SCE&G
A SCANA COMPANY

April 28, 2000
RC-00-0227

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Regional Administrator
U. S. Nuclear Regulatory Commission
Region II, Suite 2900
101 Marietta Street, N.W.
Atlanta, GA 30323

Dear Mr. Reyes:

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Subject: VIRGIL C. SUMMER NUCLEAR STATION
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT
(RR 8300)

Enclosed is the South Carolina Electric & Gas Company (SCE&G) Annual Radiological Environmental Monitoring Report as required by Regulatory Guide 4.8 and Section 6.9.1.6 of the Virgil C. Summer Nuclear Station Technical Specifications.

If there are any questions, please contact Ms. Susan B. Reese at (803) 345-4591.

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Very truly yours,

BCWilliams

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RADIOLOGICAL ENVIRONMENTAL MONITORING REPORT

VIRGIL C. SUMMER NUCLEAR STATION

FOR THE OPERATING PERIOD

JANUARY 1, 1999 - DECEMBER 31, 1999

APRIL 2000

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EXECUTIVE SUMMARY

1. Results of the 1999 Land Use Census indicated that the critical receptors remain in the east northeast sector, and there were no identified locations where a calculated dose exceeded limits specified in VCSNS Offsite Dose Calculation Manual, Section 1.4.2

2. During the ninth refueling the plant was uprated to 2900 MWt (990 MWe gross).

3. There was no detection of radioactivity in environmental media attributed to gaseous effluent releases from VCSNS.

4. Activated corrosion products attributed to liquid effluent releases from VCSNS were detected in sediment. Radiation dose to the general public attributed from this activity is a small fraction of the observed variation in natural background radiation.

5. Detection of fission product activity in environmental media is from sources other than VCSNS, based on preoperational (baseline) monitoring and excellent fuel integrity during plant operation.

6. Results of the Radiological Environmental Monitoring Program substantiate the continuing adequacy of source control at VCSNS and conformance of station operation to 10 CFR 50, Appendix I design goals.

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INTRODUCTION

Virgil C. Summer Nuclear Station (VCSNS) utilizes a pressurized water reactor rated at 2900 MWt (990 MWe gross). The station is located adjacent to the Monticello Reservoir near Jenkinsville, South Carolina and approximately 26 miles northwest of Columbia. VCSNS achieved initial criticality on October 22, 1982, reached 50% power December 12, 1982 and 100% power June 10, 1983 following steam generator feedwater modifications. Steam generators were replaced in the fall of 1994. During the ninth refuel the plant was uprated to 2900 MWt (990 MWe gross). VCSNS is currently operating in its twelfth fuel cycle.

VCSNS is operating in conjunction with the adjacent Fairfield Pump Storage Facility (FPSF) which consists of eight reversible pump-turbine units of 60 MWe capacity each. During periods of off-peak power demand, base load generating capacity is used to pump water from Parr Reservoir to Monticello Reservoir. Monticello Reservoir has a surface area of approximately 6800 acres and lies about 150 feet above Parr Reservoir whose full pool area is approximately 4400 acres. The pump-turbine units operate in the generating mode to meet peak system loads while Monticello Reservoir also provides condenser cooling water for VCSNS. Cooling water intake and discharge structures are separated by a jetty to ensure adequate circulation within the reservoir.

VCSNS is located in Fairfield County which, along with Newberry County, makes up the principle area within a 10 mile radius of the plant. This area is mainly forest with only about 30% devoted to small farming activities principally producing small grains, feed crops and beef cattle. Significant portions of Lexington and Richland Counties are encompassed within the 20 mile radius of the plant and exhibit similar agricultural activities. Columbia, the state capital, is the only large city within the 50 mile radius of the plant. Small agricultural concerns are predominant, but make up less than 50% of the land area. The main industrial activity is concentrated around Columbia and is generally greater than 20 miles from the VCSNS.

Liquid effluents from VCSNS are released into the Monticello/Parr Reservoirs at two discharge points: the Circulating Water Discharge Canal (CWDC) and the FPSF Penstocks. Unprocessed steam generator blowdown and nonnuclear drains are released to the CWDC. Effluent from the liquid waste processing system and processed steam generator blowdown are released through the penstocks. Radioactive gaseous effluents from VCSNS are released from three points: the Main Plant Vent, the Reactor Building Purge Exhaust and the Oil Incineration Facility, all considered to be ground level releases.

Radioactive liquid and gaseous releases from the facility and their potential influence on the surrounding biota and man are the primary concern of the Radiological Environmental Monitoring Program at VCSNS. This report summarizes the results of the Radiological Environmental Monitoring Program conducted during 1999. Data trends, control/indicator and preoperational/operational data intercomparisons and other data interpretations are presented.

DESCRIPTION OF THE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

The Radiological Environmental Monitoring Program is carried out in its entirety by South Carolina Electric and Gas Company. The program has been designed to meet the following general commitments:

1. To analyze selected samples in important anticipated pathways for the qualification and quantification of radionuclides released to the environment surrounding VCSNS.

2. To establish correlations between levels of environmental radioactivity and radioactive effluents from VCSNS operation.

The program utilizes the concepts of control/indicator and preoperational /operational intercomparisons in order to establish the adequacy of radioactivity source control and to realistically verify the assessment of environmental radioactivity levels and subsequent radiation dose to man.

Sample media and analysis sensitivity requirements have been established to ensure that the maximum dose pathways are monitored and sensitivities represent a small fraction of annual release limits. Effluent dispersion characteristics, demography, hydrology and land use have been considered in selection of environmental sampling locations. These criteria were used to establish both the preoperational and operational phases of the Radiological Environmental Monitoring Program. Elements of the program monitor the impact of gaseous and liquid effluents released from VCSNS.

Specific methods used in monitoring the pathways of these effluents which may lead to radiation exposure of the public, based on existing demography, are summarized below in Table 1. Requirements of the Radiological Environmental Monitoring Program are specified in the VCSNS Offsite Dose Calculation Manual (ODCM). Elements of the program monitor the impact of gaseous and liquid effluents released from VCSNS.

Table 1 - Monitoring Methods for Critical Radiation Exposure Pathways

Effluent Release Type	Exposure Pathway	Monitoring Media
Gaseous	Immersion Dose and other External Dose	Thermoluminescent Dosimetry (TLD), Area Monitoring, Air Sampling
	Vegetation (Ingestion)	Vegetation and Food Crop Sampling, Air Sampling
	Milk (Ingestion)	Milk Sampling, Vegetation Sampling, Grass (Forage) Sampling, Air Sampling
Liquid	Fish (Ingestion)	Surface Water Sampling, Bottom Sediment Sampling, Fish Sampling
	Water & Shoreline Exposure (Ingestion and Immersion)	TLD Area Monitoring, Surface Water Sampling, Shoreline and Bottom Sediment Sampling
	Drinking Water (Ingestion)	Ground Water Sampling, Drinking Water Sampling

Monitoring sites indicative of plant operating conditions are generally located within a 5 mile radius of the plant. Table 2 provides a list of ODCM required sampling locations. Table 9 provides a list of supplemental sampling locations. Maps showing radiological environmental sampling locations within a radius of approximately 5 miles from VCSNS are presented as Figures 1-2 and 1-3. Figure 1-1 shows monitoring sites at distances greater than 10 miles from the plant. These locations indicate regional fluctuations in background radiation levels.

In addition to preoperational/operational data intercomparisons, control/indicator data intercomparisons are utilized. This is done to assess the probability that any observed abnormal measurement of radioactivity concentration is due to random or regional fluctuations rather than to a true increase in local environmental radioactivity concentration.

Environmental data is gathered through multiple types of sampling and measurements at specific locations. Several multiple sampling combinations are in use around the VCSNS. For example, all air sampling locations serve as environmental dosimetry monitoring locations. At these locations, airborne plant effluents are monitored for gamma immersion dose (noble gases), in addition to air contaminants. Three of these locations have additional complementary sampling/measurement pathways for monitoring plant effluents. Sampling locations 6 (1.0 mi ESE) and 7 (1.0 mi E) have broadleaf vegetation gardens for monitoring gaseous effluent deposition (ingestion pathway) in the two sectors having the highest deposition coefficients (D/Q) with real potential for exposure. Sampling location 18 (16.5 mi S) serves as a control location for direct radiation, surface water and garden monitoring.

Liquid effluents are monitored using three different monitoring media (fish, bottom sediment and surface water) at the two most probable affected bodies of water around the plant: Site 21, Parr Reservoir (2.7 mi SSW) and Site 23, Monticello Reservoir (0.5 mi ESE). The control location for liquid effluent comparisons is at Site 22, Neal Shoals (30.0 mi NNW) on the Broad River.

Quality of analytical measurements is demonstrated by participation in a laboratory intercomparison program. Results of the intercomparison program with the VCSNS count room and an outside vendor are included in Table 4. The intercomparison program with South Carolina Department of Health and Environmental Control (SCDHEC) is outlined in Table 5. Results are reported by SCDHEC. The results of each of these four quality control checks of the Radiological Environmental Monitoring program verify the technical credibility of analytical data generated and reported by the program.

The Radiological Environmental Monitoring Program described in Tables 8 and 9 incorporates all the elements of the VCSNS ODCM and includes numerous supplemental sampling locations.

LAND USE CENSUS

Annually a land use census is performed within a 5 mile radius of VCSNS to verify the adequacy of sample locations. In addition, the location of the maximum exposed individual (MEI) is identified. The results of the land use census performed in 1999 are included in Table 7. A verification of the maximum exposed individual location is presented in Table 7a. Identification of the highest offsite dose locations was performed by calculating a hypothetical dose based on predicted VCSNS source term (Operating License Environmental Report) and 5 year average meteorological data. Exposure pathways used in the analysis were those identified during the land use census.

During the 1999 land use census, the location and pathway presently used in the ODCM for offsite organ dose calculations (E 1.2 miles - residence/garden - beef - goat) was found to have a calculated dose of 2.01 mrem/yr. In addition, the ODCM required environmental gardens (E 1.0 and ESE 1.1 miles) were found to have a calculated dose of 3.71 and 2.34 mrem/year which are higher calculated doses than garden locations of all real individuals. There were no milking animals or dairy activity found within 5 miles of VCSNS. Therefore, changes to the ODCM gaseous effluent calculations or garden sample locations are not indicated.

MONITORING RESULTS AND DISCUSSION

The results of the Radiological Environmental Monitoring Program for 1999 are summarized in Table 10. For comparison, preoperational data are summarized in Table 11. During 1999, the Radiological Environmental Program attained a program compliance rate of approximately 97.5%. A listing of program exceptions and their respective causes are included in Table 12. Detailed analysis of the impact of these omissions verified that program quality has not been affected.

Airborne gross beta activity measured in air particulate samples collected at indicator locations around VCSNS were consistent with preoperational levels and not statistically different from control locations. Mean preoperational control and all indicator levels were 2.8E-2 and 2.7E-2 pCi/m^3, respectively. Mean indicator and control location measurements during 1999 were 2.14E-2 and 2.14E-2 pCi/m^3, respectively. The highest

site specific mean activity (2.29E-2 pCi/m^3) was measured at indicator location no. 6 (Env. Lab Garden 1.0 ESE). A comparison was performed between the 1999 results and the mean for the previous operational results. No statistically significant trends were observed. The results indicate that operation of VCSNS has not resulted in detectable increases of airborne gross beta activity in the environment.

Gamma spectroscopy measurements of air particulate samples and activated charcoal cartridges support the gross beta activity trend. Only natural background activities of ^{7}Be , ^{226}Ra and ^{40}K were detected. The highest minimum detectable activity (MDA) levels for ^{134}Cs, ^{137}Cs and ^{131}I were 1.66E-3, 2.03E-3 and 2.61E-2 pCi/m^3, respectively. The average maximum results support the gaseous effluent release data reported in the 1999 Annual Effluent and Waste Disposal Reports for VCSNS. No measurable iodine or particulate were released.

Environmental dosimetry measurements during 1999 did not differ significantly from preoperational measurements. Indicator and control dosimetry measurements also showed no appreciable differences during 1999. Comparison with other operational years shows no statistically significant difference. Sampling location no. 13, north dam (2.9 miles NNW), was the indicator location showing the highest mean exposure rate of 1.08E+1 μR/hr. This value is slightly lower than in 1998 of 1.20E+01 μR/hr and consistent with the highest mean exposure rate of 1.4E+1 μR/hr measured during the preoperational period. Gaseous effluent release data reported indicated that no measurable fission and activation gases were released from VCSNS in 1999.

Gamma spectroscopy measurements of surface water samples did not indicate the presence of activated corrosion or fission products above the respective MDA's (MDA's are maintained below required LLD's). Liquid effluent release data reported for 1999 in the Annual Effluent and Waste Disposal Report indicated a total of 3.83E-2 Ci of measurable fission and activated corrosion product activity were released from VCSNS; a level not discernible in surface water due to dilution available during the releases and the detection limits of analytical methods used during gamma spectroscopy analysis.

Surface water tritium was detected in 3 of 24 indicator samples with concentrations ranging from 5.46E2 to 7.68E2 pCi/liter. The highest concentration was detected at site 23 (Mont. Res 0.5 mi. ESE). This activity is less than the preoperational indicator mean of 1.6E+3 pCi/liter. Total tritium release in liquid effluents during 1999 was reported to be 8.85E+2 Ci; a level not usually discernible in surface water due to dilution available during the releases and the detection limitations of analytical equipment used for tritium analysis.

Gamma spectroscopy measurements of ground water samples did not indicate the presence of activated corrosion or fission products above the MDA's for the respective radionuclides. Tritium analysis did not indicate the presence of any tritium above the detectable levels. The maximum MDA level for tritium at all indicator and control sites was 5.91E+2 pCi/l.

Gamma spectroscopy measurements of drinking water samples collected from the Jenkinsville and Columbia water supplies did not indicate the presence of activated corrosion or fission product activity above the MDA's of the respective radionuclides.

Naturally occurring radionuclides, ^{226}Ra, ^{214}Pb and ^{214}Bi, were observed in the Jenkinsville water supply (sample #28) at levels above those found in surface water. These elevated activity levels were also observed in the preoperational program and are attributed to several deep water wells. The supply for Jenkinsville community water is located more than 5 miles from VCSNS.

The highest mean gross beta activity in drinking water was measured at site 28 (Jenkinsville) at a level of 2.31E+0 pCi/liter, about the same as last year. There was no detectable tritium in drinking water samples. The maximum tritium MDA value is 5.90E+2 pCi/liter. The result compares to a preoperational mean of 7.8E+2 pCi/liter.

There were no milk samples collected in 1999. Milk sampling is required to be performed at the three highest dose locations (> 1 mrem/year) within 5 miles of the plant. Presently there are no locations meeting the criteria for indicator dairies.This reflects the reduction of control/indicator locations. Controls are in place where milk samples will be obtained if gaseous releases from the plant exceed 5% of quarterly organ dose limits or radionuclides (attributed to VCSNS operations) are detected in broadleaf vegetation, grass, or air samples at concentrations greater than required LLD's.

Grass samples collected from indicator sites2 and 7, with control site 18. Site 2 indicated ^{137}Cs in 9 of 12 samples at concentrations ranging from 1.24E+1 to 4.64E+1 pCi/kg, below the maximum preoperational control activity of 3.4E+2 pCi/kg. A review of site #2 air sample results indicated that no ^{137}Cs was detected during 1999.

Broadleaf vegetation collected from gardens at location numbers 6, 7 and 18 were the principal food products analyzed during 1999. The highest minimum detectable activity (MDA) levels for ^{134}Cs, ^{137}Cs and ^{131}I were 1.53E+1, 1.98E+1 and 1.70E+1 pCi/kg, respectively. No activation or fission products detected.

Other vegetation sampled in 1999 included corn, tomatoes and turnips representing the non-leafy vegetation group. No radionuclides were detected other than naturally occurring. Naturally occurring nuclides were observed in all samples at concentrations consistent with those observed during the preoperational period.

Fish species sampled at two indicator and one control location included bass, bream, catfish and carp. ^{137}Cs was detected in 3 of 12 samples collected at indicator locations and 1 of 6 at the control location. The highest ^{137}Cs concentration at the indicator locations was 1.06E+1 pCi/kg (Mont. Res 0.5 mi ESE). At the control location (Neal Shoals, 30 mi, NNW) the maximum ^{137}Cs concentration was 1.12E+1 pCi/kg. Since the levels of ^{137}Cs in fish at control location and indicator locations are about the same but less than preoperational concentrations, the ^{137}Cs radioactivity is attributed to residual fallout.

Gamma spectroscopy measurements of sediment samples collected during 1999 resulted in detection of ^{60}Co that is attributed to VCSNS operation. ^{60}Co was detected in two samples taken at the Discharge Canal at Lake Monticello (Site 23) and two samples at Parr Res. (site 21) at mean concentrations of 3.34E+1 and 2.61E+1 pCi/kg, respectively. ^{137}Cs was detected in all four indicator samples at an average concentration of 1.67E+2 pCi/kg. The mean ^{137}Cs concentration at the control location (site 22) is 2.02E+2 pCi/kg, which is greater than the average indicator activity. Since the levels of ^{137}Cs at the control

location are greater than the indicator location, the ^{137}Cs radioactivity is attributed to residual fallout.

Radiation doses to man, corresponding to the concentrations of activity in sediment, were calculated using Regulatory Guide 1.109 methodology. A 500 hour/year exposure to shoreline sediment containing maximum and mean concentrations of ^{60}Co, and ^{137}Cs, a shoreline width factor of 1 and a sediment mass of 40 kg/m^2 was assumed. The results are included in Table 2 and show a maximum dose to the public from contaminated sediment to be 2.69E-2 mrem (^{60}Co and ^{137}Cs) for 1999 based on sediment samples from Monticello Reservoir. This dose is conservative because ^{137}Cs is used in the dose calculation when actually only 1.31E-2 mrem/yr (^{60}Co) is from VCSNS.

Table 2 - 1999 Fission and Activated Corrosion Product Activity in Sediment

Location	Radionuclide	Activity (pCi/kg)		Corresponding Calculated Annual Dose Equivalent (mrem/yr)	
				Total Body	
Monticello Reservoir (Site 23)		Maximum	Mean	Maximum	Mean
	^{60}Co	3.84E+1	3.34E+1	1.31E-2	1.14E-2
	^{137}Cs	1.64E+2	1.60E+2	1.38E-2	1.34E-2
	Total		---	2.69E-2	2.48E-2
Parr Reservoir (Site 21)	^{60}Co	3.39E+1	2.61E+1	1.15E-2	8.87E-3
	^{137}Cs	2.01E+2	1.74E+2	1.69E-2	1.46E-2
	Total		---	2.84E-2	2.34E-2

CONCLUSION

As in previous years of VCSNS operation, the presence of fission product activity attributed to residual fallout from atmospheric weapons testing and the Chernobyl accident were detected in environmental media including fish and sediment.

No detectable fission or activation product activity attributed to VCSNS operation was observed in environmental media except for sediment samples from Lake Monticello and Parr Reservoir. The dose from sediment represents a small fraction of the observed variation in natural background and a small fraction of VCSNS effluent dose limits. The reported whole body and organ dose for liquid effluents during 1999 was 1.02E-2 and 1.08E-2 mrem respectively (VCSNS Annual Effluent Release Report, 1999). The absence of an impact was expected since, historically, releases from VCSNS have been a small fraction of ODCM Specification limits. The dose calculated for the maximally exposed individual will not result in observable effect on the ecosystem or general public. The results of the Radiological Environmental Monitoring Program, therefore, substantiate the continuing adequacy of source control at VCSNS and conformance of station operation to 10 CFR 50, Appendix I design objectives.

Table 3 - Required Sampling Site Locations

Site No.	Description	Distance[1] (Miles)	Direction[2]	Sample Type(s)[3]
1	Borrow Pit	1.2	1.79.8 S	DQ
2	Transmission Line	1.1	225.0 SW	AP, RI, DQ
3	Firing Range	1.2	270.0 W	DQ
4	Fairfield Hydro	1.2	289.5 WNW	DQ
5	Transmission Line Entrance	0.9	144.0 SE	DQ
6	Env. Lab Garden	1.0	111.0 ESE	AP,RI, ,GA, DQ
7	Environmental Lab Garden	1.0	97.8 E	AP,RI,DQ, GA
8	Monticello Res. S of Rd 224	1.5	62.0 ENE	DQ
9	Ball Park	2.3	41.6 NE	DQ
10	Meteorological Tower #2	2.5	25.5 NNE	DQ
12	Old Why 99	4.2	349.4N	DQ
13	North Dam	2.9	333.0 NNW	DQ
14	Dairy (Shealy)[4]	6.5	277.0 W	MK,GR
16	Dairy (Parr)[4]	20.0	275.5 W	MK,GR
16a	TLD Location	28.0	278.6W	DQ
17	Columbia Water Works	25.0	144.0 SE	AP,RI,DQ,DW
18	Residence/Pine Island Club[5]	16.5	165.0 S	DQ,GA
19	Residence/Little Saluda	21.0	224.0 SSW	DQ
20	Residence/Whitmire	22.0	309.5 NW	DQ
21	Parr Reservoir	2.7	199.5 SSW	SW,FH,BS
22	Neal Shoals	26.0	343.1 NNW	SW,FH,BS
23	Discharge Canal (Mont, Res.)	0.5	104.5 ESE	SW,FH,BS
26	On Site Well (P2)	460 Ft	270.0 W	GW
27	On Site Well (P5)	510 Ft	180.0 S	GW
28	Nuclear Training Center (EOF)[6]	2.6	170.2 SSE	DW
29	Trans. Line WSW of VCSNS	1.0	260.6 WSW	DQ
30	Oak Tree North of Borrow Pit	1.0	196.2 SSW	DQ, AP, RI
31	McCrorey-Liston School	6.6	11.5 NNE	DQ
32	Clark Bridge Road and Brooks Drive	4.6	24.0 NNE	DQ
33	Rd 48 near Hwy 213	4.2	68.0 ENE	DQ
34	Rd 419 North of Hwy 60	4.9	111.0 ESE	DQ
35	Glenn's Bridge Road	4.6	132.0 SE	DQ
36	Woods Behind Jenk. Post Office	3.1	151.0 SSE	DQ
37	Residence	4.9	304.8 NW	DQ
39	LMWTF	14.0	168.0 SSE	DW
41	Below Catwalk at Trestle	3.8	182.0 S	DQ
42	Broad River Rd (Residence Peak)	3.8	198.0 SSW	DQ
43	Hwy 176 and Rd 435	5.2	236.0 SW	DQ
44	Rd 28 at Cannon's Creek	2.8	256.6 WSW	DQ
45	Rd 33 at Pomaria	5.8	253.2 WSW	DQ
46	Rd 28 at Heller's Creek	3.7	291.5 WNW	DQ
47	Fairfield Tailrace	1.0	316.0 NW	DQ
52	Monticello (Rd 11)	3.8	13.0 NNE	DQ

Table 3 (Cont.) – Required Sampling Locations

Site No.	Description	Distance[1] (Miles)	Direction[2]	Sample Type(s)[3]
53	Rd 359	3.0	46.5 NE	DQ
54	Jenkinsville School	1.7	72.5 ENE	DQ
55	St. Barnabas Church	2.8	91.5 E	DQ
56	Old Jenkinsville Dinner	2.0	144.0 SE	DQ
58	Residence	2.5	157.0 SSE	DQ
59	Nuclear Training Center (EOF)[6]	2.6	170.2 SSE	DQ,AP,GW
60	Rd 98 near Rd 28	3.5	274.6 W	DQ

Footnotes

1. Distance given is the distance between the site location and the VCSNS reactor containment building.

2. Direction given in degrees from true north-south line through center of reactor containment building.

3. Sample Types:

AP = Air Particulate	GW = Ground Water	GA = Garden
RI = Air Radioiodine	DW = Drinking Water	FH = Fish
DQ = Quarterly TLD	MK = Milk	BS = Bottom Sediment
SW = Surface Water	GR = Grass (Forage)	

4. Site 14 and 16 are not presently in use. If conditions change, requiring a renewal of dairy sampling these sites will be reactivated.

5. Site 18 consists of 3 locations in close proximity to Lake Murray. Garden product samples are taken at the Wyse residence. Surface water is taken near the shoreline in Lake Murray. The TLD is located on Pine Island.

6. Site 28 for drinking water and site 59 for quarterly TLD measurements and continuous air sampling are co-located at the location of the SCE&G Nuclear Training Center which also serves as the Virgil C. Summer Station Emergency Offsite Facility.

Table 4 results of 1999 Environmental Intercomparison Program with Independent Lab, Analytics, Inc.

Comparison Study (Measurement Unit)	Date	Nuclides	Vendor Lab Results	Env Lab Results	Agreement
Gamma Isotopic Liquid 4 liter (pCi/l)	3/18	^{131}I	91	90	Yes
		^{141}Ce	177	178	Yes
		^{51}Cr	398	424	Yes
		^{134}Cs	114	106	Yes
		^{137}Cs	240	247	Yes
		^{54}Mn	152	158	Yes
		^{59}Fe	79	87	Yes
		^{65}Zn	195	197	Yes
		^{60}Co	181	186	Yes
Gamma Isotopic Composite Air Filters (pCi)	3/18	^{141}Ce	104	100	Yes
		^{51}Cr	233	199	Yes
		^{134}Cs	67	52	Yes
		^{137}Cs	141	141	Yes
		^{54}Mn	89	89	Yes
		^{59}Fe	46	56	Yes
		^{65}Zn	115	121	Yes
		^{60}Co	106	100	Yes
Gross Beta Filter (pCi)	3/18	N/A	44	43	Yes
Charcoal Cartridge (pCi)	3/18	^{131}I	100	92	Yes
Gamma Isotopic Liquid 1 liter (pCi/l)	6/24	^{131}I	68	75	Yes
		^{141}Ce	134	146	Yes
		^{51}Cr	172	150	Yes
		^{134}Cs	92	78	Yes
		^{137}Cs	151	155	Yes
		^{54}Mn	68	72	Yes
		^{59}Fe	38	48	Yes
		^{65}Zn	98	91	Yes
		^{60}Co	171	187	Yes
Gamma Isotopic Soil (pCi/Kg)	6/24	^{141}Ce	377	389	Yes
		^{51}Cr	483	425	Yes
		^{134}Cs	258	240	Yes
		^{137}Cs	550	605	Yes
		^{54}Mn	190	213	Yes
		^{59}Fe	107	138	Yes
		^{65}Zn	274	286	Yes
		^{60}Co	480	525	Yes

Table 4 (Cont.) Results of 1999 Environmental Intercomparison Program with Independent Lab, Analytics, Inc.

Comparison Study (Measurement Unit)	Date	Nuclides	Vendor Lab Results	Env Lab Results	Agreement
Alpha/Beta Liquid (pCi/l)	6/24	Alpha Beta	98 290	113 311	Yes Yes
Tritium (pCi/l)	6/24	^{3}H	9349	9800	Yes
Gross Beta Filter (pCi)	9/23	N/A	51	48	Yes
Charcoal Cartridge (pCi)	9/23	^{131}I	63	66	Yes
Gamma Isotopic Soil Density=1gm/cc (pCi/Kg)	9/23	^{141}Ce ^{51}Cr ^{134}Cs ^{137}Cs ^{54}Mn ^{59}Fe ^{65}Zn ^{60}Co	330 249 161 490 284 127 273 215	379 271 150 541 327 170 337 252	Yes Yes Yes Yes Yes Yes Yes Yes
Gamma Isotopic Liquid 4 liters (pCi/l)	9/23	^{131}I ^{141}Ce ^{51}Cr ^{134}Cs ^{137}Cs ^{54}Mn ^{59}Fe ^{65}Zn ^{60}Co	77 244 184 119 268 210 94 202 159	82 266 189 109 289 223 109 225 167	Yes Yes Yes Yes Yes Yes Yes Yes Yes
Alpha/Beta Liquid (pCi/l)	12/9	Alpha Beta	45 271	61 272	Yes Yes
Gamma Isotopic Composite Air Filters (pCi)	12/9	^{141}Ce ^{51}Cr ^{134}Cs ^{137}Cs ^{54}Mn ^{59}Fe ^{65}Zn ^{60}Co ^{58}Co	93 256 110 85 89 83 164 116 97	87 220 85 78 85 83 162 119 95	Yes Yes Yes Yes Yes Yes Yes Yes Yes
Tritium (pCi/l)	12/9	^{3}H	8015	7940	Yes

Table 4 (Cont.) Results of 1999 Environmental Intercomparison Program with Independent Lab, Analytics, Inc.

Comparison Study (Measurement Unit)	Date	Nuclides	Vendor Lab Results	Env Lab Results	Agreement
Gamma Isotopic Liquid 1 liter (pCi/l)	12/9	^{131}I	96	103	Yes
		^{141}Ce	105	117	Yes
		^{51}Cr	290	369	Yes
		^{134}Cs	125	119	Yes
		^{137}Cs	96	99	Yes
		^{54}Mn	100	121	Yes
		^{59}Fe	94	122	Yes
		^{65}Zn	186	199	Yes
		^{60}Co	132	142	Yes
		^{58}Co	110	124	Yes

Table 5 - Results of the 1999 Intercomparison Program with Independent Lab

Comparison Study (Measurement Unit)	Qtr.	Nuclide	Env Lab Results	Second Lab Results[1]	Agreement
Tritium (μCi/ml) (Analytics)	First	^{3}H	1.08E-3	1.05E-3	Yes
Gross Beta Liquid (μCi/ml)	First	N/A	9.48E-4	9.65E-4	Yes
Gross Alpha Liquid (μCi/ml)	First	N/A	4.74E-4	4.71E-4	Yes
Gamma Isotopic Liquid 1 liter, (μCi/ml)	First	^{141}Ce	9.42E-3	9.00E-3	Yes
		^{51}Cr	2.22E-2	2.23E-2	Yes
		^{134}Cs	2.91E-3	3.33E-3	Yes
		^{137}Cs	6.03E-3	6.87E-3	Yes
		^{54}Mn	4.68E-3	4.62E-3	Yes
		^{59}Fe	3.72E-3	3.43E-3	Yes
		^{65}Zn	6.53E-3	6.02E-3	Yes
		^{60}Co	5.28E-3	5.22E-3	Yes
Charcoal Cartridge (μCi)	Second	^{131}I	3.00E-1	3.02E-1	Yes
Gross Alpha Filter (μCi)	Second	N/A	1.79E-3	1.99E-3	Yes
Gross Beta Filter (μCi)	Second	N/A	5.96E-3	5.93E-3	Yes
Gamma Isotopic Liquid, 4 liter (μCi/ml)	Third	^{141}Ce	1.61E-2	1.49E-2	Yes
		^{51}Cr	1.41E-2	1.31E-2	Yes
		^{134}Cs	3.02E-3	3.16E-3	Yes
		^{137}Cs	7.57E-3	6.87E-3	Yes
		^{54}Mn	6.59E-3	5.86E-3	Yes
		^{59}Fe	5.22E-3	4.56E-3	Yes
		^{65}Zn	6.51E-3	5.80E-3	Yes
		^{60}Co	4.46E-3	4.12E-3	Yes
Gas Sample, 1 liter (μCi)	Second	^{133}Xe	6.89E+0	6.70E+0	Yes
		^{85}Kr	8.46E+1	8.17E+1	Yes
Gamma Isotopic Filter, Composit (μCi/ml)	Fourth	^{141}Ce	2.93E-2	3.08E-2	Yes
		^{51}Cr	8.92E-2	9.40E-2	Yes
		^{134}Cs	1.70E-2	2.10E-2	Yes
		^{137}Cs	1.57E-2	1.59E-2	Yes
		^{54}Mn	1.81E-2	1.75E-2	Yes
		^{59}Fe	2.55E-2	2.36E-2	Yes
		^{65}Zn	3.55E-2	3.30E-2	Yes
		^{60}Co	2.19E-2	2.19E-2	Yes
		^{58}Co	2.30E-2	2.35E-2	Yes

[1] The Second (Independent) Laboratory was Analytics, Inc. for 1999.

Table 5 - Results of the 1999 Intercomparison Program with Independent Lab

Comparison Study (Measurement Unit)	Qtr.	Nuclide	Env Lab Results	Second Lab Results[1]	Agreement
Gamma Isotopic Filter, 47mm (μCi)	Fourth	^{141}Ce	2.86E-2	2.89E-2	Yes
		^{51}Cr	8.63E-2	8.81E-2	Yes
		^{134}Cs	1.60E-2	1.97E-2	Yes
		^{137}Cs	1.54E-2	1.49E-2	Yes
		^{54}Mn	1.79E-2	1.64E-2	Yes
		^{58}Co	2.23E-2	2.20E-2	Yes
		^{59}Fe	2.50E-2	2.21E-2	Yes
		^{65}Zn	3.51E-2	3.10E-2	Yes
		^{60}Co	2.09E-2	2.05E-2	Yes
Gamma Istopic, Soil (ρ=1.5 g/cc) (μCi/g)	Fourth	^{141}Ce	2.95E-2	3.19E-2	Yes
		^{51}Cr	9.15E-2	9.65E-2	Yes
		^{134}Cs	1.77E-2	2.16E-2	Yes
		^{137}Cs	1.54E-2	1.63E-2	Yes
		^{54}Mn	1.75E-2	1.80E-2	Yes
		^{58}Co	2.25E-2	2.41E-2	Yes
		^{59}Fe	2.43E-2	2.42E-2	Yes
		^{65}Zn	3.37E-2	3.39E-2	Yes
		^{60}Co	2.15E-2	2.25E-2	Yes
Silver Zeolite Cartridge (μCi)	Fourth	^{131}I	3.86E-1	4.03E-1	Yes
Tritium (μCi/ml) (VCSNS) WMT	Fourth	^{3}H (distilled)	4.28E-1	4.31E-1	Yes
		^{3}H (undistilled)	4.55E-1	4.44E-1	Yes

[1] The Second (Independent) Laboratory was Analytics, Inc. for 1999 except for VCSNS tritium intercomparisons.

Table 6 – Summary of 1999 Intercomparison Program with South Carolina Department of Health and Environmental Control

Pathway (Units)	Sample Location	Frequency	Nuclide[1]
Surface Water (pCi/liter)	No. 21	Monthly	^{3}H Mixed Gamma
	No. 22	Monthly	^{3}H Mixed Gamma
Air (pCi/m^{3})	No. 6	Monthly	Gross Beta, Iodine, Mixed Gamma
	No. 17	Monthly	Gross Beta, Iodine, Mixed Gamma
Sediment (pCi/kg)	No. 23	Semiannually	Mixed Gamma
Fish (pCi/kg)	No. 23	Semiannually	Mixed Gamma
Vegetation (pCi/kg)	No. 6	Semiannually	Mixed Gamma

[1] Intercomparison results were not yet available for publication in this report. Results will be reported by SCDHEC.

Table 7 – Results of the 1999 Land Use Census Verification

Sector	Nearest Residence	Miles	Nearest Garden	Miles	Nearest Cattle	No. Milked	Miles	Nearest Goat	No. Milked	Miles
N	P. Olver (A)	3.73			John Robinson	0	3.4			
NNE	Bessie Crumblin	2.9	Bessie Crumblin	2.9	Bessie Crumblin	0	2.9			
NE	Ella B. Herndon	1.5	Ella Herndon	1.5	David Stone	0	2.1			
ENE	Robert Martin	1.6	Essie Mae Glenn (B)	1.7	Herbert Belk (C)	0	3.4	Robert Martin	0	1.6
E	George Mosley (A)	1.2	George Mosley (B)	1.2						
ESE	Walter Martin	1.1	Walter Martin	1.1	Glover/Kennedy	0	5.0			
SE	Ezell Summer (A)	1.5	Ezell Summer (B)	1.7	Sim Roberts	0	4.7			
SSE	Tony Taffer	2.5		2.5						
S	Walter Barker	4.0	Walter Barker	3.3	Shirley Counts (C)	0	3.8			
SSW	Bernice Cawley (A)	3.3	Nora Wicker	4.7	G.A. Mayers	0	4.7			
SW	Marvin Miller	3.3	Marvin Miller	3.3	Marvin Miller	0	3.3			
WSW	Ron Hope	2.9	Mary Davis	3.0	Cynithia Aull	0	4.5			
W	Marion Livingston	2.8	Marion Livingston	2.8	Marion Livingston	0	2.0			
W					Ken / Virg Graham	90	5.0			
WNW	Larraina Wicker (A)	4.2	Claude Ringer	4.8	Claude Ringer	0	4.8	Carrol Leitzey	0	4.8
NW	Louise Workman	3.9	Louise Workman	3.9						
NNW	Frank March	2.9	Frank March	2.9	Frank March	0	2.9			

(A) CHANGE IN CLOSEST RESIDENCE
(B) CHANGE IN CLOSEST GARDEN
(C) CHANGE IN CLOSEST BEEF CATTLE

Table 7a – Critical Receptor Evaluation for 1999

NAME	SECTOR	MILES	PATHWAY	X/Q	D/Q	Dose* mRem/y
Walter Barker	S	4.0	Res, Gar,	7.23E-08	3.32E-10	8.70E-02
Shirley Counts	S	5.0	Res, Gar, B	4.64E-08	2.06E-10	7.48E-02
Bernice Cawley	SSW	3.3	Res	1.29E-07	7.55E-10	5.00E-03
Nora Wicker	SSW	3.3	Res. Gar	9.78E-08	5.63E-10	1.45E-01
G.A. Mayer	SSW	4.7	Res, Gar, B	6.27E-08	3.51E-10	1.25E-01
Evelyn Nichols	SW	3.3	Res, Gar	1.31E-07	9.60E-10	2.44E-01
Marvin Miller	SW	3.3	Res, Gar, B	1.31E-07	9.60E-10	3.39E-01
Ron Hope	WSW	2.9	Res	1.43E-07	9.27E-10	5.60E-03
Mary Davis	WSW	3.0	Res, Gar	1.33E-07	8.58E-10	2.20E-01
Steve Aull	WSW	4.5	Res, B	5.80E-08	3.53E-10	3.73E-02
Marion Livingston	W	2.0	Res, Gar, B	1.66E-07	1.53E-09	3.38E-01
Ken/Virgil Graham	W	5.0	Res, Gar, B, C/M	5.21E-08	1.97E-10	1.06E-01
Lorraine Wicker	WNW	4.2	Res	4.94E-08	4.67R-10	1.85E-03
Carroll Leitzey	WNW	4.8	Res, Gar, G	3.90E-08	1.27E-10	1.56E-02
Claude Ringer	WNW	4.8	Res, Gar, B	3.90E-08	1.27E-10	4.70E-02
Louise Workman	NW	3.9	Res, Gar	1.11E-07	3.21E-10	8.84E-02
Frank March	NNW	2.9	Res, Gar, B	3.51E-07	9.68E-10	3.65E-01
John Robinson	N	3.4	B	2.83E-07	8.13E-10	8.15E-02
P. Oliver	N	3.7	Res,	2.36E-07	6.63E-10	8.80E-03
Bessie Crumblin	NNE	2.9	Res, Gar, B	3.76E-07	1.13E-09	4.24E-01
William Robinson	NNE	3.4	Res, Gar, B	2.75E-07	7.93E-10	2.98E-01
Ella B. Herndon	NE	1.5	Res, Gar	2.01E-06	6.73E-09	1.82E +00
David Stone	NE	2.1	Res,, B	9.68E-07	2.98E-09	3.34E-01
Robert Martin (1)	ENE	1.6	Res, G	1.82E-06	5.20E-09	1.30E-01
Essie Mae Glenn	ENE	1.7	Res, Gar	1.63E-06	4.61E-09	1.27E+00
Herbert Belk	ENE	3.4	B	3.81R-07	8.92E-10	8.99E-02
**VCS Garden #7	E	1.0	Res, Gar	4.43E-06	1.36E-08	3.71E+00
ODCM Assumed MEI	E	1.1	Res, Gar	3.50E-06	1.10E-08	3.00E+00
George Mosley	E	1.2	Res,	2.89E-06	8.46E-09	1.08E-01
**VCS Garden#6	ESE	1.0	Res, Gar	2.64E-06	8.62E-09	2.34E+00
Walker Martin	ESE	1.1	Res, Gar	2.10E-06	6.72E-09	1.83E+00
Glover/Kennedy	ESE	5.0	Res, Gar, B	8.90E-08	1.94E-10	7.53E-02
Ezell Summer	SE	1.5	Res, Gar	6.35E-07	2.35E-9	6.29E-01
Sim Roberts	SE	4.7	Res, Gar B	6.18E-08	1.70E-10	6.41E-02
Tony Taffer	SSE	2.5	Res, Gar	1.44E-07	6.28E-10	1.66E-01

Pathways:
Res = Residence
Gar = Garden
B = Beef
C/M = Cow/Milk (Infant)
G= Goat

Footnotes:
1 Maximum exposed individual.
* Hypothetical dose based on Operating License Environmental Report Source Term. X/Q and D/Q were derived from ODCM 5-year average meteorological data
** ODCM required environmental gardens.

Table 8 – Radiological Environmental Monitoring Program Specifications

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
AIRBORNE: I. Particulate	A) 3 Indicator samples to be taken at locations (in different sectors) beyond but as close to the exclusion boundary as practicable where the highest offsite sectorial ground level concentrations are anticipated.[2]	Continuous sampler operation with weekly collection.	2 7 30	Gross beta following filter change; Quarterly composite (by location) for gamma isotopic.
	B) 1 Indicator sample to be taken in the sector beyond but as close to the exclusion boundary as practicable corresponding to the residence having the highest anticipated offsite ground level concentration or dose.[2]	Continuous sampler operation with weekly collection.	6	Gross beta following filter change; Quarterly composite (by location) for gamma isotopic.
	C) 1 Indicator sample to be taken at the location of one of the dairies being sampled meeting the criteria of VII(A).[2,4]	Continuous sampler operation with weekly collection.	N/A	Gross beta following filter change; Quarterly composite (by location) for gamma isotopic.
	D) 1 Control sample to be taken at a location at least 10 air miles from the site and not in the most prevalent wind directions.[2]	Continuous sampler operation with weekly collection.	17	Gross beta following filter change; Quarterly composite (by location) for gamma isotopic.
II. Radioiodine	A) 3 Indicator samples to be taken at two locations as given in I(A) above	Continuous sampler operation with weekly canister collection.	2 7 30	Gamma Isotopic for Iodine 131 weekly.
	B) 1 Indicator sample to be taken at the location as given in 1(B) above.	Continuous sampler operation with weekly canister collection.	6	Gamma Isotopic for Iodine 131 weekly.
	C) 1 Indicator sample to be taken at the location as given in I(C) above.	Continuous sampler operation with weekly canister collection.	N/A	Gamma Isotopic for Iodine 131 weekly.
	D) 1 Control sample to be taken at a location similar in nature to I(D) above.	Continuous sampler operation with weekly canister collection.	17	Gamma Isotopic for Iodine 131 weekly.
III. Direct	A) 13 Indicator stations to form and inner ring of stations in the 13 accessible sectors within 1 to 2 miles of the plant.	Monthly or quarterly exchange[5,7] two or more dosimeters at each location	1,2,3,4,5,6, 7,8,9,10,29, 30,47	Gamma dose monthly or quarterly
	B) 16 indicator stations to form an inner ring of stations in the 16 accessible sectors within 3 to 5 miles of the plant	Monthly or quarterly exchange[5,7] two or more dosimeters at each location.	12,13,32,33, 34,35,36,37, 41,42,43,44, 46,53,55,60	Gamma dose monthly or quarterly

Table 8 (Cont.) - Radiological Environmental Monitoring Program Specifications

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
WATERBORNE IV. Surface Water	A) 1 Indicator sample downstream to be taken at a location which allows for mixing a dilution in the ultimate receiving river.	Time composite samples with collection every month[5]	21[3,6]	Gamma isotopic monthly with quarterly composite (by location) to be analyzed for tritium[7]
	B) 1 Control sample to be taken at a location on the receiving river sufficiently far upstream such that no effects of pumped storage operation are anticipated.	Time composite samples with collection every month[5]	22[3]	Gamma isotopic monthly with quarterly composite (by location) to be analyzed for tritium[7].
	C) 1 Indicator sample to be taken in the upper reservoir of the pumped storage facility at the plant discharge canal.	Time composite samples with collection every month[5]	23[3]	Gamma isotopic monthly with quarterly composite (by location) to be analyzed for tritium[7].
V. Ground Water	A) 2 Indicator samples to be taken within the exclusion boundary and in the direction of potentially affected ground water supplies.	Quarterly grab sampling[7]	26 27	Gamma isotopic and tritium analyses quarterly[7].
	B) 1 Control sample from unaffected location	Quarterly grab sampling[7]	59	Gamma isotopic and tritium analyses quarterly[7].
VI. Drinking Water	A) 1 Indicator sample from a nearby public ground water supply source.	Monthly grab sampling[5].	28	Monthly[5] gamma isotopic, gross beta and quarterly[7] composite for tritium analyses.
	B) 1 Indicator (finished water) sample from the nearest downstream water supply.	Monthly composite sampling.	17	Monthly[5] gamma isotopic, and gross beta and quarterly[7] composite for tritium analyses.
	C) 1 Control (finished water) sample from an unaffected water supply.	Monthly composite sampling.	39	Monthly[5] gamma isotopic, and gross beta and quarterly[7] composite for tritium analyses

Table 8 (cont.) - Radiological Environmental Monitoring Program Specifications

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
INGESTION: VII. Milk[4]	A) Samples from milking animals in 3 locations within 5 km having the highest dose potential. If there are none then 1 sample from milking animals in each of 3 areas between 5 to 8 km distance where doses are calculated to be greater than 1 mrem per year.[10]	Semimonthly when animals are on pasture[8]; monthly other times[5]	To be supplied when milk animals are found in accordance with criteria VII.A.	Gamma isotopic and I-131 analysis semimonthly[8] when animals are on pasture, monthly other times[5]
	B) 1 Control sample to be taken at the location of a dairy > 20 miles distance and not in the most prevalent wind direction[2].	Semimonthly when animals are on pasture[8]; monthly other times[5,11]	16	Gamma isotopic and I-131 analysis semimonthly[8] when animals are on pasture, monthly other times[5]
	C) 1 Indicator grass (forage) sample to be taken at the location of one of the dairies being sampled meeting the criteria of VII(A),above, when animals are on pasture	Monthly when available[5]	To be supplied when milk animals are found in accordance with criteria VII.A.	Gamma isotopic.
	D) 1 Control grass (forage) sample to be taken at the location of VII(B) above.	Monthly when available[5,11]	16	Gamma isotopic.
VIII. Food Products	A) 2 Samples of broadleaf vegetation grown in the 2 nearest offsite location of highest calculated annual average ground level D/Q if milk sampling is not performed within 3 km or if milk sampling is not performed at a location within 5-8 km where the doses are calculated to be greater than 1 mrem/yr[10].	Monthly when available[5].	6 7	Gamma isotopic on edible portion.
	B) 1 Control sample for the same foods taken at least 10 miles distance and not in the most prevalent wind direction if milk sampling is not performed within 3 km or if milk sampling is not performed at a location within 5 to 8 km where the doses are calculated to be greater than 1 mrem/yr[10]	Monthly when available[5].	18	Gamma isotopic on edible portion.

Table 8 (cont.) - Radiological Environmental Monitoring Program Specifications

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
IX. Fish	A) 1 Indicator sample to be taken at a location in the upper reservoir.	Semiannual[9] collection of the following specie types if available: bass; bream, crappie; catfish, carp.	23[3]	Gamma isotopic on edible portions semiannually[9].
	B) 1 Indicator sample to be taken at a location in the lower reservoir.	Semiannual[9] collection of the following specie types if available: bass; bream, crappie; catfish, carp.	21[3]	Gamma isotopic on edible portions semiannually[9].
	C) 1 Control sample to be taken at a location on the receiving river sufficiently far upstream such that no effects of pumped storage operation are anticipated	Semiannual[9] collection of the following specie types if available: bass; bream, crappie; catfish, carp.	22[3]	Gamma isotopic on edible portions semiannually[9].
AQUATIC: X. Sediment	A) 1 Indicator sample to be taken at a location in the upper reservoir.	Semiannual grab sample.[9]	23[3]	Gamma isotopic.
	B) 1 Indicator sample to be taken on or near the shoreline of the lower reservoir.	Semiannual grab sample.[9]	21[3]	Gamma isotopic.
	C) 1 Control sample to be taken at a location on the receiving river sufficiently far upstream such that no effects of pumped storage operation are anticipated.	Semiannual grab sample.[9]	22[3]	Gamma isotopic.

FOOTNOTES

1. Reserved for future use.
2. Sample site locations are based on 5 year average meteorological analysis.
3. Though generalized areas are noted for simplicity of sample site enumeration, airborne, water and sediment sampling is done at the same location whereas biological sampling sites are generalized areas in order to reasonably assure availability of samples.
4. Milking animal and garden survey results will be analyzed annually. Should the survey indicate new dairying activity the owners shall be contacted with regard to a contract for supplying sufficient samples. If contractual arrangements can be made, site(s) will be added for additional milk sampling up to a total of 3 Indicator Locations.
5. Not to exceed 35 days.
6. Time composite samples are samples which are collected with equipment capable of collecting an aliquot at time intervals which are short (e.g. hourly) relative to the compositing period.
7. At least once per 100 days.
8. At least once per 18 days.
9. At least once per 200 days.
10. The dose shall be calculated for the maximum organ and age group, using the guidance/methodology contained in Regulatory Guide 1.109, Rev. 1 and the parameters particular to the site.
11. Milk and forage sampling at the control location is only required when locations meeting the criteria of VII(A)are being sampled.

Table 9 – Supplemental Radiological Environmental Monitoring

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
AIRBORNE: S-I. Particulate	A) 1 Indicator sample monitoring the nearest community with the highest anticipated dose or ground level concentration.	Continuous sampler operation with weekly collection.	8	Gross beta following filter change; Monthly[+] Composite (by location) for gamma isotopic.
S-II. Radioiodine	A) 1 Indicator sample to be taken from the location of S-1(A) above.	Continuous sampler operation with weekly collection.	8	Gamma isotopic for I-131 weekly.
S-III. Direct	A) 5 stations to be placed within the exclusion boundary.	Quarterly exchange[7]; two or more dosimeters at each location.	61,62,63, 68 & 99	Gamma dose quarterly.
	B) 2 stations to be placed around VCSNS sludge lagoons.	Quarterly exchange[7]; two or more dosimeters at each location.	94,97	Gamma dose quarterly.
WATERBORNE S-IV. Surface Water	A) 1 indicator sample to be taken of the combined wastewater discharge.	Composite samples with monthly collection.[13,5]	77	Gamma isotopic and tritium.
	B) 1 Indicator sample taken at each storm drain outfall.	Daily sample with monthly composite.	72,73	Gamma isotopic and tritium.
S-V. Groundwater	A) 4 Indicator samples to be taken at NPDES monitoring wells.	Semiannual[9]	GW-9, GW-12, GW-13A, GW15	Gamma isotopic, tritium and other as directed.
	B) 1 Control sample to be taken at NPDES monitoring wells.	Semiannual[9]	GW-8	Gamma isotopic, tritium and other as directed.

Table 9 - Supplemental Radiological Environmental Monitoring

Exposure Pathway and/or Sample	Criteria for Selection of Sample Number & Location	Sampling and Collection Frequency	Sample Location	Type & Frequency of Analysis
INGESTION: S-VII. Milk[4]	A) 1 Sample from one of the nearest affected dairies at or beyond 5 miles.	Biweekly grab sample.[8,14,+]	14	Gamma isotopic and I-131 analysis biweekly.
	B) 1 Control sample to be taken at the location of a dairy greater than 20 miles distance and not in the most prevalent wind direction.	Biweekly grab sample.[8,14,+]	16	Gamma isotopic and I-131 analysis biweekly.
	C) 1 Indicator grass (forage) sample to be taken at the location of S-VII(A) above.	Monthly when available.[14]	14	Gamma isotopic.
S-VII. Milk[4]	D) 1 Control grass (forage) sample to be taken at the location of S-VII(B) above.	Monthly when available.[14]	16	Gamma isotopic.
	E) 2 Indicator grass (forage) samples to be taken at 2 of the locations beyond but as close to the exclusion boundary as practical where the highest offsite sectorial ground level concentrations are anticipated.	Monthly when available.	2,7	Gamma isotopic.
	F) 1 Control grass (forage) sample to be used for routine monitoring along with S-IV(E) above.	Monthly when available.	18	Gamma isotopic.
S-VIII. Food Products	A) 1 Indicator sample of various types of foods grown in the area surrounding the plant (root, fruit, grain).	Annually during growing season.[11]	6,7	Gamma isotopic on edible portion.

FOOTNOTES

1. Reserved for future use.

2. Reserved for future use.

3. Reserved for future use.

Table 9 (cont) - Supplemental Radiological Environmental Monitoring

4. Milking animal and garden survey results will be analyzed annually. Should the survey indicate new activity the owners shall be contacted with regard to a contract for supplying sufficient samples. If contractual arrangements can be made, site(s) will be added for additional milk sampling up to a total of 3 Indicator Locations.

5. Not to exceed 35 days.

6. Reserved for future use.

7. At least once per 100 days.

8. At least once per 18 days.

9. At least once per 200 days.

10. Reserved for future use.

11. At least once per 400 days.

12. Reserved for future use.

13. Weekly, when circulating water is not operational.

14. Milk and grass (forage) sampling is not required unless VCSNS gaseous releases exceed 5% of quarterly organ dose limits or radionuclides (attributed to VCSNS operation) are detected in broadleaf vegetation, grass or air samples at concentrations greater than required LLD. Sampling should continue for 2 months after plant releases are reduced to less than trigger levels and milk contamination levels have returned to background levels.

† Reserved for future use.

‡ The ODCM requires semimonthly sampling when animals are on pasture, monthly at other times.

Table 10 – Radiological Environmental Monitoring Program Summary for 1999

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed[1]	Lower Limit of Detection[2] Actual (Max.)	All Indicator Locations Mean[3] (#/total #) (Range)	Location with Highest Annual Mean: Name (Distance & Direction)	Location with Highest Annual Mean: Mean[3] (#/total #) (Range)	Control Locations Mean[3] (#/total #) (Range)	Number of Nonroutine Reported[4] Measurements
Air Particulate (pCi/m^3)	Gross Beta (308)	5.97E-3 (1.0E-2)	2.14E-2 (257/257) (6.40E-3 to 4.02E-2)	Site 6 Environmental Lab Garden (1.0 mi ESE)	2.29E-2 (52/52) (8.00E-3 to 4.01E-2)	2.14E-2 (51/51) (7.43E-3 to 3.89E-2)	0
	Gamma Spec (72)						
	^{134}Cs	1.66E-3 (5.0E-2)	All < LLD			All < LLD	0
	^{137}Cs	2.03E-3 (6.0E-2)	All < LLD			All < LLD	0
Air Radioiodine (pCi/m^3)	^{131}I (308)	2.61E-2 (7.0E-2)	All < LLD			All < LLD	0
Direct (TLD)[5] (μR/hr)	Gamma(132) Quarterly	1.00E+0 N/A	8.46E+0 (112/112) (5.50E+0 to 1.16E+1)	Site 13, North Dam (2.9 mi., NNW)	1.08E+1 (4/4) (1.04E+1 to 1.16E+1)	8.35E+0 (20/20) (5.80+0 to 1.16E+1)	0
	Gamma(24) Special Interest	1.00E+0 N/A	8.92E+0 (24/24) (5.50E+0 to 1.15E+1)	Site 52 Monticello, Road 11 (3.8mi., NNE)	1.10E+1 (4/4) (1.03E+1 to 1.15E+1)	N/A	0
Surface Water (pCi/l)	^{3}H (36)	5.91E+2 N/A	6.23E2 (3/24) (5.46E2 to 7.68E2)	Site 23 Discharge Canal Mont. Res. (0.5mi. ESE)	7.68E+2 (1/12)	All < LLD	0
	Gamma Spec(36)						
	^{54}Mn	1.90E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{58}Co	1.96E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{59}Fe	5.16E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{60}Co	1.83E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{65}Zn	4.20E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Zr	3.49E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Nb	2.32E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{134}Cs	1.70E+0 (1.5E+1)	All < LLD			All < LLD	0

Table 10 (Cont.) - Radiological Environmental Monitoring Program Summary for 1999

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed[1]	Lower Limit of Detection[2] Actual (Max.)	All Indicator Locations Mean[3] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[3] (#/total #) (Range)	Number of Nonroutine Reported[4] Measurements
				Name (Distance & Direction)	Mean[3] (#/total #) (Range)		
Surface Water (Continued)	^{137}Cs	1.88E+0 (1.8E+1)	All < LLD			All < LLD	0
	^{140}Ba	1.31E+1 (6.0E+1)	All < LLD			All < LLD	0
	^{140}La	4.69E+0 (1.5E+1)	All < LLD			All < LLD	0
Ground Water (pCi/l)	^{3}H (12)	5.91E+2 N/A	All < LLD			All < LLD	0
	Gamma Spec (12)						
	^{54}Mn	1.68E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{58}Co	1.70E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{59}Fe	3.84E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{60}Co	1.99E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{65}Zn	4.06E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Zr	3.34E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Nb	1.86E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{134}Cs	1.51E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{137}Cs	1.84E+0 (1.8E+1)	All < LLD			All < LLD	0
	^{140}Ba	6.62E+0 (6.0E+1)	All < LLD			All < LLD	0
	^{140}La	2.35E+0 (1.5E+1)	All < LLD			All < LLD	0

Table 10 (Cont.)- Radiological Environmental Monitoring Program Summary for 1999

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed[1]	Lower Limit of Detection[2] Actual (Max.)	All Indicator Locations Mean[3] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[3] (#/total #) (Range)	Number of Nonroutine Reported[4] Measurements
				Name (Distance & Direction)	Mean[3] (#/total #) (Range)		
Drinking Water[6] (pCi/l)	Gross Beta (36)	1.36E+0 (4.00E+0)	2.71E+0 (24/24) (1.52E+0 to 4.37E+0)	Site 28, Nuc. Trng. Center (2.6 mi, SSE)	2.95E+0 (12/12) (1.88E+0 to 4.37E+0)	2.26E+0 (12/12) (1.53E+0 to 2.26E+0)	0
	^{3}H (36)	5.90E+2 (2.0E+3)	All < LLD			All < LLD	
	Gamma Spec (36)						
	^{54}Mn	5.69E+ 0 (1.5E+ 1)	All < LLD			All < LLD	0
	^{58}Co	5.41E+ 0 (1.5E+ 1)	All < LLD			All < LLD	0
	^{59}Fe	1.08E+ 1 (3.0E+ 1)	All < LLD			All < LLD	0
	^{60}Co	6.03E+ 0 (1.5E+ 1)	All < LLD			All < LLD	0
	^{65}Zn	1.23E+1 (3.0E+ 1)	All < LLD			All < LLD	0
	Zr-95	9.15E+ 0 (3.0E+ 1)	All < LLD			All < LLD	0
	^{95}Nb	7.48E+ 0 (1.5E + 1)	All < LLD			All < LLD	0
	^{131}I	3.16E-1 (1.0E+ 0)	All < LLD			All < LLD	0
	^{134}Cs	5.44E+ 0 (1.5E + 1)	All < LLD			All < LLD	0
	^{137}Cs	5.50E+ 0 (1.8E + 1)	All < LLD			All < LLD	0
	^{140}Ba	2.02E+ 1 (6.0E+ 1)	All < LLD			All < LLD	0
	^{140}La	7.45E+ 0 (1.5E+ 1)	All < LLD			All < LLD	0

Table 10 (Cont.)- Radiological Environmental Monitoring Program Summary for 1999

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed[1]	Lower Limit of Detection[2] Actual (Max.)	All Indicator Locations Mean[3] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[3] (#/total #) (Range)	Number of Nonroutine Reported[4] Measurements
				Name (Distance & Direction)	Mean[3] (#/total #) (Range)		
Grass (pCi/kg wet)	Gamma Spec (36)						
	^{131}I	2.34E+1 (6.0E+1)	All < LLD			All < LLD	0
	^{134}Cs	1.65E+1 (6.0E+1)	All < LLD			All < LLD	0
	^{137}Cs	3.72E+1 (8.0E+1)	2.42E+1 (9/24) (1.24E+1 to 4.64E+1)	Site 2 Env. Lab Garden (1 mi ESE)	4.64E1(9/12) (1.24E+1 to 4.64E+1)	All < LLD	0
Broadleaf Vegetation (pCi/kg wet)	Gamma Spec (34)						
	^{131}I	1.70E+ 1 (6.0E+ 1)	All < LLD			All < LLD	0
	^{134}Cs	1.53E+ 1 (6.0E+ 1)	All < LLD			All < LLD	0
	^{137}Cs	1.98E+ 1 (8.0E+ 1)	All < LLD			All < LLD	0
Other Vegetation (pCi/kg wet)	Gamma Spec (9)						
	^{131}I	1.61E+ 1 (6.0E+ 1)	All < LLD			All < LLD	0
	^{134}Cs	1.26E+ 1 (6.0E+ 1)	All < LLD			All < LLD	0
	^{137}Cs	1.88E+ 1 (8.0E + 1)	All < LLD			All < LLD	0
Fish[7] (pCi/kg wet)	Gamma Spec (18)						
	^{54}Mn	1.75E+ 1 (1.3E+ 2)	All < LLD			All < LLD	0
	^{58}Co	1.84E + 1 (1.3E+ 2)	All < LLD			All < LLD	0
	^{59}Fe	4.10E+ 1 (2.6E+ 2)	All < LLD			All < LLD	0

Table 10 (Cont.)- Radiological Environmental Monitoring Program Summary for 1999

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed[1]	Lower Limit of Detection[2] Actual (Max.)	All Indicator Locations Mean[3] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[3] (#/total #) (Range)	Number of Nonroutine Reported[4] Measurements
				Name (Distance & Direction)	Mean[3] (#/total #) (Range)		
Fish[7] (Cont)	^{60}Co	2.20E+1 (1.3E+2)	All < LLD			All < LLD	0
	^{65}Zn	4.02E+1 (2.6E+2)	All < LLD			All < LLD	0
	^{134}Cs	1.49E+1 (1.3E+2)	All < LLD			All < LLD	0
	^{137}Cs	1.91E+1 (1.5E+2)	1.06E+1 (3/12) (5.45E+0 to 1.06E+1)	Site 23 Disc. Canal (Mont. Res.0.5 mi ESE)	8.89E+0 (2/6) (7.16E+0 to 1.06E+01)	1.12E+01 (1/6)	0
Sediment (pCi/kg)[8]	Gamma Spec (6)						
	^{54}Mn	1.46E+1 N/A	All < LLD			All < LLD	0
	^{58}Co	1.18E+1 N/A	All < LLD			All < LLD	0
	^{60}Co	1.23E+1 N/A	2.97E+1 (4/4) (1.83E1 to 3.84E1)	Site 23 Disc. Canal (Mont. Res.0.5 mi ESE)	3.34E+1 (2/2) (2.84E1 to 3.84E1)	All < LLD	0
	^{134}Cs	1.42E+1 (1.5E+2)	All < LLD			All < LLD	0
	^{137}Cs	* (1.8E+2)	1.67E+2 (4/4) (1.48E+1 to 2.01E+2)	Site 21	1.74+2 (2/2) (1.48E+2 to 2.01E+2)	2.02E+2 (2/2) (1.90E+2 to 2.14E+1)	0

Table 10 (cont) - Radiological Environmental Monitoring Program Summary for 1999

Footnotes

1. Includes indicator and control analyses. Does not include supplemental samples. All supplemental sample results were consistent with the tabulated results shown.

2. Values given are maximum MDA values for indicator locations calculated from the program data analyses with maximum acceptable LLD values allowed from NRC guidelines are given in parentheses.

3. Mean and range are based on detectable measurements only. The fractions of detectable measurements (i.e., number of positive results/total number of measurements) at specific locations are indicated in parentheses.

4. Any confirmed measured level of radioactivity in any environmental medium that exceeds the reporting requirements of ODCM, Section 1.4.1.2.

5. Detection sensitivity is approximately 10 mrem/yr (1.0 μR/hr).

6. Elevated levels of ^{214}Pb and ^{214}Bi were observed in all Jenkinsville drinking water samples. The values are not reported here because they are naturally occurring (do not originate from VCSNS) and furnish no quantifiable information of interest.

7. Fish include 3 groups (Bass, Bream/Crappie, Catfish/Carp).

8. Elevated levels of ^{214}Pb and ^{214}Bi plus other ^{226}Ra daughter products and ^{228}Ac plus other ^{232}Th daughter products were observed in all sediment samples. The values are not reported here because they are naturally occurring (do not originate from VCSNS) and furnish no quantifiable information of interest.

9. Maximum MDA from control location used.

* All measurements had positive results, no MDA values calculated.

Table 11 – Radiological Environmental Program Preoperational (Baseline) Summary

Medium or Pathway Sampled (Unit of Measurement and Reporting Period)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] Actual (Max.)	All Indicator Locations Mean[2] (#/total #) (Range)	Location with Highest Annual Mean: Name (Distance & Direction)	Location with Highest Annual Mean: Mean[2] (#/total #) (Range)	Control Locations Mean[2] (#/total #) (Range)	Number of Nonroutine Reported[3] Measure-ments
Air Particulate (pCi/m^3) (1981-1982)	Gross Beta (1300)	4.1E-3 (1.0E-2)	1.1E-1 (562/564)[4] (1.3E-2 to 5.5E-1) 2.7E-2 (456/462)[4] (9.3E-3 to 6.6E-2)	Site 13, North Dam (2.9 mi NNW) Site 8, Mon. Res. S of Rd 224 (1.5 ENE)	1.3E-1 (52/52) (2.1E-2 to 5.5E-1) 3.0E-2 (42/42) (1.2E-2 to 6.0E-2)	1.2E-1 (153/155) (7.9E-3 to 6.1E-1) 2.8E-2 (125/126) (1.2E-2 to 5.8E-2)	0
	Gamma Spec (307)						
	^{134}Cs	3.0E-3 (1.0E-2)	All < LLD			All < LLD	0
	^{137}Cs	3.1E-3 (1.0E-2)	3.2E-3 (22/241) (1.5E-3 to 5.2E-3)	Site 10, Met Tower (2.4 mi NNE)	3.8E-3 (2/22) (2.5E-3 to 5.2E-3)	4.2E-3 (4/66) (3.2E-3 to 5.6E-3)	0
Air Radioiodine (pCi/m^3) (1982)	^{131}I (290)	3.6E-2 (7.0E-2)	All < LLD			All < LLD	0
Direct (TLD)[5] (μR/hr) (1978-1982)	Gamma(1220) Monthly	0.5 N/A	9.9 (915/915) (6.7 to 14.7)	Site 13, North Dam (2.9 mi NNW)	13.1 (61/61) (12.2 to 14.2)	9.7 (305/305) (6.4 to 13.5)	0
	Gamma(161) Quarterly	0.5 N/A	10.2 (154/154) (6.8 to 14.7)	Site 55, St. Barnabas Church (2.8 mi E)	14.0(7/7) (13.1 to 14.7)		0
Surface Water (pCi/l) (1981-1982)	^{3}H (43)	1.1E+3 (2.0E+3)	1.4E+3 (18/29) (1.1E+3 to 2.4E+3)	Site 17, Columbia Canal (24.7 mi, SE)	1.6E+3 (2/7) (1.4E+3 to1.8E+3)	1.2E+3 (6/14) (6.7E+2 to 1.6E+3)	0
	Gamma Spec (140)						
	^{54}Mn	2.7E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{58}Co	2.9E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{59}Fe	6.0E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{60}Co	2.4E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{65}Zn	7.9E-1 (3.0E+1)	All < LLD			All < LLD	0

Table 11 (Cont.) - Radiological Environmental Program Preoperational (Baseline) Summary

Medium or Pathway Sampled (Unit of Measurement and Reporting Period)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] Actual (Max.)	All Indicator Locations Mean[2] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[2] (#/total #) (Range)	Number of Nonroutine Reported[3] Measure-ments
				Name (Distance & Direction)	Mean[2] (#/total #) (Range)		
	^{95}Zr	5.2E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{95}Nb	3.3E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{134}Cs	3.0E-1 (1.5E+1)	All < LLD			All < LLD	0
	^{137}Cs	2.2E-1 (1.8E+1)	All < LLD			All < LLD	0
	^{140}Ba	2.2E+0 (6.0E+1)	All < LLD			All < LLD	0
	^{140}La (1982 only)	5.5E-1 (1.5E+1)	All < LLD			All < LLD	0
Ground Water (pCi/l) (1981-1982)	^{3}H (29)	9.0E+2 (2.0E+3)	1.5E+3 (16/16) (9.5E+2 to 2.3E+3)	Site 26, Onsite Well P4 (265 ft, W)	1.6E+3 (8/8) (9.5E+2 to 2.3E+3)	1.3E+3 (13/13) (1.0E+3 to 1.9E+3)	0
	Gamma Spec (32)						
	^{54}Mn	3.7E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{58}Co	3.8E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{59}Fe	7.8E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{60}Co	3.8E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{65}Zn	8.1E+0 (3.0E+1)	All < LLD			All < LLD	0
	^{95}Zr	6.8E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{95}Nb	4.6E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{134}Cs	3.7E+0 (1.5E + 1)	All < LLD			All < LLD	0
	^{137}Cs	3.8E+0 (1.8E + 1)	All < LLD			All < LLD	0

Table 11 (Cont) - Radiological Environmental Program Preoperational (Baseline) Summary

Medium or Pathway Sampled (Unit of Measurement and Reporting Period)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] Actual (Max.)	All Indicator Locations Mean[2] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[2] (#/total #) (Range)	Number of Nonroutine Reported[3] Measure-ments
				Name (Distance & Direction)	Mean[2] (#/total #) (Range)		
	^{140}Ba	1.9E+1 (6.0E+1)	All < LLD			All < LLD	0
	^{140}La (1982 only)	5.0E0 (1.5E+1)	All < LLD			All < LLD	0
Drinking Water[6] (pCi/l) (1981-1982)	Gross Beta[7]	(2.0E+0)					
	^{3}H (14)	6.3E+2 (1.0E+3)	7.8E+2 (6/14) (6.8E+2 to 9.8E+2)	Site 28, Jenkinsville (2.0 mi SE)[7]	8.4E+2 (3/7) (7.0E+2 to 9.8E+2)		0
	Gamma Spec (44)						
	^{54}Mn	3.0E-1 (1.5E+1)	All < LLD				0
	^{58}Co	2.7E-1 (1.5E+1)	All < LLD				0
	^{59}Fe	9.6E0 (3.0E+1)	All < LLD				0
	^{60}Co	2.6E-1 (1.5E+1)	All < LLD				0
	^{65}Zn	3.4E-1 (3.0E+1)	All < LLD				0
	^{95}Zr	4.8E-1 (1.5E+1)	All < LLD				0
	^{131}I	3.4E-1 (1.5E+1)	All < LLD				0
	^{95}Nb	7.4E-1 (1.0E+0)	All < LLD				0
	^{134}Cs	2.2E-1 (1.0E+1)	All < LLD				0
	^{137}Cs	2.4E-1 (1.8E+1)	All < LLD				0
	^{140}Ba	2.5E0 (6.0E+1)	All < LLD				0
	^{140}La (1982 only)	4.4E-1 (1.5E+1)	All < LLD				0

Table 11 (Cont) - Radiological Environmental Program Preoperational (Baseline) Summary

Medium or Pathway Sampled (Unit of Measurement and Reporting Period)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] Actual (Max.)	All Indicator Locations Mean[2] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[2] (#/total #) (Range)	Number of Nonroutine Reported[3] Measure-ments
				Name (Distance & Direction)	Mean[2] (#/total #) (Range)		
Milk (pCi/l) (1981-1982)	Gamma Spec (94)						
	^{131}I	6.3E-1 (1.0E+0)	All < LLD			All < LLD	0
	^{134}Cs	3.3E+0 (1.5E+1)	All < LLD			All < LLD	0
	^{137}Cs	4.6E0 (1.5E+1)	4.1E+0 (8/47) (2.8E+0 to 6.1E+0)	Site 14, Dairy (5.1 mi., W)	4.1E+0 (8/47) (2.8E+0 to 6.1E+0)	5.7E+0 (37/47) (3.7E+0 to 9.2E+0)	0
	^{140}Ba	1.1E+1 (1.5E + 1)	All < LLD			All < LLD	0
	^{140}La	4.4E+0 (1.5E+1)	All < LLD			All < LLD	0
Grass (pCi/kg wet) (1981-1982)	Gamma Spec (82)						
	^{131}I	6.7E+1 (6.0E+1)	All < LLD			All < LLD	0
	^{134}Cs	2.7E+1 (8.0E+1)	All < LLD			All < LLD	0
	^{137}Cs	3.3E+1 (8.0E+1)	5.0E+1 (13/51) (1.6E+1 to 1.6E+2)	Site 14, Dairy (5.1 mi W)	5.9E+1 (5/29) (1.6E+1 to 1.6E+2)	1.3E+2 (6/31) (1.3E+1 to 3.4E+2)	0
Broadleaf Vegetation (pCi/kg wet) (1980-1982)	Gamma Spec (10)						
	^{131}I	3.7E+1 (6.0E+1)	All < LLD				0
	^{134}Cs	1.9E+1 (8.0E+1)	All < LLD				0
	^{137}Cs	2.1E+1 (8.0E+1)	3.1E+1 (2/7) (1.8E+1 to 3.6E+1)	Site 2, Trans. Line (1.2 mi SW)	3.6E+1 (1/1) (Single Value)	All < LLD	0

Table 11(Cont.) - Radiological Environmental Program Preoperational (Baseline) Summary

Medium or Pathway Sampled (Unit of Measurement and Reporting Period)	Type and Total Number of Analyses Performed	Lower Limit of Detection[1] Actual (Max.)	All Indicator Locations Mean[2] (#/total #) (Range)	Location with Highest Annual Mean		Control Locations Mean[2] (#/total #) (Range)	Number of Nonroutine Reported[3] Measure-ments
				Name (Distance & Direction)	Mean[2] (#/total #) (Range)		
Other Vegetation (pCi/kg wet) (1980-1982)	Gamma Spec (32)						
	^{134}Cs	8.4E+0 (8.0E+1)	All < LLD			All < LLD	0
	^{137}Cs	1.0E+1 (8.0E+1)	All < LLD			All < LLD	0
Fish (pCi/kg wet) (1980 - 1982)	Gamma Spec (92)						
	^{134}Cs	1.4E+1 (1.3E+2)	All < LLD			All < LLD	0
	^{137}Cs	1.8E+1 (1.3E+2)	2.8E+1 (50/71) (1.1E+1 to 1.0E+2)	Site 24, Recreation Lake (5.5 mi, N)	3.4E+1 (17/23) 1.2E+1 to 1.0E+2)	3.1E+1 (19/21) (1.0E+1 to 7.9E+1)	0
	^{58}Co	2.6E+1 (1.3E+2)	All < LLD			All < LLD	0
	^{54}Mn	1.8E+1 (1.3E+2)	All < LLD			All < LLD	0
	^{59}Fe	9.0E+1 (2.6E+2)	All < LLD			All < LLD	0
	^{65}Zn	4.1E+1 (2.6E+2)	All < LLD			All < LLD	0
	^{60}Co	1.8E+1 (1.3E+2)	All < LLD			All < LLD	0
Sediment (pCi/kg) (1980-1982)	Gamma Spec (24)						
	^{134}Cs	2.3E+1 (1.5E+2)	All < LLD			All < LLD	0
	^{137}Cs	2.4E+1 (1.5E+2)	1.7E+2 (12/18) (2.6E+1 to 4.5E+2)	Site 21, Parr Reservoir (2.7 mi, SSW)	2.6E+2 (6/6) (2.6E+1 to 4.5E+2)	4.2E+2 (6/6) (1.8E+1 to 1.0E+3)	0

Table 11 (Cont.)- Radiological Environmental Program Preoperational (Baseline) Summary

Footnotes

1. Values given are MDA values calculated from the program data analyses with maximum acceptable LLD values allowed from NRC guidelines given in parentheses.

2. Mean and range are based on detectable measurements only. The fractions of detectable measurements at specific locations are indicated in parentheses.

3. A non-routine measurement is any confirmed measured level of radioactivity in an environmental medium that exceeds the reporting requirements of VCSNS ODCM, Section 1.4.1.2.

4. The baseline values are high because of the fallout from the Chinese bomb test in 1980. The first set of data reflects the 1981 baseline. The second set of data reflects the 1982 baseline, essentially free of bomb test fallout. The 1982 data covers the period 1/1/82 - 10/22/82.

5. Detection sensitivity is approximately 5 mrem/yr (0.5 μR/hr) determined from the analyses of five years of preoperational data.

6. No control location was specified for drinking water during the preoperational monitoring period.

7. Inconclusive data.

Table 12 – 1999 Environmental Sampling Program Exceptions

Media	Sample Location	Month (Week No.)	Cause for Exception
Air	30	Jan (14)	Breaker trip
	30	June (9)	Breaker trip
	7	July (22)	Breaker trip
	7	July (28)	Breaker trip
	7	August (25)	Power Failure
	17	September (1)	Sampler malfunction
Air Radioiodine	30	Jan (14)	Breaker trip
	30	June (9)	Breaker trip
	7	July (22)	Breaker trip
	7	July (28)	Breaker trip
	7	August (25)	Power Failure
	17	September (1)	Sampler malfunction
Broadleaf	18	March (15)	Sample not available
	18	April (15)	Sample not available
Direct Radiation	32	Second Quarter	Missing
	43	Second Quarter	Missing
	47	Second Quarter	Missing
	32	Third Quarter	Missing

N

LEGEND

CONTROL SAMPLE LOCATIONS

A=AIR PARTICULATE SITE

D=DIRECT (TLD) SITE

I=AIRBORNE RADIOIODINE SITE

W=WATER SITE

O=OTHER (GARDEN PRODUCTS, FISH, SEDIMENT, GRASS, MILK)

REFERENCE:
THE BASE FOR THIS MAP WAS PREPARED FROM A PORTION OF USGS STATE OF GEORGIA, 1970.

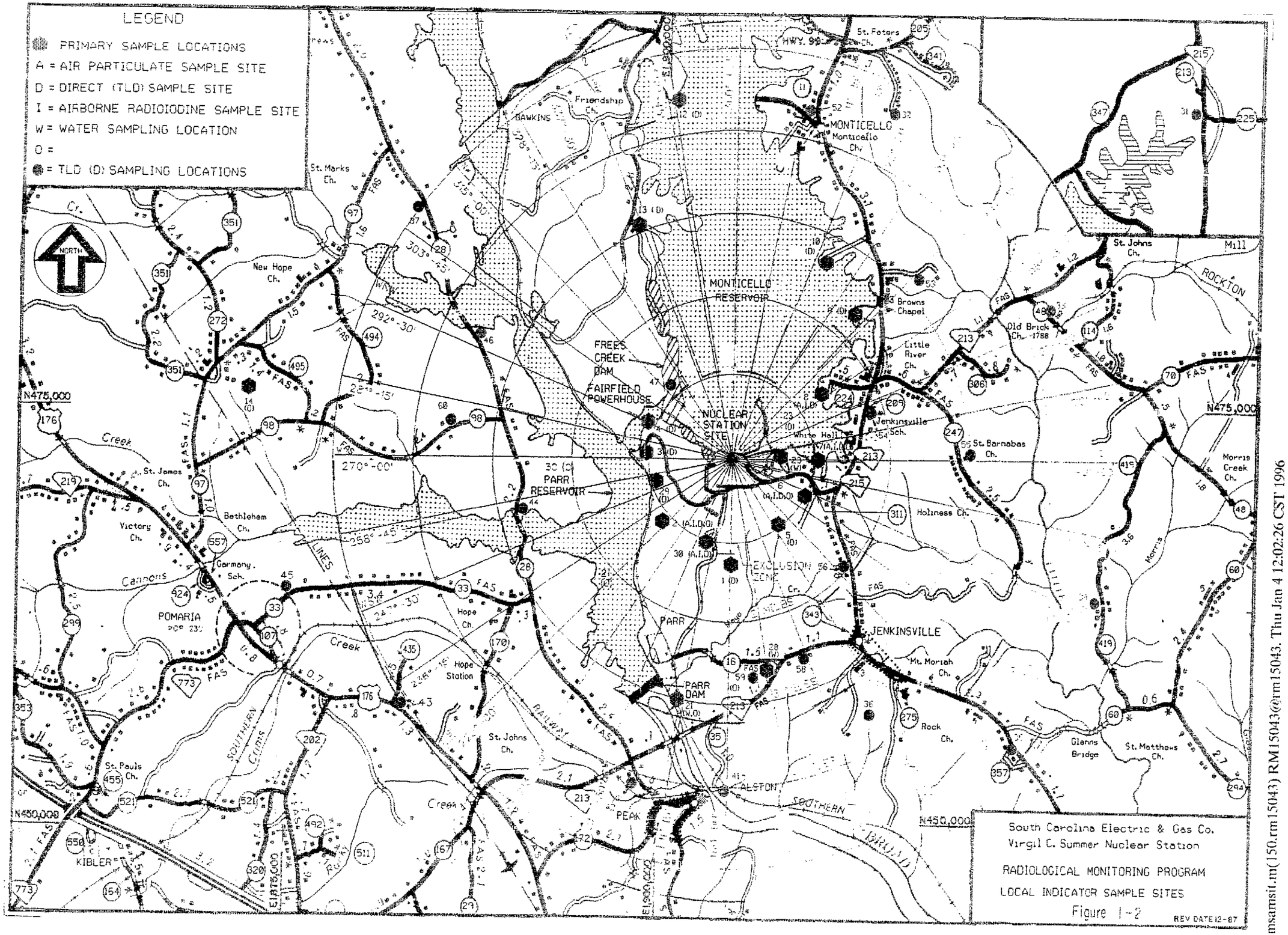
STATUTE MILES

South Carolina Electric & Gas Co.
Virgil C. Summer Nuclear Station

Regional Location Map

Figure 1-1

REV DATE 12-87



rmsamsit.m(150.rm15043) RM15043@rm15043. Thu Jan 4 12:02:26 CST 1996