ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

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

2011

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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
ISFSI	Independent Spent Fuel Storage Installation
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 Program
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 2011.

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. Evaluation of the effect of trans-Pacific transport of airborne releases from Fukushima Daiichi following the March 11, 2011 Tohoku earthquake is included for affected sample media. 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 2011 report. Based on the annual land use census, the current number of sampling sites for Oconee Nuclear Station is sufficient.

Following the March 11, 2011 Tohoku earthquake in Japan, radioactive material migrated from the Fukushima Daiichi power plant to the United States. Radioactive material was detected at numerous U.S. nuclear plants (including all three Duke nuclear plants) and detected by state and federal monitoring agencies. Where applicable in this report, radioactive material determined to be from the Fukushima Daiichi power plant has been identified and distinguished from effluents from Oconee Nuclear Station.

Concentrations observed in the environment in 2011 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 attributable to station operation 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 5.52E-02 mrem for 2011. 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

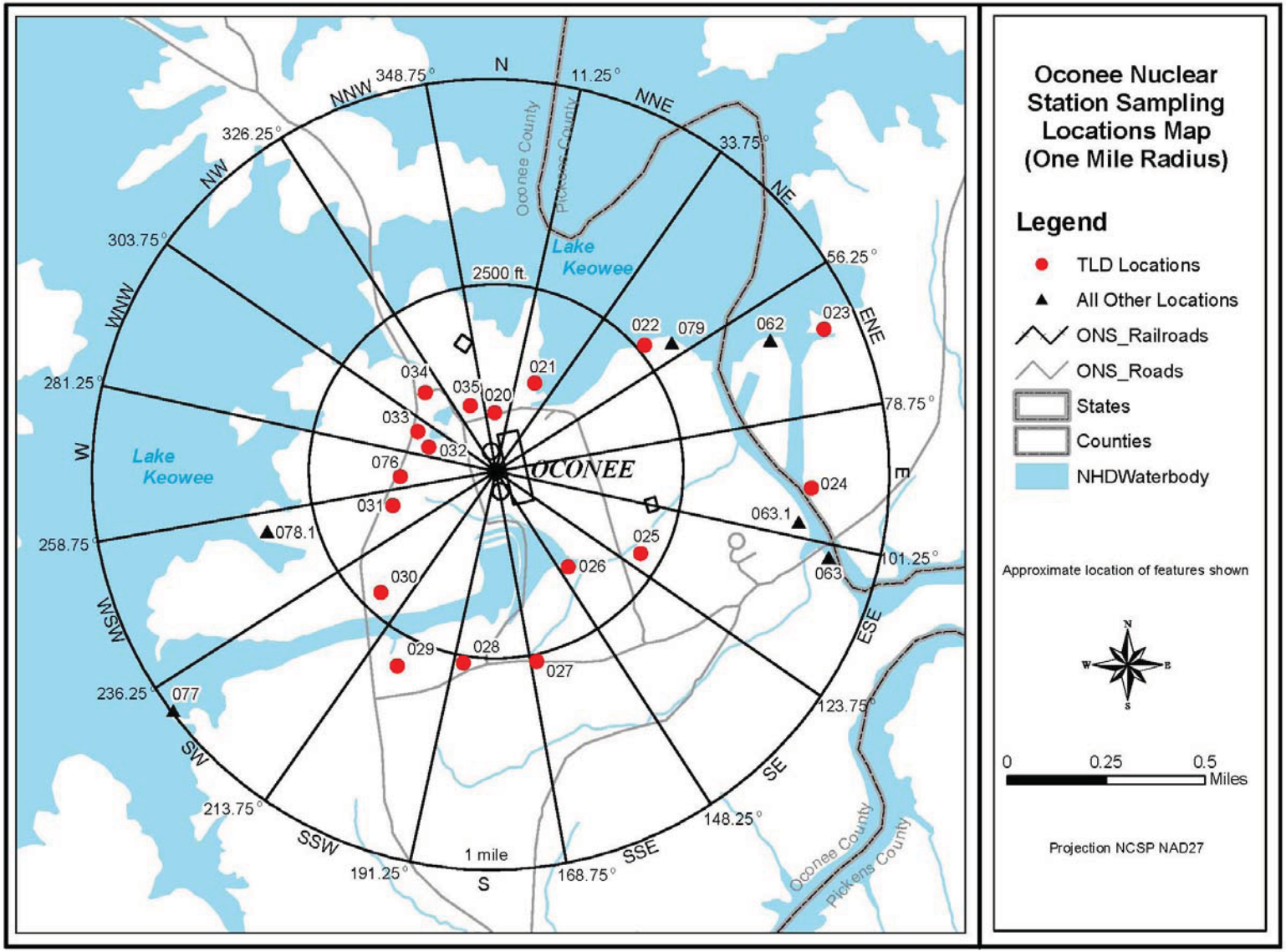

Oconee Nuclear Station Sampling Locations Map (One Mile Radius)
Legend
TLD Locations
All Other Locations
ONS_Railroads
ONS_Roads
States
Counties
NHDWaterbody
Approximate location of features shown
0
0.25
0.5
Miles
Projection NCSP NAD27
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
11.25°
33.75°
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°
348.75°
2500 ft.
1 mile
OCONEE
Lake Keowee
Lake Keowee
Oconee County
Pickens County
Oconee County
Pickens County
020
021
022
023
024
025
026
027
028
029
030
031
032
033
034
035
062
063
063.1
076
077
078.1
079

Figure 2.1-2

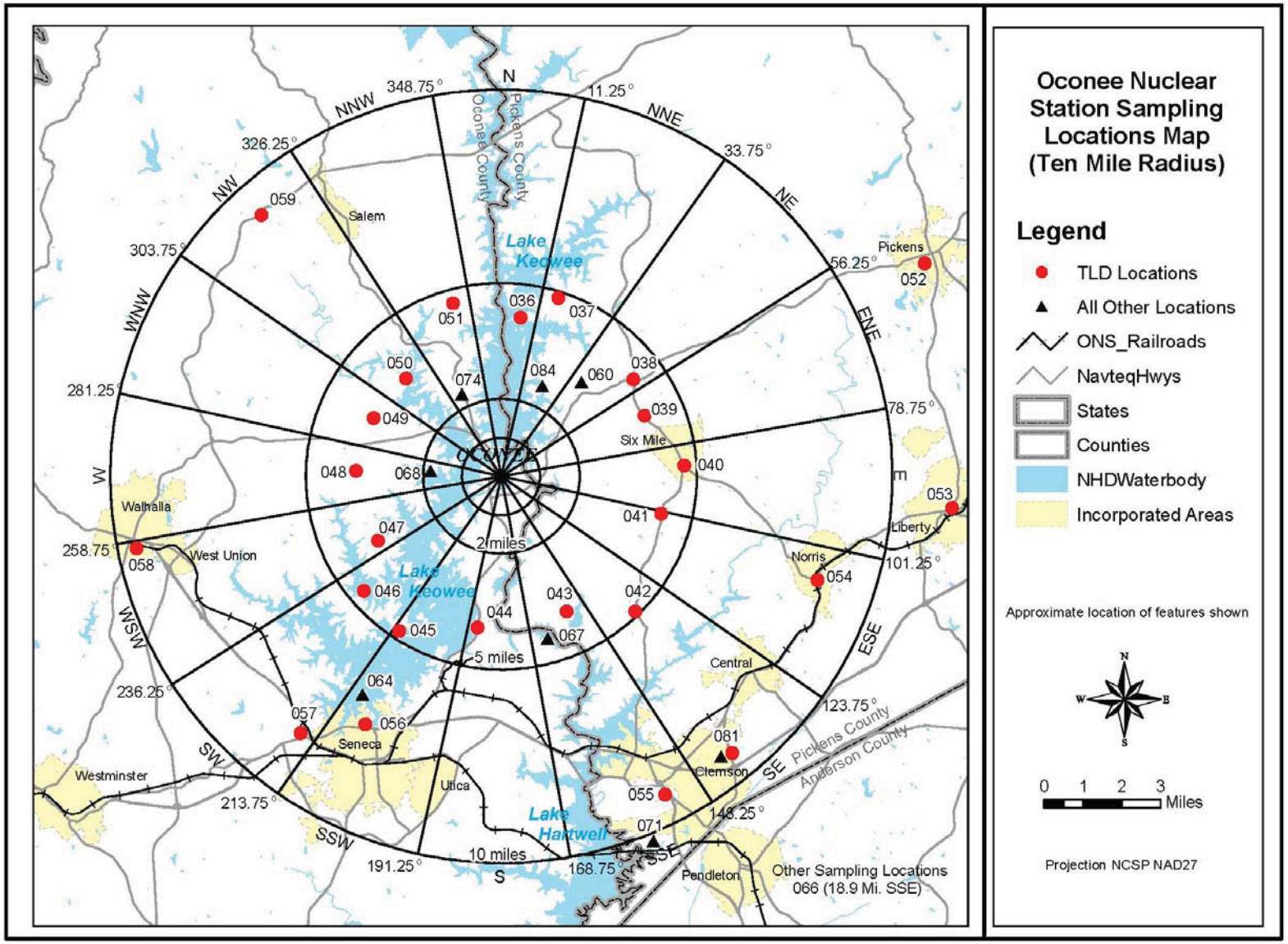

Oconee Nuclear Station Sampling Locations Map (Ten Mile Radius)
Legend
TLD Locations
All Other Locations
ONS_Railroads
NavteqHwys
States
Counties
NHDWaterbody
Incorporated Areas
Approximate location of features shown
N
W
E
S
0 1 2 3 Miles
Projection NCSP NAD27
Other Sampling Locations
066 (18.9 Mi. SSE)
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°
2 miles
5 miles
10 miles
Oconee County
Pickens County
Anderson County
Lake Keowee
Lake Hartwell
Salem
Pickens
Six Mile
Liberty
Norris
Central
Clemson
Pendleton
Seneca
Utica
Westminster
West Union
Walhalla
059
052
051
036
037
050
074
084
060
038
049
039
048
068
040
053
041
047
058
054
046
043
042
044
045
067
064
057
056
081
055
071

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	I	Indicator

Site #	Measure Type	Location Description*	Air Rad. & Particulate	Surface Water	Drinking Water	Shoreline Sediment	Fish	Milk	Broadleaf Vegetation
060	I	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	I	Lake Hartwell Hwy 183 Bridge (0.80 mi ESE) [000.7]				SA	SA		
063.1	I	Lake Hartwell Hwy 183 (0.79 mi E)		M					
064	C	Seneca (6.67 mi SSW) [004.1]			M				
066	I	Anderson (18.9 mi SSE) [012]			M				
067	I	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	I	Keowee Key Resort (2.36 mi NNW)	W						
077	I	Skimmer Wall (1.00 mi SW)	W						M
078.1	I	Recreation Site (0.53 mi WSW)	W						
079	I	Keowee Dam (0.56 mi NE)	W						M
081	C	Clemson Operations Center (9.33 mi SE)	W						M
084	I	Sue Craig Road (2.58 mi NNE)	W						M

* 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)

Table 2.1-B Codes			
IR	Inner Ring	OR	Outer Ring
C	Control	SI	Special Interest

Site #	Measure Type	Location*	Distance (miles)	Sector	Site #	Measure Type	Location*	Distance (miles)	Sector
020	IR	SITE BOUNDARY	0.16	N	040	OR	MICROWAVE TOWER, SIX MILE	4.74	E
021	IR	SITE BOUNDARY	0.25	NNE	041	OR	JCT HWY 101 & 133	4.25	ESE
022	IR	SITE BOUNDARY	0.53	NE	042	OR	LAWRENCE CHAPEL CHURCH, HWY 133	4.93	SE
023	IR	SITE BOUNDARY	0.93	ENE	043	OR	HWY 291 AT ISSAQUEENA PARK	4.09	SSE
024	IR	SITE BOUNDARY	0.79	E	044	OR	HWY 130 AT LITTLE RIVER DAM	3.96	S
025	IR	SITE BOUNDARY	0.42	ESE	045	OR	TERMINUS OF HWY 588 AT CROOKED CREEK	4.78	SSW
026	IR	SITE BOUNDARY	0.34	SE	046	OR	HWY 188 AT CROOKED CREEK	4.61	SW
027	IR	SITE BOUNDARY	0.49	SSE	047	OR	NEW HOPE CHURCH, HWY 188	3.58	WSW
028	IR	SITE BOUNDARY	0.46	S	048	OR	JCT HWY 175 & 188	3.64	W
029	IR	SITE BOUNDARY	0.56	SSW	049	OR	JCT HWY 201 & 92	3.60	WNW
030	IR	SITE BOUNDARY	0.42	SW	050	OR	STAMP CREEK LANDING, END OF HWY 92	3.53	NW
031	IR	SITE BOUNDARY	0.27	WSW	051	OR	HWY 128, 1 MILE N OF HWY 130	4.64	NNW
076	IR	SITE BOUNDARY	0.19	W	052	SI	DPC BRANCH OFFICE SITE - PICKENS	12.4	ENE
032	IR	SITE BOUNDARY	0.19	WNW	053	SI	DPC BRANCH OFFICE SITE - LIBERTY	11.7	E
033	IR	SITE BOUNDARY	0.21	WNW	054	SI	POST OFFICE - HWY 93 NORRIS	8.60	ESE
034	IR	SITE BOUNDARY	0.22	NW	055	SI	CLEMSON METEOROLOGY PLOT	9.27	SSE
035	IR	SITE BOUNDARY	0.17	NNW	056	SI	WATER TOWER - SENECA	7.30	SSW
036	OR	MILE CREEK LANDING	4.18	N	057	SI	OCONEE MEMORIAL HOSPITAL	8.42	SW
037	OR	KEOWEE CHURCH, HWY 327	4.85	NNE	058	C	BRANCH RD SUBSTATION,WALHALLA	9.39	WSW
038	OR	CONVENIENCE MART, JCT HWY 183 & 133	4.24	NE	059	SI	TAMASSEE DAR SCHOOL	9.20	NW
039	OR	HWY 133, 1 MILE EAST OF JCT HWY 183 & 133	4.02	ENE	081	C	CLEMSON OPERATIONS CENTER	9.33	SE

* 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 2011 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 2011 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 2011.

No Selected Licensee Commitments radionuclides reporting levels were exceeded in 2011 due to ONS station operations. However, during the Fukushima Daiichi fallout period several samples exceeded Selected Licensee Commitment reporting levels for I-131 and are indicated in the table below.

Sample Media	Date	Locations
Broadleaf Vegetation	4/4/2011	077, 079, 081, 084

Because the radioactivity exceeding reporting levels was attributed to Fukushima Daiichi no reports were made to the NRC.

Trending was performed by comparing annual mean concentrations of any effluent related detected radionuclide to historical results. Levels of I-131, Cs-134, and Cs-137 increased during the Fukushima Daiichi fallout period and comparisons were made to distinguish Fukushima Daiichi activity and normal activity. Samples taken during media-specific Fukushima Daiichi fallout periods (table below) were included in the trend evaluations.

Sample Media	Fukushima Daiichi Period
Air Particulate/Radioiodine	3/14/2011 – 4/18/2011
Milk	4/4/2011
Broadleaf Vegetation	4/4/2011

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 attributed to ONS operation were well below the 100% action level. The highest value reached during 2011 due to ONS operation was 1.93% 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 2011.

3.1 AIRBORNE RADIOIODINE AND PARTICULATES

In 2011, 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. During 2011 there was an increase in I-131, Cs-134, and Cs-137 concentrations due to Fukushima Daiichi fallout activity as indicated in the tables below.

Air Particulate

Analysis	Annual Concentration with Fukushima Daiichi (pCi/m^3)				Annual Concentration without Fukushima Daiichi (pCi/m^3)			
	Indicator	FRL	Control	FRL	Indicator	FRL	Control	FRL
I-131	1.46E-2	1.62E-2	2.01E-2	2.23E-2	0.00	0	0.00	0
Cs-134	1.44E-2	1.44E-3	0.00	0	0.00	0	0.00	0
Cs-137	8.08E-3	4.04E-4	0.00	0	0.00	0	0.00	0

FRL = Fraction of Selected Licensee Commitment Reporting Level

Air Radioiodine

Analysis	Annual Concentration with Fukushima Daiichi (pCi/m^3)				Annual Concentration without Fukushima Daiichi (pCi/m^3)			
	Indicator	FRL	Control	FRL	Indicator	FRL	Control	FRL
I-131	5.05E-2	5.61E-2	4.13E-2	4.59E-2	0.00	0	0.00	0

FRL = Fraction of Selected Licensee Commitment Reporting Level

There was no detectable I-131 in air samples in 2011 due to ONS plant operations. Table 3.1-A gives the highest indicator location annual mean (including Fukushima Daiichi for 2011) and control location annual mean (including Fukushima Daiichi for 2011) for I-131 since the preoperational period. The table shows similar historical concentrations (excluding Fukushima Daiichi) for both the indicator and control locations and the activities decreasing from early in the operational history of the plant. No I-131 activity due to ONS plant operations has been detected since 1994.

Cs-137 was not detected in air radioiodine samples in 2011. 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 (reference 6.13). A similar 2001 study was performed, again yielding this conclusion.

There were no detectable gamma emitting radionuclides detected in air particulate samples in 2011 due to ONS plant operations. No gamma emitting particulates due to ONS plant operations 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.

Radioactivity identified in ONS air particulate and airborne radioiodine samples during the period of 3/14/2011 through 4/18/2011 was determined to be from the Fukushima Daiichi incident based on the following:

(1) The quantities of radioactive airborne effluents from Oconee Nuclear Station during 2011 did not increase significantly compared to year 2010.
(2) REMP sample results have not typically detected the presence of these isotopes in airborne particulate and airborne radioiodine samples.
(3) Similar results were seen at other US nuclear plants and state and local government monitoring agencies.

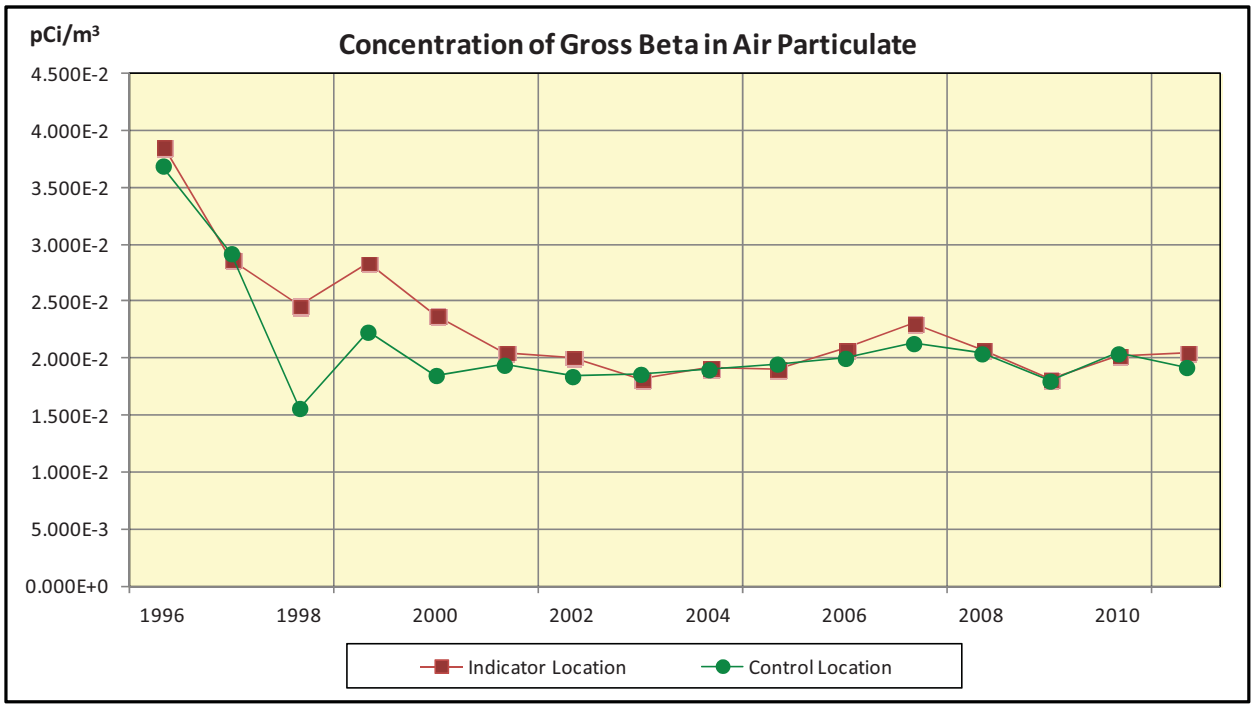
As such, the atypical detection of these radionuclides in both indicator and control samples is credibly attributed to the trans-Pacific transport of airborne releases from Fukushima Daiichi following the March 11, 2011 Tohoku earthquake and is not related to the operations of Oconee Nuclear Station.

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
2010	0.00E0	0.00E0
2011	5.05E-2	4.13E-2

0.00E0 = no detectable measurements
1979 - 1986 mean based on all net activity results
2011 concentration affected by Fukushima Daiichi

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
2009	1.82E-2	1.80E-2
2010	2.02E-2	2.04E-2
Average (2001 - 2010)	2.01E-2	1.94E-2
2011	2.06E-2	1.92E-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 1.18 pCi/liter in 2011, and the control location had a concentration of 1.00 pCi/liter. The 2010 indicator mean was 1.10 pCi/liter. The table shows that 2011 gross beta levels in drinking water are lower than preoperational concentrations. The dose for consumption of water was less than one mrem per year, historically and for 2011; therefore low-level iodine analysis is not required.

Tritium was detected in four of the twelve composite samples during 2011. The 2011 mean indicator location 066 concentration was 339 pCi/liter, which is 1.70% 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 2011. 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*

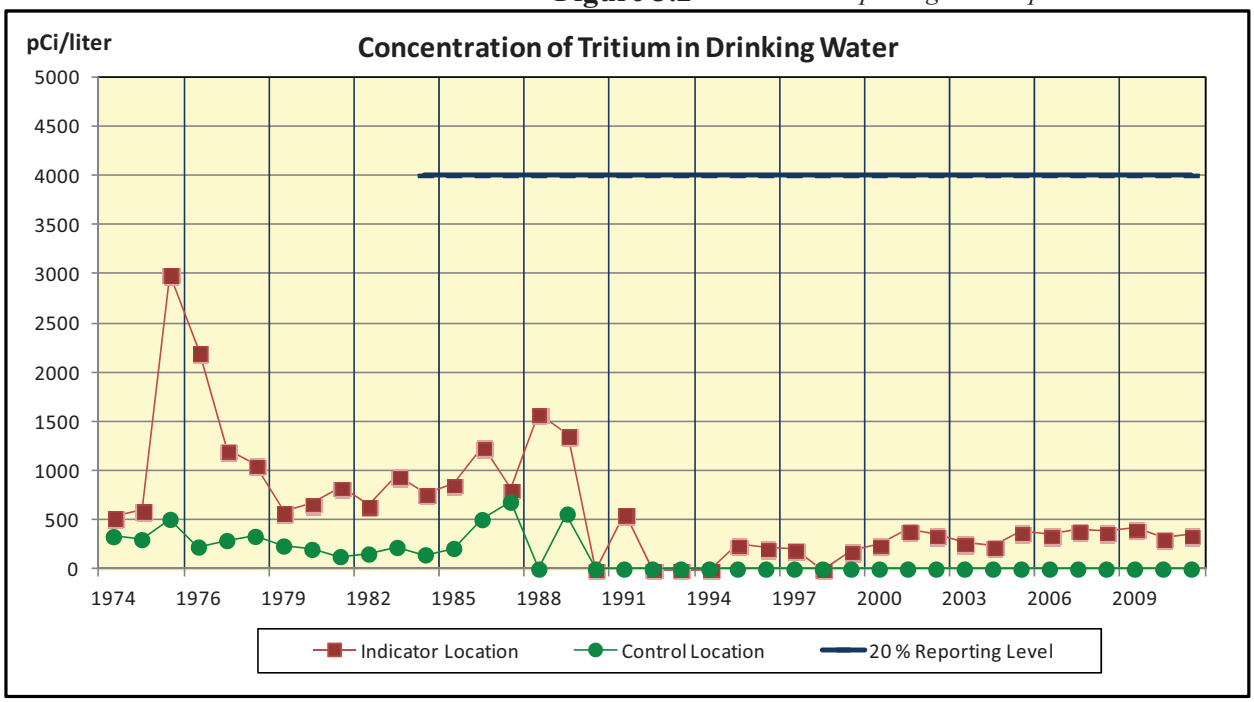


Table 3.2 Mean Concentrations of Radionuclides in Drinking Water

Year	Gross Beta (pCi/l)		Tritium (pCi/l)	
	Indicator Location	Control Location	Indicator Location	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
2010	1.10	0.97	308	0.00
2011	1.18	1.00	339	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 2011 average concentration was 4,750 pCi/liter. The individual samples ranged from 1,520 pCi/liter to 7,390 pCi/liter. The 2010 mean concentration was 12,313 pCi/liter. Tritium was not detected in any control surface water samples.

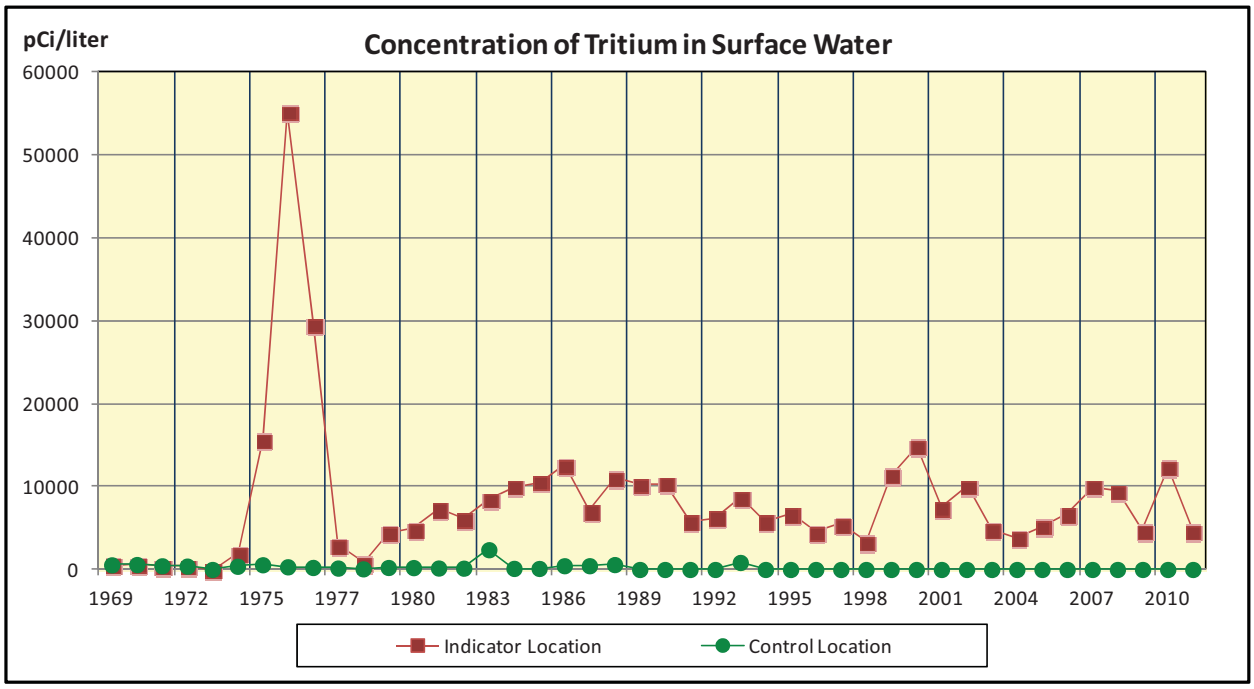
The increase in the average Tritium concentration in 2010 resulted from liquid effluent releases. Refueling and forced outages contributed to higher volumes of water requiring processing and release (reference 6.18).

Figure 3.3 shows the indicator and control annual means for Tritium since the preoperational period. Table 3.3 lists the indicator annual means.

Gamma spectroscopy analysis did not detect any station related activity during 2011. 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 2011 did not reveal any increasing trends.

K-40 and Be-7 are the naturally occurring radionuclide observed in surface water samples in 2011.

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
2010	0.00E0	0.00E0	0.00E0	0.00E0	1.23E4
2011	0.00E0	0.00E0	0.00E0	0.00E0	4.75E3

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 2011. One control location was sampled. No indicator dairies were identified by the 2011 land use census. Iodine-131 was identified in one milk sample due to Fukushima Daiichi fallout activity as indicated in the table below.

Milk

Analysis	Annual Concentration with Fukushima Daiichi (pCi/l)				Annual Concentration without Fukushima Daiichi (pCi/l)			
	Indicator	FRL	Control	FRL	Indicator	FRL	Control	FRL
LLI-131	NA	NA	0.81	0.27	NA	NA	0.00	0

FRL = Fraction of Selected Licensee Commitment Reporting Level

There were no gamma emitting radionuclides due to ONS plant operations identified in milk samples in 2011. Cs-137 is the only radionuclide, other than naturally occurring, reported in milk samples since 1988 (excluding Fukushima Daiichi). 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 2011.

Radioactivity identified in the ONS milk samples collected 4/4/2011 was determined to be from the Fukushima Daiichi incident based on the following:

(1) The quantities of radioactive airborne effluents from Oconee Nuclear Station during 2011 did not increase significantly compared to year 2010.
(2) REMP sample results have not typically detected the presence of radionuclides in milk samples since 1995.
(3) There are no indicator milk locations for Oconee Nuclear Station. Concentrations being detected were identified in the control samples for Oconee Nuclear Station.

As such, the atypical detection of these radionuclides in control samples is credibly attributed to the trans-Pacific transport of airborne releases from Fukushima Daiichi following the March 11, 2011 Tohoku earthquake and is not related to the operations of Oconee Nuclear Station.

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
2010	NO INDICATOR LOCATION	0.00E0
2011	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 2011 land use census.

3.5 BROADLEAF VEGETATION

Gamma spectroscopy was performed on 48 broadleaf vegetation samples during 2011. Three indicator locations and one control location were sampled. During 2011 there was an increase in I-131, Cs-134, and Cs-137 concentrations due to Fukushima Daiichi fallout activity as indicated in the table below.

Broadleaf Vegetation

Analysis	Annual Concentration with Fukushima Daiichi (pCi/kg)				Annual Concentration without Fukushima Daiichi (pCi/kg)			
	Indicator	FRL	Control	FRL	Indicator	FRL	Control	FRL
I-131	398	3.98	150	1.50	0.00	0	0.00	0
Cs-134	42.9	0.04	0.00	0.00	0.00	0	0.00	0
Cs-137	66.8	0.03	33.5	0.02	0.00	0	0.00	0

FRL = Fraction of Selected Licensee Commitment Reporting Level

Cs-137 (excluding Fukushima Daiichi) 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.

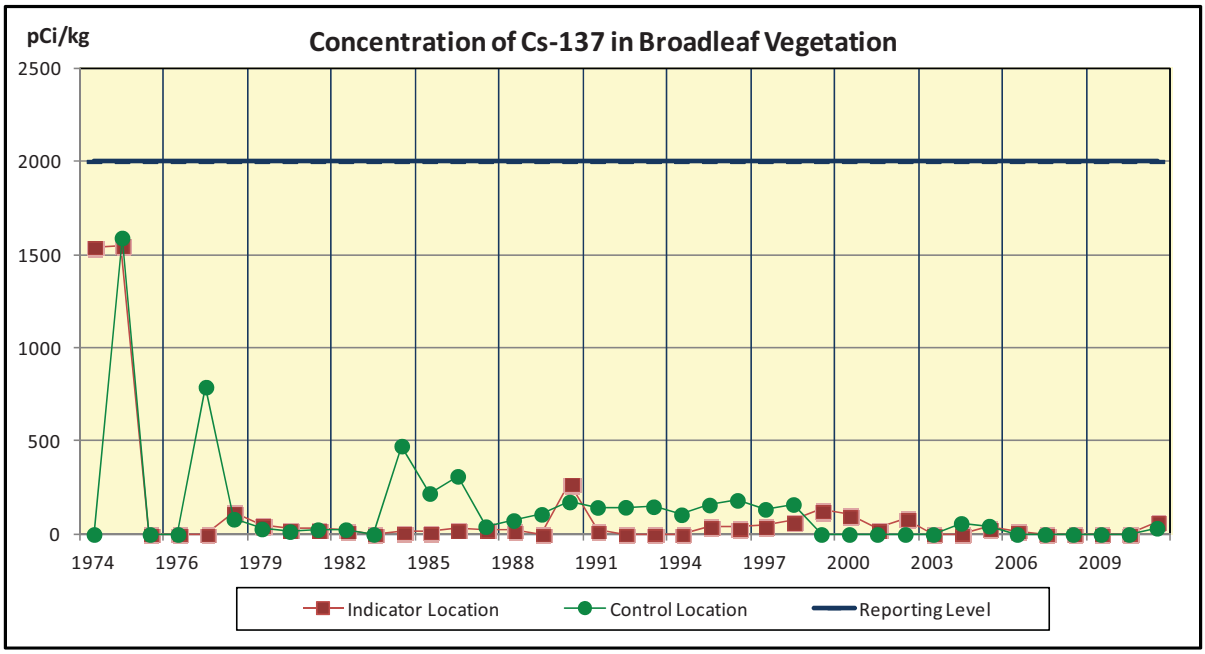
K-40 and Be-7 are naturally occurring radionuclides that were observed in broadleaf vegetation samples in 2011.

Radioactivity identified in the ONS broadleaf vegetation samples collected 4/4/2011 was determined to be from the Fukushima Daiichi incident based on the following:

(1) The quantities of radioactive airborne effluents from Oconee Nuclear Station during 2011 did not increase significantly compared to year 2010.
(2) Cs-137 has not been detected in REMP vegetation samples for several years.
(3) Similar results were seen at other US nuclear plants and state and local government monitoring agencies.

As such, the atypical detection of these radionuclides in both indicator and control samples is credibly attributed to the trans-Pacific transport of airborne releases from Fukushima Daiichi following the March 11, 2011 Tohoku earthquake and is not related to the operations of Oconee Nuclear Station.

Figure 3.5



2011 concentration affected by Fukushima Daiichi

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
2010	0.00E0	0.00E0
2011	6.68E1	3.35E1

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
2011 concentration affected by Fukushima Daiichi

3.6 FISH

In 2011, gamma spectroscopy was performed on 12 fish samples. Two downstream indicator and one control location were sampled. Cs-137 was identified in two of the eight indicator location samples. Cs-137 was detected in three of the four control location samples at a mean concentration of 22.1 pCi/kg.

The highest average indicator concentration for Cs-137 was 35.3 pCi/kg (1.77% of reporting level).

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 2011. 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

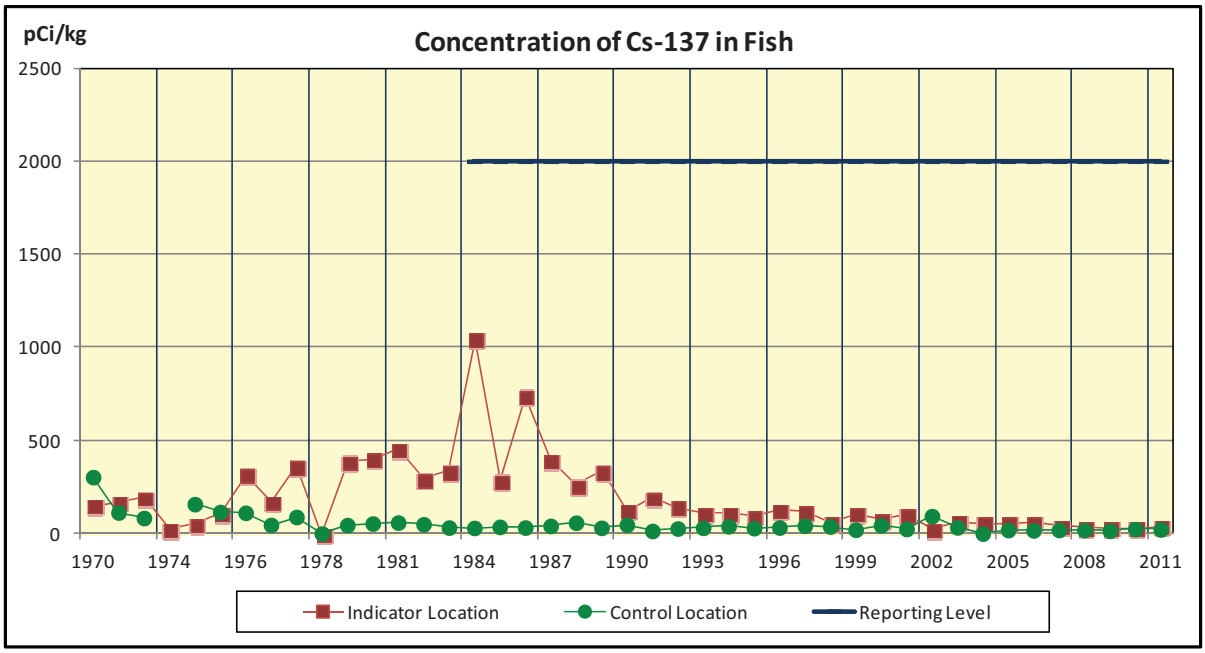
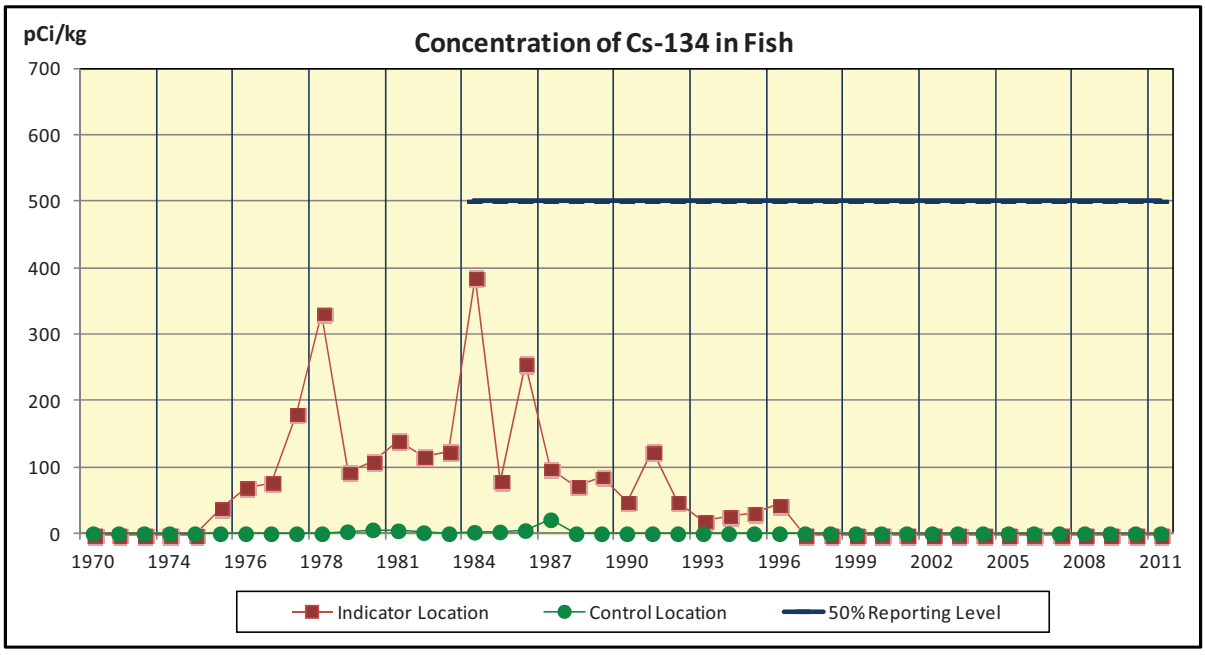


Figure 3.6-2



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
2010	0.00E0	0.00E0	0.00E0	2.69E1
2011	0.00E0	0.00E0	0.00E0	3.53E1

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 the four indicator location samples. Cs-137 was identified in one of the two control location samples. The highest 2011 individual sample Cs-137 concentration was 81.1 pCi/kg. The highest 2010 individual sample Cs-137 concentration was 198 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 2011.

Figure 3.7-1

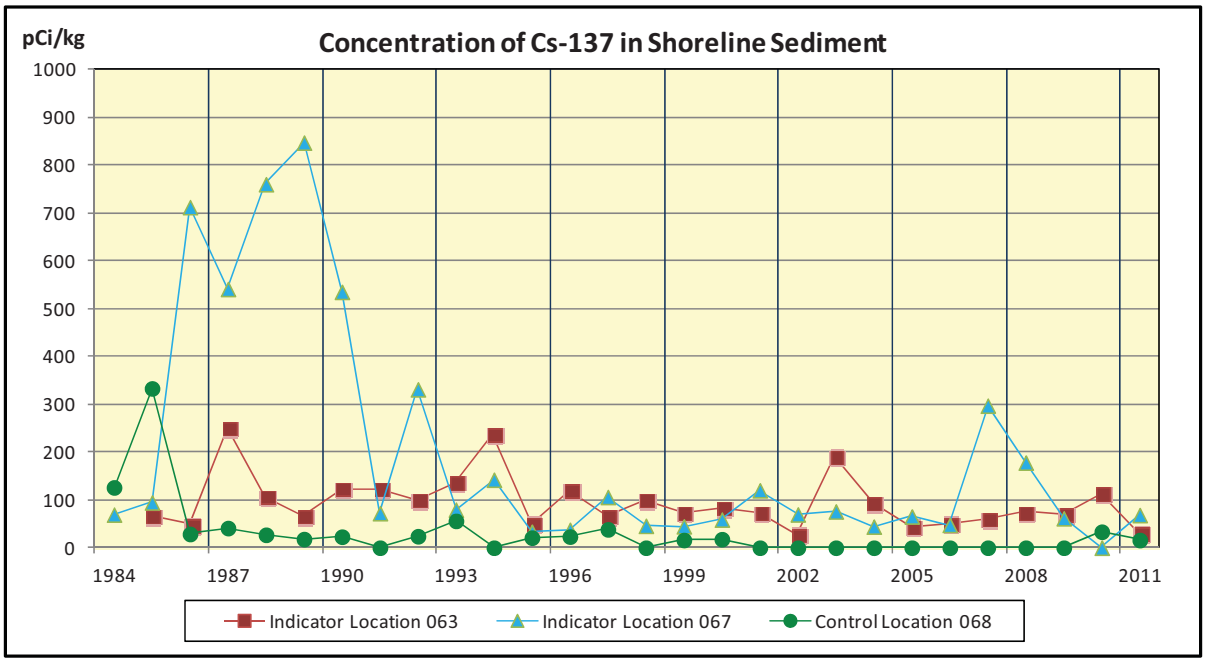
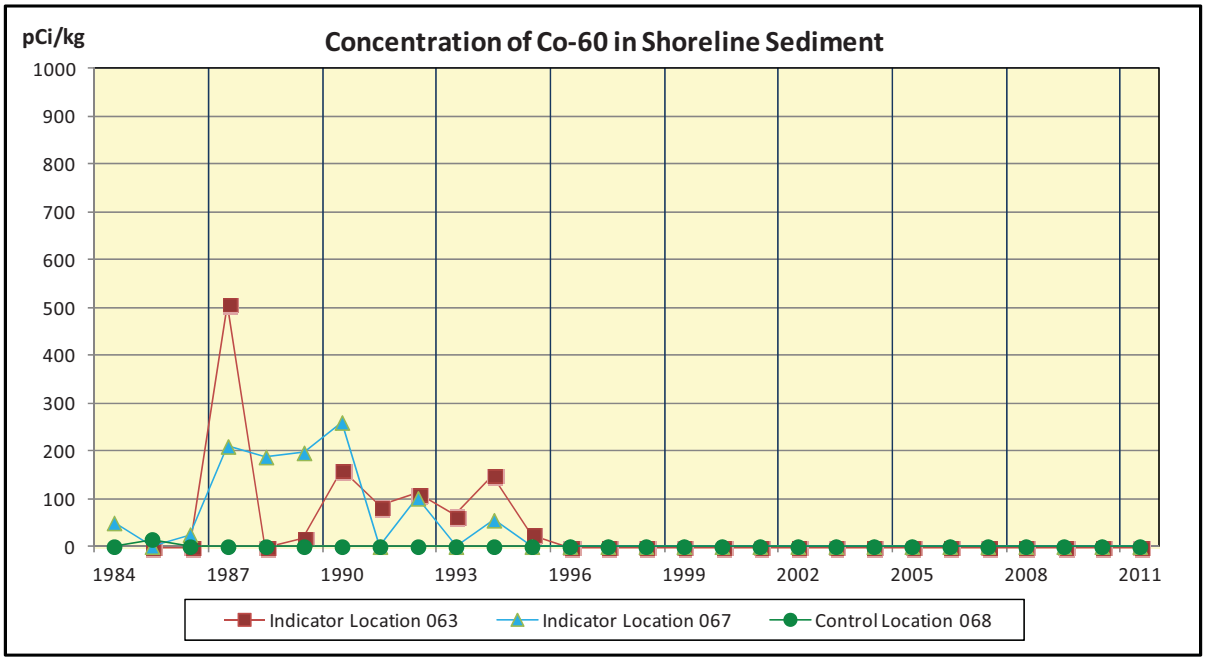


Figure 3.7-2



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
2010	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	1.15E2	0.00E0	0.00E0
2011	0.00E0	0.00E0	0.00E0	0.00E0	0.00E0	6.83E1	0.00E0	0.00E0

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

3.8 DIRECT GAMMA RADIATION

3.8.1 ENVIRONMENTAL TLD

In 2011, 168 Thermoluminescent Dosimeters (TLD) were analyzed, 160 at indicator locations, 8 at the two control locations. TLDs are collected and analyzed quarterly. A transit background for environmental TLDs is determined based on ANSI N545. The highest annual mean exposure for an indicator location was 112 milliroentgen. This TLD is located at indicator location 048, 3.64 miles from the station. The annual mean exposure for the control locations was 111 milliroentgen.

Figure 3.8-1 and Table 3.8-A 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 control locations have historically been higher than indicator locations. This is most likely an artifact of the underlying geologic structures at the control locations. The control locations are 9.39 miles WSW and 9.33 miles SE, well beyond the influence of the plant.

Figures 3.8-2 and 3.8-3 show the TLD mean for each inner and outer ring TLD location from 1984 through 2011. Data prior to 1984 was not included due to programmatic changes implemented in 1984.

The calculated total body dose (from gaseous effluents) for 2011 was 1.13E-1 mrem, which is 0.14% 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.

A TLD intercomparison program is conducted as part of the quality assurance program. Results of this program are included in section 5.10.

3.8.2 ISFSI

The Oconee Independent Spent Fuel Storage Installation (ISFSI) is a fenced, secured area constructed to provide dry storage for spent nuclear fuel. The principal components of the ISFSI are concrete horizontal storage modules that hold stainless steel dry storage canisters containing irradiated fuel assemblies.

The ISFSI is located in the southwest end of the plant, approximately 400 meters from Unit 2 reactor building. The radiological environmental monitoring program for Oconee also serves as the operational program for the ISFSI. No liquid or airborne effluents are anticipated from the passive storage provided by the ISFSI. Therefore any dose to offsite points would be from direct and scattered gamma radiation. Several environmental TLD locations are presently located at the Oconee site

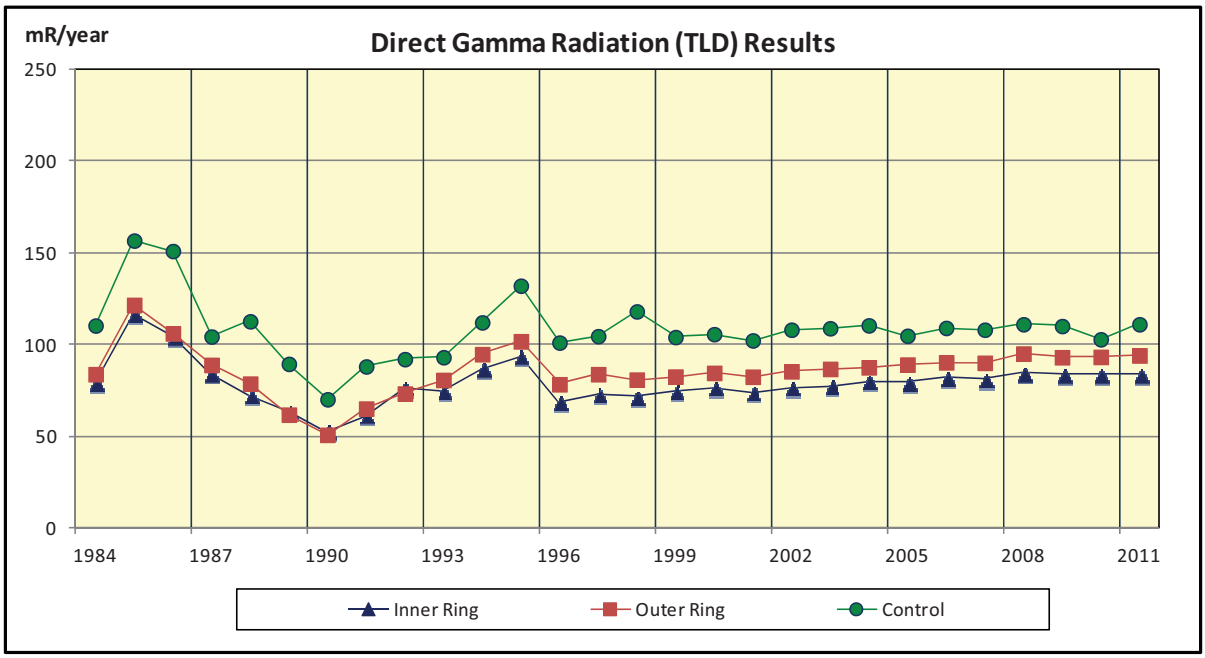
boundary fence near the ISFSI. The closest of these is 0.3 miles from the ISFSI, well within the 1-mile exclusion boundary. In addition, dose rates at the ISFSI restricted area fence are monitored with TLDs and used in monitoring occupational exposure controls.

Oconee began storage of spent fuel at the ISFSI in 1990. Six storage modules were loaded with spent fuel in 2011.

The maximum measurement from TLDs at the Independent Spent Fuel Storage Installation fence (which is not accessible to the public) was 655 milliroentgen per standard quarter. This is consistent with previous measurements.

An upward trend in environmental TLD data was identified in 2009 (reference 6.17). Additions of modules to the ISFSI are a possible cause. An evaluation of the increase is on-going. Additional environmental TLDs have been placed in the field to assist with this evaluation.

Figure 3.8-1



There is no reporting level for Direct Radiation (TLD)

Table 3.8-A Direct Gamma Radiation (TLD) Results

Year	Inner Ring Average (mR/yr)	Outer Ring Average (mR/yr)	Control (mR/yr)
Preoperational	113	124	149
1984	79.4	83.8	110
1985	117	122	157
1986	104	106	151
1987	84.3	88.8	104
1988	72.3	78.6	113
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
1995	93.6	102	132
1996	68.5	78.3	101
1997	72.8	83.8	104
1998	71.7	80.8	118
1999	74.5	82.5	104
2000	76.2	84.5	106
2001	73.6	82.4	102
2002	76.6	85.3	108
2003	77.4	86.6	109
2004	80.1	87.5	110
2005	79.3	89.0	105
2006	82.0	90.2	109
2007	81.0	90.0	108
2008	84.6	95.0	111
2009	83.7	93.0	110
2010	83.6	93.2	103
Average (2001 - 2010)	80.2	89.2	108
2011	83.7	94.0	111

Figure 3.8-2

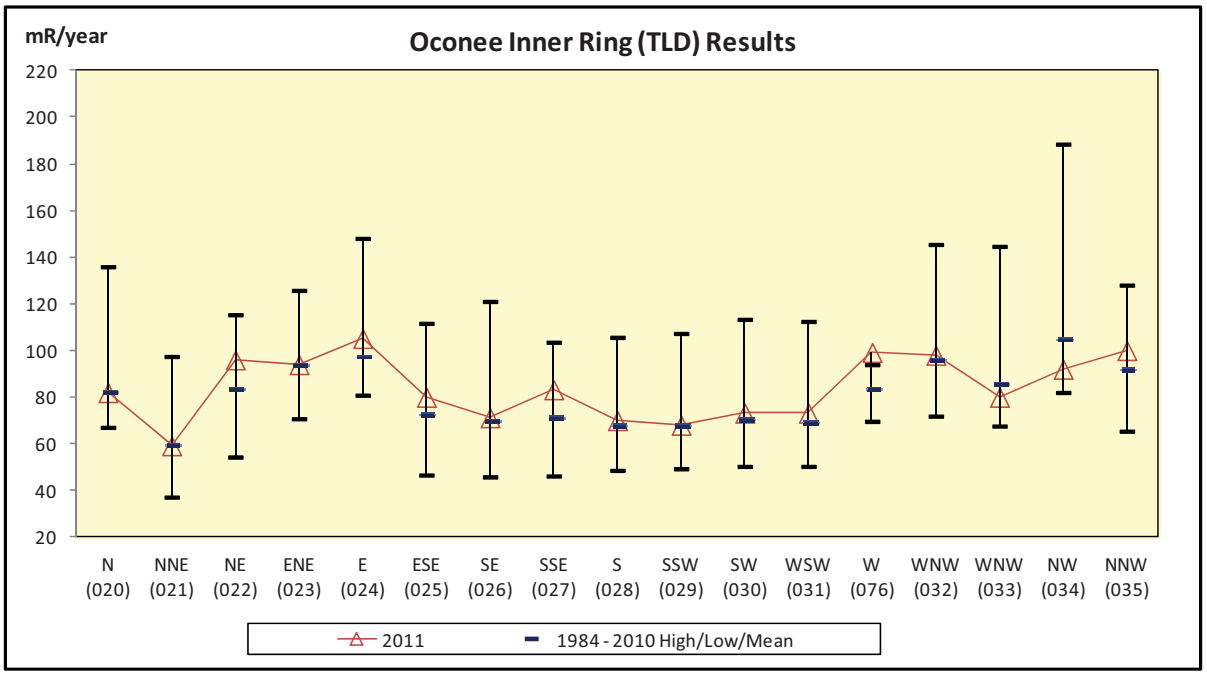


Table 3.8-B Direct Gamma Radiation (TLD) Results Inner Ring (mR/year)

Sector (Location)	1984 - 2010 Mean	1984 - 2010 Low	1984 - 2010 High	2011
N (020)	83.1	67.1	136.0	82.0
NNE (021)	60.6	37.2	97.5	59.2
NE (022)	84.1	54.4	115.4	96.0
ENE (023)	94.5	70.8	125.8	94.0
E (024)	98.3	80.9	148.1	105.2
ESE (025)	73.0	46.7	111.7	80.0
SE (026)	70.2	45.9	121.1	71.2
SSE (027)	71.4	46.3	103.6	83.2
S (028)	68.6	48.7	105.7	70.0
SSW (029)	68.3	49.4	107.4	68.0
SW (030)	70.8	50.4	113.4	73.2
WSW (031)	69.8	50.4	112.5	73.2
W (076)	84.0	69.7	94.0	99.2
WNW (032)	96.2	71.9	145.5	98.0
WNW (033)	86.6	67.7	144.7	80.0
NW (034)	105.4	82.1	188.5	92.0
NNW (035)	92.2	65.5	128.1	100.0

Figure 3.8-3

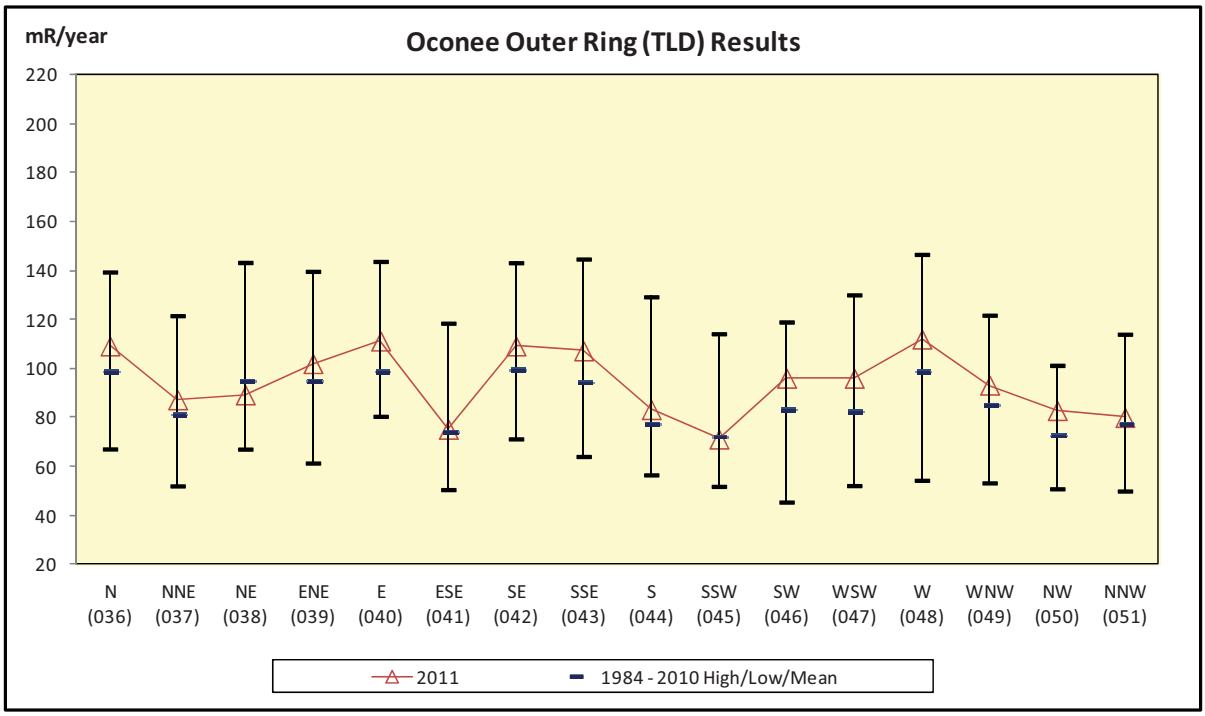


Table 3.8-C Direct Gamma Radiation (TLD) Results Outer Ring (mR/year)

Sector (Location)	1984 - 2010 Mean	1984 - 2010 Low	1984 - 2010 High	2011
N (036)	99.4	67.2	139.4	109.2
NNE (037)	82.0	52.1	121.6	87.2
NE (038)	95.7	67.1	143.3	89.2
ENE (039)	95.8	61.4	139.7	102.0
E (040)	99.3	80.5	143.7	111.2
ESE (041)	75.0	50.6	118.5	75.2
SE (042)	100.4	71.3	143.2	109.2
SSE (043)	95.2	64.1	144.7	107.2
S (044)	78.2	56.6	129.3	83.2
SSW (045)	73.0	51.9	114.2	71.2
SW (046)	84.0	45.5	119.0	96.0
WSW (047)	83.2	52.2	130.1	96.0
W (048)	99.5	54.4	146.6	112.0
WNW (049)	85.6	53.3	121.8	93.2
NW (050)	73.7	50.9	101.3	82.8
NNW (051)	78.0	50.0	114.0	80.0

3.9 LAND USE CENSUS

The Land Use Census was conducted during the growing season (6/7 - 6/8/2011) 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.

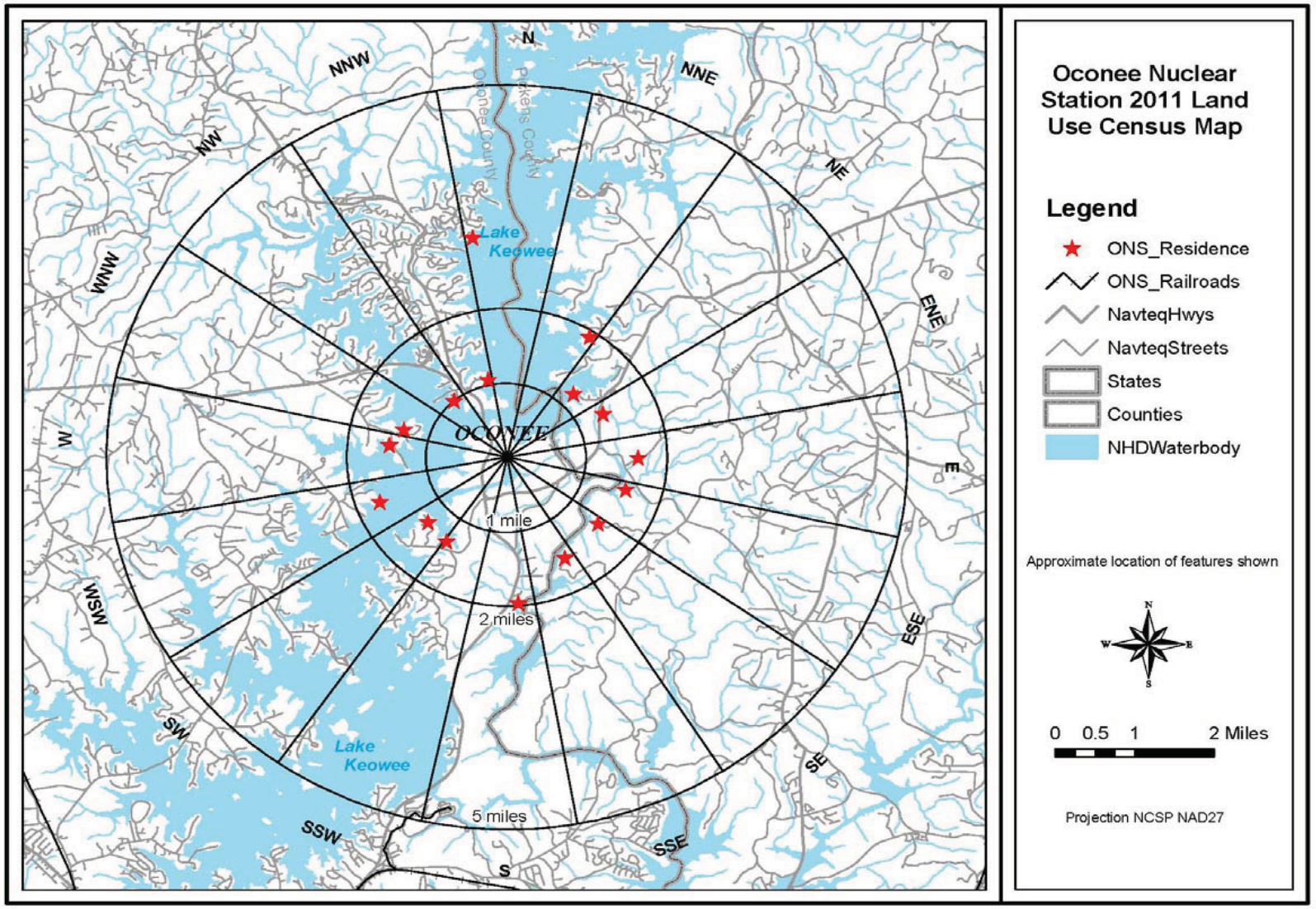
Table 3.9 Oconee 2011 Land Use Census Results

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	1.76
	Nearest Milk Animal	-		Nearest Milk Animal	-
E	Nearest Residence	1.64	W	Nearest Residence	1.58
	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 2011 Land Use Census Map
Legend
ONS_Residence
ONS_Railroads
NavteqHwys
NavteqStreets
States
Counties
NHDWaterbody
Approximate location of features shown
0 0.5 1 2 Miles
Projection NCSP NAD27
N
NNW
NNE
NW
NE
WNW
ENE
W
E
WSW
ESE
SW
SE
SSW
SSE
S
OCONEE
1 mile
2 miles
5 miles
Lake Keowee
Lake Keowee
Oconee County
Pickens 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 2011 ONS REMP samples. Only those samples that were not affected by the Fukushima Daiichi fallout were used to calculate doses. 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 attributable to ONS station operations were detected in broadleaf vegetation, milk, airborne radioiodine or airborne particulate samples. Naturally occurring K-40 and Be-7 were detected in some samples but were not included in any REMP-based dose estimates. 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 (excluding TLD results) collected during 2011 was 3.51E-2 mrem to the child liver, total body, thyroid, kidney, lung, and GI-LLI from consuming drinking water.

4.2 ESTIMATED DOSE FROM RELEASES

Throughout the year, dose estimates were calculated based on actual 2011 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. 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.

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.

Additionally, in 2010 Oconee began reporting estimated dose from effluent Carbon 14 (C-14). This change came about with the issuing of Regulatory Guide 1.21, Revision 2, Measuring, Evaluating and Reporting Radioactive Material in Liquid and Gaseous Effluents and Solid Waste. A description of this change is found in the 2010 Annual Radiological Effluent Release Report. C-14 is not measured in the environment and therefore, environmental and effluent doses from C-14 cannot be compared directly.

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 2011 environmental sample results was 6.96E-2 mrem to the child liver. The maximum total organ dose of 5.62E-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 3.26E-1 mrem to the child bone. No radioactivity was detected from gaseous pathways in environmental samples excluding Fukushima Daiichi fallout; therefore, there is no calculated dose.

The doses calculated do not exceed 40CFR190 or 10CFR50 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
2011 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	067 (4.34 mi SSE)	1.37E-04
Skin	Effluent	Teen	Shoreline Sediment	Discharge Pt.	3.10E-03
Bone	Environmental	Child	Fish	063 (0.80 mi ESE)	2.98E-02
Bone	Effluent	Child	Fish	Discharge Pt.	2.44E-01
Liver	Environmental	Child	Drinking Water	066 (18.9 mi SSE)	6.96E-02
Liver	Effluent	Adult	Fish	Discharge Pt.	4.44E-01
T. Body	Environmental	Adult	Fish	063 (0.80 mi ESE)	5.52E-02
T. Body	Effluent	Adult	Fish	Discharge Pt.	3.59E-01
Thyroid	Environmental	Child	Drinking Water	066 (18.9 mi SSE)	4.11E-02
Thyroid	Effluent	Child	Drinking Water	18.9 mi SSE	1.15E-01
Kidney	Environmental	Child	Drinking Water	066 (18.9 mi SSE)	5.04E-02
Kidney	Effluent	Adult	Fish	18.9 mi SSE	2.21E-01
Lung	Environmental	Child	Drinking Water	066 (18.9 mi SSE)	4.44E-02
Lung	Effluent	Child	Drinking Water	18.9 mi SSE	1.49E-01
GI-LLI	Environmental	Child	Drinking Water	066 (18.9 mi SSE)	4.13E-02
GI-LLI	Effluent	Adult	Fish	Discharge Pt.	5.62E-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	2.30E-07
Bone	Environmental	-	-	-	0.00E+00
Bone	Effluent	Child	Vegetation	1.0 mi. SW	3.26E-01
Liver	Environmental	-	-	-	0.00E+00
Liver	Effluent	Child	Vegetation	1.0 mi. SW	1.13E-01
T. Body	Environmental	-	-	-	0.00E+00
T. Body	Effluent	Child	Vegetation	1.0 mi. SW	1.13E-01
Thyroid	Environmental	-	-	-	0.00E+00
Thyroid	Effluent	Child	Vegetation	1.0 mi. SW	1.13E-01
Kidney	Environmental	-	-	-	0.00E+00
Kidney	Effluent	Child	Vegetation	1.0 mi. SW	1.13E-01
Lung	Environmental	-	-	-	0.00E+00
Lung	Effluent	Child	Vegetation	1.0 mi. SW	1.13E-01
GI-LLI	Environmental	-	-	-	0.00E+00
GI-LLI	Effluent	Child	Vegetation	1.0 mi. SW	1.13E-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 ground/plane, inhalation, milk and vegetation pathways.

TABLE 4.1-B

Maximum Individual Dose for 2011 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	3.45E-02	3.45E-02	3.45E-02	3.45E-02	3.45E-02	3.45E-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	3.45E-02	3.45E-02	3.45E-02	3.45E-02	3.45E-02	3.45E-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	3.51E-02	3.51E-02	3.51E-02	3.51E-02	3.51E-02	3.51E-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	2.98E-02	3.45E-02	1.02E-02	5.99E-03	1.53E-02	9.33E-03	6.17E-03	0.00E+00
	Shoreline Sediment	0.00E+00	0.00E+00	2.46E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.87E-05
	TOTAL	2.98E-02	6.96E-02	4.53E-02	4.11E-02	5.04E-02	4.44E-02	4.13E-02	2.87E-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	1.83E-02	1.83E-02	1.83E-02	1.83E-02	1.83E-02	1.83E-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	2.37E-02	3.87E-02	1.82E-02	7.25E-03	1.80E-02	1.14E-02	7.70E-03	0.00E+00
	Shoreline Sediment	0.00E+00	0.00E+00	1.18E-04	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.37E-04
	TOTAL	2.37E-02	5.70E-02	3.66E-02	2.56E-02	3.63E-02	2.97E-02	2.60E-02	1.37E-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	2.60E-02	2.60E-02	2.60E-02	2.60E-02	2.60E-02	2.60E-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	2.21E-02	3.96E-02	2.92E-02	9.43E-03	1.97E-02	1.28E-02	1.00E-02	0.00E+00
	Shoreline Sediment	0.00E+00	0.00E+00	2.11E-05	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.46E-05
	TOTAL	2.21E-02	6.56E-02	5.52E-02	3.54E-02	4.57E-02	3.88E-02	3.60E-02	2.46E-05

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

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2011 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	339	0.00E+00	3.45E-02	3.45E-02	3.45E-02	3.45E-02	3.45E-02	3.45E-02
						Dose Commitment (mrem) =				0.00E+00	3.45E-02	3.45E-02	3.45E-02	3.45E-02	3.45E-02	3.45E-02

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2011 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	339	0.00E+00	3.51E-02	3.51E-02	3.51E-02	3.51E-02	3.51E-02	3.51E-02
						Dose Commitment (mrem) =				0.00E+00	3.51E-02	3.51E-02	3.51E-02	3.51E-02	3.51E-02	3.51E-02

Oconee Nuclear Station
Dose from Fish Pathway for 2011 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 = 4750 pCi/l x 0.9 = 4275 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	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
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	13.2	2.98E-02	2.85E-02	4.21E-03	0.00E+00	9.29E-03	3.34E-03	1.79E-04
H-3	NO DATA	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	063	4275	0.00E+00	5.99E-03	5.99E-03	5.99E-03	5.99E-03	5.99E-03	5.99E-03
						Dose Commitment (mrem) =				2.98E-02	3.45E-02	1.02E-02	5.99E-03	1.53E-02	9.33E-03	6.17E-03

Oconee Nuclear Station
Dose from Shoreline Sediment Pathway for 2011 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**	**067**	**52.3**	**2.46E-05**	**2.87E-05**
		Dose Commitment (mrem) =			**2.46E-05**	**2.87E-05**

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2011 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	339	0.00E+00	1.83E-02	1.83E-02	1.83E-02	1.83E-02	1.83E-02	1.83E-02
						Dose Commitment (mrem)=				0.00E+00	1.83E-02	1.83E-02	1.83E-02	1.83E-02	1.83E-02	1.83E-02

Oconee Nuclear Station
Dose from Fish Pathway for 2011 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 = 4750 pCi/l x 0.9 = 4275 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	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
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	13.2	2.37E-02	3.15E-02	1.10E-02	0.00E+00	1.07E-02	4.16E-03	4.48E-04
H-3	NO DATA	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	063	4275	0.00E+00	7.25E-03	7.25E-03	7.25E-03	7.25E-03	7.25E-03	7.25E-03
						Dose Commitment (mrem) =				2.37E-02	3.87E-02	1.82E-02	7.25E-03	1.80E-02	1.14E-02	7.70E-03

Oconee Nuclear Station
Dose from Shoreline Sediment Pathway for 2011 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 (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	067	52.3	1.18E-04	1.37E-04
Dose Commitment (mrem) =					1.18E-04	1.37E-04

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2011 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	339	0.00E+00	2.60E-02	2.60E-02	2.60E-02	2.60E-02	2.60E-02	2.60E-02
						Dose Commitment (mrem) =				0.00E+00	2.60E-02	2.60E-02	2.60E-02	2.60E-02	2.60E-02	2.60E-02

Oconee Nuclear Station
Dose from Fish Pathway for 2011 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 = 4750 pCi/l x 0.9 = 4275 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	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
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	13.2	2.21E-02	3.02E-02	1.98E-02	0.00E+00	1.03E-02	3.41E-03	5.85E-04
H-3	NO DATA	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	063	4275	0.00E+00	9.43E-03	9.43E-03	9.43E-03	9.43E-03	9.43E-03	9.43E-03
								Dose Commitment (mrem) =		2.21E-02	3.96E-02	2.92E-02	9.43E-03	1.97E-02	1.28E-02	1.00E-02

Oconee Nuclear Station
Dose from Shoreline Sediment Pathway for 2011 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			Highest Annual Net Mean Concentration		Dose (mrem)	
	(mrem/hr per pCi/m^2)		Indicator	Sediment		
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	067	52.3	2.11E-05	2.46E-05
Dose Commitment (mrem) =					2.11E-05	2.46E-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 2011. Interlaboratory cross-check standards, including Marinelli beakers, air filters, air cartridges, gross beta in water, and tritium in water samples were analyzed at various times of the year. A summary of the EnRad Laboratory program results for 2011 is documented in Table 5.0-A.

5.6 ECKERT & ZIEGLER ANALYTICS CROSS CHECK PROGRAM

EnRad Laboratories participated in the Eckert & Ziegler Analytics Cross Check Program during 2011. Cross-check standards including, Marinelli beakers, air filters, tritium in water, and Iodine in milk samples were analyzed at various times of the year. A summary of the EnRad Laboratory program results for 2011 is documented in Table 5.0-B.

5.7 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 2011 is documented in Table 5.0-C.

5.8 DUKE ENERGY AUDITS

The Oconee Nuclear Station Radiological Environmental Monitoring Program was not audited by the Quality Assurance Group in 2011, but was audited in 2010. Additional discussion of TLD trending in Section 3.8 was added as a result of the 2010 audit (reference 6.14, 6.15).

5.9 U.S. NUCLEAR REGULATORY COMMISSION INSPECTIONS

The Oconee Nuclear Station Radiological Environmental Monitoring Program was not audited by the NRC in 2011 but was audited in 2010 (reference 6.12). No findings were noted in the 2010 report.

5.10 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.

5.11 TLD INTERCOMPARISON PROGRAM

5.11.1 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-D.

5.11.2 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-D.

TABLE 5.0-A
DUKE ENERGY
INTERLABORATORY COMPARISON PROGRAM

2011 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
8/17/2011	Q113GWSL	Cr-51	1.85 - 3.28 E5	2.47 E5	2.47 E5	3 Pass
		Mn-54	6.36 - 11.28 E4	8.48 E4	8.62 E4	3 Pass
		Co-58	5.13 - 9.10 E4	6.84 E4	6.79 E4	3 Pass
		Fe-59	3.42 - 6.07 E4	4.56 E4	4.76 E4	3 Pass
		Co-60	6.28 - 11.13 E4	8.37 E4	8.26 E4	3 Pass
		Zn-65	0.78 - 1.38 E5	1.04 E5	1.06 E5	3 Pass
		Cs-134	5.22 - 9.25 E4	6.96 E4	6.30 E4	3 Pass
		Cs-137	4.51 - 8.00 E4	6.02 E4	5.59 E4	3 Pass
		Ce-141	4.89 - 8.68 E4	6.52 E4	6.51 E4	3 Pass
12/12/2011	Q114GWR	Mn-54	2.31 - 4.09 E4	3.08 E4	3.25 E4	1 Pass
		Co-57	3.05 - 5.40 E4	4.06 E4	4.34 E4	1 Pass
		Co-60	2.76 - 4.89 E4	3.67 E4	3.65 E4	1 Pass
		Y-88	1.49 - 2.65 E4	1.99 E4	2.03 E4	1 Pass
		Cd-109	0.00 - 0.00 E3	0.00E+00	6.46 E3	1/1 High (1)
		Sn-113	1.60 - 2.84 E4	2.14 E4	2.12 E4	1 Pass
		Cs-137	2.39 - 4.23 E4	3.18 E4	3.01 E4	1 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
8/17/2011	Q113GWSL	Cr-51	1.85 - 3.28 E5	2.47 E5	2.47 E5	3 Pass
		Mn-54	6.36 - 11.28 E4	8.48 E4	8.79 E4	3 Pass
		Co-58	5.13 - 9.10 E4	6.84 E4	6.87 E4	3 Pass
		Fe-59	3.42 - 6.07 E4	4.56 E4	4.90 E4	3 Pass
		Co-60	6.28 - 11.13 E4	8.37 E4	8.35 E4	3 Pass
		Zn-65	0.78 - 1.38 E5	1.04 E5	1.09 E5	3 Pass
		Cs-134	5.22 - 9.25 E4	6.96 E4	6.12 E4	3 Pass
		Cs-137	4.51 - 8.00 E4	6.02 E4	5.65 E4	3 Pass
		Ce-141	4.89 - 8.68 E4	6.52 E4	6.40 E4	3 Pass

Gamma in Water 1.0 liter, continued

12/12/2011	Q114GWR	Mn-54	2.31 - 4.09 E4	3.08 E4	3.18 E4	1 Pass
		Co-57	3.05 - 5.40 E4	4.06 E4	4.22 E4	1 Pass
		Co-60	2.76 - 4.89 E4	3.67 E4	3.63 E4	1 Pass
		Y-88	1.49 - 2.65 E4	1.99 E4	1.97 E4	1 Pass
		Cd-109	0.00 - 0.00 E3	0.00E+00	7.68 E3	1/1 High [1]
		Sn-113	1.60 - 2.84 E4	2.14 E4	2.09 E4	1 Pass
		Cs-137	2.39 - 4.23 E4	3.18 E4	2.94 E4	1 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
8/17/2011	Q113GWSL	Cr-51	1.85 - 3.28 E5	2.47 E5	2.46 E5	3 Pass
		Mn-54	6.36 - 11.28 E4	8.48 E4	8.60 E4	3 Pass
		Co-58	5.13 - 9.10 E4	6.84 E4	6.69 E4	3 Pass
		Fe-59	3.42 - 6.07 E4	4.56 E4	4.82 E4	3 Pass
		Co-60	6.28 - 11.13 E4	8.37 E4	8.17 E4	3 Pass
		Zn-65	0.78 - 1.38 E5	1.04 E5	1.08 E5	3 Pass
		Cs-134	5.22 - 9.25 E4	6.96 E4	5.90 E4	3 Pass
		Cs-137	4.51 - 8.00 E4	6.02 E4	5.56 E4	3 Pass
		Ce-141	4.89 - 8.68 E4	6.52 E4	6.34 E4	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
8/17/2011	Q113GWSL	Cr-51	1.85 - 3.28 E5	2.47 E5	2.51 E5	3 Pass
		Mn-54	6.36 - 11.28 E4	8.48 E4	8.76 E4	3 Pass
		Co-58	5.13 - 9.10 E4	6.84 E4	6.85 E4	3 Pass
		Fe-59	3.42 - 6.07 E4	4.56 E4	4.93 E4	3 Pass
		Co-60	6.28 - 11.13 E4	8.37 E4	8.25 E4	3 Pass
		Zn-65	0.78 - 1.38 E5	1.04 E5	1.09 E5	3 Pass
		Cs-134	5.22 - 9.25 E4	6.96 E4	6.11 E4	3 Pass
		Cs-137	4.51 - 8.00 E4	6.02 E4	5.65 E4	3 Pass
		Ce-141	4.89 - 8.68 E4	6.52 E4	6.38 E4	3 Pass

Gamma in Filter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi	Reference Value pCi	Mean Reported Value pCi	Cross Check Status
6/16/2011	E7882-37	Cr-51	0.96 - 2.59 E2	1.58 E2	1.39 E2	2 Pass
		Mn-54	0.80 - 1.41 E2	1.06 E2	0.93 E2	2 Pass
		Co-58	0.88 - 1.56 E2	1.17 E2	0.96 E2	2 Pass
		Fe-59	7.10 - 12.60 E1	9.47 E1	8.62 E1	2 Pass
		Co-60	1.12 - 1.98 E2	1.49 E2	1.32 E2	2 Pass
		Zn-65	1.50 - 2.66 E2	2.00 E2	1.73 E2	2 Pass
		Cs-134	1.10 - 1.94 E2	1.46 E2	1.21 E2	2 Pass
		Cs-137	0.80 - 1.41 E2	1.06 E2	0.92 E2	2 Pass
		Ce-141	4.61 - 8.17 E1	6.14 E1	4.90 E1	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
3/23/2011	Q111LIW1	I-131	2.63 - 4.66 E3	3.51 E3	3.62 E3	3 Pass
3/23/2011	Q111LIW2	I-131	5.26 - 9.33 E2	7.01 E2	7.04 E2	3 Pass
3/23/2011	Q111LIW3	I-131	1.15 - 2.03 E2	1.53 E2	1.54 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
8/2/2011	Q113LIM1	I-131	1.84 - 3.26 E3	2.45 E3	2.60 E3	4 Pass
8/2/2011	Q113LIM2	I-131	1.58 - 2.80 E2	2.10 E2	2.19 E2	4 Pass
8/2/2011	Q113LIM3	I-131	2.63 - 4.66 E1	3.50 E1	3.67 E1	4 Pass

Iodine on Cartridge

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi	Reference Value pCi	Mean Reported Value pCi	Cross Check Status
6/16/2011	E7883-37	I-131	6.50 - 11.52 E1	8.66 E1	8.12 E1	2 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
6/22/2011	Q112TWR1	H-3	2.82 - 5.00 E6	3.76 E6	3.57 E6	3 Pass
6/22/2011	Q112TWR2	H-3	4.57 - 8.11 E5	6.10 E5	5.77 E5	3 Pass
6/22/2011	Q112TWR3	H-3	3.73 - 7.63 E2	5.33 E2	5.10 E2	3 Pass
12/12/2011	Q114TWR3	H-3	6.11 - 10.84 E3	8.15 E3	7.65 E3	3 Pass
12/14/2011	Q114TWR1	H-3	0.93 - 1.66 E3	1.24 E3	1.23 E3	3 Pass
12/14/2011	Q114TWR2	H-3	3.18 - 5.64 E5	4.24 E5	4.03 E5	3 Pass

Gross Beta in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
5/23/2011	Q112ABW1	Cs-137	5.05 - 8.95 E1	6.73 E1	6.84 E1	3 Pass
5/23/2011	Q112ABW2	Cs-137	6.60 - 11.71 E1	8.80 E1	8.47 E1	3 Pass
5/23/2011	Q112ABW3	Cs-137	4.96 - 8.79 E2	6.61 E2	6.41 E2	3 Pass

Table 5.0-A Footnote Explanations

(1) Gamma in Water, Sample ID Q114GWR, Reference Date 12/12/2011

Cd-109 was identified in the cross-check sample and reported. The cross check supplier does not include this radionuclide on the certificate of analysis for this cross-check sample. The radionuclide Cd-109 was determined to be a misidentification by the software and was determined not to be present in the cross-check sample (reference 6.19).

TABLE 5.0-B
ECKERT & ZIEGLER ANALYTICS
CROSS CHECK PROGRAM

2011 CROSS-CHECK RESULTS FOR ENRAD LABORATORIES

Cross-Check samples are received, prepared, and analyzed. Results are report directly to Eckert & Ziegler Analytics.

If applicable, footnote explanations are included following this table.

Gamma in Water 3.5 liters

Reference Date	Sample I.D.	Nuclide	Acceptance Range Ratio	Reference Value pCi/l	Reported Value pCi/l	Ratio	Cross Check Staus
9/15/2011	E8068-37	I-131	0.80 - 1.20	8.01E+01	7.96E+01	0.99	Pass
		Ce-141	0.80 - 1.20	9.15E+01	8.80E+01	0.96	Pass
		Cr-51	0.80 - 1.20	3.10E+02	3.18E+02	1.02	Pass
		Cs-134	0.80 - 1.20	1.76E+02	1.70E+02	0.97	Pass
		Cs-137	0.80 - 1.20	1.56E+02	1.57E+02	1.01	Pass
		Co-58	0.80 - 1.20	1.34E+02	1.37E+02	1.02	Pass
		Mn-54	0.80 - 1.20	2.07E+02	2.17E+02	1.05	Pass
		Fe-59	0.80 - 1.20	7.52E+01	8.34E+01	1.11	Pass
		Zn-65	0.80 - 1.20	2.47E+02	Not Reported	Not Reported	Failed (1)
		Co-60	0.80 - 1.20	2.15E+02	2.02E+02	0.94	Pass
12/8/2011	E8184-37	I-131	0.80 - 1.20	8.87E+01	9.46E+01	1.07	Pass
		Cr-51	0.80 - 1.20	5.66E+02	5.57E+02	0.98	Pass
		Cs-134	0.80 - 1.20	1.71E+02	1.76E+02	1.03	Pass
		Cs-137	0.80 - 1.20	2.10E+02	2.03E+02	0.97	Pass
		Co-58	0.80 - 1.20	2.21E+02	2.15E+02	0.97	Pass
		Mn-54	0.80 - 1.20	2.41E+02	2.52E+02	1.05	Pass
		Fe-59	0.80 - 1.20	1.83E+02	1.88E+02	1.03	Pass
		Zn-65	0.80 - 1.20	2.91E+02	2.97E+02	1.02	Pass
		Co-60	0.80 - 1.20	2.70E+02	2.87E+02	1.06	Pass

Gamma in Milk

Reference Date	Sample I.D.	Nuclide	Acceptance Range Ratio	Reference Value pCi/l	Reported Value pCi/l	Ratio	Cross Check Staus
12/8/2011	E8186-37	I-131	0.80 - 1.20	9.02E+01	9.84E+01	1.09	Pass
		Cr-51	0.80 - 1.20	5.66E+02	5.36E+02	0.95	Pass
		Cs-134	0.80 - 1.20	1.71E+02	1.59E+02	0.93	Pass
		Cs-137	0.80 - 1.20	2.10E+02	2.01E+02	0.96	Pass
		Co-58	0.80 - 1.20	2.21E+02	2.13E+02	0.96	Pass
		Mn-54	0.80 - 1.20	2.41E+02	2.45E+02	1.02	Pass
		Fe-59	0.80 - 1.20	1.83E+02	1.89E+02	1.03	Pass
		Zn-65	0.80 - 1.20	2.91E+02	2.95E+02	1.01	Pass
		Co-60	0.80 - 1.20	2.70E+02	2.74E+02	1.02	Pass

Iodine in Milk

Reference Date	Sample I.D.	Nuclide	Acceptance Range Ratio	Reference Value pCi/l	Reported Value pCi/l	Ratio	Cross Check Staus
9/15/2011	E8065-37	I-131	0.80 - 1.20	1.01E+02	9.88E+01	0.98	Pass

Tritium in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range Ratio	Reference Value pCi/l	Reported Value pCi/l	Ratio	Cross Check Staus
9/15/2011	E8069-37	H-3	0.80 - 1.20	9.01E+03	9.16E+03	1.02	Pass
12/8/2011	E8185-37	H-3	0.80 - 1.20	1.09E+04	1.04E+04	0.95	Pass

Gross Beta in Air Filter

Reference Date	Sample I.D.	Nuclide	Acceptance Range Ratio	Reference Value pCi/l	Reported Value pCi/l	Ratio	Cross Check Staus
9/15/2011	E8067-37	Cs-137	0.80 - 1.20	7.73E+01	7.60E+01	0.98	Pass
9/15/2011	E8066-37	Cs-137	0.80 - 1.20	1.94E+02	1.80E+02	0.93	Pass

Table 5.0-B Footnote Explanations

(1) Gamma in Water, Sample ID. E8068-37, Reference Date 9/15/2011

Zn-65 was identified in the cross-check sample but was not reported due to a summary report error (reference 6.20).

TABLE 5.0-C

ENVIRONMENTAL RESOURCE ASSOCIATES (ERA)
QUIK™ RESPONSE PROGRAM

2011 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
4/4/2011	RAD-85*	Ba-133	6.30 - 8.28 E1	7.53 E1	7.70 E1	Pass
		Cs-134	5.95 - 8.02 E1	7.29 E1	7.28 E1	Pass
		Cs-137	6.93 - 8.74 E1	7.70 E1	7.66 E1	Pass
		Co-60	0.799 - 1.00 E2	8.88 E1	9.41 E1	Pass
		Zn-65	0.89 - 1.18 E2	9.89 E1	1.02 E2	Pass
10/7/2011	RAD-87**	Ba-133	0.818 - 1.06 E2	9.69 E1	8.92 E1	Pass
		Cs-134	2.63 - 3.67 E1	3.34 E1	3.33 E1	Pass
		Cs-137	3.94 - 5.17 E1	4.43 E1	3.79 E1	Low (1)
		Co-60	1.07 - 1.33 E2	1.19 E2	1.11 E2	Pass
		Zn-65	6.89 - 9.25 E1	7.68 E1	7.95 E1	Pass
10/4/2010	Quik 122111A***	Ba-133	5.75 - 7.58 E1	6.89 E1	7.14 E1	Pass
		Cs-134	3.45 - 4.75 E1	4.32 E1	4.41 E1	Pass
		Cs-137	1.11 - 1.38 E2	1.23 E2	1.23 E2	Pass
		Co-60	4.81 - 6.13 E1	5.34 E1	6.00 E1	Pass
		Zn-65	0.918 - 1.22 E2	1.02 E2	1.24 E2	High (2)

Tritium in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Reported Value pCi/l	Proficiency Check Status
4/4/2011	RAD-85*	H-3	0.887 - 1.12 E4	1.02 E4	9.76 E3	Pass
10/7/2011	RAD-87**	H-3	1.52 - 1.91 E4	1.74 E4	1.68 E4	Pass

** ERA study period 4/4/2011 - 5/19/2011, ERA data report issue date 5/26/2011*

*** ERA study period 10/7/2011 - 11/21/2011, ERA data report issue date 11/29/2011*

**** ERA study period 12/21/2011 - 2/23/2012, ERA data report issue date 2/23/2012*

Table 5.0-C Footnote Explanations

(1) Gamma Emitters in Water, Sample ID RAD-87, Reference Date 10/7/2011

Reported result for Cs-137 was below the acceptance range limit (reference 6.21).

(2) Gamma Emitters in Water, Sample ID QUIK 122111A, Reference Date 10/4/2010

Sample ID QUIK 122111A originated as an evaluation sample for Sample ID RAD-87's low Cs-137 result. The reported Zn-65 result for QUIK 122111A was above the acceptance range limit (reference 6.21)

TABLE 5.0-D

2011 ENVIRONMENTAL DOSIMETER CROSS-CHECK RESULTS

Nuclear Technology Services

1st Quarter 2011

TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102178	96.3	95.1	1.26	<+/-15%	Pass
102194	99.4	95.1	4.50	<+/-15%	Pass
102234	101.4	95.1	6.65	<+/-15%	Pass
102162	99.7	95.1	4.88	<+/-15%	Pass
102099	97.5	95.1	2.52	<+/-15%	Pass
		Average Bias (B)	3.96		
		Standard Deviation (S)	2.10		
		Measure Performance |B|+S	6.07	<15%	Pass

2nd Quarter 2011

TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102021	15.7	14.6	7.81	<+/-15%	Pass
102026	15.6	14.6	6.85	<+/-15%	Pass
102038	16.3	14.6	11.92	<+/-15%	Pass
102057	14.4	14.6	-1.44	<+/-15%	Pass
102213	15.1	14.6	3.15	<+/-15%	Pass
		Average Bias (B)	5.66		
		Standard Deviation (S)	5.05		
		Measure Performance |B|+S	10.70	<15%	Pass

3rd Quarter 2011

TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102442	91.6	91.4	0.25	<+/-15%	Pass
102257	94.9	91.4	3.85	<+/-15%	Pass
102337	91.9	91.4	0.53	<+/-15%	Pass
102221	95.1	91.4	4.00	<+/-15%	Pass
102483	94.7	91.4	3.64	<+/-15%	Pass
		Average Bias (B)	2.46		
		Standard Deviation (S)	1.89		
		Measure Performance |B|+S	4.35	<15%	Pass

4th Quarter 2011

TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
101285	72.0	70.0	2.84	<+/-15%	Pass
100746	71.2	70.0	1.71	<+/-15%	Pass
100087	70.7	70.0	0.97	<+/-15%	Pass
101131	71.7	70.0	2.46	<+/-15%	Pass
101356	72.5	70.0	3.59	<+/-15%	Pass
		Average Bias (B)	2.31		
		Standard Deviation (S)	1.01		
		Measure Performance |B|+S	3.32	<15%	Pass

Internal Crosscheck (Duke Energy)

1st Quarter 2011

TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102104	33.3	34.0	-2.15	<+/-15%	Pass
102316	32.7	34.0	-3.85	<+/-15%	Pass
102325	32.3	34.0	-5.12	<+/-15%	Pass
102434	32.8	34.0	-3.44	<+/-15%	Pass
102009	33.6	34.0	-1.26	<+/-15%	Pass
102149	32.3	34.0	-4.97	<+/-15%	Pass
102419	31.8	34.0	-6.44	<+/-15%	Pass
102160	34.8	34.0	2.47	<+/-15%	Pass
102502	32.5	34.0	-4.38	<+/-15%	Pass
102496	31.3	34.0	-7.88	<+/-15%	Pass
		Average Bias (B)	-3.70		
		Standard Deviation (S)	2.90		
		Measure Performance |B|+S	6.60	<15%	Pass

2nd Quarter 2011

TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
100104	35.6	35.0	1.71	<+/-15%	Pass
100054	34.3	35.0	-2.00	<+/-15%	Pass
102410	34.4	35.0	-1.71	<+/-15%	Pass
102363	34.6	35.0	-1.09	<+/-15%	Pass
100816	34.2	35.0	-2.20	<+/-15%	Pass
101311	32.6	35.0	-6.86	<+/-15%	Pass
100432	36.1	35.0	3.03	<+/-15%	Pass
100065	33.2	35.0	-5.29	<+/-15%	Pass
100103	33.4	35.0	-4.54	<+/-15%	Pass
100097	35.1	35.0	0.23	<+/-15%	Pass
		Average Bias (B)	-1.87		
		Standard Deviation (S)	3.09		
		Measure Performance |B|+S	4.96	<15%	Pass

3rd Quarter 2011

TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102015	34.1	34.0	0.35	<+/-15%	Pass
102468	33.4	34.0	-1.91	<+/-15%	Pass
102008	33.0	34.0	-3.03	<+/-15%	Pass
102496	31.2	34.0	-8.21	<+/-15%	Pass
102160	33.2	34.0	-2.32	<+/-15%	Pass
102156	33.6	34.0	-1.26	<+/-15%	Pass
102064	32.9	34.0	-3.32	<+/-15%	Pass
102419	32.4	34.0	-4.79	<+/-15%	Pass
102498	33.0	34.0	-3.06	<+/-15%	Pass
102340	32.9	34.0	-3.29	<+/-15%	Pass
		Average Bias (B)	-3.09		
		Standard Deviation (S)	2.27		
		Measure Performance |B|+S	5.35	<15%	Pass

4th Quarter 2011

TLD Number	Reported (mR)	Delivered (mR)	Bias (% diff)	Pass/Fail Criteria	Pass/Fail
102005	38.8	40.0	-3.03	<+/-15%	Pass
101364	39.2	40.0	-1.98	<+/-15%	Pass
102164	37.5	40.0	-6.15	<+/-15%	Pass
102163	38.2	40.0	-4.43	<+/-15%	Pass
101252	37.6	40.0	-6.05	<+/-15%	Pass
102104	38.5	40.0	-3.83	<+/-15%	Pass
101297	38.0	40.0	-4.98	<+/-15%	Pass
102178	39.0	40.0	-2.50	<+/-15%	Pass
101305	38.3	40.0	-4.18	<+/-15%	Pass
102243	37.9	40.0	-5.38	<+/-15%	Pass
		Average Bias (B)	-4.25		
		Standard Deviation (S)	1.44		
		Measure Performance |B|+S	5.68	<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 1969-2010

6.6 Oconee Annual Radioactive Effluent Release Report 2011

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 05000269/2010004, 05000270/2010004, 05000287/2010004

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

6.14 Radiological Effluent Controls INOS Audit 10-14 (INOS)(REC)(ONS)

6.15 Problem Investigation Program Database, V 3.4.1, Duke Energy Company, O-10-06760

6.16 Nuclear System Directive (NSD) 701, Records Management

6.17 Problem Investigation Program Database, V 3.4.3, Duke Energy Company, G-09-00424

6.18 Problem Investigation Program Database, V 3.4.3, Duke Energy Company, O-11-00631

6.19 Problem Investigation Program Database, V 3.4.3, Duke Energy Company, G-12-00354

6.20 Problem Investigation Program Database, V 3.4.3, Duke Energy Company, G-12-00015

6.21 Problem Investigation Program Database, V 3.4.3, Duke Energy Company, G-11-01830

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

No changes were made to the sampling procedure during 2011.

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 2011.

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 078.1	=	Recreation Site (0.53 mi. WSW)
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 6/7 to 6/8/2011. Results are shown in Table 3.9. No changes were made to the sampling procedures during 2011 as a result of the 2011 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

2011

Environmental Radiological Monitoring Program Summary

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

Location: Oconee County, South Carolina **Report Period: 01-JAN-2011 to 31-DEC-2011**

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	1.97E-2 (259/260)	078.1	2.06E-2 (51/52)	1.92E-2 (52/52)	0
				8.49E-3 - 3.70E-2	(0.53 mi WSW)	1.30E-2 - 3.70E-2	9.95E-3 - 3.12E-2	
	CS-134	312	5.00E-02	1.44E-2 (1/260)	078.1	1.44E-2 (1/52)	0.00 (0/52)	0
				1.44E-2 - 1.44E-2	(0.53 mi WSW)	1.44E-2 - 1.44E-2	0.00 - 0.00	
	CS-137	312	6.00E-02	8.08E-3 (2/260)	078.1	8.08E-3 (2/52)	0.00 (0/52)	0
				3.26E-3 - 1.29E-2	(0.53 mi WSW)	3.26E-3 - 1.29E-2	0.00 - 0.00	
	I-131	312	7.00E-02	1.23E-2 (15/260)	078.1	1.46E-2 (3/52)	2.01E-2 (1/52)	0
				7.24E-3 - 2.02E-2	(0.53 mi WSW)	8.47E-3 - 2.02E-2	2.01E-2 - 2.01E-2	

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-2011 to 31-DEC-2011**

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 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	4.49E-2 (21/260)	079	5.05E-2 (4/52)	4.13E-2 (5/52)	0
				4.87E-3 - 9.87E-2	(0.56 mi NE)	1.41E-2 - 9.38E-2	1.04E-2 - 9.00E-2	

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-2011 to 31-DEC-2011**

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.
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	1.07 (23/26)	066	1.18 (12/13)	1.00 (9/13)	0
				0.63 - 1.65	(18.9 mi SSE)	0.63 - 1.65	0.60 - 1.33	
	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	339 (4/8)	066	339 (4/4)	0.00 (0/4)	0
				265 - 386	(18.9 mi SSE)	265 - 386	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-2011 to 31-DEC-2011**

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	4750 (4/4)	063.1	4750 (4/4)	0.00 (0/4)	0
			1520 - 7390	(0.79 mi E)	1520 - 7390	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-2011 to 31-DEC-2011**

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.
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)	0.81 (1/26)	0
				0.00 - 0.00		0.00 - 0.00	0.81 - 0.81	

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-2011 to 31-DEC-2011**

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.
Broadleaf Vegetation (pCi/kg-wet)							081 (9.33 mi SE)	
	CS-134	48	60	42.9 (1/36)	084	42.9 (1/12)	0.00 (0/12)	0
				42.9 - 42.9	(2.58 mi NNE)	42.9 - 42.9	0.00 - 0.00	
	CS-137	48	80	52.1 (2/36)	084	66.8 (1/12)	33.5 (1/12)	0
				37.4 - 66.8	(2.58 mi NNE)	66.8 - 66.8	33.5 - 33.5	
	I-131	48	60	333 (3/36)	084	398 (1/12)	150 (1/12)	0
				224 - 398	(2.58 mi NNE)	398 - 398	150 - 150	

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-2011 to 31-DEC-2011**

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.
Fish (pCi/kg-wet)							060 (2.28 mi NE)	
	CO-58	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	
	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	24.5 (2/8)	063	35.3 (1/4)	22.1 (3/4)	0
				13.6 - 35.3	(0.80 mi ESE)	35.3 - 35.3	14.4 - 30.4	
	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-2011 to 31-DEC-2011**

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.
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	49.6 (4/4)	067	68.3 (2/2)	16.0 (1/2)	0
				29.2 - 81.1	(4.34 mi SSE)	55.4 - 81.1	16.0 - 16.0	

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-2011 to 31-DEC-2011**

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.
Direct Radiation TLD (mR/standard quarter)						058 (9.39 mi WSW) 081 (9.33 mi SE)	
	168	0.00E+00	22.4 (160/160)	048	28.0 (4/4)	27.8 (8/8)	0
			12.0 - 32.0	(3.64 mi W)	25.0 - 32.0	20.0 - 37.0	

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

OCONEE RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SUMMARY OF 2011 RESULTS EXCLUDING RADIOACTIVITY ATTRIBUTABLE TO FUKUSHIMA DAIICHI

Environmental Radiological Monitoring Program Summary *

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

Location: Oconee County, South Carolina **Report Period: 01-JAN-2011 to 31-DEC-2011**

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	282	1.00E-02	1.97E-2 (234/235)	078.1	2.02E-2 (46/47)	1.91E-2 (47/47)	0
			8.49E-3 - 3.42E-2	(0.53 mi WSW)	1.30E-2 - 3.37E-2	9.95E-3 - 3.12E-2	
CS-134	282	5.00E-02	0.00 (0/235)		0.00 (0/47)	0.00 (0/47)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
CS-137	282	6.00E-02	0.00 (0/235)		0.00 (0/47)	0.00 (0/47)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
I-131	282	7.00E-02	0.00 (0/235)		0.00 (0/47)	0.00 (0/47)	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
* Summary does not include samples collected during Fukushima Daiichi fallout period 3/14/2011 - 4/18/2011

Environmental Radiological Monitoring Program Summary *

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

Location: Oconee County, South Carolina **Report Period: 01-JAN-2011 to 31-DEC-2011**

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	282	5.00E-02	0.00 (0/235)		0.00 (0/47)	0.00 (0/47)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	282	6.00E-02	0.00 (0/235)		0.00 (0/47)	0.00 (0/47)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	I-131	282	7.00E-02	0.00 (0/235)		0.00 (0/47)	0.00 (0/47)	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
* Summary does not include samples collected during Fukushima Daiichi fallout period 3/14/2011 - 4/18/2011

Environmental Radiological Monitoring Program Summary *

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

Location: Oconee County, South Carolina **Report Period: 01-JAN-2011 to 31-DEC-2011**

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.
Milk (pCi/liter)				NO INDICATOR LOCATION			071 (10.2 mi SSE)	
	BALA-140	25	15	0.00 (0/0)		0.00 (0/0)	0.00 (0/25)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-134	25	15	0.00 (0/0)		0.00 (0/0)	0.00 (0/25)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	25	18	0.00 (0/0)		0.00 (0/0)	0.00 (0/25)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	I-131	25	15	0.00 (0/0)		0.00 (0/0)	0.00 (0/25)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	LLI-131	25	1	0.00 (0/0)		0.00 (0/0)	0.00 (0/25)	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
* Summary does not include samples collected during Fukushima Daiichi fallout period 4/4/2011

Environmental Radiological Monitoring Program Summary *

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

Location: Oconee County, South Carolina **Report Period: 01-JAN-2011 to 31-DEC-2011**

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.
Broadleaf Vegetation (pCi/kg-wet)							081 (9.33 mi SE)	
	CS-134	44	60	0.00 (0/33)		0.00 (0/11)	0.00 (0/11)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	44	80	0.00 (0/33)		0.00 (0/11)	0.00 (0/11)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	I-131	44	60	0.00 (0/33)		0.00 (0/11)	0.00 (0/11)	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
* Summary does not include samples collected during Fukushima Daiichi fallout period 4/4/2011

SUMMARY OF RADIOACTIVITY ATTRIBUTABLE TO FUKUSHIMA DAIICHI DETECTED IN ENVIRONMENTAL MEDIA AT DUKE ENERGY FACILITIES

Fukushima Daiichi Radioactivity Detected in Environmental Media (2011)

Airborne Particulate

Station	Analysis	Annual Concentration with Fukushima Daiichi (pCi/m^3)		Annual Concentration without Fukushima Daiichi (pCi/m^3)	
		Indicator	Control	Indicator	Control
Catawba	I-131	1.39E-2	1.04E-2	0.00	0.00
Catawba	Cs-137	3.92E-3	0.00	0.00	0.00
McGuire	I-131	2.08E-2	1.54E-2	0.00	0.00
McGuire	Cs-137	7.06E-3	0.00	0.00	0.00
Oconee	I-131	1.46E-2	2.01E-2	0.00	0.00
Oconee	Cs-134	1.44E-2	0.00	0.00	0.00
Oconee	Cs-137	8.08E-3	0.00	0.00	0.00

Airborne Radioiodine

Station	Analysis	Annual Concentration with Fukushima Daiichi (pCi/m^3)		Annual Concentration without Fukushima Daiichi (pCi/m^3)	
		Indicator	Control	Indicator	Control
Catawba	I-131	5.53E-2	5.65E-2	0.00	0.00
McGuire	I-131	6.00E-2	5.46E-2	0.00	0.00
Oconee	I-131	5.05E-2	4.13E-2	0.00	0.00

Milk

Station	Analysis	Annual Concentration with Fukushima Daiichi (pCi/l)		Annual Concentration without Fukushima Daiichi (pCi/l)	
		Indicator	Control	Indicator	Control
Catawba	LLI-131	NA	6.86	NA	0.00
McGuire	LLI-131	NA	4.80	NA	0.00
Oconee	LLI-131	NA	0.81	NA	0.00

Broadleaf Vegetation

Station	Analysis	Annual Concentration with Fukushima Daiichi (pCi/kg)		Annual Concentration without Fukushima Daiichi (pCi/kg)	
		Indicator	Control	Indicator	Control
Catawba	I-131	132	156	0.00	0.00
Catawba	Cs-134	12.8	0.00	0.00	0.00
Catawba	Cs-137	26.2	0.00	26.2	0.00
McGuire	I-131	316	168	0.00	0.00
McGuire	Cs-137	22.9	0.00	0.00	0.00
Oconee	I-131	398	150	0.00	0.00
Oconee	Cs-134	42.9	0.00	0.00	0.00
Oconee	Cs-137	66.8	33.5	0.00	0.00

Food Products (Crops)

Station	Analysis	Annual Concentration with Fukushima Daiichi (pCi/kg)		Annual Concentration without Fukushima Daiichi (pCi/kg)	
		Indicator	Control	Indicator	Control
McGuire	I-131	142	NA	0.00	0.00
McGuire	Cs-137	30.6	NA	0.00	0.00

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	Code	Description	Corrective Action Identity
078.1	9/26 – 10/3/2011	9/26 – 9/26/2011	PO	Power to sampling equipment interrupted due to breaker trip. Breaker reset, normal sampling resumed.	G-11-01483
081	6/6 – 6/13/2011 6/13 – 6/20/2011	6/6 – 6/10/2011 6/14 – 6/20/2011	PO	Power to sampling equipment interrupted due to breaker trip, likely attributable to severe weather. Work request 91502 written. Fuse replaced by Site Services and normal sampling resumed 6/14/2011.	G-11-00945

Drinking Water

Location	Scheduled Collection Dates	Actual Collection Dates	Code	Description	Corrective Action Identity
060 064 066	12/13 – 1/10/2011	12/13 – 1/12/2011	IW	Collection rescheduled due to inclement weather creating potentially unsafe site access conditions.	G-11-00044
064	4/4 – 5/2/2011	5/2 – 5/2/2011	OT	Sampler did not collect sufficient volume, grab sample taken. Water plant personnel indicated site electrical work may have caused power loss to equipment for an indeterminate period.	G-11-00758

Surface Water

Location	Scheduled Collection Dates	Actual Collection Dates	Code	Description	Corrective Action Identity
062 063.1	12/13 – 1/10/2011	12/13 – 1/12/2011	IW	Collection rescheduled due to inclement weather creating potentially unsafe site access conditions.	G-11-00044

C.2 UNAVAILABLE ANALYSES

There were no unavailable samples for 2011.

APPENDIX D

ANALYTICAL DEVIATIONS

No Analytical deviations were incurred for the
2011 Radiological Environmental Monitoring Program

APPENDIX E

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM RESULTS

This appendix includes sample analysis reports and supportive data generated from each sample medium. Appendix E is located separately from this report and is permanently archived in the Nuclear Electronic Document Library (NEDL) as described in reference 6.16.

APPENDIX F

ERRATA TO PREVIOUS REPORTS

APPENDIX F

ERRATA TO THE 2011 AREOR

There are no errata to be appended to the 2011 AREOR.