

ENCLOSURE

PLANT VOGTLE - UNIT 1
NRC DOCKET 50-424
OPERATING LICENSE NPF-68
ANNUAL RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE REPORT
CALENDAR YEAR 1987

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GEORGIA POWER COMPANY
VOGTLE ELECTRIC GENERATING PLANT
ANNUAL RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE REPORT
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VOGTLE ELECTRIC GENERATING PLANT
RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE REPORT

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ACRONYMS

CSRA	Central Savannah River Area
EPA	Environmental Protection Agency
GE	Greater Than or Equal to
GPC	Georgia Power Company
LLD	Lower Limit of Detection
LT	Less Than
MDD	Minimum Detectable Difference
NA	Not Applicable
NDM	No Detectable Measurement
NRC	Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
OLSER	Operating License Stage Environmental Report
REMP	Radiological Environmental Monitoring Program
RL	Reporting Level
s	Standard Deviation
SRP	Savannah River Plant
TLD	Thermoluminescent Dosimeter
TS	Technical Specifications for Unit 1
VEGP	Vogtle Electric Generating Plant

VOGTLE ELECTRIC GENERATING PLANT
RADIOLOGICAL ENVIRONMENTAL SURVEILLANCE REPORT

1.0 INTRODUCTION

This is the initial annual Radiological Environmental Surveillance Report for the Vogtle Electric Generating Plant (VEGP). It covers activities of the operational phase of the Radiological Environmental Monitoring Program (REMP) during calendar year 1987. Hence all dates in this report are for the year 1987 unless otherwise indicated. Activities of the preoperational phase of the REMP which began in 1981 and extended into 1987 are documented in the Preoperational Radiological Environmental Surveillance Report.

The objective of the REMP is to ascertain the levels of radiation and the concentrations of radioactivity in the environs of the VEGP and to evaluate any radiological impact to the environment due to plant operations. A comparison between the results obtained during the preoperational and operational phases provides some basis for such an evaluation. A comparison between the results obtained at control stations (locations where radiological levels are not expected to be significantly affected by plant operations) and at indicator stations (locations where it is anticipated that radiological levels are more likely to be affected by plant operations) provides a further basis for the evaluation.

The specifications for the operational phase of the REMP are provided by Section 3/4.12 of the Technical Specifications for Unit 1 (TS) while the specifications for the preoperational phase were provided by Section 6.1.5 of the Operating License Stage Environmental Report (OLSER). The transition from the preoperational phase to the operational phase hinged about initial criticality for Unit 1 which occurred on March 9. Practical considerations regarding sample collections (type, schedule and composite period) and radioactive effluent releases (type, composition, date of initiation and magnitude) rendered a need for some flexibility in determining the demarcation date for each type sample.

The release of radioactive gases at measurable levels was initiated on March 20. All of the gaseous releases during the first quarter were due to the venting of waste gas tanks; a total of only 16.7 microCuries of short lived (half lives less than 10 hours) noble gases were released. There were no gaseous releases of iodines, particulates or tritium during the first quarter. Because the gaseous releases during the first quarter could be considered as trivial and innocuous, the demarcation date for the samples which monitor gaseous releases - dust filters, charcoal cartridges, thermoluminescent dosimeters (TLDs), milk and vegetation - was deemed to be the end of the first quarter. The only samples that could have been affected by the first quarter gaseous releases were the TLDs. This demarcation date also fit neatly with sampling schedules and compositing periods.

Although the quantity of radioactive liquids released during the first quarter was small, it might be considered more than trivial. For each of the samples which monitor liquid releases (river water, drinking water, fish and sediment) the demarcation date is deemed to be the last collection date before initial criticality.

A summary description of the (operational phase of the) REMP is provided in Section 2. This includes maps showing the sampling locations; the maps are keyed to a table indicating the distance and direction of each sampling location from a point midway between the two reactors.

A summary of the main laboratory analysis results obtained from the samples utilized for environmental monitoring for this report period is presented in Section 3. A discussion of the results including assessments of any radiological impacts upon the environment is provided in Section 4.

The results of the Interlaboratory Comparison Program are presented in Section 5. The chief conclusions are stated in Section 6.

2.0 SUMMARY DESCRIPTION

A summary description of the (operational phase of the) REMP is provided in Table 2-1. This table portrays the program in the manner by which it is being regularly carried out; it is essentially a copy of Table 3.12.1-1 of the TS which delineates the program's requirements. Sampling locations specified by Table 2-1 are described in Table 2-2 and are shown on maps in Figures 2-1 through 2-4. This description of the sample locations closely follows that found in the table and figures of Section 3.0 of the Offsite Dose Calculation Manual (ODCM).

It is stated in Footnote (1) of Table 3.12-1 of the TS that deviations are permitted from the required sampling schedule which is delineated in Table 2-1 herein, if specimens are unobtainable due to circumstances, such as, hazardous conditions, seasonal unavailability, and malfunction of sampling equipment. Any deviations are accounted for in the discussions for each particular sample type in Section 4.

During 1987, all the laboratory analyses except for the reading of the TLDs were performed by Georgia Power Company's (GPC's) Central Laboratory in Smyrna, Georgia. The reading of the TLDs was provided by Teledyne Isotopes Midwest Laboratory in Northbrook, Illinois. The Center for Applied Isotope Studies at the University of Georgia in Athens, Georgia, which provided much of the laboratory analyses during the preoperational phase of the REMP, now serves as a backup laboratory to the Central Laboratory.

TABLE 2-1 (SHEET 1 OF 5)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

<u>EXPOSURE PATHWAY AND/OR SAMPLE</u>	<u>NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS</u>	<u>SAMPLING AND COLLECTION FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS</u>
1. Direct Radiation ⁽¹⁾	<p>Thirty-eight routine monitoring stations with two or more dosimeters placed as follows:</p> <p>An inner ring of stations, one in each meteorological sector in the general area of the site boundary;</p> <p>An outer ring of stations, one in each meteorological sector in the 6 mile range from the site; and</p> <p>The balance of the stations to be placed in special interest areas such as population centers, nearby residences, schools, and in one or two areas to serve as control stations.</p>	Quarterly	Gamma dose quarterly

TABLE 2-1 (SHEET 2 OF 5)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

<u>EXPOSURE PATHWAY AND/OR SAMPLE</u>	<u>NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS</u>	<u>SAMPLING AND COLLECTION FREQUENCY</u>	<u>TYPE AND FREQUENCY OF ANALYSIS</u>
2. Airborne	<p data-bbox="576 563 1098 596">Samples from seven locations</p> <p data-bbox="576 662 1098 761">Five samples from close to the five site boundary locations, in different sectors;</p> <p data-bbox="576 926 1098 1050">One sample from the vicinity of a community having the highest calculated annual average ground-level D/Q; and</p> <p data-bbox="576 1083 1098 1215">One sample from a control location, as for example a population center 10 to 20 miles distant and in the least prevalent wind direction.</p>	<p data-bbox="1189 563 1519 728">Continuous sampler operation with sample collection weekly, or more frequently if required by dust loading</p>	<p data-bbox="1661 563 1959 629"><u>Radioiodine Cannister:</u> I-131 analysis weekly.</p> <p data-bbox="1661 695 1959 926"><u>Particulate Sampler:</u> Gross beta radioactivity analysis following filter change;⁽²⁾ and gamma isotopic analysis⁽³⁾ of composite (by location) quarterly.</p>

TABLE 2-1 (SHEET 3 OF 5)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
3. Waterborne			
a. Surface ⁽⁴⁾	One sample upriver	Composite sample over 1-month period ⁽⁵⁾	Gamma isotopic analysis ⁽³⁾ monthly. Composite for tritium analysis quarterly.
	Two samples downriver		
b. Drinking	Two samples at each of the two nearest water treatment plants that could be affected by plant discharges.	Composite sample of river water near intake at each water treatment plant over 2-week period ⁽⁵⁾ when I-131 analysis is performed, monthly composite other- wise; and grab sample of finished water at each water treatment plant every 2 weeks or monthly, as appropriate.	I-131 analysis on each sample when the dose calculated for the consumption of the water is greater than 1 mrem per year ⁽⁶⁾ . Composite for gross beta and gamma isotopic analyses ⁽³⁾ monthly. Composite for tritium analysis quarterly.
	Two samples at a control location.		
c. Sediment from Shoreline	One sample from downriver area with existing or potential recreational value.	Semiannually	Gamma isotopic analysis ⁽³⁾ semiannually.
	One sample from upriver area with existing or potential recreational value.		

TABLE 2-1 (SHEET 4 OF 5)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

EXPOSURE PATHWAY AND/OR SAMPLE	NUMBER OF REPRESENTATIVE SAMPLES AND SAMPLE LOCATIONS	SAMPLING AND COLLECTION FREQUENCY	TYPE AND FREQUENCY OF ANALYSIS
4. Ingestion			
a. Milk	Two samples from milking animals ⁽⁷⁾ at control locations about 10 miles distant or beyond and preferably in a wind direction of lower prevalence.	Biweekly	Gamma isotopic analysis ^(3,8) biweekly
b. Fish	At least one sample of any commercially or recreationally important species in vicinity of plant discharge area.	Semiannually	Gamma isotopic analysis ⁽³⁾ on edible portions semiannually
	At least one sample of any species in areas not influenced by plant discharge.		
	At least one sample of any anadromous species in vicinity of plant discharge.	During spring spawning season.	
c. Grass or Leafy Vegetation	One sample from two onsite locations near the site boundary in different sectors.	Monthly during growing season.	Gamma isotopic analysis ^(3,8) monthly
	One sample from a location that yielded a calculated dose commitment 20% greater than site boundary locations.		
	One sample from a control location at about 15 or more miles distance.		

TABLE 2-1 (SHEET 5 OF 5)

TABLE NOTATIONS

- (1) One or more instruments, such as a pressurized ion chamber, for measuring and recording dose rate continuously may be used in place of, or in addition to, integrating dosimeters. For the purposes of this table, a TLD is considered to be one phosphor; two or more phosphors in a packet are considered as two or more dosimeters. Film badges shall not be used as dosimeters for measuring direct radiation.
- (2) Airborne particulate sample filters shall be analyzed for gross beta radioactivity 24 hours or more after sampling to allow for radon and thoron daughter decay. If gross beta activity in air particulate samples is greater than 10 times the yearly mean of control samples, gamma isotopic analysis shall be performed on the individual samples.
- (3) Gamma isotopic analysis means the identification and quantification of gamma-emitting radionuclides that may be attributable to the effluents from the facility.
- (4) The "upriver sample" shall be taken at a distance beyond significant influence of the discharge. The "downriver" sample shall be taken in an area beyond but near the mixing zone.
- (5) Composite sample aliquots shall be collected at time intervals that are very short (e.g., hourly) relative to the compositing period (e.g., monthly) in order to assure obtaining a representative sample.
- (6) The dose shall be calculated for the maximum organ and age group, using the methodology and parameters in the ODCM.
- (7) A milking animal is a cow or goat producing milk for human consumption.
- (8) If gamma isotopic analysis is not sensitive enough to meet the Lower Limit of Detection for I-131, a separate analysis for I-131 will be performed.

TABLE 2-2 (SHEET 1 OF 3)

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

<u>Station Number</u>	<u>Station Type (1)</u>	<u>Descriptive Location</u>	<u>Direction(2)</u>	<u>Distance(2) (miles)</u>	<u>Sample Type(3)</u>
1	I	Hancock Landing Road	N	1.1	D
2	I	River Bank	NNE	0.8	D
3	I	Discharge Area	NE	0.6	A
3	I	River Bank	NE	0.7	D
4	I	River Bank	ENE	0.8	D
5	I	River Bank	E	1.0	D
6	I	Plant Wilson	ESE	1.1	D
7	I	Simulator Building	SE	1.7	D,V,A
8	I	River Road	SSE	1.1	D
9	I	River Road	S	1.1	D
10	I	Met Tower	SSW	0.8	A
10	I	River Road	SSW	1.1	D
11	I	River Road	SW	1.2	D
12	I	River Road	WSW	1.1	D,A
12	I	Trailer Park	WSW	1.3	V
13	I	River Road	W	1.3	D
14	I	River Road	WNW	1.8	D
15	I	Hancock Landing Road	NW	1.5	D,V
16	I	Hancock Landing Road	NNW	1.4	D,A
17	0	Savannah River Plant River Road	N	5.4	D
18	0	Savannah River Plant D Area	NNE	5.0	D
19	0	Savannah River Plant Road A.13	NE	4.6	D
20	0	Savannah River Plant Road A.13.1	ENE	4.8	D
21	0	Savannah River Plant Road A.17	E	5.3	D
22	0	River Bank Downstream of Buxton Landing	ESE	5.2	D
23	0	River Road	SE	4.7	D
24	0	Chance Road	SSE	4.9	D
25	0	Chance Road and Highway 23	S	5.2	D
26	0	Highway 23, mile 15.5	SSW	4.6	D
27	0	Highway 23, mile 17	SW	4.8	D
28	0	Claybon Road	WSW	5.0	D
29	0	Claxton-Lively Road	W	5.0	D
30	0	Nathaniel Howard Road	WNW	5.0	D
31	0	River Road at Allen's Church Fork	NW	5.0	D
32	0	River Bank	NNW	4.8	D
33	0	Nearby Permanent Residence	SE	3.3	D
34	0	Girard Elementary School	SSE	6.3	D

TABLE 2-2 (SHEET 2 OF 3)

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

<u>Station Number</u>	<u>Station Type (1)</u>	<u>Descriptive Location</u>	<u>Direction(2)</u>	<u>Distance(2) (miles)</u>	<u>Sample Type(3)</u>
35	O	Girard	SSE	6.6	D,A
36	C	Waynesboro	WSW	14.9	D,A
37	C	Substation (Waynesboro)	WSW	17.5	D,V
43	O	Employees Recreation Area	SW	2.2	D
80	C	Augusta Water Treatment Plant	NNW	24.5	W(4)
81	C	Savannah River	N	2.2	F(5),S(6)
82	C	Savannah River (RM 151.2)	NNE	0.8	R
83	I	Savannah River (RM 150.6)	ENE	0.8	R,S(6)
84	O	Savannah River (RM 149.5)	ESE	1.6	R
85	I	Savannah River	ESE	5.0	F(5)
87	I	Beaufort-Jasper County Water Treatment Plant; Beaufort, SC	SE	76	W(7)
88	I	Cherokee Hill Water Treatment Plant; Port Wentworth, GA	SSE	72	W(8)
98	C	W. C. Dixon Dairy	SE	9.8	M
99	C	Boyceland Dairy	W	24.5	M

TABLE NOTATION:

(1) Station Types

- C - Control
- I - Indicator
- O - Other

(2) Direction and distance are reckoned from a point midway between the two reactors

(3) Sample Types

- A - Airborne Radioactivity
- D - Direct Radiation
- F - Fish
- M - Milk
- R - River Water
- S - River Shoreline Sediment
- W - Drinking Water (at water treatment plant)
- V - Vegetation

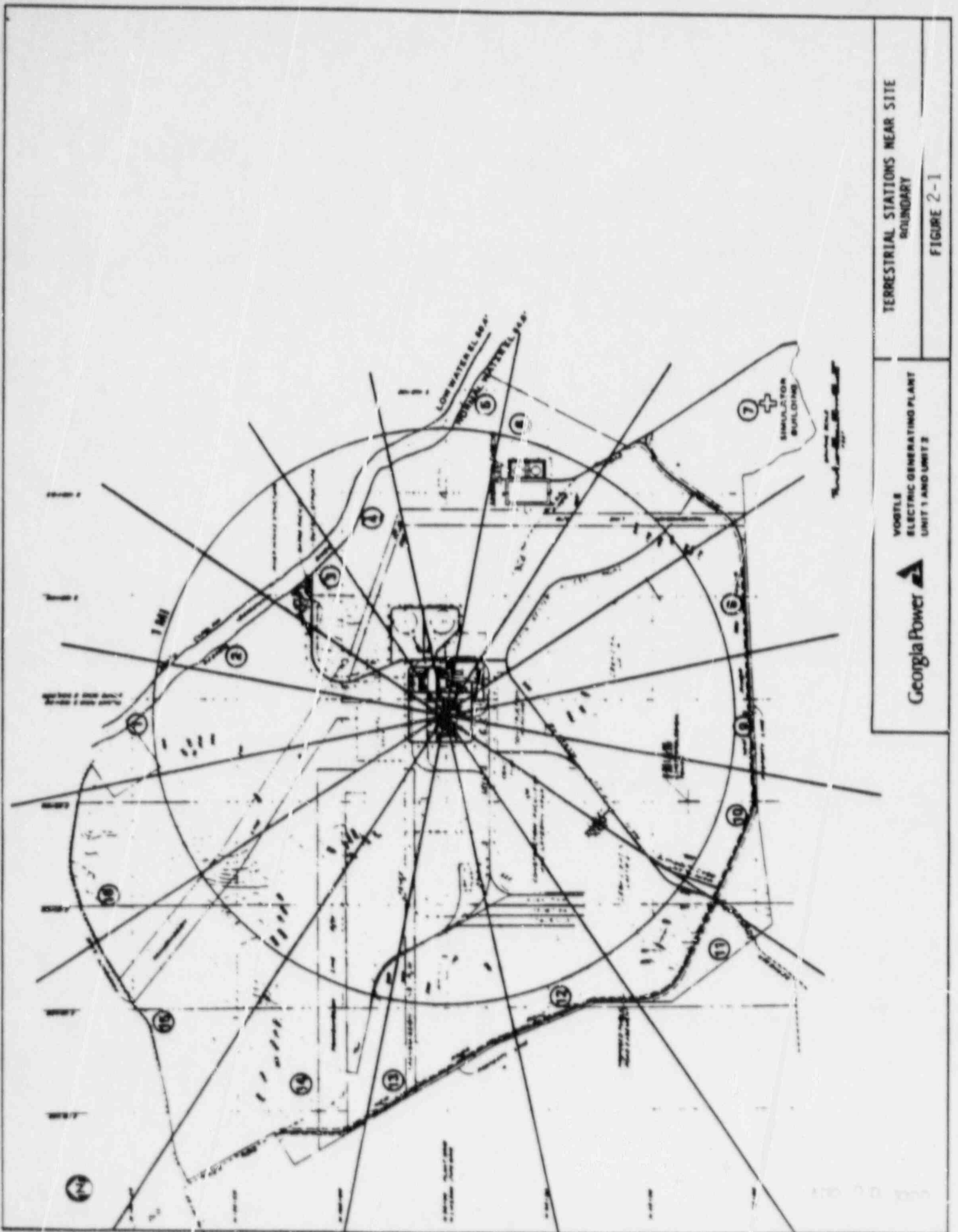
(4) The intake for the Augusta Water Treatment Plant is located on the Augusta Canal. The entrance to this canal is at River Mile (RM) 207 on the Savannah River. The canal effectively parallels the river. The intake to the pumping station is 3.6 miles down the canal and only a tenth of a mile across a narrow neck of land to the river.

TABLE 2-2 (SHEET 3 OF 3)

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

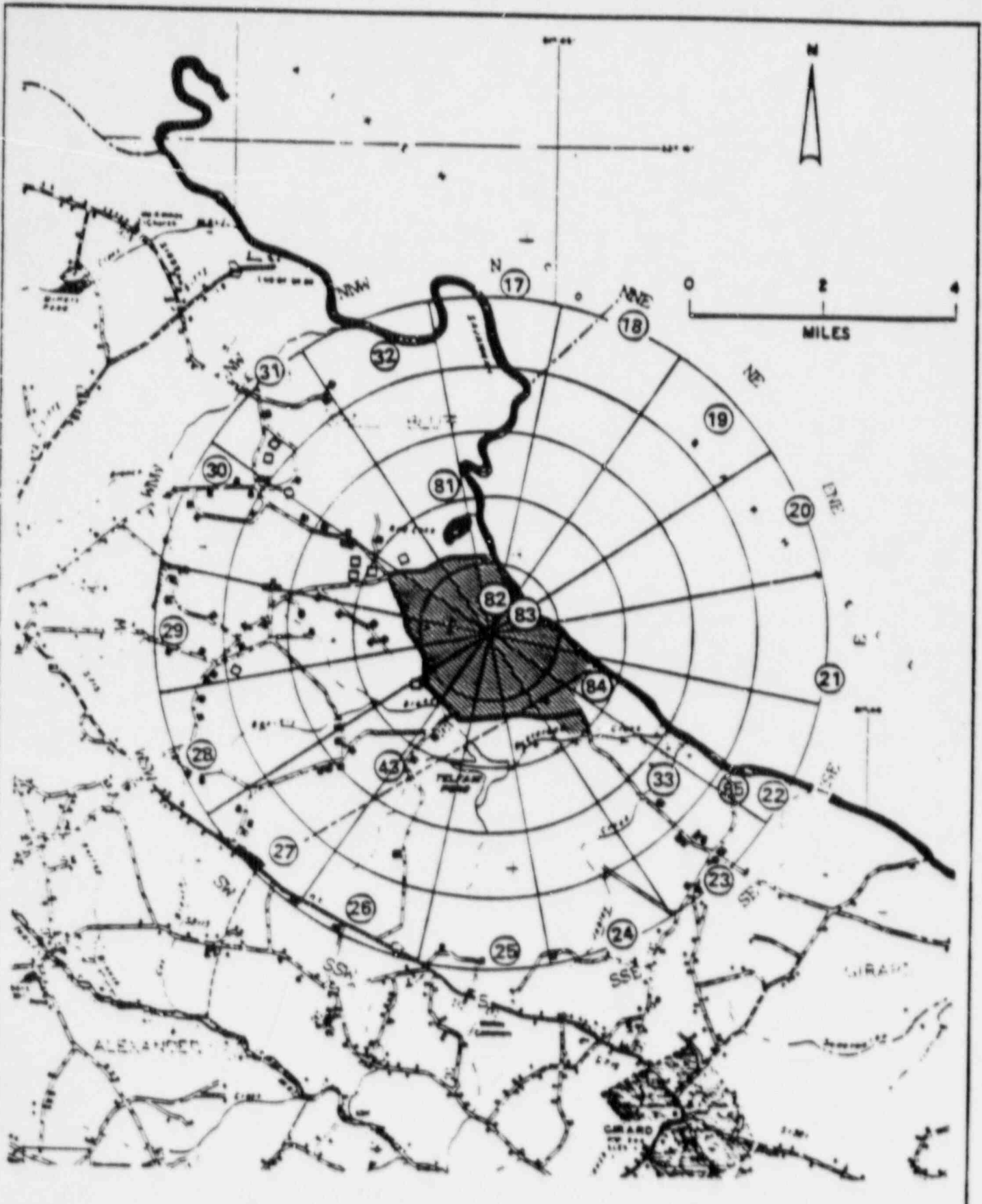
TABLE NOTATIONS (Continued)


- (5) About a five mile stretch of the river is generally needed to obtain adequate fish samples. Samples are normally gathered between RM 153 and 158 for upriver collections and between RM 144 and 149.4 for downriver collections.
- (6) Sediment is collected at locations with existing or potential recreational value. Because high water shifting of the river bottom or other reasons could cause a suitable location for sediment collection to become unavailable or unsuitable, a stretch of the river between RM 149.7 and 150.7 is designated for downriver collections while a stretch between RM 153 and 154 is designated for upriver collections. In practice, collections are normally made at RM 150.2 for downriver collections and at RM 153.2 for upriver collections.
- (7) The intake for the Beaufort-Jasper County Water Treatment Plant is located at the end of a canal which begins at RM 39.2 on the Savannah River. This intake is about 16 miles by line of sight down the canal from its beginning on the Savannah River.
- (8) The intake for the Cherokee Hill Water Treatment Plant is located on Abercorn Creek which is about one and a quarter creek miles from its mouth on the Savannah River at RM 29.



TERRESTRIAL STATIONS NEAR SITE
BOUNDARY

FIGURE 2-1

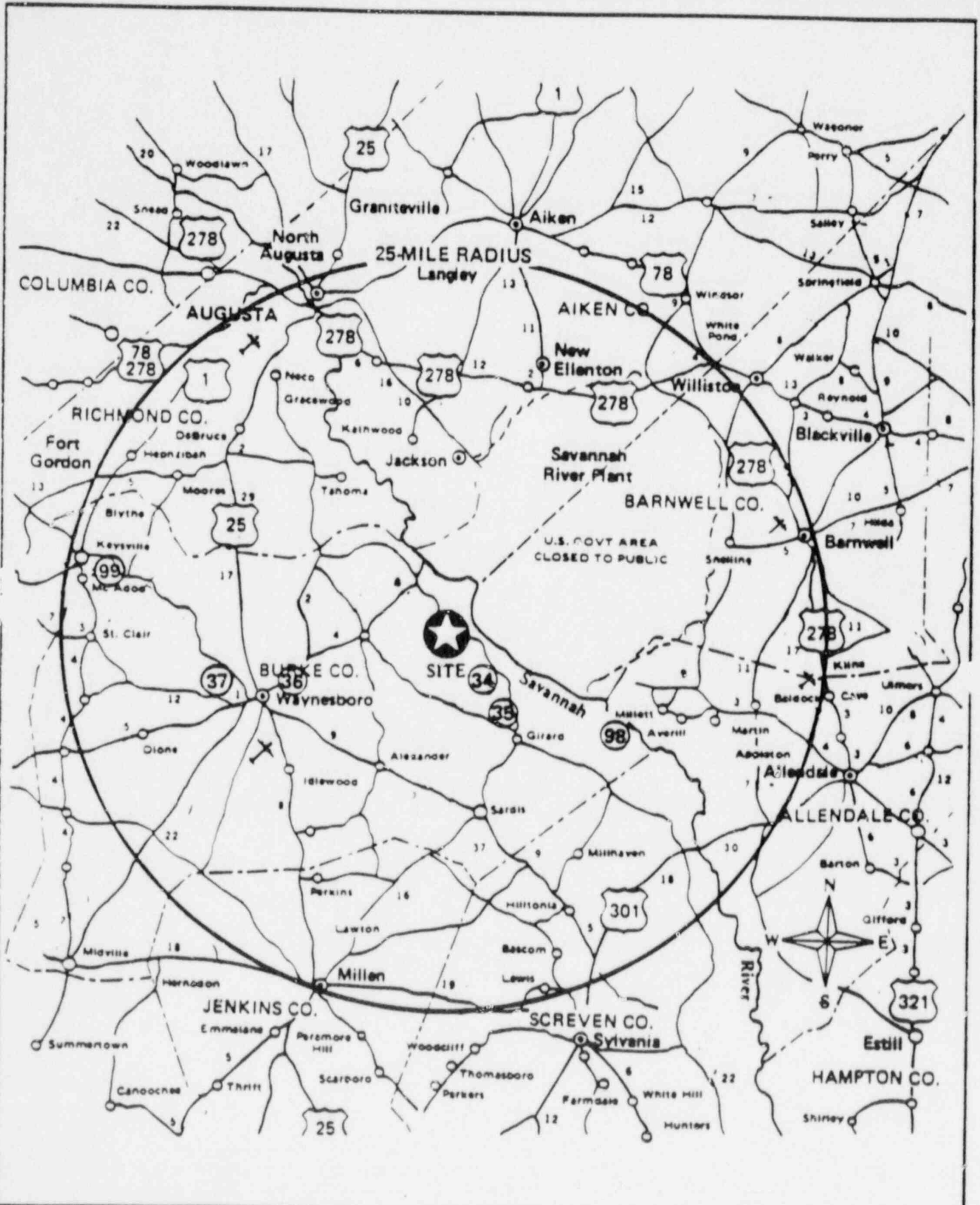



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UNIT 1 AND UNIT 2

TERRESTRIAL STATIONS BEYOND SITE
BOUNDARY OUT TO APPROXIMATELY FIVE
MILES AND AQUATIC STATIONS

FIGURE 2-2

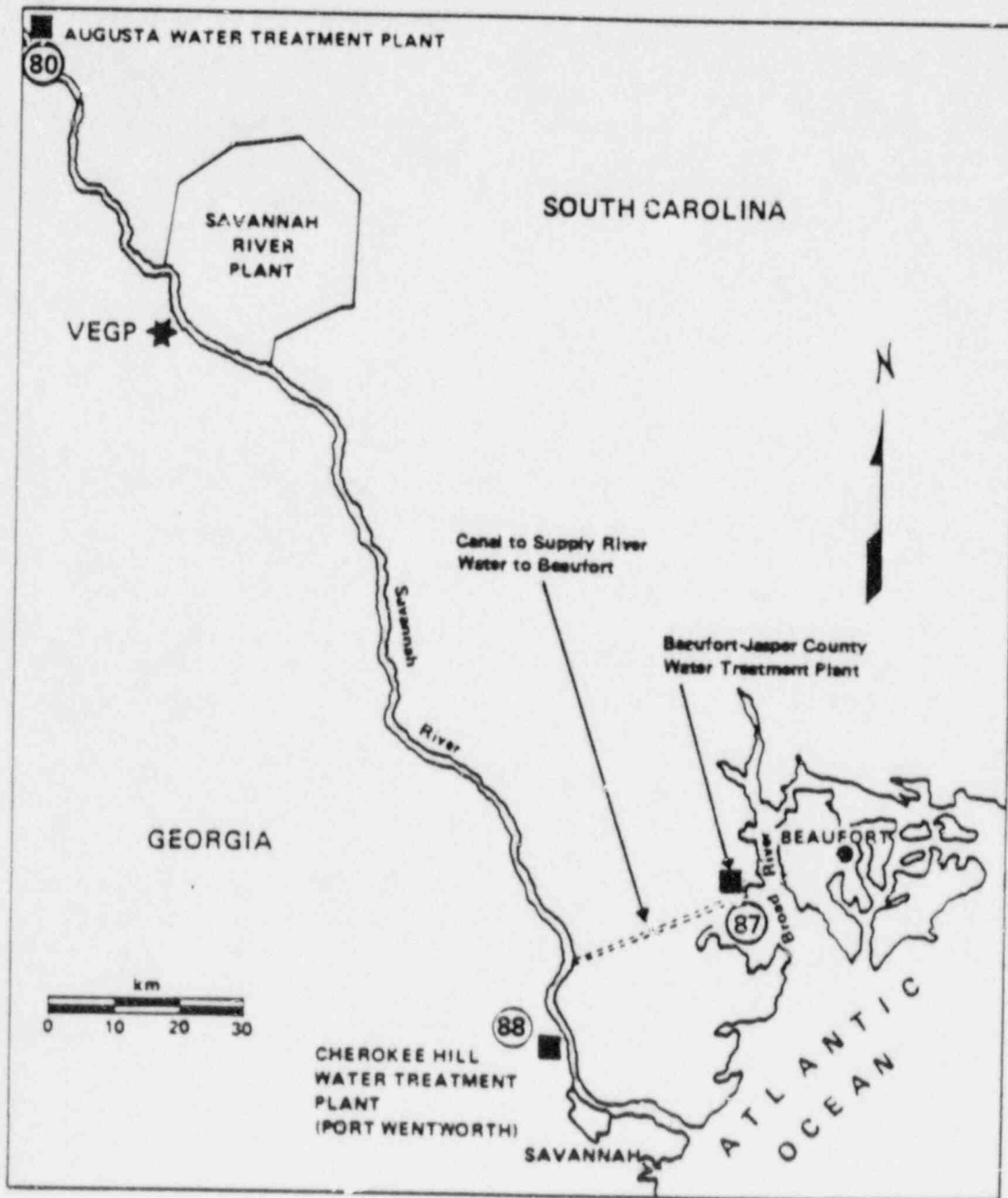



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UNIT 1 AND UNIT 2

TERRESTRIAL STATIONS
BEYOND 5 MILES

FIGURE 2-3 APR 29 1969



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UNIT 1 AND UNIT 2

DRINKING WATER STATIONS

FIGURE 2-4

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3.0 RESULTS SUMMARY

In accordance with Section 6.8.1.3 of the TS, summarized and tabulated results of all of the regular radiological environmental samples and radiation measurements taken during the report period at the designated indicator and control stations are presented in Table 3-1 in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November, 1979. Naturally occurring radionuclides which are not included in the plant's effluents are not required to be reported. Of particular note is naturally occurring Be-7 which is produced in the VEGP reactor and is released in the liquid effluents; its levels were closely watched in the samples which monitor liquid effluents - river water, drinking water, fish and sediment. Results for samples collected at locations other than indicator or control stations or in addition to those stipulated by Table 2-1 are included in Section 4, the discussion of results section, for the type sample.

TABLE 3-1 (SHEET 1 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
 Vogtle Electric Generating Plant, Docket No. 50-424
 Burke County, Georgia, Report Period 1987 (a)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (b) (LLD)	All Indicator Locations Mean (c) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (c) Range (Fraction)	Control Locations Mean (c) Range (Fraction)	Number of Nonroutine Reported Measurements
Airborne Particulates (fCi/m ³)	Gross Beta 234	10	26.3 5-213 (195/195)	No. 10 Met Tower 0.8 miles SSW	27.8 11-213 (39/39)	23.6 14-37 (39/39)	0
	Gamma Isotopic 18						
	Cs-134	50	NDM(d)		NDM	NDM	0
	Cs-137	50	8.0 1.7-12.9 (6/15)	No. 10 Met Tower 0.8 miles SSW	12.9 12.9-12.9 (1/3)	NDM	0
Airborne Radioiodine (fCi/m ³)	I-131 234	70	NDM		NDM	NDM	0
Direct Radiation (mrem/91 days)	Gamma Dose 54	NA(e)	17.6 13.1-24.3 (48/48)	No. 1 Han Lan Rd. 1.1 miles N	23.7 22.9-24.3 (3/3)	17.9 15.4-20.0 (6/6)	0

3-2

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TABLE 3-1 (SHEET 2 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
 Vogtle Electric Generating Plant, Docket No. 50-424
 Burke County, Georgia, Report Period 1987 (a)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (b) (LLD)	All Indicator Locations Mean (c) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (c) Range (Fraction)	Control Locations Mean (c) Range (Fraction)	Number of Nonroutine Reported Measurements
Milk (pCi/l)	Gamma Isotopic 39						
	Zn-65	30(f)	NA	No. 99 Boyceland 24.5 miles W	25 25-25 (1/20)	25 25-25 (1/39)	0
	Cs-134	15	NA		NDM	NDM	0
	Cs-137	18	NA	No. 98 Dixon Dairy 9.8 miles SE	10.8 10.8-10.8 (1/19)	10.4 9.9-10.8 (2/39)	0
	Ba-140	60	NA		NDM	NDM	
	La-140	15	NA		NDM	NDM	0
	I-131 39	1	NA		NDM	NDM	0

3-3

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TABLE 3-1 (SHEET 3 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
 Vogtle Electric Generating Plant, Docket No. 50-424
 Burke County, Georgia, Report Period 1987 (a)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (b) (LLD)	All Indicator Locations Mean (c) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (c) Range (Fraction)	Control Locations Mean (c) Range (Fraction)	Number of Nonroutine Reported Measurements
Grass (pCi/kg wet)	Gamma Isotopic 30						
	I-131	60	NDM		NDM	NDM	0
	Cs-134	60	NDM		NDM	NDM	0
	Cs-137	80	24.4 11.1-44.4 (7/22)	No. 37 Substation 17.5 miles WSW	61.5 38.0-85.0 (2/8)	61.5 38.0-85.0 (2/8)	0
River Water (pCi/l)	Gamma Isotopic 20						
	Be-7	80(g)	NDM		NDM	NDM	0
	Mn-54	15	NDM		NDM	NDM	0
	Fe-59	30	NDM		NDM	NDM	0
	Co-58	15	NDM		NDM	NDM	0

3-4

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TABLE 3-1 (SHEET 4 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
 Vogtle Electric Generating Plant, Docket No. 50-424
 Burke County, Georgia, Report Period 1987 (a)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (b) (LLD)	All Indicator Locations Mean (c) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (c) Range (Fraction)	Control Locations Mean (c) Range (Fraction)	Number of Nonroutine Reported Measurements
	Co-60	15	NDM		NDM	NDM	0
	Zn-65	30	NDM		NDM	NDM	0
	Zr-95	30	NDM		NDM	NDM	0
	Nb-95	15	NDM		NDM	NDM	0
	I-131	15	NDM		NDM	NDM	0
	Cs-134	15	NDM		NDM	NDM	0
	Cs-137	18	NDM		NDM	NDM	0
	Ba-140	60	NDM		NDM	NDM	0
	La-140	15	NDM		NDM	NDM	0
	Tritium 8	3000	680 391-1010 (4/4)	No. 83 Downriver 0.3 miles	680 391-1010 (4/4)	524 465-622 (4/4)	0

3-5

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TABLE 3-1 (SHEET 5 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
 Vogtle Electric Generating Plant, Docket No. 50-424
 Burke County, Georgia, Report Period 1987 (a)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (b) (LLD)	All Indicator Locations Mean (c) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (c) Range (Fraction)	Control Locations Mean (c) Range (Fraction)	Number of Nonroutine Reported Measurements
Water Near Intakes to Water Treatment Plants (pCi/l)	Gross Beta 30	4	2.2 1.0-3.7 (20/20)	No. 80 Augusta Upriver 56 miles	5.5 1.3-15.5 (10/10)	5.5 1.3-15.5 (10/10)	0
	Gamma Isotopic 30						
	Be-7	80(g)	NDM		NDM	NDM	0
	Mn-54	15	NDM		NDM	NDM	0
	Fe-59	30	NDM		NDM	NDM	0
	Co-58	15	NDM		NDM	NDM	0
	Co-60	15	NDM		NDM	NDM	0
	Zn-65	30	NDM		NDM	NDM	0
	Zr-95	30	NDM		NDM	NDM	0
Nb-95	15	NDM		NDM	NDM	0	

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TABLE 3-1 (SHEET 6 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
 Vogtle Electric Generating Plant, Docket No. 50-424
 Burke County, Georgia, Report Period 1987 (a)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (b) (LLD)	All Indicator Locations Mean (c) Range (Fraction)	Location with Highest Annual Mean		Control Locations Mean (c) Range (Fraction)	Number of Nonroutine Reported Measurements
				Name Distance & Direction	Mean (c) Range (Fraction)		
	I-131	15	NDM		NDM	NDM	0
	Cs-134	15	NDM		NDM	NDM	0
	Cs-137	18	NDM		NDM	NDM	0
	Ba-140	60	NDM		NDM	NDM	0
	La-140	15	NDM		NDM	NDM	0
	Tritium 12	3000	2229 1190-2840 (8/8)	No. 88 Port Wentworth Downriver 122 miles	2345 1620-2840 (4/4)	316 205-433 (4/4)	0
Finished Water at Water Treatment Plants (pCi/l)	Gross Beta 30	4	2.1 1.2-4.3 (20/20)	No. 88 Port Wentworth Downriver 122 miles	2.4 1.2-4.3 (10/10)	1.8 1.4-2.6 (9/10)	0

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TABLE 3-1 (SHEET 7 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
 Vogtle Electric Generating Plant, Docket No. 50-424
 Burke County, Georgia, Report Period 1987 (a)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (b) (LLD)	All Indicator Locations Mean (c) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (c) Range (Fraction)	Control Locations Mean (c) Range (Fraction)	Number of Nonroutine Reported Measurements
	Gamma Isotopic 30						
	Be-7	80(g)	68 68-68 (1/20)	No. 87 Beaufort Downriver 112 miles	68 68-68 (1/10)	NDM	0
	Mn-54	15	NDM		NDM	NDM	0
	Fe-59	30	NDM		NDM	NDM	0
	Co-58	15	NDM		NDM	NDM	0
	Co-60	15	NDM		NDM	NDM	0
	Zn-65	30	NDM		NDM	NDM	0
	Zr-95	30	NDM		NDM	NDM	0
	Nb-95	15	NDM		NDM	NDM	0
	I-131	15(h)	NDM		NDM	NDM	0
	Cs-134	15	NDM		NDM	NDM	0

TABLE 3-1 (SHEET 8 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
 Vogtle Electric Generating Plant, Docket No. 50-424
 Burke County, Georgia, Report Period 1987 (a)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (b) (LLD)	All Indicator Locations Mean (c) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (c) Range (Fraction)	Control Locations Mean (c) Range (Fraction)	Number of Nonroutine Reported Measurements
	Cs-137	18	NDM		NDM	NDM	0
	Ba-140	60	NDM		NDM	NDM	0
	La-140	15	NDM		NDM	NDM	0
	Tritium 12	2000	2406 1300-3920 (8/8)	No. 88 Port Wentworth Downriver 122 miles	2758 1300-3920 (4/4)	305 227-374 (4/4)	0
Anadromous Fish (pCi/kg wet)	Gamma Isotopic 3						
	Be-7	100(g)	NDM		NDM	NA	0
	Mn-54	130	NDM		NDM	NA	0
	Fe-59	260	NDM		NDM	NA	0
	Co-58	130	NDM		NDM	NA	0
	Co-60	130	NDM		NDM	NA	0

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TABLE 3-1 (SHEET 9 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
 Vogtle Electric Generating Plant, Docket No. 50-424
 Burke County, Georgia, Report Period 1987 (a)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (b) (LLD)	All Indicator Locations Mean (c) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (c) Range (Fraction)	Control Locations Mean (c) Range (Fraction)	Number of Nonroutine Reported Measurements
	Zn-65	260	NDM		NDM	NA	0
	Cs-134	130	NDM		NDM	NA	0
	Cs-137	150	10 10-10 (1/3)	No. 8i Upriver 2.2 miles	10 10-10 (1/3)	NA	0
Fish (pCi/kg wet)	Gamma Isotopic 6						
	Be-7	100(g)	NDM		NDM	NDM	0
	Mn-54	130	NDM		NDM	NDM	0
	Fe-59	260	NDM		NDM	NDM	0
	Co-58	130	NDM		NDM	NDM	0
	Co-60	130	NDM		NDM	NDM	0
	Zn-65	260	NDM		NDM	NDM	0

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TABLE 3-1 (SHEET 10 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
 Vogtle Electric Generating Plant, Docket No. 50-424
 Burke County, Georgia, Report Period 1987 (a)

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (b) (LLD)	All Indicator Locations Mean (c) Range (Fraction)	Location with Highest Annual Mean Name Distance & Direction	Mean (c) Range (Fraction)	Control Locations Mean (c) Range (Fraction)	Number of Nonroutine Reported Measurements
	Cs-134	130	NDM		NDM*	NDM	0
	Cs-137	150	337 228-446 (2/3)	No. 85 Downriver 3.9 miles	337 228-446 (2/3)	119 39-178 (3/3)	0
Sediment (pCi/kg dry)	Gamma Isotopic 4						
	Be-7	300(g)	987 593-1380 (2/2)	No. 83 Downriver 0.7 miles	987 593-1380 (2/2)	543 146-940 (2/2)	0
	Cs-134	150	NDM		NDM	NDM	0
	Cs-137	180	209 174-243 (2/2)	No. 83 Downriver 0.7 miles	209 174-243 (2/2)	111 94-128 (2/2)	0

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TABLE 3-1 (SHEET 11 OF 11)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Vogtle Electric Generating Plant, Docket No. 50-424
Burke County, Georgia, Report Period 1987 (a)

TABLE NOTATIONS

- a. The report period began around the time of initial criticality (March 9) but varied with sample type. See Section 1.0.
- b. The LLD is defined in table notation 3 of Table 4.12-1 of the TS. Except as noted otherwise, the values listed in the column are those found in that table.
- c. Mean and range are based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parenthesis.
- d. No Detectable Measurements.
- e. Not Applicable.
- f. This is the value listed in Table 4.12-1 of the TS for water; none was provided for milk.
- g. The Central Laboratory has determined that this value may be routinely attained. No value was provided in Table 4.12-1 of the TS.
- h. In accordance with Item 3b of Table 3.12-1 of the TS, an I-131 analysis was not performed on these samples since the dose calculated from the consumption of water was less than 1 mrem per year.

4.0 DISCUSSION OF RESULTS

An interpretation and evaluation, as appropriate, and an analysis of the laboratory results for each type sample are included in this section. Relevant comparisons are made between the difference in average values for indicator and control stations and the calculated Minimum Detectable Difference (MDD) between these two groups at the 99-percent confidence level. The MDD is determined using the standard Student's t-test. A difference in the average values which is less than the MDD is considered to be statistically indiscernible. Pertinent results are also compared with results obtained from collections during preoperations. To provide perspective, a result might also be compared with its LLD or Reporting Level (RL). Attempts are made to explain any RLs or other high radiological levels found in the samples. There were no failures in the laboratory analyses of each of the samples in attaining the LLDs required by Table 4.12-1 of the TS for this report period.

Extra sample collections and/or analyses were conducted on air particulate filters, milk and vegetation in response to gaseous releases from the Savannah River Plant (SRP) of tritium on July 31 and of Cs-137 during the third and/or fourth weeks of November. The results of these extraneous analyses are discussed in Sections 4.1, 4.3 and 4.4.

A land use census was conducted on April 27 and 28. The locations of the nearest milk animal, residence and garden of greater than 500 square feet producing broad leaf vegetation in each of the 16 meteorological sectors within a distance of 5 miles are tabulated in Table 4-1. Land within SRP was excluded from the census. The consequences of the results of the land use census upon sample collections are discussed in Sections 4.3 and 4.4. The results of the annual survey conducted downstream of the plant to determine whether water from the Savannah River is being used for drinking or irrigation purposes are presented in Section 4.5.

TABLE 4-1

LAND USE CENSUS RESULTS

Distance in Miles to Nearest Locations in Each Sector

<u>SECTOR</u>	<u>MILK ANIMAL</u>	<u>RESIDENCE</u>	<u>LEAFY GARDEN</u>
N	*	*	*
NNE	*	*	*
NE	*	*	*
ENE	*	*	*
E	*	*	*
ESE	*	*	*
SE	*	3.3	4.8
SSE	*	4.6	*
S	*	4.4	*
SSW	*	4.7	*
SW	*	1.3	3.1
WSW	*	1.2	1.3
W	*	1.4	4.2
WNW	*	1.8	4.6
NW	*	2.2	4.1
NNW	*	*	*

* None within 5 miles and outside of SRP.

4.1 Airborne

As indicated by Table 2-2, airborne particulates and airborne radioiodine are collected at 5 indicator stations (Nos. 3, 7, 10, 12, and 16) which encircle the site boundary, at a nearby community (No. 35) and at a control station (No. 36). At these locations, air is continuously drawn through a dust filter and a charcoal canister in sequence to retain airborne particulates and airborne radioiodine, respectively. The filters and canisters are collected weekly. Each of the air particulate filters is counted for gross beta activity. A gamma isotopic analysis is performed quarterly on a composite of the air particulate filters for each station.

As seen in Table 3-1, the average gross beta activity over the report period for the indicator stations is 2.7 fCi/m³ greater than that for the control station. However, this difference is not discernable since it is less than the MDD which was calculated as 4.3 fCi/m³.

The gross beta activity for the samples collected on November 24 at the five indicator stations averaged several times that normally found; for the collections on December 1, only two stations had above average readings. A gamma isotopic analysis was performed on each of the individual particulate filters collected on November 24 and on the individual particulate filters collected on December 1 at Stations 3 and 7 only; the fission product, Cs-137, was found to be present. The gross beta and Cs-137 levels in units of fCi/m³ were as follows.

<u>Station</u>	<u>Gross Beta</u>		<u>Cs-137</u>	
	11/24	12/01	11/24	12/01
3 Discharge Area	107	44	98	73
7 Simulator Building	76	48	41	36
10 Met Tower	213	23	170	
12 River Road	176	18	130	
16 Hancock Landing Road	140	24	87	
35 Girard	38	24	LT	13
36 Waynesboro	28	15	LT	13

Anomalous air particulate readings of the same order of magnitude were found during this period by several others in the Central Savannah River Area (CSRA) who implement REMPs. These high readings were due to a release from SRP.

By excluding the high gross beta readings (those obtained from filters where a gamma isotopic analysis was performed), the average gross beta activity for the report period for the indicator stations is significantly reduced. The average activities in units of fCi/m³ for the indicator stations, the community station and the control station become as follows.

<u>Group</u>	<u>Without Exclusion</u>	<u>With Exclusion</u>
Indicator Stations	26.3	23.0
Community Station	22.7	22.3
Control Station	23.6	23.5

The average activity levels with the exclusion are believed to provide a more realistic indication of any impact of plant operations upon the environment; note that the average activity for the control station becomes higher than that for any other group.

Except for the fourth quarter, the only positive result from the gamma isotopic analyses of the quarterly composites of the air particulate filters was for the second quarter at Station 3 where Cs-137 was measured at a level of 1.7 fCi/m³. For the fourth quarter the positive results reflected those for individual filters given above. At each station, except the control station, Cs-137 was found at levels ranging from 2.1 to 12.9 fCi/m³. The required LLD and the RL as given in the TS are 60 and 20,000 fCi/m³, respectively. During the second quarter of 1986, as a consequence of the Chernobyl incident positive levels of Cs-137 were found at about half of the stations; the highest level found was 84 fCi/m³. Outside of the second quarter of 1986, the highest level found on a quarterly composite during preoperations was 11 fCi/m³.

The charcoal cartridges used for adsorbing iodine from the atmosphere are analyzed for I-131 by gamma spectroscopy. I-131 was not detected in any of the samples during the report period. The maximum allowed LLD is 70 fCi/m³; however, the LLD usually attained was about a third or a fourth of this value.

4.2 Direct Radiation

Direct (external) radiation is measured by TLDs. A TLD badge is placed at each station; each badge contains 4 calcium sulfate cards. Hence, each of the TLD badges consists of 4 dosimeters.

Two TLD stations are established in each of the 16 meteorological sectors about the plant. The inner ring of stations (Nos. 1 through 16) is located near the site boundary, while the outer ring (Nos. 17 through 32) is located at a distance of about 5 miles. The 16 stations forming the inner ring are designated as the indicator stations. The 2 control stations (Nos. 36 and 37) are well over 10 miles from the plant. Special interest areas consist of a nearby permanent residence (No. 33), the Girard Elementary School (No. 34), the Town of Girard (No. 35), and the GPC employees' recreational area (No. 43).

As may be seen from Table 3-1, the average quarterly dose acquired at the indicator stations (inner ring) over the report period was 0.3 mrem less than that acquired at the control stations; this difference was not discernable, however, since it was less than the MDD of 2.6 mrem.

The quarterly doses acquired at the outer ring stations ranged from 14.1 to 26.1 mrem with an average of 16.7 mrem for the report period which is 0.9 mrem less than that found for the inner ring. There was no discernable difference between the averages of the inner and outer rings since this difference was less than the MDD of 1.3 mrem.

The quarterly doses in units of mrem acquired at the special interest areas were as follows.

<u>Station No.</u>	<u>Average</u>	<u>Minimum</u>	<u>Maximum</u>
33	21.3	20.5	22.6
34	20.1	19.3	21.7
35	18.5	17.3	19.8
43	15.2	14.7	15.9

The doses acquired at the special interest stations are seen to be somewhat typical and within the range of those acquired at the other stations.

Two TLD exposure locations implemented during the latter years of the preoperations phase of the REMP and not stipulated as a part of the operations phase were nevertheless continued to be used during the second calendar quarter of 1987. These extraneous locations were: former Station 38 (WSW at 17.5 miles) which was located adjacent to Station 37 and was used to enhance the baseline data; and former Station 91 (WNW at 2.8 miles) which was located adjacent to a onetime pasture for a milk animal. The doses for the second quarter were 19.8 and 14.2 mrem at former Stations 38 and 91 respectively; these doses are also seen to be within the range of those found at the regular sampling locations.

Frequently, TLDs are lost due to theft and damaged due to vandalism. A total of 3 badges from 2 different stations was found to be missing during the report period.

4.3 Milk

As indicated by Table 2-2, milk is collected biweekly from two control locations, Dixon's Dairy (No. 98) and the Boyceland Dairy (No. 99). Gamma isotopic and I-131 analyses are performed on each sample. No sample was available from Dixon's Dairy on May 26 due to a failure to reach the Dixons beforehand to place an order for the milk.

Milk has not been available from locations within 5 miles of the plant since April 1986 when the cow from which milk was being obtained went dry and was subsequently removed from the area. As indicated by Table 4-1, no milk animals were found in the land use census conducted in April. A milk animal is a cow or goat that is producing milk for human consumption. The availability of milk within 5 miles of the plant was meager throughout preoperations. Dixon's Dairy is believed to be the closest location of milk animals to the plant.

There was no positive results obtained from the I-131 analyses of the milk samples throughout the report period. However, three positive results were obtained from the gamma isotopic analyses. On July 14, Cs-137 was found in the samples from both stations; the levels were 10.8 and 9.9 pCi/l at Dixon's and Boyceland, respectively. On August 25, Zn-65 was found in the sample from Boyceland at a level of 25 pCi/l. These levels are below their LLDs which are 15 and 30 for Cs-137 and Zn-65, respectively.

On July 31, a gaseous release of tritium occurred at SRP. In an endeavor to detect any substantial increase of the tritium level in milk in the VEGP environs which might be attributed to this release, samples were collected at both of the milk stations on August 4. Tritium analyses were performed on these extra samples, as well as, upon those collected on August 11 which was the next regularly scheduled collection date.

The tritium levels in units of pCi/l found in these collections are compared below with the averages and ranges found at these locations during preoperations.

<u>Collections</u>	<u>Dixon's</u>	<u>Boyceland</u>
August 4	269	133
August 11	797	418
Preop Average	1200	300
Preop Range	100 - 5000	100 - 600

It is seen that the levels for these extraneous analyses are generally below the averages found during preoperations.

4.4 Vegetation

The TS call for the gamma isotopic analysis of grass or leafy vegetation collected monthly from two onsite locations near the site boundary (Stations 7 and 15) and one control location at about 15 or more miles from the plant (Station 37). Grass is collected at each of these locations. There was a failure in obtaining adequate samples at Stations 15 and 37 in November due to a lack of rain; the plots had been reseeded the previous month.

In the land use census which was conducted during the second quarter and was the first census to be conducted since plant operations began, a small scanty garden producing broad leaf vegetation was identified in the WSW Sector at 1.3 miles. This garden tended by the Lapsley family was located in a trailer park. The calculated dose commitment for this location was greater than 20% of that for any of the other locations at which vegetation was then being sampled. In accordance with Section 3.12.2.b of the TS, this new location (Station 12) was added to the REMP.

Broad leaf vegetation samples were collected from the Lapsley's garden in June and July, after which no samples were available. This is a normal occurrence in this locale with hot dry summers. In October, leafy vegetation samples became available from the Caughmans who are neighbors of the Lapsleys and whose garden is in the same sector at approximately the same distance. Hence the same station number is applicable. Samples were available for the remainder of the year.

As indicated in Table 3-1, Cs-137 was the only manmade radionuclide detected. The average level at the control station is seen to be 37.1 pCi/kg wet (or 152%) greater than that at the indicator stations. The difference between these average values is not discernable, however, since this difference is less than the MDD of 39 pCi/kg wet. Not included in the results delineated in Table 3-1 is the result for an extra sample collected at Caughmans on December 1 in response to the release at SRP during the latter part of November. In this sample, Cs-137 was detected at a level of 43.7 pCi/kg wet.

On August 4, extra grass samples were collected at Stations 7, 15 and 37 for tritium analyses as a consequence of the gaseous release of tritium at SRP on July 31. Tritium analyses were also performed on the samples collected on August 18 (the regularly scheduled collection date) at these stations. The tritium levels in units of pCi/kg wet found in these samples are compared below with the averages and ranges found at these locations during preoperations.

<u>Collections</u>	<u>Station 7</u>	<u>Station 15</u>	<u>Station 37</u>
August 4	247	198	381
August 18	849	1675	710
Preop Average	1800	1900	900
Preop Range	100-16,000	200-11,000	700-7,300

It is seen that the levels for these extraneous analyses are below the averages found during preoperations. It is also noted that the level for each of the extra samples collected on August 4 is substantially lower than that for the August 18 collections.

4.5 River Water

Surface water is composited from the Savannah River at three locations using automatic sampling machines. Small quantities of river water are collected at intervals not exceeding a few hours. River water collected by these machines is picked up monthly; quarterly composites are composed of the monthly collections. The collection points consist of a control station (No. 82) which is located about 0.3 miles upriver of the plant intake structure, an indicator station (No. 83) which is located about 0.3 miles downriver of the plant discharge structure and a special station (No. 84) which is located about 1.4 miles downriver.

A gamma isotopic analysis was made on each monthly collection but no radionuclides were detected.

A tritium analysis was performed on each quarterly composite. A positive result was obtained from each analysis. As indicated in Table 3-1, the average level at the indicator station is 156 pCi/l greater than that at the control station but this difference is not discernable because it is less than the MDD of 416 pCi/l. At Station 84, the results ranged from 725 to 1620 pCi/l with an average of 1411 pCi/l.

During preoperations, samples were also collected at Stations 81 and 85 which are respectively 2.2 miles upriver and 4.2 miles downriver. Collections at these two locations continued through the second quarter. The first and second quarter tritium levels for this report period - the first quarter consisted of the month of March only - were respectively 422 and 470 pCi/l for Station 81 and 1010 and 2670 pCi/l for Station 85.

The average tritium levels obtained during the report period at Stations 81 through 85 were respectively 446, 524, 680, 1411 and 1840 pCi/l. This profile of increasing tritium level with downriver location is similar to that found during preoperations.

On September 16 the annual survey of the Savannah River was conducted downriver of the plant for approximately 130 river miles to identify any parties who may use river water for purposes of drinking or irrigation. The only parties found to be withdrawing river water for drinking purposes were the two downriver water treatment plants (Stations 87 and 88) from which samples are collected monthly. As in all previous surveys, no intakes for irrigation use were observed. On September 22, it was confirmed by contacting the Georgia Environmental Protection Division and the South Carolina Department of Health and Environmental Control that the only water treatment plants downriver of VEGP which are permitted to use river water for drinking purposes are the two mentioned above and that no other surface water withdrawal permits are issued for Savannah River water use downriver of VEGP.

4.6 Drinking Water

Samples were collected at a control station (No. 80), the Augusta Water Treatment Plant in Augusta, Georgia, which is located about 56 miles upriver and at two indicator stations (Nos. 87 and 88), the Beaufort-Jasper County Water Treatment Plant near Beaufort, South Carolina and the Cherokee Hill Water Treatment Plant near Fort Wentworth, Georgia, which are respectively located about 112 and 122 miles downriver. These upriver and downriver distances in river miles are the distances from VEGP to the point in the river where water is diverted to the intake for each of these water treatment plants.

At each of the water treatment plants, monthly collections were made of riverwater which was composited near the plant's intake (raw drinking water) and of grab samples of finished drinking water. Gross beta and gamma isotopic analyses were performed on each of the samples collected monthly. Tritium analyses were performed on quarterly composites.

As indicated by Table 3-1, the average gross beta activity for raw drinking water was 3.3 pCi/l greater for the control station than for the indicator stations. However, this difference was not discernable because it was less than the MDD of 4.4 pCi/l. The high average reading at Station 80 is attributed to sediment being drawn into a few of the samples. For finished drinking water, the average gross beta activity was 0.3 pCi/l greater for the indicator stations than for the control station. This difference was not discernable because it was less than the MDD of 0.7 pCi/l.

Although no positive results were obtained from the gamma isotopic analyses of any of the monthly collections, positive results were obtained from the tritium analysis of each of the quarterly composites. Furthermore, there was a discernable difference between the average values for the two type stations for both the raw and finished drinking water since these differences were each greater than their MDDs. As indicated by Table 3-1, the average values of the tritium levels for the indicator stations were 1913 and 2101 pCi/l greater than those for the control station for raw and finished drinking water respectively while the MDDs were correspondingly 793 and 1007 pCi/l. Similar results were obtained during preoperations.

4.7 Fish

The TS call for the collection of at least one sample of any anadromous species of fish in the vicinity of the plant discharge during the spring spawning season. The TS also call for semiannual collections of any commercially or recreationally important species in the vicinity of the plant discharge area and in areas not influenced by plant discharge. Furthermore, the TS call for a gamma isotopic analysis on the edible portions of each sample collected.

About a five mile stretch of the river is generally needed to obtain adequate fish samples. For the semiannual collections, the control station (No. 81) extends from approximately 2 to 7 miles upriver of the plant intake structure and the indicator station (No. 85) extends from about 1.5 to 7 miles downriver of the plant discharge structure. For the anadromous species all collection points can be considered as indicator stations.

American shad, an anadromous species which may also be considered as commercially or recreationally important, was collected at Station 81 on March 17 and at Stations 81 and 85 on April 21. Channel catfish was also collected at Station 85 on April 21. On October 19, chain pickerel was collected at Station 81 while redear sunfish and largemouth bass were collected at both Station 81 and Station 85.

As indicated by Table 3-1, Cs-137 was the only radionuclide found in any of the fish samples. It was identified in only one of the anadromous fish samples (the March 17 collection) at a barely detectable level and in all but one (the channel catfish) of the other fish collected. The average level for the indicator station is seen to be 218 pCi/kg wet greater than that for the control station but this difference is not discernable since the MDD is 442 pCi/kg wet. Higher Cs-137 levels of this order were observed in fish collected downriver during preoperations. The LLD for Cs-137 in fish is 150 pCi/kg wet and the RL is 2000 pCi/kg wet.

4.8 Sediment

Sediment was collected along the shoreline of the Savannah River on April 13 and October 12 at Stations 81 and 83. Station 81 is a control station located about 2.3 miles upriver of the plant intake structure while Station 83 is an indicator station located about 0.7 miles downriver of the plant discharge structure. A gamma isotopic analysis was performed on each sample.

As indicated by Table 3-1, positive results were obtained for Be-7 and Cs-137 in each of the regular samples collected. The average levels at the indicator and the control stations for each of these radionuclides, the differences between these two values, the MDDs and LLDs were as follows:

<u>Radionuclide</u>	<u>Indicator</u>	<u>Control</u>	<u>Difference</u>	<u>MMD</u>	<u>LLD</u>
Be-7	987	543	444	2403	300
Cs-137	209	111	98	269	200

It is seen that for each of these radionuclides there is no discernable difference between their average levels in the upriver and downriver collections.

During preoperations sediment was also collected at Station 82 which was a control station located about 0.3 miles upriver. A sample was also collected at this location on April 13 in which Be-7 and Cs-137 were found at levels of 838 and 141 pCi/kg dry, respectively.

5.0 INTERLABORATORY COMPARISON PROGRAM

Section 3.16.3 of the TS requires that analyses shall be performed on radioactive materials supplied as part of an Interlaboratory Comparison Program that has been approved by the Nuclear Regulatory Commission (NRC). The Environmental Protection Agency's (EPA's) Environmental Radioactivity Laboratory Intercomparison Studies (Crosscheck) Program conducted by the Environmental Monitoring and Support Laboratory in Las Vegas, Nevada is such a program and it has been approved by the NRC. Analyses were performed only where the type analysis and sample in the EPA Crosscheck Program were the same as that delineated in Table 2-1. Reported herein are the results of participation in the EPA Crosscheck Program by the Central Laboratory.

Any results for which disagreement was established using the NRC's "Criteria for Comparing Analytical Measurements" as described in Attachment 1 to this section were investigated to determine the cause of the disagreement. Corrective actions were taken as warranted. The results of any such investigations and corrective actions are reported in this section.

Since all of the results reported herein are presented in the same tabular format, an explanation of the column headings is provided. "Date" means the collection date given by the EPA. "Known" refers to the EPA known value \pm one standard deviation, s. "Result" is the average value measured by the laboratory \pm experimental s. "Resolution" is determined by dividing the known value by its s value. "Ratio" equals the "result" (value determined by the laboratory) divided by the "known" (value determined by EPA). An explanation is provided in the text for any of the comparisons showing "Disagreement." It should be noted that whenever the EPA known value is zero or the laboratory-determined result is a less than (LT) value, or the calculated resolution value is less than 3, a comparison by the NRC criteria cannot be made.

The results of the gross beta and Cs-137 analyses of air filters are given in Table 5-1. Listed in Table 5-2 are the results of the I-131 and gamma analyses of milk samples. Table 5-3 presents the results of the gross beta, gamma and tritium analyses of water.

Disagreement was not established with any of the comparisons. However, the results of the gamma isotopic analysis of the October 9 water sample for Ru-106 were 40, 48 and LT 46 pCi/l. By using only the positive results, agreement was established. The size of the samples to be counted is being increased from 0.45 to one liter; this will improve the counting statistics.

A result outside of 2s suggests a bias in its measurement. Whenever this occurs, the Central Laboratory is required by procedure to investigate and follow-up with corrective actions, as needed.

TABLE 5-1

CROSSCHECK PROGRAM RESULTS FOR AIR FILTERS
(pCi/filter)

<u>Date</u>	<u>Known</u>	<u>Result</u>	<u>Resolution</u>	<u>Ratio</u>
		<u>Gross Beta</u>		
4/10/87	43 + 5	43.0 + 0.0	8.6	1.00
8/28/87	30 ± 5	28.0 ± 1.0	6.0	0.93
		<u>Cs-137</u>		
4/10/87	8 + 5	12.0 + 1.7	1.6	1.50
8/28/87	10 ± 5	9.7 ± 2.1	2.0	0.97

TABLE 5-2

CROSSCHECK PROGRAM RESULTS FOR MILK SAMPLES
(pCi/l)

<u>Date</u>	<u>Known</u>	<u>Result</u>	<u>Resolution</u>	<u>Ratio</u>
		<u>I-131</u>		
2/27/87	9.0 + 0.9	8.7 + 1.2	10.0	0.96
6/26/87	59.0 ± 6.0	67.3 ± 5.7	9.8	1.14
		<u>Cs-137</u>		
6/26/87	74.0 ± 5.0	78.0 ± 5.9	14.8	1.05

TABLE 5-3

CROSSCHECK PROGRAM RESULTS FOR WATER SAMPLES
(pCi/l)

<u>Date</u>	<u>Known</u>	<u>Result</u>	<u>Resolution</u>	<u>Ratio</u>
		<u>Gross Beta</u>		
1/23/87	10.0 + 5.0	11.0 + 0.0	2.0	1.10
3/20/87	13.0 + 5.0	12.3 + 0.6	2.6	0.95
5/22/87	7.0 + 5.0	6.3 + 0.6	1.4	0.90
7/24/87	5.0 + 5.0	6.0 + 1.0	1.0	1.20
9/18/87	12.0 + 5.0	12.3 + 1.5	2.4	1.03
11/20/87	19.0 + 5.0	16.7 + 0.6	3.8	0.88
		<u>Cr-51</u>		
6/05/87	41.0 + 5.0	48.0 + 27.9	8.2	1.17
10/09/87	70.0 + 5.0	66.7 + 26.1	14.0	0.95
		<u>Co-60</u>		
2/06/87	50.0 + 5.0	58.0 + 4.6	10.0	1.16
6/05/87	64.0 + 5.0	63.0 + 5.3	12.8	0.98
10/09/87	15.0 + 5.0	13.7 + 2.3	3.0	0.91
		<u>Zn-65</u>		
2/06/87	91.0 + 5.0	95.7 + 5.9	18.2	1.05
6/05/87	10.0 + 5.0	10.7 + 3.2	2.0	1.07
10/09/87	46.0 + 5.0	53.0 + 13.5	9.2	1.15
		<u>Ru-106</u>		
2/06/87	100.0 + 5.0	130.0 + 40.0	20.0	1.30
6/05/87	75.0 + 5.0	75.7 + 7.4	15.0	1.00
10/09/87	61.0 + 5.0	44.0 + 5.6*	12.2	0.72
		<u>Cs-134</u>		
2/06/87	59.0 + 5.0	57.0 + 2.0	11.8	0.97
6/05/87	40.0 + 5.0	38.0 + 1.0	8.0	0.95
10/09/87	25.0 + 5.0	25.7 + 4.0	5.0	1.03
		<u>Cs-137</u>		
2/06/87	87.0 + 5.0	86.7 + 5.7	17.4	1.00
6/05/87	80.0 + 5.0	79.3 + 7.1	16.0	0.99
10/09/87	51.0 + 5.0	49.3 + 6.7	10.2	0.97

* Result is based upon two positive values.

TABLE 5-3 (Continued)

CROSSCHECK PROGRAM RESULTS FOR WATER SAMPLES
(pCi/l)

<u>Date</u>	<u>Known</u>	<u>Result</u>	<u>Resolution</u>	<u>Ratio</u>
		<u>H-3</u>		
2/13/87	4209.0 + 421.0	4137.0 + 30.6	10.0	0.98
6/12/87	2895.0 + 357.0	2677.0 + 60.3	8.1	0.92
10/16/87	4492.0 + 449.0	4253.0 + 80.2	10.0	0.95

ATTACHMENT 1

Criteria for Comparing Analytical Measurements

This attachment provides criteria for comparing results of capability tests and verification measurements. The criteria are based on an empirical relationship which combines prior experience and the accuracy needs of this program.

In these criteria, the judgment limits are variable in relation to the comparison of the Reference Laboratory's value to its associated one sigma uncertainty. As this comparison, referred to as "Resolution", increases, the acceptability of a licensee's measurement should be more selective. Conversely, poorer agreement should be considered acceptable as the resolution decreases. The values in the ratio criteria may be rounded to fewer significant figures to maintain statistical consistency with the number of significant figures reported by the Reference Laboratory, unless such rounding will result in a narrowed category of acceptance. The acceptance category reported will be the narrowest into which the ratio fits for the resolution being used.

RESOLUTION

RATIO = LICENSEE VALUE/REFERENCE VALUE

	<u>Agreement</u>	<u>Possible Agreement "A"</u>	<u>Possible Agreement "B"</u>
LT 3	No Comparison	No Comparison	No Comparison
GE* 3 and LT 4	0.4 - 2.5	0.3 - 3.0	No Comparison
GE 4 and LT 8	0.5 - 2.0	0.4 - 2.5	0.3 - 3.0
GE 8 and LT 16	0.6 - 1.67	0.5 - 2.0	0.4 - 2.5
GE 16 and LT 51	0.75 - 1.33	0.6 - 1.67	0.5 - 2.0
GE 51 and LT 200	0.80 - 1.25	0.75 - 1.33	0.6 - 1.67
GE 200	0.85 - 1.18	0.80 - 1.25	0.75 - 1.33

* GE means greater than or equal to

"A" criteria are applied to the following analyses:

Gamma spectrometry where principal gamma energy used for identification is greater than 250 kev.

Tritium analyses of liquid samples.

"B" criteria are applied to the following analyses:

Gamma spectrometry where principal gamma energy used for identification is less than 250 kev.

Sr-89 and Sr-90 determination.

Gross beta where samples are counted on the same date using the same reference nuclide.

6.0 CONCLUSIONS

This report has shown the licensee's conformance with Section 3/4.12 of the TS during the report period. It has shown that the data were carefully examined. A summary and a discussion of the results of the laboratory analyses for each type sample collected were presented.

No measurable radiological impact upon the environment as a consequence of plant discharges to the atmosphere or to the river was established.