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U.S. Nuclear Regulatory Commission
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Subject: Oconee Nuclear Site
Docket Nos. 50-269, 50-270 and 50-287
Annual Radiological Environmental Operating Report

Dear Sir:

Pursuant to Oconee Nuclear Station Technical Specification 5.6.2, please find enclosed the Oconee Nuclear Site Annual Radiological Environmental Operating Report for 2001.

Very truly yours,

W. R. McCollum, Jr.
Site Vice President
Oconee Nuclear Station

Attachment

IE25

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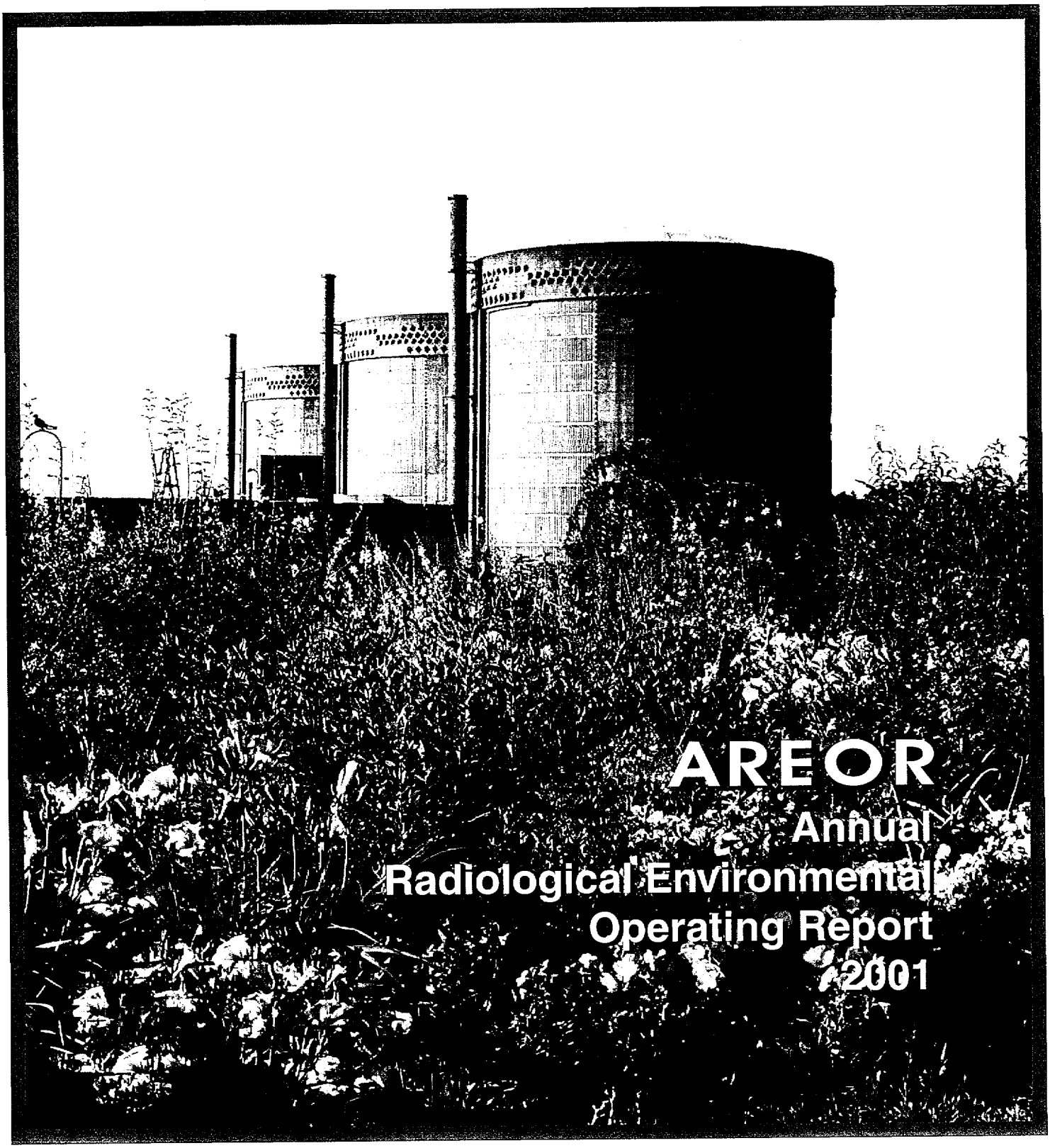
Units 1, 2, and 3



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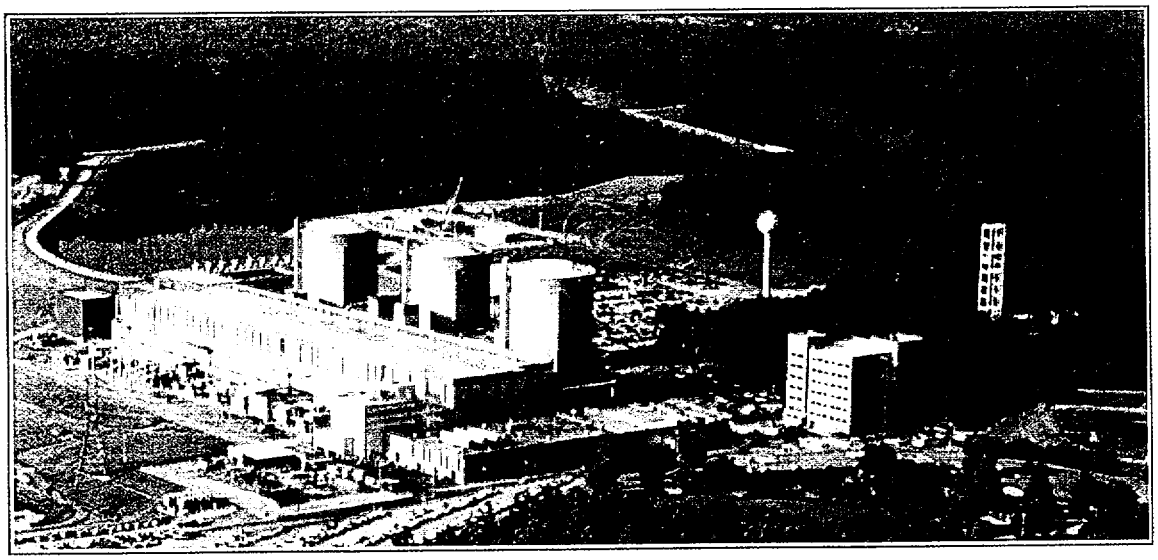
ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

DUKE POWER COMPANY
OCONEE NUCLEAR STATION
Units 1, 2, and 3

2001



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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
GI-LLI	Gastrointestinal – Lower Large Intestine
LLD	Lower Limit of Detection
M	Monthly
MDA	Minimum Detectable Activity
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
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

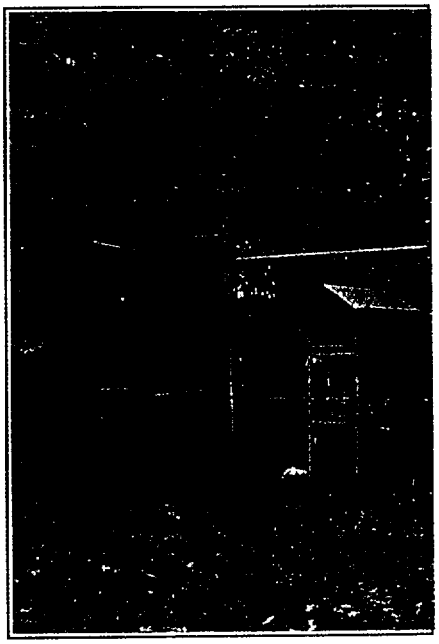
This Annual Radiological Environmental Operating Report describes the Oconee Nuclear Station Radiological Environmental Monitoring Program (REMP), and the program results for the calendar year 2001.

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

Sampling activities were conducted as prescribed by Selected Licensee Commitments (SLC's). Required analyses were performed and detection capabilities were met for all collected samples as required by SLC's. One-thousand eighty-one samples were analyzed comprising 1204 test results in order to compile data for the 2001 report. Based on the annual land use census, the current number of sampling sites for Oconee Nuclear Station is sufficient.

Concentrations observed in the environment in 2001 for station related radionuclides were within the ranges of concentrations observed in the past. Inspection of data showed that radioactivity concentrations in surface water, shoreline sediment, and fish are higher than the activities reported for samples collected prior to the operation of the station. All positively identified measurements were within limits as specified in SLC's.

Additionally, environmental radiological monitoring data is consistent with effluents introduced into the environment by plant operations. The total body dose estimated to the maximum exposed member of the public as calculated by environmental sampling data, excluding TLD results, was 3.03E-01 mrem for 2001. It is therefore concluded that station operations has had no significant radiological impact on the health and safety of the public or the environment.



Air Sampling at
Oconee Nuclear Station

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 866 megawatts net. Unit 1 began commercial operation 7/15/1973. Unit 2 began commercial operation 9/09/1974, and Unit 3 on 12/16/1974. 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. The following equation was used to estimate the mean (reference 6.8):

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

Where:

$\bar{x}$ = 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.

NOTE: "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.

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.

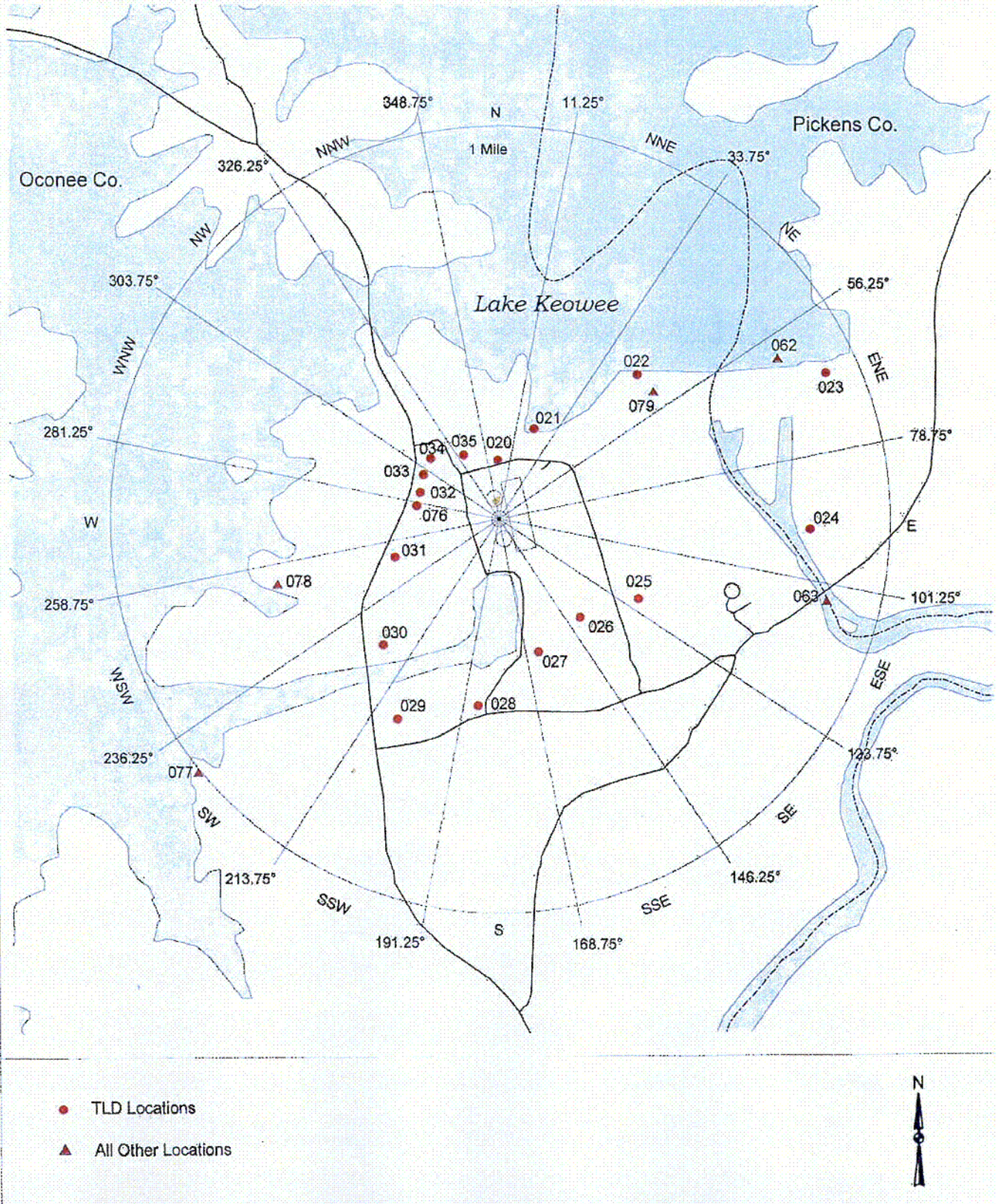
MDA - The MDA may be thought of as an "actual" LLD for a particular sample measurement remembering that the MDA is calculated using a sample background instead of a system background.

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.

Oconee Nuclear Station
Figure 2.1-1
Sampling Locations Map (One Mile Radius)



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Oconee Nuclear Station
Figure 2.1-2
Sampling Locations Map (Ten Mile Radius)

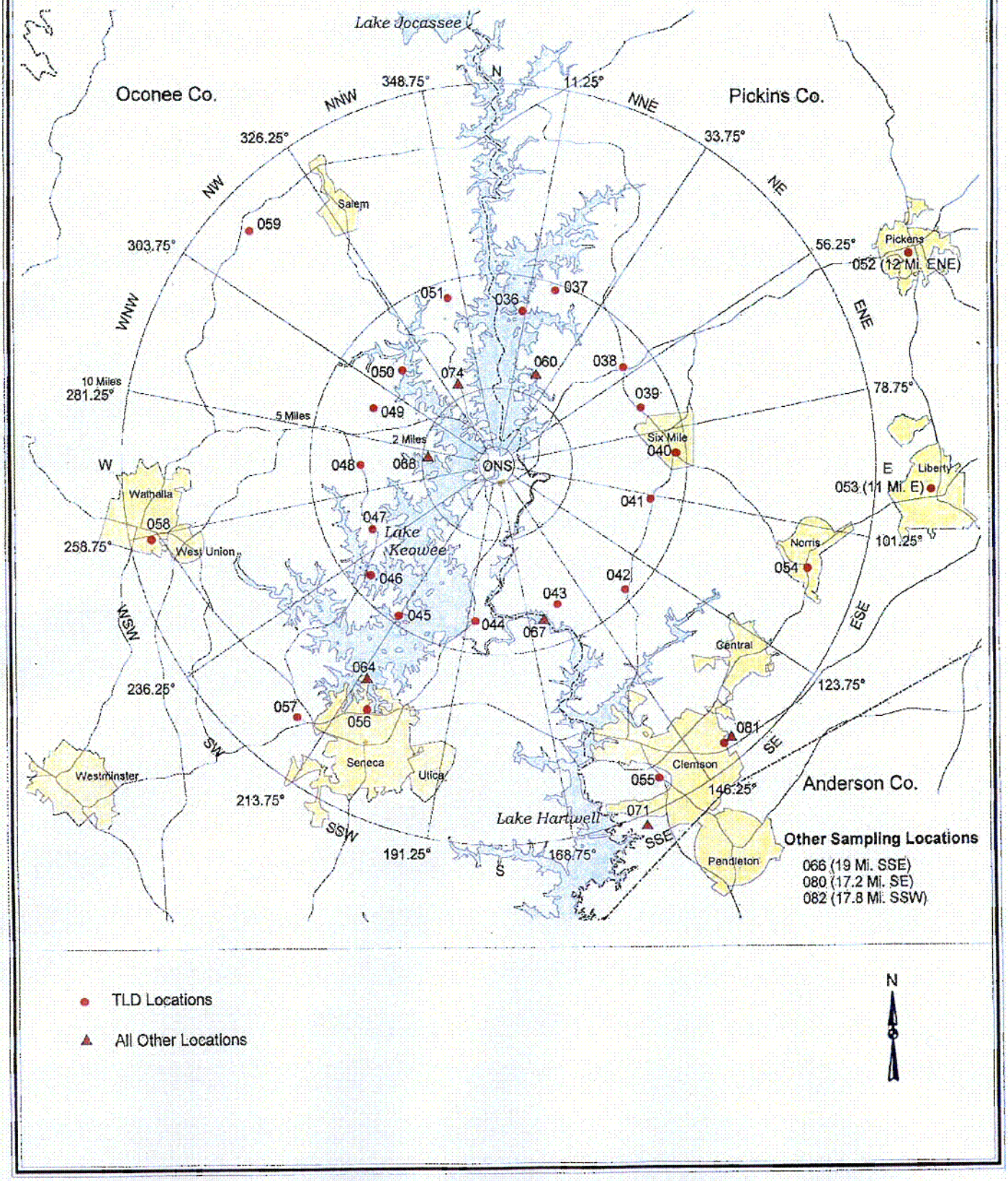

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TABLE 2.1-A

OCONEE RADIOLOGICAL MONITORING PROGRAM
SAMPLING LOCATIONS

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

Site #	Location Description	Air Rad. & Particulate	Surface Water	Drinking Water	Shoreline Sediment	Fish	Milk	Broadleaf Vegetation
060 *	Greenville Water Intake Road (2.6 mi NNE)	W		M		SA		M
062 C	Lake Keowee Hydro Intake (0.8 mi ENE)		M					
063	Lake Hartwell Hwy 183 Bridge (0.8 mi ESE) [000.7]		M		SA	SA		
064 C	Seneca (6.7 mi SSW) [004.1]			M				
066	Anderson (19.0 mi SSE) [012]			M				
067	Lawrence Ramsey Bridge Hwy 27 (4.2 mi SSE) [005.2]				SA	SA		
068 C	High Falls County Park (2.0 mi W)				SA			
071	Clemson Dairy (10.3 mi SSE) [006.3]						SM	
081 C	Clemson Operations Center (9.3 mi SE)	W						M
074	Keowee Key Resort (2.3 mi NNW)	W						
077	Skimmer Wall (1.0 mi SW)	W						M
078	Recreation Site (0.6 mi WSW)	W						
079	Keowee Dam (0.5 mi NE)	W						M
080 C	Martin Dairy (17.2 mi SE)						SM	
082	Oakway Dairy (17.8 mi SSW)						SM	

* Control for Fish Only
C = Control
[ ] Location Numbers prior to 1984

TABLE 2.1-B

OCONEE RADIOLOCICAL MONITORING PROGRAM
SAMPLING LOCATIONS

(TLD SITES)

Site #	Location Description	Distance	Sector	Site #	Location Description	Distance	Sector
020	SITE BOUNDARY	0.1 miles	N	040	MICROWAVE TOWER, SIX MILE	4.5 miles	E
021	SITE BOUNDARY	0.3 miles	NNE	041	JCT HWY 101 & 133	4.0 miles	ESE
022	SITE BOUNDARY	0.5 miles	NE	042	LAWRENCE CHAPEL CHURCH, HWY 133	5.0 miles	SE
023	SITE BOUNDARY	0.9 miles	ENE	043	HWY 291 AT ISSAQUEENA PARK ENTRANCE	4.0 miles	SSE
024	SITE BOUNDARY	0.8 miles	E	044	HWY 130 AT LITTLE RIVER DAM	4.0 miles	S
025	SITE BOUNDARY	0.4 miles	ESE	045	TERMINUS OF HWY 588 AT CROOKED CREEK	5.0 miles	SSW
026	SITE BOUNDARY	0.3 miles	SE	046	HWY 188 AT CROOKED CREEK BRIDGE	4.5 miles	SW
027	SITE BOUNDARY	0.4 miles	SSE	047	NEW HOPE CHURCH, HWY 188	4.0 miles	WSW
028	SITE BOUNDARY	0.5 miles	S	048	JCT HWY 175 & 188	4.0 miles	W
029	SITE BOUNDARY	0.6 miles	SSW	049	JCT HWY 201 & 92	4.0 miles	WNW
030	SITE BOUNDARY	0.4 miles	SW	050	STAMP CREEK LANDING - END OF HWY 92	4.0 miles	NW
031	SITE BOUNDARY	0.3 miles	WSW	051	HWY 128, 1 MILE N OF HWY 130	4.5 miles	NNW
076	SITE BOUNDARY	0.2 miles	W	052 SI	DPC BRANCH OFFICE SITE - PICKENS	12.0 miles	ENE
032	SITE BOUNDARY	0.2 miles	WNW	053 SI	DPC BRANCH OFFICE SITE – LIBERTY	11.0 miles	E
033	SITE BOUNDARY	0.2 miles	WNW	054 SI	POST OFFICE - HWY 93 NORRIS	9.5 miles	ESE
034	SITE BOUNDARY	0.2 miles	NW	055 SI	CLEMSON METEOROLOGY PLOT	9.5 miles	SSE
035	SITE BOUNDARY	0.2 miles	NNW	056 SI	WATER TOWER - SENECA	8.4 miles	SSW
036	MILE CREEK LANDING	4.0 miles	N	057 SI	OCONEE MEMORIAL HOSPITAL	9.0 miles	SW
037	KEOWEE CHURCH, HWY 327	4.5 miles	NNE	058 C	BRANCH RD SUBSTATION WALHALLA, CONTROL	9.4 miles	WSW
038	DURHAM CONVENIENCE MART, JCT HWY 183 & 133	4.0 miles	NE	059 SI	TAMASSEE DAR SCHOOL	9.2 miles	NW
039	HWY 133, 1 MILE EAST OF JCT HWY 183 & 133	4.0 miles	ENE	081 C	CLEMSON OPERATIONS CENTER	9.3 miles	SE

C = Control
SI = Special 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)]	1		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	
	Quarterly Composite	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	Semiannualy	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					
H-3	2000					
Mn-54	15		130			
Fe-59	30		260			
Co-58, 60	15		130			
Zn-65	30		260			
Zr-95	30					
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 2001 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 2001 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 2001.

Trending was performed by comparing annual mean concentrations of any effluent related detected radionuclide to historical results. Factors evaluated include the frequency of detection and the concentration in terms of the percent of the radionuclide's SLC reporting level (Table 2.2-A). All maximum percent of reporting level values were well below the 100% action level. The highest value reached during 2001 was 8.25% for Cs-137 in a fish sample collected at Location 063.

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 2000. Similarly, there was no significant increase in ambient background radiation levels in the surrounding areas.

3.1 AIRBORNE RADIOIODINE AND PARTICULATES

In 2001, 324 radioiodine and particulate samples were analyzed, 270 from five indicator locations and 54 from the control location. Radioiodine samples were analyzed by gamma spectroscopy. Particulate samples were analyzed for gross beta. Gamma analysis was performed on 24 composites of particulate samples, 20 at the five indicator locations and four at the control location.

There was no detectable I-131 in air samples in 2001. Table 3.1-A gives the highest indicator location annual mean and control location annual mean for I-131 since the preoperational period. The table shows similar concentrations for both the indicator and control locations and the activities decreasing from early in the operational history of the plant. No I-131 has been detected since 1994.

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

There were no detectable gamma emitting radionuclides detected in air particulate samples in 2001. No gamma emitting particulates have been detected in indicator location samples since the change in gamma spectroscopy analysis systems in 1987.

Oconee Air Monitoring Station

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 shows the gross beta results for the indicator location with the highest annual mean and the control location samples. Both the indicator and control location results are similar in concentration and are near the lower range of preoperational gross beta results.

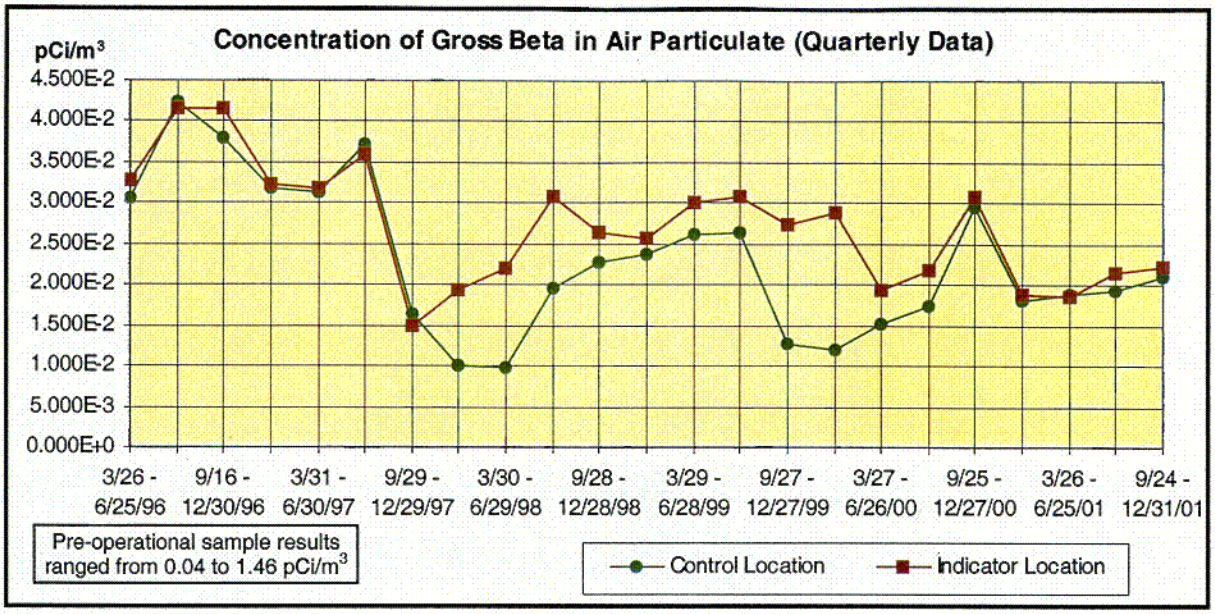
K-40 and Be-7 are the naturally occurring radionuclides that were observed in air samples.

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

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

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

Figure 3.1



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/m^3)	Control Location (pCi/m^3)
3/26 - 6/25/96	3.28E-2	3.05E-2
6/25 - 9/16/96	4.15E-2	4.22E-2
9/16 - 12/30/96	4.16E-2	3.80E-2
12/30 - 3/31/97	3.22E-2	3.18E-2
3/31 - 6/30/97	3.19E-2	3.14E-2
6/30 - 9/29/97	3.59E-2	3.72E-2
9/29 - 12/29/97	1.48E-2	1.65E-2
12/29 – 3/30/98	1.94E-2	1.00E-2
3/30 – 6/29/98	2.21E-2	9.89E-3
6/29 – 9/28/98	3.09E-2	1.95E-2
9/28 – 12/28/98	2.63E-2	2.28E-2
12/28 – 3/29/99	2.57E-2	2.37E-2
3/29 – 6/28/99	3.02E-2	2.62E-2
6/28 – 9/27/99	3.08E-2	2.65E-2
9/27 - 12/27/99	2.74E-2	1.27E-2
12/27 – 3/27/00	2.88E-2	1.19E-2
3/27 – 6/26/00	1.93E-2	1.51E-2
6/26 – 9/25/00	2.18E-2	1.73E-2
9/25 - 12/27/00	3.08E-2	2.95E-2
12/17 - 3/26/01	1.88E-2	1.82E-2
3/26 - 6/25/01	1.87E-2	1.89E-2
6/25 - 9/24/01	2.18E-2	1.92E-2
9/24 - 12/31/01	2.22E-2	2.10E-2
Average (2001)	2.05E-2	1.94E-2

C03

3.2 DRINKING WATER

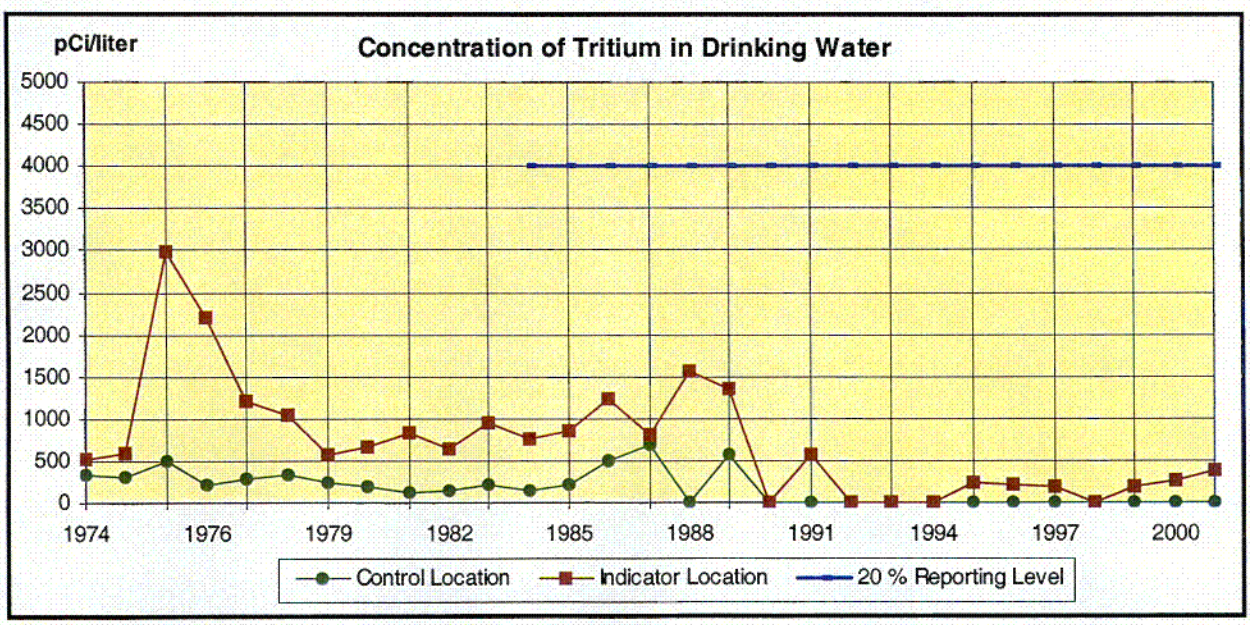
Gross beta analysis and gamma spectroscopy were performed on 42 monthly drinking water samples. These samples were composited to form 15 quarterly period samples for Tritium analysis. Two indicator locations and a control location were sampled; however, only one of the indicator locations is downstream 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 1.75 pCi/liter in 2001, and the control location had a concentration of 1.29 pCi/liter. The 2000 indicator mean was 2.07 pCi/liter. The table shows that 2001 gross beta levels in drinking water are slightly lower than preopreational concentrations. The dose for consumption of water was less than one mrem per year, historically and for 2001; therefore low-level iodine analysis is not required.

Tritium was detected in five of the 15 composite samples during 2001. Tritium was detected in five of the 15 composite samples during 2000. The 2001 mean indicator location 066 concentration was 390 pCi/liter, which is 1.95% 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 2001. 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*



C04

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

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 28 monthly surface water samples. These samples were composited to form 10 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 five indicator location samples. The 2001 average concentration was 7,426 pCi/liter. The individual samples ranged from 4,040 pCi/liter to 11,800 pCi/liter. The 2000 mean concentration was 14,802 pCi/liter. Tritium was not detected in any control surface water samples.

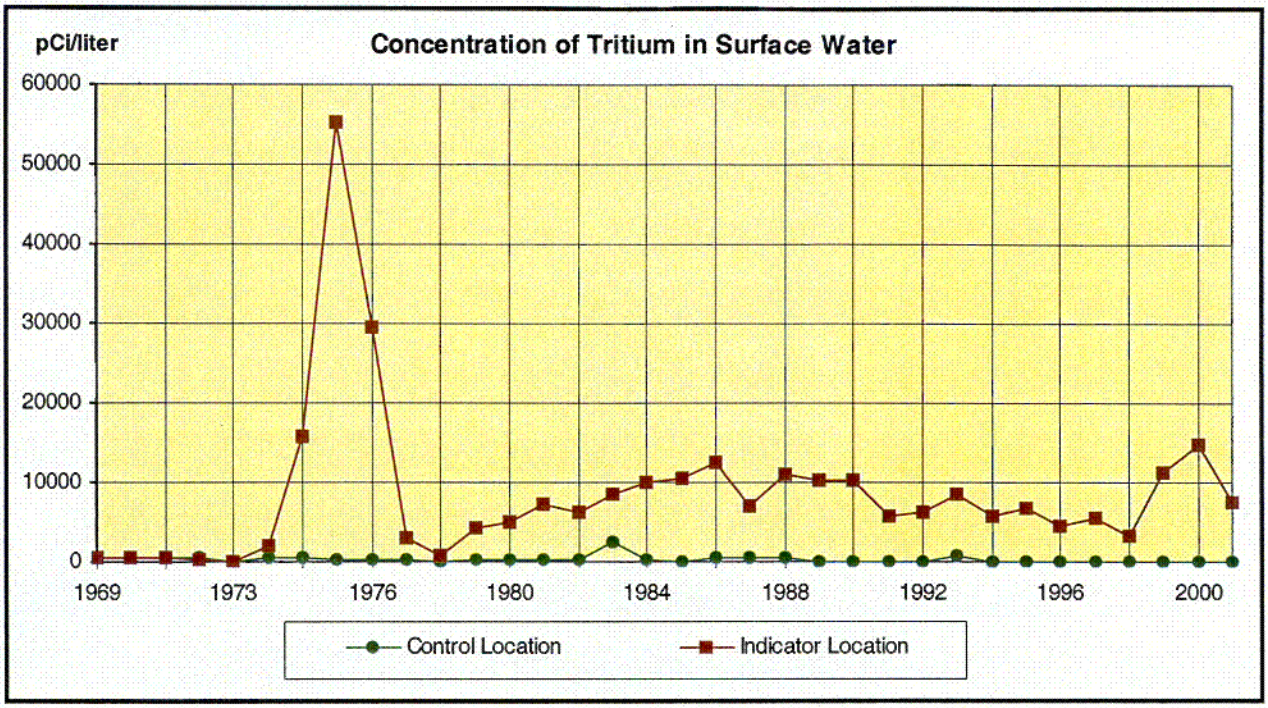
The concentration of Tritium at the 063 sample location was higher in 1999 and 2000 than in previous years. Lower than normal lake levels (and therefore lower flow in the discharge canal) and sampler operation problems during 2000 are possible reasons for the change. The chronically low water level of Lake Hartwell continues to cause sampling equipment difficulties (see Appendix C) during 2001.

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 activities during 2001. In 1999, gamma spectroscopy analysis detected Co-58 in one indicator sample at 27.2 pCi/liter, which represents 2.73% of the reporting level. 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 2001 did not reveal any increasing trends.

K-40 is the naturally occurring radionuclide observed in surface water samples in 2001.

Figure 3.3



There is no reporting level for Tritium in surface water

C05

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

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 81 milk samples collected in 2001. Two indicator and one control location were sampled.

Milk Sampling

There were no gamma emitting radionuclides identified in indicator or control location samples in 2001. Cs-137 is the only radionuclide, other than naturally occurring, reported in milk samples since 1988. Cs-137 in milk is not unusual. It is a constituent of nuclear weapons test fallout and has been observed in samples from indicator and control locations in previous years.

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

K-40 is a naturally occurring radionuclide observed in milk samples in 2001.

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

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

3.5 BROADLEAF VEGETATION

Gamma spectroscopy was performed on 48 broadleaf vegetation samples during 2001. Three indicator locations and one control location were sampled. Cs-137 was reported in one indicator sample. Cs-137 was not detected in any control location samples. No other effluent related radionuclide was identified.

Sampling of control location 073 (which has historically had measurable Cs-137 concentrations greater than any indicator location) was discontinued early in 1999 due to construction. The new control location, 081, has had no measurable Cs-137 since this location was added to the program in 1998.

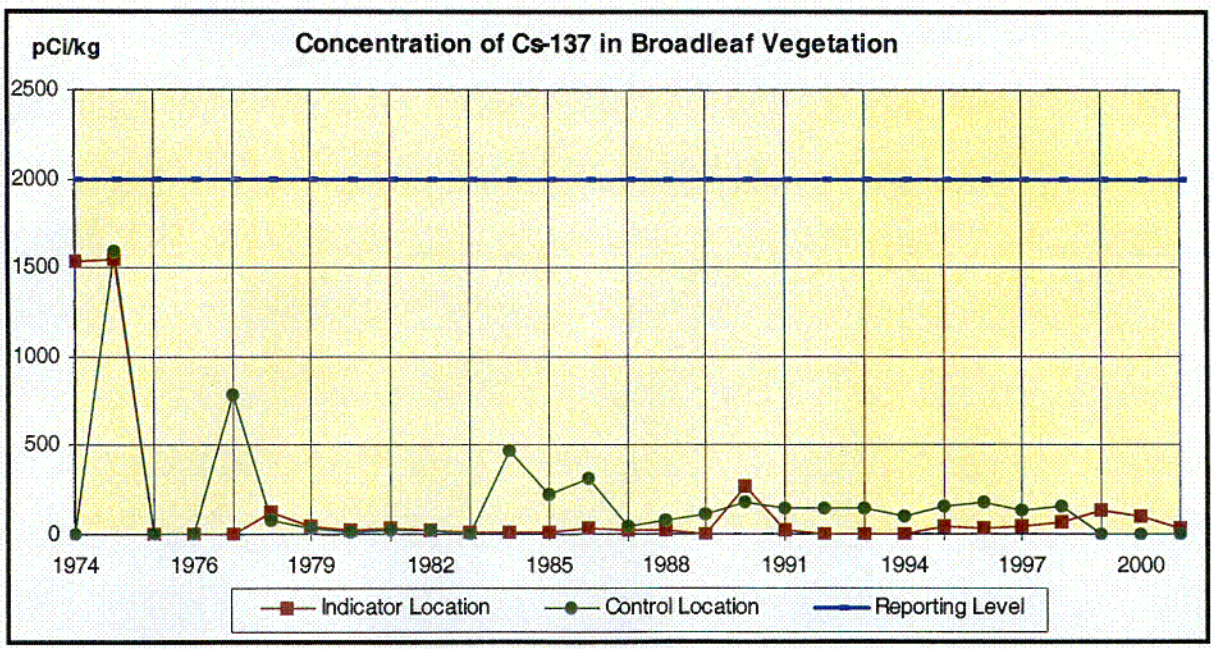
One of the thirty-six indicator location samples contained Cs-137. The highest concentration was 31.9 pCi/kg (1.60% of the reporting level). This result is less than those reported in 2000.

Cs-137 is the only radionuclide, other than naturally occurring, reported in indicator location vegetation samples since the change in gamma spectroscopy analysis systems in 1987.

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. There is no indication that the Cs-137 is due to ONS operations based on the low concentration observed and the absence of other radionuclides.

K-40 and Be-7 are naturally occurring radionuclides that were observed in broadleaf vegetation samples in 2001.

Figure 3.5



C06

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

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

3.6 FISH

In 2001, gamma spectroscopy was performed on 12 fish samples. Two downstream indicator and one control location were sampled. Cs-137 was identified in all eight of the indicator location samples and in two of the four control location samples. Co-58 was identified in two of the eight indicator location samples. Co-58 was not identified in any control location samples. No other effluent related radionuclide was identified.

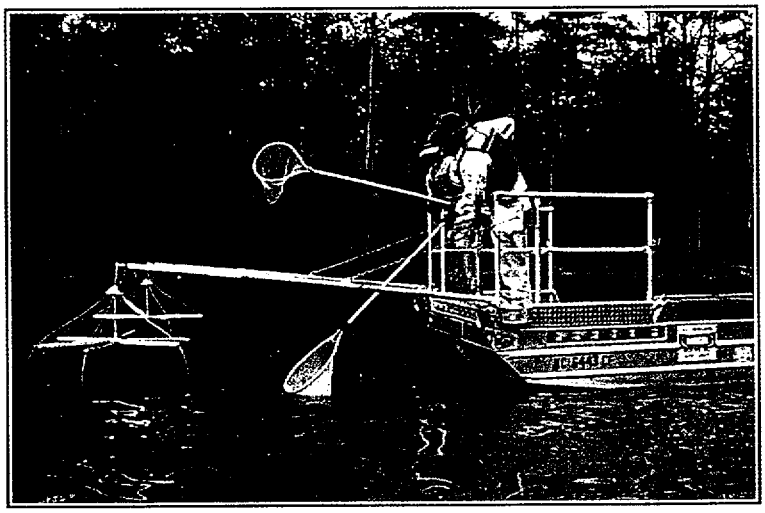
The highest average concentration for Co-58 was 17.2 pCi/kg. The highest individual sample concentration for Co-58 was 19.1 pCi/kg (0.06% of reporting level). Co-58 was last identified in a fish sample in 1992.

The highest average concentration for Cs-137 was 99.2 pCi/kg (4.96% of reporting level). The highest individual sample concentration for Cs-137 was 165 pCi/kg (8.25% of reporting level). The control Cs-137 average concentration was 24.9 pCi/kg. 2000 Cs-137 sample results for all locations were similar.

Figures 3.6-1 and 3.6-2 are graphs displaying the annual means for Cs-137 and Cs-134. Historically, both are major contributors to the calculated dose from ingestion of fish. Radioactivity concentrations in downstream fish samples are higher than those reported in preoperational fish samples, however, fluctuations in the graphed results are large and no trends are apparent. Based on these graphs, the levels at the two downstream locations do not appear to be increasing.

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.



Fish Sampling

Table 3.6 lists the highest indicator location annual means since the preoperational period for radionuclides detected in 2001. 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

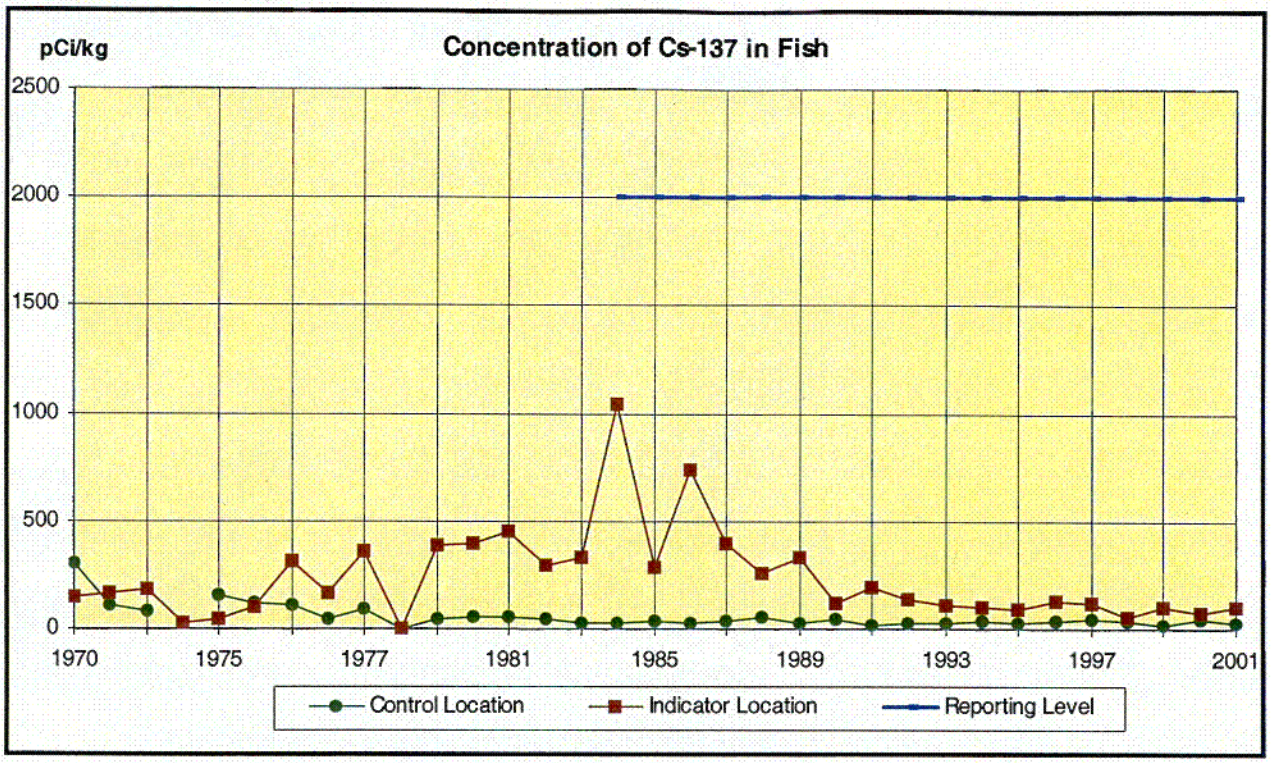
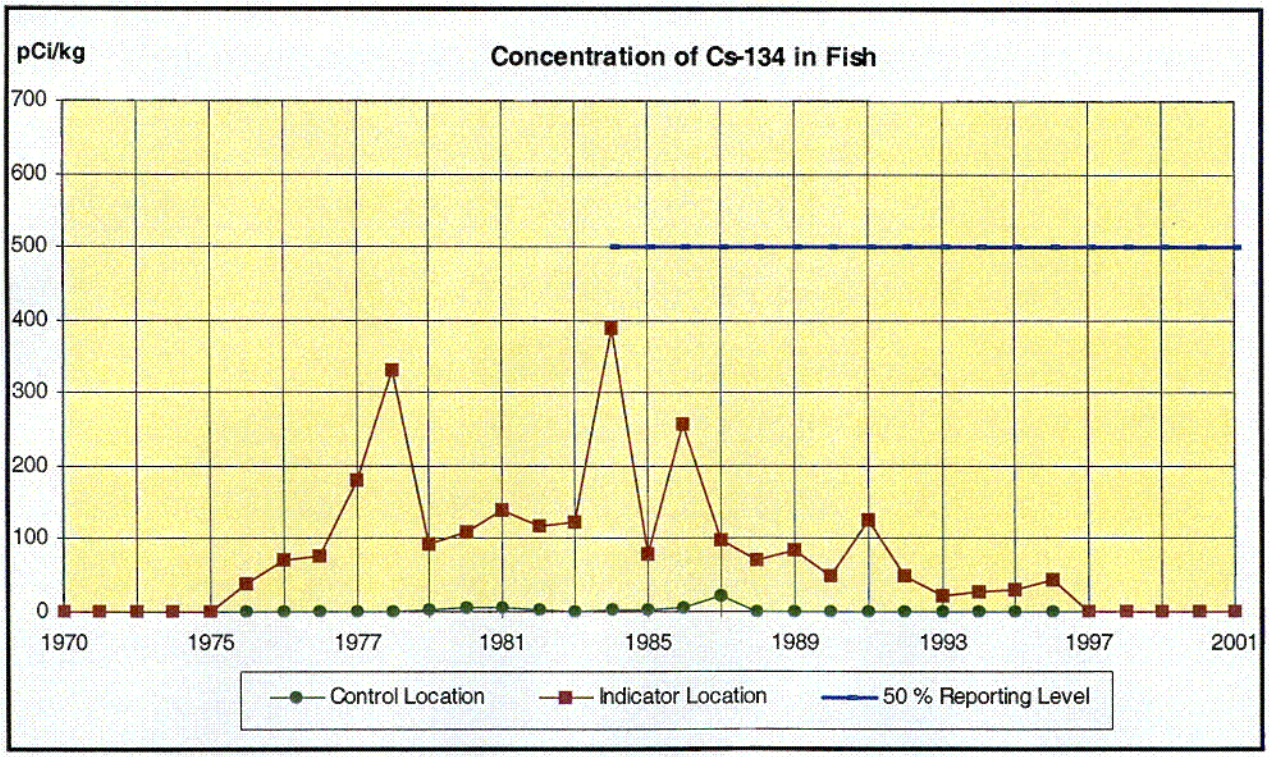


Figure 3.6-2



Current reporting levels implemented 1984

C07

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

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.

Cs-137 was identified in all of the four indicator location samples. Cs-137 was not observed in any control location samples. The highest 2001 indicator location annual mean was 120 pCi/kg. 2000 Cs-137 sample results for all indicator locations were similar. 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.

Co-58 was identified in one of the indicator location samples at a concentration of 21 pCi/kg. Co-58 was last identified in shoreline sediment in 1996.

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 major contributors to the calculated dose from shoreline sediment. Fluctuations in the graphed results are large and no trends are apparent.

Previous environmental reports (reference 6.5) have addressed the fluctuations in shoreline sediment sample results. Some of these are attributed to differences in the actual point of sampling due to periods of drought. Samples are collected at the edge of the water. Reduced lake levels caused some samples to be taken at points that are normally submerged and where sediment deposition is expected to be greater.

K-40 and Be-7 are naturally occurring radionuclides observed in shoreline sediment samples in 2001.

Figure 3.7-1

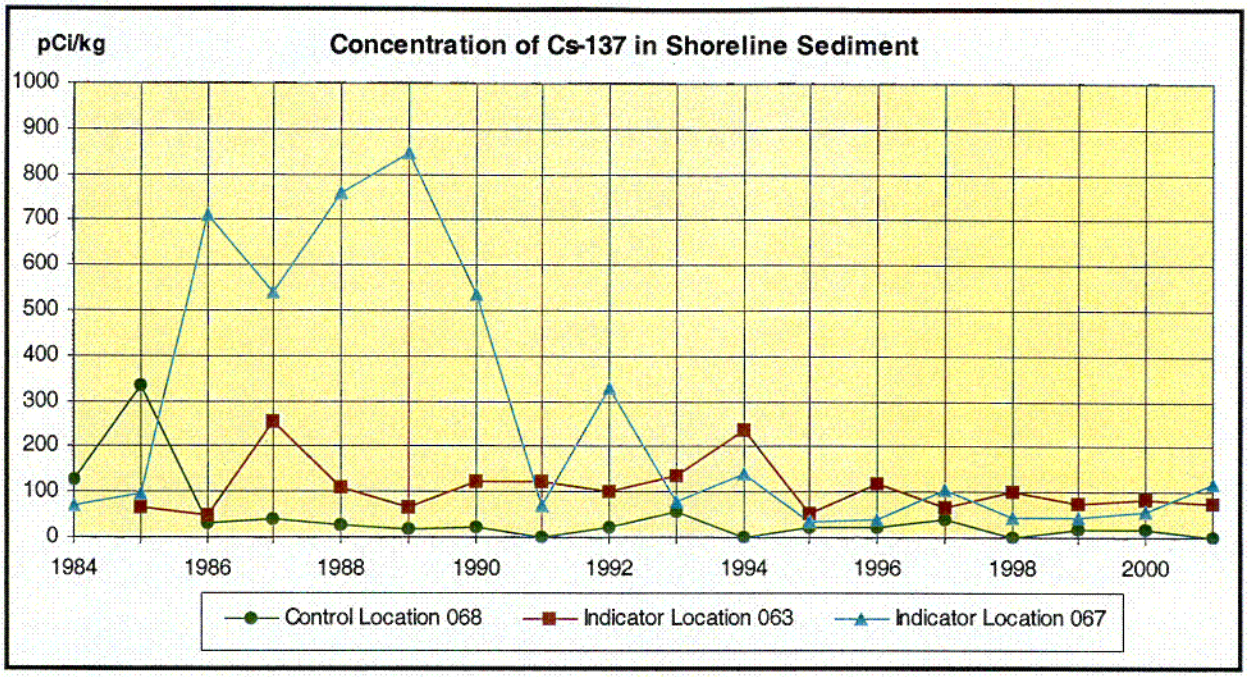
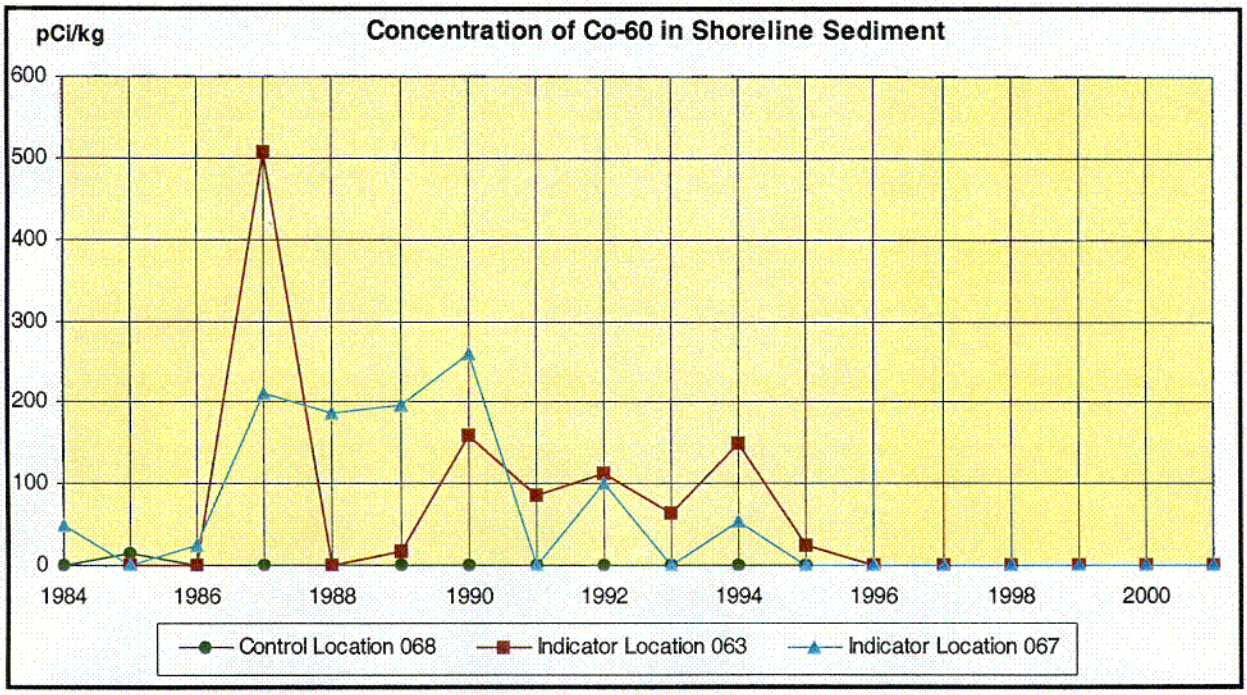


Figure 3.7-2



There are no reporting levels for shoreline sediment

C08

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

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

3.8 DIRECT GAMMA RADIATION

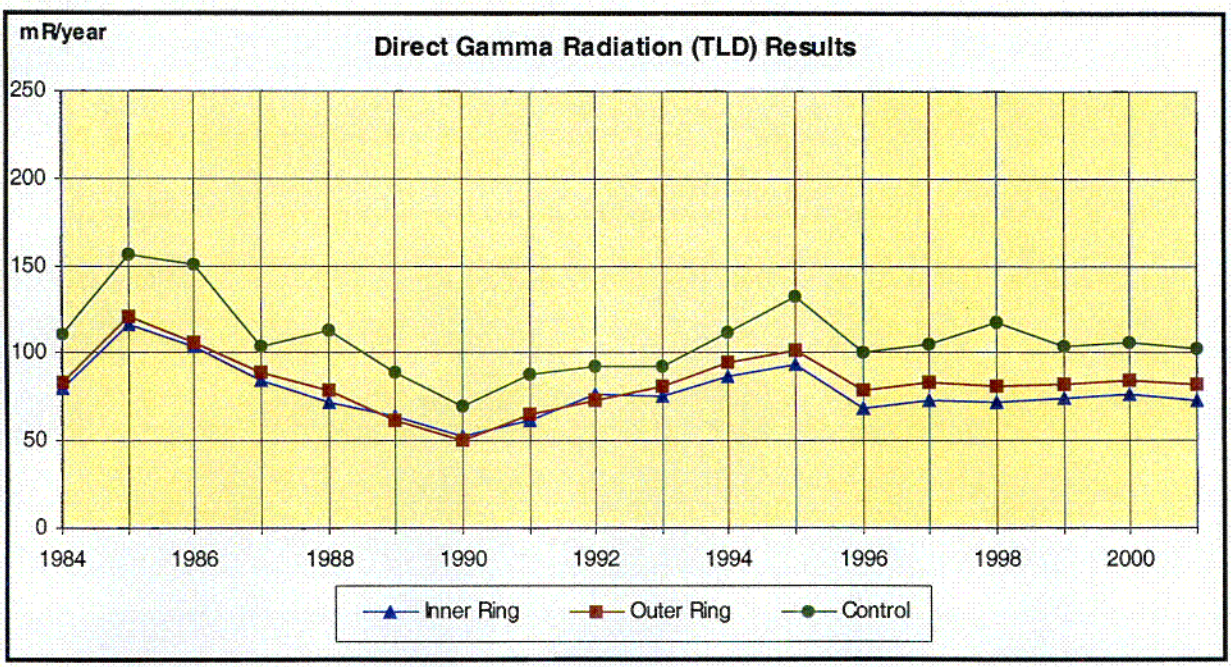
In 2001, 167 Thermoluminescent Dosimeters (TLD) were analyzed, 159 at indicator locations, 8 at the two control locations. TLDs are collected and analyzed quarterly. The highest annual mean exposure for an indicator location was 101 milliroentgen. This TLD is located at indicator location 048, 4.0 miles from the station. The annual mean exposure for the control locations was 102.4 milliroentgen.

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

The calculated total body dose (from gaseous effluents) for 2001 was 2.92E-02 mrem, which is 0.04% of the average inner ring TLD values. Therefore, it can be concluded that discharges from the plant had very little impact upon the measured TLD values.

The maximum measurement from TLDs at the Independent Spent Fuel Storage Installation (ISFSI) was 824.5 milliroentgen per standard quarter. This is higher than previous measurements but is expected due to Phase II operations of the ISFSI. TLD measurements in the inner ring (site boundary) have not shown an increase.

Figure 3.8



There is no reporting level for Direct Radiation (TLD)

C09

Table 3.8 Direct Gamma Radiation (TLD) Results

Year	Inner Ring Average (mR/yr)	Outer Ring Average (mR/yr)	Control (mR/yr)
Preoperational	113.1	123.9	148.9
1984	79.4	83.8	110.3
1985	116.9	121.5	156.6
1986	104.2	106.0	150.9
1987	84.3	88.8	104.3
1988	72.3	78.6	112.6
1989	63.7	61.7	89.4
1990	52.2	50.7	70.1
1991	61.2	65.0	88.0
1992	76.2	73.2	92.0
1993	74.8	80.6	93.0
1994	86.8	94.7	112.0
1995	93.6	101.7	132.0
1996	68.5	78.3	101.0
1997	72.8	83.8	104.5
1998	71.7	80.8	118.0
1999	74.5	82.5	104
2000	76.2	84.5	105.6
Average (1991 - 2000)	75.6	82.5	105.0
2001	73.6	82.4	102.2

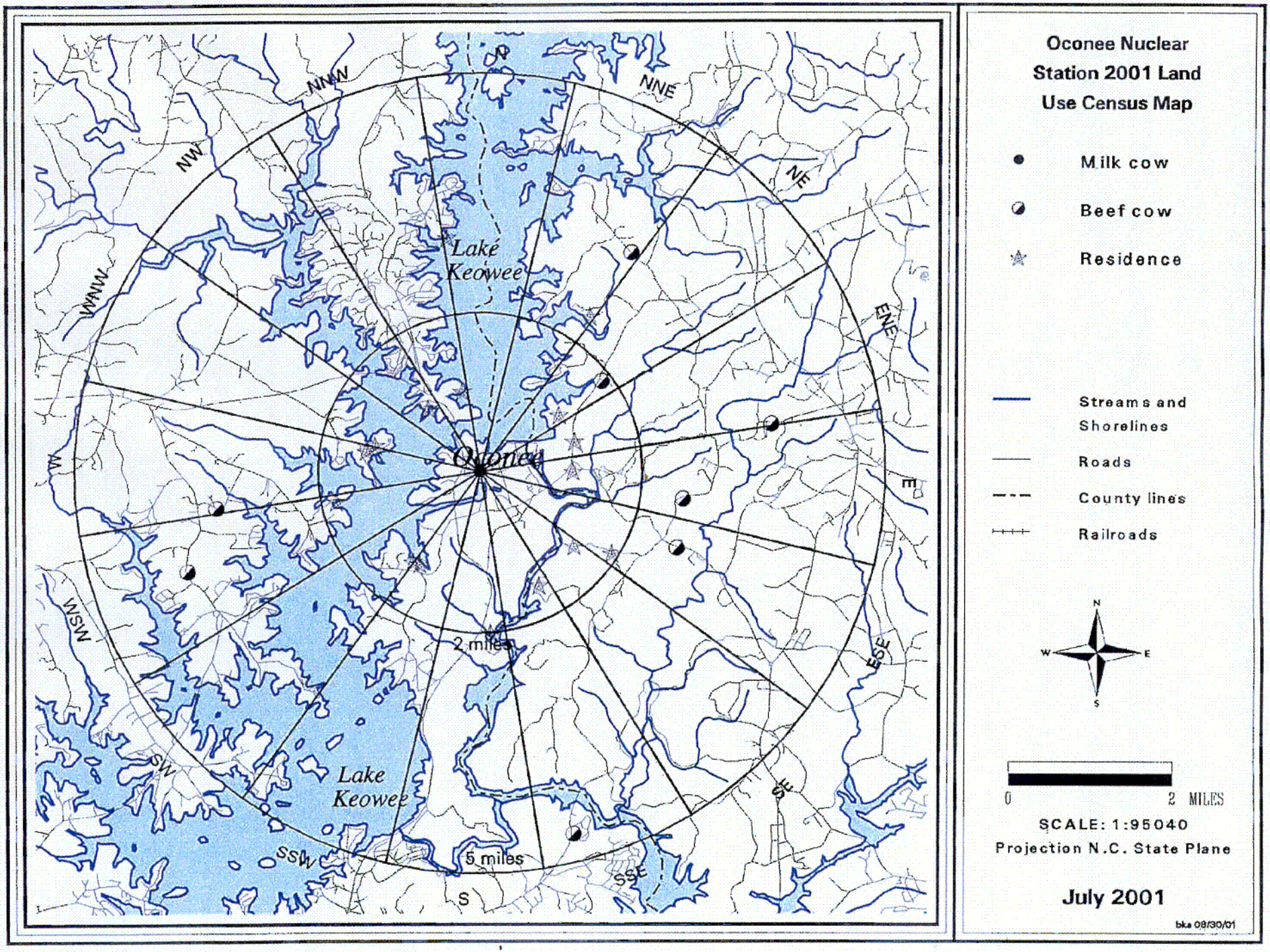
3.9 LAND USE CENSUS

The Land Use Census was conducted during the growing season (7/16 – 7/18/01 & 8/13/01) 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 2001 Land Use Census Results

Sector		Distance (Miles)	Sector		Distance (Miles)
N	Nearest Residence	2.97	S	Nearest Residence	1.98
	Nearest Milk Animal	-		Nearest Milk Animal	-
	Nearest Meat Animal (Cow)	-		Nearest Meat Animal (Cow)	-
NNE	Nearest Residence	2.39	SSW	Nearest Residence	1.34
	Nearest Milk Animal	-		Nearest Milk Animal	-
	Nearest Meat Animal (Cow)	3.32		Nearest Meat Animal	-
NE	Nearest Residence	1.22	SW	Nearest Residence	1.38
	Nearest Milk Animal	-		Nearest Milk Animal	-
	Nearest Meat Animal (Cow)	1.89		Nearest Meat Animal	-
ENE	Nearest Residence	1.23	WSW	Nearest Residence	1.81
	Nearest Milk Animal	-		Nearest Milk Animal	-
	Nearest Meat Animal (Cow)	3.64		Nearest Meat Animal (Cow)	3.81
E	Nearest Residence	1.14	W	Nearest Residence	1.43
	Nearest Milk Animal	-		Nearest Milk Animal	-
	Nearest Meat Animal (Cow)	2.52		Nearest Meat Animal (Cow)	3.28
ESE	Nearest Residence	1.90	WNW	Nearest Residence	1.35
	Nearest Milk Animal	-		Nearest Milk Animal (Cow)	-
	Nearest Meat Animal (Cow)	2.60		Nearest Meat Animal (Cow)	-
SE	Nearest Residence	1.46	NW	Nearest Residence	1.04
	Nearest Milk Animal	-		Nearest Milk Animal	-
	Nearest Meat Animal (Cow)	-		Nearest Meat Animal (Cow)	-
SSE	Nearest Residence	1.56	NNW	Nearest Residence	1.06
	Nearest Milk Animal	-		Nearest Milk Animal	-
	Nearest Meat Animal	4.63		Nearest Meat Animal	-

"-" indicates no occurrences within the 5 mile radius


Oconee Nuclear Station 2001 Land Use Census Map
Milk cow
Beef cow
Residence
Streams and Shorelines
Roads
County lines
Railroads
N
NNE
NE
ENE
E
ESE
SE
SSE
S
SSW
SW
WSW
W
WNW
NW
NNW
Lake Keowee
Lake Keowee
Oconee
2 miles
5 miles
0
2 MILES
SCALE: 1:95040
Projection N.C. State Plane
July 2001
bka 08/30/01

C10

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 2001 ONS REMP samples. The primary purpose of estimating doses based on sample results was 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, broadleaf vegetation, fish and shoreline sediment results are reported in Table 4.1-A. The individual critical population and pathway dose calculations are contained in Table 4.1-B.

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

The maximum environmental organ dose estimate for any single sample type (other than direct radiation from gaseous effluents) collected during 2001 was 2.71E-1 mrem to the child's bone from consuming broadleaf vegetation.

4.2 ESTIMATED DOSE FROM RELEASES

Throughout the year, dose estimates were calculated based on actual 2001 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. The 2001 ONS Annual Radioactive Effluent Release Report (reference 6.6) included calendar year dose estimates for the location with the highest individual organ dose from liquid and gaseous effluent releases. These reported doses are shown in Table 4.1-A along with the corresponding REMP-based dose estimates.

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

4.3 COMPARISON OF DOSES

The 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. This indicates that effluent program dose estimates are both valid and reasonably conservative.

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

In calculations based on liquid release effluent pathways, fish and drinking water were the predominant dose pathways based on environmental and effluent samples. The maximum total organ dose based on 2001 environmental sample results was 2.15E-1 mrem to the adult liver. The maximum total organ dose of 6.13E-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 maximum total organ dose for gaseous effluent estimates was 3.52E-2 mrem to the child thyroid. Vegetation was the only gaseous release pathway media that contained detectable activity. The maximum total organ dose for gaseous environmental estimates was 2.71E-1 mrem to the child bone.

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

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

TABLE 4.1-A

OCONEE NUCLEAR STATION
2001 ENVIRONMENTAL AND EFFLUENT DOSE COMPARISON

LIQUID RELEASE PATHWAY

Organ	Environmental or Effluent Data	Critical Age [1]	Critical Pathway [2]	Location	Maximum Dose [3] (mrem)
Skin	Environmental	Teen	Shoreline Sediment	063 (0.8 mi ESE)	4.07E-04
Skin	Effluent	Teen	Shoreline Sediment	0.8 mi ESE	9.25E-03
Bone	Environmental	Child	Fish	063 (0.8 mi ESE)	1.68E-01
Bone	Effluent	Child	Fish	0.8 mi ESE	4.83E-01
Liver	Environmental	Adult	Fish	063 (0.8 mi ESE)	2.15E-01
Liver	Effluent	Teen	Fish	0.8 mi ESE	5.50E-01
T. Body	Environmental	Adult	Fish	063 (0.8 mi ESE)	1.57E-01
T. Body	Effluent	Adult	Fish	0.8 mi ESE	3.63E-01
Thyroid	Environmental	Child	Drinking Water	063 (0.8 mi ESE)	4.98E-02
Thyroid	Effluent	Adult	Fish	0.8 mi ESE	3.21E-02
Kidney	Environmental	Adult	Fish	063 (0.8 mi ESE)	1.03E-01
Kidney	Effluent	Teen	Fish	0.8 mi ESE	2.06E-01
Lung	Environmental	Child	Drinking Water	063 (0.8 mi ESE)	6.87E-02
Lung	Effluent	Teen	Fish	0.8 mi ESE	9.87E-02
GI-LLI	Environmental	Adult	Drinking Water	063 (0.8 mi ESE)	5.35E-02
GI-LLI	Effluent	Adult	Fish	0.8 mi ESE	6.13E-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 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	4.07E-05
Bone	Environmental	Child	Vegetation	077 (1.0 mi SW)	2.71E-01
Bone	Effluent	Child	Vegetation	1.0 mi SW	1.42E-05
Liver	Environmental	Child	Vegetation	077 (1.0 mi SW)	2.60E-01
Liver	Effluent	Child	Vegetation	1.0 mi SW	2.30E-02
T. Body	Environmental	Adult	Vegetation	077 (1.0 mi SW)	1.46E-01
T. Body	Effluent	Child	Vegetation	1.0 mi SW	2.92E-02
Thyroid	Environmental	-	-	-	0.00E+00
Thyroid	Effluent	Child	Vegetation	1.0 mi SW	3.52E-02
Kidney	Environmental	Child	Vegetation	077 (1.0 mi SW)	8.46E-02
Kidney	Effluent	Child	Vegetation	1.0 mi SW	2.29E-02
Lung	Environmental	Child	Vegetation	077 (1.0 mi SW)	3.04E-02
Lung	Effluent	Child	Vegetation	1.0 mi SW	2.29E-02
GI-LLI	Environmental	Adult	Vegetation	077 (1.0 mi SW)	4.31E-03
GI-LLI	Effluent	Child	Vegetation	1.0 mi SW	2.29E-02

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

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

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

NOBLE GAS

Air Dose	Environmental or Effluent Data	Critical Age	Critical Pathway	Location	Maximum Dose (mrad)
Beta	Environmental	-	-	-	Not Sampled
Beta	Effluent	N/A	Noble Gas	1.0 mi SW	7.62E-04
Gamma	Environmental	N/A	-	-	Not Sampled
Gamma	Effluent	N/A	Noble Gas	1.0 mi SW	2.75E-04

TABLE 4.1-B

Maximum Individual Dose for 2001 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	3.96E-02	3.96E-02	3.96E-02	3.96E-02	3.96E-02	3.96E-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	3.96E-02	3.96E-02	3.96E-02	3.96E-02	3.96E-02	3.96E-02	0.00E+00
Child	Airborne	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Drinking Water	0.00E+00	4.04E-02	4.04E-02	4.04E-02	4.04E-02	4.04E-02	4.04E-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	2.71E-01	2.60E-01	3.83E-02	0.00E+00	8.46E-02	3.04E-02	1.63E-03	0.00E+00
	Fish	1.68E-01	1.70E-01	3.37E-02	9.36E-03	6.17E-02	2.82E-02	1.16E-02	0.00E+00
	Shoreline Sediment	7.29E-05	7.29E-05	7.29E-05	7.29E-05	7.29E-05	7.29E-05	7.29E-05	8.51E-05
	TOTAL	4.39E-01	4.70E-01	1.12E-01	4.98E-02	1.87E-01	9.91E-02	5.37E-02	8.51E-05
Teen	Airborne	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Drinking Water	0.00E+00	2.11E-02	2.11E-02	2.11E-02	2.11E-02	2.11E-02	2.11E-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	1.50E-01	2.00E-01	6.95E-02	0.00E+00	6.79E-02	2.64E-02	2.84E-03	0.00E+00
	Fish	1.33E-01	1.89E-01	7.36E-02	1.13E-02	7.16E-02	3.48E-02	1.75E-02	0.00E+00
	Shoreline Sediment	3.49E-04	3.49E-04	3.49E-04	3.49E-04	3.49E-04	3.49E-04	3.49E-04	4.07E-04
	TOTAL	2.83E-01	4.10E-01	1.65E-01	3.27E-02	1.61E-01	8.26E-02	4.18E-02	4.07E-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	2.99E-02	2.99E-02	2.99E-02	2.99E-02	2.99E-02	2.99E-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	1.63E-01	2.23E-01	1.46E-01	0.00E+00	7.55E-02	2.51E-02	4.31E-03	0.00E+00
	Fish	1.24E-01	1.85E-01	1.27E-01	1.47E-02	7.25E-02	3.39E-02	2.35E-02	0.00E+00
	Shoreline Sediment	6.25E-05	6.25E-05	6.25E-05	6.25E-05	6.25E-05	6.25E-05	6.25E-05	7.30E-05
	TOTAL	2.87E-01	4.38E-01	3.03E-01	4.47E-02	1.78E-01	8.90E-02	5.78E-02	7.30E-05

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

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2001 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	390.00	0.00E+00	3.96E-02	3.96E-02	3.96E-02	3.96E-02	3.96E-02	3.96E-02
						Dose Commitment (mrem) =				0.00E+00	3.96E-02	3.96E-02	3.96E-02	3.96E-02	3.96E-02	3.96E-02

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2001 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	390.00	0.00E+00	4.04E-02	4.04E-02	4.04E-02	4.04E-02	4.04E-02	4.04E-02
						Dose Commitment (mrem) =				0.00E+00	4.04E-02	4.04E-02	4.04E-02	4.04E-02	4.04E-02	4.04E-02

Oconee Nuclear Station
Dose from Broadleaf Vegetation Pathway for 2001 Data
Maximum Exposed Child

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

Usage (intake in one year) = **26 kg**

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Food (pCi/kg)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
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	077	31.90	2.71E-01	2.60E-01	3.83E-02	0.00E+00	8.46E-02	3.04E-02	1.63E-03
						Dose Commitment (mrem) =				2.71E-01	2.60E-01	3.83E-02	0.00E+00	8.46E-02	3.04E-02	1.63E-03

Oconee Nuclear Station
Dose from Fish Pathway for 2001 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 = 7426 pCi/l x 0.9 = 6683 pCi/kg

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

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Fish (pCi/kg)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
Mn-54	NO DATA	1.07E-05	2.85E-06	NO DATA	3.00E-06	NO DATA	8.98E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	1.80E-06	5.51E-06	NO DATA	NO DATA	NO DATA	1.05E-05	063	17.20	0.00E+00	2.14E-04	6.54E-04	0.00E+00	0.00E+00	0.00E+00	1.25E-03
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	74.30	1.68E-01	1.60E-01	2.37E-02	0.00E+00	5.23E-02	1.88E-02	1.00E-03
H-3	NO DATA	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	2.03E-07	063	6683	0.00E+00	9.36E-03	9.36E-03	9.36E-03	9.36E-03	9.36E-03	9.36E-03
						Dose Commitment (mrem) =				1.68E-01	1.70E-01	3.37E-02	9.36E-03	6.17E-02	2.82E-02	1.16E-02

Oconee Nuclear Station
Dose from Shoreline Sediment Pathway for 2001 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 Shorline Sediment Pathway (mrem) = Shorline 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
Co-58	7.00E-09	8.20E-09	063	21.00	1.65E-05	1.93E-05
Cs-134	1.20E-08	1.40E-08	ALL	0.00	0.00E+00	0.00E+00
Cs-137	4.20E-09	4.90E-09	063	120.00	5.64E-05	6.59E-05
		Dose Commitment (mrem) =			7.29E-05	8.51E-05

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2001 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	390.00	0.00E+00	2.11E-02	2.11E-02	2.11E-02	2.11E-02	2.11E-02	2.11E-02
						Dose Commitment (mrem)=				0.00E+00	2.11E-02	2.11E-02	2.11E-02	2.11E-02	2.11E-02	2.11E-02

Oconee Nuclear Station
Dose from Broadleaf Vegetation Pathway for 2001 Data
Maximum Exposed Teen

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

Usage (intake in one year) = 42 kg

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Food (pCi/kg)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
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	077	31.90	1.50E-01	2.00E-01	6.95E-02	0.00E+00	6.79E-02	2.64E-02	2.84E-03
						Dose Commitment (mrem) =				1.50E-01	2.00E-01	6.95E-02	0.00E+00	6.79E-02	2.64E-02	2.84E-03

Oconee Nuclear Station
Dose from Fish Pathway for 2001 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 = 7426 pCi/l x 0.9 = 6683 pCi/kg

Usage (intake in one year) = 16 kg

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	**Bone**	**Liver**	**T. Body**	**Thyroid**	**Kidney**	**Lung**	**GI-LLI**	**Location**	**(pCi/kg)**	**Bone**	**Liver**	**T. Body**	**Thyroid**	**Kidney**	**Lung**	**GI-LLI**
Mn-54	NO DATA	5.90E-06	1.17E-06	NO DATA	1.76E-06	NO DATA	1.21E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	9.72E-07	2.24E-06	NO DATA	NO DATA	NO DATA	1.34E-05	063	17.20	0.00E+00	2.67E-04	6.16E-04	0.00E+00	0.00E+00	0.00E+00	3.69E-03
Fe-59	5.87E-06	1.37E-05	5.29E-06	NO DATA	NO DATA	4.32E-06	3.24E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.81E-06	6.33E-06	NO DATA	NO DATA	NO DATA	3.66E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	5.76E-06	2.00E-05	9.33E-06	NO DATA	1.28E-05	NO DATA	8.47E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	8.37E-05	1.97E-04	9.14E-05	NO DATA	6.26E-05	2.39E-05	2.45E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	1.12E-04	1.49E-04	5.19E-05	NO DATA	5.07E-05	1.97E-05	2.12E-06	063	74.30	1.33E-01	1.77E-01	6.17E-02	0.00E+00	6.03E-02	2.34E-02	2.52E-03
H-3	NO DATA	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	1.06E-07	063	6683	0.00E+00	1.13E-02	1.13E-02	1.13E-02	1.13E-02	1.13E-02	1.13E-02
						Dose Commitment (mrem) =				1.33E-01	1.89E-01	7.36E-02	1.13E-02	7.16E-02	3.48E-02	1.75E-02

Oconee Nuclear Station
Dose from Shoreline Sediment Pathway for 2001 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 Shorline Sediment Pathway (mrem) = Shorline 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
Co-58	7.00E-09	8.20E-09	063	21.00	7.88E-05	9.23E-05
Cs-134	1.20E-08	1.40E-08	ALL	0.00	0.00E+00	0.00E+00
Cs-137	4.20E-09	4.90E-09	063	120.00	2.70E-04	3.15E-04
Dose Commitment (mrem) =					3.49E-04	4.07E-04

Oconee Nuclear Station
Dose from Drinking Water Pathway for 2001 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	390.00	0.00E+00	2.99E-02	2.99E-02	2.99E-02	2.99E-02	2.99E-02	2.99E-02
						Dose Commitment (mrem) =				0.00E+00	2.99E-02	2.99E-02	2.99E-02	2.99E-02	2.99E-02	2.99E-02

Oconee Nuclear Station
Dose from Broadleaf Vegetation Pathway for 2001 Data
Maximum Exposed Adult

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

Usage (intake in one year) = 64 kg

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI	Indicator Location	Food (pCi/kg)	Bone	Liver	T. Body	Thyroid	Kidney	Lung	GI-LLI
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	077	31.90	1.63E-01	2.23E-01	1.46E-01	0.00E+00	7.55E-02	2.51E-02	4.31E-03
						Dose Commitment (mrem) =				1.63E-01	2.23E-01	1.46E-01	0.00E+00	7.55E-02	2.51E-02	4.31E-03

Oconee Nuclear Station
Dose from Fish Pathway for 2001 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 = 7426 pCi/l x 0.9 = 6683 pCi/kg

Usage (intake in one year) = 21 kg

	Ingestion Dose Factor							Highest Annual Net Mean Concentration		Dose (mrem)						
Radionuclide	**Bone**	**Liver**	**T. Body**	**Thyroid**	**Kidney**	**Lung**	**GI-LLI**	**Location**	**(pCi/kg)**	**Bone**	**Liver**	**T. Body**	**Thyroid**	**Kidney**	**Lung**	**GI-LLI**
Mn-54	NO DATA	4.57E-06	8.72E-07	NO DATA	1.36E-06	NO DATA	1.40E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-58	NO DATA	7.45E-07	1.67E-06	NO DATA	NO DATA	NO DATA	1.51E-05	063	17.20	0.00E+00	2.69E-04	6.03E-04	0.00E+00	0.00E+00	0.00E+00	5.45E-03
Fe-59	4.34E-06	1.02E-05	3.91E-06	NO DATA	NO DATA	2.85E-06	3.40E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Co-60	NO DATA	2.14E-06	4.72E-06	NO DATA	NO DATA	NO DATA	4.02E-05	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zn-65	4.84E-06	1.54E-05	6.96E-06	NO DATA	1.03E-05	NO DATA	9.70E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-134	6.22E-05	1.48E-04	1.21E-04	NO DATA	4.79E-05	1.59E-05	2.59E-06	ALL	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cs-137	7.97E-05	1.09E-04	7.14E-05	NO DATA	3.70E-05	1.23E-05	2.11E-06	063	74.30	1.24E-01	1.70E-01	1.11E-01	0.00E+00	5.77E-02	1.92E-02	3.29E-03
H-3	NO DATA	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	1.05E-07	063	6683	0.00E+00	1.47E-02	1.47E-02	1.47E-02	1.47E-02	1.47E-02	1.47E-02
								Dose Commitment (mrem) =		1.24E-01	1.85E-01	1.27E-01	1.47E-02	7.25E-02	3.39E-02	2.35E-02

Oconee Nuclear Station
Dose from Shoreline Sediment Pathway for 2001 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 Shorline Sediment Pathway (mrem) = Shorline 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
Co-58	7.00E-09	8.20E-09	063	21.00	1.41E-05	1.65E-05
Cs-134	1.20E-08	1.40E-08	ALL	0.00	0.00E+00	0.00E+00
Cs-137	4.20E-09	4.90E-09	063	120.00	4.84E-05	5.64E-05
	Dose Commitment (mrem) =				6.25E-05	7.30E-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 Power Company's Environmental Center.

Duke Power Company'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 POWER INTERCOMPARISON PROGRAM

EnRad Laboratories participated in the Duke Power Nuclear Generation Department Intercomparison Program during 2001. Interlaboratory cross-check standards, including, Marinelli beakers, air filters, air cartridges, gross beta on smears, and tritium in water samples were analyzed at various times of the year by the four counting laboratories in Duke Power Company for this program. A summary of these Intercomparison Reports for 2001 is documented in Table 5.0-A.

5.6 DUKE POWER AUDITS

The Oconee Radiation Protection Section was not audited by the Quality Assurance Group in 2001. A Quality Assurance audit was performed February 15 and February 16, 2000. There were no findings as a result of this 2000 audit.

EnRad Laboratories was not audited by the Quality Assurance Group in 2001. A Quality Assurance audit was performed January 26, January 27, and February 1, 2000. Laboratory practices and procedures were reviewed. No significant problems were identified as a result of this 2000 audit.

5.7 U.S. NUCLEAR REGULATORY COMMISSION INSPECTIONS

The Oconee Nuclear Station Radiological Environmental Monitoring Program was audited by the NRC in March of 2001 (reference 6.13). Air and water sampling sites were inspected and no concerns or recommendations were noted in the report. EnRad Laboratories was not audited by the NRC in 2001.

5.8 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. Water, milk, vegetation, sediment, and fish samples collected by EnRad Laboratories 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.

5.9 TLD INTERCOMPARISON PROGRAM

5.9.1 STATE OF NORTH CAROLINA INTERCOMPARISON PROGRAM

Radiation Dosimetry and Records routinely participates in a TLD intercomparison program. The State of North Carolina Radiation Protection Section irradiates environmental dosimeters and sends them to the Radiation Dosimetry and Records group for analysis of the unknown estimated delivered exposure. A summary of the State of North Carolina Environmental Dosimetry Intercomparison Report for 2001 is documented in Table 5.0-B.

5.9.2 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-B.

TABLE 5.0-A

DUKE POWER COMPANY
INTERLABORATORY COMPARISON PROGRAM

2001 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.

Footnote explanations are included following this data table.

Gamma in Water 3.5 liters

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/15/2001	Q011GWSL	Cr-51	6.11 - 10.84 E4	8.15 E4	8.19 E4	3 Pass
		Mn-54	2.17 - 3.86 E4	2.90 E4	3.01 E4	3 Pass
		Co-57	0.00 - 0.00 E0	0.00 E0	1.42 E2	3 Pass (1)
		Co-58	1.09 - 1.93 E4	1.45 E4	1.47 E4	3 Pass
		Fe-59	2.00 - 3.54 E4	2.66 E4	2.78 E4	3 Pass
		Co-60	3.13 - 5.55 E4	4.17 E4	4.17 E4	3 Pass
		Zn-65	4.03 - 7.15 E4	5.37 E4	5.56 E4	3 Pass
		Cs-134	2.76 - 4.90 E4	3.68 E4	3.36 E4	3 Pass
		Cs-137	2.16 - 3.82 E4	2.88 E4	2.64 E4	3 Pass
		Ce-139	0.00 - 0.00 E0	0.00 E0	2.72 E2	3 Pass (1)
		Ce-141	2.31 - 4.10 E4	3.08 E4	3.11 E4	3 Pass
6/4/2001	Q012GWR	Cr-51	1.79 - 3.17 E2	2.39 E2	2.40 E2	3 Pass
		Mn-54	4.04 - 7.16 E2	5.39 E2	5.60 E2	3 Pass
		Co-58	1.09 - 1.94 E2	1.46 E2	1.46 E2	3 Pass
		Fe-59	1.26 - 2.24 E2	1.68 E2	1.76 E2	3 Pass
		Co-60	6.75 - 11.97 E2	9.00 E2	8.94 E2	3 Pass
		Zn-65	7.12 - 12.62 E2	9.49 E2	9.67 E2	3 Pass
		Cs-134	5.70 - 10.10 E2	7.59 E2	6.71 E2	3 Pass
		Cs-137	4.77 - 8.46 E2	6.36 E2	5.71 E2	3 Pass
		Ce-141	0.91 - 1.62 E2	1.22 E2	1.21 E2	3 Pass
8/20/2001	Q013GWSL	Cr-51	2.63 - 4.66 E4	3.50 E4	3.42 E4	3 Pass
		Mn-54	7.19 - 12.75 E3	9.58 E3	9.70 E3	3 Pass
		Co-58	0.79 - 1.40 E4	1.05 E4	1.04 E4	3 Pass
		Fe-59	4.57 - 8.11 E3	6.10 E3	6.36 E3	3 Pass
		Co-60	0.88 - 1.56 E4	1.17 E4	1.18 E4	3 Pass
		Zn-65	0.91 - 1.61 E4	1.21 E4	1.25 E4	3 Pass
		Cs-134	5.37 - 9.52 E3	7.16 E3	6.48 E3	3 Pass
		Cs-137	1.04 - 1.85 E4	1.39 E4	1.29 E4	3 Pass
		Ce-141	0.77 - 1.37 E4	1.03 E4	1.04 E4	3 Pass

Gamma in Water 3.5 liters continued

12/4/2001	Q014GWR	Cr-51	0.44 - 2.36 E2	1.01 E2	1.00 E2	3 Pass
		Mn-54	2.33 - 4.14 E2	3.11 E2	3.20 E2	3 Pass
		Co-58	1.14 - 2.03 E2	1.53 E2	1.55 E2	3 Pass
		Fe-59	3.38 - 6.90 E1	4.83 E1	5.66 E1	3 Pass
		Co-60	3.47 - 6.16 E2	4.63 E2	4.76 E2	3 Pass
		Zn-65	2.76 - 4.90 E2	3.69 E2	3.84 E2	3 Pass
		Cs-134	2.00 - 3.55 E2	2.67 E2	2.46 E2	3 Pass
		Cs-137	4.25 - 7.53 E2	5.66 E2	5.38 E2	3 Pass
		Ce-141	3.17 - 6.13 E1	4.41 E1	4.82 E1	3 Pass

Gamma in Water 1.0 liter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/15/2001	Q011GWSL	Cr-51	6.11 - 10.84 E4	8.15 E4	8.10 E4	3 Pass
		Mn-54	2.17 - 3.86 E4	2.90 E4	3.04 E4	3 Pass
		Co-57	0.00 - 0.00 E0	0.00 E0	1.47 E2	3 Pass [1]
		Co-58	1.09 - 1.93 E4	1.45 E4	1.45 E4	3 Pass
		Fe-59	2.00 - 3.54 E4	2.66 E4	2.81 E4	3 Pass
		Co-60	3.13 - 5.55 E4	4.17 E4	4.17 E4	3 Pass
		Zn-65	4.03 - 7.15 E4	5.37 E4	5.63 E4	3 Pass
		Cs-134	2.76 - 4.90 E4	3.68 E4	3.27 E4	3 Pass
		Cs-137	2.16 - 3.82 E4	2.88 E4	2.61 E4	3 Pass
		Ce-139	0.00 - 0.00 E0	0.00 E0	2.65 E2	3 Pass [1]
		Ce-141	2.31 - 4.10 E4	3.08 E4	3.13 E4	3 Pass
6/4/2001	Q012GWR	Cr-51	1.19 - 4.77 E2	2.39 E2	2.06 E2	3 Pass
		Mn-54	4.04 - 7.16 E2	5.39 E2	5.57 E2	3 Pass
		Co-58	1.09 - 1.94 E2	1.46 E2	1.48 E2	3 Pass
		Fe-59	1.26 - 2.24 E2	1.68 E2	1.86 E2	3 Pass
		Co-60	6.75 - 11.97 E2	9.00 E2	8.86 E2	3 Pass
		Zn-65	7.12 - 12.62 E2	9.49 E2	9.74 E2	3 Pass
		Cs-134	5.70 - 10.10 E2	7.59 E2	6.67 E2	3 Pass
		Cs-137	4.77 - 8.46 E2	6.36 E2	5.54 E2	3 Pass
		Ce-141	0.91 - 1.62 E2	1.22 E2	1.14 E2	3 Pass
8/20/2001	Q013GWSL	Cr-51	2.63 - 4.66 E4	3.50 E4	3.39 E4	3 Pass
		Mn-54	7.19 - 12.75 E3	9.58 E3	9.86 E3	3 Pass
		Co-58	0.79 - 1.40 E4	1.05 E4	1.04 E4	3 Pass
		Fe-59	4.57 - 8.11 E3	6.10 E3	6.46 E3	3 Pass
		Co-60	0.88 - 1.56 E4	1.17 E4	1.17 E4	3 Pass
		Zn-65	0.91 - 1.61 E4	1.21 E4	1.26 E4	3 Pass
		Cs-134	5.37 - 9.52 E3	7.16 E3	6.26 E3	3 Pass
		Cs-137	1.04 - 1.85 E4	1.39 E4	1.31 E4	3 Pass
		Ce-141	0.77 - 1.37 E4	1.03 E4	1.02 E4	3 Pass

Gamma in Water 1.0 liter continued

12/4/2001	Q014GWR	Cr-51	0.47 - 2.20 E2	1.01 E2	1.28 E2	3 Pass
		Mn-54	2.33 - 4.14 E2	3.11 E2	3.31 E2	3 Pass
		Co-58	1.14 - 2.03 E2	1.53 E2	1.56 E2	3 Pass
		Fe-59	2.99 - 7.77 E1	4.83 E1	5.66 E1	3 Pass
		Co-60	3.47 - 6.16 E2	4.63 E2	4.83 E2	3 Pass
		Zn-65	2.76 - 4.90 E2	3.69 E2	3.97 E2	3 Pass
		Cs-134	2.00 - 3.55 E2	2.67 E2	2.40 E2	3 Pass
		Cs-137	4.25 - 7.53 E2	5.66 E2	5.49 E2	3 Pass
		Ce-141	3.09 - 6.30 E1	4.41 E1	4.59 E1	3 Pass

Gamma in Water 0.5 liter

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/15/2001	Q011GWSL	Cr-51	6.11 - 10.84 E4	8.15 E4	8.06 E4	3 Pass
		Mn-54	2.17 - 3.86 E4	2.90 E4	2.99 E4	3 Pass
		Co-57	0.00 - 0.00 E0	0.00 E0	1.75 E2	3 Pass [1]
		Co-58	1.09 - 1.93 E4	1.45 E4	1.45 E4	3 Pass
		Fe-59	2.00 - 3.54 E4	2.66 E4	2.75 E4	3 Pass
		Co-60	3.13 - 5.55 E4	4.17 E4	4.12 E4	3 Pass
		Zn-65	4.03 - 7.15 E4	5.37 E4	5.50 E4	3 Pass
		Cs-134	2.76 - 4.90 E4	3.68 E4	3.22 E4	3 Pass
		Cs-137	2.16 - 3.82 E4	2.88 E4	2.57 E4	3 Pass
		Ce-139	0.00 - 0.00 E0	0.00 E0	2.52 E2	3 Pass [1]
		Ce-141	2.31 - 4.10 E4	3.08 E4	3.01 E4	3 Pass
6/4/2001	Q012GWR	Cr-51	1.19 - 4.77 E2	2.39 E2	2.51 E2	3 Pass
		Mn-54	4.04 - 7.16 E2	5.39 E2	5.53 E2	3 Pass
		Co-58	1.09 - 1.94 E2	1.46 E2	1.51 E2	3 Pass
		Fe-59	1.26 - 2.24 E2	1.68 E2	1.94 E2	3 Pass
		Co-60	6.75 - 11.97 E2	9.00 E2	8.83 E2	3 Pass
		Zn-65	7.12 - 12.62 E2	9.49 E2	9.98 E2	3 Pass
		Cs-134	5.70 - 10.10 E2	7.59 E2	6.44 E2	3 Pass
		Cs-137	4.77 - 8.46 E2	6.36 E2	5.73 E2	3 Pass
		Ce-141	0.91 - 1.62 E2	1.22 E2	1.13 E2	3 Pass
8/20/2001	Q013GWSL	Cr-51	2.63 - 4.66 E4	3.50 E4	3.29 E4	3 Pass
		Mn-54	7.19 - 12.75 E3	9.58 E3	9.70 E3	3 Pass
		Co-58	0.79 - 1.40 E4	1.05 E4	1.03 E4	3 Pass
		Fe-59	4.57 - 8.11 E3	6.10 E3	6.31 E3	3 Pass
		Co-60	0.88 - 1.56 E4	1.17 E4	1.17 E4	3 Pass
		Zn-65	0.91 - 1.61 E4	1.21 E4	1.25 E4	3 Pass
		Cs-134	5.37 - 9.52 E3	7.16 E3	6.06 E3	3 Pass
		Cs-137	1.04 - 1.85 E4	1.39 E4	1.29 E4	3 Pass
		Ce-141	0.77 - 1.37 E4	1.03 E4	1.01 E4	3 Pass

Gamma in Water 0.5 liter continued

12/4/2001	Q014GWR	Cr-51	0.16 - 6.34 E2	1.01 E2	0.82 E2	2 Pass
		Mn-54	2.33 - 4.14 E2	3.11 E2	3.22 E2	2 Pass
		Co-58	1.14 - 2.03 E2	1.53 E2	1.56 E2	2 Pass
		Fe-59	2.94 - 7.92 E1	4.83 E1	6.15 E1	2 Pass
		Co-60	3.47 - 6.16 E2	4.63 E2	4.74 E2	2 Pass
		Zn-65	2.76 - 4.90 E2	3.69 E2	3.89 E2	2 Pass
		Cs-134	2.00 - 3.55 E2	2.67 E2	2.30 E2	2 Pass
		Cs-137	4.25 - 7.53 E2	5.66 E2	5.31 E2	2 Pass
		Ce-141	3.04 - 6.39 E1	4.41 E1	4.08 E1	2 Pass

Gamma in Water 50 ml Bottle

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/15/2001	Q011GWSL	Cr-51	6.11 - 10.84 E4	8.15 E4	8.42 E4	3 Pass
		Mn-54	2.17 - 3.86 E4	2.90 E4	3.02 E4	3 Pass
		Co-57	0.00 - 0.00 E0	0.00 E0	1.90 E2	3 Pass [1]
		Co-58	1.09 - 1.93 E4	1.45 E4	1.48 E4	3 Pass
		Fe-59	2.00 - 3.54 E4	2.66 E4	2.85 E4	3 Pass
		Co-60	3.13 - 5.55 E4	4.17 E4	4.20 E4	3 Pass
		Zn-65	4.03 - 7.15 E4	5.37 E4	5.76 E4	3 Pass
		Cs-134	2.76 - 4.90 E4	3.68 E4	3.09 E4	3 Pass
		Cs-137	2.16 - 3.82 E4	2.88 E4	2.57 E4	3 Pass
		Ce-139	0.00 - 0.00 E0	0.00 E0	2.76 E2	3 Pass [1]
		Ce-141	2.31 - 4.10 E4	3.08 E4	3.10 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
6/14/2001	E2671-37	Cr-51	1.73 - 3.07 E2	2.31 E2	2.68 E2	3 Pass
		Mn-54	1.16 - 2.06 E2	1.55 E2	1.86 E2	3 Pass
		Co-58	0.75 - 1.33 E2	1.00 E2	1.07 E2	3 Pass
		Fe-59	6.75 - 11.97 E1	9.00 E1	12.17 E1	2/3 High [2]
		Co-60	1.04 - 1.85 E2	1.39 E2	1.56 E2	3 Pass
		Zn-65	1.40 - 2.49 E2	1.87 E2	2.40 E2	1/3 High [2]
		Cs-134	1.04 - 1.84 E2	1.38 E2	1.16 E2	3 Pass
		Cs-137	0.94 - 1.66 E2	1.25 E2	1.30 E2	3 Pass
		Ce-141	1.26 - 2.23 E2	1.68 E2	1.80 E2	3 Pass
8/10/2001	A14773-04	Cr-51	0.77 - 1.36 E5	1.02 E5	1.04 E5	3 Pass
		Mn-54	1.67 - 2.95 E4	2.22 E4	2.21 E4	3 Pass
		Co-57	0.00 - 0.00 E0	0.00 E0	1.54 E2	3 Pass [1]
		Co-58	1.97 - 3.48 E4	2.62 E4	2.62 E4	3 Pass
		Fe-59	1.21 - 2.14 E4	1.61 E4	1.65 E4	3 Pass
		Co-60	2.00 - 3.55 E4	2.67 E4	2.70 E4	3 Pass
		Zn-65	2.12 - 3.76 E4	2.83 E4	2.84 E4	3 Pass
		Cs-134	1.23 - 2.18 E4	1.64 E4	1.53 E4	3 Pass
		Cs-137	2.37 - 4.20 E4	3.16 E4	2.94 E4	3 Pass
		Ce-139	0.00 - 0.00 E0	0.00 E0	3.58 E2	3 Pass [1]
		Ce-141	2.18 - 3.86 E4	2.90 E4	2.91 E4	3 Pass

Gamma In Filter continued

12/6/2001	E2899-37	Cr-51	0.92 - 9.01 E2	2.88 E2	3.22 E2	3 Pass
		Mn-54	6.45 - 11.44 E1	8.60 E1	8.75 E1	3 Pass
		Co-58	3.48 - 7.75 E1	5.20 E1	5.35 E1	3 Pass
		Fe-59	2.66 - 13.10 E1	5.90 E1	7.96 E1	3 Pass
		Co-60	1.54 - 2.73 E2	2.05 E2	2.07 E2	3 Pass
		Zn-65	0.84 - 1.72 E2	1.20 E2	1.32 E2	3 Pass
		Cs-134	0.86 - 1.53 E2	1.15 E2	1.11 E2	3 Pass
		Cs-137	1.38 - 2.45 E2	1.84 E2	1.69 E2	3 Pass
		Ce-141	1.65 - 2.93 E2	2.20 E2	2.19 E2	3 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
4/18/2001	Q012LIW1	I-131	1.25 - 2.22 E2	1.67 E2	1.81 E2	3 Pass
4/18/2001	Q012LIW2	I-131	2.51 - 4.44 E1	3.34 E1	4.17 E1	3 Pass
4/18/2001	Q012LIW3	I-131	0.00 - 0.00 E0	0.00 E0	0.00 E0	3 Pass
8/13/2001	Q013LIW1	I-131	0.00 - 0.00 E0	0.00 E0	0.00 E0	3 Pass
8/13/2001	Q013LIW2	I-131	1.13 - 2.00 E1	1.50 E1	1.83 E1	3 Pass
8/13/2001	Q013LIW3	I-131	0.75 - 1.33 E2	1.00 E2	0.98 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
11/8/2001	Q014LIM1	I-131	0.75 - 1.34 E1	1.01 E1	0.95 E1	3 Pass
11/8/2001	Q014LIM2	I-131	5.22 - 9.26 E1	6.97 E1	6.97 E1	3 Pass
11/8/2001	Q014LIM3	I-131	0.00 - 0.00 E0	0.00 E0	0.00 E0	3 Pass

Iodine Cartridge

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi	Reference Value pCi	Mean Reported Value pCi	Cross Check Status
2/16/2001	A14175-04	I-131	2.99 - 5.29 E5	3.98 E5	3.94 E5	3 Pass
6/14/2001	E2672-37	I-131	6.00 - 10.64 E1	8.00 E1	8.81 E1	3 Pass
8/10/2001	A14774-04	I-131	3.68 - 6.53 E5	4.91 E5	5.00 E5	3 Pass
12/6/2001	E2900-37	I-131	6.90 - 12.24 E1	9.20 E1	9.79 E1	3 Pass

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
3/22/2001	E2561-37	Beta	2.01 - 3.56 E2	2.68 E2	2.88 E2	3 Pass
9/20/2001	E2804-37	Beta	1.54 - 2.73 E2	2.05 E2	1.96 E2	3 Pass

Beta Air Particulate

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi	Reference Value pCi	Mean Reported Value pCi	Cross Check Status
5/11/2001	A14318-37	Beta	5.33 - 9.44 E3	7.10 E3	6.11 E3	3 Pass
5/11/2001	A14340-04	Beta	2.81 - 4.97 E3	3.74 E3	3.92 E3	3 Pass
11/9/2001	A14998-37	Beta	5.01 - 8.88 E3	6.68 E3	5.92 E3	3 Pass

Tritium in Water

Reference Date	Sample I.D.	Nuclide	Acceptance Range pCi/l	Reference Value pCi/l	Mean Reported Value pCi/l	Cross Check Status
3/5/2001	Q011TWSL1	H-3	0.00 - 0.00 E0	0.00 E0	0.00 E0	3 Pass
3/5/2001	Q011TWSL2	H-3	1.11 - 1.97 E4	1.48 E4	1.29 E4	3 Pass
6/4/2001	Q012TWR1	H-3	0.00 - 0.00 E0	0.00 E0	0.00 E0	3 Pass
6/4/2001	Q012TWR2	H-3	1.34 - 2.37 E2	1.78 E2	0.00 E2	3 Fail [3]
6/4/2001	Q012TWR3	H-3	1.73 - 3.08 E3	2.31 E3	2.05 E3	3 Pass
8/20/2001	Q013TWS1	H-3	0.00 - 0.00 E0	0.00 E0	0.00 E0	3 Pass
8/20/2001	Q013TWS2	H-3	2.15 - 3.82 E4	2.87 E4	2.49 E4	3 Pass
12/4/2001	Q014TWR1	H-3	3.63 - 6.44 E2	4.84 E2	5.24 E2	3 Pass
12/4/2001	Q014TWR2	H-3	2.71 - 4.81 E3	3.62 E3	3.51 E3	3 Pass
12/4/2001	Q014TWR3	H-3	0.00 - 0.00 E0	0.00 E0	0.00 E0	3 Pass

Table 5.0-A Footnote Explanations

(1) Gamma in Water, Sample ID Q011GWSL, Reference Date 3/15/2001: 3.5 L Marinelli, 1.0 L Marinelli, 0.5 L Marinelli, 50 ml Bottle

Gamma in Filter, Sample ID A14773-04, Reference Date 8/10/2001

Co-57 and Ce-139 were observed in cross-checks and were attributed to contaminants arriving with the source. The nuclides were determined to be present, but there was no reference activity applicable to the results.

(2) Gamma in Filter, Sample ID E2671-37, Reference Date 6/14/2001

Three results for Fe-59 [1099.2 keV] were reported, with two being above acceptance limits. Three results for Zn-65 [1115.5 keV]were reported, with one being above acceptance limits. Coincidence loss from calibration on detector face was determined to be the cause. Sample geometry was recalibrated at 3 centimeter distance from detector face. Reanalysis of cross-check yielded acceptable data. Corrective action 2001-43386 was written to record corrective actions.

(3) Tritium in Water, Sample ID Q012TWR2, Reference Date 6/4/2001

Three results were reported as blank, all indicating absence of tritium in the cross-check. The reference activity value for this cross-check was 178 pCi/l. The calculated detection limit for this cross-check was 152 pCi/l. The reference value for this cross-check was below the lower limit of an expected value for a cross-check. The counting error at this activity level near the LLD made accurate measurement of the cross-check virtually unattainable.

TABLE 5.0-B
2001 ENVIRONMENTAL DOSIMETER CROSS-CHECK RESULTS

STATE OF NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL HEALTH AND NATURAL RESOURCES

Cross-Check Date	State of North Carolina Delivered Value (mR)	Radiation Dosimetry & Records Reported Value (mR)	Acceptance Criteria +/- 15%
Spring 2001	1.00 E2	9.29 E1	-7.10
Fall 2001	5.00 E1	4.92 E1	-1.68

NUCLEAR TECHNOLOGY SERVICES, INCORPORATED

Cross-Check Date	NTS Delivered Value (mR)	Radiation Dosimetry & Records Reported Value (mR)	Acceptance Criteria +/- 15%
1st Quarter 2001	8.30 E1	8.19 E1	-1.20
2nd Quarter 2001	8.20 E1	8.14 E1	-0.76
3rd Quarter 2001	6.70 E1	6.64 E1	-0.96
4th Quarter 2001	7.80 E1	7.76 E1	-0.46

6.0 REFERENCES

6.1 Oconee Selected License Commitments

6.2 Oconee Technical Specifications

6.3 Oconee Updated Final Safety Analysis Report

6.4 Duke Power Company Offsite Dose Calculation Manual

6.5 Oconee Annual Radiological Environmental Operating Report 1969-2000

6.6 Oconee Annual Radioactive Effluent Release Report 2001

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, Vertechs Version 3.5.0, Duke Power Revision # 3.0

6.12 Oconee Environmental Chemistry Operating Procedures

6.13 NRC Integrated Inspection Report 50-269/00-08, 50-270/00-08, 50-287/00-08

6.14 Duke Power Company EnRad Laboratory Charcoal Cartridge Study, performed 2001

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, Fisheries and Aquatic Ecology, and ONS Environmental Chemistry.

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 procedures during 2001.

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. Ten percent of samples receiving gamma analysis are analyzed as duplicate analyses.

Low-level iodine analyses are performed by passing a designated sample aliquot through an ion exchange resin to remove and concentrate any iodine in the aqueous sample (milk). The resin is then dried and 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. Tritium samples are batch processed with a tritium spike 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 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 2001.

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 weekly gamma analysis was performed on each charcoal cartridge and a weekly gross beta analysis was performed on each filter. Filters were segregated by location and a quarterly gamma analysis was performed on the filter composite. The continuous composite samples were collected from the locations listed below.

Location 060	=	New Greenville Water Intake Rd. (2.6 mi. NNE)
Location 074	=	Keowee Key Resort (2.3 mi. NNW)
Location 077	=	Skimmer Wall (1.0 mi. SW)
Location 078	=	Recreation Site (0.6 mi. WSW)
Location 079	=	Keowee Dam (0.5 mi. NE)
Location 081	=	Clemson Operations Center (9.3 mi. SE)

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	=	New Greenville Water Intake Rd. (2.6 mi. NNE)
Location 064	=	Seneca (6.7 mi. SSW)
Location 066	=	Anderson (19.0 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 (0.8 mi. ENE)
Location 063	=	Lake Hartwell - Hwy 183 Bridge (0.8 mi. ESE)

A.4 MILK

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

Location 071	=	Clemson Dairy - (10.3 mi. SSE)
Location 080	=	Martin's Dairy - (17.2 mi. SE)
Location 082	=	Oakway Dairy (17.8 mi SSW)

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 060	=	New Greenville Water Intake Rd. (2.6 mi. NNE)
Location 077	=	Skimmer Wall (1.0 mi. SW)
Location 079	=	Keowee Dam (0.5 mi. NE)
Location 081	=	Clemson Operations Center (9.3 mi. SE)

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	=	New Greenville Water Intake Rd. (2.6 mi. NNE)
Location 063	=	Lake Hartwell - Hwy 183 Bridge (0.8 mi. ESE)
Location 067	=	Lawrence Ramsey Bridge, Hwy 27 (4.2 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 (0.8 mi. ESE)
Location 067	=	Lawrence Ramsey Bridge, Hwy 27 (4.2 mi. SSE)
Location 068	=	High Falls County Park (2.0 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 Meat Animal
* The Nearest Milk-giving Animal (cow, goat, etc.) where milk is used for human consumption

The census was conducted during the growing season from 7/16 to 7/18/2001 and completed on 8/13/2001. Results are shown in Table 3.9.

APPENDIX B

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

SUMMARY OF RESULTS

2001

Environmental Radiological Monitoring Program Summary

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

Location: Oconee County, South Carolina **Report Period: 01-JAN-2001 to 31-DEC-2001**

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 (9.3 mi SE)	
BETA	324	1.00E-02	2.00E-2 (270/270)	060	2.05E-2 (54/54)	1.94E-2 (54/54)	0
			7.26E-3 - 4.66E-2	(2.6 mi NNE)	8.86E-3 - 4.66E-2	6.42E-3 - 3.83E-2	
CS-134	24	5.00E-02	0.00 (0/20)		0.00 (0/4)	0.00 (0/4)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
CS-137	24	6.00E-02	0.00 (0/20)		0.00 (0/4)	0.00 (0/4)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
I-131	24	7.00E-02	0.00 (0/20)		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-2001 to 31-DEC-2001**

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 (9.3 mi SE)	
	CS-134	324	5.00E-02	0.00 (0/270)		0.00 (0/54)	0.00 (0/54)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	324	6.00E-02	0.00 (0/270)		0.00 (0/54)	0.00 (0/54)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	I-131	324	7.00E-02	0.00 (0/270)		0.00 (0/54)	0.00 (0/54)	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-2001 to 31-DEC-2001**

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 (6.7 mi SSW)	
	BALA-140	42	15	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	BETA	42	4	1.63 (25/28)	066	1.75 (14/14)	1.29 (12/14)	0
				0.80 - 3.04	(19.0 mi SSE)	0.99 - 2.45	0.83 - 1.89	
	CO-58	42	15	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CO-60	42	15	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-134	42	15	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	42	18	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	FE-59	42	30	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	H-3	15	2000	390 (5/10)	066	390 (5/5)	0.00 (0/5)	0
				306 - 487	(19.0 mi SSE)	306 - 487	0.00 - 0.00	
	I-131	42	15	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	MN-54	42	15	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	NB-95	42	15	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	ZN-65	42	30	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	ZR-95	42	30	0.00 (0/28)		0.00 (0/14)	0.00 (0/14)	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-2001 to 31-DEC-2001**

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 (0.8 mi ENE)	
	BALA-140 28	15	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CO-58 28	15	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CO-60 28	15	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-134 28	15	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137 28	18	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	FE-59 28	30	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	H-3 10	2000	7426 (5/5)	063	7426 (5/5)	0.00 (0/5)	0
			4040 - 11800	(0.8 mi ESE)	4040 - 11800	0.00 - 0.00	
	I-131 28	15	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	MN-54 28	15	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	NB-95 28	15	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	ZN-65 28	30	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	0
			0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	ZR-95 28	30	0.00 (0/14)		0.00 (0/14)	0.00 (0/14)	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-2001 to 31-DEC-2001**

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)							080 (17.2 mi SSE)	
	BALA-140	81	15	0.00 (0/54)		0.00 (0/27)	0.00 (0/27)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-134	81	15	0.00 (0/54)		0.00 (0/27)	0.00 (0/27)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	81	18	0.00 (0/54)		0.00 (0/27)	0.00 (0/27)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	I-131	81	15	0.00 (0/54)		0.00 (0/27)	0.00 (0/27)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	LLI-131	81	1	0.00 (0/54)		0.00 (0/27)	0.00 (0/27)	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-2001 to 31-DEC-2001**

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 (9.3 mi SE)	
	CS-134	48	60	0.00 (0/36)		0.00 (0/12)	0.00 (0/12)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	
	CS-137	48	80	31.9 (1/36)	077	31.9 (1/12)	0.00 (0/12)	0
				31.9 - 31.9	(1.0 mi SW)	31.9 - 31.9	0.00 - 0.00	
	I-131	48	60	0.00 (0/36)		0.00 (0/12)	0.00 (0/12)	0
				0.00 - 0.00		0.00 - 0.00	0.00 - 0.00	

Mean and range based upon detectable measurements only
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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 (2.6 mi NNE)	
	CO-58	12	130	17.2 (2/8)	063	17.2 (2/4)	0.00 (0/4)	0
				15.2 - 19.1	(0.8 mi ESE)	15.2 - 19.1	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	83.2 (8/8)	063	99.2 (4/4)	24.9 (2/4)	0
				43.9 - 165	(0.8 mi ESE)	46.6 - 165	15.5 - 34.4	
	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-2001 to 31-DEC-2001**

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 (2.0 mi W)	
	CO-58	6	0	21.0 (1/4)	063	21.0 (1/2)	0.00 (0/2)	0
				21.0 - 21.0	(0.8 mi ESE)	21.0 - 21.0	0.00 - 0.00	
	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	97.5 (4/4)	067	120 (2/2)	0.00 (0/2)	0
				70.6 - 162	(4.2 mi SSE)	77.1 - 162	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-2001 to 31-DEC-2001**

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 (9.4 mi WSW) 081 (9.3 mi SE)	
	167	0.00E+00	19.6 (159/159)	048	25.3 (4/4)	25.3 (8/8)	0
			12.6 - 29.5	(4.0 mi W)	22.9 - 27.2	19.2 - 32.4	

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

APPENDIX C

SAMPLING DEVIATIONS
&
UNAVAILABLE ANALYSES

APPENDIX C

OCONEE NUCLEAR STATION
SAMPLING DEVIATIONS & UNAVAILABLE ANALYSES

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

C.1 SAMPLING DEVIATIONS

Air Particulate and Air Radioiodines

Location	Scheduled Collection Dates	Actual Collection Dates	Reason Code	Corrective Action
079	8/13 - 8/20/01	8/13 - 8/20/01	PO	A planned power outage due to construction occurred to sampling equipment on 8/14/01 between 8:00 and 9:00 am as part of the Keowee underground cable replacement project. Power was restored to sampling equipment on 8/14/01 at 16:13.

Drinking Water

Location	Scheduled Collection Dates	Actual Collection Dates	Reason Code	Corrective Action
060	10/15 - 11/12/01	10/17 - 11/12/01	PO	Power to sampling equipment was turned off to perform plant maintenance. Power was restored on 10/17/01 and sampling was resumed.
064	10/15 - 11/12/01	10/17 - 11/12/01	PO	Power to sampling equipment was turned off to perform plant maintenance. Power was restored on 10/17/01 and sampling was resumed.

Surface Water

Location	Scheduled Collection Dates	Actual Collection Dates	Reason Code	Corrective Action
062	12/11/00 - 1/8/01	1/8/01 - 1/8/01	PO	Faulty power supply cord to sampling equipment caused loss of power during composite period. Power was available to the site and it was determined the cord was causing power loss problem.
062	1/8 - 2/5/01	1/15 - 2/5/01	PO	Site was checked during composite period and was inoperable. The power cord for sampling equipment was replaced on 1/15/01. Sampling equipment operating normally for the remainder of the composite period.
062	5/29 - 6/25/01	6/20 - 6/25/01	PO	Construction work on a power panel supplying power to the sampling equipment caused sampling equipment to malfunction. Power was restored and equipment was reset and sampling resumed on 6/20/01.
	6/25 - 7/23/01	7/23 - 7/23/01		Power to sampling equipment was cut during composite period due to construction associated with the Keowee underground cable replacement project. Sampling equipment monitored to resume normal sampling when possible.
062	7/23 - 8/20/01	7/23 - 8/20/01	PO	
062	8/20 - 9/17/01	9/11 - 9/17/01	PS	Sampling equipment malfunctioned and was discovered on 9/10/01. A new sampler was calibrated and placed into operation on 9/11/01. Normal sampling continued for the remainder of the composite period.
	12/11/00 - 1/8/01	12/11/00 - 1/8/01		Pump out of service due to cracked intake line and low lake level. Work request 98168575 was written for equipment repair. Daily 500 ml grab samples were collected when normal sampling was not possible due to equipment failure.
	1/8 - 2/5/01	1/8 - 2/5/01		
063	2/5 - 3/5/01	2/5 - 3/5/01	PS	
063	3/5 - 4/2/01	3/6 - 4/2/01	PS	Pump remains out of service. No intake flow to reservoir pump was available at time of collection. Work request 98172647 was written for repair of this site. Grab samples were taken 3/6 and 3/7/01. Water flow was restored to the reservoir pump on 3/7/01.

C.2 UNAVAILABLE ANALYSES

TLD

Location	Scheduled Collection Dates	Reason Code	Corrective Action
056	3/19 - 6/18/01	VN	TLD missing at time of collection. 3rd quarter TLD placed in a more secluded section at this site away from the adjacent parking lot.

APPENDIX D

ANALYTICAL DEVIATIONS

No analytical deviations were incurred for the
2001 Radiological Environmental Monitoring Program

APPENDIX E

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM RESULTS

This appendix includes all of the sample analysis reports generated from each sample medium for 2001. Appendix E is located separately from this report and is permanently archived at Duke Power Company's Environmental Center radiological environmental master file, located at the McGuire Nuclear Station Site in Huntersville, North Carolina.