Edwin I. Hatch Nuclear Plant
Joseph M. Farley Nuclear Plant
Vogtle Electric Generating Plant
Annual Radiological Environmental Operating Reports for 2009

Enclosure 1

Hatch Annual Radiological Environmental Operating Report for 2009

EDWIN I. HATCH NUCLEAR PLANT
ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR 2009

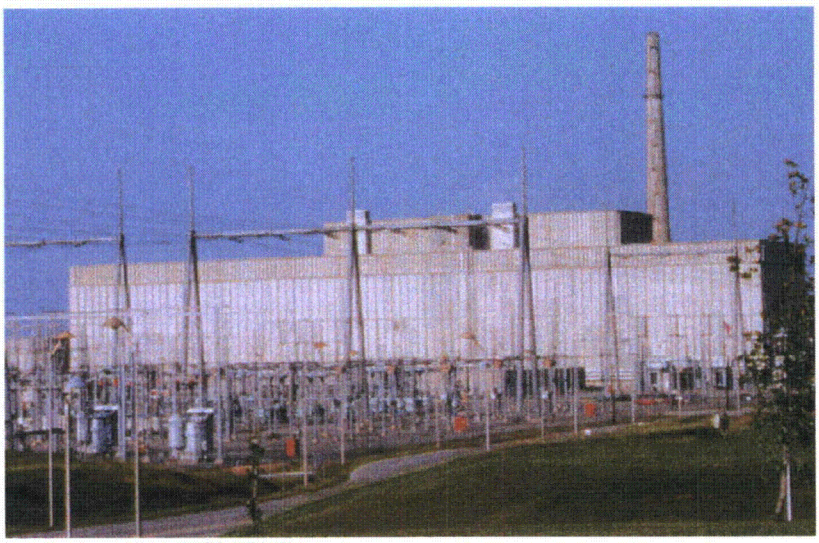

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

Acronyms presented in alphabetical order.

Acronym	Definition
ASTM	American Society for Testing and Materials
CL	Confidence Level
EL	Georgia Power Company Environmental Laboratory
EPA	Environmental Protection Agency
GPC	Georgia Power Company
HNP	Edwin I. Hatch Nuclear Plant
ICP	Interlaboratory Comparison Program
MDC	Minimum Detectable Concentration
MDD	Minimum Detectable Difference
NA	Not Applicable
NDM	No Detectable Measurement(s)
NRC	Nuclear Regulatory Commission
ODCM	Offsite Dose Calculation Manual
Po	Preoperation
REMP	Radiological Environmental Monitoring Program
RL	Reporting Level
TLD	Thermoluminescent Dosimeter
TS	Technical Specification

1.0 INTRODUCTION

The Radiological Environmental Monitoring Program (REMP) is conducted in accordance with Chapter 4 of the Offsite Dose Calculation Manual (ODCM). REMP activities for 2009 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 Edwin I. Hatch Nuclear Plant (HNP).

The assessments include comparisons between the 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.

The pre-operational stage of the REMP began with the establishment and activation of the environmental monitoring stations in January of 1972. The operational stage of the REMP began on September 12, 1974 with 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 and the river survey, 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. The sampling locations (stations) specified by ODCM 4.2 are depicted on maps in Figures 2-1 and 2-2. These maps are keyed to Table 2-2 which delineates the direction and distance of each station from the main stack.

REMP samples are collected by Georgia Power Company's (GPC) Environmental Laboratory (EL) personnel. The same lab performs all the laboratory analyses at their headquarters in Smyrna, Georgia.

TABLE 2-1 (SHEET 1 of 3)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Approximate Number of Sample Locations	Sampling and Collection Frequency	Type of Analysis and Frequency
1. Airborne Radioiodine and Particulates	6	Continuous operation of the sampler with sample collection weekly.	Radioiodine canister: I-131 analysis, weekly. Particulate sampler: analyze for gross beta radioactivity not less than 24 hours following filter change, weekly; perform gamma isotopic analysis on affected sample when gross beta activity is 10 times the yearly mean of control samples; and composite (by location) for gamma isotopic analysis, quarterly.
2. Direct Radiation	37	Quarterly	Gamma dose, quarterly.
3. Ingestion			
Milk (a)	1	Biweekly	Gamma isotopic and I-131 analysis, biweekly.
Fish or Clams (b)	2	Semiannually	Gamma isotopic analysis on edible portions, semiannually.
Grass or Leafy Vegetation	3	Monthly during growing season.	Gamma isotopic analysis, monthly. (c)
4. Waterborne			
Surface	2	Composite sample collected monthly. (d)	Gamma isotopic analysis, monthly. Composite (by location) for tritium analysis, quarterly.
Sediment	2	Semiannually.	Gamma isotopic analysis, semiannually.

TABLE 2-1 (SHEET 2 of 3)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Exposure Pathway and/or Sample	Approximate Number of Sample Locations	Sampling and Collection Frequency	Type of Analysis and Frequency
Drinking Water (e & f)	One sample of river water near the intake and one sample of finished water from each of one to three of the nearest water supplies which could be affected by HNP discharges.	River water collected near the intake will be a composite sample; the finished water will be a grab sample. These samples will be collected monthly unless the calculated dose due to consumption of the water is greater than 1 mrem/year; then the collection will be biweekly. The collections may revert to monthly should the calculated doses become less than 1 mrem/year.	I-131 analysis on each sample when biweekly collections are required. Gross beta and gamma isotopic analysis on each sample; composite (by location) for tritium analysis, quarterly.
Groundwater	See Table 2-3, Figure 2-3, and Figure 2-4	Quarterly sample; pump used to sample GW wells; grab sample from yard drains and ponds	Tritium, gamma isotopic, and field parameters (pH, temperature, conductivity, dissolved oxygen, oxidation/reduction potential, and turbidity) of each sample quarterly; Hard to detect radionuclides as necessary based on results of tritium and gamma

TABLE 2-1 (SHEET 3 of 3)

SUMMARY DESCRIPTION OF RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

Notes:

a. Up to three sampling locations within 5 miles and in different sectors will be used as available. In addition, one or more control locations beyond 10 miles will be used.

b. Commercially or recreationally important fish may be sampled. Clams may be sampled if difficulties are encountered in obtaining sufficient fish samples.

c. If gamma isotopic analysis is not sensitive enough to meet the Minimum Detectable Concentration (MDC), a separate analysis for I-131 may be performed.

d. The composite samples shall be composed of a series of aliquots collected at intervals not exceeding a few hours.

e. If it is found that river water downstream of the plant is used for drinking, drinking water samples will be collected and analyzed as specified herein.

f. A survey shall be conducted annually at least 50 river miles downstream of the plant to identify those who use water from the Altamaha River for drinking.

TABLE 2-2 (SHEET 1 of 2)

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

Station Number	Station Type	Descriptive Location	Direction (a)	Distance (a) (miles)	Sample Type
064	Other	Roadside Park	WNW	0.8	Direct Rad
101	Indicator	Inner Ring	N	1.9	Direct Rad
102	Indicator	Inner Ring	NNE	2.5	Direct Rad
103	Indicator	Inner Ring	NE	1.8	Airborne Rad Direct Rad
104	Indicator	Inner Ring	ENE	1.6	Direct Rad
105	Indicator	Inner Ring	E	3.7	Direct Rad
106	Indicator	Inner Ring	ESE	1.1	Direct Rad Vegetation
107	Indicator	Inner Ring	SE	1.2	Airborne Rad Direct Rad
108	Indicator	Inner Ring	SSE	1.6	Direct Rad
109	Indicator	Inner Ring	S	0.9	Direct Rad
110	Indicator	Inner Ring	SSW	1.0	Direct Rad
111	Indicator	Inner Ring	SW	0.9	Direct Rad
112	Indicator	Inner Ring	WSW	1.0	Airborne Rad Direct Rad Vegetation
113	Indicator	Inner Ring	W	1.1	Direct Rad
114	Indicator	Inner Ring	WNW	1.2	Direct Rad
115	Indicator	Inner Ring	NW	1.1	Direct Rad
116	Indicator	Inner Ring	NNW	1.6	Airborne Rad Direct Rad
170	Control	Upstream	WNW	(c)	River (b)
172	Indicator	Downstream	E	(c)	River (b)
201	Other	Outer Ring	N	5.0	Direct Rad
202	Other	Outer Ring	NNE	4.9	Direct Rad
203	Other	Outer Ring	NE	5.0	Direct Rad
204	Other	Outer Ring	ENE	5.0	Direct Rad
205	Other	Outer Ring	E	7.2	Direct Rad
206	Other	Outer Ring	ESE	4.8	Direct Rad
207	Other	Outer Ring	SE	4.3	Direct Rad
208	Other	Outer Ring	SSE	4.8	Direct Rad
209	Other	Outer Ring	S	4.4	Direct Rad
210	Other	Outer Ring	SSW	4.3	Direct Rad
211	Other	Outer Ring	SW	4.7	Direct Rad
212	Other	Outer Ring	WSW	4.4	Direct Rad
213	Other	Outer Ring	W	4.3	Direct Rad
214	Other	Outer Ring	WNW	5.4	Direct Rad
215	Other	Outer Ring	NW	4.4	Direct Rad
216	Other	Outer Ring	NNW	4.8	Direct Rad
301	Other	Toombs Central School	N	8.0	Direct Rad
304	Control	State Prison	ENE	11.2	Airborne Rad Direct Rad
304	Control	State Prison	ENE	10.3	Milk
309	Control	Baxley Substation	S	10.0	Airborne Rad Direct Rad
416	Control	Emergency News Center	NNW	21.0	Direct Rad Vegetation

TABLE 2-2 (SHEET 2 of 2)

RADIOLOGICAL ENVIRONMENTAL SAMPLING LOCATIONS

Notes:

a. Direction and distance are determined from the main stack.

b. River (fish or clams, shoreline sediment, and surface water)

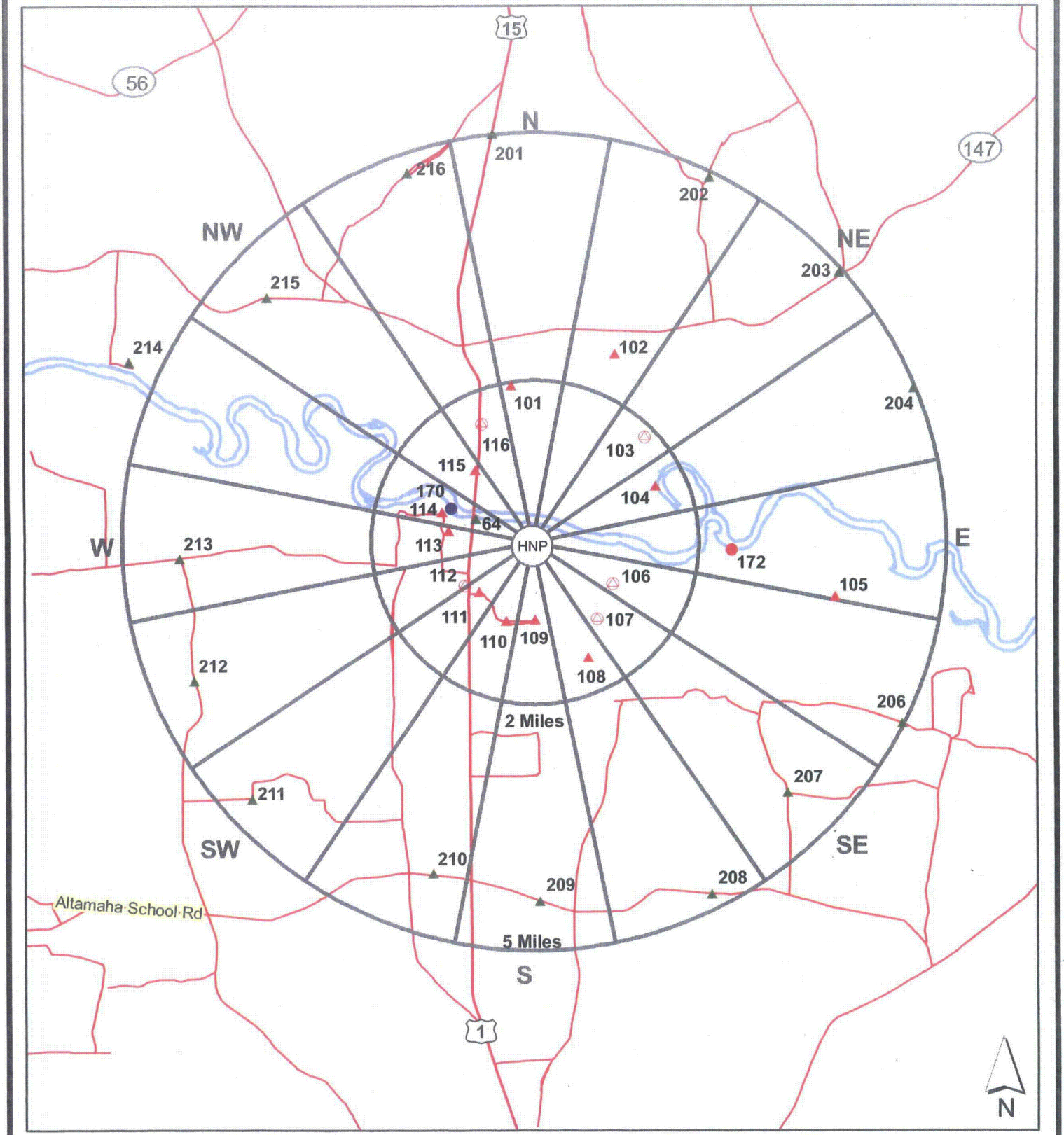
c. Station 170 is located approximately 0.6 river miles upstream of the intake structure for river water, 1.1 river miles for sediment and clams, and 1.5 river miles for fish.

   Station 172 is located approximately 3.0 river miles downstream of the discharge structure for river water, sediment and clams, and 1.7 river miles for fish.

   The locations from which river water and sediment may be taken can be sharply defined. However, the sampling locations for clams often have to be extended over a wide area to obtain a sufficient quantity. High water adds to the difficulty in obtaining clam samples and may also make an otherwise suitable location for sediment sampling unavailable. A stretch of the river of a few miles or so is generally needed to obtain adequate fish samples. The mile locations given above represent approximations of the locations where samples are collected.

Table 2-3
Groundwater Monitoring Locations

WELL	DEPTH (ft)	MONITORING PURPOSE
R1	82.9	**Confined Aquifer Upgradient**
R2	82.7	**Confined Aquifer Near Diesel Generator Bldg.**
R3	89.2	**Confined Aquifer Near CST-1**
R4	41	**Dilution Line Near River Water Discharge Structure**
R5	33.6	**Between Subsurface Drain Lines Downgradient**
R6	38.2	**Between Subsurface Drain Lines Downgradient**
NW2A	27	**Water Table Near CST-2 Inside of Subsurface Drain**
NW2B	27	**Water Table Outside of Subsurface Drain**
NW3A	26.5	**Water Table Inside of Subsurface Drain**
NW3B	25.3	**Water Table Outside of Subsurface Drain**
NW4A	27	**Water Table Upgradient Inside of Subsurface Drain**
NW5A	26.7	**Water Table Upgradient Inside of Subsurface Drain**
NW5B	26.3	**Water Table Upgradient Outside of Subsurface Drain**
NW6	27	**Water Table Near Diesel Generator Bldg.**
NW8	23	**Water Table Near Diesel Generator Bldg.**
NW9	26.1	**Water Table Downgradient Inside of Subsurface Drain**
NW10	26.2	**Water Table Near CST-2**
T2	21.9	**Water Table Near Recombiner Bldg.**
T3	18	**Water Table Near Turbine Bldg.**
T7	21.4	**Water Table Near Diesel Generator Bldg.**
T10	18.8	**Water Table Near CST-1**
T12	23.2	**Water Table Near CST-1**
T15	27.4	**Water Table Near CST-1**
P15A	74.5	**Confined Aquifer Near Turbine Bldg.**
P15B	18	**Water Table Near Turbine Bldg.**
P17A	77	**Confined Aquifer Near Diesel Generator Bldg.**
P17B	14.8	**Water Table Near Diesel Generator Bldg.**
Deep Well 1	680	**Backup Supply for Potable Water (infrequently used)**
Deep Well 2	711	**Plant Potable Water Supply**
Deep Well 3	710	**Potable Water Supply – Rec. Center, Firing Range, and Garage**

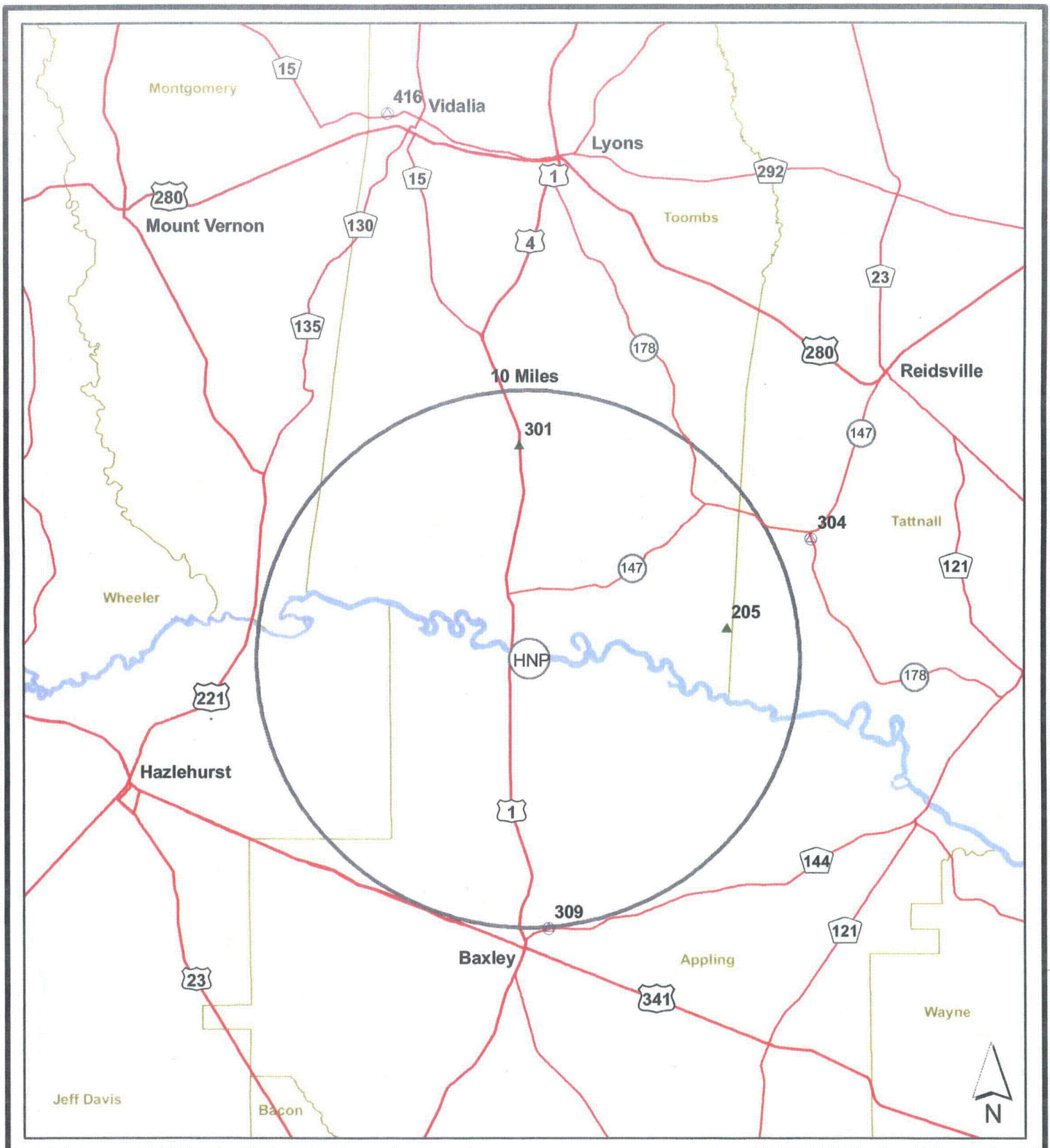


Radiological Environmental Sampling Locations

	Indicator	Control	Additional
TLD	▲	▲	▲
Other	●	●	●
TLD & Other	◬	◬	◬

REMP Stations Near the Plant

Figure 2-1



Radiological Environmental Sampling Locations

	Indicator	Control	Additional
TLD	▲	▲	▲
Other	●	●	●
TLD & Other	△	△	△

REMP Stations Beyond Five Miles from the Plant

Figure 2-2

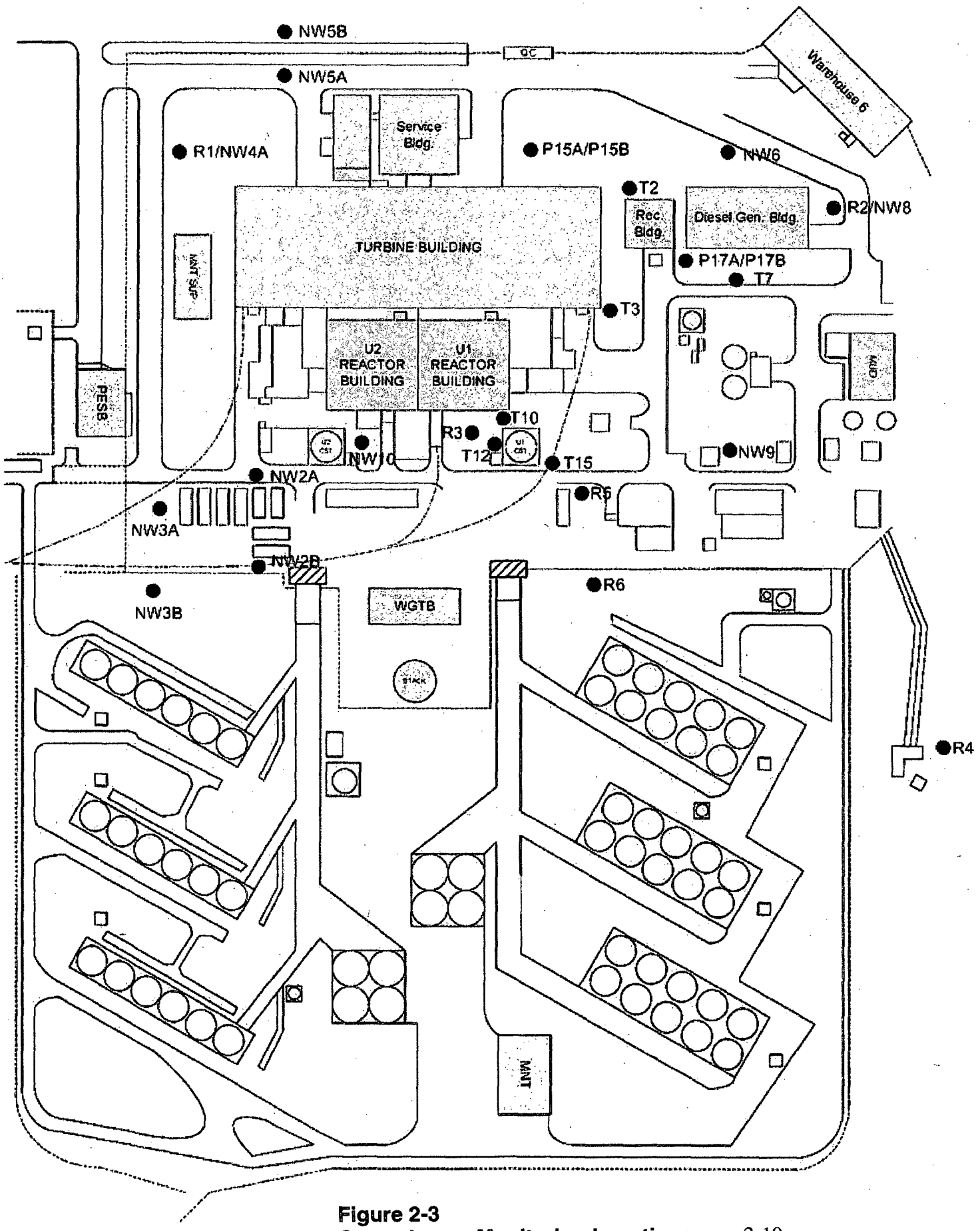
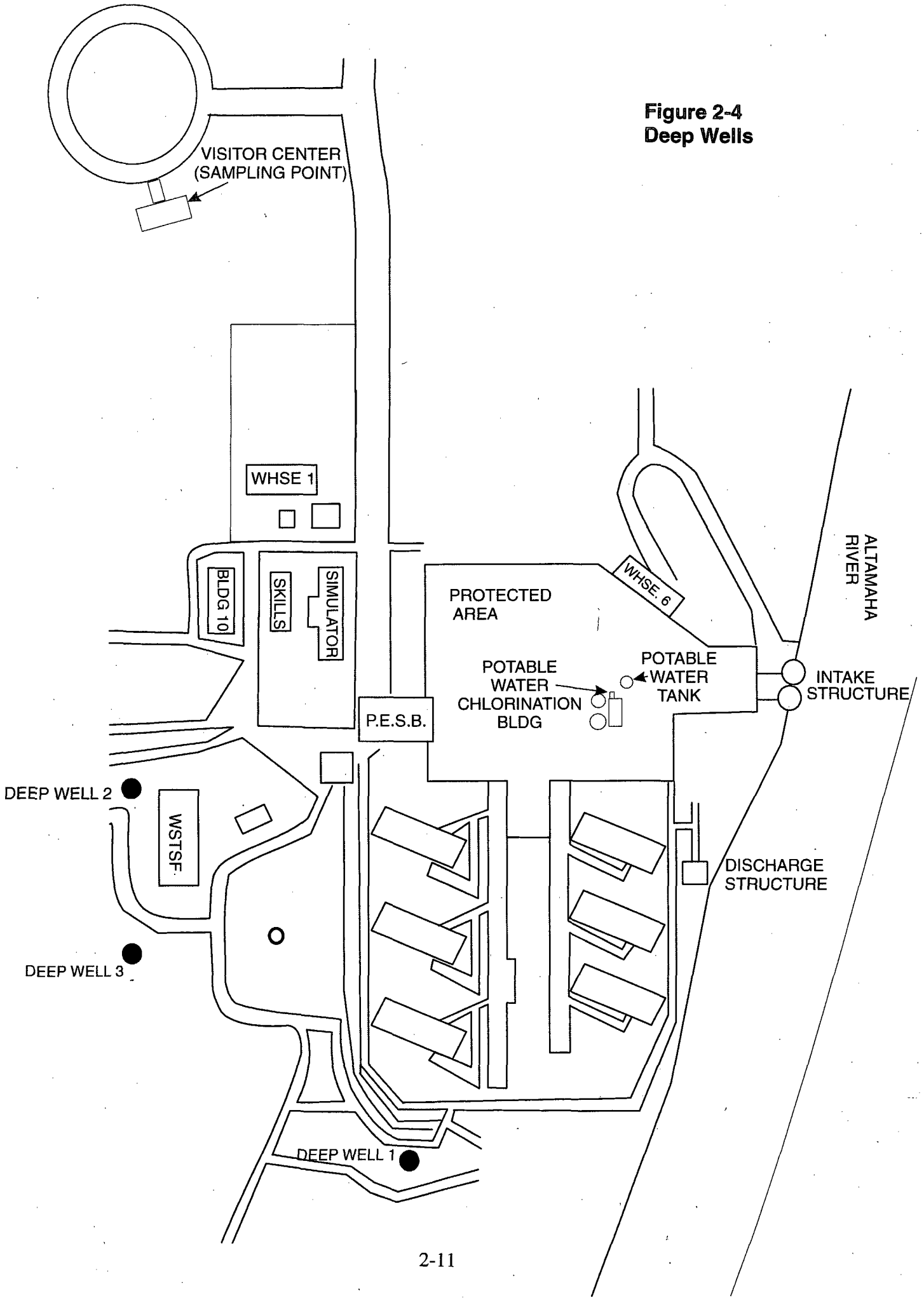


Figure 2-3
Groundwater Monitoring Locations

Figure 2-4
Deep Wells



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 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. Since no naturally occurring radionuclides were found in the plant's effluent releases, only man-made radionuclides are reported as permitted by ODCM 7.1.2.1. Results for samples collected at locations other than control or indicator stations are discussed in Section 4 under the particular sample type.

TABLE 3-1 (SHEET 1 of 4)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY

Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia

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)	Location with the Highest Annual Mean Name Distance & Direction (Fraction)	 Mean (b), Range	Other Stations(g) Mean (b), Range (Fraction)	Control Locations Mean (b), Range (Fraction)
Airborne Particulates (fCi/m3)	Gross Beta 299	10	21.2 7.6-39.7 (195/195)	No. 304 State Prison 11.2 miles, ENE	21.9 7.4-35.9 (52/52)	NA	21.4 5.0-35.9 (104/104)
	Gamma Isotopic 24 Cs-134 Cs-137	 50 60	 NDM (c) NDM		 NDM NDM		 NDM NDM
Airborne Radioiodine (fCi/m3)	I-131 299	70	NDM		NDM	NA	NDM
Direct Radiation (mR/91 days)	Gamma Dose 146	NA (d)	12.4 10.4-17.0 (62/62)	No. 214 Outer Ring 5.4 miles, WNW	15.7 14.7-16.2 (4/4)	12.2 9.4-16.2 (72/72)	12.2 10.4-13.7 (12/12)
Milk (pCi/l)	Gamma Isotopic 26 Cs-134 Cs-137 Ba-140 La-140	 15 18 60 15	 NA NA NA NA		 NDM NDM NDM NDM	NA	 NDM NDM NDM NDM
	I-131 26	1	NA		NDM		NDM

TABLE 3-1 (SHEET 2 of 4)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY

Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia

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)	Location with the Highest Annual Mean		Control Locations Mean (b), Range (Fraction)
				Name Distance & Direction	Mean (b), Range (Fraction)	
Vegetation (pCi/kg-wet)	Gamma Isotopic 36					
	I-131	60	NDM		NDM	NDM
	Cs-134	60	NDM		NDM	NDM
	Cs-137	80	46.8 21.3-68.0 (12/24)	Station 106 Inner Ring 1.1 miles; ESE	47.8 30.2-68.0 (5/12)	NDM
River Water (pCi/l)	Gamma Isotopic 24					
	Mn-54	15	NDM		NDM	NDM
	Fe-59	30	NDM		NDM	NDM
	Co-58	15	NDM		NDM	NDM
	Co-60	15	NDM		NDM	NDM
	Zn-65	30	NDM		NDM	NDM
	Zr-95	30	NDM		NDM	NDM
	Nb-95	15	NDM		NDM	NDM
	I-131	15 (e)	NDM		NDM	NDM
	Cs-134	15	NDM		NDM	NDM
	Cs-137	18	NDM		NDM	NDM
	Ba-140	60	NDM		NDM	NDM
	La-140	15	NDM		NDM	NDM
	Tritium 8	3000 (f)	242 (1/4)	No. 170 0.6 miles Upstream	343 (1/4)	343 (1/4)

TABLE 3-1 (SHEET 3 of 4)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY

Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia

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)	Location with the Highest Annual Mean		Control Locations Mean (b), Range (Fraction)
				Name Distance & Direction	Mean (b), Range (Fraction)	
Fish (pCi/kg-wet)	Gamma Isotopic 6					
	Mn-54	130	NDM		NDM	NDM
	Fe-59	260	NDM		NDM	NDM
	Co-58	130	NDM		NDM	NDM
	Co-60	130	NDM		NDM	NDM
	Zn-65	260	NDM		NDM	NDM
	Cs-134	130	NDM		NDM	NDM
	Cs-137	150	12.4 (1/1)	No. 172 3.0 miles Downstream	12.4 (1/1)	8.4 (1/1)
Sediment (pCi/kg-dry)	Gamma Isotopic 4					
	Cs-134	150	NDM		NDM	NDM
	Cs-137	180	74.9 35.3-114.5 (2/2)	No. 172 3.0 miles Downstream	74.9 35.3-114.5 (2/2)	60.5 28.6-92.5 (2/2)

TABLE 3-1 (SHEET 4 of 4)

RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM ANNUAL SUMMARY

Edwin I. Hatch Nuclear Plant, Docket Nos. 50-321 and 50-366
Appling County, Georgia

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. 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 specified locations that are detectable is placed in parenthesis.

c. No Detectable Measurement(s).

d. Not Applicable.

e. If a drinking water pathway were to exist, a MDC of 1 pCi/l would have been used (see Table 4-1 of this report).

f. If a drinking water pathway were to exist, a MDC of 2000 pCi/l would have been used (see Table 4-1 of this report).

g. "Other" stations, identified in the "station type" column of Table 2-2, include community and special stations.

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) 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 2009 results were compared with past results, including those obtained during pre-operation. 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 analyses. 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 0's and listed in the tables as NDM.

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 1940s through 1980 distributed man-made nuclides around the world. The most recent atmospheric tests in the 1970s 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 be detectable.

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 to 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 difference. 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
DEVIATIONS FROM RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

COLLECTION PERIOD	AFFECTED SAMPLES	DEVIATION	CAUSE	RESOLUTION
02/02/09-02/09/09 CR2010105981	AF Stations 107 - 1.2 miles SE 112 - 1.0 miles WSW 304 - 11.2 miles ENE 309 - 10.0 miles S	Heavy particulate loading on filter	Controlled burn in area	Filters changed at beginning of week
1st Quarter CR2010105988	TLD Station 301B 8 miles N	Direct radiation data rendered suspect due to presence of water in bag	Moisture or rainwater	Replaced TLDs at beginning of quarter
04/20/09-04/27/09 CR2010105984	AF/AC Station 103 1.8 miles NE	Non-representative direct radiation data	Sampling period was short by 15.6 hours due to blown fuse	Station operated satisfactorily after fuse replaced
06/29/09-09/28/09 CR2010105986 EXCLUDED	AF/AC Station 107 1.2 miles SE	Non-representative sample of airborne particulates	Major failure of underground power line resulted in station being out of service for 13 weeks	Station operated satisfactorily after underground line repaired
Second Semi-Annual Collection Period CR2009112046	Fish	No fish data for second semi-annual period	High river water level and flooding during the entire fall; unable to perform electrofishing	Continue to monitor conditions on river
3rd Quarter CR2010105988	TLD Station 114 1.2 miles WNW	Non-representative direct radiation data	TLDs found on ground at collection time	Replaced TLDs at beginning of quarter
4th Quarter CR2010105988 EXCLUDED	TLD Stations 102 - 2.5 miles NNE 104 – 1.6 miles ENE	Non-representative direct radiation data	TLDs were missing at mid-quarter; replaced with blanks but data was not representative of collection period	Replaced TLDs at beginning of quarter
4th Quarter CR2010105988	TLD Stations 215B – 4.4 miles NW 216A – 4.8 miles NNW	Direct radiation data loss; only companion badge results used	Mechanical reader problem	Used data from companion badges
Dec Monthly Comp. CR2010105987	RW Station 172 Downstream 3 miles E	Non-representative river sample	Grab sample taken of river water; ISCO sampler destroyed by flooding	ISCO sampler replaced when flood waters receded

4.1 Land Use Census and River Survey

In accordance with ODCM 4.1.2, a land use census was conducted on November 9, 2009, 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, and the locations of all milk animals within a distance of 3 miles. A milk animal is defined as a cow or goat producing milk for human consumption. The locations of beef cattle and of gardens greater than 500 square feet producing broad leaf vegetation were also included in the census. The census results are tabulated in the Table 4.1-1.

Table 4.1-1

LAND USE CENSUS RESULTS

Distance in Miles to Nearest Location in Each Sector

SECTOR	RESIDENCE	MILK ANIMAL	BEEF CATTLE	GARDEN
N	2.1	None	None	3.8
NNE	2.9	None	None	None
NE	3.3	None	3.5	None
ENE	4.2	None	4.1	None
E	3.0	None	None	None
ESE	3.8	None	None	None
SE	1.8	None	2.3	4.4
SSE	2.0	None	3.6	2.2
S	1.1	None	2.3	2.3
SSW	1.5	None	2.0	None
SW	1.1	None	2.3	1.6
WSW	1.0	None	4.8	3.2
W	1.1	None	2.8	None
WNW	1.1	None	None	None
NW	3.6	None	4.6	None
NNW	1.9	None	2.8	2.8

ODCM 4.1.2.2.1 requires a new controlling receptor to be identified if the land use census identifies a location that yields a calculated receptor dose greater than the one in current use. No change in the controlling receptor was required as a result of the 2009 land use census. The current controlling receptor as described in ODCM Table 3-7 is a child in the WSW Sector at 1.2 miles

ODCM 4.1.2.2.2 requires that whenever the land use census identifies a location which would yield a calculated dose (via the same ingestion pathway) 20% greater than that of a current indicator station, the new location must become a REMP station (if samples are available). The 2009 land use census did not identify a garden which yielded a calculated dose 20% greater than that for any of the current indicator stations for vegetation. The results of the census were corroborated by inquiries to the county extension agents in the 5 counties in the vicinity of the plant.

As required by Note f of Table 2-1, the annual survey of the Altamaha River for 50 miles downstream of the plant was conducted on September 28, 2009 to identify any withdrawal of river water for drinking purposes. No sources of withdrawal for drinking water or agricultural purposes were identified. Information obtained from the Georgia Department of Natural Resources on October 2, 2009 indicated that no surface water withdrawal permits for agricultural or drinking purposes had been issued for this stretch of the Altamaha River between the 2008 survey and the 2009 survey. Should it be determined that river water downstream of the plant is being used for drinking, the sampling and analysis requirements for drinking water found in Table 2-1 would be implemented.

4.2 Airborne

As indicated in Table 2-2 and Figures 2-1 and 2-2, airborne particulates and airborne radioiodine are collected at 4 indicator stations (Nos. 103, 107, 112 and 116) which encircle the plant near the site periphery and at 2 control stations (Nos. 304 and 309) which are located approximately 10 miles from the main stack. At each location, air is continuously drawn through a glass fiber filter and a charcoal canister placed in series to collect airborne particulates and radioiodine. The filters and canisters are collected weekly and analyzed for gross beta and I-131, respectively. A gamma isotopic analysis is performed quarterly on a composite of the filters for each station.

The 2009 annual average weekly gross beta concentration of 21.2 fCi/m^3 for the indicator stations was 0.2 fCi/m^3 less than that for the control stations (21.4 fCi/m^3). This difference is not statistically discernible, since it is less than the calculated MDD of 1.7 fCi/m^3. Figure 4.2-1 and Table 4.2-1 provide the historical trending of the average weekly gross beta concentrations in air. In general, there is close agreement between the results for the indicator and control stations. This close agreement supports the position that the plant is not contributing significantly to the gross beta concentration in air.

Figure 4.2-1

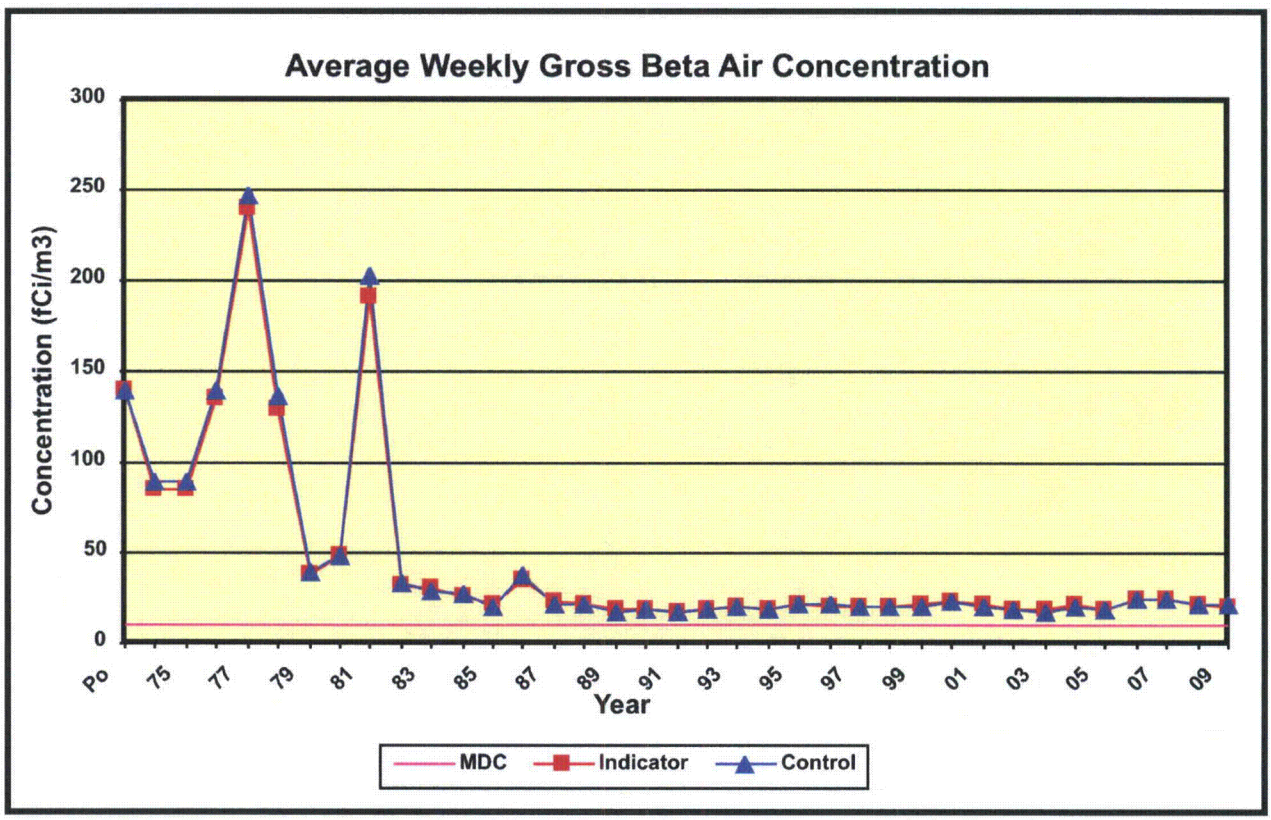


Table 4.2-1

Average Weekly Gross Beta Air Concentration

Year	Indicator (fCi/m3)	Control (fCi/m3)
Pre-op	140	140
1974	87	90
1975	85	90
1976	135	139
1977	239	247
1978	130	137
1979	38	39
1980	49	48
1981	191	203
1982	33	34
1983	31	30
1984	26	28
1985	22	21
1986	36	38
1987	23	22
1988	22.6	21.7
1989	18.4	17.8
1990	19.3	18.7
1991	18.1	18
1992	18.5	18.4
1993	20.4	20.7
1994	19.5	19.7
1995	21.7	21.7
1996	21.3	21.4
1997	20.3	20.7
1998	20.0	20.5
1999	21.3	21.3
2000	23.6	23.9
2001	21.5	21.0
2002	19.3	19.2
2003	18.8	18.2
2004	21.4	21.3
2005	19.7	19.4
2006	24.9	24.7
2007	24.4	24.3
2008	21.8	22.5
2009	21.2	21.4

During 2009, no man-made radionuclides were detected from the gamma isotopic analysis of the quarterly composites of the particulate air filters. During preoperation and during operation through 1986, a number of fission products and activation products were detected. These were generally attributed to the nuclear weapons tests and to the Chernobyl incident. On only one occasion since 1986, has a man-made radionuclide been detected in a quarterly composite. A small amount of Cs-137 (1.7 fCi/m3) was identified in the first quarter of 1991 at Station 304. The MDC and RL for Cs-137 in air are 60 and 20,000 fCi/m3, respectively. The historical trending of the average annual concentrations of detectable Cs-137 from quarterly air filter composites is provided in Figure 4.2-2 and Table 4.2-2.

Figure 4.2-2

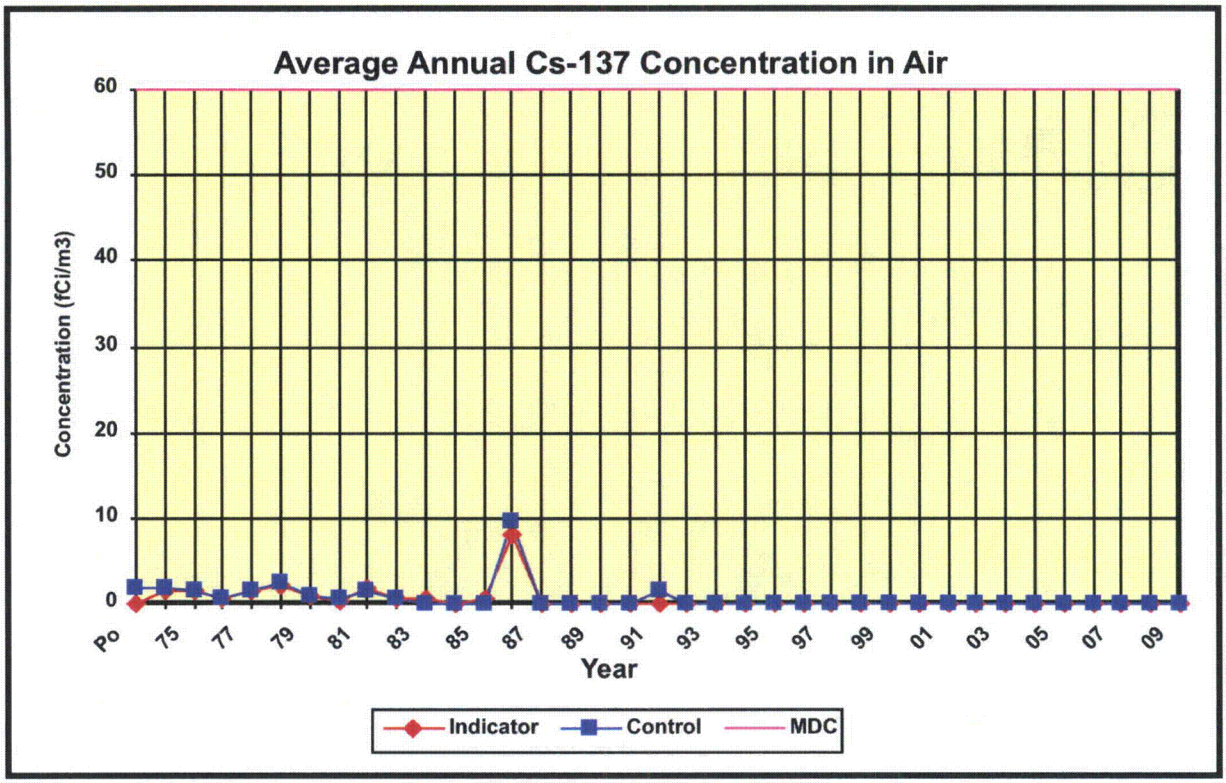


Table 4.2-2

Average Annual Cs-137 Concentration In Air

Year	Indicator (fCi/m3)	Control (fCi/m3)
Pre-op	NDM	2.0
1974	1.5	2.0
1975	1.4	1.4
1976	0.6	0.7
1977	1.5	1.4
1978	2.3	2.6
1979	0.8	0.8
1980	0.4	0.6
1981	1.8	1.7
1982	0.5	0.6
1983	0.7	NDM
1984	NDM	NDM
1985	0.7	NDM
1986	8.1	9.6
1987	NDM	NDM
1988	NDM	NDM
1989	NDM	NDM
1990	NDM	NDM
1991	NDM	1.7
1992	NDM	NDM
1993	NDM	NDM
1994	NDM	NDM
1995	NDM	NDM
1996	NDM	NDM
1997	NDM	NDM
1998	NDM	NDM
1999	NDM	NDM
2000	NDM	NDM
2001	NDM	NDM
2002	NDM	NDM
2003	NDM	NDM
2004	NDM	NDM
2005	NDM	NDM
2006	NDM	NDM
2007	NDM	NDM
2008	NDM	NDM
2009	NDM	NDM

No airborne I-131 was detected in the charcoal canisters in 2009. During 1976, 1977, and 1978, positive levels of I-131 were found in nearly all of the samples collected for a period of a few weeks following atmospheric nuclear weapons tests. Some of the concentrations were on the order of 70 fCi/m^3. In 1986, the same phenomenon occurred following the Chernobyl incident. The highest airborne I-131 concentration found to date in an individual charcoal canister was 217 fCi/m^3 in 1977. The MDC and RL for airborne I-131 are 70 fCi/m^3 and 900 fCi/m^3, respectively.

Table 4-3 lists REMP deviations that occurred in 2009. Three deviations involved air sampling. Heavy particulates were noted at four stations (107, 112, 304, and 309) after a controlled burn occurred in the area during the week 02/02-02/09. The results for these stations were compared to the unaffected stations and all four passed Chauvenet's Criterion and were retained in the data summary. Station 103 lost 15.6 hours of sampling time after a fuse was blown during the collection period from 04/20-04/27. The results passed Chauvenet's Criterion and were retained in the data summary. Station 107 was out of service for 13 weeks (06/29-09/28) due to a failure of the underground power supply. After weeks of investigation and troubleshooting, the line was successfully repaired and the station put back in service.

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 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 compass sectors around the plant to form 2 concentric rings, as seen in Figures 2-1 and 2-2. The two ring configuration of stations was established in 1980, in accordance with NRC Branch Technical Position "An Acceptable Radiological Environmental Monitoring Program", Revision 1, 1979. With the exception of the East sector, the inner ring stations (Nos. 101 through 116) are located near the site boundary and the outer ring stations (Nos. 201 through 216) are located at distances of 4 to 5 miles from the plant. The stations in the East sector are a few miles farther out than the other stations in their respective rings due to large swamps making normal access extremely difficult. The 16 stations forming the inner ring are designated as the indicator stations. The 3 control stations (Nos. 304, 309 and 416) are located 10 miles or more from the plant. Stations 064 and 301 monitor special interest areas. Station 064 is located at the onsite roadside park, while Station 301 is located near the Toombs Central School. Station 210, in the outer ring, is located near the Altamaha School (the only other nearby school).

As provided in Table 3-1, the average quarterly exposure measured at the indicator stations (inner ring) during 2009 was 12.4 mR. At the control stations, the average quarterly exposure was 12.2 mR. This difference (0.2 mR) is not statistically discernible since it is less than the MDD of 1.0 mR.

The quarterly exposures acquired at the outer ring stations during 2009 ranged from 9.4 to 16.2 mR, with an average of 12.23 mR. The average for the outer ring stations was 0.03 mR more than the average for the control stations. Since the results for the outer ring stations and the control stations differ by less than the MDD of 1.17 mR, there is no discernible difference between outer ring and control station results for 2009.

The historical trending of the average quarterly exposures for the indicator inner ring, outer ring, and the control stations are plotted in Figure 4.3-1 and listed in Table 4.3-1. The decrease between 1991 and 1992 values is attributed to a change in TLDs from Teledyne to Panasonic. It should be noted however that the differences between indicator and control and outer ring values did not change. The close agreement between the station groups supports the position that the plant is not contributing significantly to direct radiation in the environment.

Figure 4.3-1

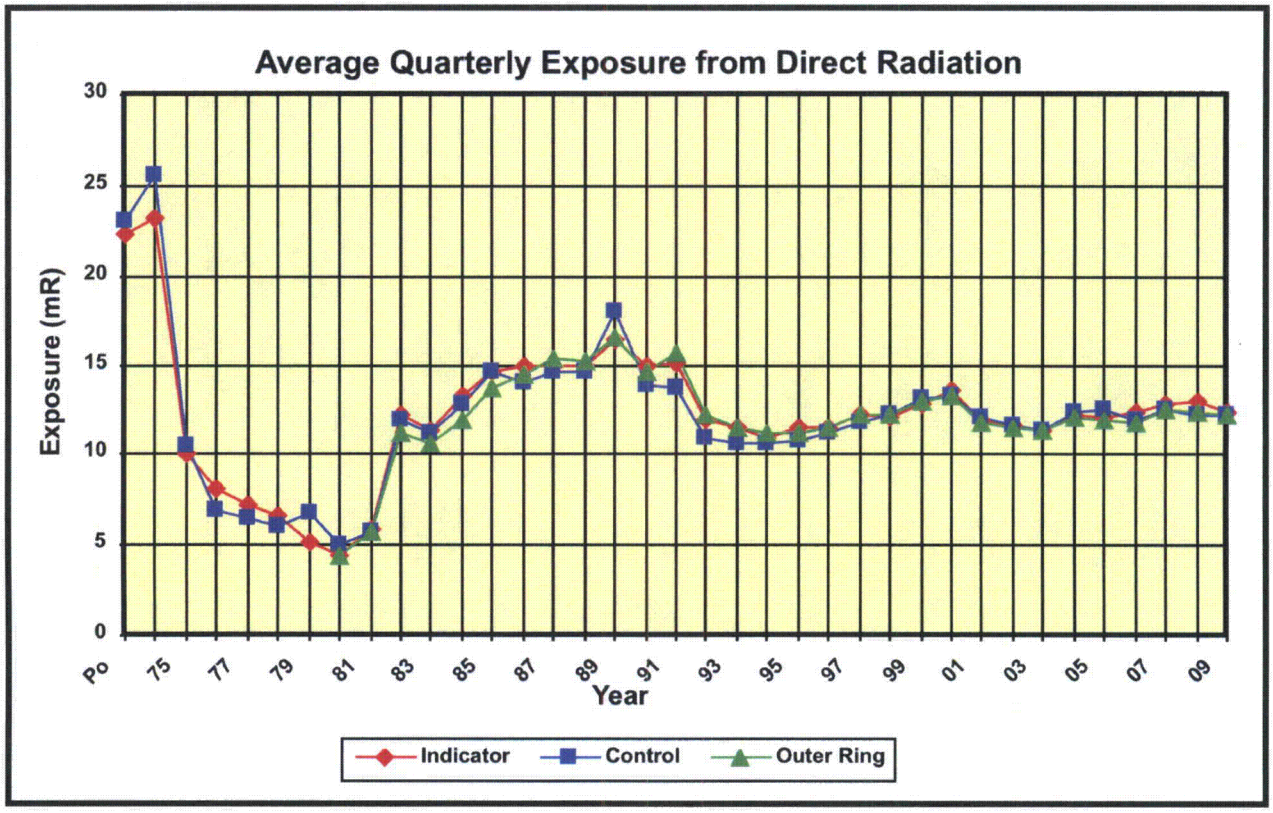

Average Quarterly Exposure from Direct Radiation
Exposure (mR)
30
25
20
15
10
5
0
Po
75
77
79
81
83
85
87
89
91
93
95
97
99
01
03
05
07
09
Year
Indicator
Control
Outer Ring

Table 4.3-1

Average Quarterly Exposure from Direct Radiation

Year	Indicator (mR)	Control (mR)	Outer Ring (mR)
Pre-op	22.3	23	NA
1974	23.2	25.6	NA
1975	10.0	10.5	NA
1976	8.18	6.9	NA
1977	7.31	6.52	NA
1978	6.67	6.01	NA
1979	5.16	6.77	NA
1980	4.44	5.04	4.42
1981	5.9	5.7	5.7
1982	12.3	12	11.3
1983	11.4	11.3	10.6
1984	13.3	12.9	11.9
1985	14.7	14.7	13.7
1986	15	14	14.5
1987	14.9	14.6	15.3
1988	15.0	14.7	15.2
1989	16.4	18.0	16.5
1990	14.9	13.9	14.7
1991	15.1	13.7	15.6
1992	11.9	10.9	12.3
1993	11.6	10.7	11.5
1994	11	10.7	11.2
1995	11.5	10.8	11.3
1996	11.6	11.3	11.6
1997	12.3	11.8	12.3
1998	12.1	12.3	12.3
1999	12.8	13.2	13.0
2000	13.6	13.3	13.3
2001	12.0	12.1	11.8
2002	11.7	11.7	11.5
2003	11.4	11.4	11.4
2004	12.2	12.4	12.2
2005	12.1	12.5	12.0
2006	12.4	11.9	11.8
2007	12.8	12.5	12.6
2008	13.0	12.3	12.4
2009	12.4	12.2	12.2

The historical trending of the average quarterly exposures at the special interest areas for the past 23 years is provided in Figure 4.3-2 and listed in Table 4.3-2. These exposures are within the range of those acquired at the other stations. They too, show that the plant is not contributing significantly to direct radiation at the special interest areas.

Figure 4.3-2

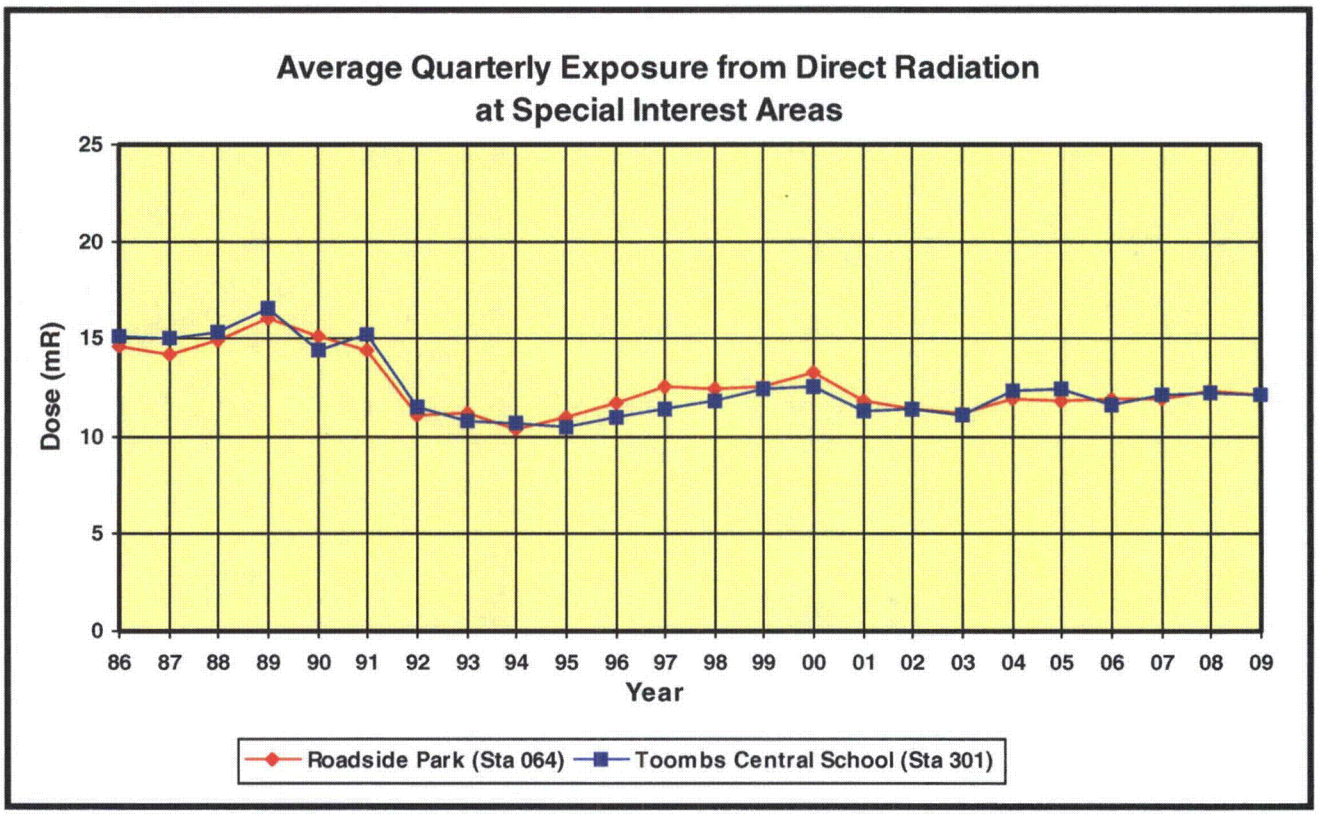


Table 4.3-2

Average Quarterly Exposure from Direct Radiation at Special Interest Areas

Period	Station 064 (mR)	Station 301 (mR)
1986	14.6	15.1
1987	14.2	15.0
1988	14.9	15.3
1989	16.1	16.6
1990	15.1	14.4
1991	14.4	15.2
1992	11.1	11.5
1993	11.2	10.8
1994	10.4	10.7
1995	11.0	10.5
1996	11.7	11.0
1997	12.6	11.4
1998	12.4	11.8
1999	12.5	12.4
2000	13.3	12.6
2001	11.8	11.3
2002	11.4	11.4
2003	11.2	11.1
2004	11.9	12.3
2005	11.8	12.4
2006	11.9	11.6
2007	11.9	12.1
2008	12.3	12.2
2009	12.1	12.1

In 2009, there were four deviations involving direct radiation measurements. In the first quarter, the TLDs at Station 110 were destroyed in a fire. In the first quarter, TLD 301B had water in the holding bag. In third quarter, the TLDs at Station 114 were found on the ground at collection time. The results passed Chauvenet's Criterion for the affected stations in first and third quarters and were retained in the data set. In fourth quarter, the TLDs at Station 102 and 104 were missing at midquarter and blanks were put in place. The results were determined not to be representative and were excluded from the data summary. Also in fourth quarter, TLD results for 215B and 216A were lost due to a mechanical reader problem. The companion badge results were used in the data summary.

The standard deviation for the quarterly result for each badge was subjected to a self-imposed limit of 1.4. This limit is based upon the standard deviations obtained with the Panasonic UD-814 badges during 1992 and is calculated using a method developed by the American Society of Testing and Materials (ASTM Special Technical Publication 15D, ASTM Manual on Presentation of Data and Control Chart Analysis, Fourth Revision, Philadelphia, PA, October 1976).

The limit serves as a flag to initiate an investigation. To be conservative, readings with a standard deviation greater than 1.4 are excluded from the data set since the high standard deviation is interpreted as an indication of unacceptable variation in TLD response. In 2009, the following TLD results were excluded from the data set because their standard deviations were greater than 1.4:

First Quarter	None
Second Quarter	None
Third Quarter	None
Fourth Quarter	None

If one badge at a station exhibited a standard deviation greater than 1.4, then the reading of the companion badge at each location would be used to determine the quarterly exposure. The badges exceeding the self-imposed limit would be visually inspected under a microscope and the glow curve and test results for the anneal data and the element correction factors would be reviewed.

4.4 Milk

Milk samples are obtained biweekly from Station 304 (the state prison dairy) which is a control station located more than 10 miles from the plant. Gamma isotopic and I-131 analyses are performed on each sample as specified in Tables 2-1 and 2-2. Since 1989, efforts to locate a reliable milk sample source within 5 miles of the plant have been unsuccessful.

During 2009, no man-made radionuclides were detected from the gamma isotopic analysis of the milk samples. Cesium-137 was found in most of the samples each year from 1978 (when this analysis became a requirement) through 1989. No other man-made radionuclides have been detected by this analysis.

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 is provided in Figure 4.4-1 and Table 4.4-1.

Figure 4.4-1

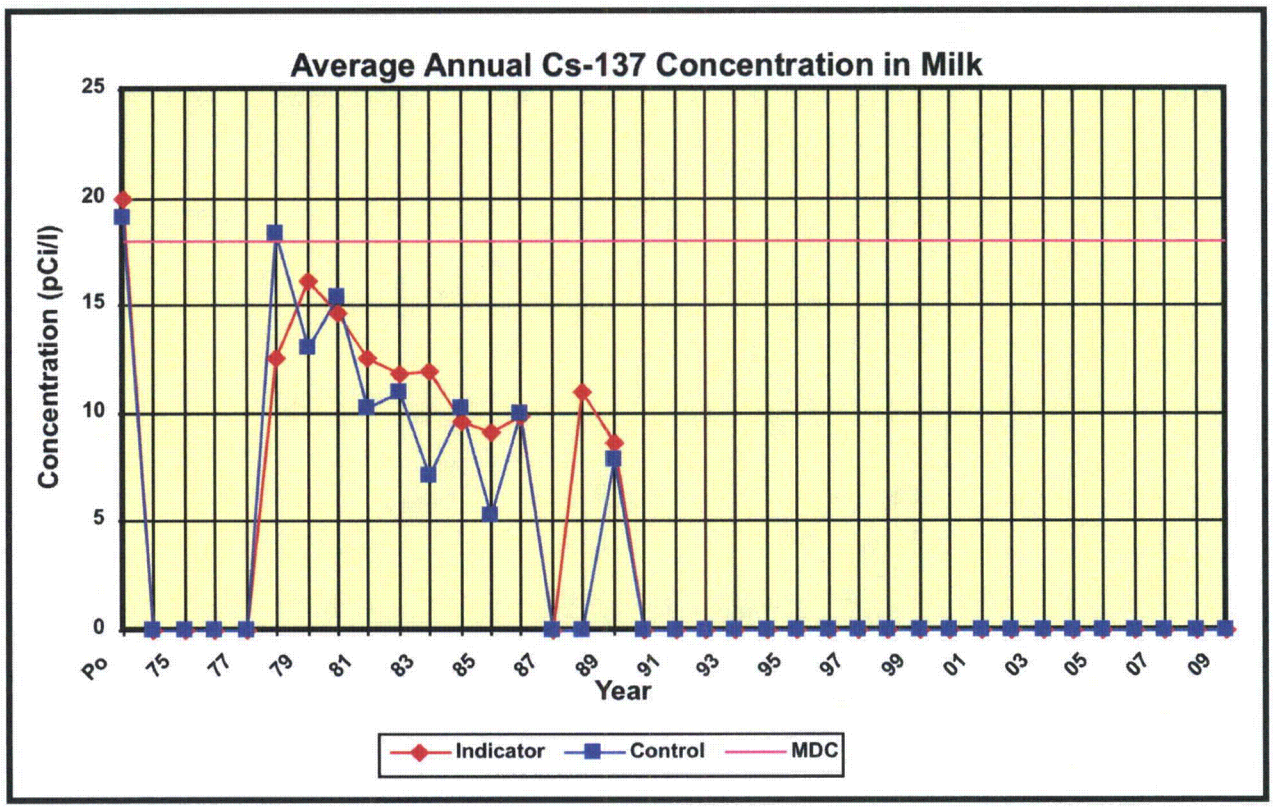


Table 4.4-1

Average Annual Cs-137 Concentration in Milk

Year	Indicator (pCi/l)	Control (pCi/l)
Pre-op	19.9	19.4
1974	NDM	NDM
1975	NDM	NDM
1976	NDM	NDM
1977	NDM	NDM
1978	12.1	18.3
1979	16.1	13
1980	14.7	15.4
1981	12.57	10.2
1982	11.8	11
1983	12	7.2
1984	9.6	10.2
1985	9.14	5.35
1986	9.8	10
1987	NDM	NDM
1988	10.9	NDM
1989	8.6	7.9
1990	NDM	NDM
1991	NDM	NDM
1992	NDM	NDM
1993	NDM	NDM
1994	NDM	NDM
1995	NDM	NDM
1996	NDM	NDM
1997	NDM	NDM
1998	NDM	NDM
1999	NDM	NDM
2000	NDM	NDM
2001	NDM	NDM
2002	NDM	NDM
2003	NDM	NDM
2004	NDM	NDM
2005	NDM	NDM
2006	NDM	NDM
2007	NDM	NDM
2008	NDM	NDM
2009	NDM	NDM

During 2009, I-131 was not detected in any of the milk samples. During preoperation, all readings were less than 2 pCi/l which was the allowed MDC at that time. Figure 4.4-2 and Table 4.4-2 provide the historical trending of the average annual detectable concentration of I-131 in milk. In 1988, a single reading of 0.32 pCi/l, which was believed to have resulted from a procedural deficiency, was reported. The MDC and RL for I-131 in milk are 1 and 3 pCi/l, respectively.

All the detectable results for Cs-137 and I-131 are attributed to fallout from the nuclear weapons tests and the Chernobyl incident.

Figure 4.4-2

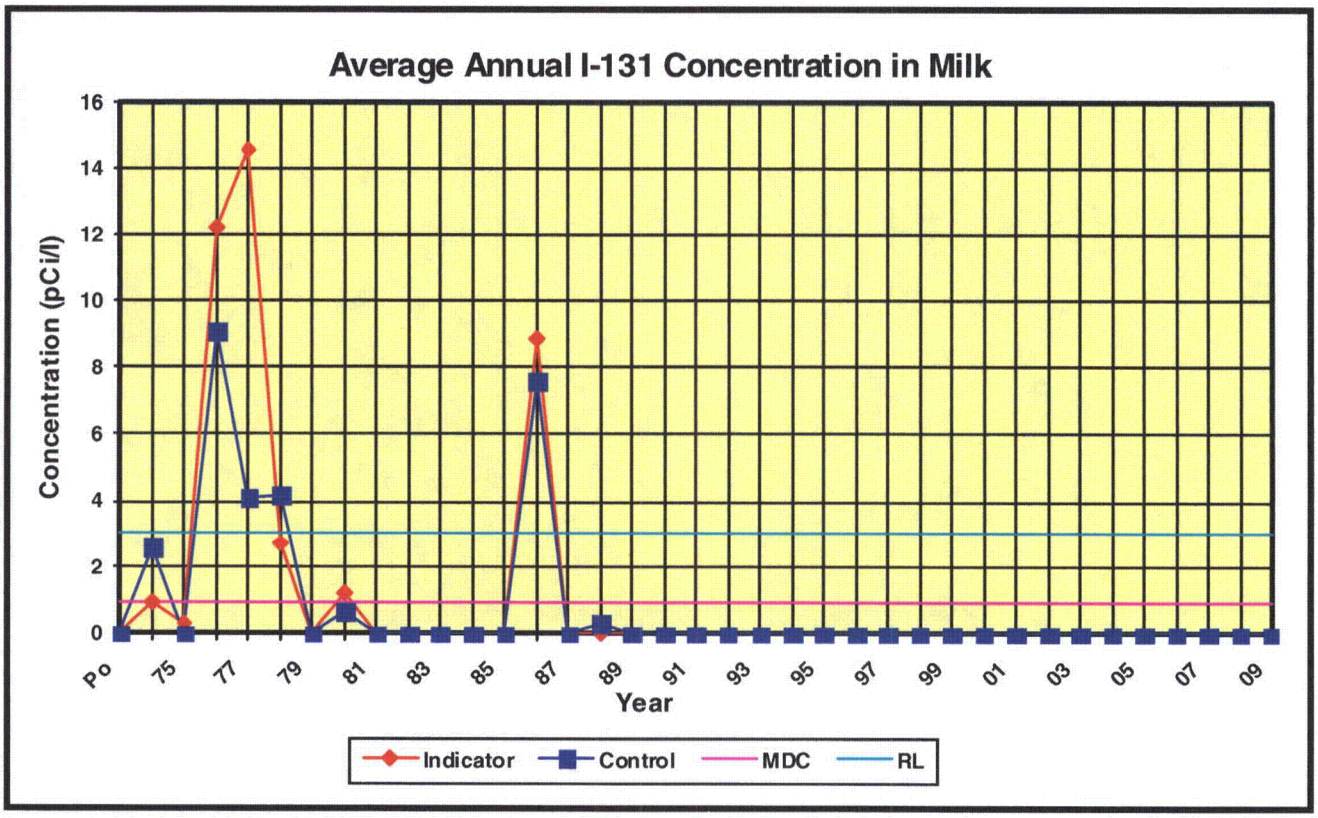


Table 4.4-2

Average Annual I-131 Concentration in Milk

Year	Indicator (pCi/l)	Control (pCi/l)
Pre-op	NDM	NDM
1974	0.98	2.6
1975	0.3	NDM
1976	12.23	9.1
1977	14.61	4.08
1978	2.72	4.18
1979	NDM	NDM
1980	1.26	0.69
1981	NDM	NDM
1982	NDM	NDM
1983	NDM	NDM
1984	NDM	NDM
1985	NDM	NDM
1986	8.9	7.6
1987	NDM	NDM
1988	NDM	0.32
1989	NDM	NDM
1990	NDM	NDM
1991	NDM	NDM
1992	NDM	NDM
1993	NDM	NDM
1994	NDM	NDM
1995	NDM	NDM
1996	NDM	NDM
1997	NDM	NDM
1998	NDM	NDM
1999	NDM	NDM
2000	NDM	NDM
2001	NDM	NDM
2002	NDM	NDM
2003	NDM	NDM
2004	NDM	NDM
2005	NDM	NDM
2006	NDM	NDM
2007	NDM	NDM
2008	NDM	NDM
2009	NDM	NDM

4.5 Vegetation

In accordance with Tables 2-1 and 2-2, grass samples are collected monthly from two indicator stations near the site boundary (Nos. 106 and 112) and at one control station located about 21 miles from the plant (No. 416). Gamma isotopic analyses are performed on each sample. Gamma isotopic analysis on vegetation samples began in 1978 when the analysis became a TS requirement.

The results presented in Table 3-1 show that Cs-137 was the only man-made radionuclide detected in vegetation samples during 2009. Cs-137 was detected in 12 samples of the 24 samples collected at the indicator stations at an average value of 46.8 pCi/kg-wet. No samples collected at the control station had detectable Cs-137. The Cs-137 seen at the indicator stations could potentially be attributed to plant effluents.

Since 1986, Cs-137 has been the only man-made radionuclide found in vegetation samples. The MDC and RL for Cs-137 in vegetation samples are 80 pCi/kg-wet and 2000 pCi/kg-wet, respectively. The occasional presence of Cs-137 in vegetation samples is attributed primarily to fallout from nuclear weapons tests and the Chernobyl incident.

Figure 4.5-1 and Table 4.5-1 provide the historical trending of the average annual detectable Cs-137 concentration found in vegetation. Since 1978, the Cs-137 concentration has been on a decline, and since about 1989, generally occurring below the required MDC.

Figure 4.5-1

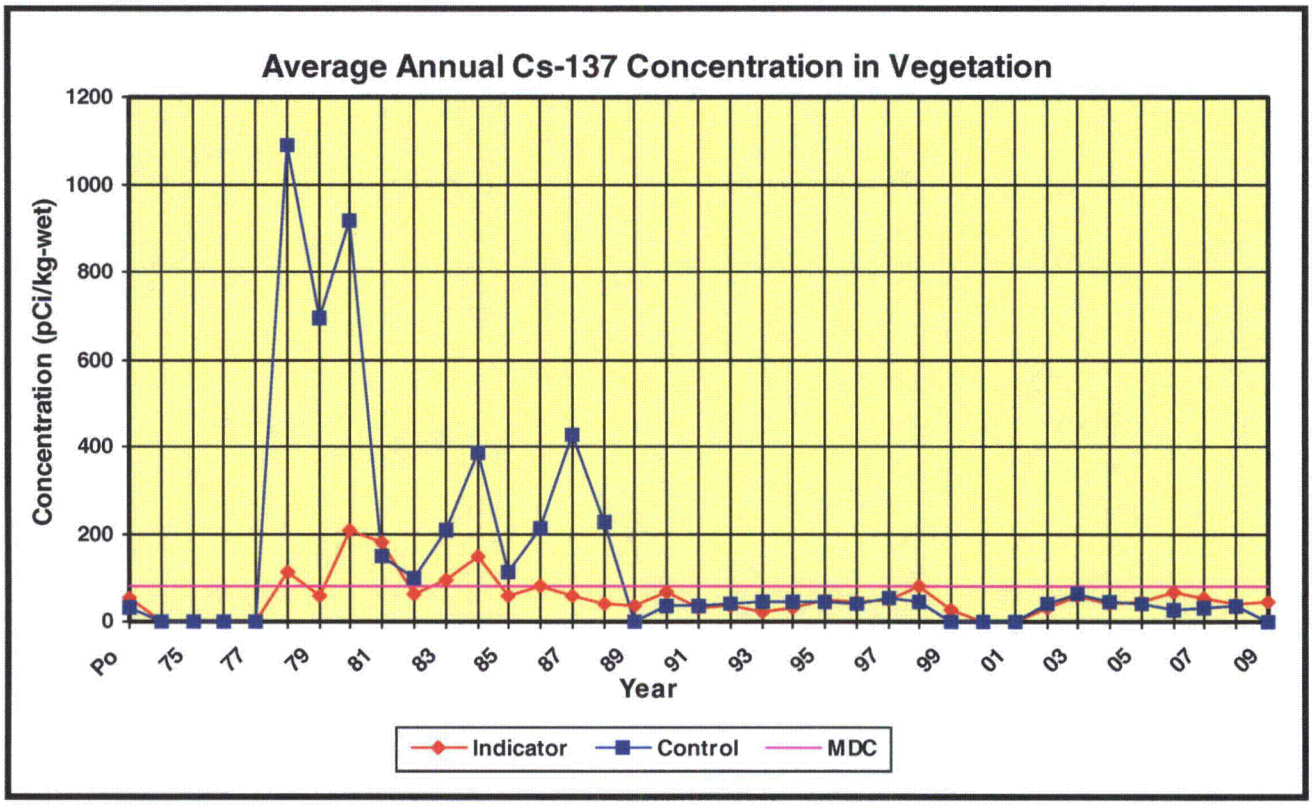

Average Annual Cs-137 Concentration in Vegetation
Concentration (pCi/kg-wet)
1200
1000
800
600
400
200
0
Po
75
77
79
81
83
85
87
89
91
93
95
97
99
01
03
05
07
09
Year
Indicator
Control
MDC

Table 4.5-1

Average Annual Cs-137 Concentration in Vegetation

Year	Indicator (pCi/kg-wet)	Control (pCi/kg-wet)
Pre-op	55	30
1974	NDM	NDM
1975	NDM	NDM
1976	NDM	NDM
1977	NDM	NDM
1978	112	1089
1979	59	695
1980	208	916
1981	182	152
1982	65	99
1983	95	211
1984	149	388
1985	60.9	113.3
1986	80	215
1987	60	428
1988	40.1	228.8
1989	37	NDM
1990	66.7	34.5
1991	34.1	36.1
1992	35.2	41.3
1993	24.7	45.8
1994	32.2	46.6
1995	49.8	47.6
1996	47.2	41.1
1997	48.4	54.9
1998	81.4	44.1
1999	26.9	NDM
2000	NDM	NDM
2001	NDM	NDM
2002	33.7	41.1
2003	61.0	62.8
2004	41.6	43.5
2005	47.7	39.8
2006	66.8	29.6
2007	55.7	31.1
2008	41.8	38.1
2009	46.8	NDM

4.6 River Water

Surface water from the Altamaha River is obtained at an upstream location (Station 170) and at a downstream location (Station 172) using automatic samplers. Small quantities are drawn at intervals not exceeding a few hours. The samples drawn are collected monthly and quarterly composites are produced from the monthly collections.

As specified in Table 2-1, a gamma isotopic analysis is conducted on each monthly sample. No man-made gamma emitters were detected during 2009. The only man-made gamma emitters previously detected are presented in the table below.

Year	Quarter	Station	Radionuclide	Level (pCi/l)
1975	4th	172	Ce-141	78.2
1986	2nd	170	La-140	18.0
1986	2nd	172	Cs-137	12.0
1988	2nd	170	Cs-137	6.8

A tritium analysis is performed on the quarterly composite. Prior to 1986, positive results were usually found in each quarterly composite at levels generally ranging from 200 and 350 pCi/l which is approximately background environmental levels. Subsequently, the number of positive results have diminished.

In 2009, tritium was detected in one of the four quarterly samples at the upstream (control) location and in one of the four quarterly samples at the downstream (indicator) location. The single positive value at the indicator station was 242 pCi/l. The single positive value at the control station was 343 pCi/l. The low levels detected at both the indicator and control stations are essentially environmental background levels (typically 350 pCi/L +/- 250 pCi/L). The MDC and RL for tritium in river water are 3000 and 30,000 pCi/l, respectively. Figure 4.6-1 and Table 4.6-1 provide the historical trending of the annual average detectable tritium concentration in river water.

The annual 50 mile downstream survey of the Altamaha River to determine if river water is being withdrawn for drinking purposes is discussed in Section 4.1.

Figure 4.6-1

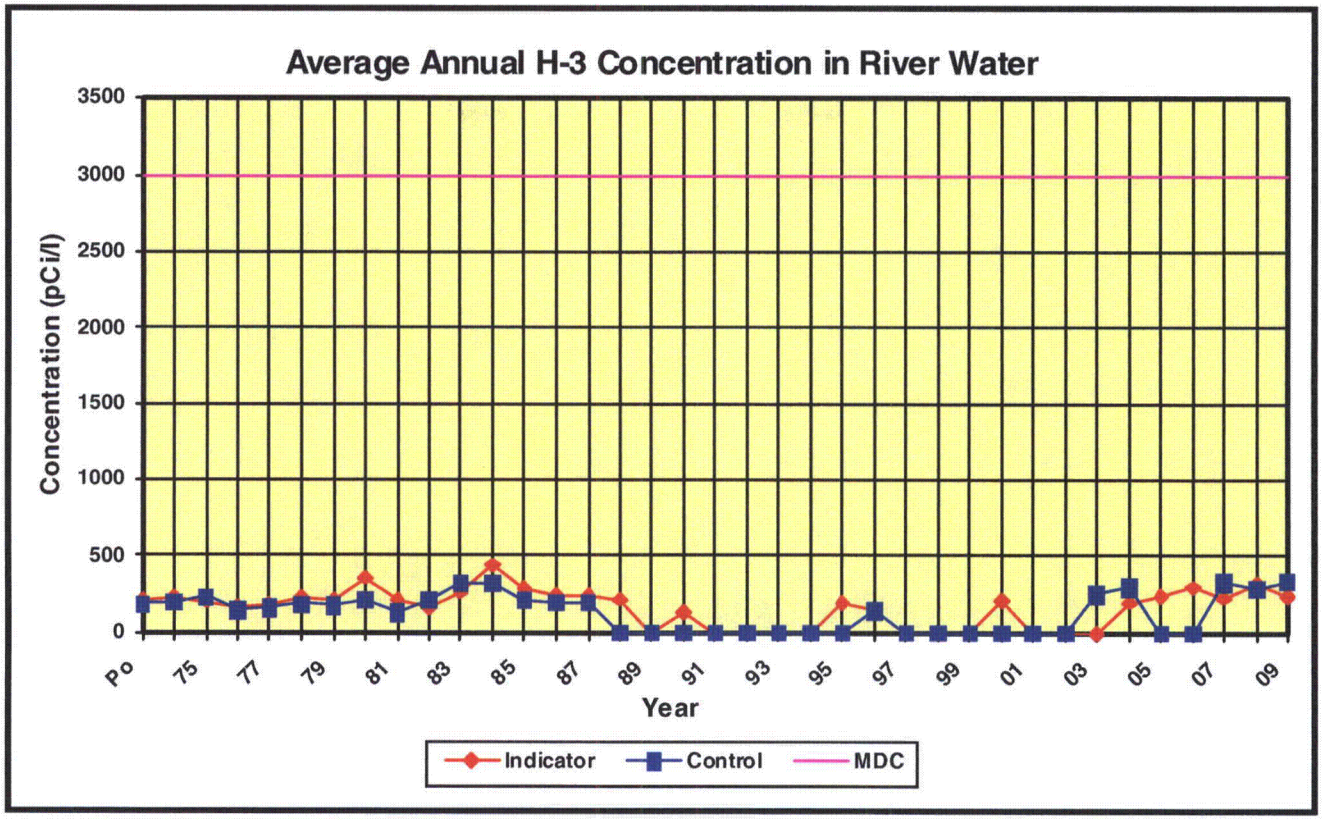

Average Annual H-3 Concentration in River Water
Concentration (pCi/l)
3500
3000
2500
2000
1500
1000
500
0
Po
75
77
79
81
83
85
87
89
91
93
95
97
99
01
03
05
07
09
Year
Indicator
Control
MDC

Table 4.6-1

Average Annual H-3 Concentration in River Water

Year	Indicator (pCi/l)	Control (pCi/l)
Pre-op	210	191
1974	230	205
1975	205	238
1976	165	153
1977	189	170
1978	224	193
1979	210	180
1980	358	218
1981	220	135
1982	165	220
1983	265	328
1984	437	327
1985	288	220
1986	242	206
1987	241	204
1988	220	NDM
1989	NDM	NDM
1990	139	NDM
1991	NDM	NDM
1992	NDM	NDM
1993	NDM	NDM
1994	NDM	NDM
1995	200	NDM
1996	144	147
1997	NDM	NDM
1998	NDM	NDM
1999	NDM	NDM
2000	209	NDM
2001	NDM	NDM
2002	NDM	NDM
2003	NDM	261
2004	206	302
2005	245	NDM
2006	299	NDM
2007	235	338
2008	329	298
2009	242	343

4.7 Fish

Gamma isotopic analyses were performed on the edible portion of the fish samples collected at the river stations on June 8, 2009 (no fish were collected during the second semi-annual period due to high river water level). The control station (No. 170) is located upstream of the plant while the indicator station (No. 172) is located downstream.

As shown in Table 3-1, Cs-137 was the only man-made radionuclide detected in fish during 2009. The concentration of 12.4 pCi/kg-wet at the indicator station was 4 pCi/kg-wet more than the concentration found at the control station (8.4 pCi/kg-wet). Cs-137 in fish samples is attributed primarily to weapons testing and the Chernobyl incident. However, the Cs-137 seen in the fish samples at the indicator station could be attributed to plant effluents. The MDC and RL for Cs-137 in fish are 150 and 2000 pCi/kg-wet, respectively.

The historical trending of the average annual detectable Cs-137 concentration in fish is provided in Figure 4.7-1 and Table 4.7-1. Figure 4.7-1 indicates, in general, a decline in the Cs-137 levels after 1983. (Note: From 1979 through 1982, clams were collected rather than fish.)

Figure 4.7-1

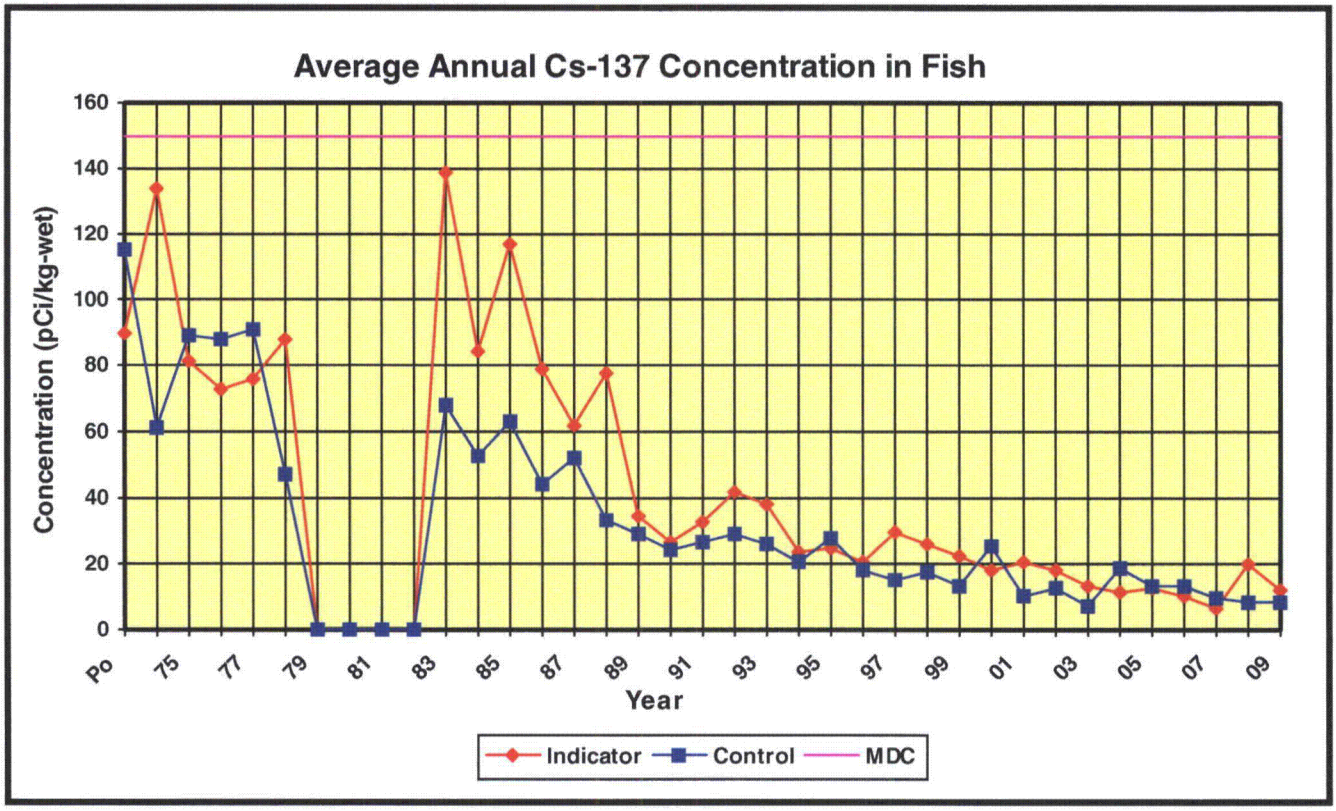


Table 4.7-1

Average Annual Cs-137 Concentration in Fish

Year	Indicator (pCi/kg-wet)	Control (pCi/kg-wet)
Pre-op	90	115
1974	134	61
1975	80.6	89.4
1976	73	88
1977	76	91
1978	88	47
1979	NDM	NDM
1980	NDM	NDM
1981	NDM	NDM
1982	NDM	NDM
1983	138.6	67.5
1984	84	53
1985	117	63.3
1986	79	44
1987	62	52
1988	77.8	33.3
1989	34.3	28.9
1990	26.7	24.2
1991	32.9	26.9
1992	41.6	28.8
1993	38.0	25.9
1994	23.8	20.7
1995	25.0	27.9
1996	20.4	18.0
1997	29.4	15.1
1998	26.1	17.7
1999	22.3	13.5
2000	17.9	25.3
2001	20.8	10.2
2002	18.2	13.0
2003	13.1	7.1
2004	11.6	18.8
2005	13.0	13.3
2006	10.4	13.5
2007	6.8	9.8
2008	19.9	8.4
2009	12.4	8.4

In the past, the only other man-made radionuclides detected in fish samples were Co-60 and Cs-134. During preoperation, Co-60 was detected in one fish sample at a very low concentration. During the period of 1983 through 1988, Cs-134 was found in about half of the samples at concentrations of the same order of magnitude as those found for Cs-137. The Co-60 and Cs-134 levels found in these samples are attributed to the nuclear weapons tests and the Chernobyl incident. Figure 4.7-2 and Table 4.7-2 show the historical trending of the annual average detectable concentration of Cs-134 in fish.

Figure 4.7-2

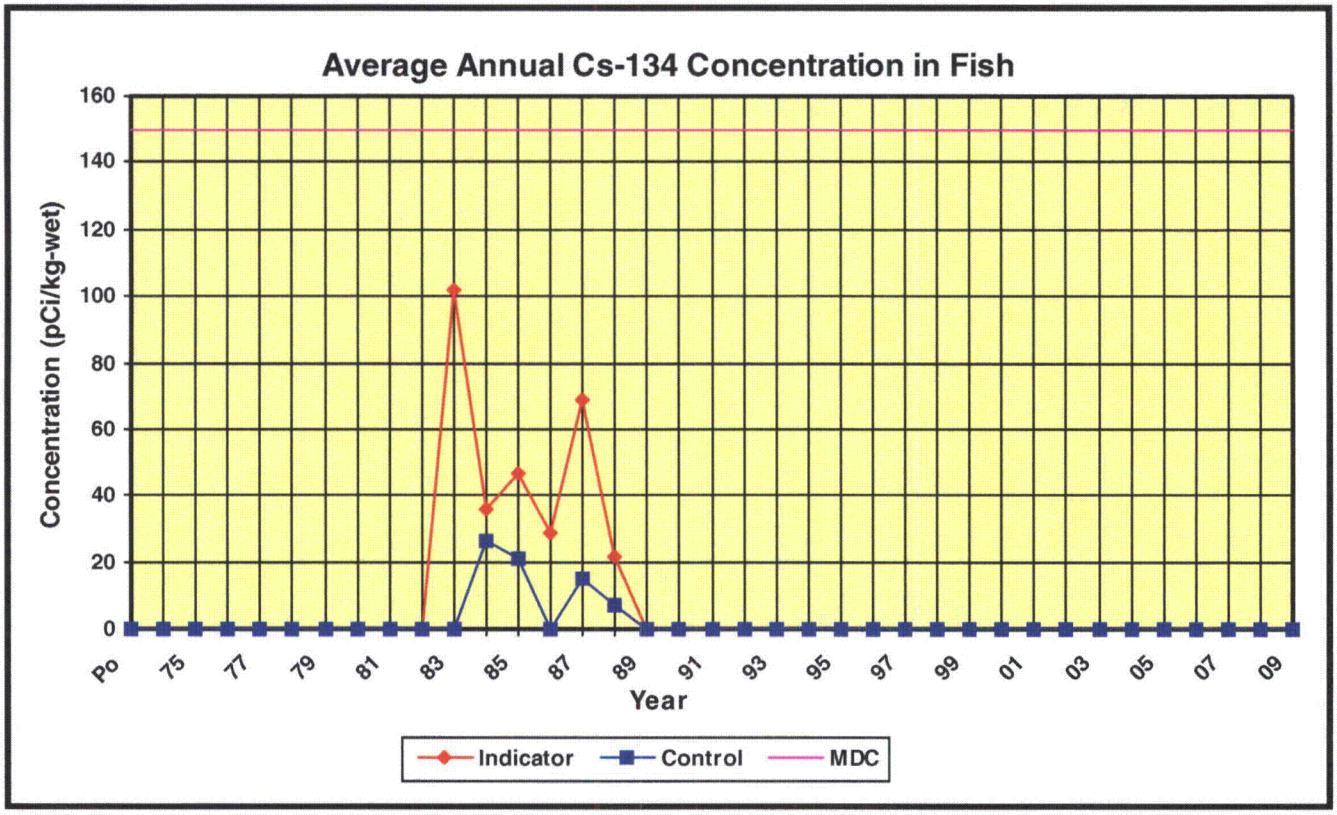


Table 4.7-2

Average Annual Cs-134 Concentration in Fish

Year	Indicator (pCi/kg-wet)	Control (pCi/kg-wet)
Pre-op	NDM	NDM
1974	NDM	NDM
1975	NDM	NDM
1976	NDM	NDM
1977	NDM	NDM
1978	NDM	NDM
1979	NDM	NDM
1980	NDM	NDM
1981	NDM	NDM
1982	NDM	NDM
1983	101.8	NDM
1984	35.8	26.3
1985	46.7	21.1
1986	29	NDM
1987	69	15
1988	21.7	6.9
1989	NDM	NDM
1990	NDM	NDM
1991	NDM	NDM
1992	NDM	NDM
1993	NDM	NDM
1994	NDM	NDM
1995	NDM	NDM
1996	NDM	NDM
1997	NDM	NDM
1998	NDM	NDM
1999	NDM	NDM
2000	NDM	NDM
2001	NDM	NDM
2002	NDM	NDM
2003	NDM	NDM
2004	NDM	NDM
2005	NDM	NDM
2006	NDM	NDM
2007	NDM	NDM
2008	NDM	NDM
2009	NDM	NDM

4.8 Sediment

Sediment was collected along the shoreline of the Altamaha River on May 4 and November 2, 2009, at the upstream control station (No. 170) and the downstream indicator station (No. 172). A gamma isotopic analysis was performed on each sample.

Co-60 was not found in sediment samples in 2009. With the exception of a few years, Co-60 has been found at either the indicator or the control station every year since 1986. There is no RL or MDC assigned to Co-60 in sediment in ODCM Tables 4-2 and 4-3 (Tables 4-2 and 4-1 of this report). The MDC assigned by the EL for Co-60 in sediment is 70 pCi/kg-dry. The historical trending of the average annual detectable Co-60 concentration in sediment is provided in Figure 4.8-1 and Table 4.8-1.

Figure 4.8-1

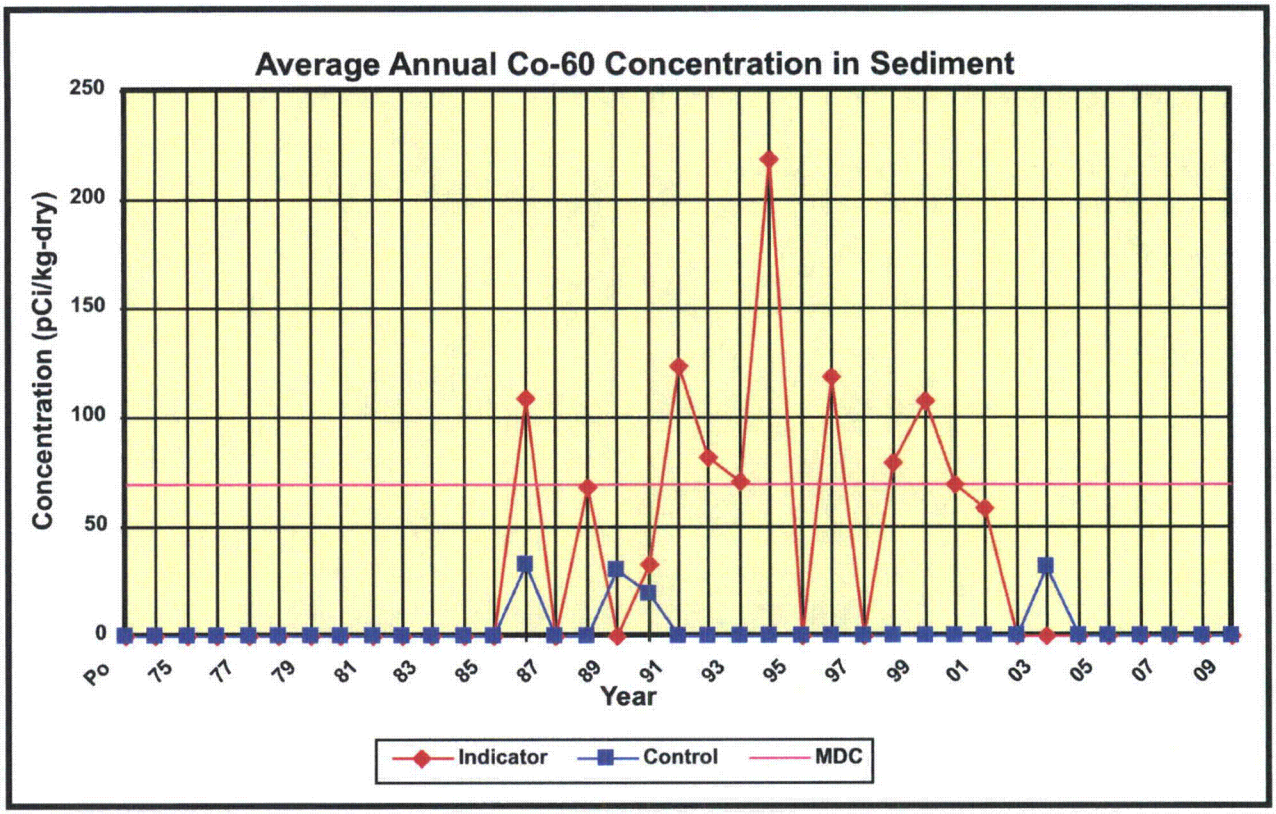


Table 4.8-1

Average Annual Co-60 Concentration in Sediment

Year	Indicator (pCi/kg-dry)	Control (pCi/kg-dry)
Pre-op	NDM	NDM
1974	NDM	NDM
1975	NDM	NDM
1976	NDM	NDM
1977	NDM	NDM
1978	NDM	NDM
1979	NDM	NDM
1980	NDM	NDM
1981	NDM	NDM
1982	NDM	NDM
1983	NDM	NDM
1984	NDM	NDM
1985	NDM	NDM
1986	108	33
1987	NDM	NDM
1988	67.8	NDM
1989	NDM	31
1990	33	19
1991	123.6	NDM
1992	81.4	NDM
1993	70.7	NDM
1994	218	NDM
1995	NDM	NDM
1996	118.5	NDM
1997	NDM	NDM
1998	79.4	NDM
1999	107.7	NDM
2000	70.0	NDM
2001	58.1	NDM
2002	NDM	NDM
2003	NDM	31.5
2004	NDM	NDM
2005	NDM	NDM
2006	NDM	NDM
2007	NDM	NDM
2008	NDM	NDM
2009	NDM	NDM

Co-60 was not detected in sediment samples near the plant until 1986, the year of the Chernobyl incident. However, because Co-60 was detected in indicator station samples more often than in control station samples during the years 1986 through 2002, some contribution from plant effluents cannot be ruled out. Co-60 has not been detected in either control or indicator station samples since 2004.

In 2009, Cs-137 was detected in both indicator and control station sediment samples. It has been found in over 95% of all of the sediment samples collected back through preoperation, and is generally attributed to the atmospheric nuclear weapons tests or to the Chernobyl incident. As shown in Table 3-1, the average at the indicator station was 74.9 pCi/kg-dry and the average at the control station was 60.5 pCi/kg-dry. The difference between the indicator and control stations (14.4 pCi/kg-dry) is not statistically discernible since it is less than the MDD of 354 pCi/kg-dry. The MDC for Cs-137 in sediment is 180 pCi/kg-dry. The historical trending of the average annual detectable Cs-137 concentration in sediment is provided in Figure 4.8-2 and Table 4.8-2.

Figure 4.8-2

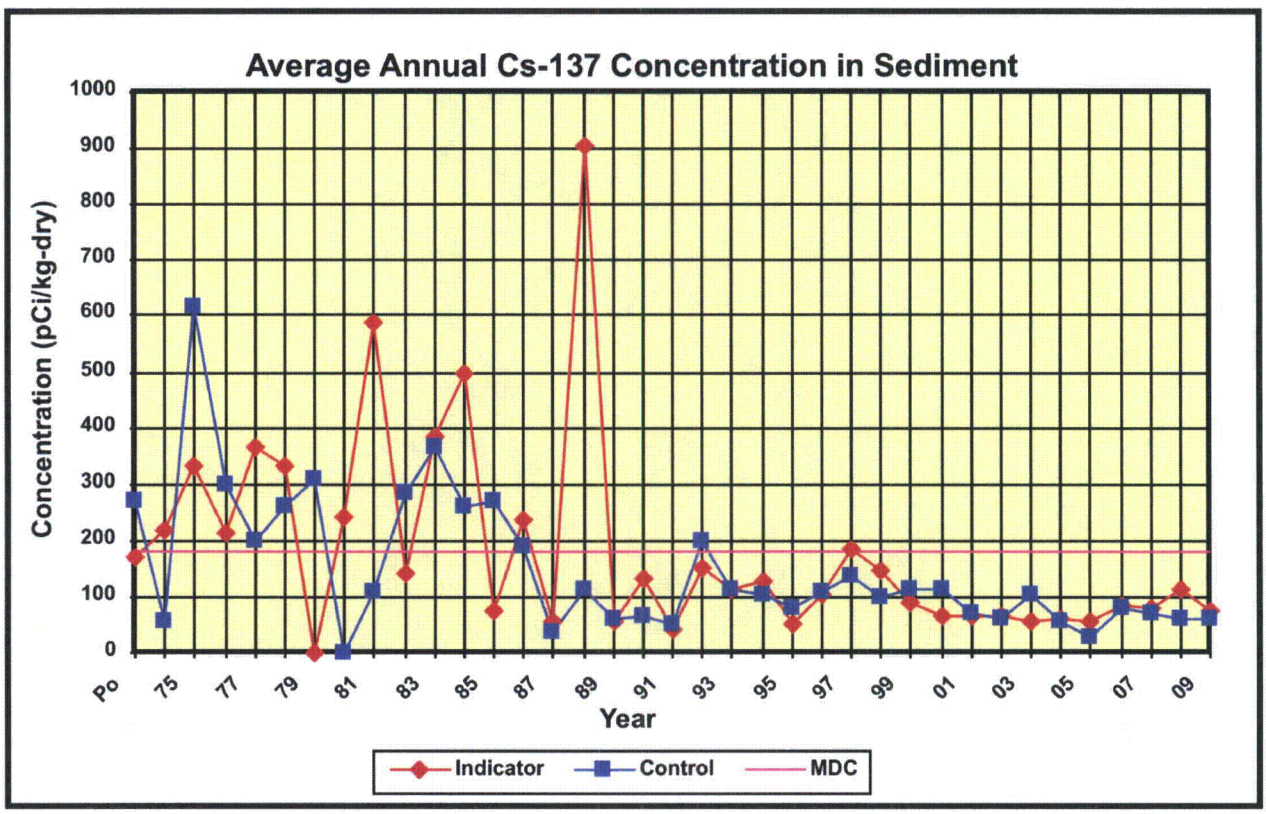


Table 4.8-2

Average Annual Cs-137 Concentration in Sediment

Year	Indicator (pCi/kg-dry)	Control (pCi/kg-dry)
Pre-op	170	270
1974	218	57
1975	330	615
1976	211	300
1977	364	200
1978	330	260
1979	NDM	310
1980	240	NDM
1981	590	110
1982	141	285
1983	384	365
1984	500	260
1985	76.5	269
1986	238	190
1987	59	39
1988	903	114
1989	56	62
1990	130.5	66
1991	43.1	54.5
1992	151	198.5
1993	113	115
1994	127	104
1995	52.3	80.6
1996	106	110
1997	186	137
1998	148.5	101.4
1999	92	111.8
2000	68.1	114.5
2001	68.7	69.6
2002	68.1	62.8
2003	57.3	106
2004	59.5	57.1
2005	57.2	30.3
2006	85.2	79.2
2007	82.1	71.6
2008	112.7	61.9
2009	74.9	60.5

Other man-made nuclides, besides Co-60 and Cs-137, were occasionally found in past years. Their presence was generally attributed to the nuclear weapons tests or to the Chernobyl incident, although plant releases were not ruled out. Mn-54, Co-58, and Zn-65, which have relatively short half-lives, are most likely a result of plant releases and have been plotted in Figure 4.8-3 along with their MDCs. All the man-made nuclides detected in sediment except for Co-60 and Cs-137 have been listed in Table 4.8-3. The Cs-134 MDC (150 pCi/kg-dry) is defined in ODCM Table 4-3 (Table 4-1 of this report). The MDCs for Mn-54 (42 pCi/kg-dry) and Zn-65 (129 pCi/kg-dry) were determined by the EL since no values are provided in ODCM Table 4-3.

Figure 4.8-3

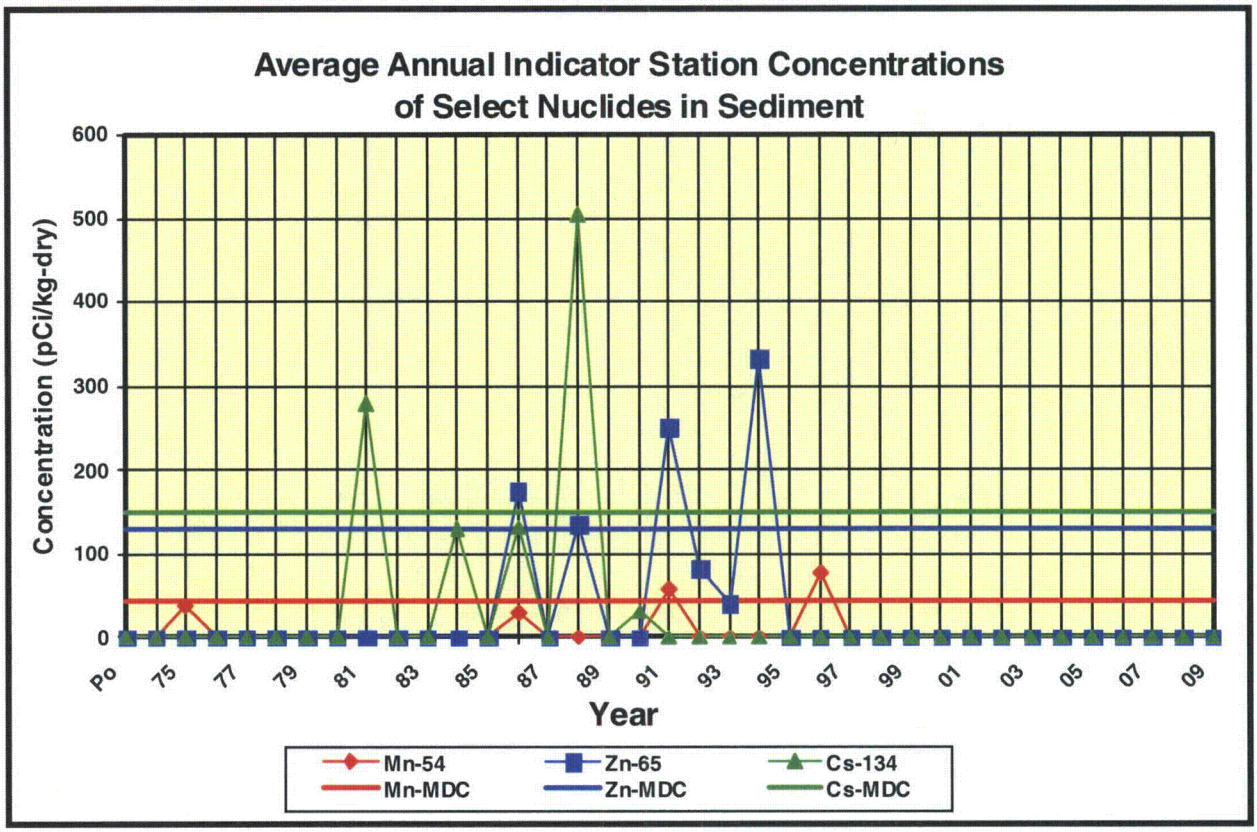


Table 4.8-3

Sediment Nuclide Concentrations Other Than Co-60 & Cs-137

Nuclide	YEAR	Indicator (pCi/kg-dry)	Control (pCi/kg-dry)
Ce-141	1976	340	254
	1977	141	
Ce-144	Preop		720
	1974	363	
	1975	342	389
	1978	700	
	1981	1290	
Co-58	1994	22.2	
Cs-134	Preop		40
	1981	280	
	1984	130	40
	1986	132	
	1988	505	
	1990	31	
Mn-54	1975	36.1	
	1986	28	26
	1991	57.2	
	1996	77.7	
Ru-103	1974	81	
	1976	158	
	1977	195	
	1981	220	
Zn-65	1986	175	
	1988	136	
	1991	250.5	
	1992	83	
	1993	39.9	
	1994	332	
Zr-95	Preop		180
	1974	138	
	1976	427	170
	1977	349	294
	1978	220	230
	1981	860	280

4.9 Groundwater

As nuclear plants began to undergo decommissioning in the late 1990's to early 2000s, instances of subsurface and/or groundwater contamination were identified. In addition, several operating facilities also identified groundwater contamination resulting from spills and leaks or equipment failure. In one instance, low levels of licensed material were detected in a private well located on property adjacent to a nuclear power plant.

In 2006, NEI (Nuclear Energy Institute) formed a task force to address monitoring onsite groundwater for radionuclides at nuclear facilities. A Groundwater Protection Initiative was developed which was adopted by all U.S. commercial operating nuclear plants.

The NRC also formed a task force to study the groundwater issues and released Information Notice 2006-13 "Ground-water Contamination due to Undetected Leakage of Radioactive Water" which summarized its review of radioactive contamination of ground water at multiple facilities as a result of undetected leakage from structures, systems, or components that contain or transport radioactive fluids. Licensees were instructed to review the information for applicability and to consider appropriate actions to avoid similar problems.

The NEI task force felt it was prudent for the industry to update site hydrology information and to develop radiological groundwater monitoring plans at each site. These groundwater protection plans would ensure that underground leaks and spills would be addressed promptly. Additionally, the task force recommended developing a communications protocol to report radioactive leaks or spills that entered groundwater (or might eventually enter groundwater) to the NRC and State and Local government officials as needed.

Southern Nuclear developed a company-wide communications protocol which is contained in the Nuclear Management Procedure, *Actions for Potential Groundwater Contamination Events*, to ensure radioactive leaks and spills would be addressed and communicated appropriately. The guidance in this procedure is used to informally update both the NRC and the State of Georgia regarding the changes in Hatch's groundwater tritium concentrations.

Plant Hatch has monitored onsite groundwater since preoperation. Initially piezometers, which were installed prior to plant construction, were used to monitor groundwater. In the late 1970s to the early 1980s timeframe, a hydrological engineering consultant was hired to evaluate several areas where leaks had occurred and tritium had been detected in onsite wells. The consultant recommended drilling additional monitoring wells to study the groundwater movement, to determine the source of the leaks, and to track the tritium concentrations in groundwater.

In the late 1970s through the mid 1980s, Hatch reported groundwater results to the NRC. The reporting frequency was decreased for several reasons – the areas where the groundwater showed tritium were all onsite and the movement of groundwater was extremely slow and in a direction (towards the river) that was not expected to impact the public. Although the reports are no longer made on a routine basis, Plant Hatch has continued to monitor onsite groundwater wells for tritium on a scheduled frequency.

In 2006 as the nuclear industry was moving towards establishing groundwater monitoring programs, Plant Hatch hired a hydrological engineering consultant to re-evaluate the groundwater study which had been done previously. The key purpose of the new study was to evaluate the adequacy of the current monitoring program and to diagram the existing groundwater tritium plume to ensure that the plume had not migrated offsite. The consultant concluded that tritium was not leaving the site through the groundwater. The consultant recommended installing additional monitoring wells to better characterize the groundwater plume in areas of the site where there were no existing wells.

During the course of Plant Hatch's groundwater evaluation in 2006, some leaks were discovered which explained why the levels of tritium around CST-1 (Unit 1 Condensate Storage Tank) were not decreasing. Underground piping which carried radioactive liquids was evaluated over the plant site and replaced in some areas around CST-1. Both CST tank/pump moats (Unit 1 and Unit 2) were coated and sealed to ensure that moats would not leak in the event of transfer pump or tank leaks.

In 2006, Plant Hatch's groundwater monitoring program included over 50 location points which were sampled on weekly, monthly, quarterly, or annual frequencies (see maps at the end of this section). Included in these sample points were the onsite drinking water wells. They did not contain detectable amounts of radioactivity. Surface drains or outfalls were also included as sample points. Tritium was detected in two of the outfalls which discharged to the river. These outfalls were initially added to the Hatch ODCM as radiological effluent release points. Permitted release point Y22N008A (by design) discharges groundwater from the site subsurface drainage system which includes the tritiated groundwater around the CST-1. The other release point, Y22N003A, discharges runoff from the roof drains. The source of tritium in this outfall has been determined to be from rain washout of the gaseous plant effluents and is no longer a permitted release point. Plant Hatch sampled rainfall during two rain events in 2006 and found tritium levels as high as 4.58E5 pCi/l on the reactor building roof. Two other outfalls, Y22N024A and Y22N025A, which discharge into the onsite swamp show sporadic levels of tritium. The source of tritium in these outfalls is also believed to be from rain washout.

In 2007, Hatch continued to aggressively monitor the groundwater tritium plume especially in two areas of higher activity around CST-1 and CST-2. The amount of seasonal rainfall during 2007 seems to have had some correlation with the tritium concentrations in the T-12 well near CST-1. During early spring and late fall rainy seasons, the concentrations of tritium were at their highest levels, whereas, during the summer and early fall drought season the tritium concentrations decreased significantly. This is indicative of water table level fluctuations.

However, this same seasonal affect was not observed in the newer NW10 monitoring well installed in 2006 near CST-2. The tritium concentration in NW10 increased from February 2007 through September 2007 by a factor of 2.5. Events which could have contributed to the increase were a CST-2 transfer pump leak (in November 2006) which led to an accumulation of a couple feet of CST-2 water in the pump moat. Although the moat had been sealed earlier in 2006, there was a possibility that some of the contaminated water seeped through the concrete moat and gradually seeped through the ground to NW10. In addition, there was a deep hole dug (in January 2007) near the CST-2 (and NW10) to replace some CST-2 piping. The hole may have altered groundwater flow toward NW10 from the CST-1 groundwater plume and resulted in higher concentrations of tritium being drawn to NW10.

In 2008, Hatch made further enhancements to the groundwater tritium monitoring program. Three additional shallow wells and three additional deep wells were installed ("R" series wells). One of the deep wells was a replacement well for the deep well N7A. The integrity of N7A was questioned due to the high level of tritium (~211,000 pCi/l) seen in this well which should have been protected from contamination by a confining layer. The well was retired and a new well (R-3) was placed in the same vicinity. The newer well showed much smaller amounts of tritium activity (average of 2180 pCi/l for the last three quarters of 2008).

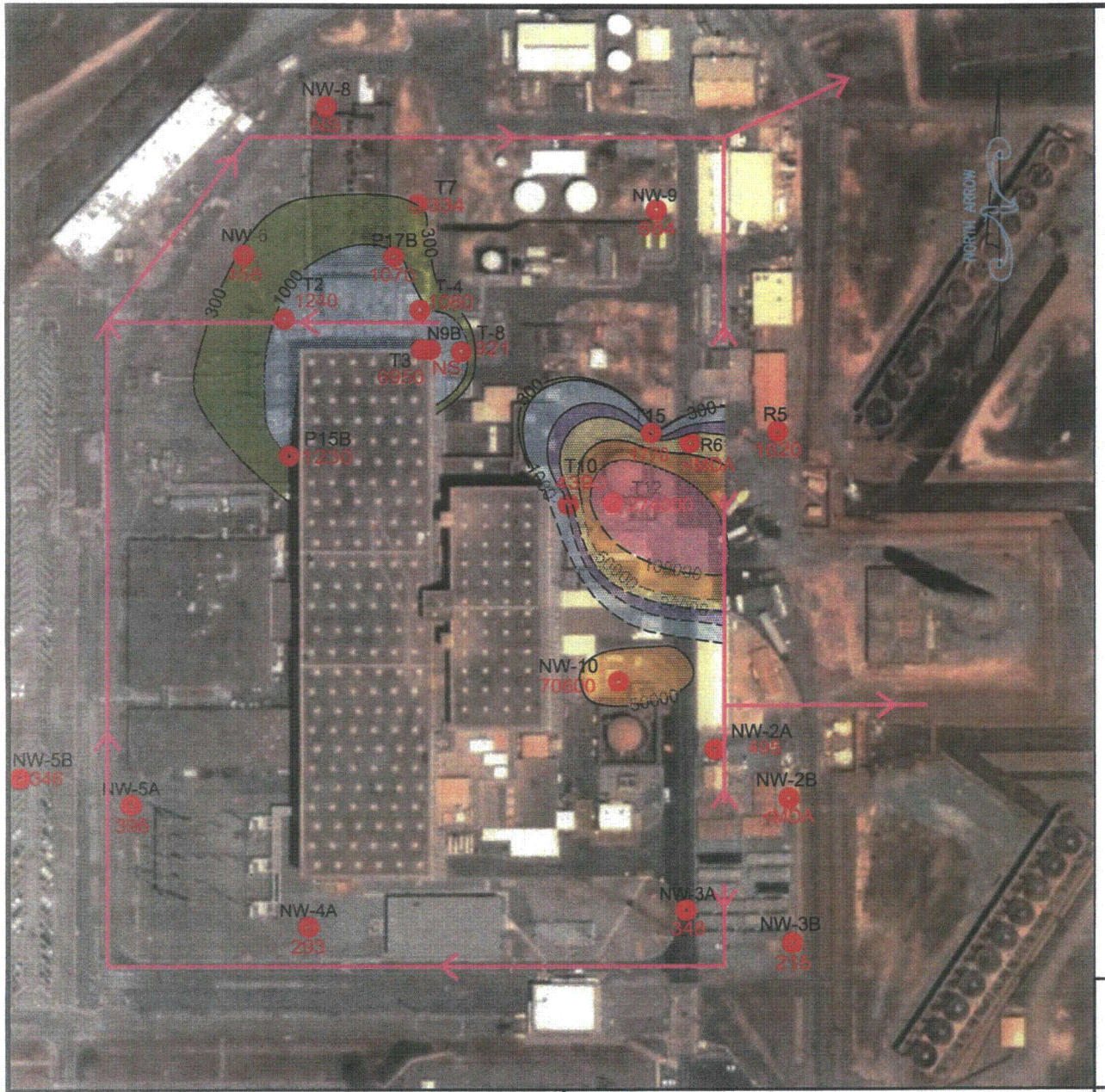
In addition, several other groups within Southern Company are now utilized to conduct an improved sampling program and to provide additional expertise in characterizing groundwater quality and flow. The sampling frequency for radiological groundwater monitoring was officially changed to quarterly starting in second quarter of 2008 with SCS Civil Field Services performing the sampling and Georgia Power Environmental Laboratory continuing to analyze the samples.

Over the past couple of years, SNC Corporate Engineering and Hatch Site Engineering have developed the Buried Piping and Tanks Inspection Program. This program should help to prevent releases of radioactive material to groundwater. Underground piping and components are risked ranked using detailed procedures and EPRI's software, BPWorks, to ensure vulnerable areas are identified and repaired or replaced before problems occur.

The latest groundwater tritium plume map (generated from the 2009 SCS sampling data) is shown on the following page. It is a representation of the current groundwater conditions at Plant Hatch. The wells of interest around the CSTs had the following average tritium concentrations from the 4 quarters of sampling in 2009: T-12, near CST-1, averaged approximately 295,000 pCi/l of tritium (down from an average of 650,000 pCi/l for the 3 quarters sampled by SCS in 2008) and NW10, near CST-2, averaged 75,400 pCi/l of tritium (down from an average of 116,000 pCi/l for the 3 quarters sampled by SCS in 2008).

In May of 2009, there was an increase in tritium concentration in well T-3 (located near the U-1 Turbine Building) from approximately 2600 pCi/l to approximately 37,000 pCi/l. Neighboring well N9B (not part of the formal GW sampling program) also showed an approximate 10X increase – going from 1300 pCi/l to over 10K pCi/l. Investigation found no process leaks and the non-rad constituents continued to match groundwater. The increase was attributed to migration of the plume. Increased rainfall and the fact that the wells are located near the subsurface drain could likely have facilitated the pathway of the plume towards the T3 well. A courtesy notification was made to the State of Georgia Dept. of Natural Resources and a 10CFR50.72 formal report was made to the NRC – although only courtesy notifications were required per procedure. The tritium concentration in T3 continues to decrease and was down to approximately 7000 pCi/l in November. N9B has not been routinely sampled since the major decline in tritium has been observed in T3 but will be sampled again in 2010 to confirm that tritium levels have declined.

No tritium activity above background was seen in the Deep Wells 2 and 3 which are used for drinking water at the plant. The plant staff continues to sample and monitor strategically located wells on a more frequent basis than quarterly to ensure that radiological leaks have not occurred. In addition, outfalls, pull boxes, manholes, and the sewage treatment plant effluent are sampled by the plant staff on a periodic basis.



CONCENTRATION DATA PCi/L

> 1.00E + 06
5.00E + 05 - 1.00E + 06
1.00E + 05 - 5.00E + 05
5.00E + 04 - 1.00E + 05
2.00E + 04 - 5.00E + 04
1.00E + 04 - 2.00E + 04
1.00E + 03 - 1.00E + 04
3.00E + 02 - 1.00E + 03

LEGEND:

NW9 ● Unconfined Perched Aquifer Tritium Source Detection Monitoring Well

→ Approximately Located French Drain & Flow

< MDA Less Than Minimum Detectable Activity

NS Not Sampled

200 0 100 200 400

Southern Company Generation
Engineering and Construction Services
FOR
Southern Nuclear Company

PLANT HATCH
UNCONFINED PERCHED AQUIFER
NOVEMBER 2009
FIGURE 4.9-1

PROJ I.D.	DRAWING NUMBER	SHEET	CONT'D	REV
		1	FINAL	0

5.0 INTERLABORATORY COMPARISON PROGRAM

In accordance with ODCM 4.1.3, the EL participates in an ICP that 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 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 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 and gamma isotopic analyses of an air filter; gamma isotopic analyses of milk samples; and gross beta, tritium and gamma isotopic analyses of water samples.

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 as reported by Analytics. The uncertainty of the reported average is the propagated error of the values in the reported average by the EL. The precision of each result is measured by the coefficient of variation, which is defined as the standard deviation of the reported result 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 (pCi/l).

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 and gamma isotopic analyses of an air filter; gamma isotopic analyses of milk samples; and gross beta, tritium and gamma isotopic analyses 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.

The EL analyzed 9 samples for 35 parameters in 2009. These analyses included tritium, gross beta and gamma emitting radio-nuclides in different matrices. The attached results indicate all analyses are acceptable for precision and one analysis outside the acceptance limits for accuracy. The activity recovery of Fe-59 in air filter was above the upper acceptance limit for accuracy.

The analysis of Fe-59 is performed by gamma spectroscopy, with the value determined by a weighted average of the three germanium detectors. In a 2005 investigation a positive bias was determined to exist in the analysis based on summing of nuclides in the calibration standard. The detectors are calibrated on a three year geometry rotation. The air filter geometry calibration is scheduled and will be completed in 2010. The 2009 sample will be reanalyzed with the new calibration to verify calibration accuracy.

TABLE 5-1 (SHEET 1 of 3)

INTERLABORATORY COMPARISON PROGRAM RESULTS

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

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation EL	Uncertainty Analytics (3S)	Percent Coef of Variation	Normalized Deviation
Gross Beta	09/17/09	85.00	85.80	1.68	0.48	5.21	-0.19

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

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation EL	Uncertainty Analytics (3S)	Percent Coef of Variation	Normalized Deviation
Ce-141	09/17/09	204.10	193.00	8.07	1.08	5.02	1.08
Co-58	09/17/09	75.60	69.90	3.81	0.39	7.23	1.05
Co-60	09/17/09	117.10	113.00	2.15	0.63	3.78	0.92
Cr-51	09/17/09	194.50	155.00	2.1	0.86	13.61	1.49
Cs-134	09/17/09	83.90	86.50	1.48	0.48	3.99	-0.77
Cs-137	09/17/09	142.40	130.00	4.01	0.72	4.46	1.95
Fe-59	09/17/09	131.30	103.00	6.51	0.58	6.86	3.14
Mn-54	09/17/09	160.10	145.00	0.86	0.81	3.44	2.74
Zn-65	09/17/09	176.20	143.00	7.22	0.80	6.35	2.97

GAMMA ISOTOPIC ANALYSIS OF A MILK SAMPLE (pCi/liter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation EL	Uncertainty Analytics (3S)	Percent Coef of Variation	Normalized Deviation
Ce-141	06/18/09	286.50	284.00	22.86	1.58	8.94	0.10
Co-58	06/18/09	97.40	91.90	3.44	0.51	8.17	0.69
Co-60	06/18/09	326.50	312.00	9.4	1.74	4.73	0.94
Cr-51	06/18/09	415.30	400.00	48.83	2.23	15.87	0.23
Cs-134	06/18/09	178.10	166.00	6.63	0.92	5.65	1.20
Cs-137	06/18/09	205.20	192.00	15.72	1.07	9.03	0.71

TABLE 5-1 (SHEET 1 of 3)

INTERLABORATORY COMPARISON PROGRAM RESULTS

GAMMA ISOTOPIC ANALYSIS OF A MILK SAMPLE (pCi/liter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation EL	Uncertainty Analytics (3S)	Percent Coef of Variation	Normalized Deviation
Fe-59	06/18/09	144.10	122.00	3.6	0.68	7.69	1.99
I-131	06/18/09	116.00	102.00	7.01	0.57	9.34	1.29
Mn-54	06/18/09	138.80	137.00	17.49	0.76	13.97	0.09
Zn-65	06/18/09	194.90	175.00	3.54	0.98	8.45	1.21

GROSS BETA ANALYSIS OF WATER SAMPLE (pCi/liter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation EL	Uncertainty Analytics (3S)	Percent Coef of Variation	Normalized Deviation
Gross Beta	03/19/09	201.70	203.00	2.72	1.13	5.28	-0.12
	06/18/09	134.40	141.00	4.6	0.79	10.03	-0.49

GAMMA ISOTOPIC ANALYSIS OF WATER SAMPLES (pCi/liter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation EL	Uncertainty Analytics (3S)	Percent Coef of Variation	Normalized Deviation
Ce-141	03/19/09	119.10	120.00	9	0.67	9.54	-0.08
Co-58	03/19/09	145.30	151.00	9.04	0.84	8.18	-0.48
Co-60	03/19/09	193.70	180.00	4.54	1.00	4.44	1.60
Cr-51	03/19/09	406.90	387.00	12.63	2.15	9.69	0.50
Cs-134	03/19/09	122.20	119.00	6.96	0.66	7.42	0.35

TABLE 5-1 (SHEET 3 of 3)

INTERLABORATORY COMPARISON PROGRAM RESULTS

GAMMA ISOTOPIC ANALYSIS OF WATER SAMPLES (pCi/liter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation EL	Uncertainty Analytics (3S)	Percent Coef of Variation	Normalized Deviation
Cs-137	03/19/09	152.00	141.00	9.57	0.79	8.05	0.90
Fe-59	03/19/09	142.00	127.00	2.78	0.70	6.68	1.58
I-131	03/19/09	76.10	69.00	3.21	0.38	7.95	1.18
Mn-54	03/19/09	179.10	162.00	3.05	0.90	4.90	1.95
Zn-65	03/19/09	210.40	197.00	4.72	1.10	6.91	0.92

TRITIUM ANALYSIS OF WATER SAMPLES (pCi/liter)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation EL	Uncertainty Analytics (3S)	Percent Coef of Variation	Normalized Deviation
H-3	03/19/09	4470.00	4480.00	106.90	24.93	4.32	-0.05
	06/18/09	12933.90	13000	267.3	74.3	2.98	-0.17

I-131 ANALYSIS OF AN AIR CARTRIDGE (pCi/cartridge)

Analysis or Radionuclide	Date Prepared	Reported Average	Known Value	Standard Deviation EL	Uncertainty Analytics (3S)	Percent Coef of Variation	Normalized Deviation
I-131	06/18/09	96.40	99.10	10.4	0.55	11.94	-0.24

6.0 CONCLUSIONS

This report confirms the licensee's conformance with the requirements of Chapter 4 of the ODCM. It provides a summary and discussion of the results of the laboratory analyses for each type of sample.

In 2009, there were two instances where the indicator station results were statistically discernible from the control station results. This is discussed below. 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.

Cesium-137 was identified in 12 of 24 samples vegetation samples at the indicator stations and in none of the samples at the control station. The average of the positive samples at the indicator stations was 46.8 pCi/kg-wet. The potential dose to a member of the public due (an adult) who would receive the highest dose due to regular consumption of vegetation containing the above level of Cs-137 would be 0.98 mrem in a year. This dose is less than 7% of the regulatory limit of 15 mrem per year to any organ due to gaseous effluents.

Cesium-137 was identified in the spring collection at both the indicator station and at the control station. The sample at the indicator station was 12.4 pCi/kg-wet and the sample at the control station was 8.4 pCi/kg-wet. The potential dose to a member of the public who would receive the highest dose (an adult) due to regular consumption of fish containing Cs-137 would be 6.00E-3 mrem in a year. This dose is approximately 0.2% of the regulatory limit of 3 mrem per year due to liquid effluents.

Low levels of Cs-137 in the environment are attributed primarily to fallout from nuclear weapons testing and from the Chernobyl incident. However, the levels of Cs-137 seen at the indicator stations for vegetation and for fish could potentially be attributed to plant effluents.

The radiological levels reported in 2009 were low and are generally trending downward. The REMP trends over the course of time from preoperation to the present are decreasing or have remained fairly constant. This supports the conclusion that there is no adverse radiological impact on the environment or to the public as a result of the operation of Hatch Nuclear Plant.