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SOUTHERN COMPANY
Energy to Serve Your World℠

April 30, 2002

Docket Nos.: 50-348
50-364

NEL-02-0105

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555-0001

Joseph M. Farley Nuclear Plant
Annual Radiological Environmental Operating Report for 2001

Ladies and Gentlemen:

The enclosed "Annual Radiological Environmental Operating Report for 2001" is transmitted in accordance with Joseph M. Farley Nuclear Plant Unit 1 and Unit 2 Technical Specification 5.6.2.

If you have any questions, please advise.

Respectfully submitted,

DM Morey

Dave Morey

DNM/JHD

Enclosure:
FNP Annual Radiological Environmental Operating Report for 2001

IE25

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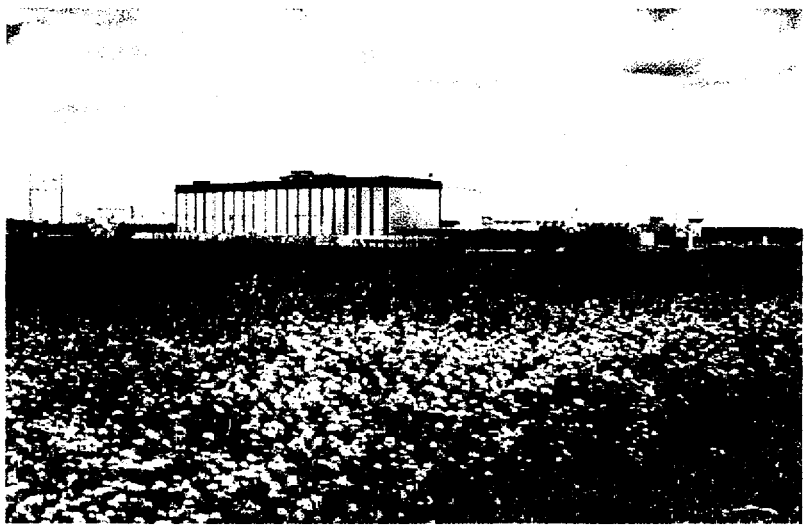
Enclosure

Joseph M. Farley Nuclear Plant
Annual Radiological Environmental Operating Report for 2001

JOSEPH M. FARLEY NUCLEAR PLANT
ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 2001



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LIST OF ACRONYMS

Acronyms presented in alphabetical order

Acronym	Definition
APCo	Alabama Power Company
ASTM	American Society for Testing and Materials
CL	Confidence Level
EL	Georgia Power Company Environmental Laboratory
EPA	Environmental Protection Agency
FNP	Joseph M. Farley Nuclear Plant
ICP	Interlaboratory Comparison Program
MDC	Minimum Detectable Concentration
MDD	Minimum Detectable Difference
MWe	MegaWatts Electric
NA	Not Applicable
NDM	No Detectable Measurement(s)
NRC	Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
Po	Preoperation
PWR	Pressurized Water Reactor
REMP	Radiological Environmental Monitoring Program
RL	Reporting Level
RM	River Mile
TLD	Thermoluminescent Dosimeter
TS	Technical Specification

1.0 INTRODUCTION

The Radiological Environmental Monitoring Program (REMP) for 2001 was conducted in accordance Chapter 4 of the Offsite Dose Calculation Manual (ODCM). The REMP activities for 2001 are reported herein in accordance with Technical Specification (TS) 5.6.2 and ODCM 7.1.

The objectives of the REMP are to:

1) Determine the levels of radiation and the concentrations of radioactivity in the environs and;

2) Assess the radiological impact (if any) to the environment due to the operation of the Joseph M. Farley Nuclear Plant (FNP).

The assessments include comparisons between results of analyses of samples obtained at locations where radiological levels are not expected to be affected by plant operation (control stations) and at locations where radiological levels are more likely to be affected by plant operation (indicator stations), as well as comparisons between preoperational and operational sample results.

FNP is owned by Alabama Power Company (APCo) and operated by Southern Nuclear Operating Company. It is located in Houston County, Alabama approximately fifteen miles east of Dothan, Alabama on the west bank of the Chattahoochee River. Unit 1, a Westinghouse Electric Corporation Pressurized Water Reactor (PWR) with a licensed core thermal power output of 2775 MegaWatts thermal (MWt), achieved initial criticality on August 9, 1977 and was declared "commercial" on December 1, 1977. Unit 2, also a 2775 MWt Westinghouse PWR, achieved initial criticality on May 8, 1981 and was declared "commercial" on July 30, 1981.

The preoperational stage of the REMP began with initial sample collections in January of 1975. The transition from the preoperational to the operational stage of the REMP was marked by Unit 1 initial criticality.

A description of the REMP is provided in Section 2 of this report. An annual summary of the results of the analyses of REMP samples is provided in Section 3. A discussion of the results, including assessments of any radiological impacts upon the environment and the results of the land use census are provided in Section 4. The results of the Interlaboratory Comparison Program (ICP) are provided in Section 5. Conclusions are provided in Section 6.

2.0 REMP DESCRIPTION

A summary description of the REMP is provided in Table 2-1. This table summarizes the program as it meets the requirements outlined in ODCM Table 4-1. It details the sample types to be collected and the analyses to be performed in order to monitor the airborne, direct radiation, waterborne and ingestion pathways, and also delineates the collection and analysis frequencies. In addition, Table 2-1 describes the locations of the indicator, community and control stations as described in ODCM Table 4-4 and the identification of each sample according to station location and analysis type. The stations are also depicted on maps in Figures 2-1 through 2-3.

The location of each REMP station for gaseous releases is described by its direction and distance from a point midway between the Unit 1 and Unit 2 plant vent stacks. The surrounding area is divided into 16 azimuthal sectors which are centered on the major compass points; each sector is numbered sequentially clockwise and oriented so that the centerline of sector 16 is due north. Each sampling station is identified by a four digit number. The first two digits indicate the sector number, and the last two digits indicate the distance from the origin to the nearest mile. For example, air monitoring station 0215 is located approximately 15 miles northeast of the origin. The locations for the sampling stations along the river are identified by the nearest River Mile (RM) which is the distance along the navigable portion of the Chattahoochee River upstream of the Jim Woodruff Dam near Chattahoochee, Florida. The approximate locations of the plant discharge and intake structures are at RM 43.5 and 43.8, respectively.

The samples are collected by the plant's technical staff, except for fish and river sediment samples which are collected by APCo Environmental Field Services personnel.

All laboratory analyses were performed by Georgia Power Company's Environmental Laboratory (EL) in Smyrna, Georgia.

TABLE 2-1 (SHEET 1 of 7)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway with Sample Types and Locations (sector-miles)	**Sample Identification**	**Sampling and Collection Frequency**	**Type and Frequency of Analysis**
AIRBORNE Particulates		Continuous sampler operation with sample collection weekly.	Particulate sampler: Analyze for gross beta radioactivity ≥ 24 hours following filter change. Perform gamma isotopic analysis on each sample when gross beta activity is > 10 times the yearly mean of control samples. Perform gamma isotopic analysis on composite sample (by location) quarterly.
Indicator Stations: River Intake Structure (ESE-0.8) South Perimeter (SSE-1.0) Plant Entrance (WSW-0.9) North Perimeter (N-0.8)	 PI-0501 PI-0701 PI-1101 PI-1601		
Control Stations: Blakely GA (NE-15) Neals Landing, FL (SSE-18) Dothan, AL (W-18)	 PB-0215 PB-0718 PB-1218		
Community Stations: GA Pacific Paper Co. (SSE-3) Ashford, AL (WSW-8) Columbia, AL (N-5)	 PC-0703 PC-1108 PC-1605		

TABLE 2-1 (SHEET 2 of 7)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway with Sample Types and Locations (sector-miles)	**Sample Identification**	**Sampling and Collection Frequency**	**Type and Frequency of Analysis**
Iodine		Continuous sampler operation with sample collection weekly	Radioiodine canister: Analyze each sample for I-131 weekly.
Indicator Stations: River Intake Structure (ESE-0.8) South Perimeter (SSE-1.0) Plant Entrance (WSW-0.9) North Perimeter (N-0.8)	 II-0501 II-0701 II-1101 II-1601		
Control Station: Blakely, GA (NE-15) Neals Landing, FL (SSE-18) Dothan, AL (W-18)	 IB-0215 IB-0718 IB-1218		
Community Station: GA Pacific Paper Co. (SSE-3)	IC-0703		
DIRECT RADIATION TLD		Quarterly	Gamma dose: Read each badge quarterly
Indicator Stations: Plant Perimeter (NNE-0.9) (NE-1.0) (ENE-0.9) (E-0.8) (ESE-0.8)	 RI-0101 RI-0201 RI-0301 RI-0401 RI-0501		

TABLE 2-1 (SHEET 3 of 7)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway with Sample Types and Locations (sector-miles)	Sample Identification	Sampling and Collection Frequency	Type and Frequency of Analysis
(SE-1.1)	RI-0601		
(SSE-1.0)	RI-0701		
(S-1.0)	RI-0801		
(SSW-1.0)	RI-0901		
(SW-0.9)	RI-1001		
(WSW-0.9)	RI-1101		
(W-0.8)	RI-1201		
(WNW-0.8)	RI-1301		
(NW-1.1)	RI-1401		
(NNW-0.9)	RI-1501		
(N-0.8)	RI-1601		
Control Stations:			
Blakely, GA (NE-15)	RB-0215		
Neals Landing, FL (SSE-18)	RB-0718		
Dothan, AL (W-15)	RB-1215		
Dothan, AL (W-18)	RB-1218		
Webb, AL (WNW-11)	RB-1311		
Haleburg, AL (N-12)	RB-1612		
Community Station By sector			
(NNE-4)	RC-0104		
(NE-4)	RC-0204		
(ENE-4)	RC-0304		
(E-5)	RC-0405		
(ESE-5)	RC-0505		
(SE-5)	RC-0605		
(SSE-3)	RC-0703		

TABLE 2-1 (SHEET 4 of 7)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway with Sample Types and Locations (sector-miles)	**Sample Identification**	**Sampling and Collection Frequency**	**Type and Frequency of Analysis**
(S-5) (SSW-4) (SW-5) (WSW-4) (W-4) (WNW-4) (NW-4) (NNW-4) (N-5) Of Special Interest: Nearest Residence (SW-1.2) City of Ashford, AL (WSW-8.0)	RC-0805 RC-0904 RC-1005 RC-1104 RC-1204 RC-1304 RC-1404 RC-1504 RC-1605 RC-1001 RC-1108		
WATERBORNE Surface Water		Aliquots taken with proportional semi-continuous sampler, having a minimum sampling frequency not exceeding two hours, collected weekly for 4 week composites and quarterly composites	Gamma isotopic analysis of each 4 week composite sample. Tritium analysis for each quarterly composite.
Indicator Station: Paper Mill, (~3 miles downstream of plant discharge, RM 40)	WRI		
Control Station: Upstream of Andrews Lock and dam (~3 miles upstream of the plant intake, RM 47)	WRB		

TABLE 2-1 (SHEET 5 of 7)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway with Sample Types and Locations (sector-miles)	Sample Identification	Sampling and Collection Frequency	Type and Frequency of Analysis
Ground Water		Grab sample quarterly	Gamma isotopic, I-131 and tritium analyses of each sample quarterly
Indicator Station: Paper Mill Well (SSE-4)	WGI-07		
Control Station: Whatley Residence Well (SW-1.2)	WGB-10		
River Sediment		Grab sample semiannually	Gamma isotopic analysis of each sample semiannually
Indicator Station: Downstream of plant discharge at Smith's Bend (RM 41)[a]	RSI		
Control Station: Upstream of plant discharge at Andrews Lock & Dam Reservoir (RM 48)[a]	RSB		
INGESTION Milk		Grab sample biweekly	Gamma isotopic and I-131 analyses of each sample biweekly
Control Station: Robert Weir Dairy Donaldsonville, GA (SSE - 14)	MB-0714		

TABLE 2-1 (SHEET 6 of 7)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway with Sample Types and Locations (sector-miles)	**Sample Identification**	**Sampling and Collection Frequency**	**Type and Frequency of Analysis**
Fish		Grab sample semiannually for Game Fish and Bottom Feeding Fish	Gamma isotopic analysis on the edible portions of each sample semiannually
Indicator Stations: Downstream of plant discharge in vicinity of Smith's Bend (RM 41)[b]	FGI & FBI		
Control Station: Upstream of plant discharge in Andrews Lock & Dam Reservoir (RM 48)[b]	FGB & FBB		
Forage		Grab sample from forage every 4 weeks.	Gamma isotopic analysis of each sample every 4 weeks.
Indicator Station: South Southeast Perimeter (SSE-1.0) North Perimeter (N-0.8)	FI-0701 FI-1601		
Control Station: Dothan, AL (W-18)	FB-1218		

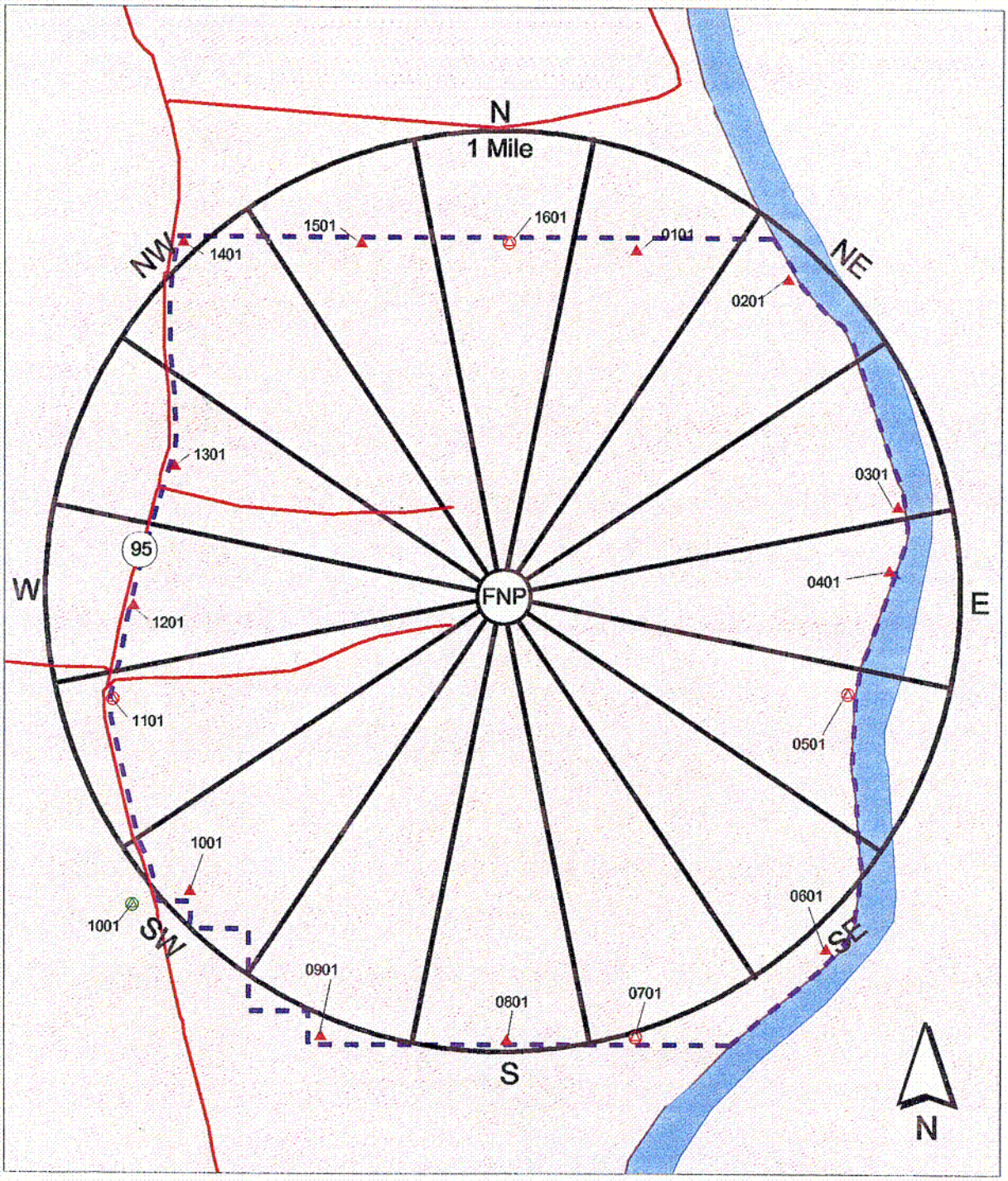
TABLE 2-1 (SHEET 7 of 7)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

NOTATIONS

a. These collections are normally made at river mile 41.3 for the indicator station and mile 47.8 for the control station; however, due to river bottom sediment shifting caused by high flows, dredging, etc., collections may be made from river mile 40 to 42 for the indicator station and from river mile 47 to 49 for the control station.

b. Since a few miles of river water may be needed to obtain adequate fish samples, these river mile positions represent the approximate locations about which the catches are taken. Collections for the indicator station should be from river mile 37.5 to 42.5 and for the control station from river mile 47 to 52.

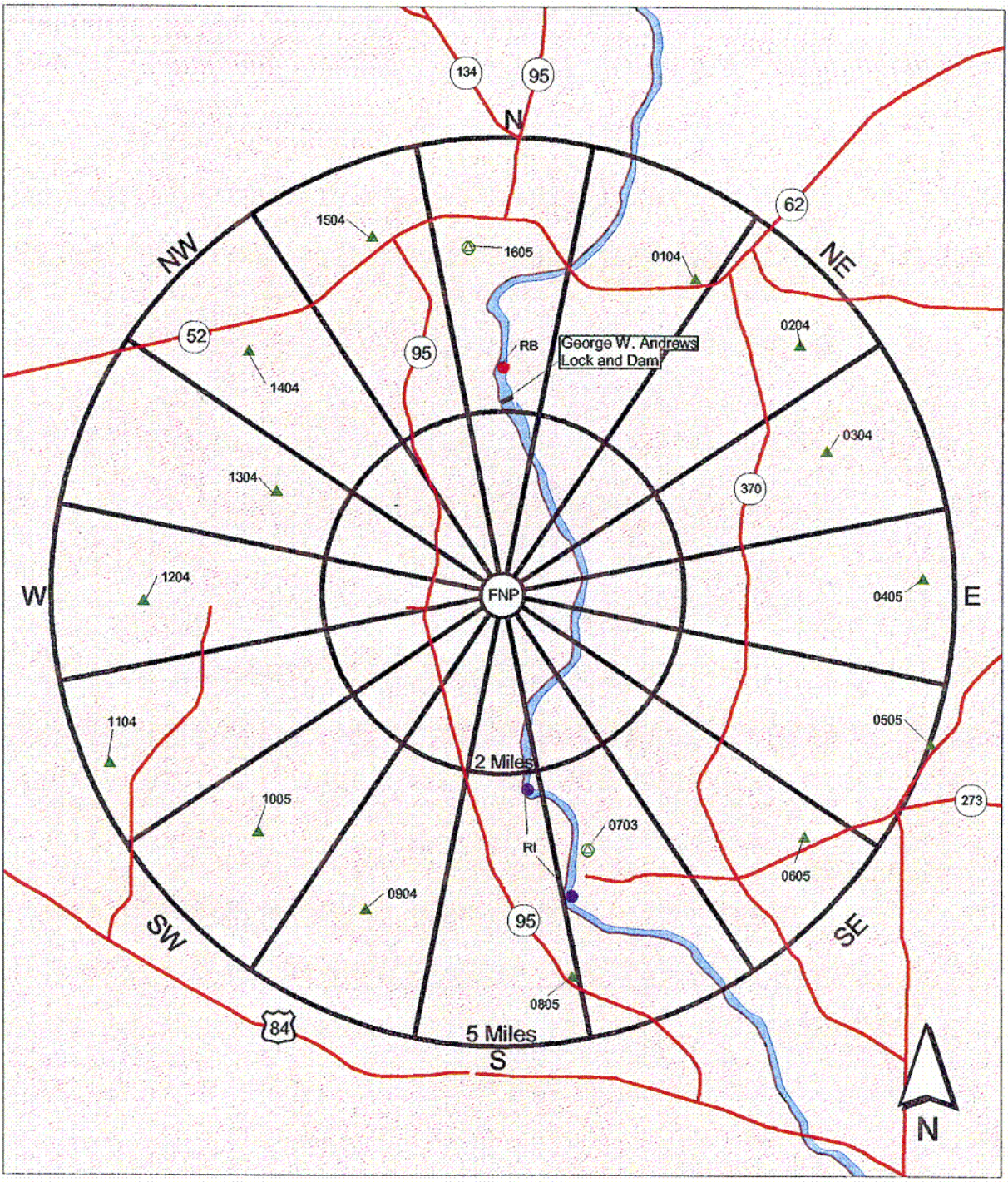


Radiological Environmental Sampling Locations			
	Indicator	Control	Community
TLD	▲	▲	▲
Other	●	●	●
TLD & Other	△	△	△

REMP Stations Near the Plant Perimeter

Figure 2-1

C01

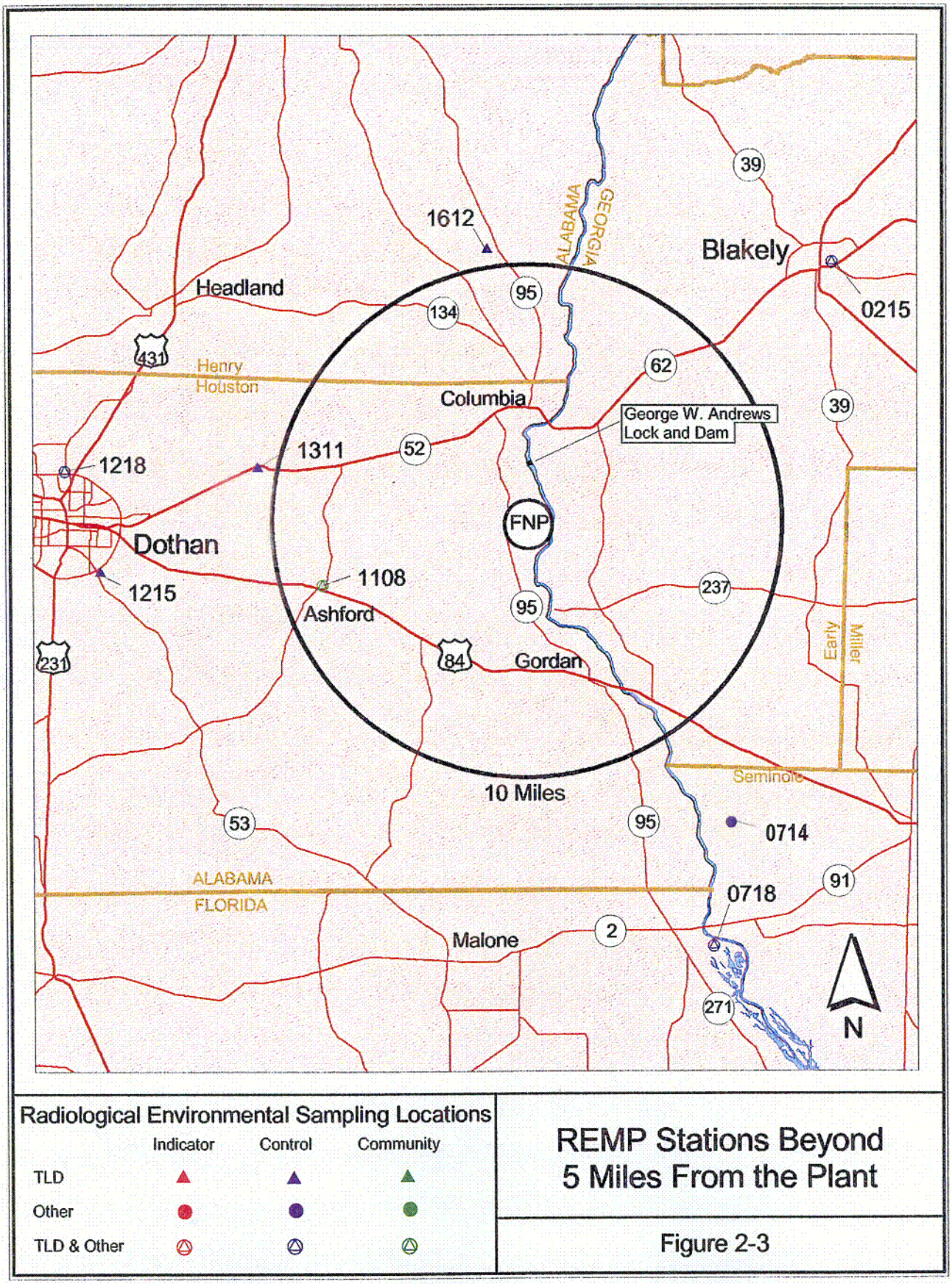


Radiological Environmental Sampling Locations			
	Indicator	Control	Community
TLD	▲	▲	▲
Other	●	●	●
TLD & Other	△	△	△

REMP Stations 2 to 5 Miles From the Plant

Figure 2-2

C02



Radiological Environmental Sampling Locations			
	Indicator	Control	Community
TLD	▲	▲	▲
Other	●	●	●
TLD & Other	△	△	△

REMP Stations Beyond 5 Miles From the Plant

Figure 2-3

C03

3.0 RESULTS SUMMARY

In accordance with ODCM 7.1.2.1, the summarized and tabulated results for all of the regular samples collected for the year at the designated indicator, community and control stations are presented in Table 3-1. The format of Table 3-1 is similar to Table 3 of the Nuclear Regulatory Commission (NRC) Branch Technical Position, "An Acceptable Radiological Environmental Monitoring Program" Revision 1, November 1979. Results for samples collected at locations other than those listed in Table 2-1 are discussed in Section 4 under the particular sample type.

As indicated in ODCM 7.1.2.1, the results for naturally-occurring radionuclides that are also found in the plant's effluent releases must be reported along with man-made radionuclides. The radionuclide, Be-7, which occurs abundantly in nature has been found in the plant's liquid effluent. No other naturally occurring radionuclides are found in the plants' liquid effluent releases. Therefore, the only radionuclides of interest in the samples monitoring liquid releases (surface water, fish, and river sediment) are the man-made radionuclides and Be-7, while only the man-made radionuclides are of interest for the other REMP samples. During 2001, Be-7 was not found in any of the REMP samples monitoring liquid releases.

TABLE 3-1 (SHEET 1 of 6)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY

Farley Nuclear Plant, Docket Nos. 50-348 and 50-364
Houston County, Alabama

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Minimum Detectable Concentration (MDC) (a)	Indicator Locations Mean (b), Range (Fraction)	Indicator Location with the Highest Annual Mean		Community Locations Mean (b), Range (Fraction)	Control Locations Mean(b), Range (Fraction)
				Name Distance & Direction	Mean (b), Range (Fraction)		
Airborne Particulates (fCi/m3)	Gross Beta 514	10	16.3 2-41 (206/206)	River Intake Structure 0.8 miles ESE	18.0 6-37 (52/52)	17.3 4-34 (155/155)	17.2 4-47 (153/153)
	Gamma Isotopic 40						
	I-131	70	NDM(c) (0/16)	NA(d)		NDM (0/12)	NDM (0/12)
	Cs-134	50	NDM (0/16)	NA		NDM (0/12)	NDM (0/12)
	Cs-137	60	NDM (0/16)	NA		NDM (0/12)	NDM (0/12)
Airborne Radioiodine (fCi/m3)	I-131 410	70	NDM (0/206)	NA		NDM (0/51)	NDM (0/153)
Direct Radiation (mR/91 days)	Gamma Dose 160	NA	14.9 11-23 (64/64)	Plt. Perimeter 0.8 miles N	14.7 13-16 (4/4)	12.7 10-17 (72/72)	13.4 10-17 (24/24)
Milk (pCi/l)	Gamma Isotopic 26						
	Cs-134	15	NA	NA		NA	NDM (0/26)
	Cs-137	18	NA	NA		NA	NDM (0/26)
	Ba-140	60	NA	NA		NA	NDM (0/26)
	La-140	15	NA	NA		NA	NDM (0/26)
	I-131 26	1	NA	NA		NA	NDM (0/26)

TABLE 3-1 (SHEET 2 of 6)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY

Farley Nuclear Plant, Docket Nos. 50-348 and 50-364
Houston County, Alabama

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Minimum Detectable Concentration (MDC) (a)	Indicator Locations Mean (b), Range (Fraction)	Indicator Location with the Highest Annual Mean		Community Locations Mean (b), Range (Fraction)	Control Locations Mean(b), Range (Fraction)
				Name Distance & Direction	Mean (b), Range (Fraction)		
Forage (pCi/kg wet)	Gamma Isotopic 39						
	I-131	60	NDM (0/26)	NA		NA	NDM (0/13)
	Cs-134	60	NDM (0/26)	NA		NA	NDM (0/13)
	Cs-137	80	NDM (0/26)	NA		NA	NDM (0/13)
Ground Water (pCi/l)	H-3 8	2000	NDM (0/4)	NA		NA	NDM (0/4)
	I-131 8	1	NDM (0/4)	NA		NA	NDM (0/4)
	Gamma Isotopic 8						
	Mn-54	15	NDM (0/4)	NA		NA	NDM (0/4)
	Fe-59	30	NDM (0/4)	NA		NA	NDM (0/4)
	Co-58	15	NDM (0/4)	NA		NA	NDM (0/4)
	Co-60	15	NDM (0/4)	NA		NA	NDM (0/4)
	Zn-65	30	NDM (0/4)	NA		NA	NDM (0/4)
	Zr-95	30	NDM (0/4)	NA		NA	NDM (0/4)
	Nb-95	15	NDM (0/4)	NA		NA	NDM (0/4)

TABLE 3-1 (SHEET 3 of 6)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Farley Nuclear Plant, Docket Nos. 50-348 and 50-364
Houston County, Alabama

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Minimum Detectable Concentration (MDC) (a)	Indicator Locations Mean (b), Range (Fraction)	Indicator Location with the Highest Annual Mean		Community Locations Mean (b), Range (Fraction)	Control Locations Mean(b), Range (Fraction)
				Name Distance & Direction	Mean (b), Range (Fraction)		
	Cs-134	15	NDM (0/4)	NA		NA	NDM (0/4)
	Cs-137	18	NDM (0/4)	NA		NA	NDM (0/4)
	Ba-140	60	NDM (0/4)	NA		NA	NDM (0/4)
	La-140	15	NDM (0/4)	NA		NA	NDM (0/4)
Surface Water (pCi/l)	H-3 8	3000	252 204-344 (3/4)	Ga Pacific Paper Co. RM 40	252 204-344 (3/4)	NA	NDM
	Gamma Isotopic 26						
	Be-7	124 (e)	NDM (0/13)	NA		NA	NDM (0/13)
	Mn-54	15	NDM (0/13)	NA		NA	NDM (0/13)
	Fe-59	30	NDM (0/13)	NA		NA	NDM (0/13)
	Co-58	15	NDM (0/13)	NA		NA	NDM (0/13)
	Co-60	15	NDM (0/13)	NA		NA	NDM (0/13)
	Zn-65	30	NDM (0/13)	NA		NA	NDM (0/13)
	Zr-95	30	NDM (0/13)	NA		NA	NDM (0/13)
	Nb-95	15	NDM (0/13)	NA		NA	NDM (0/13)

TABLE 3-1 (SHEET 4 of 6)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY
Farley Nuclear Plant, Docket Nos. 50-348 and 50-364
Houston County, Alabama

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Minimum Detectable Concentration (MDC) (a)	Indicator Locations Mean (b), Range (Fraction)	Indicator Location with the Highest Annual Mean		Community Locations Mean (b), Range (Fraction)	Control Locations Mean(b), Range (Fraction)
				Name Distance & Direction	Mean (b), Range (Fraction)		
	I-131	15 (f)	NDM (0/13)	NA		NA	NDM (0/13)
	Cs-134	15	NDM (0/13)	NA		NA	NDM (0/13)
	Cs-137	18	NDM (0/13)	NA		NA	NDM (0/13)
	Ba-140	60	NDM (0/13)	NA		NA	NDM (0/13)
	La-140	15	NDM (0/13)	NA		NA	NDM (0/13)
Bottom Feeding Fish (pCi/kg wet)	Gamma Isotopic 4						
	Be-7	655 (e)	NDM (0/2)	NA		NA	NDM (0/2)
	Mn-54	130	NDM (0/2)	NA		NA	NDM (0/2)
	Fe-59	260	NDM (0/2)	NA		NA	NDM (0/2)
	Co-58	130	NDM (0/2)	NA		NA	NDM (0/2)
	Co-60	130	NDM (0/2)	NA		NA	NDM (0/2)
	Zn-65	260	NDM (0/2)	NA		NA	NDM (0/2)
	Cs-134	130	NDM (0/2)	NA		NA	NDM (0/2)
	Cs-137	150	9.8 9.8-9.8 (1/2)	Smith's Bend 2 miles Downstream	9.8 9.8-9.8 (1/2)	NA	NDM (0/2)

TABLE 3-1 (SHEET 5 of 6)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY

Farley Nuclear Plant, Docket Nos. 50-348 and 50-364
Houston County, Alabama

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Minimum Detectable Concentration (MDC) (a)	Indicator Locations Mean (b), Range (Fraction)	Indicator Location with the Highest Annual Mean		Community Locations Mean (b), Range (Fraction)	Control Locations Mean(b), Range (Fraction)
				Name Distance & Direction	Mean (b), Range (Fraction)		
Game Fish (pCi/kg wet)	Gamma Isotopic 4						
	Be-7	655 (e)	NDM (0/2)	NA		NA	NDM (0/2)
	Mn-54	130	NDM (0/2)	NA		NA	NDM (0/2)
	Fe-59	260	NDM (0/2)	NA		NA	NDM (0/2)
	Co-58	130	NDM (0/2)	NA		NA	NDM (0/2)
	Co-60	130	NDM (0/2)	NA		NA	NDM (0/2)
	Zn-65	260	NDM (0/2)	NA		NA	NDM (0/2)
	Cs-134	130	NDM (0/2)	NA		NA	NDM (0/2)
	Cs-137	150	22.4 19.6 - 25.2 (2/2)	Smith's Bend 2 miles Downstream	22.4 19.6 - 25.2 (2/2)	NA	12.3 9.7 – 14.9 (2/2)
River Shoreline Sediment (pCi/kg dry)	Gamma Isotopic 4						
	Be-7	655 (e)	NDM (0/2)	NA		NA	NDM (0/2)
	Cs-134	150	NDM (0/2)	NA		NA	NDM (0/2)
	Cs-137	180	NDM (0/2)	NA		NA	NDM (0/2)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY

Farley Nuclear Plant, Docket Nos. 50-348 and 50-364
Houston County, Alabama

NOTATIONS

a. The MDC is defined in ODCM 10.1. Except as noted otherwise, the values listed in this column are the detection capabilities required by ODCM Table 4-3 (Table 4-1 of this report). The values listed in this column are a priori (before the fact) MDCs. In practice, the a posteriori (after the fact) MDCs are generally lower than the values listed. Any a posteriori MDC greater than the value listed in this column is discussed in Section 4.

b. Mean and range are based upon detectable measurements only. The fraction of all measurements at a specified location that are detectable is placed in parentheses.

c. No Detectable Measurement(s).

d. Not Applicable.

e. The EL has determined that this value may be routinely attained under normal conditions. No value is provided in Table 4-1 of this report.

f. If a drinking water pathway exists, a value of 1 pCi/l would be used. See note b of Table 4-1 of this report.

4.0 DISCUSSION OF RESULTS

Included in this section are evaluations of the laboratory results for the various sample types. Comparisons were made between the difference in mean values for pairs of station groups (e.g., indicator and control stations, or, community and control stations) and the calculated Minimum Detectable Difference (MDD) between these pairs, at the 99% Confidence Level (CL). The MDD was determined using the standard Student's t-test. A difference in the mean values which was less than the MDD was considered to be statistically indiscernible.

The 2001 results were compared with past results, including those obtained during preoperation. As appropriate, results were compared with their Minimum Detectable Concentrations (MDC) and Reporting Levels (RL) which are listed in Tables 4-1 and 4-2 of this report, respectively. The required MDCs were achieved during laboratory sample analysis. Any anomalous results are explained within this report.

Results of interest are graphed to show historical trends. The data points are tabulated and included in this report. The points plotted and provided in the tables represent mean values of only detectable results. Periods for which no detectable measurements (NDM) were observed, or periods for which values were not applicable (e.g., milk indicator, etc.), are plotted as and listed in the tables as 0's.

Table 4-1

Minimum Detectable Concentrations (MDC)

Analysis	Water (pCi/l)	Airborne Particulate or Gases (fCi/m3)	Fish (pCi/kg) wet	Milk (pCi/l)	Grass or Leafy Vegetation (pCi/kg) wet	Sediment (pCi/kg) dry
Gross Beta	4	10				
H-3	2000 (a)					
Mn-54	15		130			
Fe-59	30		260			
Co-58	15		130			
Co-60	15		130			
Zn-65	30		260			
Zr-95	30					
Nb-95	15					
I-131	1 (b)	70		1	60	
Cs-134	15	50	130	15	60	150
Cs-137	18	60	150	18	80	180
Ba-140	60			60		
La-140	15			15		

(a) If no drinking water pathway exists, a value of 3000 pCi/l may be used.

(b) If no drinking water pathway exists, a value of 15 pCi/l may be used.

Table 4-2

Reporting Levels (RL)

Analysis	Water (pCi/l)	Airborne Particulate or Gases (fCi/m3)	Fish (pCi/kg) wet	Milk (pCi/l)	Grass or Leafy Vegetation (pCi/kg) wet
H-3	20,000 (a)				
Mn-54	1000		30,000		
Fe-59	400		10,000		
Co-58	1000		30,000		
Co-60	300		10,000		
Zn-65	300		20,000		
Zr-95	400				
Nb-95	700				
I-131	2 (b)	900		3	100
Cs-134	30	10,000	1000	60	1000
Cs-137	50	20,000	2000	70	2000
Ba-140	200			300	
La-140	100			400	

(a) This is the 40 CFR 141 value for drinking water samples. If no drinking water pathway exists, a value of 30,000 may be used.

(b) If no drinking water pathway exists, a value of 20 pCi/l may be used.

Atmospheric nuclear weapons tests from the mid 1940's through 1980 distributed man-made nuclides around the world. The most recent atmospheric tests in the 1970's and in 1980 had a significant impact upon the radiological concentrations found in the environment prior to and during preoperation, and the earlier years of operation. Some long-lived radionuclides, such as Cs-137, continue to have some impact.

Significant upward trends also followed the Chernobyl incident, which began on April 26, 1986.

In accordance with ODCM 4.1.1.2.1, deviations from the required sampling schedule are permitted if samples are unobtainable due to hazardous conditions, unavailability, inclement weather, equipment malfunction or other just reasons. Deviations from conducting the REMP as described in Table 2-1 are summarized in Table 4-3 along with their causes and resolutions.

All results were tested for conformance with Chauvenet's criterion (G. D. Chase and J. L. Rabinowitz, Principles of Radioisotope Methodology, Burgess Publishing Company, 1962, pages 87-90) to identify values which differed from the mean of a set by a statistically significant amount. Identified outliers were investigated to determine the reason(s) for the variation. If equipment malfunction or other valid physical reasons were identified as causing the variation, the anomalous result was excluded from the data set as non-representative. No data were excluded exclusively for failing Chauvenet's criterion. Data exclusions are discussed in this section under the appropriate sample type.

TABLE 4-3 (SHEET 1 of 3)

DEVIATIONS FROM RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

COLLECTION PERIOD	AFFECTED SAMPLE(S)	DEVIATION	CAUSE	RESOLUTION
01/16/01-01/23/01	PB-0215 and IB-0215	Air sampling was not performed during this sampling period.	Based on totalizer reading and condition of filter, pump apparently had not started following previous filter replacement.	Responsible staff coached on importance of self-verification to confirm that station is operating properly following filter change-out.
01/09/01-02/06/01	WRB	River water sample overfilled sample collection container.	Debris in sample line caused auto-collector failure.	Sample line was replaced and sampler placed back in service.
02/06/01-02/13/01	PC-0703 and IC-0703	Insufficient volume of air sampled.	Airborne wood ash from the nearby paper mill accumulated on the filter and restricted air flow.	Filter replaced to begin new sampling period. (Occasional airborne wood ash from the mill is not preventable.)
02/27/01-03/06/01	PB-0718 and IB-0718	Air sampling was not performed for about 4 hours.	Power was lost to station on 03/03/01 due to severe weather in the area.	Station operated properly following resumption of electrical power
03/20/01-03/27/01	PI-1601 and II-1601	Air sampling was not performed for about 1.5 hours.	Station out of service for faulty pump replacement and for totalizer calibration.	Station returned to service following maintenance and calibration activities.
2nd Quarter 2001	Milk (ICP Sample)	No milk sample was obtained from the vendor that supplies ICP samples for analysis	Administrative error in that steps were not taken to assure that the milk sample would be supplied.	Arrangements made with vendor supplying ICP samples that all appropriate samples will be furnished to GPC EL for analyses.
05/15/01-05/22/01	PI-1601 and II-1601	Air sampling was not performed for about 141 hours.	Filter holder assembly was found detached from pump on 05/22/01. (Sampling equipment had been serviced on 05/16/01.)	Personnel coached regarding self-verification of equipment performance upon returning sampling equipment to service.

TABLE 4-3 (SHEET 2 of 3)

DEVIATIONS FROM RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

COLLECTION PERIOD	AFFECTED SAMPLE(S)	DEVIATION	CAUSE	RESOLUTION
05/22/01-05/29/01	PB-0215 and IB-0215	Air sampling was not performed for about 164 hours.	Malfunction of totalizer due to severe weather in the area.	Replaced totalizer and returned sampler to service on 05/30/01.
05/22/01-05/29/01	PB-0718 and IB-0718	Air sampling was not performed for about 123 hours.	Air sampler inoperative due to blown fuse in pump.	Fuse replaced and station returned to service on 05/29/01.
05/29/01-06/05/01	PB-0215 and IB-0215	Air sampling was not performed for about 30 hours.	Air sampler was out of service for totalizer repair.	Totalizer repair completed and station returned to service on 05/30/01.
05/29/01-06/26/01	WRB	Water sampling did not continue through complete period (105 of typical 112 samples collected).	Autosampler stopped sampling when sample container overfilled.	Sampler collection volume adjusted to value needed to obtain adequate water sample.
07/10/01-07/17/01	PB-0718 and IB-0718	Air sampling was not performed for about 0.6 hours.	Loss of electrical power due to electrical storm in area.	Air sampler continued operation upon restoration of power to station.
07/10/01-07/17/01	PI-1601 and II-1601	Air sampling was not performed for about 140 hours.	Loss of electrical power due to problem with electrical power supply line.	Power restored when a pole line jack was reset by APCO line crew at 1305 hours on 07/17/01.
08/14/01-08/21/01	PB-0718 and IB-0718	Air sampler was found not operating at filter change-out on 08/21/01.	Air sampler inoperative due to blown fuse in pump.	Fuse replaced and air sampler returned to service on 08/21/01.
08/21/01-08/28/01	PB-0215 and IB-0215	Low sample volume discovered at filter change-out on 08/28/01.	Low air sample volume due to loose air trap connections.	Air trap tightened and air sampler returned to service on 08/28/01.

TABLE 4-3 (SHEET 3 of 3)

DEVIATIONS FROM RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

COLLECTION PERIOD	AFFECTED SAMPLE(S)	DEVIATION	CAUSE	RESOLUTION
08/28/01-09/04/01	PB-0718 and IB-0718	Air sampling was not performed for about 165 hours.	Air sampler inoperative due to blown fuse in pump.	Spare pump placed in service and operation restored at 0940 hours on 09/04/01.
09/04/01-09/11/01	PI-1101 and II-1101	Air sampling was not performed for about 163 hours.	Air sampler inoperative due to totalizer circuit breaker trip.	Totalizer circuit breaker reset and operation restored on 09/11/01.
09/18/01-09/25/01	PC-0703 and IC-0703	Air sampling was not performed for about 1 hour.	Power was lost to air sampler due to severe weather on 09/23/01.	Air sampler operation continued when power was restored.
10/09/01-10/16/01	PB-0718 and IB-0718	Air sampling was not performed for about 2 hours.	Power was lost to sampler due to severe weather on 10/13/01	Air sampler operation continued when power was restored.
10/30/01-11/06/01	PI-1101 and II-1101	Air sampling was not performed for about 164 hours.	Air sampler inoperative due to totalizer circuit breaker trip.	Totalizer circuit breaker reset and operation restored on 11/06/01.
11/06/01-11/13/01	PB-0718 and IB-0718	Air sampling station was found without power on 11/13/01. Air sampling was not performed for about 1.5 hours.	Air sampler inoperative due to local power outage.	Air sampler operation continued upon restoration of power at 0940 hours on 11/13/01.
11/20/01-11/27/01	PI-1101 and II-1101	Air sampler was found not operating at filter change-out on 11/27/01. Air sampling was not performed for about 18 hours.	Air sampler inoperative due to totalizer circuit breaker trip.	Totalizer circuit breaker reset, sample pump changed out and operation restored at 1530 hrs 11/27/01.

4.1 Land Use Census

In accordance with ODCM 4.1.2, a land use census was completed June 4, 2001. The land use census is used to determine the locations of the nearest permanent residence and milk animal in each of the 16 compass sectors within a distance of 5 miles. A milk animal is a cow or goat producing milk for human consumption. The 2001 survey revealed no changes from the 2000 survey. No milk animals were found within a 5 mile distance. The census results are tabulated in Table 4.1-1.

Table 4.1-1

LAND USE CENSUS RESULTS

Distance in Miles to the Nearest Location in Each Sector

SECTOR	RESIDENCE	MILK ANIMAL
N	2.6	none
NNE	2.5	none
NE	2.4	none
ENE	2.4	none
E	2.8	none
ESE	3.0	none
SE	3.4	none
SSE	none	none
S	4.3	none
SSW	2.9	none
SW	1.2	none
WSW	2.4	none
W	1.3	none
WNW	2.1	none
NW	1.5	none
NNW	2.0	none

The Houston County, Alabama and the Early County, Georgia Extension Agents were contacted for assistance in locating commercial dairy farms and privately owned milk animals within 5 miles of the plant. A list of commercial dairy farms in Houston County was provided; there are no commercial dairy farms in Early County. Neither agent knew of privately owned milk animals within 5 miles of FNP. In addition, field surveys were conducted in the plant vicinity along the state and county highways and the interconnecting secondary roads. No milk animals were found within 5 miles of the plant.

ODCM 4.1.2.2.1 requires a new controlling receptor to be determined, if the land use census identifies a location that yields a calculated receptor dose greater than the one in current use. Neither current sampling locations nor the controlling receptor were affected by the 2001 land use census results. The current controlling receptor as described in ODCM Table 3-7 remains a child in the SW Sector at 1.2 miles.

4.2 Airborne

As specified in Table 2-1 and shown in Figures 4.2-1 and 4.2-2, airborne particulate filters and charcoal canisters are collected weekly at 4 indicator, 3 control and 3 community stations. Particulate filters are collected at all of the stations while the charcoal canisters are collected at all but 2 of the community stations. At each location, air is continuously drawn through a glass fiber filter to retain airborne particulate and, as appropriate, an activated charcoal canister is placed in series to adsorb radioiodine.

During the weekly period 05/15/01 – 05/22/01, air sampling was conducted at only one control station. This is contrary to the requirements stated in Table 4-1 of the FNP ODCM, which requires at least two air sample control stations to be in operation at all times. The deviations associated with the two control station air samplers that were out of service during this period are described in Table 4-3.

Each particulate filter is counted for gross beta activity. A quarterly gamma isotopic analysis is performed on a composite of the air particulate filters for each station. Each charcoal canister is analyzed for I-131.

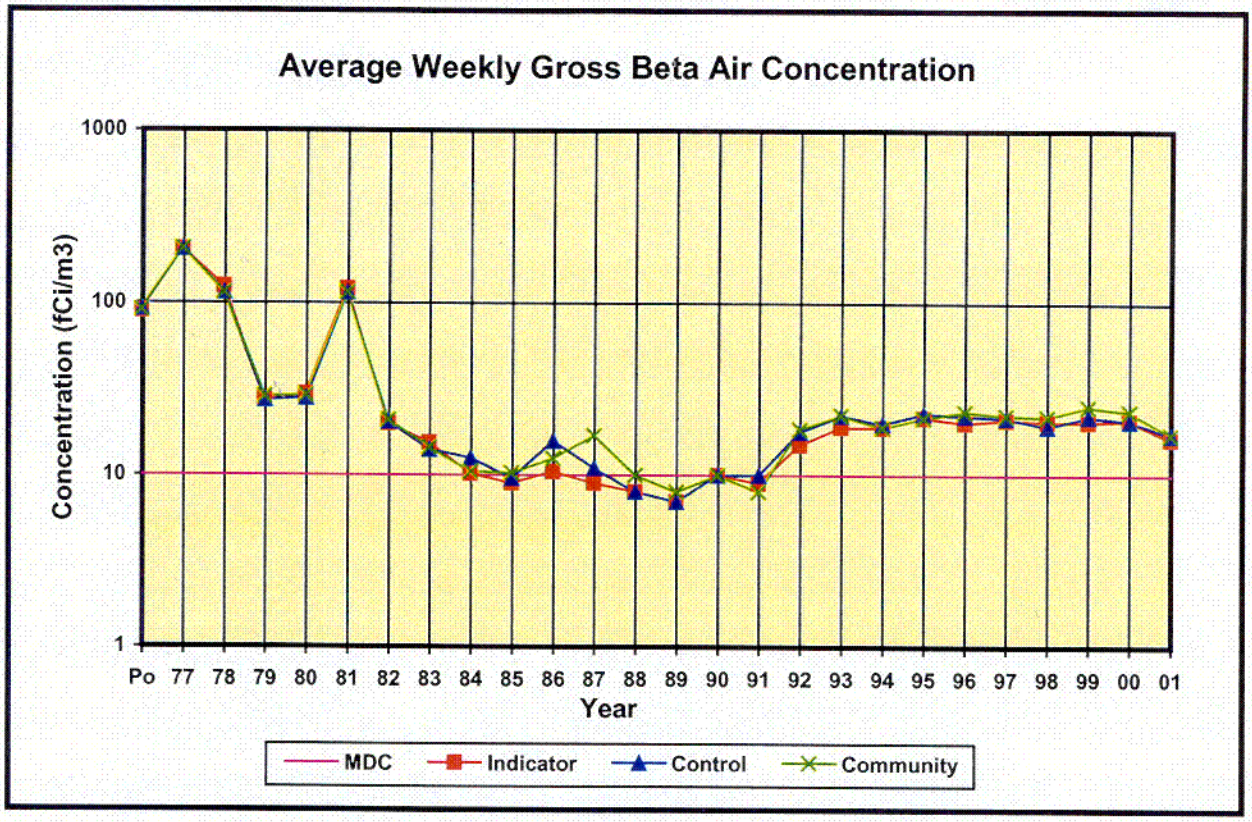
As provided in Table 3-1, the 2001 annual average weekly gross beta activity was 16.3 fCi/m^3 at the indicator stations and 17.2 fCi/m^3 at the control stations. However, the difference of 0.9 fCi/m^3 between the two averages is not statistically discernible since the MDD for these two average values is 1.7 fCi/m^3.

As shown in Table 3-1, the 2001 annual average weekly gross beta concentration was 17.3 fCi/m^3 at community stations. Although the community stations average was 0.1 fCi/m^3 higher than the average for the control stations, the difference is not statistically discernible since it is less than the MDD of 1.7 fCi/m^3 between the two averages.

Due to the weapons tests during preoperation and the early years of operation, the average gross beta concentrations were 5 to 10 times greater than those currently being measured. By the mid 1980s, the readings had diminished to about half the current levels. These annual averages approximately doubled as a consequence of the Chernobyl incident in 1986; this impact faded away in approximately 2 years. The installation of new air monitoring equipment in 1992 yielded an approximate factor of 2 increase in the readings. Since then, the levels have been fairly flat.

The historical trending of the average weekly gross beta air concentrations for each year of operation and the preoperational period at the indicator, control and community stations is plotted in Figure 4.2-1 and listed in Table 4.2-1. In general, there is a close agreement between the results for the indicator, control and community stations. This close agreement supports the position that the plant's contribution to gross beta concentration in air is insignificant.

Figure 4.2-1



C04

Table 4.2-1

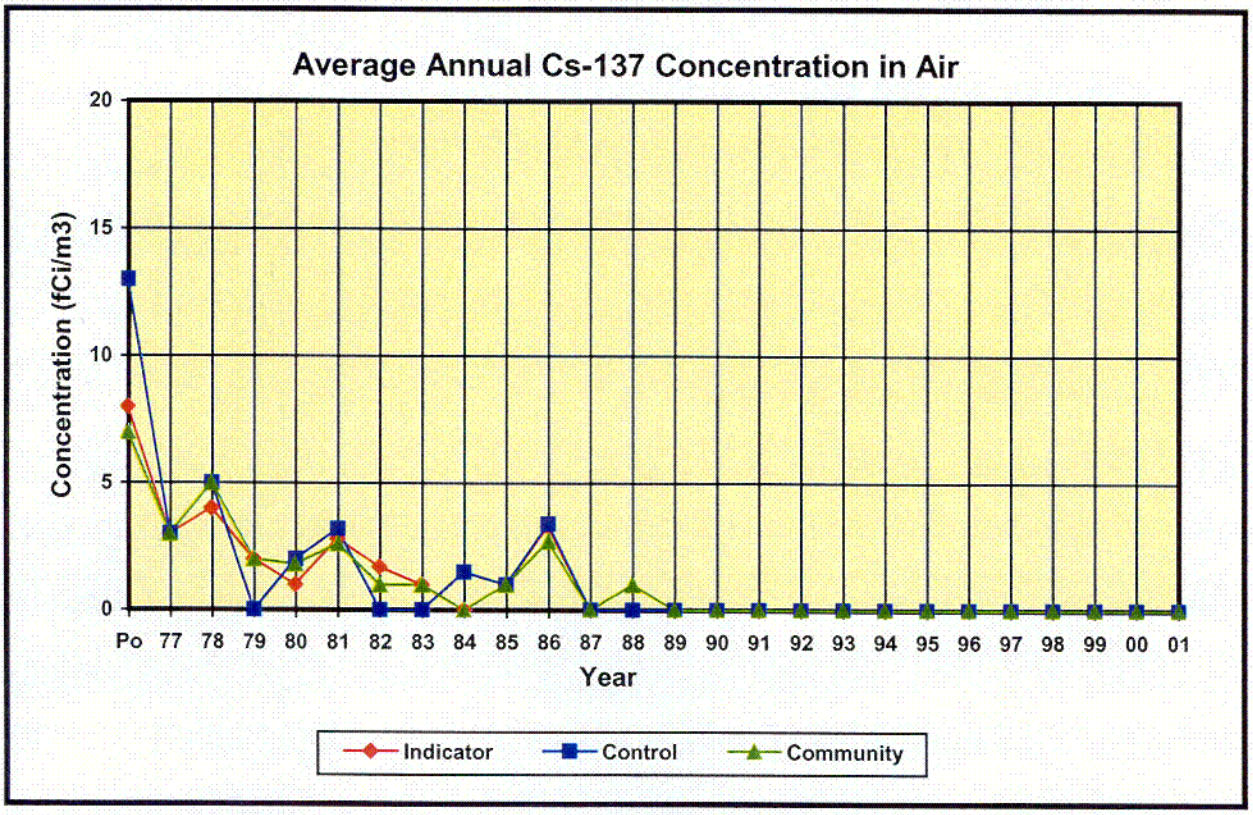
Average Weekly Gross Beta Air Concentration

Period	Indicator (fCi/m3)	Control (fCi/m3)	Community (fCi/m3)
Pre-op	90	92	91
1977	205	206	206
1978	125	115	115
1979	27.3	27.3	28.7
1980	29.7	28.1	29.2
1981	121	115	115
1982	20.0	20.4	21.0
1983	15.5	14.1	14.5
1984	10.2	12.6	10.5
1985	9.0	9.6	10.3
1986	10.5	15.8	12.5
1987	9.0	11.0	17.0
1988	8.0	8.0	10.0
1989	7.0	7.0	8.0
1990	10.0	10.0	10.0
1991	9.0	10.0	8.0
1992	15.0	17.9	18.5
1993	19.1	22.3	22.4
1994	19.0	20.0	19.0
1995	21.7	22.9	21.6
1996	20.3	22.3	23.5
1997	21.1	21.6	22.4
1998	20.6	19.3	22.0
1999	20.5	22.1	25.2
2000	20.9	20.8	23.6
2001	16.3	17.2	17.3

During 2001, no man-made radionuclides were detected from the gamma isotopic analysis of the quarterly composites of the air particulate filters. This has generally been the case since the impact of the weapons tests and the Chernobyl incident have faded. During preoperation and the early years of operation, a number of fission and activation products were detected. During preoperation, the average levels for Cs-134 and Cs-137 were 22 and 9 fCi/m^3, respectively. In 1986, as a consequence of the Chernobyl incident, Cs-134 and Cs-137 levels of 3 to 4 fCi/m^3 were found. The MDC and RL for Cs-134 are 50 and 10,000 fCi/m^3 and the MDC and RL for Cs-137 are 60 and 20,000 fCi/m^3 respectively.

The historical trending of the annual detectable Cs-137 concentrations for the indicator, control and community stations is provided in Figure 4.2-2 and Table 4.2-2. The trend has been generally downward since preoperation and no positive results have been observed since 1988.

Figure 4.2-2



C05

Table 4.2-2

Average Annual Cs-137 Concentration in Air

Period	Indicator (fCi/m3)	Control (fCi/m3)	Community (fCi/m3)
Pre-op	8	13	7
1977	3.0	3.0	3.0
1978	4.0	5.0	5.0
1979	2.0	0	2.0
1980	1.0	2.0	1.8
1981	2.8	3.2	2.6
1982	1.7	0	1.0
1983	1.0	0	1.0
1984	0	1.5	0
1985	1.0	1.0	1.0
1986	3.3	3.4	2.7
1987	0	0	0
1988	0	0	1
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	0
1993	0	0	0
1994	0	0	0
1995	0	0	0
1996	0	0	0
1997	0	0	0
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	0	0	0

Airborne I-131 was not detected in the charcoal canisters during 2001. In 1978, levels between 40 and 50 fCi/m^3 were found in a few samples and attributed to the Chinese weapons tests; then after the Chernobyl incident, levels up to a few hundred fCi/m^3 were found in some samples. At no other times has airborne I-131 been detected in the environmental samples. The MDC and RL for airborne I-131 are 70 and 900 fCi/m3 respectively.

Table 4-3 lists REMP deviations that occurred during 2001. Not all of the deviations listed in Table 4-3 required data to be excluded from the calculation of the mean values. For air samples, six sets of sample results were excluded for failing Chauvenet's Criterion following equipment malfunctions:

For the period 1/16 – 1/23, Station 0215 experienced no sampler air flow due to air sample pump not being activated following filter replacement.

For the period 2/6 – 2/13, Station 0703 accumulated wood ash on the filter, which caused a reduction in air flow.

For the period 8/28 – 9/4, Station 0718 experienced short run time due to blown fuse.

For the period 9/4 – 9/11, Station 1101 experienced low volume of sampled air due to tripped circuit breaker.

For the period 10/31 – 11/6, Station 1101 experienced low volume of sampled air due to tripped circuit breaker.

For the period 11/6 – 11/13, Station 0718 experienced low volume due to an electrical power outage.

4.3 Direct Radiation

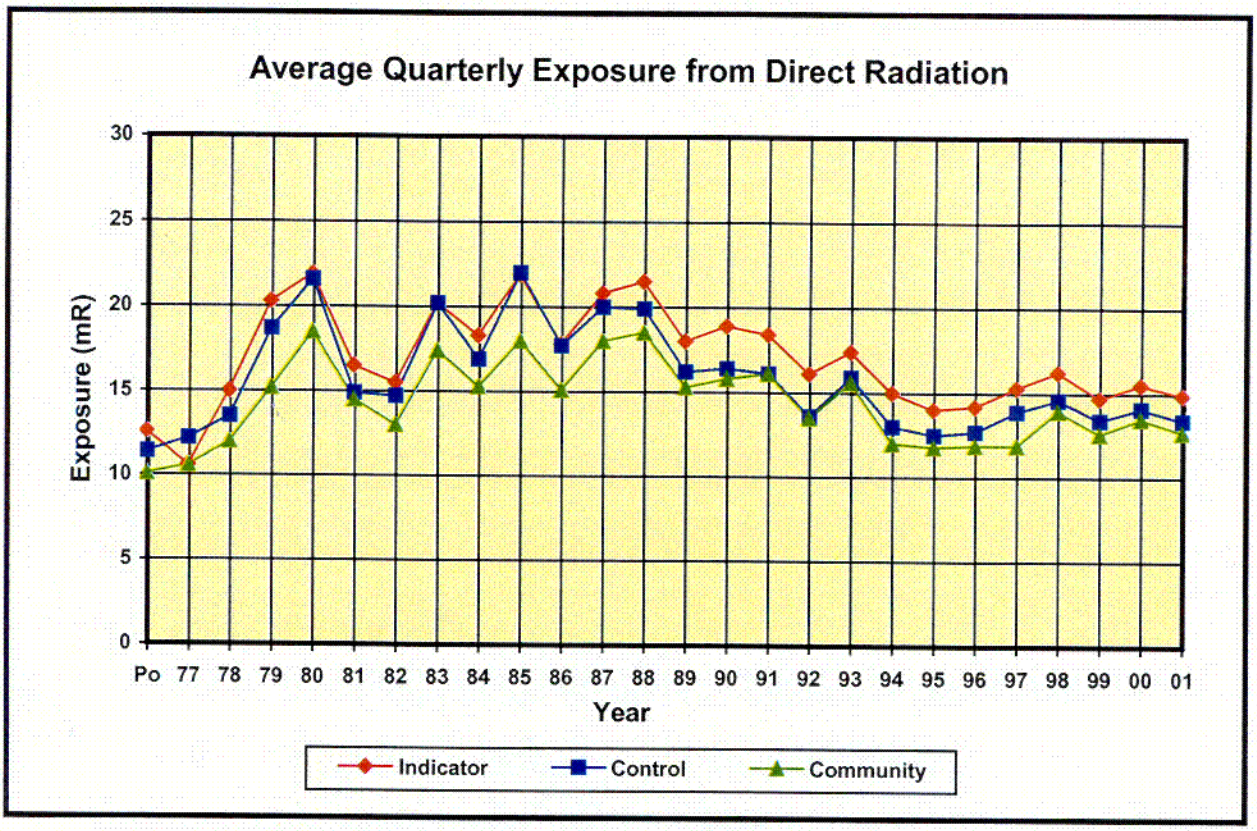
Direct (external) radiation is measured with thermoluminescent dosimeters (TLDs). Two Panasonic UD-814 TLD badges are placed at each station. Each badge contains three phosphors composed of calcium sulfate crystals (with thulium impurity). The gamma dose at each station is based upon the average readings of the phosphors from the two badges. The two badges for each station are placed in thin plastic bags for protection from moisture while in the field. The badges are nominally exposed for periods of a quarter of a year (91 days). An inspection is performed near mid-quarter to assure that all badges are on-station and to replace any missing or damaged badges.

Two TLD stations are established in each of the 16 sectors, to form 2 concentric rings. The inner ring stations are located near the plant perimeter, as shown in Figure 2-1, and the outer ring stations are located at distances of approximately 3 to 5 miles from the plant, as shown in Figure 2-2. The stations forming the inner ring are designated as the indicator stations. The 6 control stations are located at distances greater than 10 miles from the plant, as shown in Figure 2-3. Stations are also provided which monitor special interest areas: the nearest occupied residence (SW at 1.2 miles), as shown in Figure 2-1, and the city of Ashford (WSW at 8 miles), as shown in Figure 2-3. The 16 outer ring stations and the 2 special interest stations are designated as community stations.

As provided in Table 3-1, the average quarterly exposure measured at the indicator stations (inner ring) during 2001was 1.5 mR greater than that acquired at the control stations. Although this small difference is greater than the MDD of 1.49 mR and is therefore statistically discernible, it is consistent with the difference between indicator and control station locations observed during preoperation. The difference of 0.7 mR found between the control stations and community stations is not statistically discernible since the difference is less than the MDD of 0.9 mR.

The historical trending of the average quarterly exposures in units of mR at the indicator, control and community locations are plotted in Figure 4.3-1 and listed in Table 4.3-1. During preoperation the average exposure at the indicator stations was 1.2 mR greater than that for the control stations, but the average over the entire period of operation was only 1.1 mR greater. During preoperation, the average exposure at the control stations was 1.3 mR greater than that at the community stations and the average over the period of operation is 1.5 mR greater. This supports the position that the plant is not contributing significantly to direct radiation in the environment.

Figure 4.3-1



C06

Table 4.3-1

Average Quarterly Exposure from Direct Radiation

Period	Indicator (mR)	Control (mR)	Community (mR)
Pre-op	12.6	11.4	10.1
1977	10.6	12.2	10.6
1978	15.0	13.5	12.0
1979	20.3	18.7	15.2
1980	21.9	21.6	18.5
1981	16.5	14.9	14.5
1982	15.5	14.7	13.0
1983	20.2	20.2	17.4
1984	18.3	16.9	15.3
1985	21.9	22.0	18.0
1986	17.8	17.7	15.1
1987	20.8	20.0	18.0
1988	21.5	19.9	18.5
1989	18.0	16.2	15.3
1990	18.9	16.4	15.8
1991	18.4	16.1	16.1
1992	16.1	13.6	13.5
1993	17.4	15.9	15.6
1994	15.0	13.0	12.0
1995	14.0	12.5	11.8
1996	14.2	12.7	11.9
1997	15.3	13.9	11.9
1998	16.2	14.6	13.9
1999	14.7	13.4	12.6
2000	15.5	14.1	13.5
2001	14.9	13.4	12.7

The standard deviation limit of 1.4 is calculated using a method developed by the American Society for Testing and Materials (ASTM) (ASTM Special Technical Publication 15D, ASTM Manual on Presentation of Data and Control Chart Analysis, Fourth Revision, Philadelphia, PA, October 1976). The calculation is based upon the standard deviations obtained by the EL with the Panasonic UD-814 badges during 1992. This limit serves as a flag to initiate an investigation. To be conservative, readings with a standard deviation greater than 1.4 are excluded since the high standard deviation is interpreted as an indication of unacceptable variation in TLD response.

The TLD results from the following stations were excluded from the data set because their standard deviations were greater than 1.4:

Quarter 1 - 1605A
Quarter 2 - 0215B, 1404B, 0601B and 1601B
Quarter 3 - None
Quarter 4 - None

For the five TLD stations where these badges were located, only the reading of the companion badge was used to determine the quarterly exposure for the station.

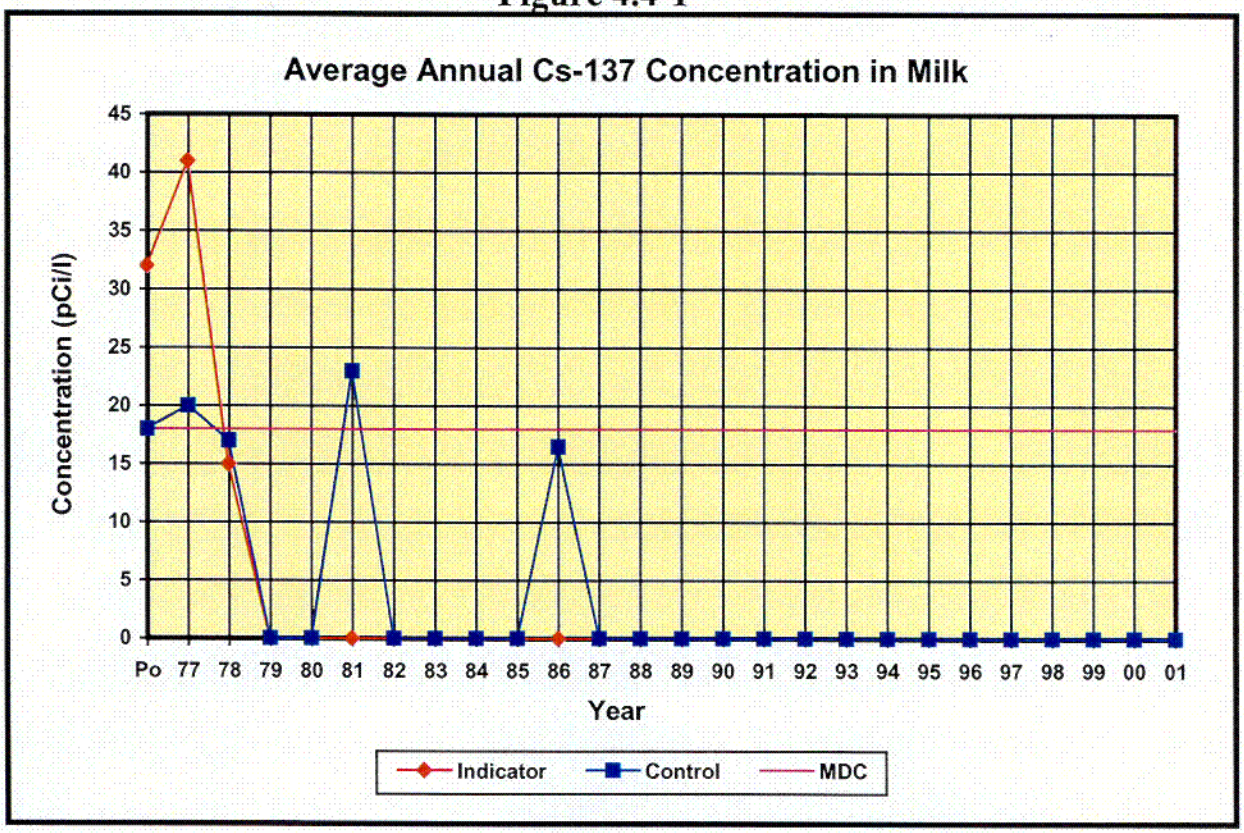
The affected badges were visually inspected under a microscope and the glow curve and test results for the anneal data and the element correction factors were reviewed. No reason was found for the high standard deviations.

4.4 Milk

In accordance with Table 2-1, milk samples are collected biweekly from a control location. No indicator station (a location within five miles of the plant) has been available for milk sampling since 1987. As discussed in Section 4.0, no milk animals were found within five miles of the plant during the 2001 land use census.

Gamma isotopic analyses were performed on each sample as specified in Table 2-1. No man-made radionuclides were identified from the gamma isotopic analysis of the milk samples during 2001. The MDC and RL for Cs-137 in milk are 18 and 70 pCi/l, respectively. The historical trending of the average annual detectable Cs-137 concentration in milk samples is shown in Figure 4.4-1 and Table 4.4-1. Cs-137 has not been detected in milk since 1986. Its presence at that time is attributed to the Chernobyl incident. The earlier detectable results were attributed to the weapons tests.

Figure 4.4-1



C07

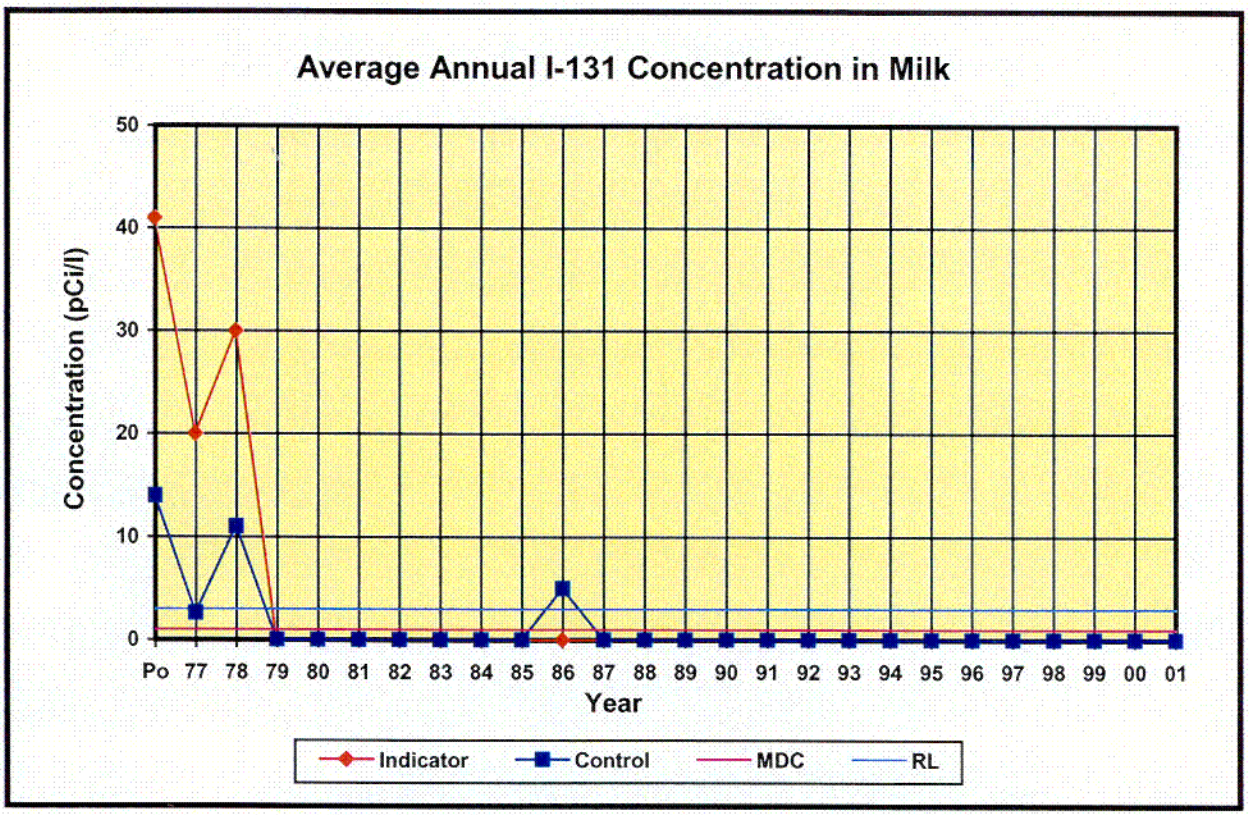
Table 4.4-1

Average Annual Cs-137 Concentration in Milk

Period	Indicator (pCi/l)	Control (pCi/l)
Pre-op	32	18
1977	41	20
1978	15	17
1979	0	0
1980	0	0
1981	0	23.0
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	16.5
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0

As specified in Table 2-1, each sample was analyzed for I-131, which has not been detected in milk since 1986 and its presence at that time is attributed to the Chernobyl incident. The earlier detectable results were attributed to the weapons tests. The MDC and RL for I-131 are 1 and 3 pCi/l, respectively. Figure 4.4-2 and Table 4.4-2 show the historical trending of the average annual detectable I-131 concentration in milk samples.

Figure 4.4-2



COB

Table 4.4-2

Average Annual I-131 Concentration in Milk

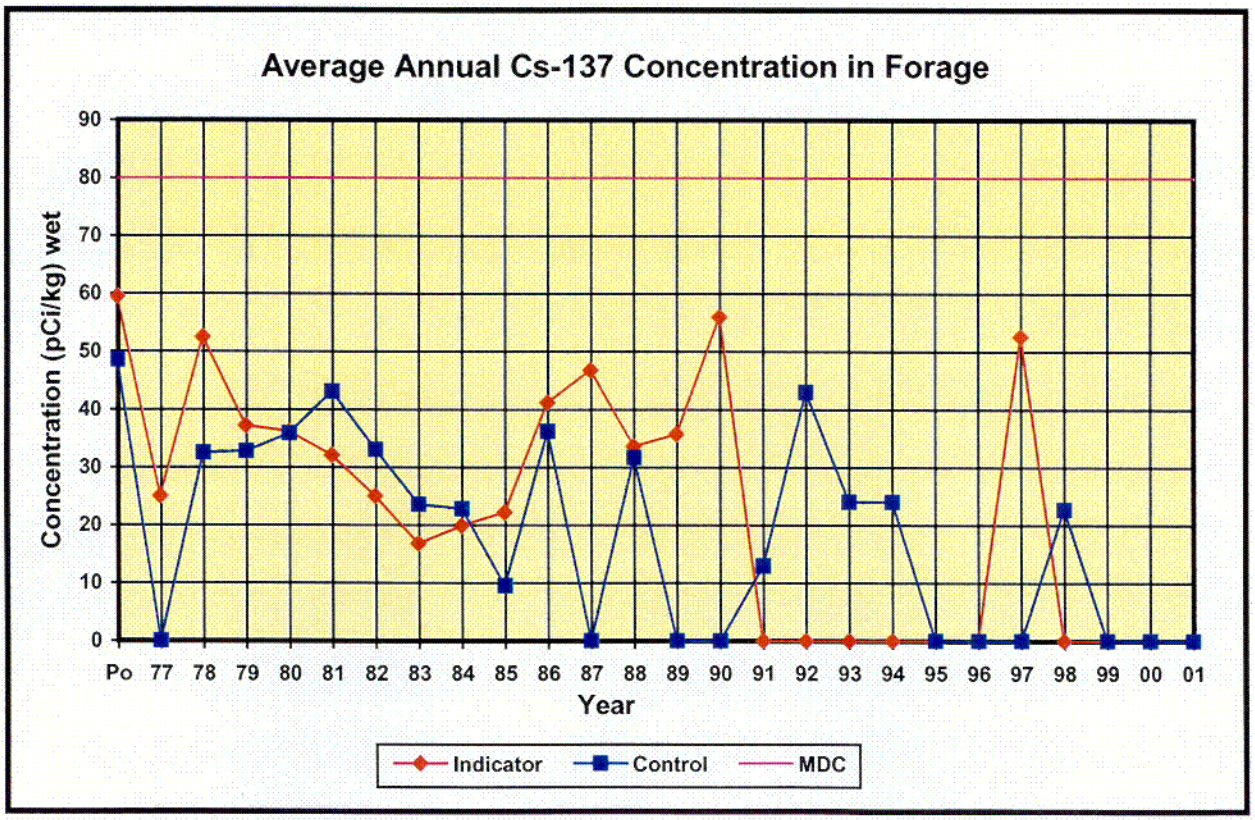
Period	Indicator (pCi/l)	Control (pCi/l)
Pre-op	41	14
1977	20	2.6
1978	30	11
1979	0	0
1980	0	0
1981	0	0
1982	0	0
1983	0	0
1984	0	0
1985	0	0
1986	0	5.0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0

4.5 Forage

In accordance with Table 2-1, forage samples are collected every 4 weeks at two indicator stations on the plant perimeter, and at one control station located approximately 18 miles west of the plant, in Dothan. Gamma isotopic analyses are performed on each sample.

No manmade radionuclide was found in forage at an indicator or control station during 2001. During preoperation and the years of operation through 1986 (the year of the Chernobyl incident), Cs-137 was typically found in about a third of the 35 to 40 samples collected per year. In 1987 and 1988 the number dropped to about a seventh of the total samples and from 1989 through 1994, it was only found in one or two samples every year. Since 1994, Cs-137 has been detected in only two samples, one indicator and one control. The MDC and RL for Cs-137 in forage are 80 and 2000 pCi/kg wet, respectively. Table 4.5-1 presents the average detectable results of Cs-137 found in forage over the life of the plant and Figure 4.5-1 shows the historical trending of this data.

Figure 4.5-1



C09

Table 4.5-1

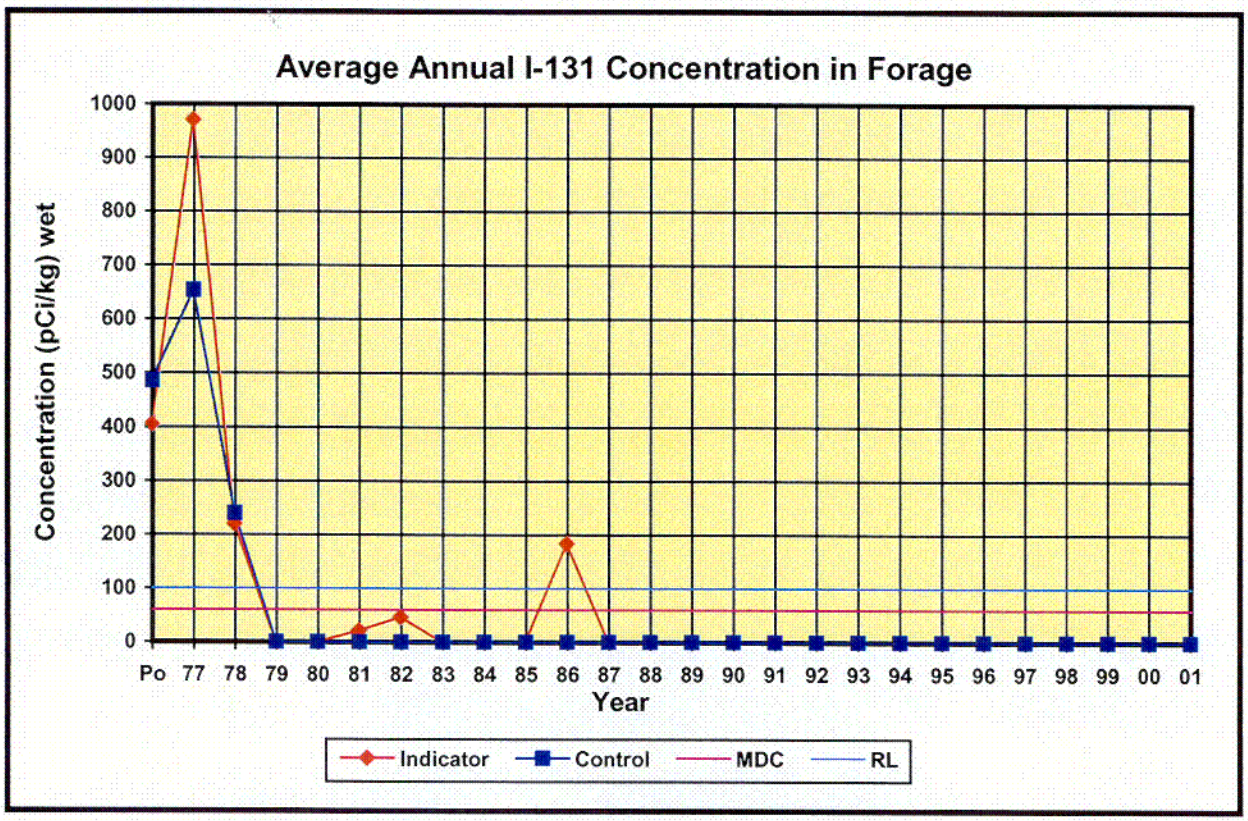
Average Annual Cs-137 Concentration in Forage

Period	Indicator (pCi/kg) wet	Control (pCi/kg) wet
Pre-op	59.4	48.6
1977	25.0	0
1978	52.5	32.5
1979	37.2	32.8
1980	36.2	35.9
1981	32.1	43.1
1982	25.0	33.1
1983	16.8	23.6
1984	19.9	22.8
1985	22.2	9.5
1986	41.2	36.2
1987	46.8	0
1988	33.6	31.7
1989	35.7	0
1990	56.0	0
1991	0	12.9
1992	0	43.0
1993	0	24.0
1994	0	24
1995	0	0
1996	0	0
1997	52.6	0
1998	0	22.7
1999	0	0
2000	0	0
2001	0	0

During preoperation and in the early years of operation, I-131 was found in 10% to 25% of the forage samples at very high levels which ranged from around 100 to 1,000 pCi/kg wet. In 1986 (Chernobyl incident), I-131 reappeared after not having been detected for 3 years. The MDC and RL for I-131 are 60 and 100 pCi/kg wet, respectively. Table 4.5-2 lists the average detectable results of I-131 found in forage over the life of the plant and Figure 4.5-2 plots the historical trending of this data.

I-131 has not been detected in vegetation samples since the 1986 Chernobyl accident.

Figure 4.5-2



C10

Table 4.5-2

Average Annual I-131 Concentration in Forage

Period	Indicator (pCi/kg) wet	Control (pCi/kg) wet
Pre-op	405	486
1977	971	654
1978	220	240
1979	0	0
1980	0	0
1981	21.4	0
1982	46.4	0
1983	0	0
1984	0	0
1985	0	0
1986	184	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0

These forage analyses results show the impact of the weapons tests during preoperation and the early years of operation and of the Chernobyl incident in 1986 and for a few years afterwards. The impact is reflected by the number of different radionuclides detected, the fraction of samples with detectable results, as well as the magnitude of the results. During preoperation and for the first few years of operation, 11 different radionuclides from fission and activation products were detected. By 1985, only 2 different radionuclides were detected and the fraction of samples with detectable results had diminished. In 1986, the same two nuclides as seen in 1985 appeared at a significantly higher magnitude and I-131 reappeared. In the years following 1986, only Cs-137 has been found and it has been found in a decreasing fraction of the samples.

4.6 Ground Water

In the FNP environs, there are no true indicator sources of ground water. A well located on the east bank of the Chattahoochee River, about four miles south-southeast of the plant, which serves Georgia Pacific Paper Company as a source of potable water, is designated as the indicator station. A deep well located about 1.2 miles southwest of the plant, which supplies water to the Whatley residence, is designated as the control station. Samples are collected quarterly and analyzed for gamma isotopic, I-131 and tritium as specified in Table 2-1. No radionuclides were found in ground water samples in 2001.

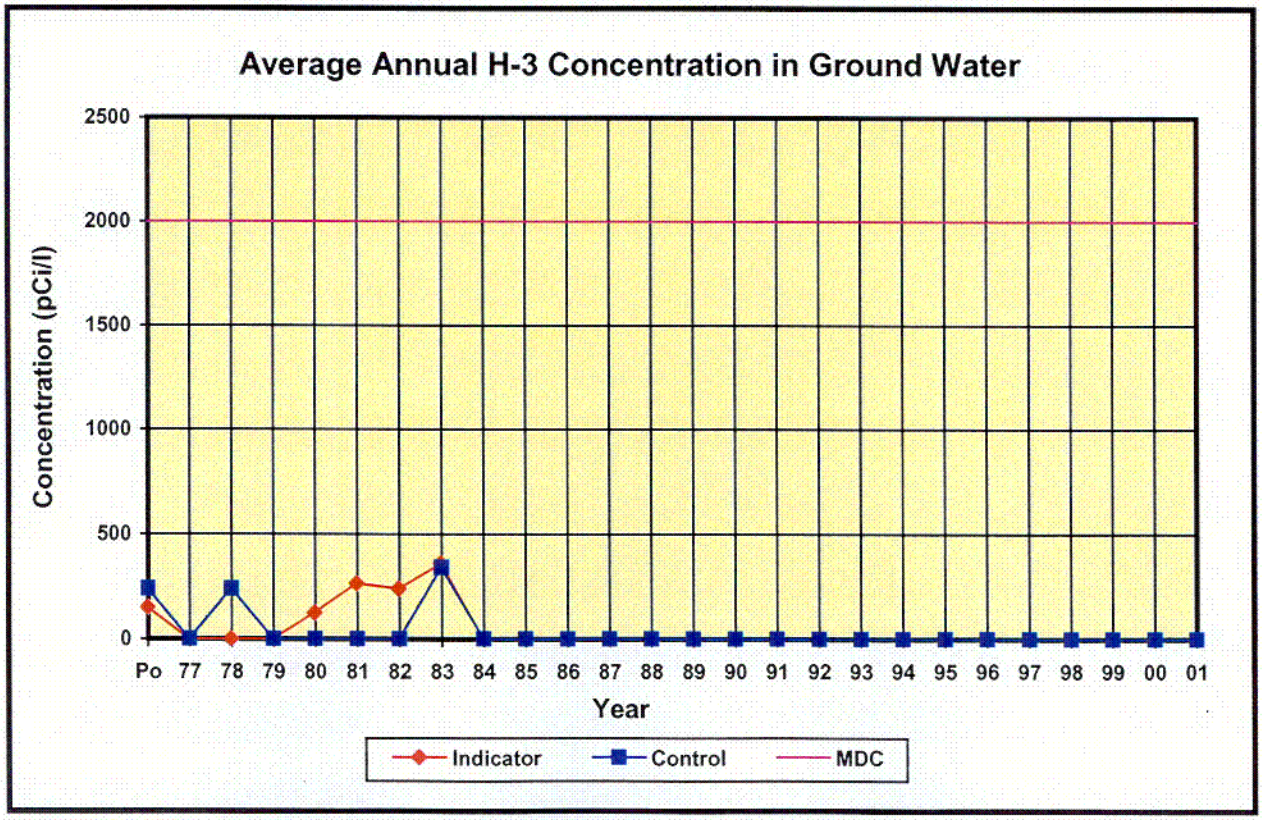
In 1983, 1985, and 1986, Cs-134 was detected in one sample at levels ranging from 3 to 13 pCi/l. The MDC and RL for Cs-134 in water are 15 and 30 pCi/l, respectively.

During preoperation, Cs-137 was detected in two of the samples at levels of 15 and 17 pCi/l. Then in 1984 and 1985, Cs-137 was again detected in a few samples with levels ranging from 4 to 5 pCi/l. The MDC and RL for Cs-137 in water are 18 and 50 pCi/l, respectively.

I-131 has never been detected in ground water samples. Tritium has not been detected in any sample since 1983. There have been no radionuclides detected in any of the ground water samples since 1986. The MDC and RL for tritium are 2,000 and 20,000 pCi/l, respectively.

Figure 4.6-1 and Table 4.6-1 show the historical trending of the average annual detectable tritium concentration in ground water.

Figure 4.6-1



C11

Table 4.6-1

Average Annual H-3 Concentration in Ground Water

Period	Indicator (pCi/l)	Control (pCi/l)
Pre-op	150	240
1977	0	0
1978	0	240
1979	0	0
1980	124	0
1981	264	0
1982	240	0
1983	360	341
1984	0	0
1985	0	0
1986	0	0
1987	0	0
1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0

4.7 Surface Water

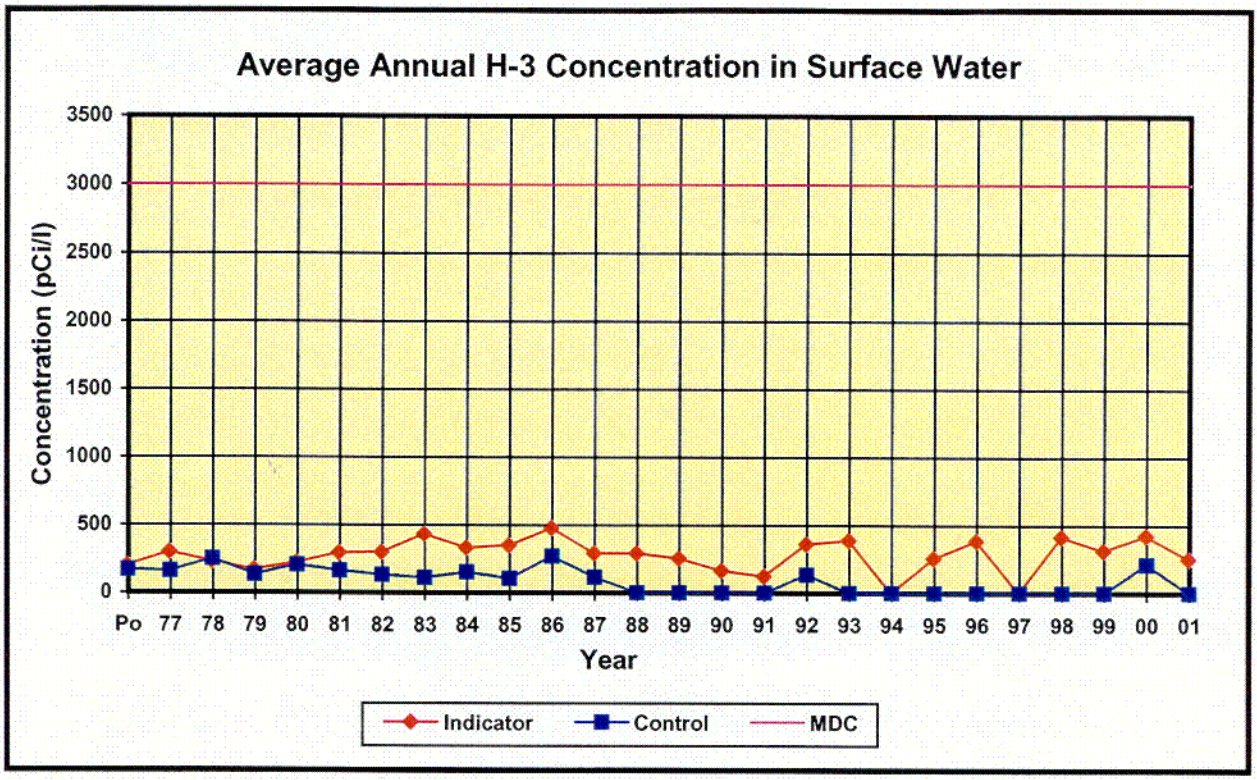
As specified in Table 2-1 and shown in Figure 2-2, water samples are collected from the Chattahoochee River at a control station approximately 3 miles upstream of the intake structure and at an indicator station approximately 4 miles downstream of the discharge structure. Small quantities are collected during the week at periodic intervals using automatic samplers. For each station, one liter from each of four consecutive weekly samples is combined into a composite sample which is analyzed for gamma emitters. In addition, 0.075 liters is collected from 13 consecutive weekly samples for each station to form composite quarterly samples which are analyzed for tritium.

No detectable results have been found from these gamma isotopic analyses since 1988. During preoperation and in every year of operation through 1988 (except 1979 and 1980), a few samples showed at least one of nine different activation or fission products at levels less than or on the order of their MDCs. During preoperation, Cs-137 was found in about 3% of the samples. From 1981 through 1988, it was found in about 15% of the samples. Cs-134 was found in about 15% of the samples from 1981 to 1986. All of these gamma emitters are attributed to the weapons tests and the Chernobyl incident.

As shown in Table 3-1, tritium was found in three of the composite samples collected at the indicator station during 2001. The average concentration was 252 pCi/l. No tritium was found at the control station during 2001. Therefore, this small tritium concentration, which is about 0.8% of the RL, may potentially be attributed to plant releases.

Historical trending of the detectable concentrations of tritium in surface water is provided in Figure 4.7-1 and Table 4.7-1. The slightly elevated plot of the indicator stations is indicative of plant tritium contributions to surface water, although it is noteworthy that the annual average levels are less than 16% of the MDC and less than 1.6% of the RL. The MDC and RL for tritium in surface water are 3000 and 30,000, respectively.

Figure 4.7-1



C12

Table 4.7-1

Average Annual H-3 Concentration in Surface Water

Period	Indicator (pCi/l)	Control (pCi/l)
Pre-op	200	170
1977	300	160
1978	230	250
1979	169	135
1980	221	206
1981	294	162
1982	300	132
1983	434	111
1984	333	152
1985	351	105
1986	478	272
1987	291.8	116.5
1988	293.3	0
1989	253.8	0
1990	166	0
1991	122	0
1992	360.5	134
1993	388.8	0
1994	0	0
1995	257	0
1996	386	0
1997	0	0
1998	415	0
1999	314	0
2000	424	212
2001	252	0

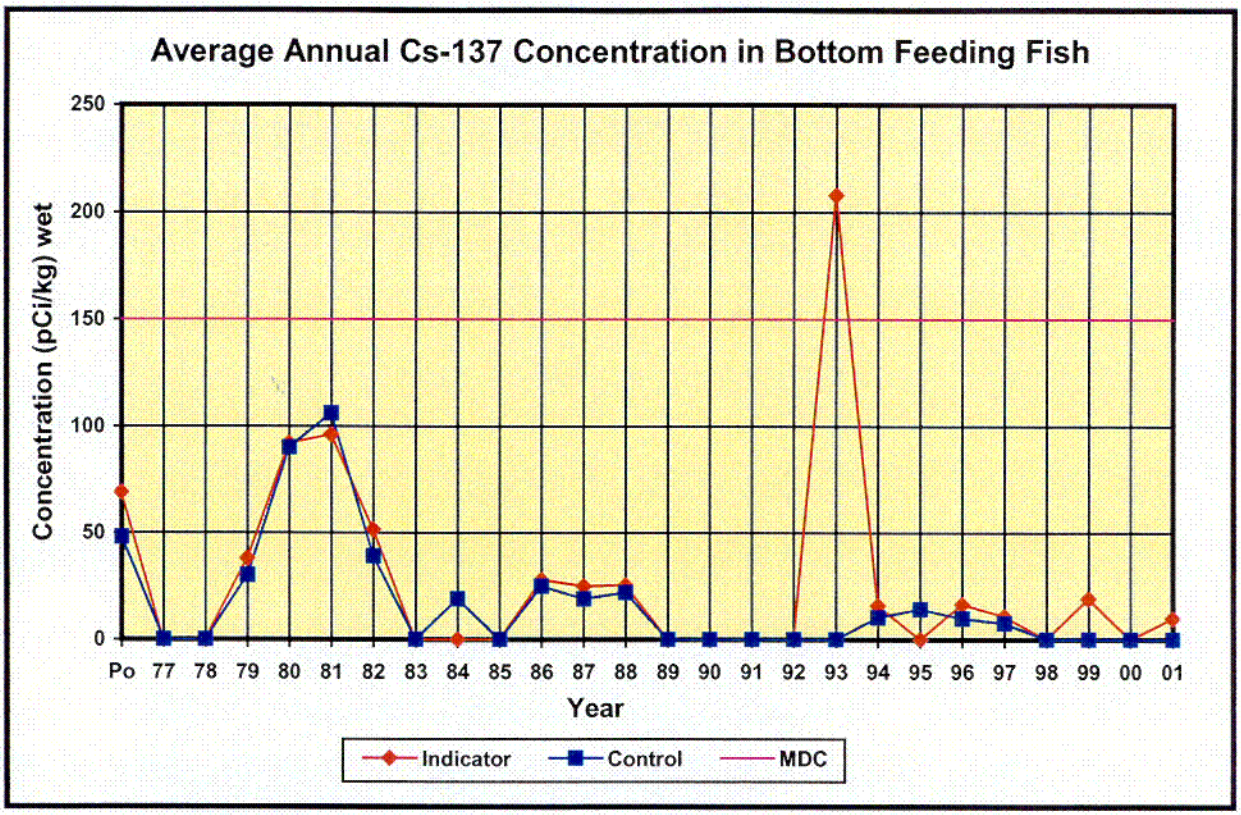
4.8 Fish

Two types of fish (bottom feeding and game) are collected semiannually from the Chattahoochee River at a control station several miles upstream of the plant intake structure and at an indicator station a few miles downstream of the plant discharge structure. These locations are shown in Figure 2-2. Gamma isotopic analysis is performed on the edible portions of each sample as specified in Table 2-1.

As provided in Table 3-1, Cs-137 was the only radionuclide of interest that was found from the gamma isotopic analysis in 2001. For the bottom feeding fish, Cs-137 was detected in one indicator sample at a concentration of 9.8 pCi/kg-wet. Since no Cs-137 was detected in bottom feeding fish at the control station, this result may potentially be attributable to plant releases. The dose to the total body of a member of the public from annual consumption of fish containing this level of Cs-137 would be 0.015 mrem, which is about 0.5% of the regulatory dose limit. For game fish, Cs-137 was found in all indicator station samples and all control station samples. The average Cs-137 concentration for game fish samples from the indicator station was 22.4 pCi/kg wet. The average for samples taken from the control station was 12.3 pCi/kg wet. The 10.1 pCi/kg-wet difference between indicator and control stations is not statistically discernible since it is less than the MDD of 26.6 pCi/kg-wet.

Historically, Cs-137 has been found in approximately 30% of the bottom feeding fish samples and in 80% of the game fish samples. Figures 4.8-1 and 4.8-2 and Tables 4.8-1 and 4.8-2 provide the historical trending of the average annual detectable concentrations of Cs-137 in pCi/kg wet in bottom feeding and game fish, respectively. Since the early 1980s, values have generally decreased for both indicator and control groups, with the exception of the bottom feeding fish collected at the indicator station in 1993. While some contribution from the plant cannot be ruled out, most of the Cs-137 in these samples may be attributed to the nuclear weapons tests and the Chernobyl incident, as evidenced by the normally close agreement between the control and indicator station results.

Figure 4.8-1



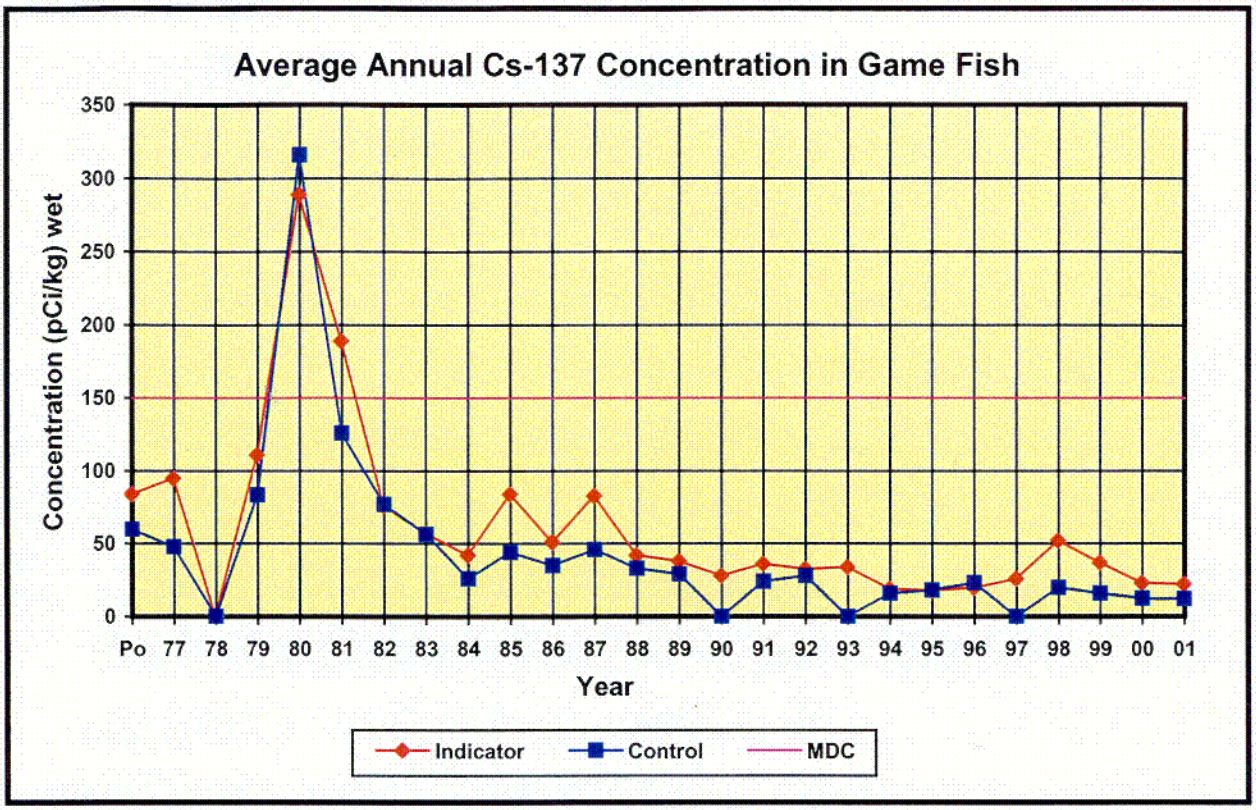
C13

Table 4.8-1

Average Annual Cs-137 Concentration in Bottom Feeding Fish

Period	Indicator (pCi/kg) wet	Control (pCi/kg) wet
Pre-op	69	48
1977	0	0
1978	0	0
1979	38	30
1980	92	90
1981	96	106
1982	51.5	39.0
1983	0	0
1984	0	19
1985	0	0
1986	28	25
1987	25	19
1988	25.5	22.0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	208	0
1994	15.9	10.3
1995	0	14.2
1996	16.4	9.9
1997	10.9	7.7
1998	0	0
1999	19.2	0
2000	0	0
2001	9.8	0

Figure 4.8-2



C14

Table 4.8-2

Average Annual Cs-137 Concentration in Game Fish

Period	Indicator (pCi/kg) wet	Control (pCi/kg) wet
Pre-op	84	60
1977	95	48
1978	0	0
1979	111	83.5
1980	289	316
1981	189	126
1982	76	77
1983	57	56.5
1984	42	26
1985	84	44
1986	51	35
1987	83	46
1988	42	33
1989	38	29
1990	28	0
1991	36	24
1992	32.5	28
1993	34	0
1994	19	16
1995	17.9	18.2
1996	19.6	23.1
1997	25.9	0
1998	52	20
1999	36.9	15.9
2000	22.9	12.5
2001	22.4	12.3

Radionuclides of interest other than Cs-137 have been found in only a few samples in the past. The following table provides a summary of the results in pCi/kg wet compared with the applicable MDCs.

YEAR	Nuclide	Fish Type	Indicator (pCi/kg)	Control (pCi/kg)	MDC (pCi/kg)
1978	Ce-144	Bottom Feeding	0	200	
1981	Nb-95	Bottom Feeding	38	0	50 (a)
1982	Nb-95	Game	31	0	50 (a)
1986	Co-60	Game	25	0	130

(a) Determined by the EL. Not defined in ODCM Table 4-3 (Table 4-1 of this report)

4.9 Sediment

River sediment samples are collected semiannually on the Chattahoochee River at a control station which is approximately 4 miles upstream of the intake structure and at an indicator station which is approximately 2 miles downstream of the discharge structure as shown in Figure 2-2. A gamma isotopic analysis is performed on each sample as specified in Table 2-1. During 2001, no radionuclides of interest were detected.

Historically, Be-7, Cs-134, Cs-137, and Nb-95 have been detected in some samples. These positive results were generally for samples collected at the control station. A summary of the positive historical results for these nuclides along with their applicable MDCs in units of pCi/kg dry is provided in Table 4.9. Cs-134 and Cs-137 data are plotted in Figures 4.9-1 and 4.9-2, respectively.

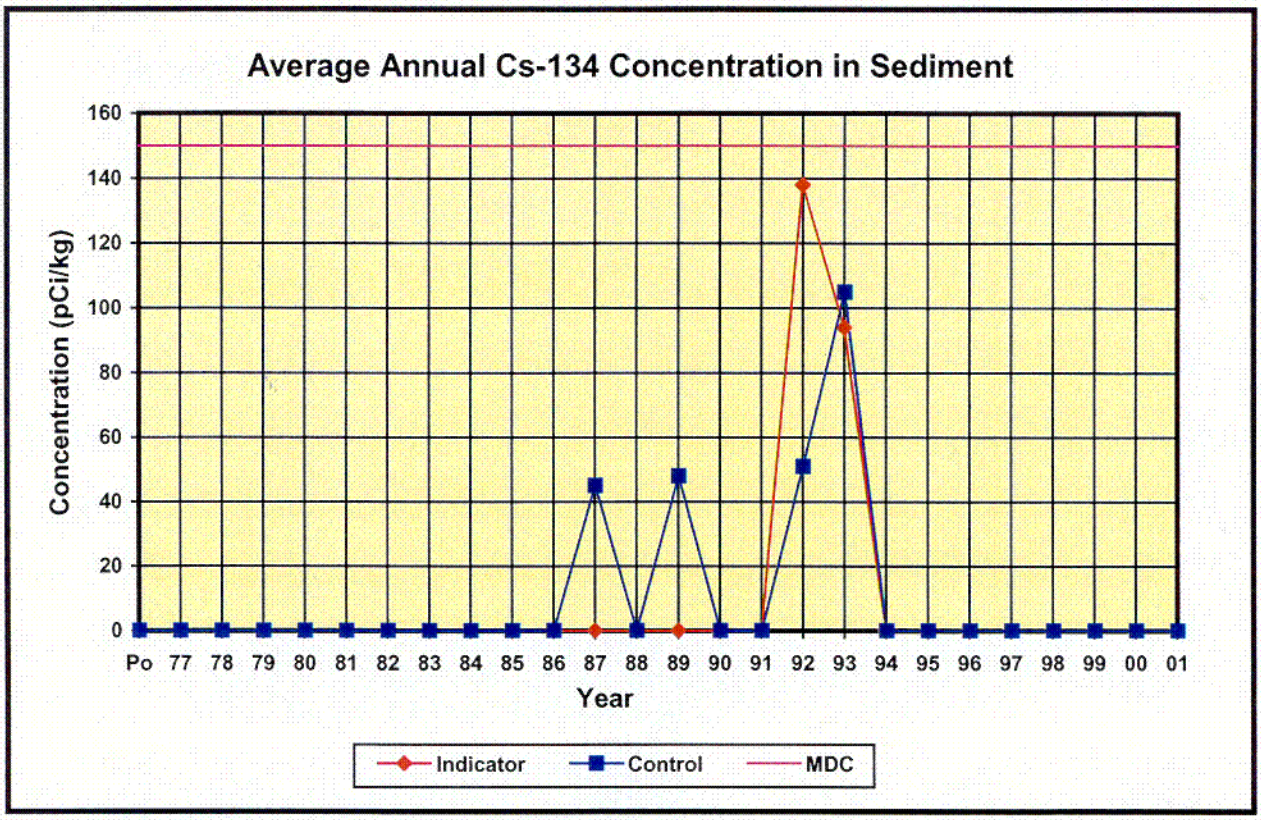
Table 4.9

Sediment Nuclide Concentrations

Nuclide	YEAR	Indicator (pCi/kg)	Control (pCi/kg)	MDC (pCi/kg)
Be-7	**1985**	535	945	655 (a)
Cs-134	**1987**	0	45	150
	1989	0	48	
	1992	138	51	
	1993	94	105	
Cs-137	**1981**	0	185	180
	1985	0	97	
	1989	0	39	
	1994	29	11	
	1996	11.8	0	
Nb-95	**1981**	52	113	50 (a)

(a) Determined by the EL. Not defined in ODCM Table 4-3 (Table 4-1 of this report).

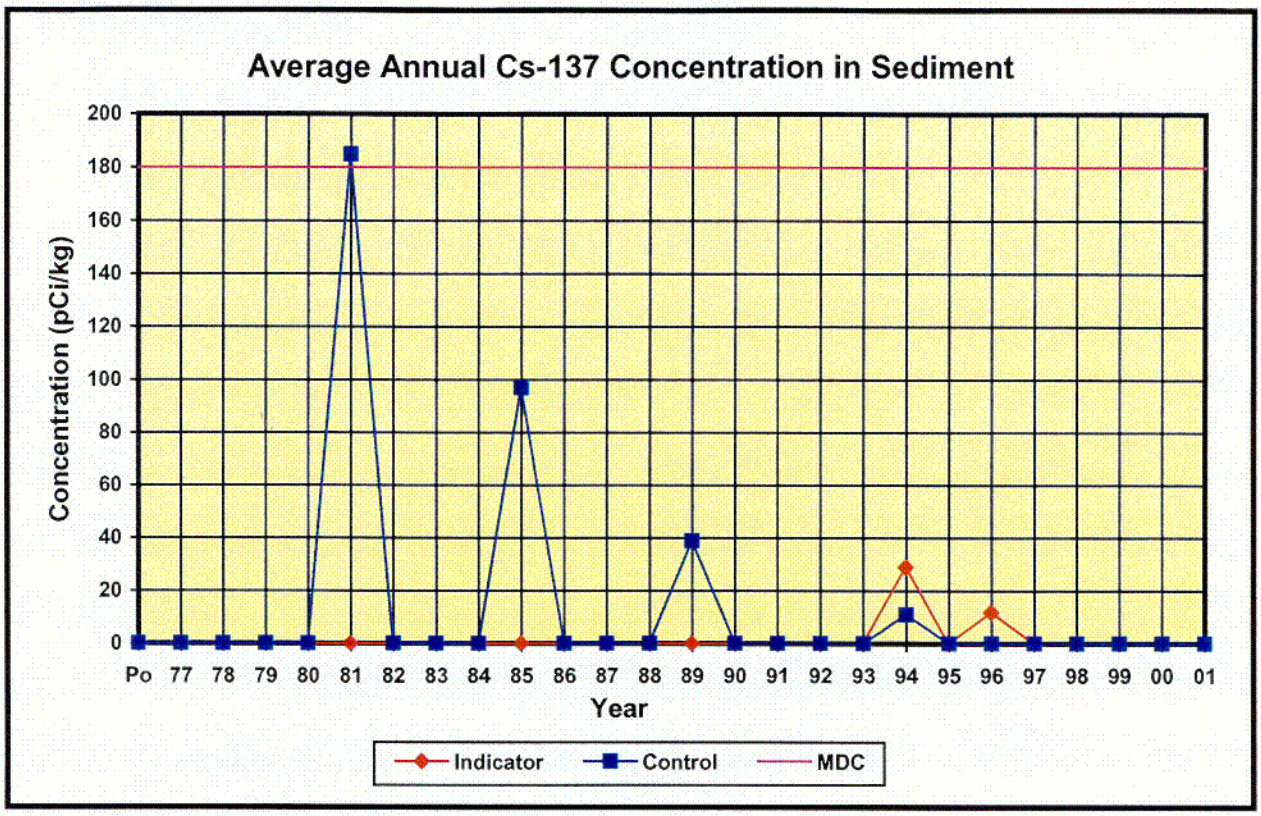
Figure 4.9-1



The positive results for Cs-134 appear mostly at the Control Station. Due to its relatively short half-life of approximately 2 years, the positive results may be attributed to the Chernobyl incident. The overall plotting of the positive results does not show any discernible trends.

C15

Figure 4.9-2



Cs-137 appears to be trending down since the ceasing of above ground weapons testing and the majority of the positive results appear at the control stations. Therefore in general, the positive results can be attributed to the weapons tests and the Chernobyl incident.

C16

5.0 INTERLABORATORY COMPARISON PROGRAM

In accordance with ODCM 4.1.3, the EL participates in an ICP which satisfies the requirements of Regulatory Guide 4.15, Revision 1, "Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment", February 1979. The guide indicates that the ICP is to be conducted with the Environmental Protection Agency (EPA) Environmental Radioactivity Laboratory Intercomparison Studies (Cross-check) Program or an equivalent program, and that the ICP should include all of the determinations (sample medium/radionuclide combinations) that are offered by the EPA and included in the REMP.

The ICP is conducted by Analytics, Inc. of Atlanta, Georgia. Analytics has a documented Quality Assurance (QA) program and the capability to prepare Quality Control (QC) materials traceable to the National Institute of Standards and Technology. The ICP is a third party blind testing program which provides a means to ensure independent checks are performed on the accuracy and precision of the measurements of radioactive materials in environmental sample matrices. Analytics supplies the crosscheck samples to the EL which performs the laboratory analyses in a normal manner. Each of the specified analyses is performed three times. The results are then sent to Analytics who performs an evaluation which may be helpful to the EL in the identification of instrument or procedural problems.

The samples offered by Analytics and included in the EL analyses are gross beta in air filters, gamma-emitting radionuclides in air filters, gamma-emitting radionuclides in milk, gross beta in water, tritium in water, and gamma-emitting radionuclides in water. Normally, all of these types of samples are supplied each year by Analytics and analyzed by EL. In 2001, milk was offered by Analytics but, due to administrative problems, was not supplied to EL for analysis. To prevent recurrence of this situation, EL has established a long-term agreement with Analytics that includes provisions for supplying to EL all of the sample types listed above.

The accuracy of each result is measured by the normalized deviation, which is the ratio of the reported average less the known value to the total error. The total error is the square root of the sum of the squares of the uncertainties of the known value and of the reported average. The uncertainty of the known value includes all analytical uncertainties (counting statistics, calibration uncertainties, chemical yield etc.). The uncertainty of the reported average is the standard deviation of the analysis results performed by the EL. The precision of each result is measured by the coefficient of variation, which is defined as the standard deviation divided by the reported average. An investigation is undertaken whenever the absolute value of the normalized deviation is greater than three or whenever the coefficient of variation is greater than 15% for all radionuclides other than Cr-51 and Fe-59. For Cr-51 and Fe-59, an investigation is undertaken when the coefficient of variation exceeds the values shown as follows:

Nuclide	Concentration *	Total Sample Activity (pCi)	Percent Coefficient of Variation
Cr-51	<300	NA	25
Cr-51	NA	>1000	25
Cr-51	>300	<1000	15
Fe-59	<80	NA	25
Fe-59	>80	NA	15

* For air filters, concentration units are pCi/filter. For all other media, concentration units are pCi/liter.

As required by ODCM 4.1.3.3 and 7.1.2.3, a summary of the results of the EL's participation in the ICP is provided in Table 5-1 for: the gross beta analysis of an air filter; the gamma isotopic analysis of an air filter and water samples; and the tritium analysis of water samples. Delineated in this table for each of the media/analysis combinations, are: the specific radionuclides; Analytics' preparation dates; the known values with their uncertainties supplied by Analytics; the reported averages with their standard deviations; and the resultant normalized deviations and coefficients of variation expressed as a percentage.

It may be seen from Table 5-1 that all results were acceptable for precision, with one exception. The analysis of I-131 in a water sample prepared on 06/14/2001, exceeded the coefficient of variation acceptance criterion of 15%. None of the analysis results exceeded the acceptance criteria for accuracy, which is a normalized deviation no greater than three. The outcome of the investigation into the result that failed to meet ICP acceptance criteria is provided in the following paragraph.

The precision deviation was from the determination of I-131 in water by gamma spectroscopy. The precision result was outside the upper control limit. The high error of the gamma spectroscopy values was due to the low level of activity, approximately 14 pCi of I-131, contained in the sample on the count date. Although this level of activity is measurable by gamma spectroscopy as shown in the accuracy results, the low activity level presents high counting errors. This result was not due to sample processing nor analysis problems, therefore no further action will be necessary to address analytical problems. The cause of the low activity that resulted in the precision deviation was administrative in nature. The water sample containing I-131 was prepared by Analytics, but was not shipped to EL in a timely manner due to administrative problems. To reduce potential of recurrence of this problem, EL has established a long-term agreement with Analytics including provisions to assure that samples containing I-131 are supplied to EL in a timely manner following preparation, including notification to EL prior to shipment for processing.

TABLE 5-1 (SHEET 1 of 2)

INTERLABORATORY COMPARISON PROGRAM RESULTS

GROSS BETA ANALYSIS OF AN AIR FILTER (pCi/filter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation	Uncertainty of Known (3S)	Percent Coef of Variation	Normalized Deviation
Gross Beta	12/06/01	114	106	3.71	1.67	3.25	1.97

GAMMA ISOTOPIC ANALYSIS OF AN AIR FILTER (pCi/filter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation	Uncertainty of Known (3S)	Percent Coef of Variation	Normalized Deviation
Ce-141	12/06/01	288	314	7.23	5.33	2.51	-2.89
Co-58	12/06/01	273	293	4.77	5	1.75	-2.89
Co-60	12/06/01	188	171	7.91	3	4.21	2.01
Cr-51	12/06/01	402	412	30.31	7	7.54	-0.32
Cs-134	12/06/01	166	165	4.61	2.67	2.77	0.19
Cs-137	12/06/01	266	263	8.70	4.33	3.27	0.31
Fe-59	12/06/01	74	75	7.45	1.33	10.07	-0.13
Mn-54	12/06/01	125	123	6.17	2	4.94	0.31
Zn-65	12/06/01	95	84	12.03	1.33	12.66	0.91

GROSS BETA ANALYSIS OF WATER SAMPLE (pCi/liter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation	Uncertainty of Known (3S)	Percent Coef of Variation	Normalized Deviation
Gross Beta	03/22/01	313	268	4.43	4.33	10.00	1.44
	06/14/01	263	248	3.98	4.00	2.00	2.49

TABLE 5-1 (SHEET 2 of 2)

INTERLABORATORY COMPARISON PROGRAM RESULTS

GAMMA ISOTOPIC ANALYSIS OF WATER SAMPLES (pCi/liter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation	Uncertainty of Known (3S)	Percent Coef of Variation	Normalized Deviation
Ce-141	03/22/01	91.0	94	8.22	1.67	9.04	-0.36
	06/14/01	239.0	234	15.36	4.00	6.43	0.31
Co-58	03/22/01	51.5	48	5.40	0.67	10.39	0.73
	06/14/01	113.0	139	8.70	2.33	7.70	-2.89
Co-60	03/22/01	152.0	147	6.42	2.33	4.22	0.73
	06/14/01	201.0	194	7.65	3.33	3.80	0.84
Cr-51	03/22/01	242.0	242	41.31	4.00	17.07	0.00
	06/14/01	327.0	322	64.26	5.33	19.65	0.08
Cs-134	03/22/01	115.0	129	13.25	2.00	11.52	-1.04
	06/14/01	169.0	193	13.74	3.33	8.13	-1.70
Cs-137	03/22/01	99.0	102	7.33	1.67	7.40	-0.40
	06/14/01	183.0	174	9.29	3.00	5.08	0.92
Fe-59	03/22/01	95.2	84	9.82	1.33	10.34	1.11
	06/14/01	136.0	126	12.67	2.00	9.32	0.78
I-131	03/22/01	93.3	90	9.39	1.67	10.10	0.31
	06/14/01	91.0	74	28.40	1.33	31.21	0.60
Mn-54	03/22/01	106.0	101	7.65	1.67	7.21	0.64
	06/14/01	218.0	216	9.76	3.67	4.48	0.19
Zn-65	03/22/01	195.0	186	8.11	3.00	8.11	0.56
	06/14/01	291.0	261	18.70	4.33	6.43	1.56

TRITIUM ANALYSIS OF WATER SAMPLES (pCi/liter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation	Uncertainty of Known (3S)	Percent Coef of Variation	Normalized Deviation
H-3	03/22/01	3080	3114	67.10	52	2.18	-0.40
	06/14/01	7130	7494	76.14	125	1.07	-2.49

6.0 CONCLUSIONS

This report confirms the licensee's conformance during 2001 with Chapter 4 of the ODCM. It provides summaries of data collection activities and a discussion of the results of the laboratory analyses of the samples.

All of the radiological levels were low and are generally trending downward. In only three instances in 2001 were the indicator station results discernibly greater than the results found at the control stations. In all three cases, the differences were small. The three instances are discussed in the following paragraphs.

The average quarterly direct radiation exposure measured at the indicator stations (inner ring) during 2001 was 1.5 mR greater than that acquired at the control stations. Although this small difference is greater than the MDD of 1.49 mR and is therefore statistically discernible, it is consistent with the difference between indicator and control station locations observed during preoperation. Since this level of difference between direct radiation exposure at the control and indicator station locations existed before plant operation began, it is unlikely that the difference discerned in 2001 was attributable to the plant.

Tritium was found in three of the surface water composite samples collected at the indicator station during 2001. The average concentration was 252 pCi/l. No tritium was found at the surface water control station during 2001. Therefore, this small tritium concentration, which is about 0.8% of the RL, may potentially be attributed to plant releases.

The only radionuclide of interest identified by gamma isotopic analysis of fish samples collected in 2001 was Cs-137. For bottom feeding fish, Cs-137 was detected in one indicator sample at a concentration of 9.8 pCi/kg-wet. Since no Cs-137 was detected in bottom feeding fish at the control station, this result may potentially be attributable to plant releases. This very low concentration of Cs-137 in fish is only 0.5% of the RL. As reported in section 4.8, there was no discernible difference between Cs-137 concentrations in game fish samples collected at the control and indicator stations.

No discernible radiological impact upon the environment or the public as a consequence of plant discharges to the atmosphere and to the river was established for any other REMP samples.