. Green leafy vegetables
During the growing season, October through March, green leafy vegetables were obtained monthly as available from gardens in the vicinity of the plant (1-3 miles) and from gardens in the Dothan area (>10 miles) and were analyzed by U. Ga. for gamma emitters using a 9 per cent relative efficiency low background emitters using a 9 per cent relative efficiency low background Ge(Li) detector (18% efficiency detector after May, 1978) and a Canberra 4096 channel computer-based MCA.

b. Other Vegetables and Fruits
As available. samples of the principal vegetables and fruits (non-green leafy) grown in the plant vicinity (1-3 miles) were obtained at harvest along with samples from gardens in the Dothan area (>10 miles). The edible portions of these samples were prepared and analyzed for gamma emitters by U. Ga. using a 9 per cent relative efficiency low background Ge(Li) detector (18% efficiency

detector after May, 1978) and a Canberra 4096 channel computer-based MCA.

E. Soil

Semi-annual in situ gamma-ray spectroscopy measurements were made by U. Ga. using a 14 per cent relative efficiency Ge(Li) detector and gamma-ray spectroscopy system specially designed for field use, at the 9 indicator locations shown in Figure 1 and at the 6 community and control (background) locations shown in Figure 2. A 1024 channel Canberra MCA was interfaced to a Hewlett-Packard 9825A calculator for data storage and analysis.

F. Surface Water (River)

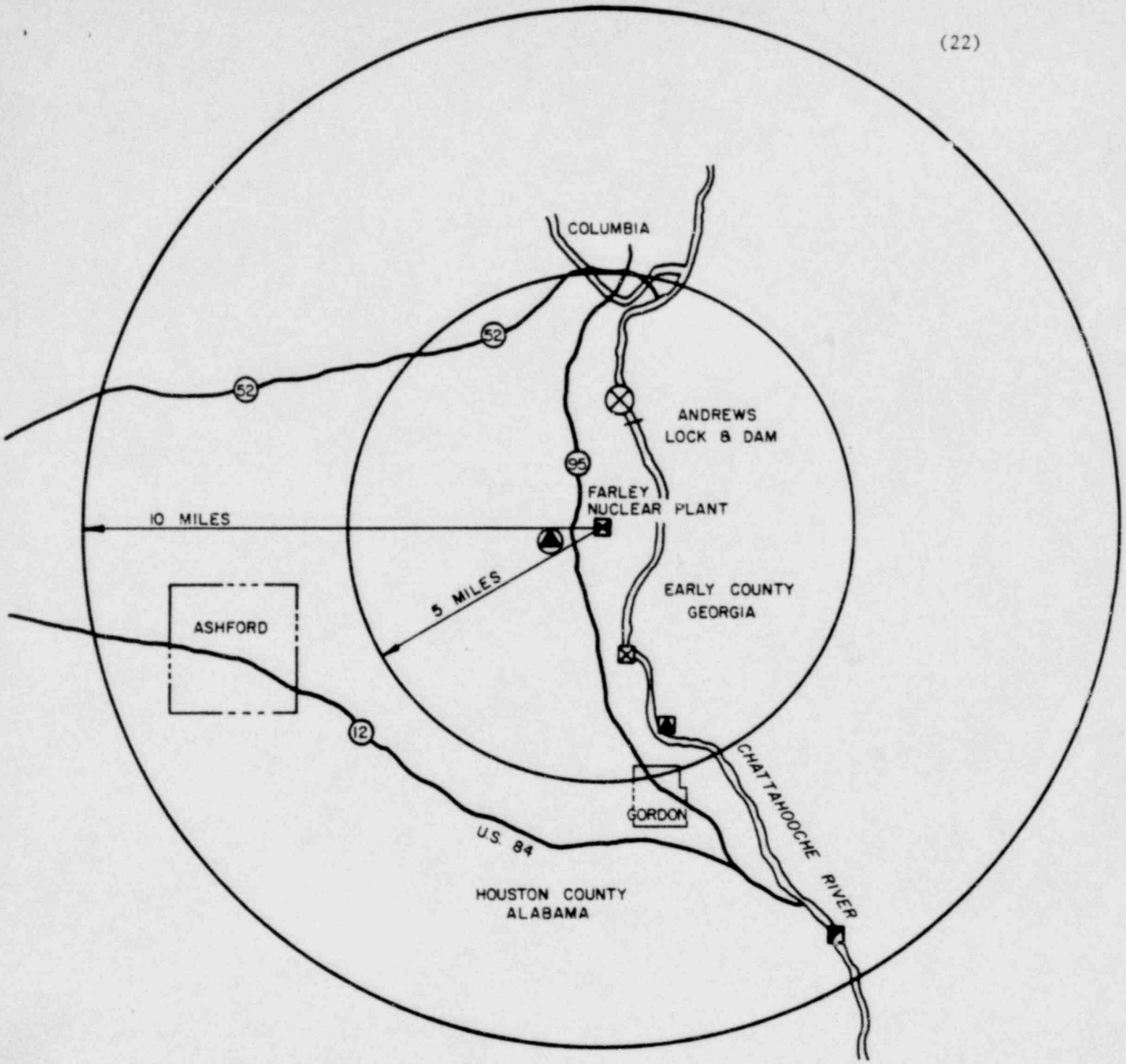
Samples of water from the Chattahoochee River, above and below the plant site at the locations shown in Figure 3, were collected on a semi-continuous basis with Instrumentation Specialties Company (ISCO) samplers. Monthly composites were sent to U. Ga. for radioactivity analysis. One liter aliquots from each monthly composite were placed in trays lined with plastic film and evaporated to dryness at 100°C. The residue and plastic film was folded to fit a petri-dish and analyzed for gamma emitters using a 9 per cent relative efficiency Ge(Li) low background detector (18% efficiency detector after May, 1978) and a Canberra 4096 channel computer-based MCA.

At the end of each quarter, for each sampling location, the balance of the three monthly composites were combined to give a quarterly composite sample. Approximately 50 ml from each quarterly composite sample was distilled and a 25 ml aliquot taken for tritium analysis using a large volume (100 ml) low background liquid scintillation counter specially designed and built by U. Ga.

One liter aliquots were taken from the quarterly strontium-89, 90 composites, evaporated to dryness, acidified and the strontium converted to the carbonate for strontium-89, 90 analysis using the single separation dual count technique. Stable strontium carrier was used for determination of radiochemical yield. The beta activity was determined using a Beckman Lowbeta II low background proportional counter.

G. Aquatic Vegetation (River)

Samples of aquatic vegetation were collected from the Chattahoochee River above and below the plant site on a semi-annual schedule at locations shown in Figure 3 and were sent to EIC for radioactivity analysis. A portion of each sample was taken, dried, pulverized, and analyzed for gamma emitters using a 10 per cent relative efficiency low background Ge(Li) detector (either an 18 or 20% efficiency detector was used after March, 1978) and 4096 channel computer-based Nuclear Data MCA.
The remainder of each sample was dried, ashed, acidified and converted to strontium carbonate for strontium-89, 90 analysis. The single separation dual count technique, using a Beckman Widebeta II or Lowbeta II low background proportional counter was used. This was followed by a yttrium separation and a count of the in-grown yttrium-90. Stable strontium and yttrium carriers were added for determination of the respective radiochemical yields.



INDICATORS STATIONS

- FISH AND SEDIMENT
- SURFACE AND GROUND WATER
- BENTHOS AND VEGETATION (WHERE AVAILABLE-BELOW PLANT DISCHARGE)

CONTROL STATIONS

- SURFACE WATER AND FISH BENTHOS AND VEGETATION (WHERE AVAILABLE-ABOVE ANDREWS LOCK & DAM)
- GROUND WATER

FIGURE 3. INDICATOR AND CONTROL SAMPLING LOCATIONS FOR WATERBORNE ENVIRONMENTAL RADIOACTIVITY IN THE FARLEY NUCLEAR PLANT AREA.

H. Benthos (Clams)

Samples of clams were collected from the Chattahoochee River above and below the plant site on a semi-annual schedule at locations shown in Figure 3 and were sent to EIC for radioactivity analysis. The tissue was separated from the shells, dried and pulverized for analysis of gamma emitters using a 10 per cent relative efficiency low background Ge(Li) detector (either an 18 or 20% efficiency detector was used after March, 1978) and 4096 channel computer-based Nuclear Data MCA. After completion of the gamma-ray spectroscopy analysis, the tissue samples were ashed, acidified and converted to strontium carbonate for strontium-89, 90 analysis. The single separation dual count technique using a Beckman Widebeta II or Lowbeta II low background proportional counter was used. This was followed by a uttrium separation and a count of the in-grown yttrium-90. Stable strontium and yttrium carriers were added for determination of the respective radiochemical yields.

I. Fish (River)

On a semi-annual basis three types of fish - game, forage feeding, and bottom feeding - were collected from the Chattahoochee River at the locations shown in Figure 3 and were sent to EIC for gamma-ray spectroscopy analysis. The edible tissue was removed, dried, pulverized and analyzed for gamma emitters using a 10 per cent relative efficiency low background Ge(Li) detector (either an 18 or 20% efficiency detector was used after March, 1978) and a 4096 channel computer-based Nuclear Data MCA.

J. Sediment (River)

On a semi-annual basis sediment samples were collected from the Chattahoochee River above and below the plant site at the locations shown in Figure 3. Approximately 1 kg from each sampling point was sent to U. Ga. for gamma-ray spectroscopy analysis. The samples were dried, mixed, and analyzed using a 9 per cent relative efficiency low background Ge(Li) detector (18% efficiency detector after May, 1978) and a Canberra 4096 channel computer-based MCA.

Also, approximately 1 kg from each location was sent to EIC for strontium-90 analysis. The samples were dried, mixed, and a portion of each was treated with acid. The strontium was converted to the carbonate and the strontium-90 content determined using the single separation dual count technique. The beta activity was measured with a Beckman Widebeta II or Lowbeta II low background proportional counter. Stable strontium carrier was added for determination of radiochemical yield.

K. Groundwater (Well)

In the Farley Plant area, there were no indicator sources of groundwater in the true sense of the definition. A well which serves the Great Southern Paper as a source of potable water, which is located on the east bank of the Chattahoochee River about four miles south-southeast of the plant was sampled on a quarterly basis and designated as an indicator station. A deep well which supplies water to King's Trailer Court located about 0.9 mile west of the center of the plant was sampled on a quarterly basis and designated as a control (back-

ground) station. Samples from both were sent to U. Ga. for radioactivity analysis. An aliquot from each sample was taken for tritium analysis. After distillation, 25 ml samples were analyzed using a large volume (100 ml) low background liquid scintillation counter specially designed and built by U. Ga. From the remainder of each sample, a one liter aliquot was taken and evaporated to dryness at 100°C in a tray lined with plastic film. The residue and film was folded to fit a petri dish and analyzed for gamma emitters using a nine relative per cent Ge(Li) detector (18% efficiency detector was used after May, 1978) and a Canberra 4096 channel computer-based MCA.

III. Results and Discussion

Two atmospheric nuclear tests were conducted by the Peoples Republic of China during this operational period. The fallout radioactivity from the test on March 14, 1978 arrived at the plant site about 10 days later during an extended dry period. The second test occurred on December 17, 1978, thus had little influence on this report period.

For measurements involving radioactivity concentrations by volume or mass the designation "minimum detectable concentration" (MDC) is used to denote the limit of detection applicable at the 95 percent confidence level. The MDC is defined as "the smallest concentration of radioactive material in a sample that will be detected with 95 percent probability with only 5 percent probability of falsely concluding its presence." For a particular measurement, which may include radiochemical separation:

$$MDC = \frac{4.66\ Sb}{2.22\ EMY}$$

where

MDC is the estimated minimum detectable concentration as defined above (pCi per unit mass or volume)

Sb is the standard deviation of the background counting rate for the sample being analyzed (a posteriori) or of a blank sample (a priori) as appropriate (counts per minute)

2.22 is the number of transformations per picocurie per minute

E is the counting efficiency (counts per transformation)

M is the weight of sample in kilograms or volume of sample in liters, as applicable

Y is the fractional radiochemical yield (when applicable)

For measurements involving a quantity of radioactivity or radiation that is independent of the sample volume or mass the designation "lower limit of detection" (LLD) is used to denote the limit of detection applicable at the 95 percent confidence level. The LLD is defined as "the smallest amount of sample activity that will yield a net count for which there is confidence at a predetermined level that activity is present". It applications are limited to measurement systems to denote a limiting detection capability without respect to the size of sample and/or radiochemical yield and to measurements which by their nature do not involve concentrations, such as radiation dose rates (mrad/hr., mrad/qtr., etc.)

A. Airborne Particulates and Iodine

The results of the radioactivity analyses of airborne particulate filters and iodine charcoal cartridges are shown in Table F02-1. The mean gross beta activity was slightly higher for the indicator stations than for the community and control station locations. The mean values for this operational period were also slightly greater than the preoperational mean values. However, the differences in both cases is not considered to be significant.

The gamma-ray spectroscopy data for the air particulate filters following the March 15, 1978 Chinese nuclear test showed the presence of fission product fallout similar to that noted during the preoperational period following the September 26, 1976 Chinese nuclear test. This is also true for the strontium-89 and strontium-90 analysis results. However, for the first time iodine-131 was measured at concenetraions above the MDC in both the particulate samples and the charcoal cartridges. No significant differences were noted between the indicator and control locations. The detection of measurable particulate iodine-131 is attributed to the fact that it was formed during a nuclear test about 10 days earlier, thus a portion of the gaseous iodine-131 had been absorbed on particulates, and the very short time interval from collection to gamma spec measurement of the filter paper composites. The detection of iodine-131 on some charcoal cartridges resulted from the use of new detection equipment which lowered the MDC by approximately a factor of two.

B. External Radiation

The results of the external radiation measurements using TLD packets, each containing five LiF chips, are shown in Table F02-2. Because of differences in soil radioactivity site specific differences in external radiation levels are reflected in these data. The mean values for the annual TLD's were higher than the four quarterly TLD's for the same locations, as had been noted during the preoperational period. However, the difference was greater for the indicator locations than for the community and control locations. This is an example of the unexplainable variability in results, which was noted during the preoperational period from the use of LiF TLD's to measure external radiation levels. (NOTE: At some TLD measurement locations duplicate TLD packets were exposed for QA purposes, thus the number of TLD values reported exceeds the number of external radiation measurement locations shown in Table 2.)

C. Milk

The results from the analysis of milk for radioactivity are shown in Table F02-3. Milk from the Brooks-Silcox Dairy was sampled as the control, whereas milk from a single individually owned cow was sampled for the indicator location from January through May. The effect of the fallout radioactivity from the Chinese nuclear test for iodine-131 and

strontium-90 was enhanced, for the indicator cow primarily on pasture, when compared to the control dairy. This difference was noted following atmospheric nuclear tests by the Chinese during the preoperational period. The maximum value for iodine-131 during this operational period was 51 pCi/l as compared to 120 pCi/l during the preoperational period. Also, the gamma-ray spectroscopy data did not reflect the effect of the fallout radioactivity to the extend that had been noted during the preoperational period.

D. Vegetation

The vegetation sampled during this operational period included forage, green leafy vegetables and food crops grown in the area. The radioactivity analysis results for this operational period are shown in Table F02-4.

Forage, as during the peroperational period, continued to be a very effective and sensitive indicator of airborne radioactivity. All of the expected gamma emitting fission products were measured at both the indicator and control locations following the Chinese nuclear test on March 5, 1978. The specific activity values for the various gamma emitting radionuclides were not significantly different for the indicator locations and the control location. The average value for those measurements in which the radioisotope concentration exceeded the MDC was significantly less than for the preoperational period. This is attributed to dry deposition as compared to wet deposition during the preoperational period. The number of gamma emitting fission products measured on the green leafy vegetables was much smaller and the radioactivity levels were much lower per kilogram of sample, even when both are compared on a wet weight basis. This is in part due to no samples of green leafy vegetables being available immediately after the Chinese nuclear test. As noted during the preoperational period the vegetables and fruits sampled during the summer were poor indicators of airborne radioactivity. Occasionally cesium-137 was measured at levels near its MDC in both the indicator and control samples.

E. Soil

The results of the in situ Ge(Li) gamma-ray spectroscopy analysis of soil during this operational period are shown in Table F02-5. Cesium-137 was measured at all locations in detectable quantities. However, niobium-95 and cesium-134 were present in measurable quantities only in the spring following the Chinese nuclear test. The differences between indicator and control locations were not significant.

F. Waterborne: Surface and Ground Water

The results of radioactivity analyses of surface water from the Chattahoochee River and ground water from wells are shown in Table F02-6. For the monthly surface water composite samples only one sample from the upstream control location showed the presence of man-made gamma emitters in excess of the MDC. For the quarterly composites the upstream control location showed a higher strontium-89 level in one sample. No significant

difference were noted for tritium in the indicator and control station samples. For the ground water samples a detectable quantity of tritium was measured in only one control sample. During the preoperational period a number of man-made and natural radionuclides were detected on a somewhat random basis at very low concentrations in both the surface and ground water samples.

G. Aquatic Vegetation (River)

The results of the radioactivity analysis of aquatic vegetation from the Chattahoochee River are shown in FO2-7. From the one set of samples only strontium-90 was found in detectable concentrations and these were considerably less than measured during the preoperational period.

H. Benthos: Clams

The results of the radioactivity analysis of tissue from Chattahoochee River clams are shown in Table FO2-8. From the one set of samples only strontium-90 was found in detectable quantities. As noted during the preoperational period clams appear to be a poor indicator for waterborne radioactivity.

I. Fish: River

The results of gamma-ray spectroscopy analysis of the edible portions of three types of fish taken from the Chattahoochee River are shown in Table FO2-9. As was noted during the preoperational period, Cesium-137 was the only man-made radionuclide found in excess of the measurement MDC and this true for only one sample.

J. Sediment: River

The results of radioactivity analysis of sediment samples from the Chattahoochee River are shown in Table FO2-10. No man-made radionuclides were found in the samples. The results were typical of those found during the preoperational period.

IV. Conclusion

During this operational period there was no evidence to indicate any increase in airborne or waterborne environmental radioactivity as the result of plant operation. This conclusion resulted from a comparison of indicator and control location values, as well as, with data for the preoperational surveillance period. This conclusion is supported by the very small quantities of radioisotopes measured in the plant effluents discharged to the environment, as reported in the semi-annual radioactive effluent release reports for 1978.

TABLE F02-1

AIRBORNE: PARTICULATES AND IODINE - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location With Highest Annual Mean: Name, Distance and Direction	Indicator Location With Highest Annual Mean: Mean (f)[b] Range[b]	Community Locations Mean (f)[b] Range[b]	Control Locations Mean (f)[b] Range[b]
Air Particulates (pCi/m^3)	Gross β 516	0.002	0.125 (205/205) (0.020 - 1.55)	River Intake Structure 0.8 Mile - ESE	0.125 (50/50) (0.025 - 1.35)	0.115 (155/155) (0.021 - 1.35)	0.115 (156/156) (0.023 - 1.45)
	Gamma Spec 40						
	^{7}Be	0.016	0.078 (16/16) (0.065 - 0.10)	River Intake Structure 0.8 Mile - ESE	0.082 (4/4) (0.078 - 0.083)	0.084 (12/12) (0.067 - 0.15)	0.088 (12/12) (0.069 - 0.098)
	^{40}K	0.021	0.062 (3/16) (0.048 - 0.077)	North Perimeter 0.8 Mile - N	0.077 (1/4) ----	0.050 (4/12) (0.043 - 0.055)	0.053 (3/12) (0.040 - 0.068)
	^{95}Zr	0.005	0.010 (2/16) (0.009 - 0.010)	South Perimeter 1.0 Mile - SSE	0.010 (1/4) ----	0.007 (3/12) (0.007 - 0.008)	0.008 (1/12) ----
	^{95}Nb	0.002	0.003 (6/16) (0.002 - 0.004)	Plant Entrance 0.9 Mile - WSW	0.004 (1/4) ----	0.004 (6/12) (0.002 - 0.004)	0.003 (5/12) (0.002 - 0.005)
	^{103}Ru	0.002	0.038 (4/16) (0.034 - 0.050)	River Intake Structure 0.8 Mile - ESE	0.050 (1/4) ----	0.036 (3/12) (0.030 - 0.041)	0.026 (4/12) (0.003 - 0.042)
	^{106}Ru	0.016	(0.028 (2/16) (0.027 - 0.029)	River Intake Structure 0.8 Mile - ESE	0.029 (1/4) ----	0.020 (2/12) (0.014 - 0.025)	0.025 (4/12) (0.023 - 0.028)
	^{131}I	0.002	0.034 (4/16) (0.031 - 0.041)	River Intake Structure 0.8 Mile - ESE	0.041 (1/4) ----	0.032 (3/12) (0.031 - 0.034)	0.029 (3/12) (0.018 - 0.036)

TABLE F02-1 (Cont'd)

AIRBORNE: PARTICULATES AND IODINE - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location With Highest Annual Mean		Community Locations Mean (f)[b] Range[b]	Control Locations Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f)[b] Range[b]		
	^{137}Cs	0.002	0.004 (9/16) (0.002 - 0.006)	Plant Entrance 0.9 Mile - WSW	0.005 (2/4) (0.004 - 0.006)	0.005 (8/12) (0.002 - 0.007)	0.005 (7/12) (0.002 - 0.007)
	^{140}Ba	0.009	0.050 (4/16) (0.034 - 0.064)	River Intake Structure 0.8 Mile - ESE	0.064 (1/4) ----	0.050 (3/12) (0.047 - 0.054)	0.043 (3/12) (0.038 - 0.051)
	^{140}La	0.005	0.056 (4/16) (0.043 - 0.078)	River Intake Structure 0.8 Mile - ESE	0.078 (1/4) ----	0.050 (3/12) (0.043 - 0.054)	0.049 (3/12) (0.034 - 0.060)
	^{141}Ce	0.003	0.023 (4/16) (0.020 - 0.027)	River Intake Structure 0.8 Mile - ESE	0.027 (1/4) ----	0.021 (3/12) (0.019 - 0.023)	0.021 (3/12) (0.013 - 0.027)
	^{144}Ce	0.010	0.032 (8/16) (0.026 - 0.044)	South Perimeter 1.0 Mile - SSE	0.035 (2/4) (0.026 - 0.044)	0.030 (6/12) (0.025 - 0.036)	0.032 (6/12) (0.025 - 0.040)
	^{203}Tl	0.002	< MDC	----	----	< MDC	< MDC
	^{212}Pb	0.002	< MDC	----	----	< MDC	----
	^{214}Pb	0.004	< MDC	----	----	----	< MDC
	^{214}Bi	0.003	0.003 (1/16) ----	River Intake Structure 0.8 Mile - ESE	0.003 (1/4) ----	0.004 (1/12) ----	< MDC

TABLE F02-1 (Cont'd)

AIRBORNE: PARTICULATES AND IODINE - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1973[c]

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location With Highest Annual Mean		Community Locations Mean (f)[b] Range[b]	Control Locations Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f)[b] Range[b]		
	Radiostrontium 40						
	^{89}Sr	0.0003	0.0115 (8/16) (0.0010 - 0.0250)	North Perimeter 0.8 Mile - N	0.0195 (1/4) ----	0.0125 (5/12) (0.0015 - 0.0210)	0.0120 (5/12) (0.0012-0.0230)
	^{90}Sr	0.0002	0.0019 (15/16) (0.0006 - 0.0033)	Plant Entrance 0.9 Mile - WSW	0.0020 (4/4) (0.0006 - 0.0033)	0.0018 (12/12) (0.0006 - 0.0033)	0.0023 (12/12) (0.0010-0.0036)
	Iodine 259						
Air Charcoal Cartridges (pCi/m^3)	^{131}I	0.041	0.039 (4/155) (0.034 - 0.043)	North Perimeter 0.8 Mile - N	0.043 (1/51) ----	0.037 (1/52) ----	0.048 (2/52) (0.045 - 0.050)

(a) Mean Minimum Detectable Concentrations Calculated per Equation 1 of this report. The MDC's for Gross β, Radiostrontium and Iodine were Obtained Using Blank Backgrounds (A Priori), Whereas, for Gamma-Ray Spectroscopy Actual Sample Backgrounds were Used (A Posteriori).

(b) Mean and Range Based Upon Detectable Measurements Only. Fraction of Detectable Measurements at Specified Locations in Parenthesis (f).

(c) No Non-routine Anomalous Measurements Reported During This Period.

TABLE F02-2

EXTERNAL RADIATION - OPERATIONAL SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1973[c]

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal LLD[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location With Highest Annual Mean		Community Locations Mean (f)[b] Range[b]	Control Locations Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f)[b] Range[b]		
TLD - Quarterly (MRAD)	Gross γ 110	10	15.0 (70/70) (9.9 - 27)	East Perimeter 0.8 Mile - E	23 (3/3) (20-27)	12.0 (16/16) (9.3 - 13.0)	13.5 (24/24) (9.0 - 18.0)
TLD - Annual (MRAD)	Gross γ 27	10	70 (18/18) (58 - 100)	East Perimeter 0.8 Mile - E	100 (1/1) ---	54 (4/4) (58 - 60)	61 (5/5) (49 - 70)
TLD - Annual[d] (MRAD)	Gross γ 26	10	58 (16/16) (48 - 84)	East Perimeter 1.0 Mile - NE	84 (1/1) ---	47 (4/4) (46 - 48)	53 (6/6) (46 - 62)

(a) Lower Limit of Detection as Defined in HASL-300, For LiF TLDs as Achieveable in Practice.
(b) Mean and Range Based on Detectable Measurements Only. Fraction of Detectable Measurements at Specified Location in Parenthesis (f).
(c) No Nonroutine Anomalous Measurements Reported During This Period.
(d) Sum of Four Quarters for Comparative Purposes.

TABLE F02-3

(32)

MILK - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations[d] Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
Milk (pCi/l)	Radioiodine 34					
	^{131}I	0.4 (0.5)	30 (2/10) (10 - 51)	Cedar Springs 5 Miles - E	30 (2/10) (10 - 51)	11 (2/24) (1.0 - 21)
	Gamma Spec 13					
	^{40}K	400	1000 (3/3) (620 - 1600)	Cedar Springs 5 Miles - E	1000 (3/3) (620 - 1600)	1300 (9/10) (840 - 1900)
	^{137}Cs	31 (25)	15 (1/3) ----	Cedar Springs 5 Miles - E	15 (1/3) ----	17 (1/10) ----
	^{208}Tl	23	----	----	----	< MDC
	^{212}Pb	84	< MDC	----	----	< MDC
	^{214}Pb	100	< MDC	----	----	< MDC
	^{214}Bi	64	----	----	----	< MDC
	^{226}Ra	810	----	----	----	< MDC

TABLE F02-3 (Cont'd)

MILK - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations[d] Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	Radiostrontium 13					
	^{89}Sr	1.0 (10)	MDC	----	----	MDC
	^{90}Sr	1.4 (2)	14 (3/3) (9 - 23)	Cedar Springs 5 Miles - E	14 (3/3) (9 - 23)	4 (9/10) (1.6 - 6)

(a) Mean minimum detectable concentrations calculated per equation 1 of this report using blank backgrounds (a priori). For the period April-December, 1978 MDC values from Farley ETS Table 3.2-3 were used as the basis for reporting measurement data. (Shown in parenthesis where applicable)

(b) Mean and range based on detectable measurements only. Fraction of detectable measurements at specified locations in parenthesis (f).

(c) No nonroutine anomalous measurements reported during this period.

(d) Indicator milk sampling locations not available after May, 1978.

TABLE FO2-4

VEGETATION: FORAGE, VEGETABLES AND FRUITS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
Forage[d] (pCi/kg-Dry)	Gamma Spec 42					
	^{7}Be	920	4900 (22/28) (1200 - 12000)	North Perimeter 0.8 Mile - N	5300 (9/14) (1850 - 12000)	4600 (11/14) (1350 - 10600)
	^{40}K	2500	17000 (28/28) (3400 - 39000)	North Perimeter 0.8 Mile - N	13500 (14/14) (6500 - 39000)	12500 (14/14) (4400 - 19500)
	^{95}Zr	255	330 (2/28) (360 - 410)	North Perimeter 0.8 Mile - N	410 (1/14) ----	360 (1/14) ----
	^{95}Nb	145	600 (4/28) (550 - 650)	South Perimeter 1.0 Mile - SSE	650 (2/14) (560 - 740)	300 (3/14) (140 - 550)
	^{103}Ru	140	470 (4/28) (220 - 930)	South Perimeter 1.0 Mile - SSE	580 (2/14) (230 - 930)	360 (2/14) (480 - 630)
	^{106}Ru	920	1500 (1/28) ---	South Perimeter 1.0 Mile - SSE	1500 (1/14) ----	< MDC
	^{131}I	130	880 (4/28) (230 - 1650)	South Perimeter 1.0 Mile - SSE	950 (2/14) (230 - 1650)	960 (2/14) (270 - 1650)
	^{137}Cs	130	210 (11/28 (77 - 330)	South Perimeter 1.0 Mile - SSE	220 (7/14) (77 - 330)	130 (5/14) (100 - 250)

TABLE F02-4 (Cont'd)

VEGETATION: FORAGE, VEGETABLES AND FRUITS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	^{140}Ba	600	1400 (2/28) (800 - 2000)	South Perimeter 1.0 Mile - SSE	2000 (1/14) ----	1350 (1/14) ----
	^{140}La	240	1000 (3/28) (400 - 1450)	South Perimeter 1.0 Mile - SSE	1450 (1/14) ----	800 (2/14) (400 - 1200)
	^{141}Ce	180	470 (3/28) (220 - 700)	North Perimeter 0.8 Mile - N	500 (1/14) ----	340 (2/14) (210 - 480)
	^{144}Ce	680	1900 (9/28) (660 - 4000)	South Perimeter 1.0 Mile - SSE	1950 (4/14) (940 - 3000)	1650 (5/14) (720 - 3000)
	^{208}Tl	105	150 (2/28) (125 - 170)	South Perimeter 1.0 Mile - SSE	170 (1/14) ----	< MDC
	^{212}Pb	185	310 (5/28) (155 - 430)	South Perimeter 1.0 Mile - SSE	320 (4/14) (155 - 430)	155 (2/14) (120 - 190)
	^{214}Pb	200	440 (4/28) (280 - 850)	South Perimeter 1.0 Mile - SSE	440 (4/14) (280 - 850)	260 (2/14) (240 - 290)
	^{214}Bi	230	610 (7/28) (250 - 1900)	South Perimeter 1.0 Mile - SSE	640 (6/14) (250 - 1900)	230 (3/14) (170 - 310)

TABLE F02-4 (Cont'd)

VEGETATION: FORAGE, VEGETABLES AND FRUITS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	^{228}Ac	530	420 (1/28) ---	South Perimeter 1.0 Mile - SSE	420 (1/14) ----	----
Green Leafy Vegetables (pCi/kg-Wet)	Gamma Spec 8 ^{7}Be	135	165 (1/4) ---	Farley Plant Area 1-3 Miles - All Directions	165 (1/4) ----	160 (1/4) ----
	^{40}K	320	6200 (4/4) (2700 - 9300)	Farley Plant Area 1-3 Miles - All Directions	6200 (4/4) (2700 - 9300)	5700 (4/4) (4700 - 6800)
	^{95}Nb	26	---	----	----	28 (1/4) ----
	^{137}Cs	24	< MDC	----	----	26 (1/4) ----
	^{144}Ce	75	< MDC	----	----	----
	^{212}Pb	36	57 (1/4) ---	Farley Plant Area 1-3 Miles - All Directions	57 (1/4) ----	< MDC
	^{214}Pb	43	60 (2/4) (50 - 70)	Farley Plant Area 1-3 Miles - All Directions	60 (2/4) (50 - 70)	60 (2/4) (52 - 69)

TABLE F02-4 (Cont'd)

VEGETATION: FORAGE, VEGETABLES AND FRUITS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	^{214}Bi	50	85 (2/4) (66 - 105)	Farley Plant Area 1-3 Miles - All Directions	85 (2/4) (66 - 105)	66 (1/4) ----
	^{226}Ra	420	< MDC	----	----	----
	^{228}Ac	64	< MDC	----	----	130 (1/4) ----
Beans (Butter) (pCi/kg-Wet)	Gamma Spec 2					
	^{40}K	495	4600 (1/1) ---	Farley Plant Area 1-3 Miles - All Directions	4600 (1/1) ----	3800 (1/1) ----
	^{214}Pb	51	< MDC	----	----	----
	^{214}Bi	43	60 (1/1) ---	Farley Plant Area 1-3 Miles - All Directions	60 (1/1) ----	< MDC
Cantaloupe (pCi/kg-Wet)	Gamma Spec 2					
	^{40}K	495	1200 (1/1) ---	Farley Plant Area 1-3 Miles - All Directions	1200 (1/1) ----	1100 (1/1) ----
	^{137}Cs	25	---	----	----	25 (1/1) ----

TABLE F02-4 (Cont'd)

VEGETATION: FORAGE, VEGETABLES AND FRUITS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	^{214}Bi	43	< MDC	----	----	< MDC
Corn (pCi/kg-Wet)	Gamma Spec 2					
	^{40}K	495	2100 (1/1) ----	Farley Plant Area 1-3 Miles - All Directions	2100 (1/1) ----	1800 (1/1) ----
	^{137}Cs	25	21 (1/1) ----	Farley Plant Area 1-3 Miles - All Directions	21 (1/1) ----	31 (1/1) ----
	^{208}Tl	20	< MDC	----	----	----
	^{212}Pb	41	< MDC	----	----	----
	^{214}Bi	43	----	----	----	< MDC
Cucumbers (pCi/kg-Wet)	Gamma Spec 2					
	^{40}K	495	1100 (1/1) ----	Farley Plant Area 1-3 Miles - All Directions	1100 (1/1) ----	1200 (1/1) ----
	^{137}Cs	25	----	----	----	27 (1/1) ----

TABLE F02-4 (Cont'd)

VEGETATION: FORAGE, VEGETABLES AND FRUITS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	^{212}Pb	41	----	----	----	< MDC
	^{214}Pb	51	< MDC	----	----	< MDC
	^{214}Bi	43	< MDC	----	----	< MDC
Okra (pCi/kg-Wet)	Gamma Spec 2					
	^{40}K	495	2000 (1/1) ----	Farley Plant Area 1-3 Miles - All Directions	2000 (1/1) ----	1850 (1/1) ----
	^{208}Tl	20	< MDC	----	----	----
	^{212}Pb	41	< MDC	----	----	< MDC
	^{214}Pb	51	< MDC	----	----	----
	^{214}Bi	43	48 (1/1) ----	Farley Plant Area 1-3 Miles - All Directions	48 (1/1) ----	< MDC
Peanuts (pCi/kg-Wet)	Gamma Spec 2					
	^{40}K	495	3000 (1/1) ----	Farley Plant Area 1-3 Miles - All Directions	3000 (1/1) ----	4100 (1/1) ----

TABLE F02-4 (Cont'd)

VEGETATION: FORAGE, VEGETABLES AND FRUITS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	^{137}Cs	25	< MDC	----	----	70 (1/1) ----
	^{214}Bi	43	< MDC	----	----	< MDC
Peas (pCi/kg-Wet)	Gamma Spec 2					
	^{40}K	495	4200 (1/1) ----	Farley Plant Area 1-3 Miles - All Directions	4200 (1/1) ----	2300 (1/1) ----
	^{137}Cs	25	17 (1/1) ----	Farley Plant Area 1-3 Miles - All Directions	17 (1/1) ----	----
	^{208}Tl	20	< MDC	----	----	----
	^{212}Pb	41	< MDC	----	----	< MDC
	^{214}Pb	51	< MDC	----	----	----
	^{214}Bi	43	< MDC	----	----	< MDC
Pecans (pCi/kg-Wet)	Gamma Spec 4					
	^{7}Be	215	< MDC	----	----	----

TABLE F02-4 (Cont'd)

VEGETATION: FORAGE, VEGETABLES AND FRUITS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	^{40}K	495	3000 (2/2) (2600 - 3300)	Farley Plant Area 1-3 Miles - Any Direction	3000 (2/2) (2600 - 3300)	3200 (2/2) (2800 - 3500)
	^{137}Cs	25	62 (1/2) ----	Farley Plant Area 1-3 Miles - Any Direction	62 (1/2) ----	< MDC
	^{214}Bi	43	< MDC	----	----	< MDC
	^{228}Ac	110	184 (1/2) ----	Farley Plant Area 1-3 Miles - Any Direction	184 (1/2)	----
Squash (pCi/kg-Wet)	Gamma Spec 2 ^{40}K	495	1300 (1/2) ----	Farley Plant Area 1-3 Miles - Any Direction	1300 (1/2) ----	2100 (1/2) ----
	^{137}Cs	25	----	----	----	22 (1/2) ----
	^{208}Tl	20	< MDC	----	----	----
	^{212}Pb	41	< MDC	----	----	----
	^{214}Pb	51	----	----	----	< MDC

TABLE F02-4 (Cont'd) (42)

VEGETATION: FORAGE, VEGETABLES AND FRUITS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	^{214}Bi	43	< MDC	----	----	< MDC
Tomatoes (pCi/kg-Wet)	Gamma Spec 2					
	^{40}K	495	1600 (1/1) ----	Farley Plant Area 1-3 Miles - Any Direction	1600 (1/1) ----	1150 (1/1) ----
	^{137}Cs	25	16 (1/1) ----	Farley Plant Area 1-3 Miles - Any Direction	16 (1/1) ----	< MDC
	^{214}Bi	43	< MDC	----	----	< MDC
Turnips (Roots (pCi/kg-Wet)	Gamma Spec 2					
	^{40}K	495	3100 (1/1) ----	Farley Plant Area 1-3 Miles - Any Direction	3100 (1/1) ----	2900 (1/1) ----
	^{228}Ac	110	85 (1/1)	Farley Plant Area 1-3 Miles - Any Direction	85 (1/1)	----
Watermellon (pCi/kg-Wet)	Gamma Spec 1					
	^{40}K	495	(e)	----	----	< MDC
	^{137}Cs	25	(e)	----	----	< MDC

TABLE F02-4 (Cont'd)

VEGETATION: FORAGE, VEGETABLES AND FRUITS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	^{214}Bi	43	(e)	----	----	< MDC

(a) Mean minimum detectable concentrations calculated per equation 1 of this report using actual sample backgrounds (a posteriori).
(b) Mean and range based on detectable measurements only. Fraction of detectable measurements at specified locations in parenthesis (f).
(c) No nonroutine anomalous measurements reported during this period.
(d) Mean wet/dry ratio for 1978 was 4.0.
(e) Initial and replacement samples were both lost in transit to U. GA.

TABLE F02-5

SOIL - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location With Highest Annual Mean		Community Locations Mean (f)[b] Range[b]	Control Locations Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f)[b] Range[b]		
Soil (In Situ) (pCi/kg - Dry)	Gamma Spec 30						
	^{40}K	380	4200 (18/18) (560 - 14500)	East Perimeter 0.8 Mile - E	13500 (2/2) (12000 - 14500)	1050 (6/6) (650 - 1450)	3000 (6/6) (820 - 5200)
	^{95}Nb	30	66 (9/18) (24 - 125)	East Perimeter 1.0 Mile - NE	125 (1/2) ----	51 (3/6) (48 - 54)	50 (3/6) (33 - 65)
	^{134}Cs	25	26 (9/18) (17 - 55)	East Perimeter 0.8 Mile - E	55 (1/2) ----	25 (1/6) ----	29 (3/6) (22 - 33)
	^{137}Cs	50	420 (18/18) (145 - 600)	South Perimeter 1.0 Mile - SSE	570 (2/2) (540 - 600)	310 (6/6) (215 - 530)	430 (6/6) (320 - 530)
	^{208}Tl	80	530 (18/18) (290 - 1050)	East Perimeter 1.0 Mile - NE	1000 (2/2) (1000 - 1050)	360 (5/6) (260 - 400)	540 (5/6) (390 - 630)
	^{212}Pb	240	1650 (18/18) (750 - 3250)	East Perimeter 1.0 Mile - NE	3150 (2/2) (3050 - 3250)	1050 (6/6) (790 - 1300)	1500 (6/6) (1050 - 1900)
	^{214}Pb	200	1450 (18/18) (680 - 3500)	East Perimeter 0.8 Mile - E	2750 (2/2) (2000 - 3500)	1150 (6/6) (770 - 2450)	1150 (6/6) (780 - 1350)
	^{212}Bi	570	1100 (18/13) (500 - 2350)	East Perimeter 1.0 Mile - NE	2000 (2/2) (1600 - 2350)	360 (6/6) (425 - 1250)	1000 (6/6) (550 - 1600)

TABLE F02-5 (Cont'd)

SOIL - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1973[c]

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location With Highest Annual Mean		Community Locations Mean (f)[b] Range[b]	Control Locations Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f)[b] Range[b]		
	^{214}Bi	130	1450 (18/18) (680 - 3850)	East Perimeter 0.8 Mile - E	3000 (2/2) (2200 - 3850)	1150 (6/6) (750 - 2900)	1100 (6/6) (750 - 1300)
	^{226}Ra	600	----	----	----	----	590 (1/6) ----
	^{228}Ac	230	1500 (18/18) (590 - 3000)	East Perimeter 1.0 Mile - NE	2900 (2/2) (2800 - 3000)	950 (6/6) (790 - 1100)	1450 (6/6) (930 - 1850)

(a) Mean Minimum Detectable Concentrations Calculated per Equation 1 of this report using Actual Sample Backgrounds (A Posteriori).

(b) Mean and Range Based on Detectable Measurements Only. Fraction of Detectable Measurements at Specified Locations in Parenthesis (f).

(c) No nonroutine anomalous measurements reported during this period.

TABLE F02-6

WATERBORNE: SURFACE AND GROUND WATER - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
Surface Water (River) (pCi/l)	Gamma Spec 24					
	^{40}K 46		92 (1/12) ---	Great Southern Paper River Mile - 40	92 (1/12) ---	100 (2/12) (98 - 105)
	^{137}Cs 4		< MDC	----	---	< MDC
	^{140}Ba 7		---	----	---	15 (1/12) ---
	^{208}Tl 4		< MDC	----	---	---
	^{212}Pb 6		< MDC	----	---	< MDC
	^{214}Bi 7		< MDC	----	---	---
	^{226}Ra 60		---	----	---	< MDC
	^{228}Ac 13		< MDC	----	---	---
	Tritium 8					
	^{3}H 74		230 (3/4) (180 - 290)	Great Southern Paper River Mile - 40	230 (3/4) (180 - 290)	250 (3/4) (140 - 370)

TABLE F02-6 (Cont'd)

WATERBORNE: SURFACE AND GROUND WATER - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	Radiostrontium 8					
	^{89}Sr	2.0	6.1 (2/4) (5.6 - 6.6)	Great Southern Paper River Mile - 40	6.1 (2/4) (5.6 - 6.6)	42 (1/4) ---
	^{90}Sr	1.4	< MDC	----	---	< MDC
Ground Water (Well) (pCi/l)	Gamma Spec 8					
	^{40}K	47	33 (1/4) ---	Great Southern Paper Well 4 Miles - SSE	33 (1/4) ---	61 (1/4) ---
	^{137}Cs	3	< MDC	----	---	---
	^{212}Pb	5	< MDC	----	---	< MDC
	214Bi	7	---	----	---	< MDC
	Tritium 8					
	^{3}H	49	< MDC	----	---	240 (1/4) ---

(a) Mean minimum detectable concentrations calculated per equation 1 of this report. The MDC's for tritium and radiostrontium were obtained using blank backgrounds (a priori), whereas, for gamma-ray spectroscopy actual sample backgrounds were used (a posteriori).

(b) Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations in parenthesis (f).

(c) No nonroutine anomalous measurements reported during this period.

TABLE F02-7

VEGETATION: AQUATIC - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed[d]	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
Aquatic (River) Vegetation (pCi/kg-Wet)	Gamma Spec 2					
	^{40}K	--	1800 1/1 ---	Chattahoochee River River Mile - 12	1800 1/1 ---	---
	^{137}Cs	100	< MDC	----	---	< MDC
	Radiostrontium 2					
	^{89}Sr	10	< MDC	----	---	< MDC
	^{90}Sr	5	20 1/1 ---	Chattahoochee River River Mile - 12	20 1/1 ---	64 1/1 ---

(a) Minimum detectable concentrations from Farley ETS Table 3.2-3 used as basis for reporting measurement data.
(b) Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations in parenthesis (f).
(c) No nonroutine anomalous measurements were reported during this period.
(d) Samples for first half of 1978 were lost in transit.

TABLE F02-8

BENTHOS: CLAMS - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed[d]	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
Benthos (Clams) (pCi/kg-Wet Tissue)	Gamma Spec 2					
	^{137}Cs	100	< MDC	----	---	< MDC
	Radiostrontium 2					
	^{89}Sr	10	< MDC	----	---	< MDC
	^{90}Sr	5	51 (1/1) ---	Chattahoochee River River Mile - 14	51 (1/1) ---	42 (1/1) ---

(a) Minimum detectable concentrations from Farley ETS Table 3.2-3 used as basis for reporting measurement data.

(b) Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations in parenthesis (f).

(c) No nonroutine anomalous measurements were reported during this period.

(d) Samples for first half of 1978 were lost in transit.

TABLE F02-9

FISH: RIVER - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
Fish (Forage Feeding) (pCi/kg-Wet Tissue)	Gamma Spec 4					
	^{40}K	--	12,000 (1/2) ----	Chattahoochee River River Mile, 41-42	12,000 (1/2) ----	12,500 (2/2) (12,000-13,000)
	^{137}Cs	100	100 (1/2) ----	Chattahoochee River River Mile, 41-42	100 (1/2) ----	< MDC
	^{144}Ce	100	< MDC	----	----	< MDC
Fish (Game) (pCi/kg-Wet Tissue)	Gamma Spec 4					
	^{40}K		2600 (2/2) (2100 - 3000)	Chattahoochee River River Mile, 41-42	2600 (2/2) (2100 - 3000)	2100 (1/2) ----
	^{137}Cs	100	< MDC	----	----	< MDC
	^{144}Ce	100	< MDC	----	----	200 (1/2) ----
Fish (Bottom Feeding) (pCi/kg-Wet Tissue)	Gamma Spec 4					
	^{40}K	--	1950 (2/2) (900 - 3000)	Chattahoochee River River Mile, 41-42	1950 (2/2) (900 - 3000)	< MDC

TABLE F02-9 (Cont'd)

FISH: RIVER - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	^{137}Cs	100	< MDC	----	---	< MDC
	^{144}Ce	100	< MDC	----	---	< MDC

(a) Minimum detectable concentrations from Farley ETS Table 3.2-3 used as basis for reporting measurement data.
(b) Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations in parenthesis (f).
(c) No non-routine anomalous measurements were reported during this period.

TABLE F02-10

SEDIMENT: RIVER - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
Sediment (River) (pCi/kg-Dry)	Gamma Spec 4					
	^{40}K	480	1300 (2/2) (1200 - 1450)	Smith's Bend River Mile, 41-42	1300 (2/2) (1200 - 1450)	1350 (2/2) (940 - 1750)
	^{137}Cs	51	< MDC	----	---	---
	^{208}Tl	38	110 (2/2) (78 - 140)	Smith's Bend River Mile, 41-42	110 (2/2) (78 - 140)	58 (2/2) (51 - 65)
	^{212}Pb	62	235 (2/2) (235 - 240)	Smith's Bend River Mile, 41-42	235 (2/2) (235 - 240)	130 (2/2) (100 - 165)
	^{214}Pb	77	255 (2/2) (220 - 285)	Smith's Bend River Mile, 41-42	255 (2/2) (220 - 285)	185 (2/2) (185 - 190)
	^{214}Bi	76	230 (2/2) (200 - 265)	Smith's Bend River Mile, 41-42	230 (2/2) (200 - 265)	170 (2/2) (165 - 180)
	^{226}Ra	540	< MDC	----	---	< MDC
	^{228}Ac	170	< MDC	----	---	---

TABLE F02-10 (Cont'd)

SEDIMENT: RIVER - OPERATIONAL RADIOACTIVITY SUMMARY

JOSEPH M. FARLEY NUCLEAR PLANT
LICENSE NO. NPF-2, HOUSTON COUNTY, ALABAMA
January - December, 1978[c]

Medium or Pathway Samples (Unit of Measurement)	Type and Total Number of Analyses Performed	Nominal MDC[a]	All Indicator Locations Mean (f)[b] Range[b]	Indicator Location with Highest Annual Mean		Control Location Mean (f)[b] Range[b]
				Name Distance and Direction	Mean (f) Range[b]	
	Radiostrontium 4					
	^{89}Sr	200	< MDC	----	---	< MDC
	^{90}Sr	200	< MDC	----	---	< MDC

(a) For Gamma Spectroscopy measurements the mean minimum detectable concentrations were calculated per equation 1 of this report using actual sample backgrounds (a posteriori). For radiostrontium analyses the MDC's were taken from the Farley ETS, Table 3.2-3 as the basis for reporting measurement data.

(b) Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations in parenthesis (f).

(c) No nonroutine anomalous measurements were reported during this period.