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May 13, 2010

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Station
Docket Nos. 50-269, 50-270 and 50-287
Annual Radiological Environmental Operating Report

Dear Sir:

Pursuant to Oconee Nuclear Station Technical Specification 5.6.2, please find enclosed the Oconee Nuclear Site Annual Radiological Environmental Operating Report for 2009.

Any questions concerning this report may be directed to Judy Smith at 864-873-4309.

Sincerely,

Dave Baxter
Vice President
Oconee Nuclear Station

Attachment 1 Annual Radiological Environmental Operating Report (hard copy)
Attachment 2 Annual Radiological Environmental Operating Report (CD)

IE25
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Duke Energy

Oconee Nuclear Station
Units 1, 2 and 3

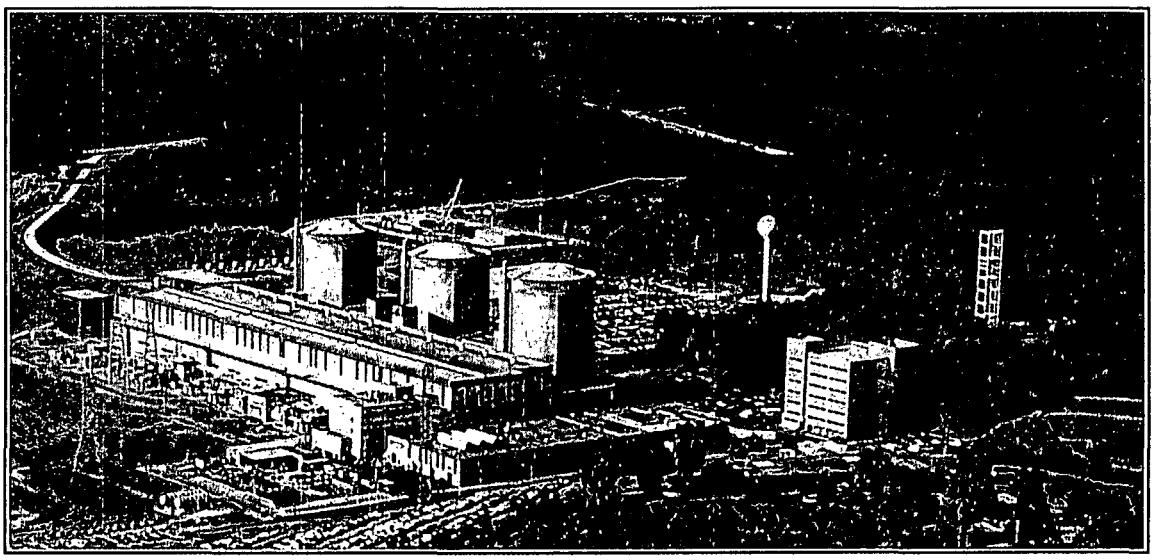
AREOR

Annual
Radiological Environmental
Operating Report
2009

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

DUKE ENERGY CORPORATION
OCONEE NUCLEAR STATION
Units 1, 2, and 3

2009



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LIST OF ACRONYMS USED IN THIS TEXT *(in alphabetical order)*

BW	BiWeekly
C	Control
DEHNR	Department of Environmental Health and Natural Resources
DHEC	Department of Health and Environmental Control
EPA	Environmental Protection Agency
ERA	Environmental Resource Associates
GI-LLI	Gastrointestinal – Lower Large Intestine
GPS	Global Positioning System
LLD	Lower Limit of Detection
M	Monthly
MDA	Minimum Detectable Activity
MOA	Memorandum of Agreement
mrem	Millirem
NIST	National Institute of Standards and Technology
NRC	Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
ONS	Oconee Nuclear Station
pCi/kg	picocurie per kilogram
pCi/l	picocurie per liter
pCi/m3	picocurie per cubic meter
PIP	Problem Investigation Process
Q	Quarterly
REMP	Radiological Environmental Monitoring Program
SA	Semiannually
SLCs	Selected Licensee Commitments
SM	Semimonthly
TECH SPECs	Technical Specifications
TLD	Thermoluminescent Dosimeter
μCi/ml	microcurie per milliliter
UFSAR	Updated Final Safety Analysis Report
W	Weekly

1.0 EXECUTIVE SUMMARY

This Annual Radiological Environmental Operating Report describes the Oconee Nuclear Station Radiological Environmental Monitoring Program (REMP), and the program results for the calendar year 2009.

Included are the identification of sampling locations, descriptions of environmental sampling and analysis procedures, comparisons of present environmental radioactivity levels and pre-operational environmental data, comparisons of doses calculated from environmental measurements and effluent data, analysis of trends in environmental radiological data as potentially affected by station operations, and a summary of environmental radiological sampling results. Quality assurance practices and program changes are also discussed.

Sampling activities were conducted as prescribed by Selected Licensee Commitments (SLC's). Required analyses were performed and detection capabilities were met for all collected samples as required by SLC's. Nine-hundred sixty-nine samples were analyzed comprising 1,346 test results in order to compile data for the 2009 report. Based on the annual land use census, the current number of sampling sites for Oconee Nuclear Station is sufficient.

Concentrations observed in the environment in 2009 for station related radionuclides were within the ranges of concentrations observed in the past. Inspection of data showed that radioactivity concentrations in drinking water, surface water, shoreline sediment, and fish are higher than the activities reported for samples collected at control locations. All positively identified measurements were within limits as specified in SLC's.

Additionally, environmental radiological monitoring data is consistent with effluents introduced into the environment by plant operations. The total body dose estimated to the maximum exposed member of the public as calculated by environmental sampling data, excluding TLD results, was 5.97E-02 mrem for 2009. It is therefore concluded that station operations has had no significant radiological impact on the health and safety of the public or the environment.

2.0 INTRODUCTION

2.1 SITE DESCRIPTION AND SAMPLE LOCATIONS

Oconee Nuclear Station (ONS) is located in Oconee County, South Carolina, approximately 8 miles northeast of Seneca, South Carolina, on the shore of Lake Keowee. This lake was formed by damming the Keowee and Little Rivers in that location. Immediately to the south is the U.S. Government Hartwell Project. The Keowee Hydroelectric Plant near the station joins Lake Keowee and the upper reaches of Lake Hartwell. To the north, the Jocassee Hydroelectric Plant joins Lake Jocassee and Lake Keowee. Jocassee is a pumped storage plant.

ONS consists of three pressurized water reactors. Each unit has an output of 846 megawatts net. Unit 1 license for operation was issued 2/6/1973. Unit 2 license for operation was issued 10/6/1973. Unit 3 license for operation was issued 7/19/1974. An independent spent fuel storage installation is also located at the site.

Figures 2.1-1 and 2.1-2 are maps depicting the Thermoluminescent Dosimeter (TLD) monitoring locations and the sampling locations. The location numbers shown on these maps correspond to those listed in Tables 2.1-A and 2.1-B. Figure 2.1-1 comprises all sample locations within a one mile radius of ONS. Figure 2.1-2 comprises all sample locations within a ten mile radius of ONS.

2.2 SCOPE AND REQUIREMENTS OF THE REMP

An environmental monitoring program has been in effect at Oconee Nuclear Station since 1969, four years prior to operation of Unit 1 in 1973. The preoperational program provides data on the existing environmental radioactivity levels for the site and vicinity which may be used to determine whether increases in environmental levels are attributable to the station. The operational program provides surveillance and backup support of detailed effluent monitoring which is necessary to evaluate the significance, if any, of the contributions to the existing environmental radioactivity levels that result from station operation.

This monitoring program is based on NRC guidance as reflected in the Selected Licensee Commitments Manual, with regard to sample media, sampling locations, sampling frequency, and analytical sensitivity requirements. Indicator and control locations were established for comparison purposes to distinguish radioactivity of station origin from natural or other "man-made" environmental radioactivity. The environmental monitoring program also verifies projected and anticipated radionuclide concentrations in the environment and related exposures from releases of radionuclides from Oconee Nuclear Station. This program satisfies the requirements of Section IV.B.2 of Appendix I to 10CFR50 and 10CFR72.44(d)(2) and provides surveillance of all appropriate critical exposure pathways to man and protects vital interests of the company, public, and state and federal agencies concerned with the environment. Reporting

levels for radioactivity found in environmental samples are listed in Table 2.2-A. Table 2.2-B lists the REMP analysis and frequency schedule.

The Annual Land Use Census, required by Selected Licensee Commitments, is performed to ensure that changes in the use of areas at or beyond the site boundary are identified and that modifications to the Radiological Environmental Monitoring Program are made if required by changes in land use. This census satisfies the requirements of Section IV.B.3 of Appendix I to 10CFR50. Results are shown in Table 3.9.

Participation in an interlaboratory comparison program as required by Selected Licensee Commitments provides for independent checks on the precision and accuracy of measurements of radioactive material in REMP sample matrices. Such checks are performed as part of the quality assurance program for environmental monitoring in order to demonstrate that the results are valid for the purposes of Section IV.B.2 of Appendix I to 10CFR50. A summary of the results obtained as part of this comparison program are in Section 5 of this annual report.

2.3 STATISTICAL AND CALCULATIONAL METHODOLOGY

2.3.1 ESTIMATION OF THE MEAN VALUE

There was one (1) basic statistical calculation performed on the raw data resulting from the environmental sample analysis program. The calculation involved the determination of the mean value for the indicator and the control samples for each sample medium. The mean is a widely used statistic. This value was used in the reduction of the data generated by the sampling and analysis of the various media in the Radiological Environmental Monitoring Program. "Net activity (or concentration)" is the activity (or concentration) determined to be present in the sample. No "Minimum Detectable Activity", "Lower Limit of Detection", "Less Than Level", or negative activities or concentrations are included in the calculation of the mean. The following equation was used to estimate the mean (reference 6.8):

$$\overline{x} = \frac{\sum_{i=1}^{N} x_i}{N}$$

Where:

$\overline{x}$ = estimate of the mean,
i = individual sample,
N = total number of samples with a net activity (or concentration),
χ_i = net activity (or concentration) for sample i.

2.3.2 LOWER LEVEL OF DETECTION AND MINIMUM DETECTABLE ACTIVITY

The Lower Level of Detection (LLD) and Minimum Detectable Activity (MDA) are used throughout the Environmental Monitoring Program.

LLD - The LLD, as defined in the Selected Licensee Commitments Manual is the smallest concentration of radioactive material in a sample that will yield a net count, above the system background, that will be detected with 95% probability with only 5% probability of falsely concluding that a blank observation represents a "real" signal. The LLD is an *a priori* lower limit of detection. The actual LLD is dependent upon the standard deviation of the background counting rate, the counting efficiency, the sample size (mass or volume), the radiochemical yield, and the radioactive decay of the sample between sample collection and counting. The "required" LLD's for each sample medium and selected radionuclides are given in the Selected Licensee Commitments and are listed in Table 2.2-C.

MDA - The MDA is the net counting rate (sample after subtraction of background) that must be surpassed before a sample is considered to contain a scientifically measurable amount of a radioactive material exceeding background amounts. The MDA is calculated using a sample background and may be thought of as an "actual" LLD for a particular sample measurement.

2.3.3 TREND IDENTIFICATION

One of the purposes of an environmental monitoring program is to determine if there is a buildup of radionuclides in the environment due to the operation of the nuclear station. Visual inspection of tabular or graphical presentations of data (including preoperational) is used to determine if a trend exists. A decrease in a particular radionuclide's concentration in an environmental medium does not indicate that reactor operations are removing radioactivity from the environment but that reactor operations are not adding that radionuclide to the environment in quantities exceeding the preoperational level and that the normal removal processes (radioactive decay, deposition, resuspension, etc.) are influencing the concentration.

Substantial increases or decreases in the amount of a particular radionuclide's release from the nuclear plant will greatly affect the resulting environmental levels; therefore, a knowledge of the release of a radionuclide from the nuclear plant is necessary to completely interpret the trends, or lack of trends, determined from the environmental data. Some factors that may affect environmental levels of radionuclides include prevailing weather conditions (periods of drought, solar cycles or heavier than normal precipitation), construction in or around either the nuclear plant or the sampling location, and addition or deletion of other sources of radioactive materials (such as the Chernobyl accident). Some of these factors may be obvious while others are sometimes unknown. Therefore, how trends are identified will include some judgment by plant personnel.

Figure 2.1-1

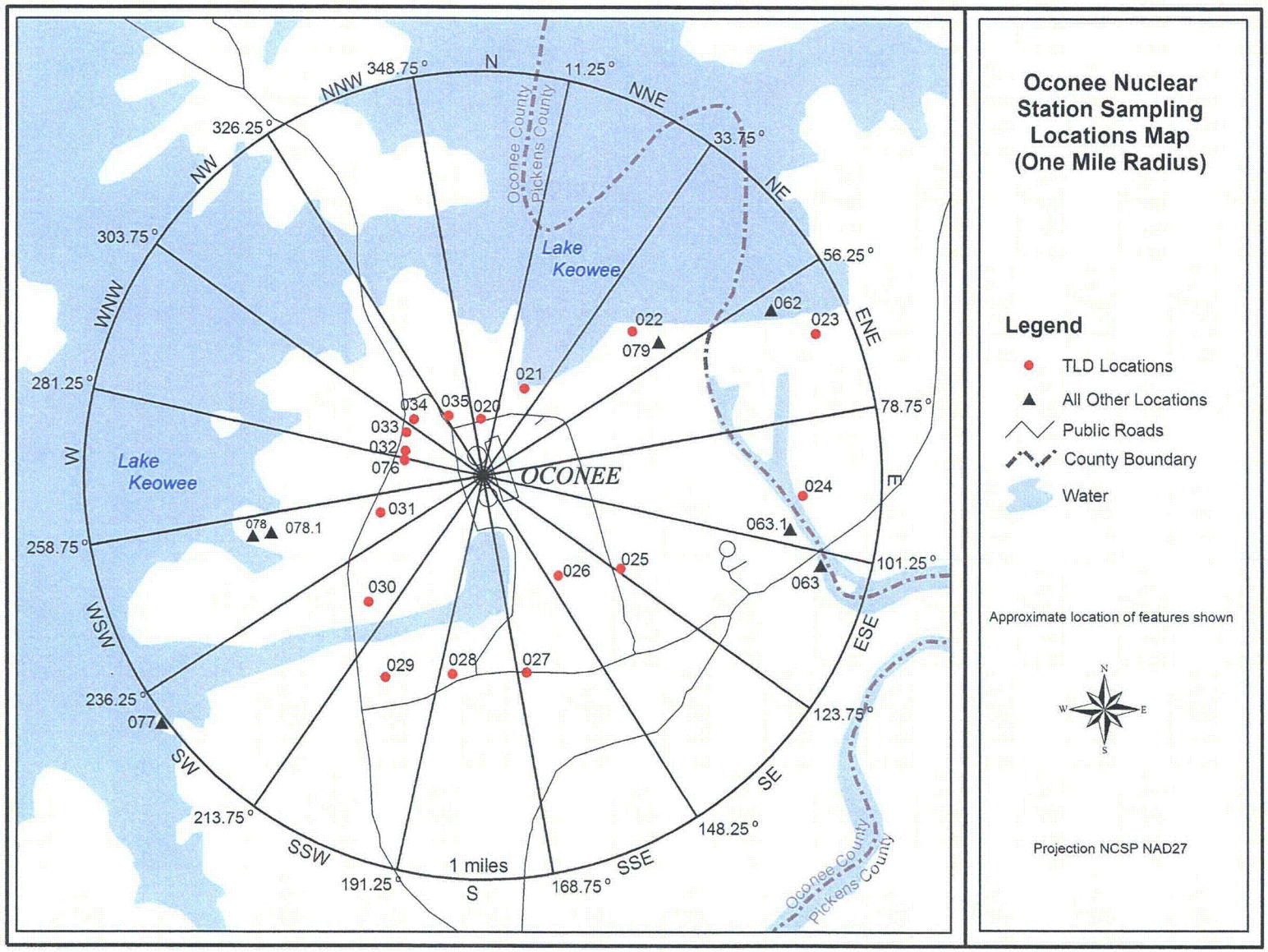

Oconee Nuclear Station Sampling Locations Map (One Mile Radius)
Legend
TLD Locations
All Other Locations
Public Roads
County Boundary
Water
Approximate location of features shown
Projection NCSP NAD27
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
348.75°
11.25°
33.75°
56.25°
78.75°
101.25°
123.75°
148.25°
168.75°
191.25°
213.75°
236.25°
258.75°
281.25°
303.75°
326.25°
1 miles
OCONEE
Lake Keowee
Lake Keowee
Oconee County
Pickens County
Oconee County
Pickens County
021
022
023
024
025
026
027
028
029
030
031
032
033
034
035
020
076
077
078
078.1
079
062
063
063.1

Figure 2.1-2

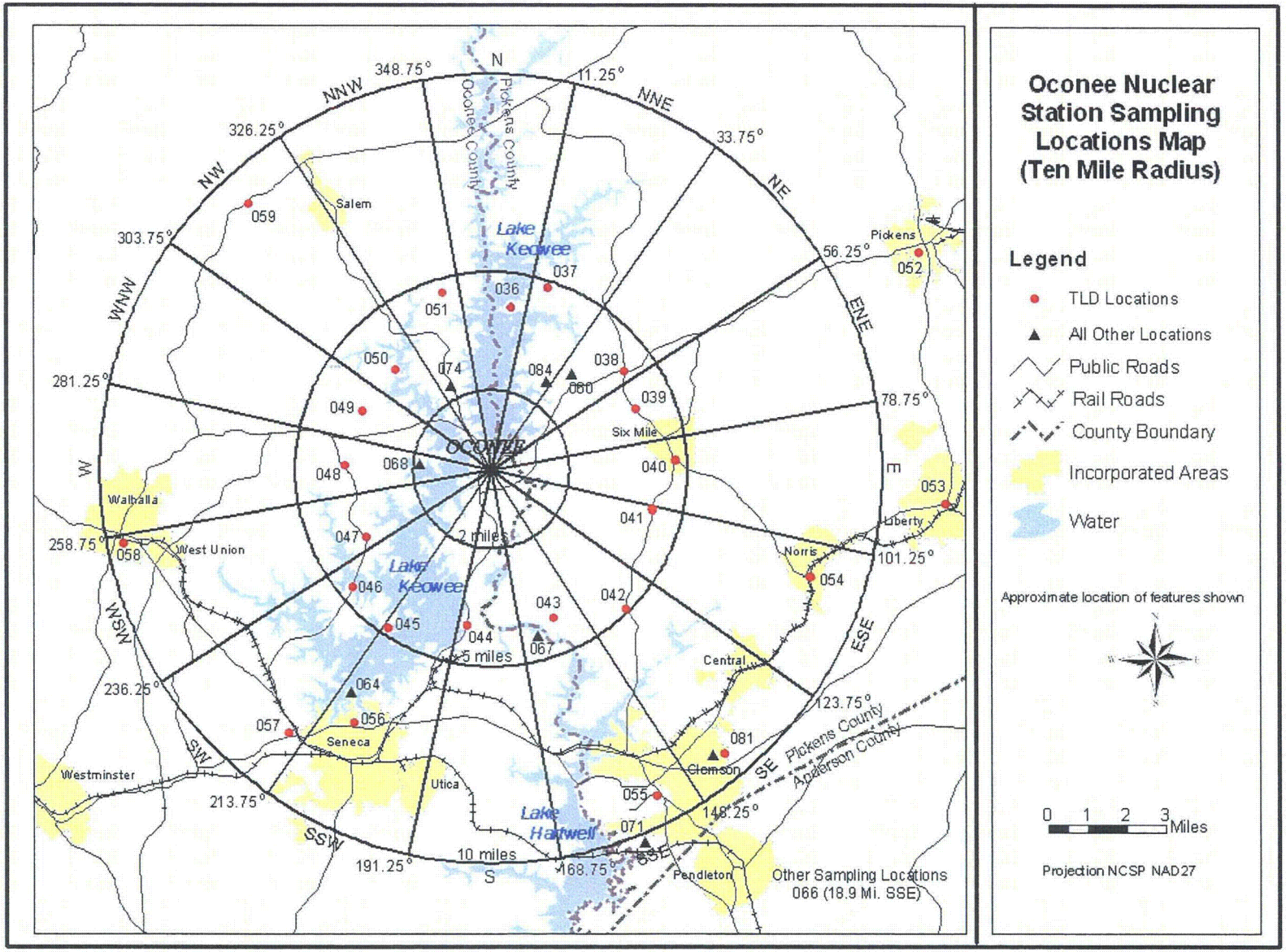

Oconee Nuclear Station Sampling Locations Map (Ten Mile Radius)
Legend
TLD Locations
All Other Locations
Public Roads
Rail Roads
County Boundary
Incorporated Areas
Water
Approximate location of features shown
0 1 2 3 Miles
Projection NCSP NAD27
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
348.75°
11.25°
33.75°
56.25°
78.75°
101.25°
123.75°
148.25°
168.75°
191.25°
213.75°
236.25°
258.75°
281.25°
303.75°
326.25°
OCONEE
2 miles
5 miles
10 miles
Lake Keowee
Lake Hartwell
Oconee County
Pickens County
Anderson County
Salem
Pickens
Six Mile
Walhalla
West Union
Norris
Liberty
Central
Seneca
Westminster
Utica
Clemson
Pendleton
059
052
036
037
051
050
074
084
060
038
039
049
040
068
048
053
041
047
058
046
054
043
042
045
044
067
064
056
057
081
055
071
Other Sampling Locations
066 (18.9 Mi. SSE)

TABLE 2.1-A

OCONEE RADIOLOGICAL MONITORING PROGRAM SAMPLING LOCATIONS

Table 2.1-A Codes			
W	Weekly	SM	Semimonthly
BW	BiWeekly	Q	Quarterly
M	Monthly	SA	Semiannually
C	Control		

Site #	Location Description*	Air Rad. & Particulate	Surface Water	Drinking Water	Shoreline Sediment	Fish	Milk	Broadleaf Vegetation
060	Greenville Water Intake Road (3.23 NE)			M				
060 C **	Greenville Water Intake Road (2.28 NE)					SA		
062 C	Lake Keowee Hydro Intake (0.85 mi ENE)		M					
063	Lake Hartwell Hwy 183 Bridge (0.80 mi ESE) [000.7]				SA	SA		
063.1	Lake Hartwell Hwy 183 (0.79 mi E)		M					
064 C	Seneca (6.67 mi SSW) [004.1]			M				
066	Anderson (18.9 mi SSE) [012]			M				
067	Lawrence Ramsey Bridge Hwy 27 (4.34 mi SSE) [005.2]				SA	SA		
068 C	High Falls County Park (1.82 mi W)				SA			
071 C	Clemson Dairy (10.2 mi SSE) [006.3]						SM	
074	Keowee Key Resort (2.36 mi NNW)	W						
077	Skimmer Wall (1.00 mi SW)	W						M
078 (1)	Recreation Site (0.58 mi WSW)	W						
078.1 (1)	Recreation Site (0.53 mi WSW)	W						
079	Keowee Dam (0.56 mi NE)	W						M
081 C	Clemson Operations Center (9.33 mi SE)	W						M
084	Sue Craig Road (2.58 mi NNE)	W						M

(1) Location 078.1 (Air Radioiodine, Air Particulate) was added as a replacement for location 078 (Air Radioiodine, Air Particulate), which was removed from the program. Movement of the air radioiodine and air particulate location is described in reference 6.20.

* GPS data reflect approximate accuracy to within 2-5 meters. GPS field measurements were taken as close as possible to the item of interest.

** Control for Fish Only

[ ] Location Numbers prior to 1984

TABLE 2.1-B

OCONEE RADIOLOCICAL MONITORING PROGRAM
SAMPLING LOCATIONS

(TLD SITES)

Site #	Location*	Distance	Sector	Site #	Location*	Distance	Sector
020	SITE BOUNDARY	0.16 miles	N	040	MICROWAVE TOWER, SIX MILE	4.74 miles	E
021	SITE BOUNDARY	0.25 miles	NNE	041	JCT HWY 101 & 133	4.25 miles	ESE
022	SITE BOUNDARY	0.53 miles	NE	042	LAWRENCE CHAPEL CHURCH, HWY 133	4.93 miles	SE
023	SITE BOUNDARY	0.93 miles	ENE	043	HWY 291 AT ISSAQUEENA PARK	4.09 miles	SSE
024	SITE BOUNDARY	0.81 miles	E	044	HWY 130 AT LITTLE RIVER DAM	3.96 miles	S
025	SITE BOUNDARY	0.42 miles	ESE	045	TERMINUS OF HWY 588 AT CROOKED CREEK	4.78 miles	SSW
026	SITE BOUNDARY	0.34 miles	SE	046	HWY 188 AT CROOKED CREEK	4.61 miles	SW
027	SITE BOUNDARY	0.49 miles	SSE	047	NEW HOPE CHURCH, HWY 188	3.58 miles	WSW
028	SITE BOUNDARY	0.46 miles	S	048	JCT HWY 175 & 188	3.64 miles	W
029	SITE BOUNDARY	0.56 miles	SSW	049	JCT HWY 201 & 92	3.60 miles	WNW
030	SITE BOUNDARY	0.42 miles	SW	050	STAMP CREEK LANDING, END OF HWY 92	3.53 miles	NW
031	SITE BOUNDARY	0.27 miles	WSW	051	HWY 128, 1 MILE N OF HWY 130	4.64 miles	NNW
076	SITE BOUNDARY	0.19 miles	W	052	DPC BRANCH OFFICE SITE - PICKENS	12.4 miles	ENE
032	SITE BOUNDARY	0.19 miles	WNW	053	DPC BRANCH OFFICE SITE - LIBERTY	11.7 miles	E
033	SITE BOUNDARY	0.21 miles	WNW	054	POST OFFICE - HWY 93 NORRIS	8.60 miles	ESE
034	SITE BOUNDARY	0.22 miles	NW	055	CLEMSON METEOROLOGY PLOT	9.27 miles	SSE
035	SITE BOUNDARY	0.17 miles	NNW	056	WATER TOWER - SENECA	7.30 miles	SSW
036	MILE CREEK LANDING	4.32 miles	N	057	OCONEE MEMORIAL HOSPITAL	8.42 miles	SW
037	KEOWEE CHURCH, HWY 327	4.85 miles	NNE	058 C	BRANCH RD SUBSTATION, WALHALLA	9.39 miles	WSW
038	CONVENIENCE MART, JCT HWY 183 & 133	4.24 miles	NE	059	TAMASSEE DAR SCHOOL	9.20 miles	NW
039	HWY 133, 1 MILE EAST OF JCT HWY 183 & 133	4.02 miles	ENE	081 C	CLEMSON OPERATIONS CENTER	9.33 miles	SE

C = Control

* GPS data reflect approximate accuracy to within 2-5 meters. GPS field measurements were taken as close as possible to the item of interest.

TABLE 2.2-A

REPORTING LEVELS FOR RADIOACTIVITY CONCENTRATIONS IN ENVIRONMENTAL SAMPLES

Analysis	Water (pCi/liter)	Air Particulates or Gases (pCi/m^3)	Fish (pCi/kg-wet)	Milk (pCi/liter)	Broadleaf Vegetation (pCi/kg-wet)
H-3	20,000[a]				
Mn-54	1,000		30,000		
Fe-59	400		10,000		
Co-58	1,000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-Nb-95	400				
I-131	2[b]	0.9		3	100
Cs-134	30	10	1,000	60	1,000
Cs-137	50	20	2,000	70	2,000
Ba-La-140	200			300	

(a) For drinking water samples only. This is 40CFR Part 141 value.
(b) If low-level I-131 analyses are performed.

TABLE 2.2-B

REMP ANALYSIS FREQUENCY

Sample Medium	Analysis Schedule	Gamma Isotopic	Tritium	Low Level I-131	Gross Beta	TLD
Air Radioiodine	Weekly	X				
Air Particulate	Weekly	X			X	
Direct Radiation	Quarterly					X
Surface Water	Monthly	X				
	Quarterly Composite		X			
Drinking Water	Monthly	X		(a)	X	
	Quarterly Composite		X			
Shoreline Sediment	Semiannually	X				
Milk	Semimonthly	X		X		
Fish	Semiannually	X				
Broadleaf Vegetation	Monthly	X				

(a) Low level I-131 analysis will be performed if abnormal releases occur which could reasonably result in > 1 pCi/liter of I-131 in drinking water. An LLD of 1 pCi/liter will be required for this analysis.

TABLE 2.2-C

MAXIMUM VALUES FOR THE LOWER LIMITS OF DETECTION

Analysis	Water (pCi/liter)	Air Particulates or Gases (pCi/m^3)	Fish (pCi/kg-wet)	Milk (pCi/liter)	Broadleaf Vegetation (pCi/kg-wet)	Sediment (pCi/kg-dry)
Gross Beta	4	0.01				
H-3	2000					
Mn-54	15		130			
Fe-59	30		260			
Co-58, 60	15		130			
Zn-65	30		260			
Zr-95	15					
Nb-95	15					
I-131	15[(a)]	0.07		1	60	
Cs-134	15	0.05	130	15	60	150
Cs-137	18	0.06	150	18	80	180
Ba-La-140	15			15		

(a) LLD for low-level I-131 analyses is 1 pCi/liter if performed

3.0 INTERPRETATION OF RESULTS

Review of 2009 REMP analysis results was performed to identify changes in environmental levels as a result of station operations. The review is summarized in this section. Data from 2009 was compared to preoperational and historical data. Sample data for some media is not directly comparable to preoperational and earlier operational sample results because of either significant changes in the analysis methods or changes in the reporting of the results.

Evaluation for significant trends was performed for the radionuclides that have required LLDs listed in Selected Licensee Commitment 16.11.6. These radionuclides are collectively referred to as "Selected Licensee Commitments radionuclides" and include H-3, Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, I-131, Cs-134, Cs-137, Ba-140, and La-140. Drinking water gross beta results are routinely trended. Trending of air particulate gross beta results was initiated in 1996 when the analysis was resumed. Trending is also performed for other radionuclides that are detected and could have been the result of station effluents. Only Selected Licensee Commitment radionuclides were detected in 2009.

Trending was performed by comparing annual mean concentrations of any effluent related detected radionuclide to historical results. Factors evaluated include the frequency of detection and the concentration in terms of the percent of the radionuclide's SLC reporting level (Table 2.2-A). All maximum percent of reporting level values were well below the 100% action level. The highest value reached during 2009 was 2.66% for H-3 in a drinking water sample collected at location 066.

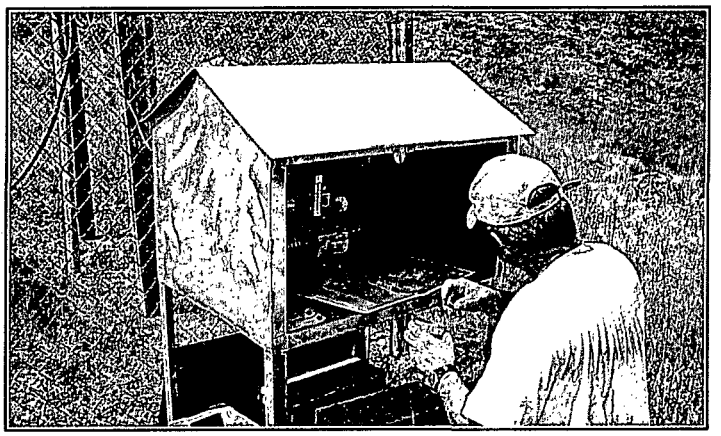
Changes in sample location, analytical technique, and presentation of results must be considered when reviewing for trends. Calculation of the annual mean concentrations has been performed differently over the history of the REMP. During 1979-1986, all net results (sample minus background), positive and negative, were included in the calculation of the mean. Only positive net activity results were used to calculate the mean for the other years. A change in gamma spectroscopy analysis systems in 1987 ended a period when many measurements yielded detectable low-level activity for both indicator and control location samples. It is thought that the method the previous system used to estimate net activity may have been vulnerable to false-positive results.

Data presented in Sections 3.1 - 3.8 support the conclusion that there were no significant increases in radionuclides in the environment around ONS due to station operations in 2009. Similarly, there was no significant increase in ambient background radiation levels in the surrounding areas.

3.1 AIRBORNE RADIOIODINE AND PARTICULATES

In 2009, 312 radioiodine and particulate samples were analyzed, 260 from five indicator locations and 52 from the control location. Particulate samples were analyzed weekly for gamma and gross beta. Radioiodine samples received a weekly gamma analysis.

There was no detectable I-131 in air samples in 2009. Table 3.1-A gives the highest indicator location annual mean and control location annual mean for I-131 since the preoperational period. The table shows similar concentrations for both the indicator and control locations and the activities decreasing from early in the operational history of the plant. No I-131 has been detected since 1994.



Cs-137 was not detected in air radioiodine samples in 2009. Cs-137 has been detected in cartridges in previous years. A study performed in 1990 determined Cs-137 to be an active constituent of the charcoal. A similar study was performed in 2001 again yielding this conclusion.

There were no detectable gamma emitting radionuclides detected in air particulate samples in 2009. No gamma emitting particulates have been detected in indicator location samples since the change in gamma spectroscopy analysis systems in 1987.

Beta analysis of particulate filters was initiated in March of 1996 and became required by Selected Licensee Commitments in 1998. Gross beta analysis was performed on particulate filters during the preoperational and early operational history of the plant but had not been required since 1984. Figure 3.1 summarizes gross beta results for the indicator location with the highest annual mean and the control location samples. Both the indicator and control location results are similar in concentration and are near the lower range of preoperational gross beta results.

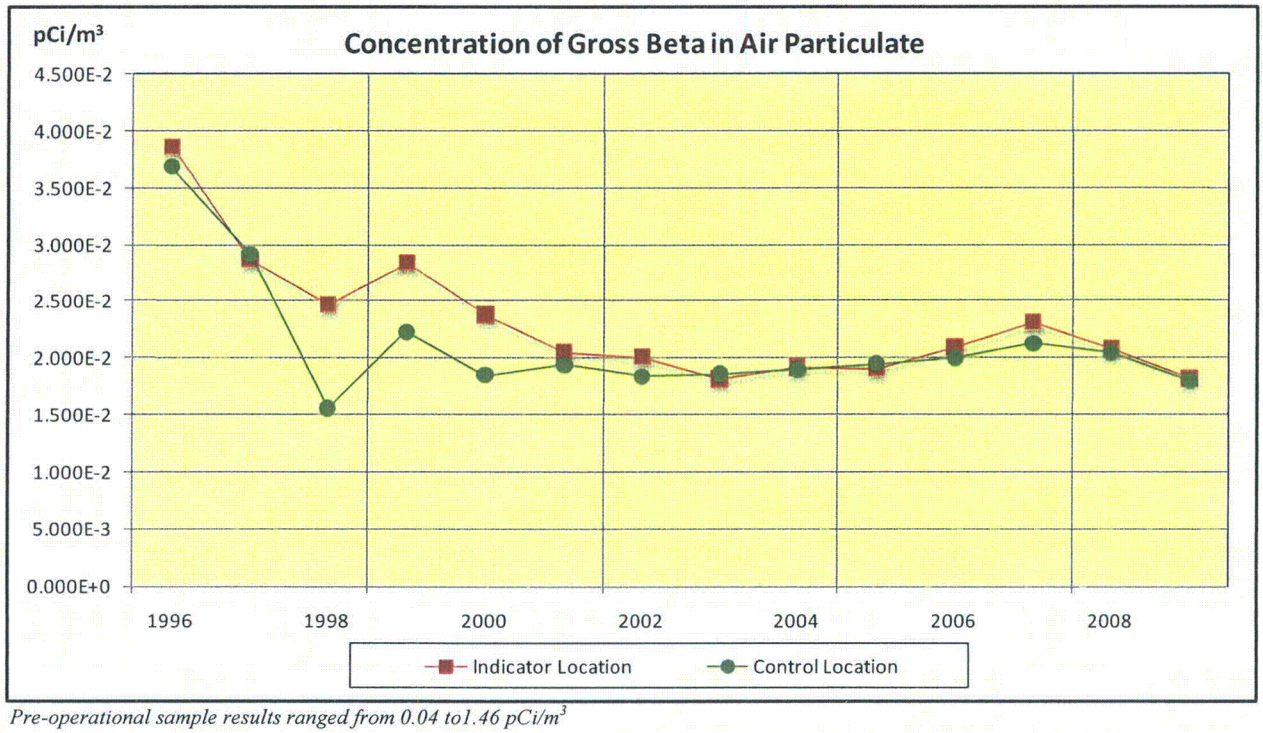
K-40 and Be-7 are the naturally occurring radionuclides that were observed in air samples.

Table 3.1-A Mean Concentration of Air Radioiodine (I-131)

Year	Indicator Location (pCi/m^3)	Control Location (pCi/m^3)
Preoperational 1969-1972	0.00E0	0.00E0
Feb. 1973 - June 1973	0.00E0	0.00E0
July 1973 - Dec. 1973	0.00E0	0.00E0
Jan. 1974 - June 1974	0.00E0	0.00E0
July 1974 - Dec. 1974	2.60E-2	8.00E-3
Jan. 1975 - June 1975	8.65E-2	3.12E-2
July 1975 - Dec. 1975	1.13E-2	9.52E-3
1976	2.76E-2	2.18E-2
1977	3.60E-2	3.60E-2
1978	2.19E-1	1.15E-1
1979	7.54E-3	4.75E-4
1980	3.07E-3	9.67E-4
1981	6.31E-3	5.39E-4
1982	2.87E-3	8.10E-4
1983	1.48E-3	3.05E-4
1984	8.11E-4	-2.30E-5
1985	7.71E-4	4.54E-4
1986	5.02E-3	7.86E-3
1987	4.29E-3	5.19E-3
1988	0.00E0	0.00E0
1989	4.99E-4	0.00E0
1990	0.00E0	0.00E0
1991	0.00E0	0.00E0
1992	0.00E0	0.00E0
1993	0.00E0	0.00E0
1994	1.03E-2	0.00E0
1995	0.00E0	0.00E0
1996	0.00E0	0.00E0
1997	0.00E0	0.00E0
1998	0.00E0	0.00E0
1999	0.00E0	0.00E0
2000	0.00E0	0.00E0
2001	0.00E0	0.00E0
2002	0.00E0	0.00E0
2003	0.00E0	0.00E0
2004	0.00E0	0.00E0
2005	0.00E0	0.00E0
2006	0.00E0	0.00E0
2007	0.00E0	0.00E0
2008	0.00E0	0.00E0
2009	0.00E0	0.00E0

0.00E0 = no detectable measurements
1979 - 1986 mean based on all net activity results

Figure 3.1



Pre-operational sample results ranged from 0.04 to1.46 pCi/m³

There is no reporting level for gross beta in air particulate

Table 3.1-B Mean Concentration of Gross Beta in Air Particulate

Monitoring Period	Indicator Location (pCi/m³)	Control Location (pCi/m³)
1996	3.87E-2	3.69E-2
1997	2.87E-2	2.92E-2
1998	2.47E-2	1.56E-2
1999	2.85E-2	2.23E-2
2000	2.38E-2	1.85E-2
2001	2.05E-2	1.94E-2
2002	2.01E-2	1.84E-2
2003	1.86E-2	1.82E-2
2004	1.92E-2	1.90E-2
2005	1.95E-2	1.91E-2
2006	2.09E-2	2.00E-2
2007	2.31E-2	2.13E-2
2008	2.08E-2	2.04E-2
Average (1999 - 2008)	2.15E-2	1.97E-2
2009	1.82E-2	1.80E-2

3.2 DRINKING WATER

Gross beta analysis and gamma spectroscopy were performed on 39 monthly drinking water samples. These samples were composited to form 12 quarterly period samples for Tritium analysis. Two indicator locations and a control location were sampled; however, only one of the indicator locations is downstream of the effluent release point.

Table 3.2 lists the highest indicator location annual mean and control location annual mean for gross beta results since the preoperational period. The indicator location had an average concentration of 1.37 pCi/liter in 2009, and the control location had a concentration of 1.19 pCi/liter. The 2008 indicator mean was 1.82 pCi/liter. The table shows that 2009 gross beta levels in drinking water are slightly lower than preoperational concentrations. The dose for consumption of water was less than one mrem per year, historically and for 2009; therefore low-level iodine analysis is not required.

Tritium was detected in four of the twelve composite samples during 2009. The 2009 mean indicator location 066 concentration was 415 pCi/liter, which is 2.08% of the reporting level. Table 3.2 and Figure 3.2 show the highest indicator and control location annual means for Tritium since analysis was initiated early in the operational period. Tritium concentrations have decreased at both the indicator and control locations. The closure of the Clemson water plant in 1989 is one reason for the decrease shown in the table and graph. The Clemson site was typically the high mean location when the plant was in operation.

There were no gamma emitting radionuclides identified in drinking water samples in 2009. Gamma spectroscopy analysis has not detected any activity in the water supplies since 1988. K-40 is the naturally occurring radionuclide that was observed in drinking water samples.

Figure 3.2 *Current reporting level implemented 1984*

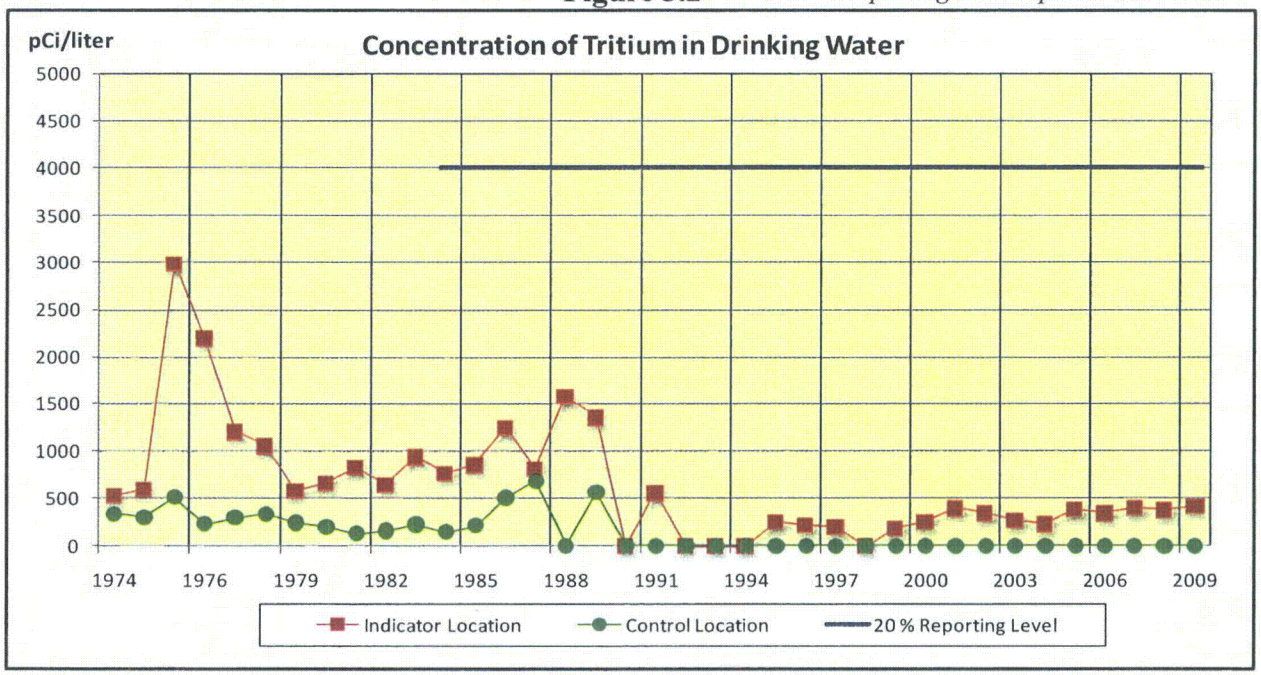


Table 3.2 Mean Concentrations of Radionuclides in Drinking Water

Year	Gross Beta (pCi/l) Indicator Location	Gross Beta (pCi/l) Control Location	Tritium (pCi/l) Indicator Location	Tritium (pCi/l) Control Location
Preoperational ending Jan. 1971	3.03	5.90	Analysis not required	
Preoperational ending Jan. 1973	3.58	4.94	Analysis not required	
Feb. 1973 - June 1973	Qualitative results reported		Analysis not required	
June 1973 - Dec. 1973	7.15	21.78	Analysis not required	
Jan. 1974 - June 1974	3.13	6.98	Analysis not required	
July 1974 - Dec. 1974	2.24	2.02	525	330
Jan. 1975 - June 1975	1.98	1.59	600	300
July 1975 - Dec. 1975	2.01	1.22	2990	505
1976	2.38	2.00	2196	224
1977	2.70	2.30	1200	290
1978	2.56	2.17	1050	333
1979	1.83	1.36	576	235
1980	1.86	1.63	660	200
1981	1.98	1.88	830	127
1982	2.04	1.45	643	153
1983	1.85	1.54	937	220
1984	1.87	1.08	765	145
1985	2.14	1.16	856	210
1986	1.91	1.04	1240	503
1987	2.00	1.20	815	680
1988	2.00	1.40	1570	0.00
1989	2.30	1.80	1350	559
1990	3.00	2.70	0.00	0.00
1991	1.80	1.40	558	0.00
1992	3.20	1.60	0.00	0.00
1993	2.10	1.90	0.00	0.00
1994	1.90	2.10	0.00	0.00
1995	5.10	2.90	248	0.00
1996	2.07	1.77	214	0.00
1997	2.52	2.23	194	0.00
1998	2.48	1.70	0.00	0.00
1999	1.73	1.49	185	0.00
2000	2.07	1.68	251	0.00
2001	1.75	1.29	390	0.00
2002	1.61	1.21	338	0.00
2003	1.51	1.05	266	0.00
2004	1.58	1.25	225	0.00
2005	1.28	1.37	377	0.00
2006	1.54	1.75	340	0.00
2007	1.58	1.08	402	0.00
2008	1.82	1.25	372	0.00
2009	1.37	1.19	415	0.00

0.00 = no detectable measurements
1989 - Clemson water plant closes; nearest downstream plant is Anderson.
1979 - 1986 mean based on all net activity results

3.3 SURFACE WATER

Gamma spectroscopy was performed on 26 monthly surface water samples. These samples were composited to form eight quarterly samples for Tritium analysis. One indicator and one control location were sampled. The indicator location is near the liquid effluent release point.

Tritium was detected in the four indicator location samples. The 2009 average concentration was 4,678 pCi/liter. The individual samples ranged from 1,440 pCi/liter to 9,760 pCi/liter. The 2008 mean concentration was 9,430 pCi/liter. Tritium was not detected in any control surface water samples.

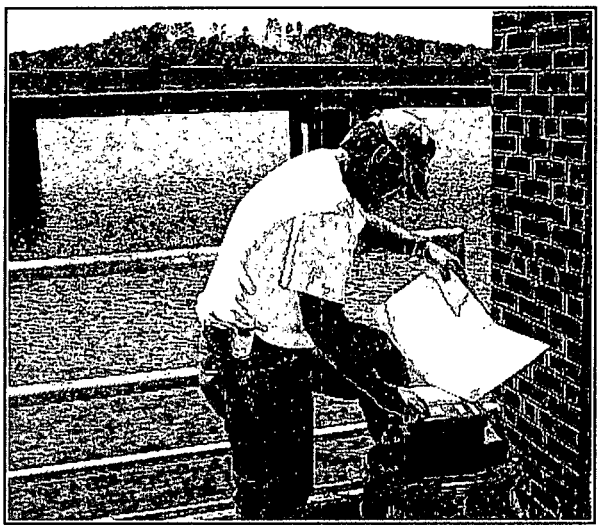
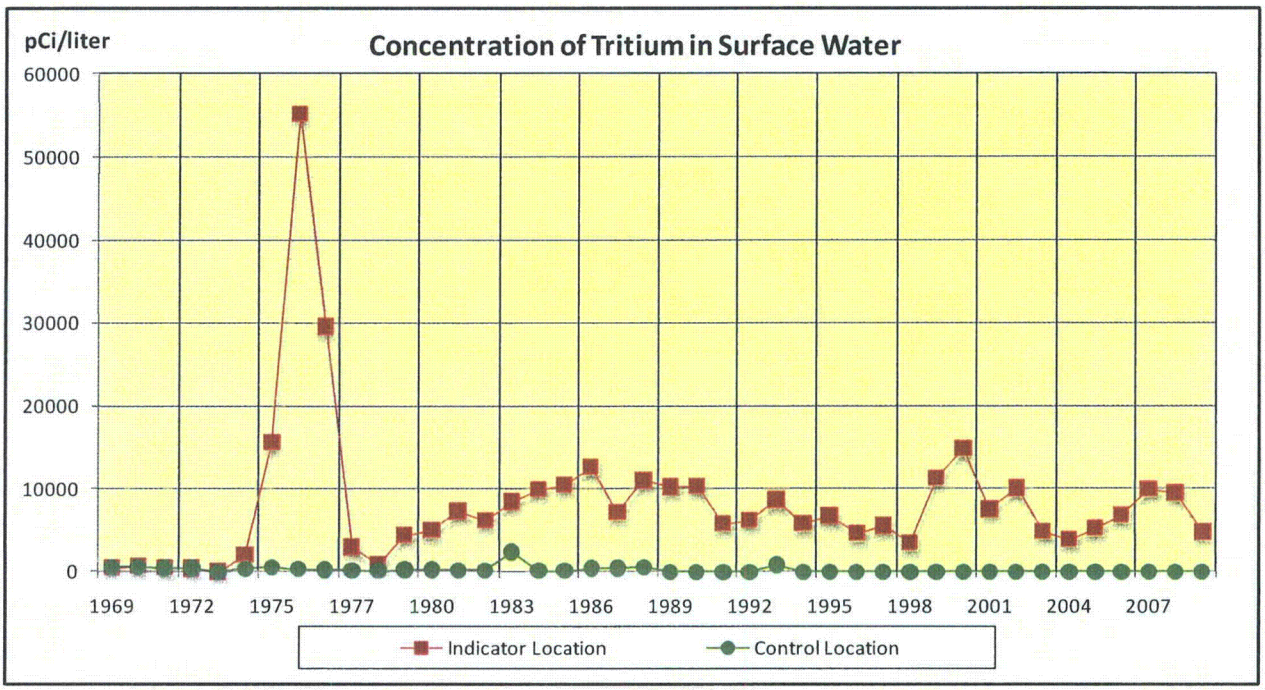


Figure 3.3 shows the indicator and control annual means for Tritium since the preoperational period. Table 3.3 lists the indicator annual means. Tritium in the indicator location was elevated during an extended drought from 1998 through 2002. The average tritium concentration decreased in 2003 with increased rainfall. Extreme drought conditions existed through much of 2008 and continued until mid-2009 (reference 6.16). Drought conditions could impact surface water tritium concentrations.

Gamma spectroscopy analysis did not detect any station related activity during 2009. In 1999, gamma spectroscopy analysis detected Co-58 in one indicator sample at 27.3 pCi/liter. Gamma spectroscopy analysis has not detected any other activity in surface water samples since 1992. Table 3.3 summarizes the indicator annual means of radionuclides detected since the change in the gamma spectroscopy analysis system in 1987. Visual inspection of the gamma spectroscopy tabular data covering the early operational period through 2009 did not reveal any increasing trends.

K-40 and Be-7 are the naturally occurring radionuclide observed in surface water samples in 2009.

Figure 3.3



There is no reporting level for Tritium in surface water

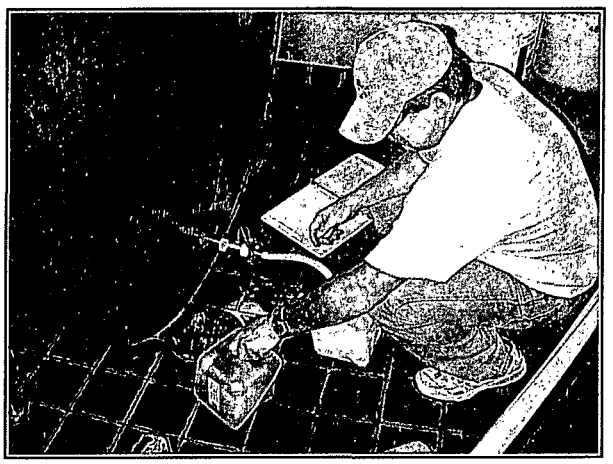
Table 3.3 Mean Concentrations of Radionuclides in Surface Water

Year	Co-58 (pCi/l)	Co-60 (pCi/l)	Nb-95 (pCi/l)	Cs-137 (pCi/l)	H-3 pCi/l)
Preoperational 1969		Qualitative results reported			4.86E2
Preoperational 1970		"			5.94E2
Preoperational 1971		"			4.01E2
Preoperational 1972		"			3.62E2
1973		"			0.00E0
1974	0.00E0	1.32E1	0.00E0	1.60E1	1.99E3
Jan. 1975 – June 1975	0.00E0	0.00E0	0.00E0	0.00E0	1.56E4
July 1975 – Dec. 1975	0.00E0	1.34E1	0.00E0	0.00E0	5.52E4
1976	1.08E2	3.30E1	0.00E0	3.50E1	2.95E4
1977	2.60E1	1.80E1	0.00E0	3.10E1	2.90E3
1978	2.96E2	0.00E0	0.00E0	2.22E1	8.00E2
1979	1.33E0	2.60E0	1.78E0	2.82E0	4.37E3
1980	1.56E0	2.30E0	1.22E0	5.40E0	4.93E3
1981	1.10E0	6.10E-1	1.70E0	3.90E0	7.21E3
1982	6.14E-1	1.99E0	2.29E0	4.85E0	6.13E3
1983	6.99E-1	3.02E0	3.91E-1	6.83E-1	8.40E3
1984	9.40E-1	6.30E-1	7.90E-1	4.83E-1	9.90E3
1985	2.15E-1	6.27E-1	4.95E-1	9.90E-1	1.05E4
1986	3.28E0	1.23E0	1.14E0	3.07E-1	1.26E4
1987	5.10E1	3.40E0	4.00E0	0.00E0	7.08E3
1988	6.20E0	5.00E0	2.50E0	3.50E0	1.10E4
1989	5.30E0	3.00E0	0.00E0	3.40E0	1.02E4
1990	1.70E0	1.60E0	0.00E0	0.00E0	1.03E4
1991	5.40E0	0.00E0	0.00E0	0.00E0	5.76E3
1992	2.50E0	0.00E0	0.00E0	0.00E0	6.22E3
1993	0.00E0	0.00E0	0.00E0	0.00E0	8.62E3
1994	0.00E0	0.00E0	0.00E0	0.00E0	5.75E3
1995	0.00E0	0.00E0	0.00E0	0.00E0	6.65E3
1996	0.00E0	0.00E0	0.00E0	0.00E0	4.54E3
1997	0.00E0	0.00E0	0.00E0	0.00E0	5.50E3
1998	0.00E0	0.00E0	0.00E0	0.00E0	3.35E3
1999	2.73E1	0.00E0	0.00E0	0.00E0	1.13E4
2000	0.00E0	0.00E0	0.00E0	0.00E0	1.48E4
2001	0.00E0	0.00E0	0.00E0	0.00E0	7.43E3
2002	0.00E0	0.00E0	0.00E0	0.00E0	1.00E4
2003	0.00E0	0.00E0	0.00E0	0.00E0	4.77E3
2004	0.00E0	0.00E0	0.00E0	0.00E0	3.86E3
2005	0.00E0	0.00E0	0.00E0	0.00E0	5.15E3
2006	0.00E0	0.00E0	0.00E0	0.00E0	6.72E3
2007	0.00E0	0.00E0	0.00E0	0.00E0	9.91E3
2008	0.00E0	0.00E0	0.00E0	0.00E0	9.43E3
2009	0.00E0	0.00E0	0.00E0	0.00E0	4.68E3

0.00E0 = no detectable measurements
1979-1986 mean based on all net activity results

3.4 MILK

Gamma spectroscopy and low level iodine analysis was performed on 26 milk samples collected in 2009. One control location was sampled. No indicator dairies were identified by the 2009 land use census.



There were no gamma emitting radionuclides identified in milk samples in 2009. Cs-137 is the only radionuclide, other than naturally occurring, reported in milk samples since 1988. Cs-137 in milk is not unusual. It is a constituent of nuclear weapons test fallout and has been observed in samples from indicator and control locations in previous years.

Table 3.4 lists the highest indicator location annual mean and control location annual mean for Cs-137 since the preoperational period. The table shows similar concentrations for both indicator and control locations.

K-40 is a naturally occurring radionuclide observed in milk samples in 2009.

Table 3.4 Mean Concentration of Radionuclides in Milk

Year	Cs-137 Indicator (pCi/l)	Cs-137 Control (pCi/l)
Preoperational	1.57E1	1.46E1
Feb. 1973 – June 1973	Qualitative results reported	Qualitative results reported
July 1973 – Dec. 1973	5.80E0	"
Jan. 1974 – June 1974	5.30E0	0.00E0
July 1974 – Dec. 1974	1.11E1	0.00E0
Jan. 1975 – June 1975	1.51E1	9.45E0
July 1975 – Dec. 1975	0.00E0	0.00E0
1976	1.80E1	7.47E0
1977	0.00E0	0.00E0
1978	1.33E1	1.33E1
1979	7.25E0	2.52E0
1980	3.58E0	2.63E0
1981	5.52E0	5.51E0
1982	2.71E0	3.25E0
1983	5.04E0	-4.27E-1
1984	2.30E0	2.58E0
1985	2.38E0	1.31E0
1986	2.92E0	2.97E0
1987	4.90E0	4.90E0
1988	3.90E0	3.20E0
1989	4.70E0	2.90E0
1990	6.40E0	0.00E0
1991	5.00E0	0.00E0
1992	6.60E0	0.00E0
1993	0.00E0	0.00E0
1994	0.00E0	1.80E0
1995	2.30E0	2.00E0
1996	0.00E0	4.10E0
1997	0.00E0	0.00E0
1998	0.00E0	0.00E0
1999	0.00E0	0.00E0
2000	0.00E0	0.00E0
2001	0.00E0	0.00E0
2002	0.00E0	0.00E0
2003	0.00E0	0.00E0
2004	0.00E0	0.00E0
2005	0.00E0	0.00E0
2006	NO INDICATOR LOCATION	0.00E0
2007	NO INDICATOR LOCATION	0.00E0
2008	NO INDICATOR LOCATION	0.00E0
2009	NO INDICATOR LOCATION	0.00E0

0.00E0 = no detectable measurements
1979 - 1986 mean based on all net activity results

The Oconee milk program was updated to align with NUREG-1301 during 2005 and documented in PIP O-04-01179. Location 071 was designated as the new control site effective with the 7/12/2005 sampling. No indicator dairies were identified by the 2009 land use census.

3.5 BROADLEAF VEGETATION

Gamma spectroscopy was performed on 48 broadleaf vegetation samples during 2009. Three indicator locations and one control location were sampled. There were no gamma emitting radionuclides identified in vegetation samples in 2009.

Cs-137 is the only radionuclide, other than naturally occurring, reported in vegetation samples since the change in gamma spectroscopy analysis systems in 1987. Table 3.5 shows historical concentrations of Cs-137.

It is not unusual for Cs-137 to be present in vegetation. It is a constituent of nuclear weapons test fallout and has been observed in samples from indicator and control locations in previous years. Table 3.5 lists the highest indicator location annual mean and control location annual mean for Cs-137 since early in the station's operational history. Visual inspection of the tabular data did not reveal any increasing trends.

K-40 and Be-7 are naturally occurring radionuclides that were observed in broadleaf vegetation samples in 2009.

Figure 3.5

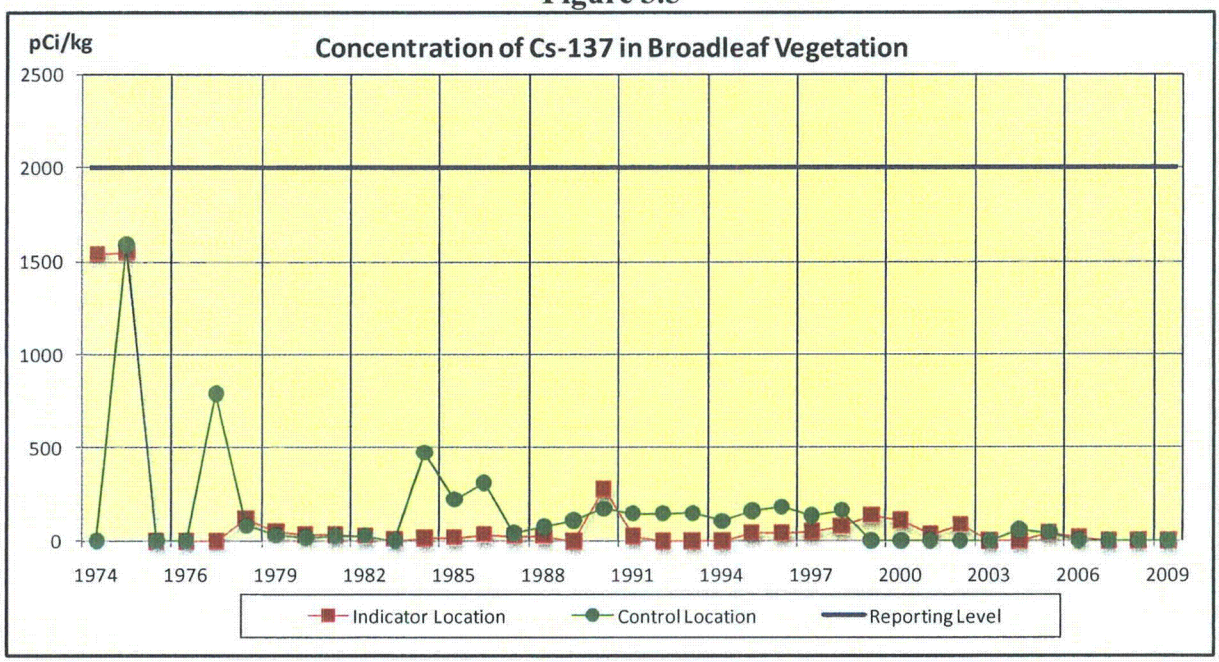


Table 3.5 Mean Concentration of Radionuclides in Vegetation

Year	Cs-137 Indicator (pCi/kg)	Cs-137 Control (pCi/kg)
July 1974 - Dec. 1974	1.54E3	0.00E0
Jan. 1975 - June 1975	1.55E3	1.59E3
July 1975 - Dec. 1975	0.00E0	0.00E0
1976	0.00E0	0.00E0
1977	0.00E0	7.90E2
1978	1.19E2	8.19E1
1979	5.04E1	2.96E1
1980	2.80E1	1.55E1
1981	2.99E1	2.60E1
1982	2.42E1	2.62E1
1983	7.44E0	5.35E-1
1984	1.37E1	4.74E2
1985	1.62E1	2.20E2
1986	3.28E1	3.12E2
1987	2.70E1	4.20E1
1988	2.40E1	7.50E1
1989	0.00E0	1.08E2
1990	2.73E2	1.74E2
1991	2.20E1	1.45E2
1992	0.00E0	1.46E2
1993	0.00E0	1.49E2
1994	0.00E0	1.06E2
1995	4.30E1	1.58E2
1996	3.79E1	1.83E2
1997	4.73E1	1.35E2
1998	7.28E1	1.61E2
1999	1.34E2	0.00E0
2000	1.06E2	0.00E0
2001	3.19E1	0.00E0
2002	8.44E1	0.00E0
2003	0.00E0	0.00E0
2004	0.00E0	5.96E1
2005	4.51E1	4.11E1
2006	1.77E1	0.00E0
2007	0.00E0	0.00E0
2008	0.00E0	0.00E0
2009	0.00E0	0.00E0

0.00E0 = no detectable measurements
Only qualitative results reported prior to 1974
Control location changed to 073 in 1984
Control location 081 added in 1998
Control location 073 was removed in 1999
1979 - 1986 mean based on all net activity results

3.6 FISH

In 2009, gamma spectroscopy was performed on 12 fish samples. Two downstream indicator and one control location were sampled. Cs-137 was identified in all eight of the indicator location samples. Cs-137 was detected in three of the four control location samples at a mean concentration of 14.6 pCi/kg.

The highest average indicator concentration for Cs-137 was 26.8 pCi/kg (1.34% of reporting level). The highest individual indicator sample concentration for Cs-137 was 51.4 pCi/kg (2.57% of reporting level).

Co-58 was identified in one of the eight indicator location samples at a concentration of 9.01 pCi/kg (0.03% of reporting level). Co-58 was not identified in any of the control samples.

Figures 3.6-1 and 3.6-2 are graphs displaying the annual means for Cs-137 and Cs-134. Historically, both are contributors to the calculated dose from liquid effluents from ingestion of fish. Radioactivity concentrations in downstream fish samples are higher than those reported in preoperational fish samples, however, concentrations in fish have decreased over time with decreases in radioactive material releases from the plant.

One factor affecting the trend analysis is a change in sampling locations. In 1984, a second downstream fish location was added. Location 063 is closer to the liquid effluent discharge point and has been the highest mean indicator since it was added.

K-40 was observed in fish samples in addition to the radionuclides discussed above.

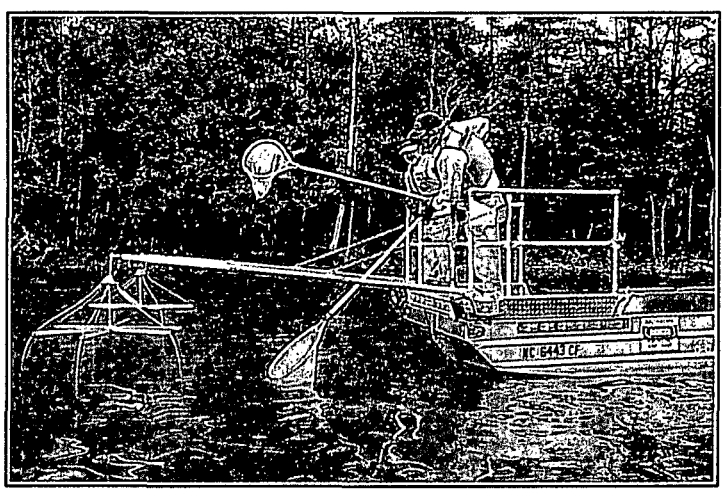


Table 3.6 lists the highest indicator location annual means since the preoperational period for radionuclides detected in 2009. Also included in the table are radionuclides that have been identified in this media since the change in analysis systems in 1987. Comparison of data to previous years does not indicate any increases in concentrations.

Figure 3.6-1

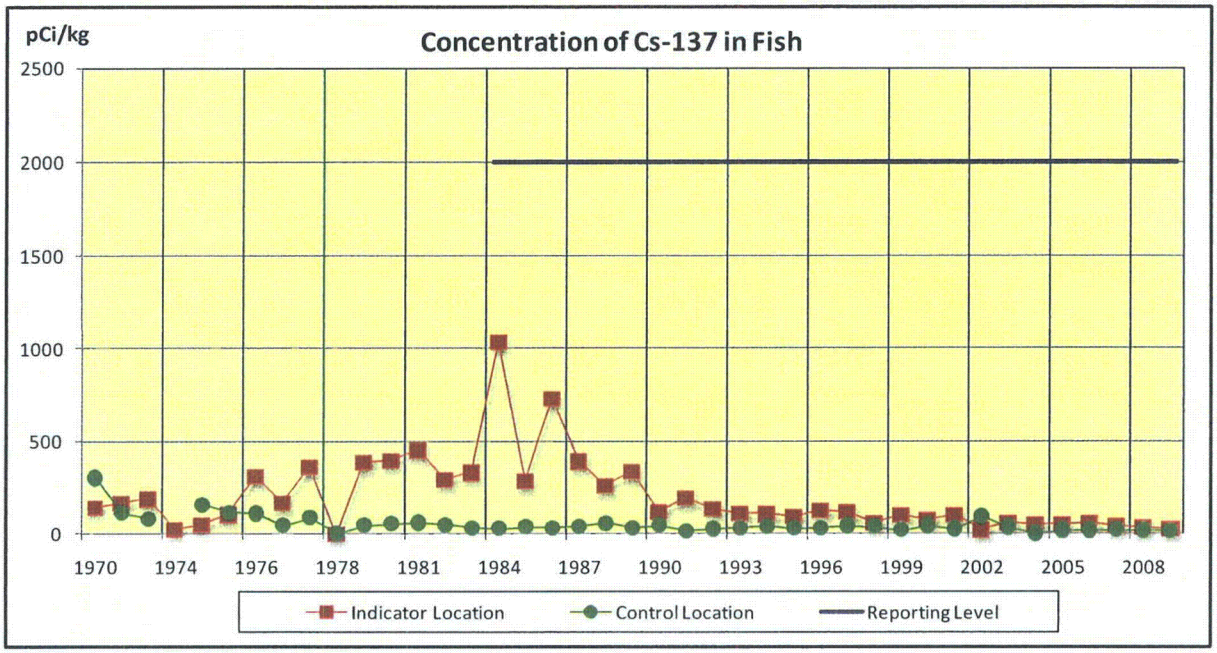
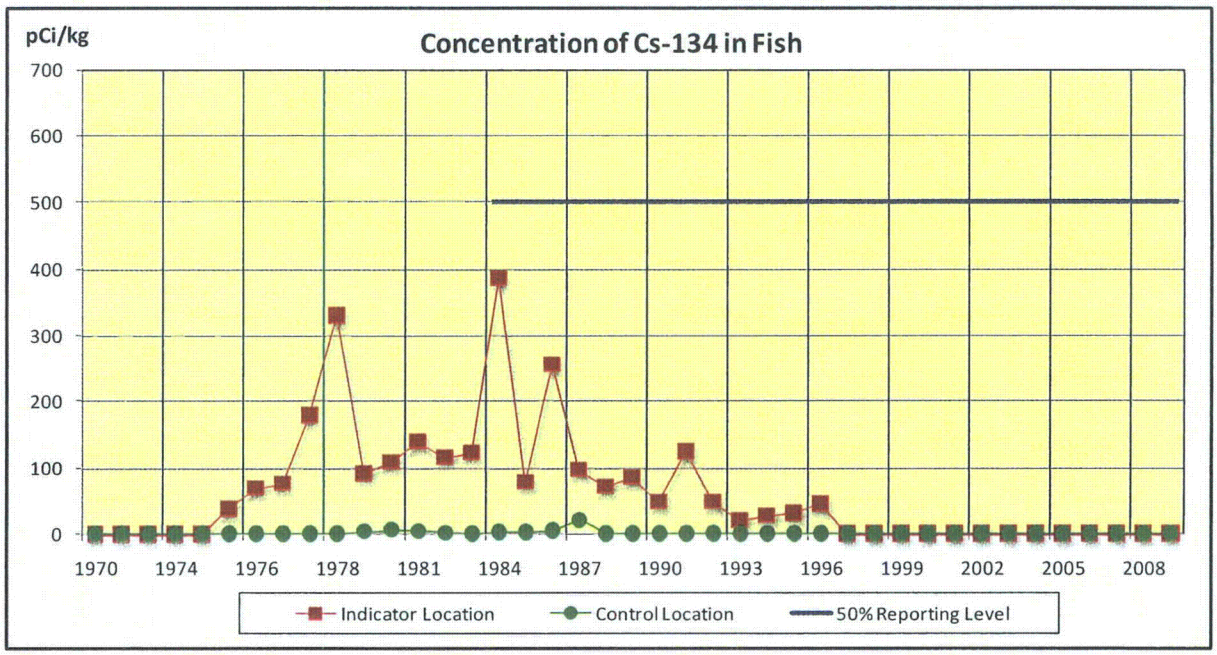


Figure 3.6-2



Current reporting levels implemented 1984

Table 3.6 Mean Concentrations of Radionuclides in Fish

Year	Co-58 (pCi/kg)	Co-60 (pCi/kg)	Cs-134 (pCi/kg)	Cs-137 (pCi/kg)
Preop ending Jan.1971	0.00E0	0.00E0	0.00E0	1.46E2
Preop ending Jan.1973	0.00E0	0.00E0	0.00E0	1.66E2
Feb. 1973 - June 1973	Qualitative results reported-no significant measurements above background			
July 1973 - Dec. 1973	0.00E0	0.00E0	0.00E0	1.89E2
Jan. 1974 - June 1974	0.00E0	0.00E0	0.00E0	2.47E1
July 1974 - Dec. 1974	0.00E0	0.00E0	0.00E0	4.85E1
Jan. 1975 - June 1975	0.00E0	0.00E0	3.81E1	1.05E2
July 1975 - Dec. 1975	8.50E1	0.00E0	7.00E1	3.13E2
1976	5.70E1	1.14E2	7.73E1	1.66E2
1977	0.00E0	0.00E0	1.80E2	3.60E2
1978	3.27E2	0.00E0	3.31E2	0.00E0
1979	1.91E0	1.56E1	9.26E1	3.88E2
1980	1.45E1	1.90E1	1.10E2	3.99E2
1981	2.25E1	1.49E1	1.40E2	4.51E2
1982	9.83E-1	8.03E0	1.17E2	2.94E2
1983	3.35E1	4.53E0	1.24E2	3.32E2
1984	1.21E2	6.23E1	3.87E2	1.04E3
1985	1.62E1	1.10E1	7.93E1	2.85E2
1986	9.56E1	2.59E1	2.57E2	7.36E2
1987	1.63E2	6.30E1	9.80E1	3.93E2
1988	9.60E1	0.00E0	7.20E1	2.60E2
1989	4.30E1	1.50E1	8.60E1	3.36E2
1990	1.50E1	0.00E0	4.80E1	1.19E2
1991	4.59E1	0.00E0	1.25E2	1.94E2
1992	6.10E1	0.00E0	4.80E1	1.36E2
1993	0.00E0	0.00E0	2.10E1	1.10E2
1994	0.00E0	0.00E0	2.80E1	1.05E2
1995	0.00E0	0.00E0	3.10E1	9.20E1
1996	0.00E0	0.00E0	4.49E1	1.25E2
1997	0.00E0	0.00E0	0.00E0	1.18E2
1998	0.00E0	0.00E0	0.00E0	5.79E1
1999	0.00E0	0.00E0	0.00E0	1.04E2
2000	0.00E0	0.00E0	0.00E0	7.54E1
2001	1.72E1	0.00E0	0.00E0	9.92E1
2002	0.00E0	0.00E0	0.00E0	9.37E1
2003	5.02E1	0.00E0	0.00E0	6.04E1
2004	0.00E0	0.00E0	0.00E0	5.29E1
2005	0.00E0	0.00E0	0.00E0	5.14E1
2006	0.00E0	0.00E0	0.00E0	5.58E1
2007	0.00E0	0.00E0	0.00E0	4.10E1
2008	0.00E0	0.00E0	0.00E0	3.13E1
2009	9.01E0	0.00E0	0.00E0	2.68E1

0.00E0 = no detectable measurements
1979 - 1986 mean based on all net activity results

3.7 SHORELINE SEDIMENT

Gamma spectroscopy was performed on six sediment samples. Two downstream indicator locations and one control location were sampled. Four samples were taken from indicator locations and two from the control location.

Cs-137 was identified in two of the four indicator location samples. Cs-137 was not observed in any control location samples. The highest 2009 individual sample Cs-137 concentration was 69.7 pCi/kg. The highest 2008 individual sample Cs-137 concentration was 240 pCi/kg. Table 3.7 lists the highest indicator location annual means since shoreline sediment was initiated in 1984. Included in the table are radionuclides that have been identified in this media since the change in analysis systems in 1987.

Visual inspection of the tabular data did not reveal any trends. Figure 3.7-1 is a graph of the Cs-137 annual means. Figure 3.7-2 is a graph of the Co-60 annual means. Historically, both are contributors to the calculated dose from liquid effluents from shoreline sediment. No trends are apparent.

K-40 and Be-7 are naturally occurring radionuclides observed in shoreline sediment samples in 2009.

Figure 3.7-1

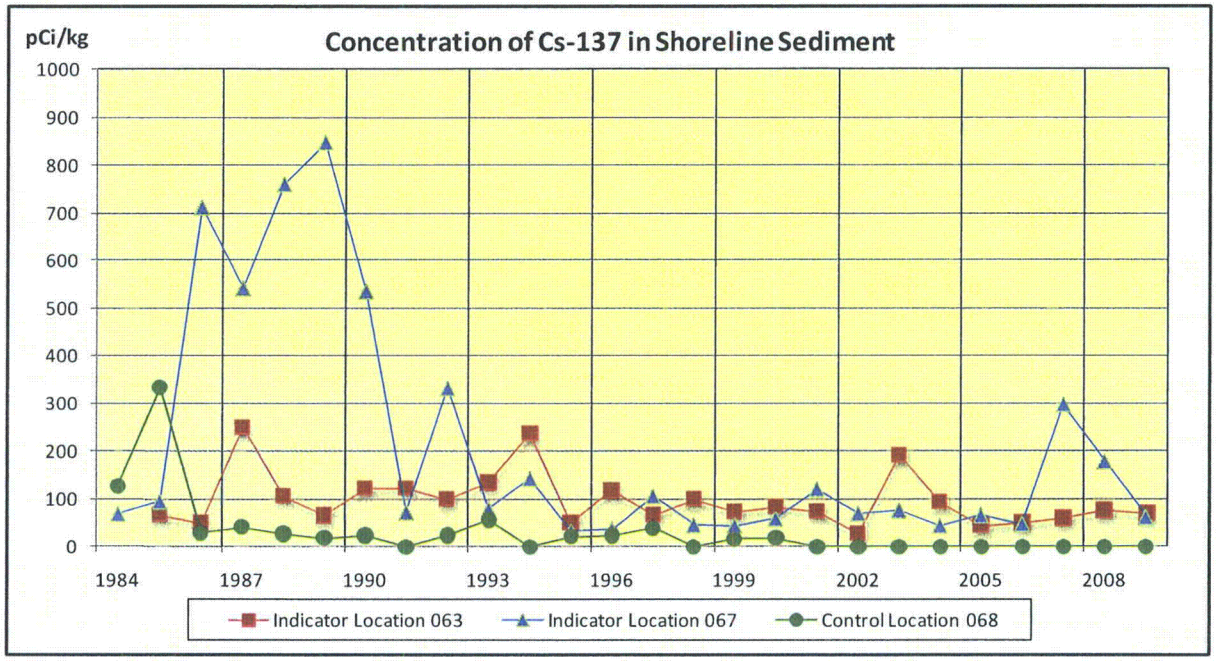
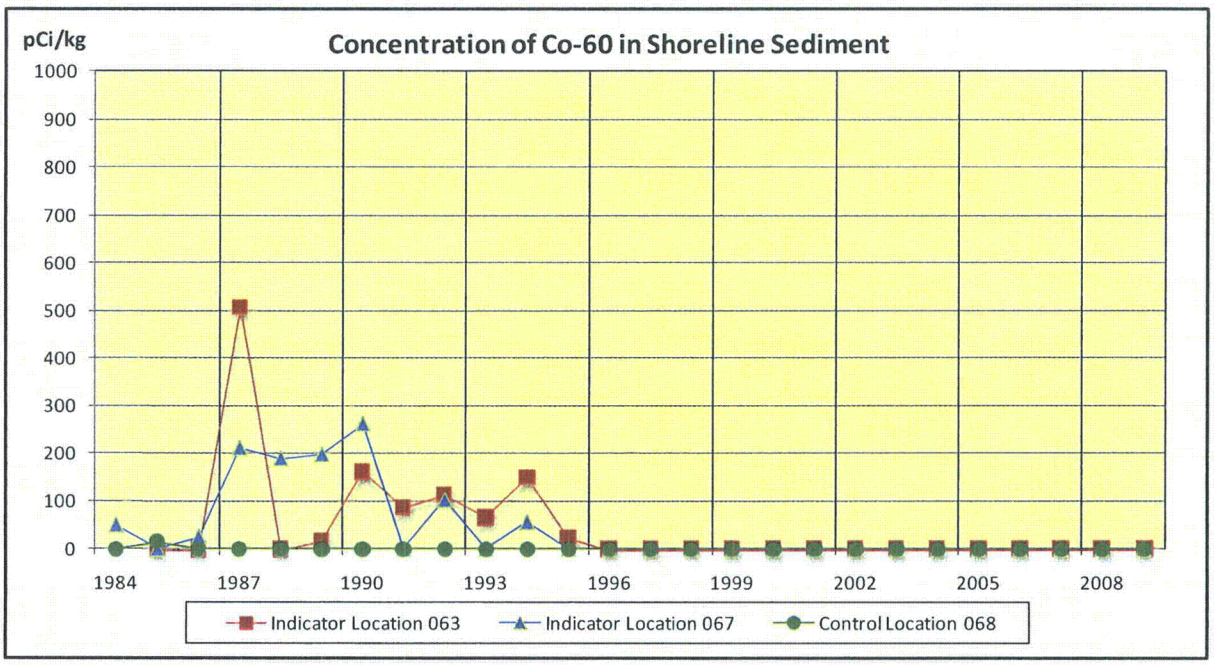


Figure 3.7-2



There are no reporting levels for shoreline sediment

Table 3.7 Mean Concentrations of Radionuclides in Shoreline Sediment (pCi/kg)

Year	Mn-54	Co-58	Co-60	Zn-65	Cs-134	Cs-137	Ag-110m	Sb-125
1984	1.10E1	1.09E1	1.19E1	0.00E0	7.77E1	5.16E1	0.00E0	0.00E0
1985	9.39E0	1.27E0	4.79E0	0.00E0	7.63E1	9.47E1	0.00E0	0.00E0
1986	2.24E1	1.62E1	2.50E1	0.00E0	1.41E2	7.12E2	0.00E0	0.00E0
1987	5.40E1	4.70E2	5.07E2	0.00E0	1.01E2	6.22E2	3.46E2	0.00E0
1988	3.30E1	1.20E2	1.87E2	6.70E1	6.60E1	7.59E2	1.62E2	3.67E2
1989	2.30E1	1.24E2	1.96E2	0.00E0	5.40E1	8.48E2	5.50E1	1.86E2
1990	3.40E1	8.00E1	2.59E2	0.00E0	4.50E1	5.36E2	1.71E2	9.00E1
1991	3.26E1	5.60E1	8.57E1	0.00E0	6.91E1	1.24E2	1.10E2	1.78E2
1992	8.79E1	1.79E2	1.12E2	0.00E0	5.60E1	3.31E2	1.69E2	2.08E2
1993	8.20E1	8.20E1	6.50E1	0.00E0	3.20E1	1.36E2	5.63E1	1.11E2
1994	5.30E1	7.00E1	1.49E2	0.00E0	6.70E1	2.38E2	1.04E2	1.29E2
1995	1.43E2	3.90E1	2.40E1	0.00E0	1.10E1	5.20E1	0.00E0	0.00E0
1996	0.00E0	5.10E1	0.00E0	0.00E0	1.98E1	1.19E2	0.00E0	0.00E0
1997	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	1.06E2	0.00E0	0.00E0
1998	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	1.01E2	0.00E0	0.00E0
1999	6.96E1	0.00E0	0.00E0	0.00E0	0.00E0	7.38E1	0.00E0	0.00E0
2000	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	8.54E1	0.00E0	0.00E0
2001	0.00E0	2.10E1	0.00E0	0.00E0	0.00E0	1.20E2	0.00E0	0.00E0
2002	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	6.96E1	0.00E0	0.00E0
2003	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	1.93E2	0.00E0	0.00E0
2004	8.54E1	0.00E0	0.00E0	0.00E0	0.00E0	9.56E1	0.00E0	0.00E0
2005	2.00E2	0.00E0	0.00E0	0.00E0	0.00E0	6.53E1	0.00E0	0.00E0
2006	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	5.01E1	0.00E0	0.00E0
2007	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	2.97E2	0.00E0	0.00E0
2008	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	1.78E2	0.00E0	0.00E0
2009	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	6.97E1	0.00E0	0.00E0

0.00E0 = no detectable measurements
1984-1986 mean based on all net activity results

3.8 DIRECT GAMMA RADIATION

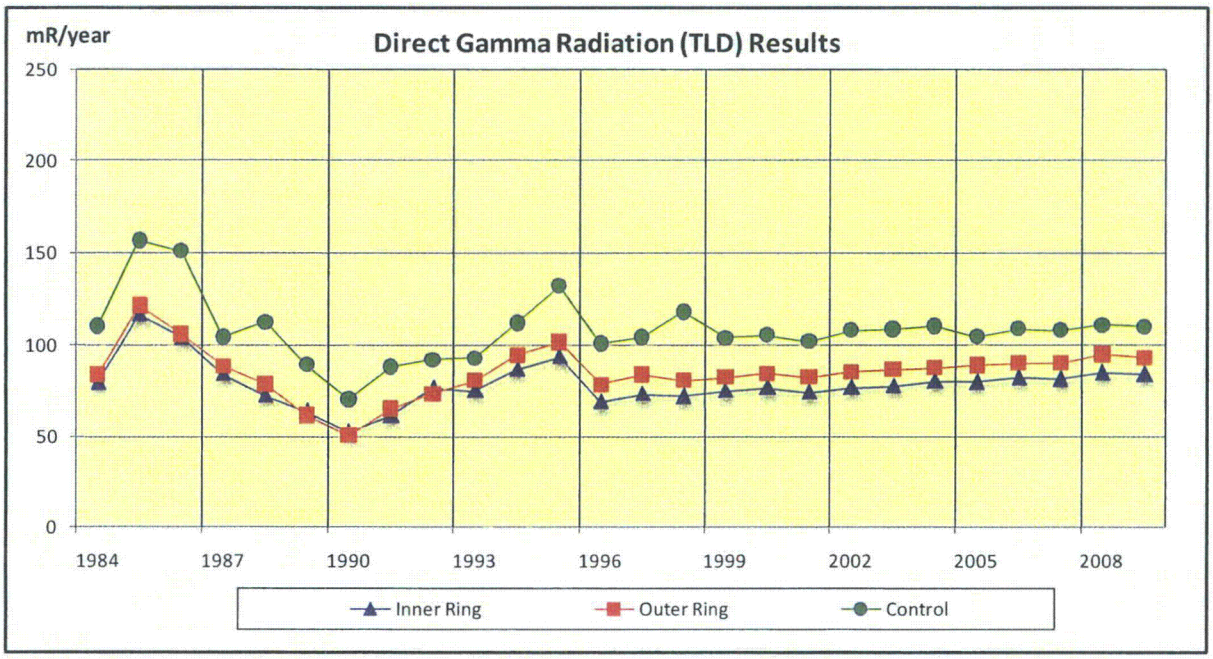
In 2009, 168 Thermoluminescent Dosimeters (TLD) were analyzed, 160 at indicator locations, 8 at the two control locations. TLDs are collected and analyzed quarterly. The highest annual mean exposure for an indicator location was 110 milliroentgen. This TLD is located at indicator location 042, 4.93 miles from the station. The annual mean exposure for the control locations was 110 milliroentgen.

Figure 3.8 and Table 3.8 show TLD inner ring (site boundary), outer ring (4-5 miles), and control location annual averages in milliroentgen per year. Data is provided from 1984 when TLD locations were added and arranged in an inner ring and outer ring configuration. Preoperational data is also provided in the table. As shown in the graph, inner and outer ring averages historically compare closely, with control data somewhat higher. Inner and outer ring averages comprise a number of data points with control averages representing only two locations.

The calculated total body dose (from gaseous effluents) for 2009 was 2.02E-2 mrem, which is 0.02% of the average inner ring TLD values. Therefore, it can be concluded that discharges from the plant had very little impact upon the measured TLD values.

The maximum measurement from TLDs at the Independent Spent Fuel Storage Installation ISFSI) was 699 milliroentgen per standard quarter. This is consistent with previous measurements. TLD measurements in the inner ring (site boundary) have remained relatively constant.

Figure 3.8



There is no reporting level for Direct Radiation (TLD)

Table 3.8 Direct Gamma Radiation (TLD) Results

Year	Inner Ring Average (mR/yr)	Outer Ring Average (mR/yr)	Control (mR/yr)
Preoperational	113.1	123.9	148.9
1984	79.4	83.8	110.3
1985	116.9	121.5	156.6
1986	104.2	106.0	150.9
1987	84.3	88.8	104.3
1988	72.3	78.6	112.6
1989	63.7	61.7	89.4
1990	52.2	50.7	70.1
1991	61.2	65.0	88.0
1992	76.2	73.2	92.0
1993	74.8	80.6	93.0
1994	86.8	94.7	112.0
1995	93.6	101.7	132.0
1996	68.5	78.3	101.0
1997	72.8	83.8	104.5
1998	71.7	80.8	118.0
1999	74.5	82.5	104
2000	76.2	84.5	105.6
2001	73.6	82.4	102.2
2002	76.6	85.3	108.0
2003	77.4	86.6	108.8
2004	80.1	87.5	110.4
2005	79.3	89.0	104.7
2006	82.0	90.2	108.8
2007	81.0	90.0	108
2008	84.6	95.0	111
Average (1999 - 2008)	78.5	87.3	107
2009	83.7	93.0	110

3.9 LAND USE CENSUS

The Land Use Census was conducted during the growing season (6/15 – 6/16/2009) as required by SLC 16.11.6. Table 3.9 summarizes census results. A map indicating identified locations is shown in Figure 3.9. The nearest residence is located in the NW sector at 1.04 miles. No program changes were required based on the results of the census.

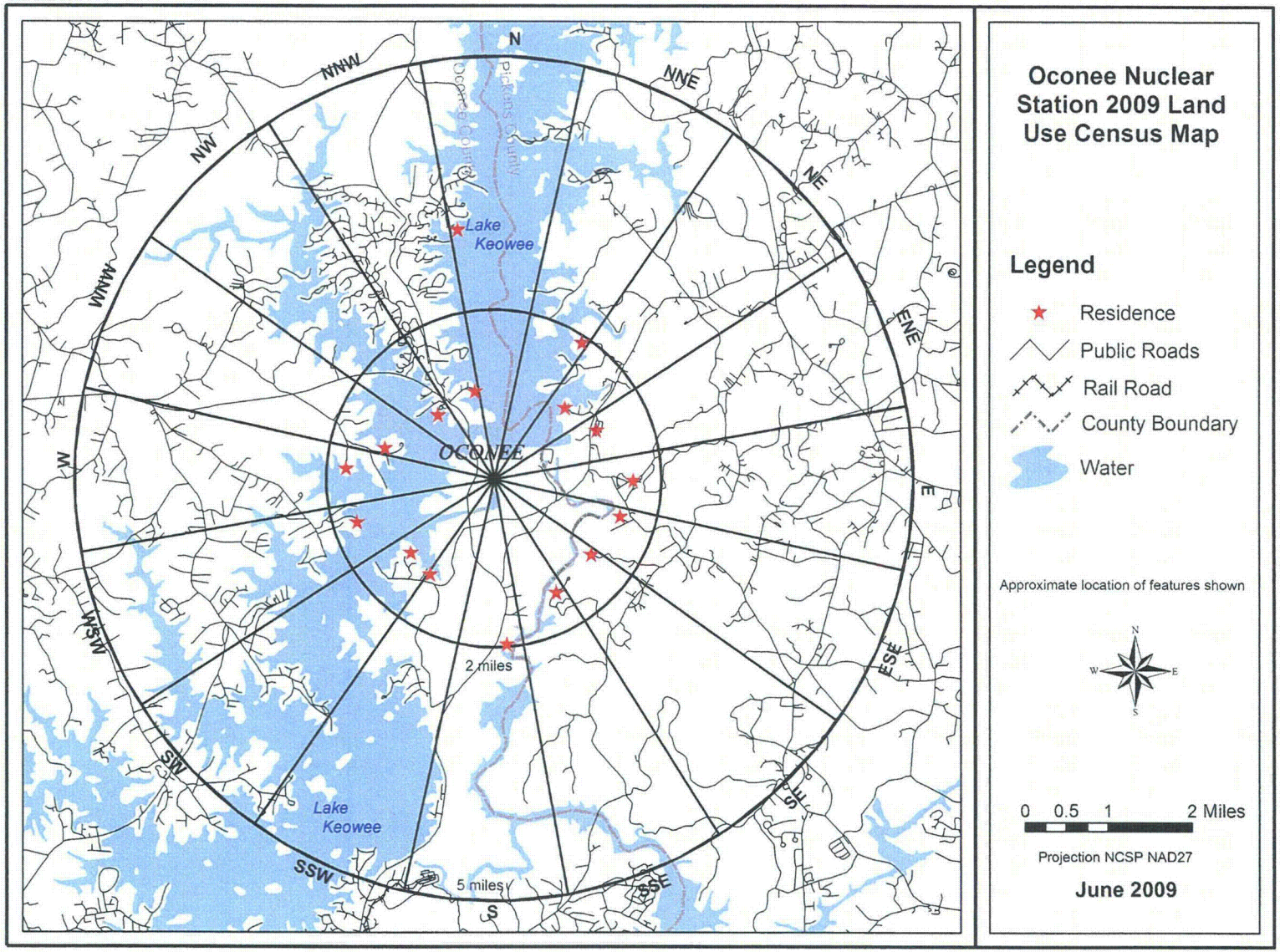
Table 3.9 Oconee 2009 Land Use Census Results

Sector		Distance (Miles)	Sector		Distance (Miles)
N	Nearest Residence	2.98	S	Nearest Residence	1.96
	Nearest Milk Animal	-		Nearest Milk Animal	-
NNE	Nearest Residence	1.84	SSW	Nearest Residence	1.36
	Nearest Milk Animal	-		Nearest Milk Animal	-
NE	Nearest Residence	1.20	SW	Nearest Residence	1.31
	Nearest Milk Animal	-		Nearest Milk Animal	-
ENE	Nearest Residence	1.34	WSW	Nearest Residence	1.77
	Nearest Milk Animal	-		Nearest Milk Animal	-
E	Nearest Residence	1.64	W	Nearest Residence	1.76
	Nearest Milk Animal	-		Nearest Milk Animal	-
ESE	Nearest Residence	1.57	WNW	Nearest Residence	1.35
	Nearest Milk Animal	-		Nearest Milk Animal	-
SE	Nearest Residence	1.46	NW	Nearest Residence	1.04
	Nearest Milk Animal	-		Nearest Milk Animal	-
SSE	Nearest Residence	1.54	NNW	Nearest Residence	1.06
	Nearest Milk Animal	-		Nearest Milk Animal	-

"-" indicates no occurrences within the 5 mile radius

* GPS data reflect approximate accuracy to within 2-5 meters. GPS field measurements were taken as close as possible to the item of interest.

Figure 3.9


Oconee Nuclear Station 2009 Land Use Census Map
Legend
Residence
Public Roads
Rail Road
County Boundary
Water
Approximate location of features shown
0 0.5 1 2 Miles
Projection NCSP NAD27
June 2009
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
OCONEE
2 miles
5 miles
Lake Keowee
Lake Keowee
Pickens County
Oconee County

4.0 EVALUATION OF DOSE

4.1 DOSE FROM ENVIRONMENTAL MEASUREMENTS

Annual doses to maximum exposed individuals were estimated based on measured concentrations of radionuclides in 2009 ONS REMP samples. The primary purpose of estimating doses based on sample results is to allow comparison to effluent program dose estimates. Doses based on sample results were conservatively calculated in a manner as equivalent as possible to effluent-based dose estimates.

Doses based on REMP sample results were calculated using the methodology and data presented in NRC Regulatory Guide 1.109. Measured radionuclide concentrations, averaged over the entire year for a specific radionuclide, indicator location, and sample type, were used to calculate REMP-based doses, after subtracting the applicable average background concentration (as measured at the corresponding control location). Regulatory Guide 1.109 consumption rates for the maximum exposed individual were used in the calculations. A dose factor of zero was assumed when the guide listed "NO DATA" as the dose factor for a given radionuclide and organ.

Maximum dose estimates calculated using drinking water, fish and shoreline sediment results are reported in Table 4.1-A. The individual critical population and pathway dose calculations are contained in Table 4.1-B.

No radionuclides were detected in broadleaf vegetation, milk, airborne radioiodine or airborne particulate samples other than naturally-occurring K-40 and Be-7. Dose estimates were not calculated for surface water samples because surface water is not considered a potable drinking water source although surface water tritium concentrations are used in calculating doses from fish. REMP TLD exposure results are discussed in Section 3.8.

The maximum environmental organ dose estimate for any single sample type (other than direct radiation from gaseous effluents) collected during 2009 was 7.54E-2 mrem to the child liver from consuming drinking water and fish.

4.2 ESTIMATED DOSE FROM RELEASES

Throughout the year, dose estimates were calculated based on actual 2009 liquid and gaseous effluent release data. Effluent-based dose estimates were calculated using the RETDAS computer program which employs methodology and data presented in NRC Regulatory Guide 1.109. These doses are shown in Table 4.1-A along with the corresponding REMP-based dose estimates. Summaries of RETDAS dose calculations are reported in the Annual Radioactive Effluent Release Report (reference 6.6).

The effluent-based liquid release doses are summations of the dose contributions of the drinking water, fish and shoreline pathways. The effluent-based gaseous release doses report

noble gas exposure separately from iodine, particulate, and tritium exposure. For noble gas exposure there is no critical age group; as the maximum exposed individuals are assumed to receive the same doses, regardless of their age group. For iodine, particulate, and tritium exposure the effluent-based gaseous release doses are summations of the dose contributors from ground/plane, milk, inhalation and vegetation pathways.

4.3 COMPARISON OF DOSES

The liquid environmental and release data doses given in Table 4.1-A agree reasonably well. The similarity of the doses indicate that the radioactivity levels in the environment do not differ significantly from those expected based on effluent measurements and modeling of the environmental exposure pathways.

In addition, there are some differences in how effluent and environmental doses are calculated that affect the comparison. Doses calculated from environmental data are conservative because they are based on a mean that includes only samples with a net positive activity versus a mean that includes all sample results (i.e. zero results are not included in the mean). Also, airborne tritium is not measured in environmental samples but is used to calculate effluent doses.

In calculations based on liquid release effluent pathways, fish and drinking water were the predominant dose pathways based on environmental and effluent samples. The maximum total organ dose based on 2009 environmental sample results was 7.54E-2 mrem to the child liver. The maximum total organ dose of 1.46E-1 mrem for liquid effluent-based estimates was to the adult GI-LLI.

In calculations based on gaseous release pathways, vegetation was the predominant dose pathway for effluent samples. The gaseous effluent dose is due to tritium on broadleaf vegetation. The maximum total organ dose for gaseous effluent estimates was 2.75E-2 mrem to the child thyroid. No radioactivity was detected from gaseous pathways in environmental samples; therefore, there is no calculated dose.

Noble gas samples are not collected as part of the REMP, preventing an analogous comparison of effluent-based noble gas exposure estimates.

The doses calculated do not exceed the 40CFR190 dose commitment limits for members of the public. Doses to members of the public attributable to the operation of ONS are being maintained well within regulatory limits.

TABLE 4.1-A

OCONEE NUCLEAR STATION
2009 ENVIRONMENTAL AND EFFLUENT DOSE COMPARISON

LIQUID RELEASE PATHWAY

Organ	Environmental or Effluent Data	Critical Age (1)	Critical Pathway (2)	Location	Maximum Dose (3) (mrem)
Skin	Environmental	Teen	Shoreline Sediment	063 (0.83 mi ESE)	1.83E-04
Skin	Effluent	Teen	Shoreline Sediment	Discharge Pt.	5.67E-04
Bone	Environmental	Child	Fish	063 (0.83 mi ESE)	2.75E-02
Bone	Effluent	Child	Fish	Discharge Pt.	1.07E-02
Liver	Environmental	Child	Drinking Water	066 (18.9 mi SSE)	7.54E-02
Liver	Effluent	Adult	Fish	Discharge Pt.	6.46E-02
T. Body	Environmental	Adult	Drinking Water	066 (18.9 mi SSE)	5.97E-02
T. Body	Effluent	Adult	Fish	Discharge Pt.	6.11E-02
Thyroid	Environmental	Child	Drinking Water	066 (18.9 mi SSE)	4.89E-02
Thyroid	Effluent	Child	Drinking Water	18.9 mi SSE	5.17E-02
Kidney	Environmental	Child	Drinking Water	066 (18.9 mi SSE)	5.75E-02
Kidney	Effluent	Child	Drinking Water	18.9 mi SSE	5.49E-02
Lung	Environmental	Child	Drinking Water	066 (18.9 mi SSE)	5.20E-02
Lung	Effluent	Child	Drinking Water	18.9 mi SSE	5.21E-02
GI-LLI	Environmental	Child	Drinking Water	066 (18.9 mi SSE)	4.97E-02
GI-LLI	Effluent	Adult	Fish	Discharge Pt.	1.46E-01

(1) Critical Age is the highest total dose (all pathways) to an age group.

(2) Critial Pathway is the highest individual dose within the identified Critical Age group.

(3) Maximum dose is a summation of the fish, drinking water and shoreline sediment pathways.

GASEOUS RELEASE PATHWAY

IODINE, PARTICULATE, and TRITIUM

Organ	Environmental or Effluent Data	Critical Age (1)	Critical Pathway (2)	Location	Maximum Dose (3) (mrem)
Skin	Environmental	-	-	-	0.00E+00
Skin	Effluent	All	Ground Plane	1.0 mi. SW	9.32E-06
Bone	Environmental	-	-	-	0.00E+00
Bone	Effluent	Child	Vegetation	1.0 mi. SW	4.22E-05
Liver	Environmental	-	-	-	0.00E+00
Liver	Effluent	Child	Vegetation	1.0 mi. SW	2.02E-02
T. Body	Environmental	-	-	-	0.00E+00
T. Body	Effluent	Child	Vegetation	1.0 mi. SW	2.02E-02
Thyroid	Environmental	-	-	-	0.00E+00
Thyroid	Effluent	Child	Vegetation	1.0 mi. SW	2.75E-02
Kidney	Environmental	-	-	-	0.00E+00
Kidney	Effluent	Child	Vegetation	1.0 mi. SW	2.02E-02
Lung	Environmental	-	-	-	0.00E+00
Lung	Effluent	Child	Vegetation	1.0 mi. SW	2.01E-02
GI-LLI	Environmental	-	-	-	0.00E+00
GI-LLI	Effluent	Child	Vegetation	1.0 mi. SW	2.01E-02

(1) Critical Age is the highest total dose (all pathways) to an age group.

(2) Critial Pathway is the highest individual dose within the identified Critical Age group.

(3) Maximum dose is a summation of the ground/plane, inhalation, milk and vegetation pathways.

NOBLE GAS

Air Dose	Environmental or Effluent Data	Critical Age	Critical Pathway	Location	Maximum Dose (mrad)
Beta	Environmental	-	-	-	Not Sampled
Beta	Effluent	N/A	Noble Gas	1.0 mi. SW	1.42E-03
Gamma	Environmental	-	-	-	Not Sampled
Gamma	Effluent	N/A	Noble Gas	1.0 mi. SW	3.34E-04

TABLE 4.1-B

Maximum Individual Dose for 2009 based on Environmental Measurements (mrem) for Oconee Nuclear Station

Age	Sample Medium	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Skin
Infant	Airborne	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Drinking Water	0.00E+00	4.22E-02	4.22E-02	4.22E-02	4.22E-02	4.22E-02	4.22E-02	0.00E+00
	Milk	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	TOTAL	0.00E+00	4.22E-02	4.22E-02	4.22E-02	4.22E-02	4.22E-02	4.22E-02	0.00E+00
Child	Airborne	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Drinking Water	0.00E+00	4.30E-02	4.30E-02	4.30E-02	4.30E-02	4.30E-02	4.30E-02	0.00E+00
	Milk	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Broadleaf Vegetation	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Fish	2.75E-02	3.24E-02	1.01E-02	5.90E-03	1.45E-02	8.99E-03	6.71E-03	0.00E+00
	Shoreline Sediment	0.00E+00	0.00E+00	3.28E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.83E-05
	TOTAL	2.75E-02	7.54E-02	5.31E-02	4.89E-02	5.75E-02	5.20E-02	4.97E-02	3.83E-05
Teen	Airborne	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Drinking Water	0.00E+00	2.24E-02	2.24E-02	2.24E-02	2.24E-02	2.24E-02	2.24E-02	0.00E+00
	Milk	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Broadleaf Vegetation	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Fish	2.19E-02	3.64E-02	1.76E-02	7.14E-03	1.70E-02	1.10E-02	9.49E-03	0.00E+00
	Shoreline Sediment	0.00E+00	0.00E+00	1.57E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.83E-04
	TOTAL	2.19E-02	5.88E-02	4.02E-02	2.95E-02	3.94E-02	3.34E-02	3.19E-02	1.83E-04
Adult	Airborne	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Drinking Water	0.00E+00	3.18E-02	3.18E-02	3.18E-02	3.18E-02	3.18E-02	3.18E-02	0.00E+00
	Milk	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Broadleaf Vegetation	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Fish	2.04E-02	3.73E-02	2.79E-02	9.28E-03	1.88E-02	1.24E-02	1.27E-02	0.00E+00
	Shoreline Sediment	0.00E+00	0.00E+00	2.81E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.28E-05
	TOTAL	2.04E-02	6.91E-02	5.97E-02	4.11E-02	5.06E-02	4.42E-02	4.45E-02	3.28E-05

Note: Dose tables are provided for sample media displaying positive nuclide occurrence.

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2009 Data
Maximum Exposed Infant

Infant Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = 330 l

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Water (pCi/l)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.99E-05	4.51E-06	NO DATA	4.41E-06	NO DATA	7.31E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	3.60E-06	8.98E-06	NO DATA	NO DATA	NO DATA	8.97E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	3.08E-05	5.38E-05	2.12E-05	NO DATA	NO DATA	1.59E-05	2.57E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	1.08E-05	2.55E-05	NO DATA	NO DATA	NO DATA	2.57E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.84E-05	6.31E-05	2.91E-05	NO DATA	3.06E-05	NO DATA	5.33E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	4.20E-08	1.73E-08	1.00E-08	NO DATA	1.24E-08	NO DATA	1.46E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	2.06E-07	5.02E-08	3.56E-08	NO DATA	5.41E-08	NO DATA	2.50E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	3.59E-05	4.23E-05	1.86E-05	1.39E-02	4.94E-05	NO DATA	1.51E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	3.77E-04	7.03E-04	7.10E-05	NO DATA	1.81E-04	7.42E-05	1.91E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	5.22E-04	6.11E-04	4.33E-05	NO DATA	1.64E-04	6.64E-05	1.91E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	1.71E-04	1.71E-07	8.81E-06	NO DATA	4.06E-08	1.05E-07	4.20E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	3.08E-07	3.08E-07	3.08E-07	3.08E-07	3.08E-07	3.08E-07	066	415	0.00E+00	4.22E-02	4.22E-02	4.22E-02	4.22E-02	4.22E-02	4.22E-02
							Dose Commitment (mrem) =			0.00E+00	4.22E-02	4.22E-02	4.22E-02	4.22E-02	4.22E-02	4.22E-02

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2009 Data
Maximum Exposed Child

Child Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = 510 l

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Water (pCi/l)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.07E-05	2.85E-06	NO DATA	3.00E-06	NO DATA	8.98E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	1.80E-06	5.51E-06	NO DATA	NO DATA	NO DATA	1.05E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	1.65E-05	2.67E-05	1.33E-05	NO DATA	NO DATA	7.74E-06	2.78E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C0-60	NO DATA	5.29E-06	1.56E-05	NO DATA	NO DATA	NO DATA	2.93E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.37E-05	3.65E-05	2.27E-05	NO DATA	2.30E-05	NO DATA	6.41E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	2.25E-08	8.76E-09	6.26E-09	NO DATA	8.23E-09	NO DATA	1.62E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	1.16E-07	2.55E-08	2.27E-08	NO DATA	3.65E-08	NO DATA	2.66E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	1.72E-05	1.73E-05	9.83E-06	5.72E-03	2.84E-05	NO DATA	1.54E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	2.34E-04	3.84E-04	8.10E-05	NO DATA	1.19E-04	4.27E-05	2.07E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	3.27E-04	3.13E-04	4.62E-05	NO DATA	1.02E-04	3.67E-05	1.96E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	8.31E-05	7.28E-08	4.85E-06	NO DATA	2.37E-08	4.34E-08	4.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	066	415	0.00E+00	4.30E-02	4.30E-02	4.30E-02	4.30E-02	4.30E-02	4.30E-02
						Dose Commitment (mrem) =				0.00E+00	4.30E-02	4.30E-02	4.30E-02	4.30E-02	4.30E-02	4.30E-02

Oconee Nuclear Station
Dose from Fish Pathway for 2009 Data
Maximum Exposed Child

Child Dose from Fish Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

H-3 Concentration in Fish = Surface Water pCi/l x Bioaccumulation Factor 0.9 pCi/kg per pCi/l = 4678 pCi/l x 0.9 = 4210 pCi/kg

Usage (intake in one year) = **6.9 kg**

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Fish (pCi/kg)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.07E-05	2.85E-06	NO DATA	3.00E-06	NO DATA	8.98E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	1.80E-06	5.51E-06	NO DATA	NO DATA	NO DATA	1.05E-05	063	9.01	0.00E+00	1.12E-04	3.43E-04	0.00E+00	0.00E+00	0.00E+00	6.53E-04
Fe-59	1.65E-05	2.67E-05	1.33E-05	NO DATA	NO DATA	7.74E-06	2.78E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
C0-60	NO DATA	5.29E-06	1.56E-05	NO DATA	NO DATA	NO DATA	2.93E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	1.37E-05	3.65E-05	2.27E-05	NO DATA	2.30E-05	NO DATA	6.41E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	2.34E-04	3.84E-04	8.10E-05	NO DATA	1.19E-04	4.27E-05	2.07E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	3.27E-04	3.13E-04	4.62E-05	NO DATA	1.02E-04	3.67E-05	1.96E-06	063	12.2	2.75E-02	2.63E-02	3.89E-03	0.00E+00	8.59E-03	3.09E-03	1.65E-04
H-3	NO DATA	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	063.1	4210	0.00E+00	5.90E-03	5.90E-03	5.90E-03	5.90E-03	5.90E-03	5.90E-03
								Dose Commitment (mrem) =		2.75E-02	3.24E-02	1.01E-02	5.90E-03	1.45E-02	8.99E-03	6.71E-03

Oconee Nuclear Station
Dose from Shoreline Sediment Pathway for 2009 Data
Maximum Exposed Child

Shoreline Recreation =	14	hr (in one year)
Shore Width Factor =	0.2	
Sediment Surface Mass =	40	kg/m^2

Child Dose from Shoreline Sediment Pathway (mrem) = Shoreline Recreation (hr) x External Dose Factor (mrem/hr per pCi/m^2) x Shore Width Factor x Sediment Surface Mass (kg/m^2) x Sediment Concentration (pCi/kg)

	External Dose Factor Standing on Contaminated Ground		Highest Annual Net Mean Concentration		Dose	
	(mrem/hr per pCi/m^2)		Indicator	Sediment	(mrem)	
Radionuclide	T. Body	Skin	Location	(pCi/kg)	T. Body	Skin
Cs-134	1.20E-08	1.40E-08	ALL	0.00	0.00E+00	0.00E+00
Cs-137	4.20E-09	4.90E-09	063	69.7	3.28E-05	3.83E-05
		Dose Commitment (mrem) =			3.28E-05	3.83E-05

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2009 Data
Maximum Exposed Teen

Teen Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = 510 l

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Water (pCi/l)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	5.90E-06	1.17E-06	NO DATA	1.76E-06	NO DATA	1.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	9.72E-07	2.24E-06	NO DATA	NO DATA	NO DATA	1.34E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	5.87E-06	1.37E-05	5.29E-06	NO DATA	NO DATA	4.32E-06	3.24E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.81E-06	6.33E-06	NO DATA	NO DATA	NO DATA	3.66E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	5.76E-06	2.00E-05	9.33E-06	NO DATA	1.28E-05	NO DATA	8.47E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	8.22E-09	4.56E-09	2.51E-09	NO DATA	4.42E-09	NO DATA	1.95E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	4.12E-08	1.30E-08	8.94E-09	NO DATA	1.91E-08	NO DATA	3.00E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	5.85E-06	8.19E-06	4.40E-06	2.39E-03	1.41E-05	NO DATA	1.62E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	8.37E-05	1.97E-04	9.14E-05	NO DATA	6.26E-05	2.39E-05	2.45E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.07E-05	1.97E-05	2.12E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.84E-05	3.48E-08	1.83E-06	NO DATA	1.18E-08	2.34E-08	4.38E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	066	415	0.00E+00	2.24E-02	2.24E-02	2.24E-02	2.24E-02	2.24E-02	2.24E-02
						Dose Commitment (mrem)=				0.00E+00	2.24E-02	2.24E-02	2.24E-02	2.24E-02	2.24E-02	2.24E-02

Oconee Nuclear Station
Dose from Fish Pathway for 2009 Data
Maximum Exposed Teen

Teen Dose from Fish Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

H-3 Concentration in Fish = Surface Water pCi/l x Bioaccumulation Factor 0.9 pCi/kg per pCi/l = 4678 pCi/l x 0.9 = 4210 pCi/kg

Usage (intake in one year) = 16 kg

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Location	(pCi/kg)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	5.90E-06	1.17E-06	NO DATA	1.76E-06	NO DATA	1.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	9.72E-07	2.24E-06	NO DATA	NO DATA	NO DATA	1.34E-05	063	9.01	0.00E+00	1.40E-04	3.23E-04	0.00E+00	0.00E+00	0.00E+00	1.93E-03
Fe-59	5.87E-06	1.37E-05	5.29E-06	NO DATA	NO DATA	4.32E-06	3.24E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.81E-06	6.33E-06	NO DATA	NO DATA	NO DATA	3.66E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	5.76E-06	2.00E-05	9.33E-06	NO DATA	1.28E-05	NO DATA	8.47E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	8.37E-05	1.97E-04	9.14E-05	NO DATA	6.26E-05	2.39E-05	2.45E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.07E-05	1.97E-05	2.12E-06	063	12.2	2.19E-02	2.91E-02	1.01E-02	0.00E+00	9.90E-03	3.85E-03	4.14E-04
H-3	NO DATA	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	063.1	4210	0.00E+00	7.14E-03	7.14E-03	7.14E-03	7.14E-03	7.14E-03	7.14E-03
						Dose Commitment (mrem) =				2.19E-02	3.64E-02	1.76E-02	7.14E-03	1.70E-02	1.10E-02	9.49E-03

Oconee Nuclear Station
Dose from Shoreline Sediment Pathway for 2009 Data
Maximum Exposed Teen

Shoreline Recreation = 67 hr (in one year)
Shore Width Factor = 0.2
Sediment Surface Mass = 40 kg/m^2

Teen Dose from Shoreline Sediment Pathway (mrem) = Shoreline Recreation (hr) x External Dose Factor (mrem/hr per pCi/m^2) x Shore Width Factor x Sediment Surface Mass (kg/m^2) x Sediment Concentration (pCi/kg)

	External Dose Factor Standing on Contaminated Ground		Highest Annual Net Mean Concentration		Dose	
	(mrem/hr per pCi/m^2)		Indicator	Sediment	(mrem)	
Radionuclide	T. Body	Skin	Location	(pCi/kg)	T. Body	Skin
Cs-134	1.20E-08	1.40E-08	ALL	0.00	0.00E+00	0.00E+00
Cs-137	4.20E-09	4.90E-09	063	69.7	1.57E-04	1.83E-04
	Dose Commitment (mrem) =				1.57E-04	1.83E-04

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2009 Data
Maximum Exposed Adult

Adult Dose from Drinking Water Pathway (mrem) = Usage (l) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/l)

Usage (intake in one year) = 730 l

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Water (pCi/l)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.36E-06	NO DATA	1.40E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	7.45E-07	1.67E-06	NO DATA	NO DATA	NO DATA	1.51E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fe-59	4.34E-06	1.02E-05	3.91E-06	NO DATA	NO DATA	2.85E-06	3.40E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.02E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.84E-06	1.54E-05	6.96E-06	NO DATA	1.03E-05	NO DATA	9.70E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nb-95	6.22E-09	3.46E-09	1.86E-09	NO DATA	3.42E-09	NO DATA	2.10E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zr-95	3.04E-08	9.75E-09	6.60E-09	NO DATA	1.53E-08	NO DATA	3.09E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
I-131	4.16E-06	5.95E-06	3.41E-06	1.95E-03	1.02E-05	NO DATA	1.57E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
BaLa-140	2.03E-05	2.55E-08	1.33E-06	NO DATA	8.67E-09	1.46E-08	4.18E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
H-3	NO DATA	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	066	415	0.00E+00	3.18E-02	3.18E-02	3.18E-02	3.18E-02	3.18E-02	3.18E-02
						Dose Commitment (mrem) =				0.00E+00	3.18E-02	3.18E-02	3.18E-02	3.18E-02	3.18E-02	3.18E-02

Oconee Nuclear Station
Dose from Fish Pathway for 2009 Data
Maximum Exposed Adult

Adult Dose from Fish Pathway (mrem) = Usage (kg) x Dose Factor (mrem/pCi ingested) x Concentration (pCi/kg)

H-3 Concentration in Fish = Surface Water pCi/l x Bioaccumulation Factor 0.9 pCi/kg per pCi/l = 4678 pCi/l x 0.9 = 4210 pCi/kg

Usage (intake in one year) = 21 kg

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Location	(pCi/kg)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.36E-06	NO DATA	1.40E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	7.45E-07	1.67E-06	NO DATA	NO DATA	NO DATA	1.51E-05	063	9.01	0.00E+00	1.41E-04	3.16E-04	0.00E+00	0.00E+00	0.00E+00	2.86E-03
Fe-59	4.34E-06	1.02E-05	3.91E-06	NO DATA	NO DATA	2.85E-06	3.40E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.02E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.84E-06	1.54E-05	6.96E-06	NO DATA	1.03E-05	NO DATA	9.70E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06	063	12.2	2.04E-02	2.79E-02	1.83E-02	0.00E+00	9.48E-03	3.15E-03	5.41E-04
H-3	NO DATA	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	063.1	4210	0.00E+00	9.28E-03	9.28E-03	9.28E-03	9.28E-03	9.28E-03	9.28E-03
								Dose Commitment (mrem) =		2.04E-02	3.73E-02	2.79E-02	9.28E-03	1.88E-02	1.24E-02	1.27E-02

Oconee Nuclear Station
Dose from Shoreline Sediment Pathway for 2009 Data
Maximum Exposed Adult

Shoreline Recreation = 12 hr (in one year)
Shore Width Factor = 0.2
Sediment Surface Mass = 40 kg/m^2

Adult Dose from Shoreline Sediment Pathway (mrem) = Shoreline Recreation (hr) x External Dose Factor (mrem/hr per pCi/m^2) x Shore Width Factor x Sediment Surface Mass (kg/m^2) x Sediment Concentration (pCi/kg)

	External Dose Factor Standing on Contaminated Ground (mrem/hr per pCi/m^2)		Highest Annual Net Mean Concentration		Dose (mrem)	
Radionuclide	T. Body	Skin	Indicator Location	Sediment (pCi/kg)	T. Body	Skin
Cs-134	1.20E-08	1.40E-08	ALL	0.00	0.00E+00	0.00E+00
Cs-137	4.20E-09	4.90E-09	063	69.7	2.81E-05	3.28E-05
	Dose Commitment (mrem) =				2.81E-05	3.28E-05

5.0 QUALITY ASSURANCE

5.1 SAMPLE COLLECTION

EnRad Laboratories, Fisheries, and Aquatic Ecology performed the environmental sample collections as specified by approved sample collection procedures.

5.2 SAMPLE ANALYSIS

EnRad Laboratories performed the environmental sample analyses as specified by approved analysis procedures. EnRad Laboratories is located in Huntersville, North Carolina, at Duke Energy Corporation's Environmental Center.

Duke Energy Corporation's
Environmental Center

5.3 DOSIMETRY ANALYSIS

The Radiation Dosimetry and Records group performed environmental dosimetry measurements as specified by approved dosimetry analysis procedures.

5.4 LABORATORY EQUIPMENT QUALITY ASSURANCE

5.4.1 DAILY QUALITY CONTROL

EnRad Laboratories has an internal quality assurance program which monitors each type of instrumentation for reliability and accuracy. Daily quality control checks ensure that instruments are in proper working order and these checks are used to monitor instrument performance.

5.4.2 CALIBRATION VERIFICATION

National Institute of Standards and Technology (NIST) standards that represent counting geometries are analyzed as unknowns at various frequencies ranging from weekly to annually to verify that efficiency calibrations are valid. The frequency is dependent upon instrument use and performance. Investigations are performed and documented should calibration verification data fall out of limits.

5.4.3 BATCH PROCESSING

Method quality control samples are analyzed with sample analyses that are processed in batches. These include gross beta in drinking water and all tritium analyses.

5.5 DUKE ENERGY INTERCOMPARISON PROGRAM

EnRad Laboratories participated in the Duke Energy Nuclear Generation Department Intercomparison Program during 2009. Interlaboratory cross-check standards, including, Marinelli beakers, air filters, air cartridges, gross beta on smears, and tritium in water samples were analyzed at various times of the year. A summary of the EnRad Laboratory program results for 2009 is documented in Table 5.0-A.

5.6 ERA PROFICIENCY TESTING

EnRad Laboratories performed method proficiency testing through a program administered by Environmental Resource Associates (ERA) of Arvada, CO. ERA supplied requested method proficiency samples for analysis and nuclide concentration determination. ERA reported proficiency test results to the North Carolina Department of Health and Human Services, North Carolina Public Health Drinking Water Laboratory Certification Program. A summary of these proficiency test data for 2009 is documented in Table 5.0-B.

5.7 DUKE ENERGY AUDITS

The Oconee Radiation Protection Section was not audited by the Quality Assurance Group in 2009, but was audited in 2008 (reference 6.14). There were some REMP safety enhancements identified as a result of the 2008 audit.

EnRad Laboratories was not audited by the Quality Assurance Group in 2009, but was audited in 2008 (reference 6.15). There were some REMP recommendations as a result of the 2008 audit.

5.8 U.S. NUCLEAR REGULATORY COMMISSION INSPECTIONS

The Oconee Nuclear Station Radiological Environmental Monitoring Program was not audited by the NRC in 2009. The program was audited by the NRC in 2008 (reference 6.12). No findings were noted in the 2008 report.

5.9 STATE OF SOUTH CAROLINA INTERCOMPARISON PROGRAM

Oconee Nuclear Station routinely participates with the Bureau of Radiological Health of the State's Department of Health and Environmental Control (DHEC) in an

intercomparison program. The Memorandum of Agreement (MOA) between SC DHEC and Duke Energy describes the sampling frequency and analysis parameters for drinking water, surface water, milk, fish, vegetation, and shoreline sediment samples collected by EnRad Laboratories. Samples are routinely split with DHEC for intercomparison analysis. DHEC collects air samples near two of the locations sampled for air by ONS. Results of the analyses performed on split and duplicate samples are sent to DHEC.

5.10 TLD INTERCOMPARISON PROGRAM

5.10.1 NUCLEAR TECHNOLOGY SERVICES INTERCOMPARISON PROGRAM

Radiation Dosimetry and Records participates in a quarterly TLD intercomparison program administered by Nuclear Technology Services, Inc. of Roswell, GA. Nuclear Technology Services irradiates environmental dosimeters quarterly and sends them to the Radiation Dosimetry and Records group for analysis of the unknown estimated delivered exposure. A summary of the Nuclear Technology Services Intercomparison Report is documented in Table 5.0-C.

5.10.2 INTERNAL CROSSCHECK (DUKE ENERGY)

Radiation Dosimetry and Records participates in a quarterly TLD intracomparison program administered internally by the Dosimetry Lab. The Dosimetry Lab Staff irradiates environmental dosimeters quarterly and submits them for analysis of the unknown estimated delivered exposure. A summary of the Internal Cross Check (Duke Energy) Result is documented in Table 5.0-C.

TABLE 5.0-A
DUKE ENERGY
INTERLABORATORY COMPARISON PROGRAM

2009 CROSS-CHECK RESULTS FOR ENRAD LABORATORIES

Cross-Check samples are normally analyzed a minimum of three times. A status of "3 Pass" indicates that all three analyses yielded results within the designated acceptance range. A status of "1 Pass" indicates that one analysis of the cross check was performed

If applicable, footnote explanations are included following this table.

Gamma in Water 3.5 liters

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/5/2009	Q091GWL	Cr-51	1.54 - 2.73 E5	2.05 E5	2.06 E5	3 Pass
		Mn-54	4.68 - 8.30 E4	6.24 E4	6.47 E4	3 Pass
		Co-58	4.88 - 8.65 E4	6.50 E4	6.52 E4	3 Pass
		Fe-59	4.40 - 7.80 E4	5.87 E4	6.15 E4	3 Pass
		Co-60	5.08 - 9.02 E4	6.78 E4	7.05 E4	3 Pass
		Zn-65	5.79 - 10.26 E4	7.72 E4	8.01 E4	3 Pass
		Cs-134	3.38 - 5.99 E4	4.50 E4	4.13 E4	3 Pass
		Cs-137	3.96 - 7.03 E4	5.28 E4	5.05 E4	3 Pass
		Ce-141	4.55 - 8.07 E4	6.07 E4	5.99 E4	3 Pass
7/29/2009	Q093GWS	Co-57	1.22 - 2.16 E5	1.62 E5	1.73 E5	2 Pass
		Co-60	1.88 - 3.33 E5	2.50 E5	2.65 E5	2 Pass
		Y-88	1.22 - 2.16 E5	1.62 E5	1.63 E5	2 Pass
		Sn-113	1.91 - 3.38 E5	2.54 E5	2.46 E5	2 Pass
		Cs-137	3.28 - 5.81 E5	4.37 E5	4.46 E5	2 Pass

Gamma in Water 1.0 liter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/5/2009	Q091GWL	Cr-51	1.54 - 2.73 E5	2.05 E5	2.04 E5	3 Pass
		Mn-54	4.68 - 8.30 E4	6.24 E4	6.53 E4	3 Pass
		Co-58	4.88 - 8.65 E4	6.50 E4	6.48 E4	3 Pass
		Fe-59	4.40 - 7.80 E4	5.87 E4	6.17 E4	3 Pass
		Co-60	5.08 - 9.02 E4	6.78 E4	6.96 E4	3 Pass
		Zn-65	5.79 - 10.26 E4	7.72 E4	7.98 E4	3 Pass
		Cs-134	3.38 - 5.99 E4	4.50 E4	4.03 E4	3 Pass
		Cs-137	3.96 - 7.03 E4	5.28 E4	5.03 E4	3 Pass
		Ce-141	4.55 - 8.07 E4	6.07 E4	5.94 E4	3 Pass

Gamma in Water 1.0 liter, continued

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
7/29/2009	Q093GWS	Co-57	1.22 - 2.16 E5	1.62 E5	1.64 E5	3 Pass
		Co-60	1.88 - 3.33 E5	2.50 E5	2.59 E5	3 Pass
		Y-88	1.22 - 2.16 E5	1.62 E5	1.58 E5	3 Pass
		Sn-113	1.91 - 3.38 E5	2.54 E5	2.40 E5	3 Pass
		Cs-137	3.28 - 5.81 E5	4.37 E5	4.28 E5	3 Pass

Gamma in Water 0.5 liter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/5/2009	Q091GWL	Cr-51	1.54 - 2.73 E5	2.05 E5	2.05 E5	3 Pass
		Mn-54	4.68 - 8.30 E4	6.24 E4	6.35 E4	3 Pass
		Co-58	4.88 - 8.65 E4	6.50 E4	6.27 E4	3 Pass
		Fe-59	4.40 - 7.80 E4	5.87 E4	6.10 E4	3 Pass
		Co-60	5.08 - 9.02 E4	6.78 E4	6.94 E4	3 Pass
		Zn-65	5.79 - 10.26 E4	7.72 E4	8.01 E4	3 Pass
		Cs-134	3.38 - 5.99 E4	4.50 E4	3.88 E4	3 Pass
		Cs-137	3.96 - 7.03 E4	5.28 E4	4.90 E4	3 Pass
		Ce-141	4.55 - 8.07 E4	6.07 E4	5.80 E4	3 Pass
7/29/2009	Q093GWS	Co-57	1.22 - 2.16 E5	1.62 E5	1.61 E5	3 Pass
		Co-60	1.88 - 3.33 E5	2.50 E5	2.55 E5	3 Pass
		Y-88	1.22 - 2.16 E5	1.62 E5	1.58 E5	3 Pass
		Sn-113	1.91 - 3.38 E5	2.54 E5	2.36 E5	3 Pass
		Cs-137	3.28 - 5.81 E5	4.37 E5	4.27 E5	3 Pass

Gamma in Water 0.25 liter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/5/2009	Q091GWL	Cr-51	1.54 - 2.73 E5	2.05 E5	2.08 E5	3 Pass
		Mn-54	4.68 - 8.30 E4	6.24 E4	6.51 E4	3 Pass
		Co-58	4.88 - 8.65 E4	6.50 E4	6.43 E4	3 Pass
		Fe-59	4.40 - 7.80 E4	5.87 E4	6.15 E4	3 Pass
		Co-60	5.08 - 9.02 E4	6.78 E4	7.13 E4	3 Pass
		Zn-65	5.79 - 10.26 E4	7.72 E4	7.93 E4	3 Pass
		Cs-134	3.38 - 5.99 E4	4.50 E4	4.00 E4	3 Pass
		Cs-137	3.96 - 7.03 E4	5.28 E4	5.07 E4	3 Pass
		Ce-141	4.55 - 8.07 E4	6.07 E4	5.97 E4	3 Pass

Gamma in Water 0.25 liter, continued

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
7/29/2009	Q093GWS	Co-57	1.22 - 2.16 E5	1.62 E5	1.58 E5	2 Pass
		Co-60	1.88 - 3.33 E5	2.50 E5	2.57 E5	2 Pass
		Y-88	1.22 - 2.16 E5	1.62 E5	1.58 E5	2 Pass
		Sn-113	1.91 - 3.38 E5	2.54 E5	2.32 E5	2 Pass
		Cs-137	3.28 - 5.81 E5	4.37 E5	4.13 E5	2 Pass

Gamma in Filter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi	Reference Value pCi	Mean Reported Value pCi	Cross Check Status
6/18/2009	E6701-37	Cr-51	0.29 - 10.17 E2	1.73 E2	1.61 E2	2 Pass
		Mn-54	4.45 - 7.89 E1	5.93 E1	5.96 E1	2 Pass
		Co-58	2.94 - 5.36 E1	3.97 E1	3.95 E1	2 Pass
		Fe-59	2.06 - 13.54 E1	5.29 E1	4.50 E1	2 Pass
		Co-60	1.01 - 1.80 E2	1.35 E2	1.36 E2	2 Pass
		Zn-65	5.68 - 10.07 E1	7.57 E1	8.01 E1	2 Pass
		Cs-134	5.38 - 9.54 E1	7.17 E1	6.50 E1	2 Pass
		Cs-137	6.23 - 11.04 E1	8.30 E1	7.61 E1	2 Pass
		Ce-141	0.92 - 1.64 E2	1.23 E2	1.30 E2	2 Pass

Iodine in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
7/21/2009	Q093LIW1	I-131	1.99 - 3.53 E2	2.65 E2	2.29 E2	3 Pass
7/21/2009	Q093LIW2	I-131	0.87 - 1.55 E1	1.16 E1	0.89 E1	1/3 Low (1)
7/21/2009	Q093LIW3	I-131	5.09 - 9.03 E2	6.79 E2	5.99 E2	3 Pass

Iodine in Milk

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/4/2009	Q091LIM2	I-131	3.30 - 5.85 E3	4.40 E3	2.65 E3	3/3 Low (2)
3/4/2009	Q091LIM3	I-131	1.41 - 2.51 E2	1.88 E2	1.38 E2	2/3 Low (3)
6/8/2009	Q092LIM1	I-131	3.36 - 5.95 E2	4.48 E2	4.54 E2	3 Pass
6/8/2009	Q092LIM2	I-131	0.86 - 1.53 E3	1.15 E3	1.08 E3	3 Pass
6/8/2009	Q092LIM3	I-131	7.49 - 13.28 E1	9.99 E1	9.61 E1	3 Pass

Iodine on Cartridge

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi	Reference Value pCi	Mean Reported Value pCi	Cross Check Status
6/18/2009	E6702-37	I-131	7.24 - 12.83 E1	9.65 E1	9.53 E1	3 Pass

Beta Air Particulate

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi	Reference Value pCi	Mean Reported Value pCi	Cross Check Status
12/10/2009	E6903-37	Cs-137	1.97 - 3.50 E2	2.63 E2	2.36 E2	3 Pass

Tritium in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
1/28/2009	Q091TWR1	H-3	4.30 - 7.62 E3	5.73 E3	5.54 E3	3 Pass
1/28/2009	Q091TWR2	H-3	0.86 - 1.53 E4	1.15 E4	1.09 E4	3 Pass
7/22/2009	Q093TWS1	H-3	0.88 - 1.56 E4	1.18 E4	1.13 E4	3 Pass
7/22/2009	Q093TWS2	H-3	3.43 - 6.61 E2	4.76 E2	5.10 E2	3 Pass
11/12/2009	Q094TWS1	H-3	5.30 - 9.40 E8	7.07 E8	7.82 E8	3 Pass
11/12/2009	Q094TWS2	H-3	0.77 - 1.36 E5	1.02 E5	0.97 E5	3 Pass

Table 5.0-A Footnote Explanations

(1) Iodine in Water, Sample ID Q093LIW2, Reference Date 7/21/2009

One of three results was outside of the acceptance range (reference 6.17).

(2) Iodine in Milk, Sample ID Q091LIM2, Reference Date 3/4/2009

Three results for this cross-check were reported. All three of the reported results trended low and were outside of the acceptance range (reference 6.18).

(3) Iodine in Milk, Sample ID Q091LIM3, Reference Date 3/4/2009

Three results for this cross-check were reported. Two of the three reported results trended low and were outside of the acceptance range (reference 6.18).

TABLE 5.0-B

ENVIRONMENTAL RESOURCE ASSOCIATES (ERA) QUIK™ RESPONSE PROGRAM

2009 PROFICIENCY TEST RESULTS FOR ENRAD LABORATORIES

ERA LABORATORY CODE: D242401

Proficiency test samples are received, prepared, analyzed, and reported to Environmental Resource Associates as described in the "Quik" Response instruction package within the study period. Proficiency test data are reported to ERA for evaluation. ERA reports proficiency test results to the North Carolina Department of Health and Human Services, North Carolina Public Drinking Water Laboratory Certification Program.

If applicable, footnote explanations are included following this data table.

Gamma Emitters in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Reported Value pCi/l	Proficiency Check Status
4/6/2009	RAD-77*	Ba-133	4.34 - 5.83 E1	5.27 E1	6.18 E1	High (1)
		Cs-134	5.95 - 8.02 E1	7.29 E1	6.86 E1	Pass
		Cs-137	1.51 - 1.87 E2	1.68 E2	1.52 E2	Pass
		Co-60	8.00 - 10.0 E1	8.89 E1	9.56 E1	Pass
		Zn-65	7.60 - 10.1 E1	8.44 E1	9.97 E1	Pass
10/5/2009	RAD-79**	Ba-133	7.83 - 10.2 E1	9.29 E1	9.35 E1	Pass
		Cs-134	6.50 - 8.73 E1	7.94 E1	7.60 E1	Pass
		Cs-137	4.91 - 6.29 E1	5.46 E1	5.51 E1	Pass
		Co-60	1.05 - 1.31 E2	1.17 E2	1.15 E2	Pass
		Zn-65	8.96 - 11.9 E1	9.95 E1	1.11 E2	Pass

Tritium in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Reported Value pCi/l	Proficiency Check Status
4/6/2009	RAD-77*	H-3	1.78 - 2.23 E4	2.03 E4	1.87 E4	Pass
10/5/2009	RAD-79**	H-3	1.43 - 1.80 E4	1.64 E4	1.53 E4	Pass

** ERA study period 4/6/2009 - 5/21/2009, ERA data report issue date 6/3/2009*

*** ERA study period 10/5/2009 - 11/19/2009, ERA data report issue date 12/4/2009*

Table 5.0-B Footnote Explanations

(1) Gamma Emitters in Water, Sample ID RAD-77, Reference Date 4/6/2009

Reported result for Ba-133 was above the acceptance range limit (reference 6.19).

TABLE 5.0-C

2009 ENVIRONMENTAL DOSIMETER CROSS-CHECK RESULTS

Nuclear Technology Services

1st Quarter 2009

TLD Number	Delivered (mrem)	Reported (mrem)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
100125	110.1	104.0	5.87	<+/-15%	Pass
100203	109.2	104.0	5.00	<+/-15%	Pass
101141	105.4	104.0	1.35	<+/-15%	Pass
100210	104.5	104.0	0.48	<+/-15%	Pass
100386	108.6	104.0	4.42	<+/-15%	Pass
		Average Bias (B)	3.42		
		Standard Deviation (S)	2.37		
		Measure Performance |B|+S	5.79	<15%	Pass

2nd Quarter 2009

TLD Number	Delivered (mrem)	Reported (mrem)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102077	106	101.0	4.95	<+/-15%	Pass
102243	100	101.0	-0.99	<+/-15%	Pass
102244	108	101.0	6.93	<+/-15%	Pass
102323	102	101.0	0.99	<+/-15%	Pass
102329	101	101.0	0.00	<+/-15%	Pass
		Average Bias (B)	2.38		
		Standard Deviation (S)	3.40		
		Measure Performance |B|+S	5.78	<15%	Pass

3rd Quarter 2009

TLD Number	Delivered (mrem)	Reported (mrem)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102228	69.5	70.2	-1.00	<+/-15%	Pass
102492	71.1	70.2	1.28	<+/-15%	Pass
102007	69.9	70.2	-0.43	<+/-15%	Pass
102041	73.4	70.2	4.56	<+/-15%	Pass
102078	70.6	70.2	0.57	<+/-15%	Pass
		Average Bias (B)	1.00		
		Standard Deviation (S)	2.18		
		Measure Performance |B|+S	3.17	<15%	Pass

4th Quarter 2009

TLD Number	Delivered (mrem)	Reported (mrem)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
100140	14.0	14.0	0.00	<+/-15%	Pass
100358	14.0	14.0	0.00	<+/-15%	Pass
100404	13.0	14.0	-7.14	<+/-15%	Pass
100405	14.0	14.0	0.00	<+/-15%	Pass
100415	15.0	14.0	7.14	<+/-15%	Pass
		Average Bias (B)	0.00		
		Standard Deviation (S)	5.05		
		Measure Performance |B|+S	5.05	<15%	Pass

Internal Crosscheck (Duke Energy)

1st Quarter 2009

TLD Number	Delivered (mrem)	Reported (mrem)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
101297	18.3	19.0	-3.95	<+/-15%	Pass
101286	18.5	19.0	-2.58	<+/-15%	Pass
101258	18.2	19.0	-4.26	<+/-15%	Pass
101216	18.4	19.0	-3.42	<+/-15%	Pass
101252	18.1	19.0	-4.74	<+/-15%	Pass
101356	18.7	19.0	-1.74	<+/-15%	Pass
101339	18.2	19.0	-4.32	<+/-15%	Pass
101127	17.6	19.0	-7.47	<+/-15%	Pass
101278	19.4	19.0	1.89	<+/-15%	Pass
101305	18.4	19.0	-3.05	<+/-15%	Pass
		Average Bias (B)	-3.36		
		Standard Deviation (S)	2.40		
		Measure Performance |B|+S	5.76	<15%	Pass

2nd Quarter 2009

TLD Number	Delivered (mrem)	Reported (mrem)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102325	49.1	50.0	-1.78	<+/-15%	Pass
102491	48.7	50.0	-2.68	<+/-15%	Pass
102374	48.4	50.0	-3.26	<+/-15%	Pass
102084	47.6	50.0	-4.88	<+/-15%	Pass
102404	51.3	50.0	2.56	<+/-15%	Pass
102396	47.8	50.0	-4.32	<+/-15%	Pass
102346	48.7	50.0	-2.60	<+/-15%	Pass
102485	48.6	50.0	-2.80	<+/-15%	Pass
102059	48.2	50.0	-3.68	<+/-15%	Pass
102263	50.0	50.0	-0.08	<+/-15%	Pass
		Average Bias (B)	-2.35		
		Standard Deviation (S)	2.18		
		Measure Performance |B|+S	4.53	<15%	Pass

3rd Quarter 2009

TLD Number	Delivered (mrem)	Reported (mrem)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102400	25.9	27.0	-3.93	<+/-15%	Pass
102486	25.7	27.0	-4.70	<+/-15%	Pass
102402	25.9	27.0	-4.04	<+/-15%	Pass
102406	26.9	27.0	-0.44	<+/-15%	Pass
102435	26.6	27.0	-1.63	<+/-15%	Pass
102442	25.3	27.0	-6.48	<+/-15%	Pass
102436	25.9	27.0	-3.93	<+/-15%	Pass
102440	25.1	27.0	-7.19	<+/-15%	Pass
102479	25.2	27.0	-6.81	<+/-15%	Pass
102384	26.0	27.0	-3.67	<+/-15%	Pass
		Average Bias (B)	-4.28		
		Standard Deviation (S)	2.17		
		Measure Performance |B|+S	6.45	<15%	Pass

4th Quarter 2009

TLD Number	Delivered (mrem)	Reported (mrem)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
100955	20.4	22.0	-7.14	<+/-15%	Pass
100050	20.0	22.0	-9.18	<+/-15%	Pass
100885	21.2	22.0	-3.68	<+/-15%	Pass
101409	19.2	22.0	-12.77	<+/-15%	Pass
100389	20.3	22.0	-7.82	<+/-15%	Pass
100401	20.4	22.0	-7.18	<+/-15%	Pass
101383	21.0	22.0	-4.45	<+/-15%	Pass
100551	20.4	22.0	-7.14	<+/-15%	Pass
100748	20.9	22.0	-4.95	<+/-15%	Pass
100263	20.9	22.0	-4.91	<+/-15%	Pass
		Average Bias (B)	-6.92		
		Standard Deviation (S)	2.68		
		Measure Performance |B|+S	9.61	<15%	Pass

6.0 REFERENCES

6.1 Oconee Selected License Commitment Manual

6.2 Oconee Technical Specifications

6.3 Oconee Updated Final Safety Analysis Report

6.4 Oconee Offsite Dose Calculation Manual

6.5 Oconee Annual Radiological Environmental Operating Report 1969-2008

6.6 Oconee Annual Radioactive Effluent Release Report 2009

6.7 Probability and Statistics in Engineering and Management Science, Hines and Montgomery, 1969, pages 287-293.

6.8 Practical Statistics for the Physical Sciences, Havilcek and Crain, 1988, pages 83-93.

6.9 Nuclear Regulatory Commission Regulatory Guide 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purposes of Evaluating Compliance with 10CFR50, Appendix I.

6.10 EnRad Laboratories Operating Procedures

6.11 RETDAS, Radiological Effluent Tracking and Dose Assessment Software, Canberra Version 3.5.1, DPC Revision #4.0

6.12 NRC Integrated Inspection Report 50-269/08-04, 50-270/08-04, and 50-287/08-04

6.13 Duke Energy Corporation EnRad Laboratory Charcoal Cartridge Study, performed 2001

6.14 Radiological Effluent Controls Audit GO-08-21 (INOS)(REC)(ONS)

6.15 Radiological Effluent Controls Audit GO-08-23 (INOS)(REC)(NGO)

6.16 South Carolina State Climatology Office 2009, South Carolina Department of Natural Resources, Land, Water, and Conservation Division State Climate Office, Columbia, South Carolina, viewed 9 April 2009, <http://www.dnr.sc.gov/climate/sco/Drought/drought_current_info.php>

6.17 Problem Investigation Process Database, V 3.2.27, Duke Power Company, G-09-01278

6.18 Problem Investigation Process Database, V 3.2.27, Duke Power Company, G-09-00423

6.19 Problem Investigation Process Database, V 3.2.27, Duke Power Company, G-09-01295

6.20 Problem Investigation Process Database, V 3.2.27, Duke Power Company, G-07-01048

APPENDIX A

ENVIRONMENTAL SAMPLING
&
ANALYSIS PROCEDURES

APPENDIX A

ENVIRONMENTAL SAMPLING AND ANALYSIS PROCEDURES

Adherence to established procedures for sampling and analysis of all environmental media at Oconee Nuclear Station is required to ensure compliance with Station Selected Licensee Commitments. Analytical procedures were employed to ensure that Selected Licensee Commitments detection capabilities were achieved.

Environmental sampling and analyses were performed by EnRad Laboratories, Dosimetry and Records, and Fisheries and Aquatic Ecology.

Section IV of this appendix describes the environmental sampling frequencies and analysis procedures by media type.

I. CHANGE OF SAMPLING PROCEDURES

Indicator location 078.1 (Air Radioiodine, Air Particulate) was added as a replacement for indicator location 078 (Air Radioiodine, Air Particulate), which was removed from the program (reference 6.20).

II. DESCRIPTION OF ANALYSIS PROCEDURES

Gamma spectroscopy analyses are performed using high purity germanium gamma detectors and Canberra analytical software. Designated sample volumes are transferred to appropriate counting geometries and analyzed by gamma spectroscopy. Perishable samples such as fish and broadleaf vegetation are ground to achieve a homogeneous mixture. Soils and sediments are dried, sifted to remove foreign objects (rocks, clams, glass, etc.) then transferred to appropriate counting geometry.

Low-level iodine analyses are performed by passing a designated sample aliquot through a pre-weighed amount of ion exchange resin to remove and concentrate any iodine in the aqueous sample (milk). The resin is then dried, mixed thoroughly, and a net resin weight determined before being transferred to appropriate counting geometry and analyzed by gamma spectroscopy.

Tritium analyses are performed quarterly by using low-level environmental liquid scintillation analysis technique on a Packard 2550 liquid scintillation system or Perkin-Elmer 2900TR liquid scintillation system. Tritium samples are distilled and batch processed with a tritium spike and blank to verify instrument performance and sample preparation technique are acceptable.

Gross beta analysis is performed by concentrating a designated aliquot of sample precipitate and analyzing by Tennelec XLB Series 5 gas-flow proportional counters. Samples are batch processed with a blank to ensure sample contamination has not occurred.

III. CHANGE OF ANALYSIS PROCEDURES

No analysis procedures were changed during 2009.

IV. SAMPLING AND ANALYSIS PROCEDURES

A.1 AIRBORNE PARTICULATE AND RADIOIODINE

Airborne particulate and radioiodine samples at each of six locations were composited continuously by means of continuous air samplers. Air particulates were collected on a particulate filter and radioiodines were collected in a charcoal cartridge positioned behind the filter in the sampler. The samplers are designed to operate at a constant flow rate (in order to compensate for any filter loading) and are set to sample approximately 2 cubic feet per minute. Filters and cartridges were collected weekly. A separate weekly gamma analysis was performed on each charcoal cartridge and air particulate. A weekly gross beta analysis was performed on each filter. The continuous composite samples were collected from the locations listed below.

Location 074 = Keowee Key Resort (2.36 mi. NNW)
Location 077 = Skimmer Wall (1.00 mi. SW)
Location 078 = Recreation Site (0.58 mi. WSW)
Programmatic sampling terminated 8/31/2009, reference 6.20
Location 078.1 = Recreation Site (0.53 mi. WSW)
Programmatic sampling initiated 8/31/2009, reference 6.20
Location 079 = Keowee Dam (0.56 mi. NE)
Location 081 = Clemson Operations Center (9.33 mi. SE)
Location 084 = Sue Craig Road (2.58 mi. NNE)

A.2 DRINKING WATER

Monthly composite samplers were operated to collect an aliquot at least every two hours. Gross beta and gamma analysis was performed on the monthly composites. Tritium analysis was performed on the quarterly composites. The composites were collected monthly from the locations listed below.

Location 060 = Greenville Water Intake Rd. (3.23 mi. NE)
Location 064 = Seneca (6.67 mi. SSW)
Location 066 = Anderson (18.9 mi SSE)

A.3 SURFACE WATER

Monthly composite samplers were operated to collect an aliquot at least every two hours. Gamma analysis was performed on the monthly composites. Tritium analysis was performed on the quarterly composites sample. The composites were collected monthly from the locations listed below.

Location 062	=	Lake Keowee Hydro Intake (0.85 mi. ENE)
Location 063.1	=	Lake Hartwell Hwy 183 Bridge (0.79 mi. E)

A.4 MILK

Semimonthly grab samples were collected at one location. A gamma and low-level Iodine-131 analysis was performed on each sample. The semimonthly grab samples were collected from the location listed below.

Location 071	=	Clemson Dairy (10.2 mi. SSE)

A.5 BROADLEAF VEGETATION

Monthly samples were collected and a gamma analysis was performed on each sample. The samples were collected from the locations listed below.

Location 077	=	Skimmer Wall (1.00 mi. SW)
Location 079	=	Keowee Dam (0.56 mi. NE)
Location 081	=	Clemson Operations Center (9.33 mi. SE)
Location 084	=	Sue Craig Road (2.58 mi. NNE)

A.6 FISH

Semiannual samples were collected and a gamma analysis was performed on the edible portions of each sample. The samples were collected from the locations listed below.

Location 060	=	Greenville Water Intake Rd. (2.28 mi. NE)
Location 063	=	Lake Hartwell Hwy 183 Bridge (0.80 mi. ESE)
Location 067	=	Lawrence Ramsey Bridge Hwy 27 (4.34 mi. SSE)

A.7 SHORELINE SEDIMENT

Semiannual samples were collected and a gamma analysis was performed on each sample following the drying and removal of rocks and clams. The samples were collected from the locations listed below.

Location 063	=	Lake Hartwell Hwy 183 Bridge (0.80 mi. ESE)
Location 067	=	Lawrence Ramsey Bridge Hwy 27 (4.34 mi. SSE)
Location 068	=	High Falls County Park (1.82 mi. W)

A.8 DIRECT GAMMA RADIATION (TLD)

Thermoluminescent dosimeters (TLD) were collected quarterly at forty-two locations. A gamma exposure rate was determined for each TLD. The TLDs were placed as indicated below.

* An inner ring of 17 TLDs, one in each meteorological sector in the general area of the site boundary.

* An outer ring of 16 TLDs, one in each meteorological sector in the 6 to 8 kilometer range.

* The remaining TLDs were placed in special interest areas such as population centers, residential areas, schools, and control locations.

TLD Locations are listed in Table 2.1-B.

A.9 ANNUAL LAND USE CENSUS

An annual Land Use Census was conducted to identify within a distance of 8 kilometers (5.0 miles) from the station, the following locations in each of the sixteen meteorological sectors:

* The Nearest Residence
* The Nearest Milk-giving Animal (cow, goat, etc.) where milk is used for human consumption

The census was conducted during the growing season from 6/15 to 6/16/2009. Results are shown in Table 3.9. No changes were made to the sampling procedures during 2009 as a result of the 2009 census.

V. GLOBAL POSITIONING SYSTEM (GPS) ANALYSIS

The Oconee site centerline used for GPS measurements was referenced from the Oconee Nuclear Station Updated Final Safety Analysis Report (UFSAR), section 2.1.1.1, Specification of Location. Waypoint coordinates used for ONS GPS measurements were latitude 34°-47'-38.2"N and longitude 82°-53'-55.4"W. Maps and tables were generated using North American Datum (NAD) 27. Data normally reflect accuracy to within 2 to 5 meters from point of measurement. GPS field measurements were taken as close as possible to the item of interest. Distances for the locations are displayed using three significant figures.

APPENDIX B

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SUMMARY OF RESULTS

2009

Environmental Radiological Monitoring Program Summary

Facility: Oconee Nuclear Station **Docket No. 50-269,270,287**

Location: Oconee County, South Carolina **Report Period: 01-JAN-2009 to 31-DEC-2009**

Medium or Pathway Sampled Unit of Measurement	Type and Total Number of Analyses Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction Location Code	 Mean (Fraction) Range	Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
Air Particulate (pCi/m3)							081 (9.33 mi SE)	
	BETA	312	1.00E-02	1.77E-2 (260/260)	074	1.82E-2 (52/52)	1.80E-2 (52/52)	0
				6.54E-3 - 3.04E-2	(2.36 mi NNW)	8.92E-3 - 2.84E-2	8.44E-3 - 2.94E-2	
	CS-134	312	5.00E-02	0.00 (0/260)		0.00 (0/52)	0.00 (0/52)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	312	6.00E-02	0.00 (0/260)		0.00 (0/52)	0.00 (0/52)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	I-131	312	7.00E-02	0.00 (0/260)		0.00 (0/52)	0.00 (0/52)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	

Mean and range based upon detectable measurements only
Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: Oconee Nuclear Station **Docket No. 50-269,270,287**

Location: Oconee County, South Carolina **Report Period: 01-JAN-2009 to 31-DEC-2009**

Medium or Pathway Sampled	Type and Total Number of		Lower Limit of Detection	All Indicator Locations	Location with Highest Annual Mean Name, Distance, Direction		Control Location	No. of Non-Routine Report Meas.
Unit of Measurement	Analyses Performed		(LLD)	Mean (Fraction) Range	Location Code	Mean (Fraction) Range	Mean (Fraction) Range	
Air Radioiodine (pCi/m3)							081 (9.33 mi SE)	
	CS-134	312	5.00E-02	0.00 (0/260)		0.00 (0/52)	0.00 (0/52)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	312	6.00E-02	0.00 (0/260)		0.00 (0/52)	0.00 (0/52)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	I-131	312	7.00E-02	0.00 (0/260)		0.00 (0/52)	0.00 (0/52)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	

Mean and range based upon detectable measurements only
Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: Oconee Nuclear Station **Docket No. 50-269,270,287**

Location: Oconee County, South Carolina **Report Period: 01-JAN-2009 to 31-DEC-2009**

Medium or Pathway Sampled	Type and Total Number of		Lower Limit of Detection	All Indicator Locations	Location with Highest Annual Mean Name, Distance, Direction		Control Location	No. of Non-Routine Report Meas.
Unit of Measurement	Analyses Performed		(LLD)	Mean (Fraction) Range	Location Code	Mean (Fraction) Range	Mean (Fraction) Range	
Drinking Water (pCi/liter)							064 (6.67 mi SSW)	
	BALA-140	39	15	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	BETA	39	4	1.30 (19/26)	066	1.37 (12/13)	1.19 (7/13)	0
				0.69 - 2.11	(18.9 mi SSE)	0.69 - 2.11	0.64 - 1.62	
	CO-58	39	15	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CO-60	39	15	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-134	39	15	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	39	18	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	FE-59	39	30	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	H-3	12	2000	415 (4/8)	066	415 (4/4)	0.00 (0/4)	0
				347 - 531	(18.9 mi SSE)	347 - 531	0.00 - 0.00	
	I-131	39	15	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	MN-54	39	15	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	NB-95	39	15	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	ZN-65	39	30	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	ZR-95	39	15	0.00 (0/26)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	

Mean and range based upon detectable measurements only
Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: Oconee Nuclear Station **Docket No. 50-269,270,287**

Location: Oconee County, South Carolina **Report Period: 01-JAN-2009 to 31-DEC-2009**

Medium or Pathway Sampled Unit of Measurement	Type and Total Number of Analyses Performed		Lower Limit of Detection (LLD)	All Indicator Locations Mean (Fraction) Range	Location with Highest Annual Mean Name, Distance, Direction Location Code	 Mean (Fraction) Range	Control Location Mean (Fraction) Range	No. of Non-Routine Report Meas.
Surface Water (pCi/liter)							062 (0.85 mi ENE)	
	BALA-140	26	15	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CO-58	26	15	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CO-60	26	15	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-134	26	15	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	26	18	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	FE-59	26	30	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	H-3	8	2000	4678 (4/4)	063.1	4678 (4/4)	0.00 (0/4)	0
				1440 - 9760	(0.79 mi E)	1440 - 9760	0.00 - 0.00	
	I-131	26	15	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	MN-54	26	15	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	NB-95	26	15	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	ZN-65	26	30	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	ZR-95	26	15	0.00 (0/13)		0.00 (0/13)	0.00 (0/13)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	

Mean and range based upon detectable measurements only
Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: Oconee Nuclear Station **Docket No. 50-269, 270, 287**

Location: Oconee County, South Carolina **Report Period: 01-JAN-2009 to 31-DEC-2009**

Medium or Pathway Sampled	Type and Total Number of		Lower Limit of Detection	All Indicator Locations	Location with Highest Annual Mean Name, Distance, Direction		Control Location	No. of Non-Routine Report Meas.
Unit of Measurement	Analyses Performed		(LLD)	Mean (Fraction) Range	Location Code	Mean (Fraction) Range	Mean (Fraction) Range	
Milk (pCi/liter)				NO INDICATOR LOCATION			071 (10.2 mi SSE)	
	BALA-140	26	15	0.00 (0/0)		0.00 (0/0)	0.00 (0/26)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-134	26	15	0.00 (0/0)		0.00 (0/0)	0.00 (0/26)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	26	18	0.00 (0/0)		0.00 (0/0)	0.00 (0/26)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	I-131	26	15	0.00 (0/0)		0.00 (0/0)	0.00 (0/26)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	LLI-131	26	1	0.00 (0/0)		0.00 (0/0)	0.00 (0/26)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	

Mean and range based upon detectable measurements only
Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: Oconee Nuclear Station **Docket No. 50-269,270,287**

Location: Oconee County, South Carolina **Report Period: 01-JAN-2009 to 31-DEC-2009**

Medium or Pathway Sampled	Type and Total Number of		Lower Limit of Detection	All Indicator Locations	Location with Highest Annual Mean Name, Distance, Direction		Control Location	No. of Non-Routine Report Meas.
Unit of Measurement	Analyses Performed		(LLD)	Mean (Fraction) Range	Location Code	Mean (Fraction) Range	Mean (Fraction) Range	
Broadleaf Vegetation (pCi/kg-wet)							081 (9.33 mi SE)	
	CS-134	48	60	0.00 (0/36)		0.00 (0/12)	0.00 (0/12)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	48	80	0.00 (0/36)		0.00 (0/12)	0.00 (0/12)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	I-131	48	60	0.00 (0/36)		0.00 (0/12)	0.00 (0/12)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	

Mean and range based upon detectable measurements only
Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: Oconee Nuclear Station **Docket No. 50-269,270,287**

Location: Oconee County, South Carolina **Report Period: 01-JAN-2009 to 31-DEC-2009**

Medium or Pathway Sampled	Type and Total Number of		Lower Limit of Detection	All Indicator Locations	Location with Highest Annual Mean Name, Distance, Direction		Control Location	No. of Non-Routine Report Meas.
Unit of Measurement	Analyses Performed		(LLD)	Mean (Fraction) Range	Location Code	Mean (Fraction) Range	Mean (Fraction) Range	
Fish (pCi/kg-wet)							060 (2.28 mi NE)	
	CO-58	12	130	9.01 (1/8)	063	9.01 (1/4)	0.00 (0/4)	0
				9.01 - 9.01	(0.80 mi ESE)	9.01 - 9.01	0.00 - 0.00	
	CO-60	12	130	0.00 (0/8)		0.00 (0/4)	0.00 (0/4)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-134	12	130	0.00 (0/8)		0.00 (0/4)	0.00 (0/4)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	12	150	24.2 (8/8)	063	26.8 (4/4)	14.6 (3/4)	0
				14.9 - 51.4	(0.80 mi ESE)	15.2 - 51.4	12.1 - 18.3	
	FE-59	12	260	0.00 (0/8)		0.00 (0/4)	0.00 (0/4)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	MN-54	12	130	0.00 (0/8)		0.00 (0/4)	0.00 (0/4)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	ZN-65	12	260	0.00 (0/8)		0.00 (0/4)	0.00 (0/4)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	

Mean and range based upon detectable measurements only
Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: Oconee Nuclear Station **Docket No. 50-269,270,287**

Location: Oconee County, South Carolina **Report Period: 01-JAN-2009 to 31-DEC-2009**

Medium or Pathway Sampled	Type and Total Number of		Lower Limit of Detection	All Indicator Locations	Location with Highest Annual Mean Name, Distance, Direction		Control Location	No. of Non-Routine Report Meas.
Unit of Measurement	Analyses Performed		(LLD)	Mean (Fraction) Range	Location Code	Mean (Fraction) Range	Mean (Fraction) Range	
Shoreline Sediment (pCi/kg-dry)							068 (1.82 mi W)	
	CS-134	6	150	0.00 (0/4)		0.00 (0/2)	0.00 (0/2)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	6	180	65.6 (2/4)	063	69.7 (1/2)	0.00 (0/2)	0
				61.5 - 69.7	(0.80 mi ESE)	69.7 - 69.7	0.00 - 0.00	

Mean and range based upon detectable measurements only
Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
Zero range indicates no detectable activity measurements

Environmental Radiological Monitoring Program Summary

Facility: Oconee Nuclear Station **Docket No. 50-269,270,287**

Location: Oconee County, South Carolina **Report Period: 01-JAN-2009 to 31-DEC-2009**

Medium or Pathway Sampled	Type and Total Number of	Lower Limit of Detection	All Indicator Locations	Location with Highest Annual Mean Name, Distance, Direction		Control Location	No. of Non-Routine Report Meas.
Unit of Measurement	Analyses Performed	(LLD)	Mean (Fraction) Range	Location Code	Mean (Fraction) Range	Mean (Fraction) Range	
Direct Radiation TLD (mR/standard quarter)						058 (9.39 mi WSW) 081 (9.33 mi SE)	
	168	0.00E+00	22.3 (160/160)	042	27.5 (4/4)	27.5 (8/8)	0
			13.9 - 30.9	(4.93 mi SE)	23.2 - 30.7	20.4 - 34.8	

Mean and range based upon detectable measurements only
Fraction of detectable measurements at specified locations is indicated in parentheses, (Fraction)
Zero range indicates no detectable activity measurements

APPENDIX C

SAMPLING DEVIATIONS
&
UNAVAILABLE ANALYSES

APPENDIX C

OCONEE NUCLEAR STATION
SAMPLING DEVIATIONS & UNAVAILABLE ANALYSES

DEVIATION & UNAVAILABLE REASON CODES			
BF	Blown Fuse	PO	Power Outage
FZ	Sample Frozen	PS	Pump out of service / Undergoing Repair
IW	Inclement Weather	SL	Sample Loss/Lost due to Lab Accident
LC	Line Clog to Sampler	SM	Motor / Rotor Seized
OT	Other	TF	Torn Filter
PI	Power Interrupt	VN	Vandalism
PM	Preventive Maintenance	CN	Construction

C.1 SAMPLING DEVIATIONS

Air Particulate and Air Radioiodines

Location	Scheduled Collection Dates	Actual Collection Dates	Reason Code	Corrective Action
078	1/5 - 1/12/2009	1/5 - 1/12/2009	PI	Power to sampling equipment was interrupted for about 35 minutes due to scheduled maintenance by Site Services.
078	1/12 - 1/19/2009	1/12 - 1/19/2009	PI	Power to sampling equipment was interrupted for about 4.4 hours due to underground electrical line repair work performed by Site Services.
078	3/30 - 4/6/2009	3/30 - 4/3/2009	PO	Power outage to sampling equipment due to indeterminate cause. Work request 66771 initiated.
081	4/13 - 4/20/2009 4/20 - 4/27/2009	4/13 - 4/14/2009 4/22 - 4/27/2009	PI PI	Power interruption to sampling equipment. Work request 67111 initiated. Power restored by maintenance personnel 4/22/2009 and normal sampling resumed.

Surface Water

Location	Scheduled Collection Dates	Actual Collection Dates	Reason Code	Corrective Action
062	8/24 - 9/21/2009	8/24 - 9/21/2009	PS	Pump out of service at time of collection. Work request 71950 written. Composite sample volume was available at time of collection. A grab sample was also taken.

C.2 UNAVAILABLE ANALYSES

There were no unavailable analyses during 2009.

APPENDIX D

ANALYTICAL DEVIATIONS

No Analytical deviations were incurred for the
2009 Radiological Environmental Monitoring Program

APPENDIX E

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM RESULTS

This appendix includes all of the sample analysis reports generated from each sample medium for 2009. Appendix E is located separately from this report and is permanently archived at the Duke Energy Corporation Environmental Center radiological environmental master file, located at the McGuire Nuclear Station Site in Huntersville, North Carolina.