

VIRGINIA ELECTRIC AND POWER COMPANY  
RICHMOND, VIRGINIA 23261

April 27, 2004

United States Nuclear Regulatory Commission  
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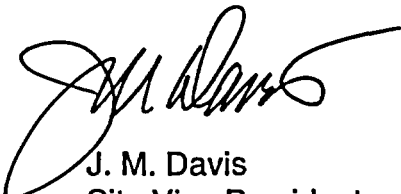
Gentlemen:

**VIRGINIA ELECTRIC AND POWER COMPANY**  
**NORTH ANNA POWER STATION UNITS 1 & 2 AND**  
**INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)**  
**ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT**

Enclosed is the Annual Radiological Environmental Operating Report for the reporting period of January 1, 2003 through December 31, 2003. This report is provided pursuant to North Anna Units 1 and 2, Technical Specifications 5.6.2, and North Anna Independent Spent Fuel Storage Installation Technical Specification 5.5.2b.

If you have any questions or require additional information, please contact us.

Very truly yours,



J. M. Davis  
Site Vice President

Enclosure

Commitments made in this letter: None

IE25

cc: U. S. Nuclear Regulatory Commission  
Region II  
Atlanta Federal Center  
61 Forsyth St., SW, Suite 23T85  
Atlanta, Georgia 30303

Director, Nuclear Material Safety and Safeguards  
U. S. Nuclear Regulatory Commission  
Washington, D. C. 20555

Mr. M. T. Widmann  
NRC Senior Resident Inspector  
North Anna Power Station



**Dominion<sup>®</sup>**

*North Anna Power Station*

**2003 Annual  
Radiological  
Environmental  
Operating Report**

***Dominion***  
***North Anna Power Station***  
***Radiological Environmental Monitoring Program***  
***January 1, 2003 to December 31, 2003***

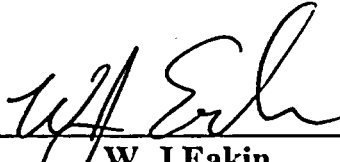
***Prepared by***  
**Dominion, North Anna Power Station**  
***and***  
**Dominion Resources Services**

***Annual Radiological Environmental Operating Report***

***North Anna Power Station***

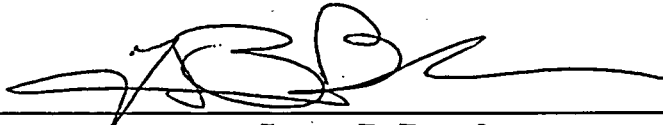
***January 1, 2003 to December 31, 2003***

***Prepared by:***



**W. J Eakin  
Supervisor Radiological Engineering  
Dominion Resources Services**

***Prepared by:***



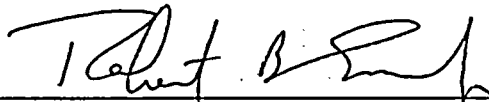
**James B. Breeden  
Supervisor Radiological Analysis and Material Control  
Dominion North Anna Power Station**

***Reviewed by:***



**Erich W. Dreyer  
Supervisor Health Physics Technical Services  
Dominion North Anna Power Station**

***Approved by:***



**Robert B. Evans, Jr.  
Manager Radiological Protection and Chemistry  
Dominion North Anna Power Station**

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## 1. EXECUTIVE SUMMARY

This document is a detailed report of the 2003 North Anna Nuclear Power Station Radiological Environmental Monitoring Program (REMP). It is submitted in accordance with North Anna Unit 1 and 2 Technical Specification 5.6.2 and North Anna Independent Spent Fuel Storage Installation (ISFSI) Technical Specification 5.5.2b. Radioactivity levels from January 1 through December 31, 2003, in water, silt, shoreline sediment, milk, aquatic biota, food products, vegetation, and direct exposure pathways have been analyzed, evaluated and summarized. The REMP is designed to confirm that radiological effluent releases are As Low As is Reasonably Achievable (ALARA), no undue environmental effects occur and the health and safety of the public are protected. The program also detects any unexpected environmental processes that could allow radiation accumulations in the environment or food pathway chains.

Radiation and radioactivity in the environment is monitored within a 25-mile radius of the station. North Anna Power Station personnel collect a variety of samples within this area. A number of sampling locations for each medium are selected using available meteorological, land use, and water use data. Two types of samples are obtained. The first type, control samples, are collected from areas that are beyond the measurable influence of North Anna Power Station or any other nuclear facility. These samples are used as reference data. Normal background radiation levels, or radiation present due to causes other than North Anna Power Station, can be compared to the environment surrounding the station. Indicator samples are the second sample type obtained. These samples show how much radiation is contributed to the environment by the station. Indicator samples are taken from areas close to the station where any station contribution will be at the highest concentration.

Prior to station operation, samples were collected and analyzed to determine the amount of radioactivity present in the area. The resulting values are used as a "pre-operational baseline." Analysis results from the indicator samples are compared to both current control sample values and the pre-operational baseline to determine if changes in radioactivity levels are attributable to station operations, or causes such as the Chernobyl accident or natural variation.

Global Dosimetry Solutions Incorporated (formerly ICN Biomedicals) provided thermoluminescent dosimetry (TLD) services and Framatome ANP DE&S Environmental Laboratory provided radioanalytical services. Participation in an Interlaboratory Comparison Program provides an independent check of sample measurement precision and accuracy. Typically, radioactivity levels in the environment are so low that analysis values frequently fall below the minimum detection limits of state-of-the-art measurement methods. Because of this, the Nuclear Regulatory Commission (NRC) requires that equipment used for radiological environmental monitoring must be able to detect specified minimum

Lower Limits of Detection (LLDs). This ensures that analyses are as accurate as possible. The NRC also mandates a reporting level for certain radionuclides. Licensed nuclear facilities must report the radionuclide activities in those environmental samples that are equal to or greater than the specified reporting level. Environmental radiation levels are sometimes referred to as a percent of the reporting level.

Analytical results are reported for all possible radiation exposure pathways to man. These pathways include airborne, water, aquatic, terrestrial and direct radiation exposure. The airborne exposure pathway includes radioactive airborne iodine and particulates and precipitation. The 2003 airborne results were similar to previous years. No plant related radioactivity was detected and fallout or natural radioactivity levels remained at levels consistent with past year's results.

Water and aquatic exposure pathway samples include surface, river and well water, silt and shoreline sediments, and fish. No plant related isotopes were detected in Lake Anna surface water except for tritium. The average tritium activity in surface water for 2003 was 2000 pCi/liter. Naturally occurring potassium-40 was detected at average environmental levels. River water collected from the North Anna River, 5.8 miles downstream of the site had an average tritium level of 1868 pCi/liter. No plant related radioisotopes were detected in well water. This trend is consistent throughout the environmental operational monitoring program. One Silt sample indicated the presence of cesium-137 and is attributable to global fallout from past nuclear weapons testing and nuclear accidents such as Chernobyl. Shoreline sediment, which may provide a direct exposure pathway, indicated the presence of Cs-137 also at levels consistent with global fallout levels. The terrestrial exposure pathway includes milk and food/vegetation products. Iodine-131 was not detected in any 2003 milk samples and has not been detected in milk prior to or since the 1986 Chernobyl accident. Although normally observed, Strontium-90 was not detected in milk during 2003. Its historical presence is attributable to past atmospheric nuclear weapons testing. A ten-year activity trend indicates a slow decrease in Sr-90 activity. Naturally occurring potassium-40 and thorium-228 were detected at average environmental levels. No man-made radioisotopes were detected in vegetation samples. Consistent with historical data, potassium-40 was detected. The direct exposure pathway measures environmental radiation doses by use of thermoluminescent dosimeters (TLDs). TLD results have remained relatively constant over the years.

During 2003, as in previous years, operation of the North Anna Power Station and the Independent Spent Fuel Storage Installation (ISFSI) created no adverse environmental effects or health hazards. The maximum dose calculated for a hypothetical individual at the station site boundary due to liquid and gaseous effluents released from the station during 2003 was 0.14 millirem. For reference, this dose may be compared to the 360 millirem average annual exposure to every



person in the United States from natural and man-made sources. Natural sources in the environment provide approximately 82% of radiation exposure to man, while nuclear power contributes less than 0.1%. These results demonstrate not only compliance with federal and state regulations but also demonstrate the adequacy of radioactive effluent control at North Anna Power Station.

## 2. PROGRAM DESCRIPTION

### 2.1 Introduction

This report documents the 2003 North Anna Power Station operational Radiological Environmental Monitoring Program (REMP).

The North Anna Power Station of Dominion Virginia Power Company is located on Lake Anna in Mineral, Virginia, approximately 35 miles southwest of Fredericksburg, Virginia. The site consists of two units, each with a pressurized water reactor (PWR) nuclear steam supply system and turbine generator furnished by Westinghouse Electric Corporation. Each unit was designed with a gross electrical output of 979 megawatts electric (MWe). Unit 1 achieved commercial operation on June 6, 1978 and Unit 2 on December 14, 1980. An independent spent fuel storage facility was licensed for dry cask storage of spent fuel in 1998.

The United States Nuclear Regulatory Commission (USNRC) regulations require that nuclear power plants be designed, constructed, and operated to keep levels of radioactive material in effluents to unrestricted areas as low as is reasonably achievable (ALARA). To ensure these criteria are met, the operating license for North Anna Power Station includes Technical Specifications which address the release of radioactive effluents. In-plant monitoring is used to ensure release limits are not exceeded. As a precaution against unexpected or undefined environmental processes which might allow undue accumulation of radioactivity in the environment, a program for monitoring the plant environs is also included in North Anna Power Station Offsite Dose Calculation Manual (ODCM).

North Anna Power Station is responsible for collecting the various indicator and control environmental samples. Global Dosimetry Solutions Incorporated (formerly ICN Biomedicals) is responsible for processing the TLDs. Framatome ANP DE&S Environmental Laboratory is responsible for sample analyses. The results of the analyses are used to determine if changes in radioactivity levels may be attributable to station operations. Measured values are compared with control levels, which vary with time due to external events, such as cosmic ray bombardment, nuclear weapons test fallout and seasonal variations of naturally occurring radioisotopes. Data collected prior to station operation is used to indicate the degree of natural variation to be expected. This pre-operational data is compared with data collected during the operational phase to assist in evaluating any radiological impact of station operation.

Occasional samples of environment media show the presence of man-made isotopes. As a method of referencing the measured radionuclide concentrations in the sample media to a dose consequence to man, the data is compared to the reporting level concentrations listed in the USNRC Regulatory Guide 4.8 and North Anna's ODCM. These concentrations are based upon the annual dose

commitment recommended by 10CFR50, Appendix I, to meet the criterion of "As Low As Is Reasonably Achievable".

This report documents the results of the Radiological Environmental Monitoring Program for 2003 and satisfies the following objectives of the program:

- To provide measurements of radiation and of radioactive materials in those exposure pathways and for those radionuclides that lead to the highest potential radiation exposure of the maximum exposed member of the public resulting from station operations.
- To supplement the radiological effluent monitoring program by verifying that radioactive effluents are within allowable limits.
- To identify changes in radioactivity in the environment.
- To verify that station operations have no detrimental effect on the health and safety of the public.

## ***2.2 Sampling and Analysis Program***

Table 2-1 summarizes the 2003 sampling program for North Anna Power Station. All samples listed in Table 2-1 are taken at indicator locations except those labeled "control." The North Anna Radiological Monitoring Locations maps denote sample locations for North Anna Power Station. The locations are color coded to designate sample types. Table 2-2 summarizes the analysis program conducted by Framatome ANP DE&S Environmental Laboratory for North Anna Power Station during the year 2003.

**Table 2-1**  
**NORTH ANNA - 2003**  
**RADIOLOGICAL SAMPLING STATION**  
**DISTANCE AND DIRECTION FROM UNIT NO. 1**

Sample Media	Location	Station	Distance	Direction	Degrees	Collection Frequency	Remarks
Environmental Thermoluminescent Dosimetry (TLD)	NAPS Sewage Treatment Plant	01	0.20	NE	42°	Quarterly & Annually	
	Fredericks Hall	02	5.30	SSW	203°	Quarterly & Annually	
	Mineral, Va	03	7.10	WSW	243°	Quarterly & Annually	
	Wares Crossroads	04	5.10	WNW	287°	Quarterly & Annually	
	Route 752	05	4.20	NNE	20°	Quarterly & Annually	
	Sturgeon's Creek Marina	05A	2.04	N	11°	Quarterly & Annually	
	Levy, VA	06	4.70	ESE	115°	Quarterly & Annually	
	Bumpass, VA	07	7.30	SSE	167°	Quarterly & Annually	
	End of Route 685	21	1.00	WNW	301°	Quarterly & Annually	
	Route 700	22	1.00	WSW	242°	Quarterly & Annually	
	"Aspen Hills"	23	0.93	SSE	158°	Quarterly & Annually	
	Orange, VA	24	22.00	NW	325°	Quarterly & Annually	Control
	Bearing Cooling Tower	N-1/33	0.06	N	10°	Quarterly	
	Sturgeon's Creek Marina	N-2/34	2.04	N	11°	Quarterly	
	Parking Lot "C" (on-site)	NNE-3/35	0.24	NNE	32°	Quarterly	
	Good Hope Church	NNE-4/36	3.77	NNE	25°	Quarterly	
	Parking Lot "B"	NE-5/37	0.20	NE	42°	Quarterly	
	Lake Anna Marina (Bogg's Drive)	NE-6/38	1.46	NE	34°	Quarterly	
	Weather Tower Fence	ENE-7/39	0.36	ENE	74°	Quarterly	
	Route 689	ENE-8/40	2.43	ENE	65°	Quarterly	
	Near Training Facility	E-9/41	0.30	E	91°	Quarterly	
	"Morning Glory Hill"	E-10/42	2.85	E	93°	Quarterly	
	Island Dike	ESE-11/43	0.12	ESE	103°	Quarterly	
	Route 622	ESE-12/44	4.70	ESE	115°	Quarterly	
	DVP Biology Lab	SE-13/45	0.64	SE	138°	Quarterly	
	Route 701 (Dam Entrance)	SE-14/46	5.88	SE	137°	Quarterly	
	"Aspen Hills"	SSE-15/47	0.93	SSE	158°	Quarterly	
	Elk Creek	SSE-16/48	2.33	SSE	165°	Quarterly	
	NAPS Access Rd.	S-17/49	0.47	S	173°	Quarterly	

**Table 2-1**  
**NORTH ANNA - 2003**  
**RADIOLOGICAL SAMPLING STATION**  
**DISTANCE AND DIRECTION FROM UNIT NO. 1**

Sample Media	Location	Station	Distance	Direction	Degrees	Collection Frequency	Remarks
Environmental Thermoluminescent Dosimetry (TLD)	Elk Creek Church	S-18/50	1.55	S	178°	Quarterly	
	NAPS Access Rd.	SSW-19/51	0.42	SSW	197°	Quarterly	
	Route 618	SSW-20/52	5.30	SSW	205°	Quarterly	
	500kv Tower	SW-21/53	0.6	SW	218°	Quarterly	
	Route 700	SW-22/54	3.96	SW	232°	Quarterly	
	NAPS Radio Tower	WSW-23/55	0.38	WSW	237°	Quarterly	
	Route 700 (Exclusion Boundary)	WSW-24/56	1.00	WSW	242°	Quarterly	
	South Gate Switchyard	W-25/57	0.32	W	279°	Quarterly	
	Route 685	W-26/58	1.55	W	274°	Quarterly	
	End of Route 685	WNW-27/59	1.00	WNW	301°	Quarterly	
	Route 685	WNW-28/60	1.40	WNW	303°	Quarterly	
	North Gate - Construction Side	NW-29/61	0.45	NW	321°	Quarterly	
	Laydown Area						
	Lake Anna Campground	NW-30/62	2.54	NW	319°	Quarterly	
	#1/#2 Intake	NNW-31/63	0.07	NNW	349°	Quarterly	
	Route 208	NNW-32/64	2.21	NNW	344°	Quarterly	
	Bumpass Post Office	C-1/2	7.30	SSE	167°	Quarterly	Control
	Orange, VA	C-3/4	22.00	NW	325°	Quarterly	Control
	Mineral, VA	C-5/6	7.10	WSW	243°	Quarterly	Control
	Louisa, VA	C-7/8	11.54	WSW	257°	Quarterly	Control
Airborne Particulate and Radioiodine	NAPS Sewage Treatment Plant	01	0.20	NE	42°	Weekly	
	Fredericks Hall	02	5.30	SSW	203°	Weekly	
	Mineral, VA	03	7.10	WSW	243°	Weekly	
	Wares Crossroads	04	5.10	WNW	287°	Weekly	
	Route 752	05	4.20	NNE	20°	Weekly	
	Sturgeon's Creek Marina	05A	2.04	N	11°	Weekly	
	Levy, VA	06	4.70	ESE	115°	Weekly	
	Bumpass, VA	07	7.30	SSE	167°	Weekly	

**Table 2-1**  
**NORTH ANNA - 2003**  
**RADIOLOGICAL SAMPLING STATION**  
**DISTANCE AND DIRECTION FROM UNIT NO. 1**

Sample Media	Location	Station	Distance	Direction	Degrees	Collection Frequency	Remarks
Airborne Particulate and Radioiodine	End of Route 685	21	1.00	WNW	301°	Weekly	Control
	Route 700	22	1.00	WSW	242°	Weekly	
	"Aspen Hills"	23	0.93	SSE	158°	Weekly	
	Orange, VA	24	22.00	NW	325°	Weekly	
Surface Water	Waste Heat Treatment Facility (Second Cooling Lagoon)	08	3.37	SSE	148°	Monthly	Control
	*Lake Anna (upstream) (Route 669 Bridge)	09A	12.90	WNW	295°	Monthly	
River Water	North Anna River (downstream)	11	5.80	SE	128°	Monthly	
Ground Water (Well Water)	Biology Lab	01A	0.64	SE	138°	Quarterly	
Precipitation	Biology Lab	01A	0.64	SE	138°	Monthly	
Aquatic Sediment	Waste Heat Treatment Facility (Second Cooling Lagoon)	08	3.37	SSE	148°	Semi-Annually	Control
	Lake Anna (upstream) (Route 669 Bridge)	09A	12.90	WNW	295°	Semi-Annually	
	North Anna River (Downstream)	11	5.80	SE	128°	Semi-Annually	
Shoreline Soil	Waste Heat Treatment Facility (Second Cooling Lagoon)	08 **	3.37	SSE	148°	Semi-Annually	
Soil	NAPS Sewage Treatment Plant	01	0.20	NE	42°	Once/3 years	
	Fredericks Hall	02	5.30	SSW	203°	Once/3 years	
	Mineral, VA	03	7.10	WSW	243°	Once/3 years	
	Wares Crossroads	04	5.10	WNW	287°	Once/3 years	

\* In October 1991 the Surface Water Sample location at station 09 was moved to 09A.

\*\* Shoreline soil was changed from station 09 to 08 effective with the August 1996 sample.

**Table 2-1**  
**NORTH ANNA - 2003**  
**RADIOLOGICAL SAMPLING STATION**  
**DISTANCE AND DIRECTION FROM UNIT NO. 1**

Sample Media	Location	Station	Distance	Direction	Degrees	Collection Frequency	Remarks
Soil	Route 752	05	4.20	NNE	20°	Once/3 years	
	Sturgeon's Creek Marina	05A	2.04	N	11°	Once/3 years	
	Levy, VA	06	4.70	ESE	115°	Once/3 years	
	Bumpass, VA	07	7.30	SSE	167°	Once/3 years	
	End of Route 685	21	1.00	WNW	301°	Once/3 years	
	Route 700 (Exclusion Boundary)	22	1.00	WSW	242°	Once/3 years	
	"Aspen Hills"	23	0.93	SSE	158°	Once/3 years	
	Orange, VA	24	22.00	NW	325°	Once/3 years	Control
Milk	Holladay Dairy (R.C. Goodwin)	12	8.30	NW	310°	Monthly	
	Terrell's Dairy (Fredericks Hall)	13	5.60	SSW	203°	Monthly	
Fish	Waste Heat Treatment Facility (Second Cooling Lagoon)	08	3.37	SSE	148°	Semi-Annually	
	Lake Orange	25	16.5	NW	312°	Semi-Annually	Control
Food Products (Broadleaf Vegetation)	Bel Aire Plantation	14	1.20	NE	43°	Monthly if available or at harvest	
	Route 614	15	1.37	SE	133°	Monthly if available or at harvest	
	Route 629/522	16	12.60	NW	314°	Monthly if available or at harvest	Control
	Aspen Hills	23	0.93	SSE	158°	Monthly if available or at harvest	
	"Historic Lane"	26	1.15	S	172°	Monthly if available or at harvest	

**TABLE 2-2**  
**North Anna Power Station**  
**SAMPLE ANALYSIS PROGRAM**

<b>SAMPLE MEDIA</b>	<b>FREQUENCY</b>	<b>ANALYSIS</b>	<b>LLD</b>	<b>REPORT UNITS</b>
<b>Thermoluminescent Dosimetry (TLD)</b> (84 TLDs)	Quarterly	Gamma Dose	2 mR±2mR	mR/std. Month
(12 TLDs)	Annually	Gamma Dose	2 mR±2mR	mR/std. Month
<b>Airborne Radioiodine</b>	Weekly	I-131	0.07	pCi/m <sup>3</sup>
<b>Airborne Particulate</b>	Weekly	Gross Beta	0.01	pCi/m <sup>3</sup>
	Quarterly (a)	Gamma Isotopic		pCi/m <sup>3</sup>
		Cs-134	0.05	
		Cs-137	0.06	
	2 <sup>nd</sup> Quarter Composite	Sr-89	(b)	pCi/m <sup>3</sup>
		Sr-90	(b)	
<b>Surface Water</b>	Monthly	I-131	1(c)	pCi/L
		Gamma Isotopic		pCi/L
		Mn-54	15	
		Fe-59	30	
		Co-58	15	
		Co-60	15	
		Zn-65	30	
		Zr-95	30	
		Nb-95	15	
		Cs-134	15	
		Cs-137	18	
		Ba-140	60	
		La-140	15	
	Quarterly(a)	Tritium (H-3)	2000	pCi/L
	2 <sup>nd</sup> Quarter Composite	Sr-89	(b)	pCi/L
		Sr-90	(b)	
<b>River Water</b>	Monthly	I-131	1(c)	pCi/L
		Gamma Isotopic		pCi/L
		Mn-54	15	
		Fe-59	30	
		Co-58	15	
		Co-60	15	
		Zn-65	30	
		Zr-95	30	
		Nb-95	15	
		Cs-134	15	
		Cs-137	18	
		Ba-140	60	
		La-140	15	

\*LLDs indicate those levels to which environmental samples are required to be analyzed. Actual analysis of samples may be lower than the these listed values.

(a) Quarterly composite of each location's samples are used for the required analysis

(b) There are no required LLDs for Sr-89/90

(c) LLD for non-drinking water is 10 pCi/liter.



**TABLE 2-2**  
**North Anna Power Station**  
**SAMPLE ANALYSIS PROGRAM**

<b>SAMPLE MEDIA</b>	<b>FREQUENCY</b>	<b>ANALYSIS</b>	<b>LLD</b>	<b>REPORT UNITS</b>
River Water	Quarterly(a)	Tritium (H-3)	2000	pCi/L
	2 <sup>nd</sup> Quarter	Sr-89	(b)	pCi/L
	Composite	Sr-90	(b)	
Ground Water (Well Water)	Quarterly	Gamma Isotopic		pCi/L
		Mn-54	15	
		Fe-59	30	
		Co-58	15	
		Co-60	15	
		Zn-65	30	
		Zr-95	30	
		Nb-95	15	
		I-131	1(c)	
		Cs-134	15	
		Cs-137	18	
		Ba-140	60	
		La-140	15	
	Quarterly(a) 2 <sup>nd</sup> Quarter	Tritium (H-3)	2000	pCi/L
		Sr-89	(b)	pCi/L
		Sr-90	(b)	
Aquatic Sediment	Semi-Annually	Gamma Isotopic		pCi/kg (dry)
		Cs-134	150	
		Cs-137	180	
	Annually	Sr-89	(b)	pCi/kg (dry)
		Sr-90	(b)	
Precipitation	Monthly Semi-Annual Composite	Gross Beta	4	pCi/L
		Gamma Isotopic		pCi/L
		Mn-54	15	
		Fe-59	30	
		Co-58	15	
		Co-60	15	
		Zn-65	30	
		Zr-95	30	
		Nb-95	15	
		I-131	1(c)	
		Cs-134	15	
		Cs-137	18	
		Ba-140	60	
		La-140	15	
Shoreline Soil	Semi-Annually	Gamma Isotopic		pCi/kg (dry)
		Cs-134	150	
		Cs-137	180	
	Annually	Sr-89	(b)	pCi/kg (dry)
		Sr-90	(b)	

\*LLDs indicate those levels to which environmental samples are required to be analyzed. Actual analysis of samples may be lower than the these listed values.

(a) Quarterly composite of each location's samples are used for the required analysis

(b) There are no required LLDs for Sr-89/90

(c) LLD for non-drinking water is 10 pCi/liter.

**TABLE 2-2**  
**North Anna Power Station**  
**SAMPLE ANALYSIS PROGRAM**

<b>SAMPLE MEDIA</b>	<b>FREQUENCY</b>	<b>ANALYSIS</b>	<b>LLD</b>	<b>REPORT UNITS</b>
<b>Soil</b>	<b>Once per 3 years</b>	<b>Gamma Isotopic</b>		<b>pCi/kg (dry)</b>
		<b>Cs-134</b>	<b>150</b>	
		<b>Cs-137</b>	<b>180</b>	<b>pCi/kg (dry)</b>
		<b>Sr-89</b>	<b>(b)</b>	
<b>Milk</b>	<b>Monthly</b>	<b>Sr-90</b>	<b>(b)</b>	<b>pCi/L</b>
	<b>Monthly</b>	<b>I-131</b>	<b>1</b>	
	<b>Monthly</b>	<b>Gamma Isotopic</b>		
		<b>Cs-134</b>	<b>15</b>	
		<b>Cs-137</b>	<b>18</b>	
		<b>Ba-140</b>	<b>60</b>	
		<b>La-140</b>	<b>15</b>	
		<b>Sr-89</b>	<b>(b)</b>	<b>pCi/L</b>
	<b>Quarterly</b>	<b>Sr-90</b>	<b>(b)</b>	
<b>Fish</b>	<b>Semi-Annually</b>	<b>Gamma Isotopic</b>		<b>pCi/kg (wet)</b>
		<b>Mn-54</b>	<b>130</b>	
		<b>Fe-59</b>	<b>260</b>	
		<b>Co-58</b>	<b>130</b>	
		<b>Co-60</b>	<b>130</b>	
		<b>Zn-65</b>	<b>260</b>	
		<b>Cs-134</b>	<b>130</b>	
		<b>Cs-137</b>	<b>150</b>	
<b>Food Products (Broadleaf Vegetation)</b>	<b>Monthly if available or at harvest</b>	<b>Gamma Isotopic</b>		<b>pCi/kg (wet)</b>
		<b>Cs-134</b>	<b>60</b>	
		<b>Cs-137</b>	<b>80</b>	
		<b>I-131</b>	<b>60</b>	

\*LLDs indicate those levels to which environmental samples are required to be analyzed. Actual analysis of samples may be lower than the these listed values.

(a) Quarterly composite of each location's samples are used for the required analysis

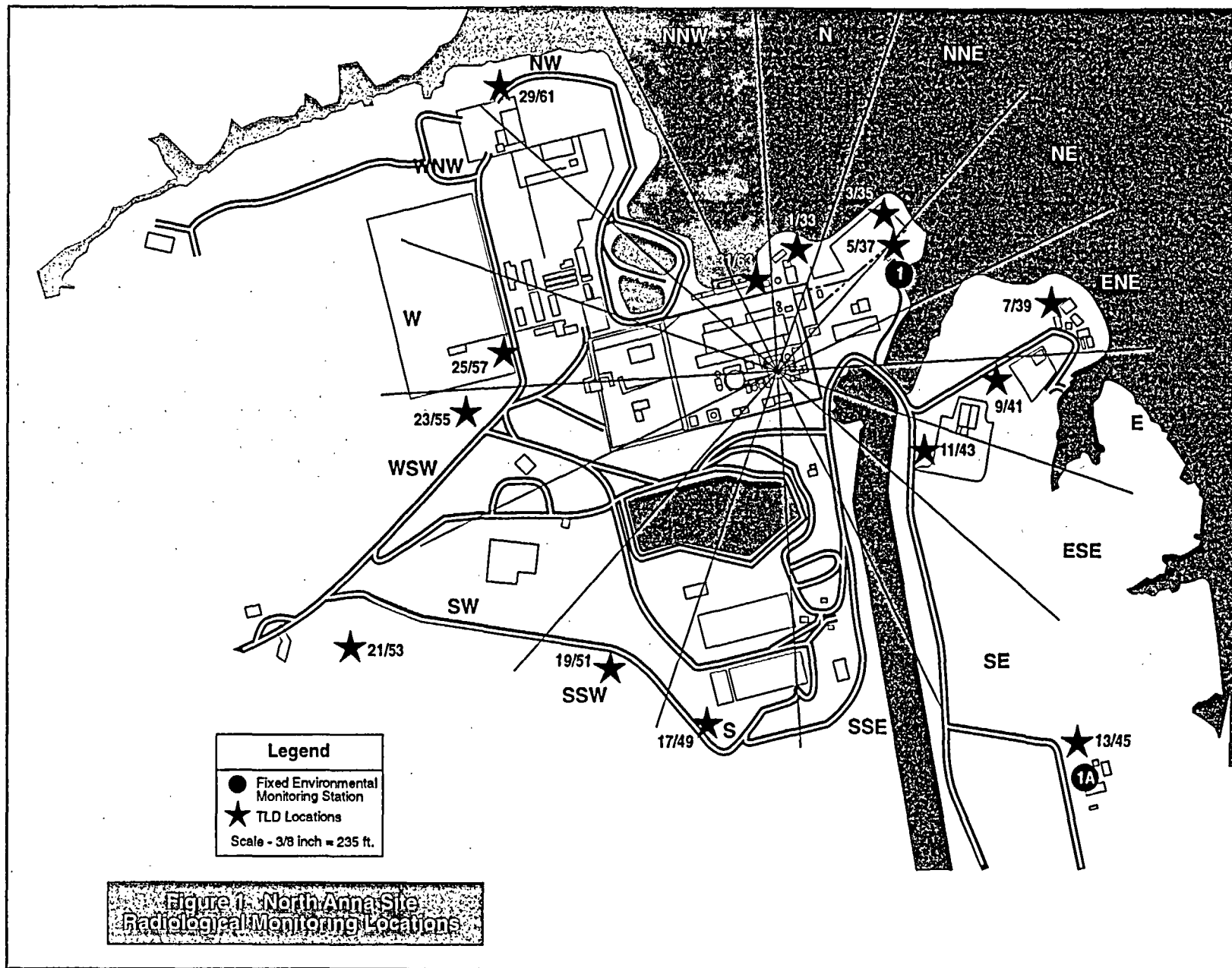
(b) There are no required LLDs for Sr-89/90

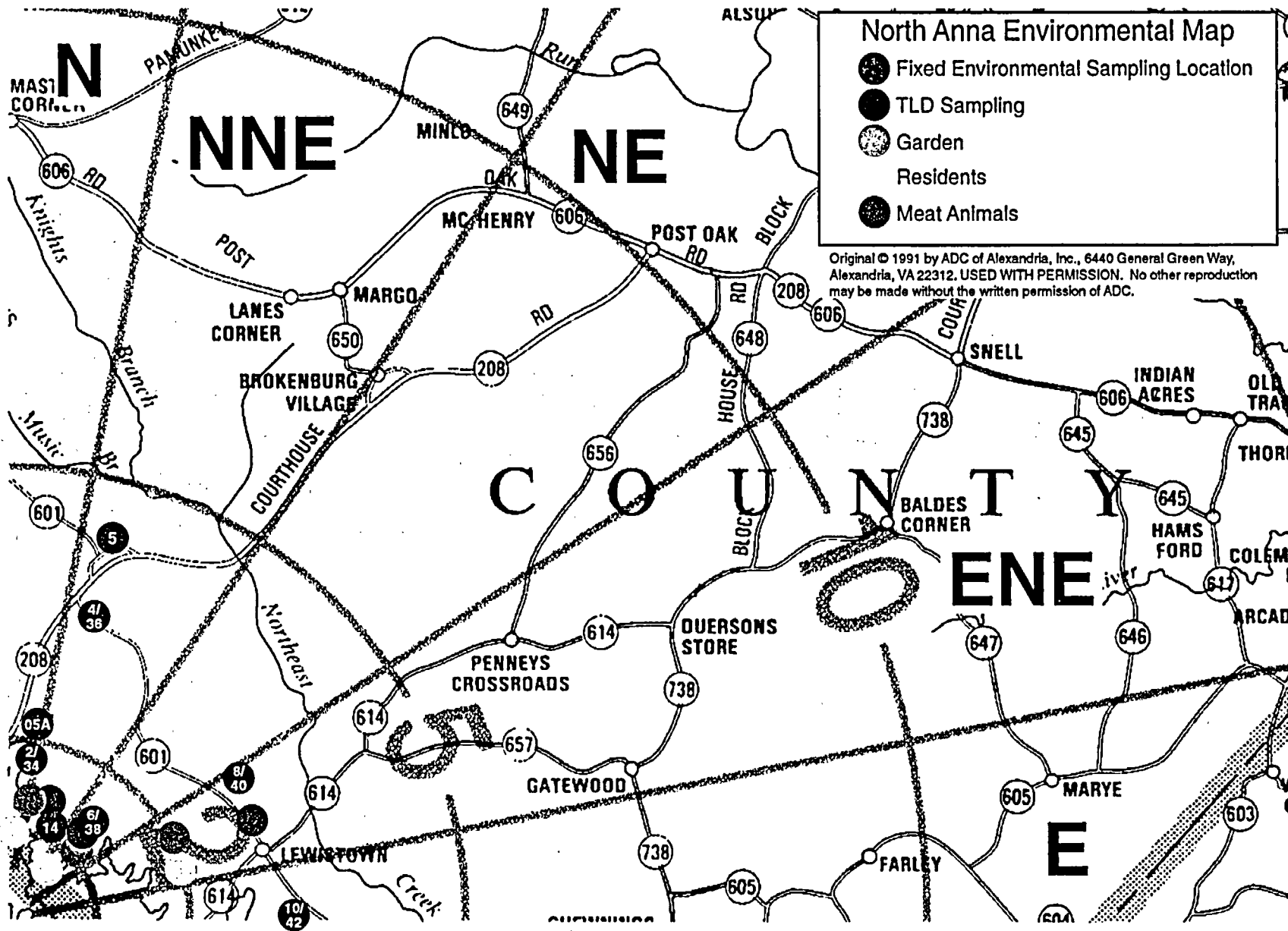
(c) LLD for non-drinking water is 10 pCi/liter.

**Legend For The North Anna Power Station  
Environmental Monitoring Stations Overview Maps**

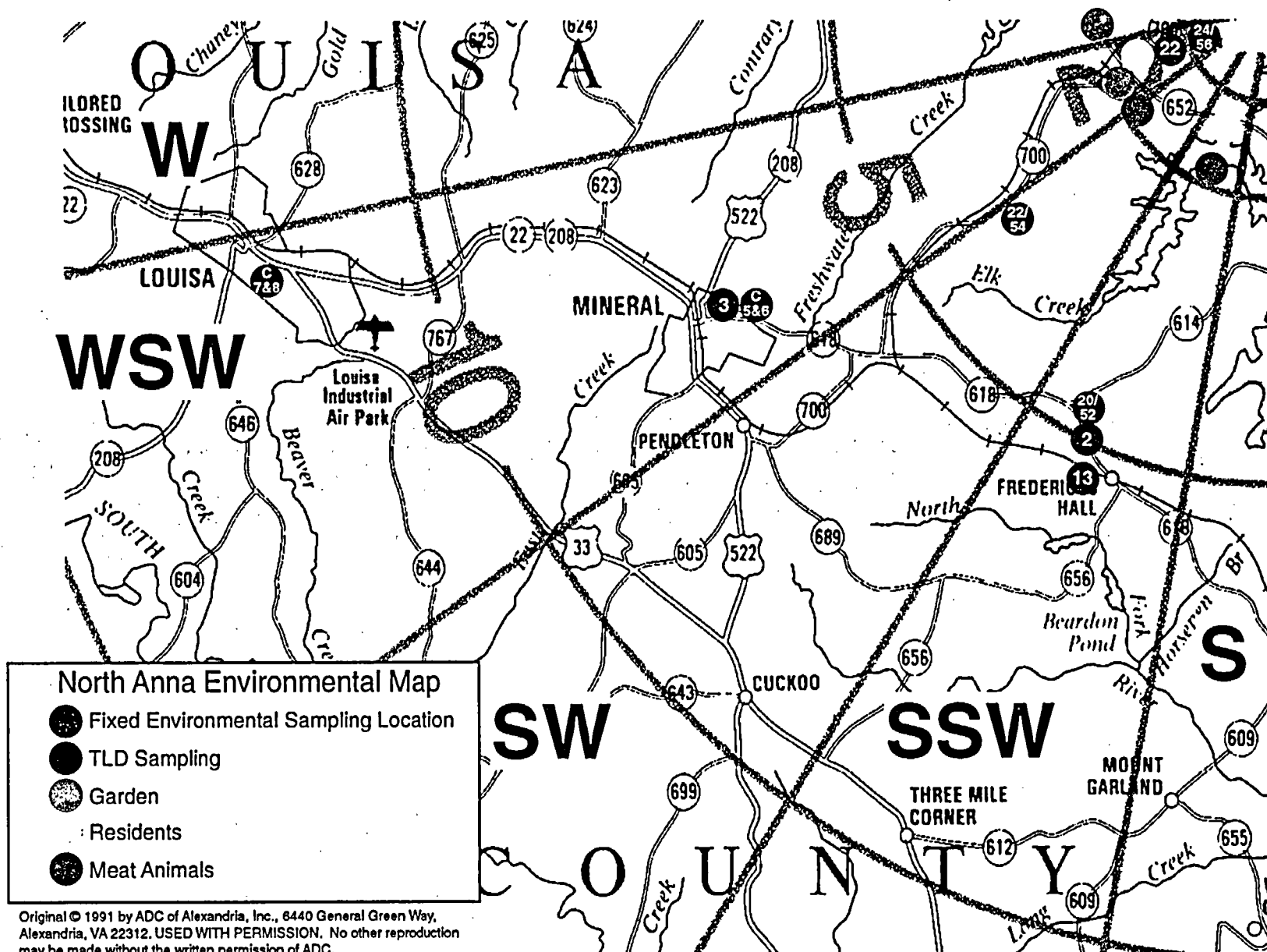
Map Designation		Environmental Station Identification	Map Designation	Environmental Station
1	(a)	01,NE-5/37	7/8	C-7/8
1A		01A,SE-13/45	1/33	N-1/33
2	(a)	02,SSW-20/52	31/63	NNW-31/63
3	(a)	03,C-5/16	29/61	NW-29/61
4	(a)	04	3/35	NNE-3/35
5	(a)	05	7/39	ENE-7/39
5A	(a)	05A,N-2/34	9/41	E-9/41
6	(a)	06,ESE-12/44	11/43	ESE-11/43
7	(a)	07,C-1&2	17/49	S-17/49
8		08-Water, Fish Sediment,	19/51	SSW-19/51
		Shoreline Soil (d)	21/53	SW-21/53
9A		09A-Water sample, sediment	23/55	WSW-23/55
11		11-River Water, Sediment	25/57	W-25/57
12		12-Milk	16/48	SSE-16/48
13		13-Milk	18/50	S-18/50
14		14-Vegetation, NE-6/38	14/46	SE-14/46
15		Vegetation	22/54	SW-22/54
16		Vegetation	26/58	W-26/58
21	(a)	21,WNW-27/59	28/60	WNW-28/60
22	(a)	22,WSW-24/56	32/64	NNW-32/64
23	(a)	23-SSE-15/47	8/40	ENE-8/40
24	(a)(b)	24,C-3&4	4/36	NNE-40/36
25	(c)	25-Fish	10/42	E-10/42
26	(e)	26-Vegetation		

- (a) Indicates air sample station, annual and quarterly TLD, Triennial soil.  
 (b) In Orange  
 (c) In Lake Orange  
 (d) Station 09 changed to 08 effective August 1996.  
 (e) Vegetation changed to Station 26 effective Oct 2001









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### 3. ANALYTICAL RESULTS

#### *3.1 Summary of Results*

In accordance with the North Anna Offsite Dose Calculation Manual (ODCM), a summary table of the analytical results has been prepared and is presented in Table 3-1. This data is presented in accordance with the format of the USNRC Branch Technical Position, "Acceptable Radiological Environmental Monitoring Program", Rev. 1, November 1979.

A more detailed analysis of the data is given in Section 4 where a discussion of the variations in the data explains many aspects that are not evident in the Summary Table because of the basic limitation of data summaries.

Table 3-1

**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY**

North Anna Nuclear Power Station, Louisa County, Virginia – 2003

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Medium or Pathway Sampled (Unit)	Analysis		LLD*	All Indicator Locations	Location with Highest Mean			Control Location	Non-routine Reported Measurements
	Type	Total No.		Mean Range	Name	Distance Direction	Mean Range	Mean Range	
Air Iodine (pCi/m <sup>3</sup> )	I-131	636	0.07	(0/583)	N/A		N/A	(0/53)	0
Airborne Particulates (1E-03 pCi/m <sup>3</sup> )	Gross Beta	636	0.01	23.1(583/583) (4.3-43.9)	05	4.20 mi. NNE	25.2(53/53) (7.6-40.3)	23.2(53/53) (7.8-36.8)	0
	Gamma	48							
	Be-7	48	-	0.1(43/44) (0.0-0.9)	07	7.30 mi. SSE	0.1(4/4) (0.1-0.13)	0.3(4/4) (0.1-0.9)	0
	Cs-134	48	0.05	(0/44)	N/A		N/A	(0/4)	0
	Cs-137	48	0.06	(0/44)	N/A		N/A	(0/4)	0
	Sr-89	12	-	(0/11)	N/A		N/A	(0/1)	0
	Sr-90	12	-	(0/11)	N/A		N/A	(0/1)	0
Ground Well Water (pCi/liter)	Tritium	4	2000	(0/4)	N/A		N/A	N/A	0
	Gamma	4							
	Mn-54	4	15	(0/4)	N/A		N/A	N/A	0
	Fe-59	4	30	(0/4)	N/A		N/A	N/A	0
	Co-58	4	15	(0/4)	N/A		N/A	N/A	0

\* LLD is the Lower Limit of Detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.

Table 3-1

**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY**

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Medium or Pathway Sampled (Unit)	Analysis		LLD*	All Indicator Locations	Location with Highest Mean			Control Location	Non-routine Reported Measurements
	Type	Total No.		Mean Range	Name	Distance Direction	Mean Range	Mean Range	
Ground Well Water (pCi/liter)	Co-60	4	15	(0/4) -	N/A		N/A	N/A -	0
	Zn-65	4	30	(0/4) -	N/A		N/A	N/A -	0
	Zr-95	4	30	(0/4) -	N/A		N/A	N/A -	0
	Nb-95	4	15	(0/4) -	N/A		N/A	N/A -	0
	I-131	4	10	(0/4) -	N/A		N/A	N/A -	0
	Cs-134	4	15	(0/4) -	N/A		N/A	N/A -	0
	Cs-137	4	18	(0/4) -	N/A		N/A	N/A -	0
	Ba-140	4	60	(0/4) -	N/A		N/A	N/A -	0
	La-140	4	15	(0/4) -	N/A		N/A	N/A -	0
	Sr-89	1	-	(0/1) -	N/A		N/A	N/A -	0
	Sr-90	1	-	(0/1) -	N/A		N/A	N/A -	0
River Water (pCi/liter)	Tritium	4	2000	1868(4/4) (800-3560)	11	5.80 mi. SE	1868(4/4) (800-3560)	N/A -	0

\* LLD is the Lower Limit of Detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.

Table 3-1

**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY**

North Anna Nuclear Power Station, Louisa County, Virginia – 2003

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Medium or Pathway Sampled (Unit)	Analysis		LLD*	All Indicator Locations	Location with Highest Mean			Control Location	Non-routine Reported Measurements
	Type	Total No.		Mean Range	Name	Distance Direction	Mean Range	Mean Range	
River Water (pCi/liter)	Gamma	12							
	Mn-54	12	15	(0/12)	N/A		N/A	N/A	0
				-				-	
	Fe-59	12	30	(0/12)	N/A		N/A	N/A	0
				-				-	
	Co-58	12	15	(0/12)	N/A		N/A	N/A	0
				-				-	
	Co-60	12	15	(0/12)	N/A		N/A	N/A	0
				-				-	
	Zn-65	12	30	(0/12)	N/A		N/A	N/A	0
				-				-	
	Zr-95	12	30	(0/12)	N/A		N/A	N/A	0
				-				-	
	Nb-95	12	15	(0/12)	N/A		N/A	N/A	0
				-				-	
	I-131	12	1	(0/12)	N/A		N/A	N/A	0
				-				-	
	Cs-134	12	15	(0/12)	N/A		N/A	N/A	0
				-				-	
	Cs-137	12	18	(0/12)	N/A		N/A	N/A	0
				-				-	
	Ba-140	12	60	(0/12)	N/A		N/A	N/A	0
				-				-	
	La-140	12	15	(0/12)	N/A		N/A	N/A	0
				-				-	
	Sr-89	1	-	(0/1)	N/A		N/A	N/A	0

\* LLD is the Lower Limit of Detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.

**Table 3-1**

**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY**

North Anna Nuclear Power Station, Louisa County, Virginia - 2003

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Medium or Pathway Sampled (Unit)	Analysis		LLD*	All Indicator Locations	Location with Highest Mean			Control Location	Non-routine Reported Measurements
	Type	Total No.		Mean Range	Name	Distance Direction	Mean Range	Mean Range	
River Water (pCi/liter)	Sr-90	1	-	(0/1)	N/A		N/A	N/A	0
Surface Water (pCi/liter)	Tritium	8	2000	2000(4/4) (940-3630)	08	1.10 mi. SSE	2000(4/4) (940-3630)	(0/4) -	0
	Gamma	24							
	Mn-54	24	15	(0/12)	N/A		N/A	(0/12)	0
	Fe-59	24	30	(0/12)	N/A		N/A	(0/12)	0
	Co-58	24	15	(0/12)	N/A		N/A	(0/12)	0
	Co-60	24	15	(0/12)	N/A		N/A	(0/12)	0
	Zn-65	24	30	(0/12)	N/A		N/A	(0/12)	0
	Zr-95	24	30	(0/12)	N/A		N/A	(0/12)	0
	Nb-95	24	15	(0/12)	N/A		N/A	(0/12)	0
	I-131	24	1	(0/12)	N/A		N/A	(0/12)	0
	Cs-134	24	15	(0/12)	N/A		N/A	(0/12)	0
	Cs-137	24	18	(0/12)	N/A		N/A	(0/12)	0

\* LLD is the Lower Limit of Detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.

Table 3-1

**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY**

North Anna Nuclear Power Station, Louisa County, Virginia - 2003

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Medium or Pathway Sampled (Unit)	Analysis		LLD*	All Indicator Locations	Location with Highest Mean			Control Location	Non-routine Reported Measurements
	Type	Total No.		Mean Range	Name	Distance Direction	Mean Range	Mean Range	
Surface Water (pCi/liter)	Ba-140	24	60	(0/12) -	N/A		N/A	(0/12) -	0
	La-140	24	15	(0/12) -	N/A		N/A	(0/12) -	0
	Sr-89	1	-	(0/1) -	N/A		N/A	(0/1) -	0
	Sr-90	1	-	(0/1) -	N/A		N/A	(0/1) -	0
Precipitation (pCi/liter)	Monthly Gross Beta	12	4	7.61(9/12) (3.1-15.4)	01A	0.75 mi. SE	7.61 (3.1-15.4)	N/A -	
	Semiannually Gamma	2							
	Mn-54	2	15	(0/2) -	N/A		N/A	N/A -	0
	Fe-59	2	30	(0/2) -	N/A		N/A	N/A -	0
	Co-58	2	15	(0/2) -	N/A		N/A	N/A -	0
	Co-60	2	15	(0/2) -	N/A		N/A	N/A -	0
	Zn-65	2	30	(0/2) -	N/A		N/A	N/A -	0

\* LLD is the Lower Limit of Detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.

Table 3-1

**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM  
SUMMARY**

North Anna Nuclear Power Station, Louisa County, Virginia - 2003

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Medium or Pathway Sampled (Unit)	Analysis		LLD*	All Indicator Locations	Location with Highest Mean			Control Location	Non-routine Reported Measurements
	Type	Total No.		Mean Range	Name	Distance Direction	Mean Range	Mean Range	
Precipitation (pCi/liter)	Zr-95	2	30	(0/2)	N/A		N/A	N/A	0
				-				-	
	Nb-95	2	15	(0/2)	N/A		N/A	N/A	0
				-				-	
	I-131	2	10	(0/2)	N/A		N/A	N/A	0
				-				-	
	Cs-134	2	15	(0/2)	N/A		N/A	N/A	0
Sediment Silt (pCi/kg (dry))				-				-	
	Cs-137	2	18	(0/2)	N/A		N/A	N/A	0
				-				-	
	Ba-140	2	60	(0/2)	N/A		N/A	N/A	0
				-				-	
	La-140	2	15	(0/2)	N/A		N/A	N/A	0
				-				-	
Sediment Silt (pCi/kg (dry))	Gamma	6							
	K-40	6	-	14080(4/4) (5590-17510)	11	5.80 mi. SSE	17015(2/2) (16520-17510)	10750(2/2) (10480-11020)	0
	Cs-134	6	150	(0/4)	N/A		N/A	(0/2)	0
				-				-	
	Cs-137	6	180	133(1/4)	11	5.80 mi. SSE	133(1/2)	(0/2)	0
				-				-	
Sediment Silt (pCi/kg (dry))	Th-228	6	-	1412(4/4) (837-2070)	08	1.10 mi. SE	1454(2/2) (837-2070)	567(2/2) (360-774)	0
				-				-	
	Sr-89 (0/1) (Annually)	3 0	-	(0/2)	N/A		N/A		
				-				-	

\* LLD is the Lower Limit of Detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.

Table 3-1

**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY**

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Medium or Pathway Sampled (Unit)	Analysis		LLD*	All Indicator Locations	Location with Highest Mean			Control Location	Non-routine Reported Measurements
	Type	Total No.		Mean Range	Name	Distance Direction	Mean Range	Mean Range	
Sediment Silt (pCi/kg) (dry)	Sr-90 (Annually)	3	-	(0/2)	N/A		N/A	(0/1)	0
Soil (pCi/Kg) (dry)	Triennial Gamma	0							
	Cs-134	0	150						
	Cs-137	0	180						
	Sr-89	0	-						
	Sr-90	0	-						
Shoreline Soil (pCi/kg) (dry)	Gamma	2							
	K-40	2	-	2320(2/2) (2280-2360)	8	1.10 mi. SSE	2320(2/2) (2280-2360)	N/A -	0
	Th-228	2	-	262(2/2) (239-284)	8	1.10 mi. SSE	262(2/2) (239-284)	N/A -	0
	Cs-134	2	150	(0/2)	N/A		N/A	N/A -	0
	Cs-137	2	180	216(2/2) (199-233)	8	1.10 mi. SSE	216(2/2) (199-233)	N/A -	0
	Sr-89 (Annually)	1	-	(0/1)	N/A		N/A	N/A -	0
	Sr-90 (Annually)	1	-	(0/1)	N/A		N/A	N/A -	0

Soil samples are collected every three years. Since they were collected in 2001, they were not collected during 2003.

\* LLD is the Lower Limit of Detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.



Table 3-1

**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY**

North Anna Nuclear Power Station, Louisa County, Virginia - 2003

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Medium or Pathway Sampled (Unit)	Analysis		LLD*	All Indicator Locations	Location with Highest Mean			Control Location	Non-routine Reported Measurements
	Type	Total No.		Mean Range	Name	Distance Direction	Mean Range	Mean Range	
Milk (pCi/liter)	Gamma	24							
	K-40	24	-	1361(24/24) (1196-1530)	12	8.3 mi. NW	1399(12/12) (1320-1530)	N/A -	0
	I-131	24	1	(0/24) -	N/A		N/A	N/A -	0
	Cs-134	24	15	(0/24) -	N/A		N/A	N/A -	0
	Cs-137	24	18	(0/24) -	N/A		N/A	N/A -	0
	Ba-140	24	60	(0/24) -	N/A		N/A	N/A -	0
	La-140	24	15	(0/24) -	N/A		N/A	N/A -	0
	Sr-89 (Quarterly)	8	-	(0/8) -	N/A		N/A	N/A -	0
	Sr-90 (Quarterly)	8	-	(0/8) -	N/A		N/A	N/A -	0
Fish (pCi/kg) (wet)	Gamma	8							
	K-40	8	-	1560(4/4) (1210-1900)	08	1.10 mi. SSE	1560(4/4) (1210-1900)	1567(3/4) (1420-1730)	0
	Mn-54	8	130	(0/4) -	N/A		N/A	(0/4) -	0
	Fe-59	8	260	(0/4) -	N/A		N/A	(0/4) -	0
	Co-58	8	130	(0/4)	N/A		N/A	(0/4)	0

\* LLD is the Lower Limit of Detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.

Table 3-1

**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY**

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Medium or Pathway Sampled (Unit)	Analysis		LLD*	All Indicator Locations	Location with Highest Mean			Control Location	Non-routine Reported Measurements
	Type	Total No.		Mean Range	Name	Distance Direction	Mean Range	Mean Range	
Fish (pCi/kg) (wet)	Co-60	8	130	(0/4)	N/A		N/A	(0/4)	0
				-				-	
	Zn-65	8	260	(0/4)	N/A		N/A	(0/4)	0
				-				-	
	Cs-134	8	130	(0/4)	N/A		N/A	(0/4)	0
				-				-	
	Cs-137	8	150	(0/4)	N/A		N/A	(0/4)	0
				-				-	
Food Vegetation (pCi/kg) (wet))	Gamma	25							
	Be-7	25	-	2210(19/20) (470-8260)	14	varies NE	3160(5/5) (740-6680)	936(5/5) (470-1420)	0
	K-40	25	-	14833(20/20) (8540-32300)	14	varies NE	16436(5/5) (9750-32300)	12140(5/5) (5530-26100)	0
	I-131	25	60	(0/24)	N/A		N/A	(0/5)	0
				-				-	
	Cs-134	25	60	(0/24)	N/A		N/A	(0/5)	0
				-				-	
	Cs-137	25	80	96(5/20) (53-165)	23	varies SSE	165(1/5)	104(1/5)	0
				-			-	-	
	Th-228	25	-	280(7/20) (190-437)	15	varies SE	360(1/5) (282-437)	224(1/5)	0
				-			-	-	
Direct Radiation (mR/std. month) (Environmental TLDs)	Gamma Dose	48	2	3.4(44/44) (1.0-5.6)	01	0.20 mi. NE	5.0(4/4) (4.4-5.6)	2.9(4/4) (2.5-3.4)	0

\* LLD is the Lower Limit of Detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.

**Table 3-1**

**RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY**

North Anna Nuclear Power Station, Louisa County, Virginia - 2003  
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Medium or Pathway Sampled (Unit)	Analysis		LLD*	All Indicator Locations	Location with Highest Mean			Control Location	Non- routine Reported Measure- ments
	Type	Total No.		Mean Range	Name	Distance Direction	Mean Range	Mean Range	
Direct Radiation (mR/std. Month) (Annual TLDs)	Gamma Dose	12	2	3.0(11/11) (1.6-5.4)	01	0.2 mi. NE	5.1(1/1) -	3.0(1/1) -	0
Direct Radiation (mR/std. Month) (Sector TLDs)	Gamma Dose	288	2	4.4(256/256) (1.1-19.3)	19/51	0.42 mi. SSW	14.4(8/8) (10.2-19.3)	3.0(32/32) (2.0-4.0)	0

\* LLD is the Lower Limit of Detection as defined and required in USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979.

### 3.2 Analytical Results of 2003 REMP Samples

Radiological analyses of environmental media characteristically approach and frequently fall below the detection limits of state-of-the-art measurement methods. The data reported in the following tables are strictly counting statistics. The reported error is two times the standard deviation ( $2\sigma$ ) of the net activity. Unless otherwise noted, the overall error (counting, sample size, chemistry, errors, etc.) is estimated to be 2 to 5 times that listed. Results are considered positive when the measured value exceeds 1.5 times the listed  $2\sigma$  error (i.e., the measured value exceeds  $3\sigma$ ).

Because of counting statistics, negative values, zeros and numbers below the Minimum Detectable Level (MDL) are statistically valid pieces of data<sup>1</sup>. For the purposes of this report all valid data are presented in order to indicate any background biases. Framatome ANP DE&S's analytical methods meet the Lower Limit of Detection (LLD) requirements given in Table 2 of the USNRC Branch Technical Position, "An Acceptable Radiological Environmental Monitoring Program", (November 1979, Revision 1) and the North Anna ODCM.

Data are given according to sample type as indicated below.

1. Gamma Exposure Rate
2. Air Particulates, Gross Beta Radioactivity
3. Air Particulates, Weekly I-131
4. Air Particulates, Quantitative Gamma Spectra and Strontium
5. Soil\*
6. Precipitation
7. Cow Milk
8. Food Products and Vegetation
9. Well Water
10. River Water
11. Surface Water
12. Bottom Sediment/Silt
13. Shoreline Soil
14. Fish

\* Soil sampling is performed once per three years, therefore no table is included this year. Next sample will be collected 2004.

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<sup>1</sup> Analytical results are handled as recommended by HASL ("Reporting of Analytical Results from HASL," letter by Leo B. Higginbotham) and NUREG/CR-4007 (Sept. 1984).

**TABLE 3-2**  
**Direct Radiation Measurements – Sector Quarterly TLD Results**  
**mR/Std. Month (30.4 days) ± 2 Sigma**

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Station Name	First Quarter 1/9/2003 4/3/2003	Second Quarter 4/3/2003 7/8/2003	Third Quarter 7/8/2003 10/8/2003	Fourth Quarter 10/8/2003 1/7/2004	Quarterly Average
C-1	2.8	3.0	3.2	3.1	3.0 ± 0.4
C-2	2.6	3.0	2.9	3.3	3.0 ± 0.5
C-3	2.9	3.3	3.2	3.7	3.3 ± 0.7
C-4	3.0	3.2	2.2	3.5	3.0 ± 1.1
C-5	2.0	2.5	2.3	2.4	2.3 ± 0.4
C-6	2.1	2.5	2.4	2.1	2.3 ± 0.5
C-7	3.1	3.8	3.9	4.0	3.7 ± 0.8
C-8	3.2	3.7	3.2	3.5	3.4 ± 0.5
E-10	4.0	3.0	4.2	4.2	3.9 ± 1.2
E-41	4.5	4.8	4.5	5.3	4.8 ± 0.7
E-42	3.7	4.3	4.2	4.5	4.2 ± 0.7
E-9	4.6	4.9	4.8	5.3	4.9 ± 0.6
ENE-39	4.4	4.8	4.4	4.8	4.6 ± 0.5
ENE-40	2.8	3.0	2.9	3.4	3.0 ± 0.5
ENE-7	4.6	4.9	4.4	4.3	4.6 ± 0.5
ENE-8	2.9	3.1	3.2	3.1	3.1 ± 0.2
EPSA-01	4.6	4.6	4.9	4.6	4.7 ± 0.3
EPSA-02	4.8	4.7	4.7	4.9	4.8 ± 0.2
EPSF-03	4.0	4.4	4.3	5.6	4.6 ± 1.4
EPSF-04	4.4	4.4	4.1	4.9	4.5 ± 0.7
EPSJ-07	2.8	3.1	2.4	3.4	2.9 ± 0.8
EPSJ-08	3.3	3.1	3.5	3.2	3.3 ± 0.4
EPSP-09	6.9	7.2	7.1	7.8	7.3 ± 0.8
EPSP-10	7.3	7.2	7.2	8.0	7.4 ± 0.8
EPSR-05	5.6	5.0	4.7	4.9	5.0 ± 0.8
EPSR-06	5.2	5.2	3.6	4.9	4.7 ± 1.5
ESE-11	4.1	4.4	4.6	4.4	4.4 ± 0.4
ESE-12	4.0	4.1	2.8	4.0	3.7 ± 1.2
ESE-43	3.9	4.1	4.0	2.9	3.7 ± 1.1
ESE-44	4.1	4.1	4.1	4.5	4.2 ± 0.4
N-1	5.0	4.9	4.4	4.5	4.7 ± 0.6
N-2	2.8	3.6	3.2	3.3	3.2 ± 0.6
N-33	4.8	5.0	4.1	4.6	4.6 ± 0.7
N-34	2.6	3.1	3.2	3.2	3.0 ± 0.6
NE-37	5.6	5.9	4.3	4.8	5.1 ± 1.5
NE-38	3.2	3.6	3.0	3.5	3.3 ± 0.5
NE-5	4.4	4.3	3.2	4.5	4.1 ± 1.2
NE-6	3.1	3.4	2.1	4.0	3.1 ± 1.6
NNE-36	3.6	4.0	3.5	3.8	3.7 ± 0.4
NNE-3	7.0	5.1	6.0	6.5	6.2 ± 1.7
NNE-35	7.0	6.5	5.9	6.4	6.4 ± 0.9
NNE-4	3.4	4.1	3.7	4.2	3.9 ± 0.7

**TABLE 3-2**  
**Direct Radiation Measurements – Sector Quarterly TLD Results**  
**mR/Std. Month (30.4 days)  $\pm$  2 Sigma**

Page 2 of 3

Station Name	First Quarter 1/9/2003 4/3/2003	Second Quarter 4/3/2003 7/8/2003	Third Quarter 7/8/2003 10/8/2003	Fourth Quarter 10/8/2003 1/7/2004	Quarterly Average
NNW-31	3.6	3.7	3.0	3.5	3.5 $\pm$ 0.6
NNW-32	3.0	3.8	3.5	4.1	3.6 $\pm$ 0.9
NNW-63	4.4	3.8	3.2	3.4	3.7 $\pm$ 1.0
NNW-64	3.0	4.1	3.4	3.5	3.5 $\pm$ 0.9
NW-29	6.6	5.7	5.6	5.8	5.9 $\pm$ 0.9
NW-30	2.4	2.8	2.4	2.6	2.5 $\pm$ 0.5
NW-61	5.6	5.6	5.9	5.6	5.7 $\pm$ 0.3
NW-62	2.6	2.8	1.6	3.0	2.5 $\pm$ 1.3
S-17	6.9	7.3	6.5	7.0	6.9 $\pm$ 0.6
S-18	2.8	2.8	1.1	3.1	2.5 $\pm$ 1.8
S-49	7.2	6.4	7.1	6.9	6.9 $\pm$ 0.7
S-50	2.3	2.5	2.2	1.7	2.2 $\pm$ 0.6
SE-13	4.1	3.8	3.8	3.8	3.9 $\pm$ 0.3
SE-14	6.5	6.8	4.5	7.0	6.2 $\pm$ 2.3
SE-45	3.9	4.2	3.9	4.1	4.0 $\pm$ 0.3
SE-46	6.7	6.7	6.0	6.3	6.4 $\pm$ 0.7
SSE-15	4.7	4.8	5.1	4.9	4.9 $\pm$ 0.3
SSE-16	2.9	3.2	2.3	3.2	2.9 $\pm$ 0.8
SSE-47	4.9	4.6	4.8	4.9	4.8 $\pm$ 0.3
SSE-48	3.3	3.1	3.1	3.6	3.3 $\pm$ 0.4
SSW-19	12.5	13.1	18.0	13.4	14.2 $\pm$ 5.1
SSW-20	2.1	2.8	2.2	2.1	2.3 $\pm$ 0.6
SSW-51	14.7	13.9	10.2	19.3	14.5 $\pm$ 7.5
SSW-52	2.0	3.2	2.2	2.6	2.5 $\pm$ 1.1
SW-21	4.0	3.5	3.5	3.4	3.6 $\pm$ 0.6
SW-22	4.4	4.1	3.0	4.3	3.9 $\pm$ 1.3
SW-53	4.0	3.2	3.4	4.3	3.7 $\pm$ 1.0
SW-54	3.9	4.4	4.1	5.3	4.4 $\pm$ 1.2
W-25	5.5	5.9	6.8	6.5	6.2 $\pm$ 1.1
W-26	2.8	2.8	2.3	2.3	2.5 $\pm$ 0.6
W-57	5.3	6.0	5.8	6.1	5.8 $\pm$ 0.6
W-58	2.5	2.8	2.4	2.6	2.6 $\pm$ 0.3
WNW-27	2.9	3.5	3.2	2.3	3.0 $\pm$ 1.1
WNW-28	2.6	3.7	2.1	3.0	2.9 $\pm$ 1.4
WNW-59	2.8	3.1	3.0	3.1	3.0 $\pm$ 0.3
WNW-60	2.9	2.9	3.1	2.6	2.9 $\pm$ 0.4
WSW-23	5.3	5.8	5.2	5.2	5.4 $\pm$ 0.6
WSW-24	5.1	4.4	4.5	5.0	4.7 $\pm$ 0.7
WSW-55	4.9	5.6	5.1	5.3	5.2 $\pm$ 0.6
WSW-56	3.8	5.1	4.8	4.2	4.5 $\pm$ 1.2
Average $\pm$ 2 s.d.	4.0 $\pm$ 3.6	4.2 $\pm$ 3.4	3.9 $\pm$ 4.4	4.2 $\pm$ 3.8	4.1 $\pm$ 3.7

**TABLE 3-2****Direct Radiation Measurements – Quarterly and Annual TLD****mR/Std. Month (30.4 days)  $\pm$  2 Sigma**

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Station Name	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Quarterly Average	Annual TLD
	1/9/2003 4/3/2003	4/3/2003 7/8/2003	7/8/2003 10/8/2003	10/8/2003 1/7/2004		
STA-01	5.4	5.6	4.7	4.5	5.1 $\pm$ 1.1	3.9
STA-02	2.2	2.3	1.6	2.6	2.2 $\pm$ 0.9	1.5
STA-03	2.1	2.2	1.0	1.9	1.8 $\pm$ 1.1	2.1
STA-04	2.3	2.6	1.5	2.6	2.3 $\pm$ 1.0	2.0
STA-05	3.1	3.4	3.2	3.7	3.4 $\pm$ 0.5	3.1
STA-05A	3.1	3.2	3.0	3.4	3.2 $\pm$ 0.3	2.6
STA-06	3.8	4.0	4.1	4.2	4.0 $\pm$ 0.3	4.2
STA-07	2.7	3.1	3.1	3.0	3.0 $\pm$ 0.4	2.9
STA-21	3.0	2.3	3.1	3.0	2.8 $\pm$ 0.7	2.9
STA-22	4.2	4.5	4.2	4.5	4.4 $\pm$ 0.3	4.2
STA-23	4.8	5.0	4.7	5.2	4.9 $\pm$ 0.4	4.5
STA-24	3.1	3.4	2.8	2.5	3.0 $\pm$ 0.8	2.7
Average $\pm$ 2 s.d.	3.3 $\pm$ 2.1	3.5 $\pm$ 2.2	3.1 $\pm$ 2.5	3.4 $\pm$ 2.0	3.3 $\pm$ 2.1	3.1 $\pm$ 1.9

**Table 3-3**  
**Air Particulate**  
**Gross Beta Radioactivity**  

[pCi/m<sup>3</sup>] x 10<sup>-3</sup>

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Period Ending	Station 01	Station 02	Station 03	Station 04	Station 05	Station 05A	Station 06
01/01/03	43.9 +/- 4.1	39.7 +/- 3.9	36.5 +/- 3.9	34.2 +/- 3.7	40.3 +/- 3.9	36.6 +/- 3.8	37.8 +/- 3.9
01/08/03	14.5 +/- 3.0	13.5 +/- 3.0	11.8 +/- 2.8	16.5 +/- 3.1	14.9 +/- 3.0	14.5 +/- 3.0	13.2 +/- 2.9
01/15/03	27.1 +/- 3.3	27.8 +/- 3.3	22.7 +/- 3.1	24.8 +/- 3.2	24.2 +/- 3.1	29.3 +/- 3.3	27.0 +/- 3.2
01/22/03	37.2 +/- 3.8	36.0 +/- 3.8	36.8 +/- 3.8	37.7 +/- 3.8	36.6 +/- 3.8	36.0 +/- 3.7	37.5 +/- 3.8
01/29/03	27.0 +/- 3.3	24.1 +/- 3.2	22.0 +/- 3.1	26.1 +/- 3.3	26.0 +/- 3.2	24.3 +/- 3.2	26.0 +/- 3.2
02/05/03	30.8 +/- 3.6	28.2 +/- 3.5	28.5 +/- 3.5	31.5 +/- 3.6	31.0 +/- 3.6	30.9 +/- 3.6	29.7 +/- 3.6
02/12/03	26.7 +/- 3.5	34.3 +/- 3.8	30.6 +/- 3.6	34.8 +/- 3.8	27.4 +/- 3.5	28.1 +/- 3.6	31.3 +/- 3.7
02/19/03	15.2 +/- 2.7	17.3 +/- 2.8	15.5 +/- 2.7	19.7 +/- 4.9	15.8 +/- 2.7	14.8 +/- 2.7	16.5 +/- 2.8
02/26/03	20.8 +/- 3.4	21.3 +/- 3.3	19.8 +/- 3.4	21.3 +/- 3.4	19.0 +/- 3.3	19.0 +/- 3.3	18.2 +/- 3.3
03/05/03	20.5 +/- 3.1	26.4 +/- 3.3	26.1 +/- 3.3	24.7 +/- 3.3	20.8 +/- 3.1	24.4 +/- 3.2	25.7 +/- 3.2
03/12/03	31.2 +/- 3.6	26.4 +/- 3.5	27.4 +/- 3.5	34.1 +/- 3.7	30.6 +/- 3.6	24.3 +/- 3.4	27.8 +/- 3.5
03/19/03	24.3 +/- 3.2	27.7 +/- 3.4	27.0 +/- 3.3	30.9 +/- 3.5	31.2 +/- 3.5	27.2 +/- 3.3	27.3 +/- 3.4
03/26/03	19.0 +/- 3.2	18.4 +/- 3.2	18.9 +/- 3.2	19.5 +/- 3.2	22.4 +/- 3.3	21.0 +/- 3.3	21.0 +/- 3.3
04/02/03	19.1 +/- 3.2	15.9 +/- 3.1	19.9 +/- 3.2	22.5 +/- 3.3	20.8 +/- 3.2	17.6 +/- 3.1	22.4 +/- 3.3
04/09/03	14.9 +/- 2.8	18.2 +/- 3.0	18.2 +/- 3.0	19.6 +/- 3.0	19.5 +/- 3.1	18.2 +/- 3.0	18.9 +/- 3.0
04/17/03	24.1 +/- 3.0	23.4 +/- 2.9	22.2 +/- 2.8	25.9 +/- 3.0	26.0 +/- 3.0	24.6 +/- 2.9	22.8 +/- 2.9
04/23/03	15.8 +/- 2.7	11.6 +/- 2.6	15.9 +/- 2.7	17.1 +/- 2.8	18.8 +/- 2.8	11.6 +/- 2.6	14.0 +/- 2.7
05/01/03	25.7 +/- 3.0	23.7 +/- 2.9	22.2 +/- 2.9	23.2 +/- 2.9	25.0 +/- 3.0	24.0 +/- 2.9	20.9 +/- 2.8
05/07/03	19.2 +/- 3.2	19.4 +/- 3.2	22.2 +/- 3.3	20.6 +/- 3.4	19.9 +/- 3.2	20.4 +/- 3.2	17.1 +/- 3.1
05/14/03	17.9 +/- 3.0	16.0 +/- 2.9	14.9 +/- 2.9	16.6 +/- 3.0	18.1 +/- 3.0	17.3 +/- 3.0	15.7 +/- 2.9
05/21/03	17.2 +/- 3.0	17.4 +/- 3.0	17.2 +/- 3.0	18.7 +/- 3.1	17.6 +/- 3.0	18.3 +/- 3.0	17.5 +/- 3.0
05/28/03	8.1 +/- 2.2	7.2 +/- 2.1	7.1 +/- 3.1	4.3 +/- 2.0	7.6 +/- 2.2	5.3 +/- 2.1	7.5 +/- 2.2
06/04/03	15.7 +/- 3.0	16.5 +/- 3.0	15.7 +/- 3.0	18.9 +/- 3.1	20.0 +/- 3.1	14.4 +/- 2.9	17.4 +/- 3.0
06/11/03	17.9 +/- 3.4	18.3 +/- 3.4	16.7 +/- 3.3	18.9 +/- 3.4	13.7 +/- 3.2	16.3 +/- 3.3	15.8 +/- 3.3
06/18/03	20.4 +/- 4.3	15.9 +/- 2.4	17.4 +/- 2.4	17.7 +/- 2.5	20.7 +/- 2.6	20.2 +/- 2.6	13.8 +/- 2.3
06/25/03	19.0 +/- 3.4	17.0 +/- 3.3	19.1 +/- 3.4	23.0 +/- 3.6	21.8 +/- 3.5	17.9 +/- 3.4	17.1 +/- 3.3



**Table 3-3**  
**Air Particulate**  
**Gross Beta Radioactivity**  
**[pCi/m3] x 10-3**

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Period Ending	Station 07	Station 21	Station 22	Station 23	Station 24
01/01/03	36.5 +/- 3.8	17.1 +/- 3.1	38.1 +/- 3.9	38.9 +/- 3.9	33.7 +/- 3.4
01/08/03	13.0 +/- 3.0	6.1 +/- 2.6	14.4 +/- 3.0	12.9 +/- 2.9	17.4 +/- 3.5
01/15/03	27.7 +/- 3.3	12.7 +/- 2.7	28.9 +/- 3.3	26.3 +/- 3.2	24.6 +/- 3.2
01/22/03	34.4 +/- 3.7	17.2 +/- 3.1	33.0 +/- 3.6	33.1 +/- 3.7	32.5 +/- 3.7
01/29/03	21.5 +/- 3.1	10.9 +/- 2.6	24.8 +/- 3.2	20.7 +/- 3.0	25.0 +/- 3.2
02/05/03	26.9 +/- 3.5	18.0 +/- 3.2	30.5 +/- 3.6	28.7 +/- 3.6	31.5 +/- 3.6
02/12/03	28.3 +/- 3.6	31.7 +/- 3.7	33.6 +/- 3.8	27.7 +/- 3.6	32.0 +/- 3.7
02/19/03	17.3 +/- 2.8	19.7 +/- 2.8	16.0 +/- 2.7	16.6 +/- 2.7	17.3 +/- 2.7
02/26/03	19.2 +/- 3.3	20.0 +/- 3.4	20.0 +/- 3.4	16.4 +/- 3.2	17.5 +/- 3.3
03/05/03	24.3 +/- 3.2	24.9 +/- 3.2	21.6 +/- 3.1	26.5 +/- 3.3	18.2 +/- 3.0
03/12/03	28.1 +/- 3.5	26.9 +/- 3.5	27.2 +/- 3.5	30.9 +/- 3.6	28.0 +/- 3.5
03/19/03	26.2 +/- 3.3	23.5 +/- 3.2	29.7 +/- 3.4	27.3 +/- 3.3	27.7 +/- 3.3
03/26/03	17.1 +/- 3.1	14.9 +/- 3.0	19.8 +/- 3.2	16.7 +/- 3.1	18.3 +/- 3.2
04/02/03	20.1 +/- 3.2	20.1 +/- 3.2	16.9 +/- 3.1	20.4 +/- 3.2	17.3 +/- 3.1
04/09/03	16.0 +/- 2.9	17.0 +/- 3.0	20.1 +/- 3.1	16.6 +/- 2.9	17.4 +/- 3.0
04/17/03	21.4 +/- 2.8	21.7 +/- 2.8	13.1 +/- 2.5	24.7 +/- 2.9	22.2 +/- 2.8
04/23/03	14.1 +/- 2.7	16.3 +/- 2.7	16.6 +/- 2.7	12.8 +/- 2.6	15.0 +/- 2.6
05/01/03	22.0 +/- 2.9	19.2 +/- 2.7	15.8 +/- 2.6	20.8 +/- 2.8	24.9 +/- 3.0
05/07/03	17.0 +/- 3.1	19.8 +/- 3.2	18.2 +/- 3.2	18.3 +/- 3.2	19.2 +/- 3.2
05/14/03	15.7 +/- 2.9	14.3 +/- 2.9	17.2 +/- 3.0	17.8 +/- 3.0	14.8 +/- 2.9
05/21/03	15.3 +/- 2.9	17.6 +/- 3.0	15.5 +/- 2.9	16.0 +/- 3.0	15.3 +/- 2.9
05/28/03	7.1 +/- 2.1	5.7 +/- 2.1	8.9 +/- 2.2	7.8 +/- 2.1	7.8 +/- 2.2
06/04/03	17.1 +/- 3.0	17.1 +/- 3.0	15.0 +/- 2.9	18.8 +/- 3.1	17.5 +/- 3.1
06/11/03	19.6 +/- 3.4	16.8 +/- 3.3	15.5 +/- 3.3	20.3 +/- 3.4	17.7 +/- 3.4
06/18/03	17.5 +/- 2.5	15.2 +/- 2.3	17.7 +/- 2.5	17.1 +/- 2.5	13.7 +/- 2.3
06/25/03	16.2 +/- 3.3	19.3 +/- 3.5	17.2 +/- 3.3	21.2 +/- 3.4	21.8 +/- 3.5

**Table 3-3**  
**Air Particulate**  
**Gross Beta Radioactivity**  

[pCi/m<sup>3</sup>] x 10<sup>-3</sup>

pg. 3 of 4

Period Ending	Station 01			Station 02			Station 03			Station 04			Station 05			Station 05A			Station 06		
07/02/03	33.3	+/-	3.5	27.8	+/-	3.4	27.1	+/-	3.4	32.7	+/-	3.6	30.8	+/-	3.5	31.3	+/-	3.5	26.5	+/-	3.4
07/09/03	17.3	+/-	3.4	19.3	+/-	3.2	20.1	+/-	3.2	24.3	+/-	3.3	23.4	+/-	3.3	21.2	+/-	3.2	19.7	+/-	3.2
07/16/03	16.8	+/-	3.4	18.2	+/-	2.5	16.2	+/-	2.5	17.4	+/-	2.5	20.4	+/-	2.6	21.4	+/-	2.6	19.0	+/-	2.5
07/23/03	31.8	+/-	3.6	26.0	+/-	3.4	29.4	+/-	3.5	31.0	+/-	3.6	36.2	+/-	3.7	29.2	+/-	3.5	25.0	+/-	3.4
07/30/03	24.5	+/-	4.1	19.0	+/-	3.2	21.4	+/-	3.3	24.7	+/-	3.4	29.5	+/-	3.5	24.5	+/-	3.4	18.3	+/-	3.1
08/06/03	16.7	+/-	3.0	15.2	+/-	2.9	20.1	+/-	3.1	18.4	+/-	3.1	20.9	+/-	3.2	16.3	+/-	3.0	14.8	+/-	2.9
08/13/03	17.1	+/-	3.1	18.0	+/-	3.1	18.3	+/-	3.1	23.9	+/-	3.3	22.5	+/-	3.3	20.0	+/-	3.2	19.4	+/-	3.1
08/20/03	24.1	+/-	2.6	27.7	+/-	2.7	28.3	+/-	2.7	30.2	+/-	2.8	36.3	+/-	3.0	35.1	+/-	5.1	26.9	+/-	2.7
08/27/03	30.5	+/-	3.5	32.9	+/-	3.7	28.3	+/-	3.5	37.2	+/-	3.8	38.4	+/-	3.8	29.3	+/-	3.5	30.4	+/-	3.6
09/03/03	31.2	+/-	3.6	26.1	+/-	3.4	27.3	+/-	3.5	29.5	+/-	3.5	35.3	+/-	3.7	27.2	+/-	3.4	30.3	+/-	3.5
09/10/03	30.0	+/-	70.0	17.8	+/-	2.3	17.0	+/-	2.3	18.7	+/-	2.3	18.8	+/-	2.3	17.7	+/-	2.3	19.1	+/-	2.3
09/17/03	17.1	+/-	3.2	19.4	+/-	3.2	15.8	+/-	3.1	16.3	+/-	3.2	21.1	+/-	3.3	13.7	+/-	3.0	13.0	+/-	3.0
09/24/03	26.1	+/-	3.5	29.6	+/-	3.2	27.4	+/-	4.1	31.1	+/-	4.0	30.0	+/-	11.0	28.2	+/-	2.8	31.6	+/-	3.2
10/01/03	28.6	+/-	3.5	24.1	+/-	3.4	29.1	+/-	3.5	29.3	+/-	3.7	26.3	+/-	4.5	26.7	+/-	3.6	26.5	+/-	3.6
10/08/03	28.9	+/-	2.7	26.2	+/-	2.5	25.3	+/-	2.5	30.5	+/-	2.7	32.2	+/-	2.7	15.1	+/-	6.1	28.1	+/-	2.6
10/15/03	34.8	+/-	3.7	31.5	+/-	3.6	36.6	+/-	3.8	42.9	+/-	4.0	40.3	+/-	3.9	34.1	+/-	3.7	36.6	+/-	3.8
10/22/03	35.6	+/-	3.6	35.3	+/-	3.7	31.2	+/-	3.5	38.2	+/-	3.7	37.7	+/-	3.7	32.6	+/-	3.6	37.3	+/-	3.7
10/29/03	19.5	+/-	3.2	17.8	+/-	3.1	14.3	+/-	3.0	17.2	+/-	3.1	16.1	+/-	3.6	14.2	+/-	3.0	17.2	+/-	3.1
11/05/03	31.9	+/-	3.6	26.9	+/-	3.5	29.4	+/-	3.5	33.3	+/-	3.7	26.6	+/-	3.4	29.8	+/-	3.5	36.8	+/-	3.7
11/13/03	25.0	+/-	3.1	25.5	+/-	3.1	20.4	+/-	3.0	25.1	+/-	3.1	25.4	+/-	3.1	25.0	+/-	3.1	26.7	+/-	3.2
11/19/03	27.4	+/-	2.9	28.5	+/-	2.9	27.8	+/-	2.9	30.9	+/-	3.0	29.9	+/-	3.0	29.0	+/-	2.9	31.8	+/-	3.0
11/25/03	23.6	+/-	3.5	23.4	+/-	3.5	27.2	+/-	3.6	23.3	+/-	3.5	27.2	+/-	3.6	25.4	+/-	3.5	29.7	+/-	3.7
12/03/03	25.8	+/-	3.2	25.8	+/-	3.2	24.8	+/-	3.2	26.6	+/-	3.2	24.5	+/-	3.2	26.4	+/-	3.2	26.1	+/-	3.2
12/10/03	15.1	+/-	3.2	11.5	+/-	4.1	14.4	+/-	3.1	17.7	+/-	3.3	17.3	+/-	3.3	17.1	+/-	3.2	16.0	+/-	3.2
12/17/03	19.2	+/-	2.9	17.8	+/-	2.9	16.9	+/-	2.9	22.0	+/-	3.1	16.0	+/-	2.8	18.2	+/-	2.9	19.7	+/-	3.1
12/23/03	28.0	+/-	3.9	25.9	+/-	3.8	24.8	+/-	4.0	27.9	+/-	3.9	30.8	+/-	4.1	24.2	+/-	3.9	27.4	+/-	4.0
12/30/03	21.0	+/-	3.1	23.5	+/-	3.2	22.0	+/-	3.1	22.5	+/-	3.1	23.5	+/-	3.2	22.8	+/-	3.1	22.5	+/-	3.1

**Table 3-3**  
**Air Particulate**  
**Gross Beta Radioactivity**  

[pCi/m3] x 10-3

pg. 4 of 4

Period Ending	Station 07	Station 21	Station 22	Station 23	Station 24
07/02/03	29.1 +/- 3.5	28.0 +/- 3.5	25.3 +/- 3.4	25.9 +/- 3.4	31.4 +/- 3.6
07/09/03	21.4 +/- 3.3	17.1 +/- 3.1	17.1 +/- 3.1	22.6 +/- 3.3	22.5 +/- 3.3
07/16/03	17.2 +/- 2.5	17.0 +/- 2.5	18.3 +/- 2.5	17.6 +/- 2.5	18.4 +/- 2.5
07/23/03	29.0 +/- 3.5	25.4 +/- 3.4	25.8 +/- 3.4	33.2 +/- 3.6	28.9 +/- 3.5
07/30/03	18.3 +/- 3.1	22.0 +/- 3.3	24.1 +/- 3.3	24.7 +/- 3.4	21.8 +/- 3.3
08/06/03	16.1 +/- 3.0	17.6 +/- 3.0	18.1 +/- 3.1	20.0 +/- 3.1	15.7 +/- 3.0
08/13/03	16.7 +/- 3.1	19.3 +/- 3.2	17.5 +/- 3.1	21.4 +/- 3.2	22.0 +/- 3.2
08/20/03	28.8 +/- 2.8	28.9 +/- 2.8	27.9 +/- 2.7	30.9 +/- 2.8	27.8 +/- 2.8
08/27/03	32.2 +/- 3.6	29.3 +/- 3.5	25.5 +/- 3.4	33.4 +/- 3.7	34.8 +/- 3.7
09/03/03	26.1 +/- 3.4	28.7 +/- 3.5	28.7 +/- 3.6	29.0 +/- 3.5	23.9 +/- 3.3
09/10/03	16.6 +/- 2.3	14.9 +/- 2.2	16.4 +/- 2.3	17.4 +/- 2.3	16.2 +/- 2.2
09/17/03	14.4 +/- 3.1	15.6 +/- 3.1	15.9 +/- 3.1	15.9 +/- 3.1	17.9 +/- 3.2
09/24/03	30.0 +/- 3.2	31.8 +/- 3.4	12.0 +/- 2.3	34.8 +/- 3.6	28.4 +/- 2.8
10/01/03	26.1 +/- 3.5	25.9 +/- 3.5	28.6 +/- 3.5	27.4 +/- 3.5	29.2 +/- 3.6
10/08/03	26.9 +/- 2.6	22.6 +/- 2.4	23.4 +/- 2.5	26.9 +/- 2.6	27.2 +/- 2.6
10/15/03	36.3 +/- 3.8	35.3 +/- 3.8	29.8 +/- 3.6	40.2 +/- 3.9	34.5 +/- 3.8
10/22/03	36.5 +/- 3.7	30.1 +/- 3.5	33.0 +/- 3.6	35.1 +/- 3.7	33.6 +/- 3.6
10/29/03	17.3 +/- 3.0	17.0 +/- 3.1	15.4 +/- 3.0	17.4 +/- 3.1	17.3 +/- 3.1
11/05/03	33.4 +/- 3.7	30.0 +/- 3.5	32.6 +/- 3.6	33.4 +/- 3.6	36.8 +/- 3.7
11/13/03	25.7 +/- 3.1	18.5 +/- 2.9	21.3 +/- 3.0	23.2 +/- 3.0	25.4 +/- 3.1
11/19/03	15.9 +/- 6.0	27.8 +/- 2.9	26.4 +/- 2.8	31.1 +/- 3.0	28.4 +/- 2.9
11/25/03	22.2 +/- 3.4	28.5 +/- 3.6	20.3 +/- 3.3	23.8 +/- 3.5	22.9 +/- 3.4
12/03/03	23.4 +/- 3.1	25.3 +/- 3.2	22.9 +/- 3.1	29.0 +/- 3.3	25.6 +/- 3.2
12/10/03	15.5 +/- 3.2	14.9 +/- 3.2	15.6 +/- 3.2	18.8 +/- 3.3	15.9 +/- 3.2
12/17/03	19.9 +/- 3.0	19.3 +/- 3.0	20.3 +/- 3.0	20.7 +/- 3.0	19.7 +/- 2.9
12/23/03	26.4 +/- 3.9	28.7 +/- 4.0	26.6 +/- 3.9	24.8 +/- 3.8	30.8 +/- 4.1
12/30/03	22.3 +/- 3.1	19.6 +/- 3.0	21.0 +/- 3.1	24.9 +/- 3.2	22.9 +/- 3.1

**Table 3-4**  
**Airborne Iodine**

I - 131  
[pCi/m<sup>3</sup>] x 10<sup>-3</sup>

pg. 1 of 4

Period Ending	Station 01	Station 02	Station 03	Station 04	Station 05	Station 05A	Station 06
01/01/03	-17.0 +/- 15.0	9.0 +/- 16.0	11.0 +/- 15.0	-2.0 +/- 12.0	-6.0 +/- 15.0	-5.0 +/- 15.0	-7.0 +/- 14.0
01/08/03	9.0 +/- 11.0	0.0 +/- 16.0	1.0 +/- 13.0	4.0 +/- 13.0	-7.0 +/- 15.0	-6.0 +/- 13.0	-8.0 +/- 13.0
01/15/03	0.0 +/- 13.0	-6.0 +/- 13.0	1.0 +/- 15.0	6.0 +/- 15.0	-1.0 +/- 14.0	1.0 +/- 14.0	-4.0 +/- 13.0
01/22/03	-3.0 +/- 16.0	4.0 +/- 17.0	-1.0 +/- 16.0	12.0 +/- 18.0	5.0 +/- 16.0	10.0 +/- 14.0	-14.0 +/- 18.0
01/29/03	-4.0 +/- 17.0	-2.0 +/- 16.0	5.0 +/- 14.0	0.0 +/- 14.0	-8.0 +/- 21.0	-10.0 +/- 18.0	-10.0 +/- 19.0
02/05/03	7.0 +/- 12.0	2.0 +/- 13.0	1.0 +/- 11.0	4.0 +/- 11.0	-9.0 +/- 12.0	-14.0 +/- 13.0	0.0 +/- 11.0
02/12/03	4.0 +/- 11.0	-4.0 +/- 12.0	4.0 +/- 12.0	-3.0 +/- 12.0	0.0 +/- 14.0	2.0 +/- 13.0	-7.0 +/- 12.0
02/19/03	-15.0 +/- 13.0	7.0 +/- 17.0	7.0 +/- 16.0	36.0 +/- 30.0	-1.0 +/- 16.0	11.0 +/- 16.0	-1.0 +/- 18.0
02/26/03	7.0 +/- 16.0	2.0 +/- 16.0	4.0 +/- 16.0	-1.0 +/- 14.0	5.0 +/- 16.0	2.0 +/- 16.0	0.0 +/- 15.0
03/05/03	7.0 +/- 14.0	2.0 +/- 13.0	1.0 +/- 12.0	-5.0 +/- 13.0	0.0 +/- 11.0	-7.0 +/- 12.0	1.0 +/- 13.0
03/12/03	3.0 +/- 12.0	-2.0 +/- 12.0	11.0 +/- 12.0	-5.0 +/- 11.0	-4.0 +/- 12.0	5.0 +/- 12.0	5.0 +/- 11.0
03/19/03	-4.0 +/- 11.0	-5.0 +/- 11.0	-4.0 +/- 10.0	4.0 +/- 13.0	-4.0 +/- 14.0	1.0 +/- 14.0	4.0 +/- 14.0
03/26/03	-4.0 +/- 11.0	-5.0 +/- 12.0	7.0 +/- 11.0	3.0 +/- 14.0	-7.0 +/- 13.0	-7.0 +/- 12.0	-8.0 +/- 15.0
04/02/03	10.0 +/- 13.0	11.0 +/- 12.0	-4.0 +/- 12.0	-4.0 +/- 12.0	-2.0 +/- 14.0	-1.0 +/- 14.0	-3.0 +/- 12.0
04/09/03	-2.0 +/- 11.0	1.0 +/- 10.0	2.9 +/- 9.8	-4.7 +/- 9.4	6.0 +/- 12.0	-6.7 +/- 9.9	-3.0 +/- 13.0
04/17/03	-1.0 +/- 10.0	-13.1 +/- 9.3	-3.0 +/- 12.0	-5.0 +/- 10.0	10.0 +/- 10.0	-4.0 +/- 10.0	-14.0 +/- 11.0
04/23/03	10.0 +/- 15.0	7.0 +/- 14.0	1.0 +/- 11.0	-8.0 +/- 13.0	1.0 +/- 12.0	-3.0 +/- 12.0	-5.0 +/- 13.0
05/01/03	2.0 +/- 11.0	7.0 +/- 10.0	-8.0 +/- 11.0	-7.0 +/- 11.0	0.0 +/- 11.0	0.0 +/- 12.0	-2.0 +/- 10.0
05/07/03	-9.0 +/- 16.0	-4.0 +/- 17.0	-24.0 +/- 14.0	-3.0 +/- 19.0	2.0 +/- 17.0	0.0 +/- 16.0	-3.0 +/- 17.0
05/14/03	7.0 +/- 14.0	0.0 +/- 14.0	-5.0 +/- 13.0	-6.0 +/- 19.0	-6.0 +/- 13.0	4.0 +/- 13.0	-6.0 +/- 11.0
05/21/03	-11.0 +/- 15.0	2.0 +/- 12.0	-4.0 +/- 13.0	6.0 +/- 17.0	2.0 +/- 15.0	18.0 +/- 15.0	0.0 +/- 17.0
05/28/03	0.0 +/- 11.0	2.0 +/- 11.0	0.0 +/- 11.0	-8.0 +/- 11.0	-1.0 +/- 13.0	-4.0 +/- 12.0	12.0 +/- 14.0
06/04/11	-10.0 +/- 11.0	6.0 +/- 13.0	9.0 +/- 12.0	-2.0 +/- 13.0	10.0 +/- 12.0	-9.0 +/- 12.0	4.0 +/- 10.0
06/11/03	-2.0 +/- 12.0	6.0 +/- 12.0	2.0 +/- 12.0	-3.0 +/- 13.0	-2.0 +/- 12.0	4.0 +/- 14.0	-3.0 +/- 13.0
06/18/03	-10.0 +/- 17.0	-4.0 +/- 12.0	-1.0 +/- 12.0	4.0 +/- 14.0	10.0 +/- 13.0	-2.0 +/- 12.0	1.0 +/- 12.0
06/25/03	0.9 +/- 9.3	5.0 +/- 10.0	-3.5 +/- 9.6	4.0 +/- 13.0	-4.0 +/- 16.0	4.0 +/- 15.0	3.0 +/- 14.0

**Table 3-4**  
**Airborne Iodine**  
**I - 131**  
**[pCi/m3] x 10-3**

pg. 2 of 4

Period Ending	Station 07	Station 21	Station 22	Station 23	Station 24
01/01/03	-6.0 +/- 15.0	-10.0 +/- 14.0	1.0 +/- 12.0	0.0 +/- 13.0	-4.0 +/- 12.0
01/08/03	-15.0 +/- 12.0	-3.0 +/- 14.0	2.0 +/- 11.0	3.0 +/- 12.0	-1.0 +/- 13.0
01/15/03	-5.0 +/- 15.0	-7.0 +/- 15.0	-7.0 +/- 12.0	-1.0 +/- 12.0	-3.0 +/- 16.0
01/22/03	-11.0 +/- 15.0	9.0 +/- 14.0	5.0 +/- 15.0	15.0 +/- 17.0	5.0 +/- 16.0
01/29/03	-6.0 +/- 18.0	11.0 +/- 16.0	2.0 +/- 16.0	-3.0 +/- 19.0	11.0 +/- 16.0
02/05/03	-7.0 +/- 12.0	-1.0 +/- 12.0	8.0 +/- 10.0	-10.0 +/- 11.0	4.0 +/- 12.0
02/12/03	-4.0 +/- 13.0	-11.0 +/- 13.0	-2.0 +/- 13.0	0.0 +/- 12.0	4.0 +/- 13.0
02/19/03	-16.0 +/- 20.0	-14.0 +/- 18.0	-14.0 +/- 18.0	-6.0 +/- 17.0	-16.0 +/- 17.0
02/26/03	-2.0 +/- 16.0	7.0 +/- 16.0	2.0 +/- 19.0	-14.0 +/- 17.0	-10.0 +/- 16.0
03/05/03	11.0 +/- 15.0	-5.0 +/- 12.0	-2.0 +/- 14.0	-5.0 +/- 12.0	6.0 +/- 14.0
03/12/03	4.0 +/- 13.0	6.0 +/- 11.0	6.0 +/- 12.0	0.0 +/- 10.0	0.0 +/- 11.0
03/19/03	-7.0 +/- 12.0	2.0 +/- 14.0	11.0 +/- 13.0	1.0 +/- 13.0	-4.0 +/- 14.0
03/26/03	3.0 +/- 15.0	-5.0 +/- 13.0	-5.0 +/- 15.0	-10.0 +/- 14.0	3.0 +/- 13.0
04/02/03	5.0 +/- 12.0	-5.0 +/- 11.0	-4.0 +/- 12.0	-4.0 +/- 13.0	1.0 +/- 14.0
04/09/03	0.0 +/- 11.0	4.0 +/- 11.0	-6.0 +/- 11.0	3.0 +/- 13.0	3.0 +/- 11.0
04/17/03	4.5 +/- 9.5	-4.0 +/- 11.0	1.0 +/- 11.0	5.0 +/- 12.0	6.0 +/- 13.0
04/23/03	0.0 +/- 14.0	-3.0 +/- 13.0	5.0 +/- 14.0	-15.0 +/- 13.0	-4.0 +/- 14.0
05/01/03	10.0 +/- 11.0	-5.0 +/- 13.0	-1.0 +/- 12.0	-2.0 +/- 10.0	-1.0 +/- 11.0
05/07/03	-3.0 +/- 15.0	-19.0 +/- 16.0	20.0 +/- 18.0	-17.0 +/- 17.0	-1.0 +/- 17.0
05/14/03	13.0 +/- 15.0	1.0 +/- 14.0	12.0 +/- 14.0	14.0 +/- 15.0	-4.0 +/- 14.0
05/21/03	-5.0 +/- 17.0	-3.0 +/- 14.0	-2.0 +/- 13.0	7.0 +/- 20.0	8.0 +/- 17.0
05/28/03	-3.0 +/- 11.0	14.0 +/- 11.0	4.0 +/- 11.0	2.0 +/- 11.0	-2.0 +/- 10.0
06/04/11	-2.0 +/- 12.0	9.0 +/- 12.0	-4.0 +/- 11.0	5.0 +/- 12.0	14.0 +/- 12.0
06/11/03	-5.0 +/- 11.0	4.0 +/- 11.0	9.0 +/- 15.0	5.0 +/- 14.0	-7.0 +/- 13.0
06/18/03	-2.0 +/- 15.0	0.0 +/- 14.0	7.0 +/- 13.0	7.0 +/- 14.0	2.0 +/- 14.0
06/25/03	11.0 +/- 13.0	8.0 +/- 13.0	5.0 +/- 14.0	-5.0 +/- 14.0	-14.0 +/- 14.0

**Table 3-4**  
**Airborne Iodine**  
**I - 131**  
**[pCi/m<sup>3</sup>] x 10<sup>-3</sup>**

pg. 3 of 4

Period Ending	Station 01	Station 02	Station 03	Station 04	Station 05	Station 05A	Station 06
07/02/03	-5.0 +/- 11.0	-5.0 +/- 11.0	3.0 +/- 13.0	2.0 +/- 12.0	1.0 +/- 11.0	12.0 +/- 12.0	8.3 +/- 8.3
07/09/03	-1.1 +/- 8.8	-4.0 +/- 11.0	5.0 +/- 11.0	-5.0 +/- 12.0	8.0 +/- 10.0	-5.0 +/- 12.0	-2.0 +/- 12.0
07/16/03	-12.0 +/- 23.0	-2.0 +/- 20.0	6.0 +/- 20.0	0.0 +/- 15.0	-15.0 +/- 18.0	7.0 +/- 19.0	-13.0 +/- 14.0
07/23/03	13.0 +/- 12.0	-7.0 +/- 14.0	8.0 +/- 14.0	-5.0 +/- 13.0	-3.0 +/- 14.0	-4.0 +/- 13.0	11.0 +/- 15.0
07/30/03	-3.0 +/- 16.0	4.0 +/- 14.0	0.0 +/- 13.0	0.0 +/- 14.0	-4.0 +/- 15.0	-2.0 +/- 13.0	6.0 +/- 13.0
08/06/03	4.0 +/- 12.0	-2.0 +/- 12.0	-6.0 +/- 14.0	10.0 +/- 11.0	10.0 +/- 12.0	1.0 +/- 12.0	7.0 +/- 14.0
08/13/03	-2.0 +/- 12.0	-12.0 +/- 12.0	4.0 +/- 12.0	-2.0 +/- 12.0	3.0 +/- 13.0	1.0 +/- 13.0	-2.0 +/- 14.0
08/20/03	14.0 +/- 11.0	12.0 +/- 14.0	-6.0 +/- 13.0	-6.0 +/- 13.0	3.0 +/- 10.0	-14.0 +/- 27.0	3.0 +/- 13.0
08/27/03	9.0 +/- 15.0	-20.0 +/- 17.0	0.0 +/- 16.0	2.0 +/- 15.0	0.0 +/- 16.0	2.0 +/- 15.0	4.0 +/- 15.0
09/03/03	7.0 +/- 17.0	0.0 +/- 14.0	-11.0 +/- 18.0	4.0 +/- 17.0	-7.0 +/- 21.0	0.0 +/- 16.0	-9.0 +/- 23.0
09/10/03	-160.0 +/- 660.0	-5.0 +/- 11.0	3.0 +/- 15.0	5.0 +/- 15.0	7.0 +/- 14.0	7.0 +/- 14.0	5.0 +/- 13.0
09/17/03	7.0 +/- 17.0	-12.0 +/- 15.0	-8.0 +/- 15.0	-17.0 +/- 16.0	-2.0 +/- 16.0	10.0 +/- 17.0	-6.0 +/- 17.0
09/24/03	-4.0 +/- 21.0	5.0 +/- 16.0	-7.0 +/- 19.0	-13.0 +/- 20.0	3.0 +/- 17.0	1.0 +/- 12.0	-5.0 +/- 15.0
10/01/03	0.0 +/- 15.0	9.0 +/- 14.0	8.0 +/- 14.0	12.0 +/- 16.0	11.0 +/- 21.0	3.0 +/- 19.0	-8.0 +/- 15.0
10/08/03	-2.0 +/- 15.0	8.0 +/- 15.0	8.0 +/- 15.0	0.0 +/- 13.0	5.0 +/- 12.0	7.0 +/- 19.0	-9.0 +/- 14.0
10/15/03	-11.0 +/- 14.0	-6.0 +/- 11.0	-6.0 +/- 15.0	5.0 +/- 13.0	7.0 +/- 13.0	0.0 +/- 13.0	-7.0 +/- 15.0
10/22/03	2.0 +/- 16.0	-6.0 +/- 15.0	-11.0 +/- 16.0	10.0 +/- 16.0	0.0 +/- 15.0	3.0 +/- 13.0	5.0 +/- 17.0
10/29/03	3.0 +/- 12.0	-2.0 +/- 11.0	9.0 +/- 14.0	-11.0 +/- 17.0	-8.0 +/- 20.0	-2.0 +/- 13.0	-6.0 +/- 15.0
11/05/03	6.0 +/- 13.0	-9.0 +/- 15.0	5.0 +/- 16.0	6.0 +/- 14.0	0.0 +/- 15.0	-14.0 +/- 15.0	-20.0 +/- 14.0
11/13/03	-6.0 +/- 16.0	0.0 +/- 12.0	3.0 +/- 14.0	-1.0 +/- 15.0	-13.0 +/- 13.0	-1.0 +/- 12.0	-4.0 +/- 14.0
11/19/03	14.0 +/- 14.0	-3.0 +/- 12.0	1.0 +/- 11.0	-8.0 +/- 14.0	4.0 +/- 14.0	-6.0 +/- 14.0	0.0 +/- 10.0
11/25/03	14.0 +/- 20.0	1.0 +/- 16.0	6.0 +/- 18.0	13.0 +/- 22.0	14.0 +/- 18.0	10.0 +/- 15.0	-3.0 +/- 20.0
12/03/03	0.0 +/- 17.0	-1.0 +/- 16.0	-1.0 +/- 16.0	7.0 +/- 15.0	-7.0 +/- 15.0	1.0 +/- 15.0	-6.0 +/- 14.0
12/10/03	-4.0 +/- 17.0	4.0 +/- 25.0	-13.0 +/- 19.0	-10.0 +/- 18.0	15.0 +/- 17.0	-9.0 +/- 15.0	5.0 +/- 16.0
12/17/03	7.0 +/- 15.0	-11.0 +/- 15.0	1.0 +/- 16.0	-4.0 +/- 14.0	11.0 +/- 12.0	12.0 +/- 13.0	-6.0 +/- 13.0
12/23/03	33.0 +/- 35.0	20.0 +/- 28.0	3.0 +/- 38.0	0.0 +/- 34.0	30.0 +/- 37.0	-10.0 +/- 28.0	-11.0 +/- 33.0
12/30/03	10.0 +/- 20.0	-2.0 +/- 21.0	-16.0 +/- 20.0	-2.0 +/- 16.0	4.0 +/- 21.0	-10.0 +/- 19.0	10.0 +/- 21.0

**Table 3-4**  
**Airborne Iodine**  
**I - 131**  
**[pCi/m3] x 10-3**

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Period Ending	Station 07	Station 21	Station 22	Station 23	Station 24
07/02/03	-1.0 +/- 13.0	-13.0 +/- 12.0	3.0 +/- 11.0	-3.0 +/- 12.0	-11.0 +/- 13.0
07/09/03	3.0 +/- 12.0	-4.0 +/- 11.0	-3.0 +/- 11.0	-2.0 +/- 13.0	-8.0 +/- 11.0
07/16/03	2.0 +/- 15.0	8.0 +/- 13.0	16.0 +/- 15.0	6.0 +/- 16.0	-7.0 +/- 13.0
07/23/03	2.0 +/- 13.0	7.0 +/- 13.0	-11.0 +/- 13.0	-12.0 +/- 15.0	7.0 +/- 15.0
07/30/03	7.9 +/- 8.5	-8.0 +/- 11.0	11.4 +/- 9.6	3.1 +/- 7.8	0.0 +/- 10.0
08/06/03	-10.0 +/- 14.0	-4.0 +/- 13.0	-16.0 +/- 14.0	6.0 +/- 13.0	14.0 +/- 13.0
08/13/03	-1.0 +/- 13.0	1.0 +/- 14.0	-12.0 +/- 12.0	-1.0 +/- 13.0	1.0 +/- 12.0
08/20/03	11.0 +/- 15.0	-3.0 +/- 14.0	-3.0 +/- 14.0	-11.0 +/- 13.0	3.0 +/- 11.0
08/27/03	-3.0 +/- 23.0	1.0 +/- 19.0	5.0 +/- 20.0	0.0 +/- 16.0	2.0 +/- 17.0
09/03/03	-18.0 +/- 17.0	-2.0 +/- 19.0	-5.0 +/- 17.0	9.0 +/- 21.0	-9.0 +/- 22.0
09/10/03	-1.0 +/- 14.0	-8.0 +/- 14.0	-2.0 +/- 13.0	0.0 +/- 15.0	10.0 +/- 13.0
09/17/03	-4.0 +/- 14.0	-2.0 +/- 17.0	0.0 +/- 20.0	-8.0 +/- 14.0	-4.0 +/- 17.0
09/24/03	14.0 +/- 17.0	11.0 +/- 16.0	6.0 +/- 11.0	-1.0 +/- 16.0	10.0 +/- 13.0
10/01/03	5.0 +/- 14.0	-10.0 +/- 16.0	0.0 +/- 15.0	-11.0 +/- 14.0	8.0 +/- 15.0
10/08/03	3.0 +/- 11.0	-3.0 +/- 16.0	-3.0 +/- 15.0	10.0 +/- 15.0	-10.0 +/- 14.0
10/15/03	-8.0 +/- 13.0	0.0 +/- 13.0	-9.0 +/- 15.0	-18.0 +/- 13.0	4.0 +/- 14.0
10/22/03	-13.0 +/- 14.0	10.0 +/- 14.0	-10.0 +/- 15.0	-18.0 +/- 15.0	-3.0 +/- 16.0
10/29/03	-11.0 +/- 14.0	0.0 +/- 18.0	-14.0 +/- 17.0	-11.0 +/- 13.0	3.0 +/- 13.0
11/05/03	13.0 +/- 17.0	2.0 +/- 13.0	6.0 +/- 14.0	3.0 +/- 11.0	6.0 +/- 15.0
11/13/03	-9.0 +/- 14.0	-7.0 +/- 13.0	0.0 +/- 13.0	-4.0 +/- 15.0	0.0 +/- 14.0
11/19/03	-6.0 +/- 16.0	-4.0 +/- 12.0	10.0 +/- 11.0	1.0 +/- 15.0	-1.0 +/- 12.0
11/25/03	9.0 +/- 19.0	14.0 +/- 20.0	16.0 +/- 19.0	0.0 +/- 18.0	3.0 +/- 17.0
12/03/03	3.0 +/- 14.0	-1.0 +/- 14.0	6.0 +/- 13.0	-4.0 +/- 14.0	-1.0 +/- 15.0
12/10/03	9.0 +/- 14.0	12.0 +/- 20.0	-4.0 +/- 17.0	14.0 +/- 18.0	-12.0 +/- 16.0
12/17/03	-2.0 +/- 15.0	2.0 +/- 14.0	-1.0 +/- 13.0	-9.0 +/- 16.0	-6.0 +/- 14.0
12/23/03	16.0 +/- 37.0	0.0 +/- 24.0	-17.0 +/- 32.0	30.0 +/- 33.0	0.0 +/- 33.0
12/30/03	0.0 +/- 26.0	14.0 +/- 17.0	-14.0 +/- 20.0	-10.0 +/- 26.0	-10.0 +/- 24.0

**Table 3-5**  
**Airborne Particulate**

**First Quarter Gamma Spectra and Strontium**  
**[pCi/m<sup>3</sup>] x 10<sup>-3</sup>**

Sampling Location	Be-7	K-40	Cs-134*	Cs-137*	Sr-89	Sr-90
01	109.0 +/- 32.0	-17.0 +/- 13.0	-0.6 +/- 0.9	-1.8 +/- 1.4	[a]	[a]
02	86.0 +/- 30.0	-25.0 +/- 9.1	-0.4 +/- 0.3	0.0 +/- 1.4	[a]	[a]
03	74.0 +/- 29.0	-20.0 +/- 11.0	-0.5 +/- 0.9	-0.4 +/- 1.6	[a]	[a]
04	77.0 +/- 29.0	-18.0 +/- 13.0	0.0 +/- 1.1	0.0 +/- 1.7	[a]	[a]
05	101.0 +/- 30.0	-18.0 +/- 12.0	-0.1 +/- 0.9	0.4 +/- 1.4	[a]	[a]
05A	108.0 +/- 34.0	-20.0 +/- 11.0	-0.1 +/- 0.9	-1.2 +/- 1.4	[a]	[a]
06	111.0 +/- 30.0	-20.0 +/- 11.0	0.0 +/- 0.7	0.4 +/- 1.6	[a]	[a]
07	128.0 +/- 34.0	-25.0 +/- 11.0	-0.1 +/- 1.0	0.1 +/- 1.5	[a]	[a]
21	95.0 +/- 33.0	-25.0 +/- 9.1	-0.4 +/- 0.6	0.8 +/- 1.6	[a]	[a]
22	115.0 +/- 29.0	-20.0 +/- 9.4	-0.5 +/- 0.9	-0.4 +/- 1.4	[a]	[a]
23	76.0 +/- 34.0	-19.0 +/- 13.0	0.0 +/- 0.8	0.8 +/- 1.6	[a]	[a]
24	88.0 +/- 30.0	-25.0 +/- 11.0	0.5 +/- 0.8	0.4 +/- 1.9	[a]	[a]

**Second Quarter Gamma Spectra and Strontium**  
**[pCi/m<sup>3</sup>] x 10<sup>-3</sup>**

Sampling Location	Be-7	K-40	Cs-134*	Cs-137*	Sr-89	Sr-90
01	104.0 +/- 33.0	-2.0 +/- 11.0	0.0 +/- 0.6	-0.1 +/- 0.7	1.3 +/- 9.3	0.6 +/- 1.5
02	100.0 +/- 33.0	-5.2 +/- 8.7	-0.2 +/- 0.6	-0.3 +/- 0.5	-4.0 +/- 11.0	0.2 +/- 1.9
03	121.0 +/- 33.0	0.1 +/- 8.0	0.4 +/- 0.5	-0.2 +/- 0.6	1.6 +/- 9.2	-0.5 +/- 1.3
04	115.0 +/- 32.0	0.1 +/- 8.1	-0.4 +/- 0.8	0.0 +/- 0.8	-4.9 +/- 8.3	-4.0 +/- 1.4
05	112.0 +/- 32.0	4.3 +/- 8.6	0.2 +/- 0.7	0.0 +/- 0.6	-9.6 +/- 6.5	0.1 +/- 1.3
05A	131.0 +/- 32.0	1.0 +/- 10.0	0.2 +/- 0.8	0.0 +/- 0.8	-5.2 +/- 6.7	0.1 +/- 1.2
06	95.0 +/- 30.0	1.4 +/- 7.6	-0.1 +/- 0.7	-0.7 +/- 0.7	-2.7 +/- 6.8	0.1 +/- 1.1
07	95.0 +/- 30.0	-2.6 +/- 7.9	0.6 +/- 0.8	0.5 +/- 0.7	-6.6 +/- 6.8	-0.5 +/- 1.2
21	118.0 +/- 32.0	10.0 +/- 10.0	0.7 +/- 0.6	0.1 +/- 0.6	-2.7 +/- 8.2	0.8 +/- 1.4
22	82.0 +/- 30.0	-1.0 +/- 9.3	0.2 +/- 0.7	0.7 +/- 0.8	-5.8 +/- 6.9	0.0 +/- 1.2
23	94.0 +/- 34.0	-9.5 +/- 7.2	0.4 +/- 0.7	0.2 +/- 0.5	-5.9 +/- 6.3	0.1 +/- 1.1
24	117.0 +/- 31.0	-8.4 +/- 5.5	0.0 +/- 0.6	0.0 +/- 0.8	-4.9 +/- 8.3	0.2 +/- 1.5

\* LLD identified in ODCM

[a] Sr-89/90 analysis performed on the second quarter composite



**Table 3-5**  
**Airborne Particulate**

**Third Quarter Gamma Spectra and Strontium**  
**[pCi/m<sup>3</sup>] x 10<sup>-3</sup>**

Sampling Location	Be-7	K-40	Cs-134*	Cs-137*	Sr-89	Sr-90
01	69.0 +/- 22.0	3.0 +/- 10.0	0.4 +/- 0.7	-0.3 +/- 0.7	[a]	[a]
02	67.0 +/- 22.0	-0.5 +/- 7.0	-0.3 +/- 0.5	-0.2 +/- 0.7	[a]	[a]
03	88.0 +/- 23.0	-6.3 +/- 5.6	0.0 +/- 0.7	-0.4 +/- 0.7	[a]	[a]
04	82.0 +/- 24.0	4.0 +/- 9.6	0.2 +/- 0.6	0.4 +/- 0.6	[a]	[a]
05	105.0 +/- 26.0	-3.3 +/- 8.5	0.2 +/- 0.7	0.4 +/- 0.7	[a]	[a]
05A	82.0 +/- 26.0	-0.1 +/- 9.9	-0.2 +/- 0.6	-0.3 +/- 0.6	[a]	[a]
06	53.0 +/- 21.0	5.0 +/- 12.0	-0.6 +/- 0.6	0.4 +/- 0.7	[a]	[a]
07	100.0 +/- 29.0	0.0 +/- 15.0	0.6 +/- 1.0	-0.2 +/- 1.6	[a]	[a]
21	78.0 +/- 28.0	-6.0 +/- 15.0	0.1 +/- 0.8	-0.6 +/- 1.8	[a]	[a]
22	89.0 +/- 26.0	-4.0 +/- 9.5	0.0 +/- 0.9	1.3 +/- 1.8	[a]	[a]
23	116.0 +/- 32.0	-4.0 +/- 12.0	0.2 +/- 1.0	0.6 +/- 1.8	[a]	[a]
24	90.0 +/- 28.0	-8.0 +/- 11.0	0.9 +/- 0.7	-0.6 +/- 1.7	[a]	[a]

**Fourth Quarter Gamma Spectra and Strontium**  
**[pCi/m<sup>3</sup>] x 10<sup>-3</sup>**

Sampling Location	Be-7	K-40	Cs-134*	Cs-137*	Sr-89	Sr-90
01	80.0 +/- 26.0	2.0 +/- 10.0	0.2 +/- 0.6	-0.6 +/- 0.9	[a]	[a]
02	79.0 +/- 27.0	-4.9 +/- 6.9	-0.1 +/- 0.7	0.1 +/- 0.8	[a]	[a]
03	65.0 +/- 27.0	-0.7 +/- 7.3	0.0 +/- 0.7	-0.1 +/- 0.8	[a]	[a]
04	87.0 +/- 31.0	0.6 +/- 6.9	-0.6 +/- 0.6	-0.4 +/- 0.6	[a]	[a]
05	78.0 +/- 27.0	-6.5 +/- 4.8	0.0 +/- 0.6	0.2 +/- 0.7	[a]	[a]
05A	87.0 +/- 31.0	-3.3 +/- 9.8	0.0 +/- 0.8	0.1 +/- 0.7	[a]	[a]
06	96.0 +/- 30.0	-6.0 +/- 8.2	0.0 +/- 0.8	0.2 +/- 0.5	[a]	[a]
07	74.0 +/- 27.0	-2.0 +/- 10.0	0.1 +/- 0.7	-0.8 +/- 0.8	[a]	[a]
21	105.0 +/- 29.0	3.0 +/- 11.0	-0.2 +/- 0.7	-0.5 +/- 0.7	[a]	[a]
22	64.0 +/- 25.0	6.5 +/- 9.8	0.1 +/- 0.8	0.2 +/- 0.5	[a]	[a]
23	100.0 +/- 28.0	1.1 +/- 9.3	0.3 +/- 0.7	0.0 +/- 0.5	[a]	[a]
24	76.0 +/- 27.0	-3.2 +/- 8.3	0.3 +/- 0.7	-0.3 +/- 0.7	[a]	[a]

\* LLD Identified in ODCM

[a] Sr-89/90 analysis performed on the second quarter composite

**Table 3-6**

Soil sampling is performed once per three years, therefore no table is included this year.  
Next sample will be collected in 2004

**Table 3-7**  
**Precipitation**  
**Gamma Spectra**  

pg. 1 of 2

06/25/2003

Sampling Location	Be-7	K-40	Cr-51	Mn-54	Fe-59	Co-58	Co-60
01A	16.0 +/- 15.0	1.0 +/- 28.0	-10.0 +/- 14.0	-1.9 +/- 1.7	-1.8 +/- 3.4	1.0 +/- 1.8	-0.2 +/- 1.8
	Zn-65	Zr-95	Nb-95	Ru-103	Ru-106	Sb-125	I-131
01A	-0.8 +/- 3.6	-1.5 +/- 3.7	1.2 +/- 2.0	-0.1 +/- 1.9	3.0 +/- 14.0	-3.8 +/- 4.6	-1.4 +/- 4.0
	Cs-134	Cs-137	Ba-140	La-140	Th-228		
01A	0.7 +/- 1.8	1.1 +/- 1.5	0.0 +/- 3.4	0.0 +/- 3.9	4.9 +/- 6.0		

12/30/2004

Sampling Location	Be-7	K-40	Cr-51	Mn-54	Fe-59	Co-58	Co-60
01A	-5.0 +/- 21.0	22.0 +/- 34.0	15.0 +/- 25.0	0.2 +/- 2.4	0.9 +/- 8.2	-1.4 +/- 2.3	-1.5 +/- 2.6
	Zn-65	Zr-95	Nb-95	Ru-103	Ru-106	Sb-125	I-131
01A	5.0 +/- 9.3	-0.7 +/- 4.2	-0.3 +/- 2.4	-1.5 +/- 2.6	-3.0 +/- 23.0	3.8 +/- 6.6	-1.3 +/- 5.1
	Cs-134	Cs-137	Ba-140	La-140	Th-228		
01A	-1.9 +/- 2.4	-0.5 +/- 2.7	-0.9 +/- 3.4	-1.1 +/- 4.0	-5.5 +/- 9.4		

\* LLD Identified in ODCM

**Table 3-7**  
**Precipitation**  
**Gross Beta**  
**[pCi/L]**

pg. 2 of 2

Sampling Date	Gross Beta*	Rainfall (Inches)
01/29/03	13.3 +/- 2.2	1.99
02/26/03	15.4 +/- 2.9	4.60
03/26/03	4.8 +/- 1.4	3.95
05/01/03	4.6 +/- 2.0	5.83
05/28/03	1.6 +/- 1.5	7.14
06/25/03	3.3 +/- 1.9	6.80
07/30/03	3.5 +/- 1.9	5.88
08/27/03	15.2 +/- 2.9	1.03
09/24/03	0.4 +/- 1.6	9.97
10/29/03	5.3 +/- 2.1	2.95
11/25/03	3.1 +/- 1.9	4.28
12/31/03	0.3 +/- 1.6	6.26
mean	5.9 +/- 2.0	

\* LLD identified in ODCM

**Table 3-8**  
Milk  
Gamma Spectra  
[pCi/L]

									<b>Station 12</b>	
Sampling Date	K-40	Sr-89	Sr-90	I-131*	Cs-134*	Cs-137*	Ba-140*	La-140*		
01/22/03	1360.0 +/- 120.0	[a]	[a]	0.15 +/- 0.26	3.7 +/- 3.1	-0.9 +/- 3.3	-0.8 +/- 5.9	-1.0 +/- 6.8		
02/19/03	1350.0 +/- 120.0	[a]	[a]	-0.06 +/- 0.02	1.6 +/- 3.4	-1.9 +/- 3.3	1.8 +/- 4.6	2.1 +/- 5.3		
03/19/03	1358.0 +/- 96.0	-41.0 +/- 12.0	0.8 +/- 2.3	-0.02 +/- 0.07	-0.1 +/- 3.0	0.0 +/- 2.4	3.1 +/- 4.9	3.5 +/- 5.6		
04/23/03	1400.0 +/- 100.0	[a]	[a]	-0.12 +/- 0.04	-0.4 +/- 2.7	-0.2 +/- 2.6	-0.5 +/- 5.6	-0.6 +/- 6.4		
05/21/03	1420.0 +/- 140.0	[a]	[a]	0.30 +/- 0.35	-3.6 +/- 3.9	0.8 +/- 3.4	3.8 +/- 6.1	4.3 +/- 7.0		
06/25/03	1380.0 +/- 120.0	-4.2 +/- 4.4	0.0 +/- 1.1	-0.08 +/- 0.21	1.2 +/- 3.4	1.0 +/- 2.8	0.7 +/- 5.0	0.8 +/- 5.8		
07/23/03	1320.0 +/- 140.0	[a]	[a]	-0.06 +/- 0.02	1.9 +/- 4.1	-0.6 +/- 3.6	1.8 +/- 6.7	2.1 +/- 7.7		
08/27/03	1480.0 +/- 120.0	[a]	[a]	0.20 +/- 0.34	0.5 +/- 3.0	4.2 +/- 3.1	-3.9 +/- 4.7	-4.5 +/- 5.4		
09/24/03	1380.0 +/- 120.0	2.0 +/- 4.3	0.4 +/- 1.0	0.13 +/- 0.49	1.4 +/- 3.4	-3.2 +/- 3.1	0.3 +/- 4.3	0.4 +/- 5.0		
10/28/03	1320.0 +/- 110.0	[a]	[a]	0.17 +/- 0.43	-0.9 +/- 3.1	1.3 +/- 2.5	-2.7 +/- 4.0	-3.1 +/- 4.6		
11/25/03	1530.0 +/- 120.0	[a]	[a]	0.26 +/- 0.56	-0.8 +/- 3.8	-3.7 +/- 3.3	3.5 +/- 7.1	4.0 +/- 8.2		
12/17/03	1500.0 +/- 99.0	3.5 +/- 5.0	1.0 +/- 1.0	0.12 +/- 0.31	-1.1 +/- 2.9	-0.7 +/- 2.5	2.1 +/- 5.8	2.5 +/- 6.7		

									<b>Station 13</b>	
Sampling Date	K-40	Sr-89	Sr-90	I-131*	Cs-134*	Cs-137*	Ba-140*	La-140*		
01/22/03	1260.0 +/- 120.0	[a]	[a]	0.13 +/- 0.24	0.4 +/- 3.0	-2.4 +/- 3.0	2.4 +/- 4.5	2.7 +/- 5.2		
02/19/03	1339.0 +/- 87.0	[a]	[a]	-0.06 +/- 0.02	0.0 +/- 2.2	-3.4 +/- 2.3	-0.2 +/- 3.1	-0.2 +/- 3.6		
03/19/03	1330.0 +/- 96.0	-15.0 +/- 13.0	0.0 +/- 2.2	0.25 +/- 0.36	-0.8 +/- 2.8	1.4 +/- 2.4	-1.2 +/- 4.7	-1.4 +/- 5.4		
04/23/03	1196.0 +/- 86.0	[a]	[a]	0.43 +/- 0.43	-1.5 +/- 2.7	0.0 +/- 2.1	-1.3 +/- 5.1	-1.5 +/- 5.9		
05/21/03	1340.0 +/- 130.0	[a]	[a]	0.00 +/- 0.17	1.4 +/- 3.7	-1.0 +/- 3.5	-4.3 +/- 6.1	-4.9 +/- 7.0		
06/25/03	1290.0 +/- 100.0	-0.7 +/- 5.2	1.5 +/- 1.8	0.13 +/- 0.30	1.0 +/- 2.7	-1.6 +/- 2.8	-1.4 +/- 3.9	-1.6 +/- 4.5		
07/23/03	1480.0 +/- 140.0	[a]	[a]	-0.08 +/- 0.03	0.2 +/- 3.7	0.2 +/- 3.8	0.4 +/- 6.0	0.5 +/- 6.9		
08/27/03	1360.0 +/- 110.0	[a]	[a]	0.01 +/- 0.19	-0.1 +/- 2.7	-0.6 +/- 3.0	0.4 +/- 5.0	0.5 +/- 5.7		
09/24/03	1370.0 +/- 110.0	-1.3 +/- 5.2	0.0 +/- 1.0	-0.21 +/- 0.45	-2.9 +/- 3.4	2.9 +/- 3.1	0.0 +/- 4.1	0.0 +/- 4.7		
10/28/03	1274.0 +/- 99.0	[a]	[a]	0.12 +/- 0.40	3.7 +/- 2.8	-0.2 +/- 2.7	-4.1 +/- 4.9	-4.7 +/- 5.6		
11/25/03	1410.0 +/- 140.0	[a]	[a]	0.19 +/- 0.57	1.8 +/- 4.0	-0.4 +/- 4.3	3.4 +/- 7.3	3.9 +/- 8.4		
12/17/03	1210.0 +/- 140.0	3.4 +/- 6.1	1.1 +/- 1.1	-0.10 +/- 0.04	-3.7 +/- 4.7	-0.3 +/- 4.6	4.8 +/- 7.5	5.5 +/- 8.6		

\* LLD Identified in ODCM

[a] Sr-89/90 analyses performed on the last monthly sample of each quarter.

**Table 3-9**  
**Food and Vegetation**  
**Gamma Spectra**  
 [pCi/kg]  
 pg. 1 of 2

Sampling Location	Sampling Date	Be-7	K-40	I-131*	Cs-134*	Cs-137*	Th-228
14	05/21/03	1590.0 +/- 560.0	12300.0 +/- 1400.0	54.0 +/- 49.0	28.0 +/- 36.0	5.0 +/- 31.0	80.0 +/- 140.0
	06/18/03	3310.0 +/- 400.0	14700.0 +/- 960.0	39.0 +/- 42.0	30.0 +/- 25.0	5.0 +/- 26.0	160.0 +/- 130.0
	07/16/03	3480.0 +/- 450.0	13130.0 +/- 850.0	13.0 +/- 29.0	-1.0 +/- 26.0	10.0 +/- 23.0	109.0 +/- 86.0
	08/20/03	740.0 +/- 240.0	9750.0 +/- 680.0	-2.0 +/- 21.0	4.00 +/- 20.00	3.0 +/- 16.0	-3.0 +/- 87.0
	09/17/03	6680.0 +/- 580.0	32300.0 +/- 1200.0	14.0 +/- 28.0	29.00 +/- 33.00	75.0 +/- 37.0	290.0 +/- 120.0
		x +/- y	x +/- y	x +/- y	x +/- y	x +/- y	x +/- y
15	05/21/03	1080.0 +/- 450.0	11900.0 +/- 1200.0	15.0 +/- 30.0	6.0 +/- 33.0	0.0 +/- 28.0	80.0 +/- 160.0
	06/18/03	680.0 +/- 300.0	16900.0 +/- 960.0	45.0 +/- 45.0	33.0 +/- 28.0	55.0 +/- 34.0	437.0 +/- 91.0
	07/16/03	570.0 +/- 350.0	9940.0 +/- 860.0	-8.4 +/- 3.7	5.0 +/- 28.0	0.0 +/- 26.0	50.0 +/- 130.0
	08/20/03	1510.0 +/- 320.0	8540.0 +/- 700.0	-8.0 +/- 18.0	9.00 +/- 22.00	-7.0 +/- 19.0	18.0 +/- 97.0
	09/17/03	6070.0 +/- 500.0	31400.0 +/- 1300.0	0.0 +/- 28.0	31.00 +/- 29.00	53.0 +/- 33.0	282.0 +/- 98.0
		x +/- y	x +/- y	x +/- y	x +/- y	x +/- y	x +/- y
16	05/21/03	1240.0 +/- 520.0	10600.0 +/- 1400.0	6.0 +/- 25.0	18.0 +/- 33.0	-19.0 +/- 32.0	-10.0 +/- 150.0
	06/18/03	1280.0 +/- 250.0	5530.0 +/- 490.0	16.0 +/- 32.0	2.0 +/- 20.0	13.0 +/- 18.0	-12.0 +/- 87.0
	07/16/03	920.0 +/- 290.0	8520.0 +/- 820.0	21.0 +/- 35.0	32.0 +/- 22.0	-10.0 +/- 20.0	98.0 +/- 87.0
	08/20/03	1290.0 +/- 350.0	9950.0 +/- 720.0	7.0 +/- 27.0	9.00 +/- 23.00	-14.0 +/- 20.0	95.0 +/- 77.0
	09/17/03	7120.0 +/- 440.0	26100.0 +/- 1000.0	18.0 +/- 30.0	27.00 +/- 24.00	104.0 +/- 28.0	224.0 +/- 84.0

\* LLD identified in ODCM

**Table 3-9**  
**Food and Vegetation**  
**Gamma Spectra**  
 [pCi/kg]  
 pg. 2 of 2

Sampling Location	Sampling Date	Be-7	K-40	I-131*	Cs-134*	Cs-137*	Th-228
23	05/21/03	470.0 +/- 360.0	13700.0 +/- 1400.0	-6.0 +/- 16.0	11.0 +/- 30.0	30.0 +/- 30.0	30.0 +/- 120.0
	06/18/03	1070.0 +/- 200.0	8920.0 +/- 560.0	5.0 +/- 2.5	5.0 +/- 16.0	5.0 +/- 17.0	21.0 +/- 71.0
	07/16/03	860.0 +/- 280.0	12020.0 +/- 810.0	23.0 +/- 35.0	12.0 +/- 22.0	3.0 +/- 19.0	100.0 +/- 100.0
	08/20/03	1420.0 +/- 660.0	15100.0 +/- 1400.0	3.0 +/- 22.0	37.0 +/- 37.0	40.0 +/- 36.0	290.0 +/- 120.0
	09/17/03	8260.0 +/- 520.0	25560.0 +/- 950.0	0.0 +/- 27.0	8.0 +/- 26.0	165.0 +/- 32.0	190.0 +/- 120.0
		x +/- y	x +/- y	x +/- y	x +/- y	x +/- y	x +/- y
26	05/21/03	860.0 +/- 420.0	12400.0 +/- 1200.0	1.0 +/- 19.0	26.0 +/- 33.0	-11.0 +/- 35.0	100.0 +/- 170.0
	06/18/03	1140.0 +/- 180.0	10220.0 +/- 510.0	30.0 +/- 38.0	23.0 +/- 21.0	2.0 +/- 13.0	44.0 +/- 68.0
	07/16/03	830.0 +/- 250.0	9280.0 +/- 670.0	26.0 +/- 31.0	13.0 +/- 19.0	-2.0 +/- 16.0	96.0 +/- 87.0
	08/20/03	1680.0 +/- 510.0	8800.0 +/- 1100.0	-3.0 +/- 24.0	13.0 +/- 32.0	-20.0 +/- 32.0	240.0 +/- 130.0
	09/17/03	6780.0 +/- 540.0	19800.0 +/- 1000.0	3.0 +/- 23.0	30.0 +/- 29.0	134.0 +/- 36.0	228.0 +/- 98.0

\* LLD identified in ODCM

**Table 3-10**  
**Well Water**  
**Gamma Spectra, Strontium, and Tritium**  
**[pCi/L]**

Sampling Date	<b>Station 01A</b>									
	H-3	Be-7	K-40	Sr-89	Sr-90	I-131*	Ba-140	Th-228		
03/26/03	20.0 +/- 910.0	-2.0 +/- 22.0	-8.0 +/- 25.0	[a]	[a]	1.2 +/- 4.6	-1.7 +/- 3.7	0.9 +/- 8.9		
06/25/03	-400.0 +/- 790.0	-14.0 +/- 24.0	-7.0 +/- 34.0	0.5 +/- 2.6	0.9 +/- 1.0	-1.5 +/- 5.4	0.0 +/- 4.6	4.7 +/- 8.8		
09/24/03	-70.0 +/- 860.0	10.0 +/- 20.0	15.0 +/- 39.0	[a]	[a]	-2.5 +/- 3.8	-3.3 +/- 3.8	-7.5 +/- 9.0		
12/30/03	-80.0 +/- 830.0	1.0 +/- 16.0	-8.0 +/- 18.0	[a]	[a]	2.8 +/- 5.5	0.3 +/- 3.4	1.5 +/- 5.4		

\* LLD identified in ODCM

[a] Sr-89/90 analyses performed on the second quarter sample.



**Table 3-11**  
**River Water**  
**Gamma Spectra, Strontium, and Tritium**  
**[pCi/L]**

										Station 11
Sampling Date	H-3	Be-7	K-40	Sr-89	Sr-90	I-131*	Cs-137	Ba-140	Th-228	
01/15/03	b	2.0 +/- 23.0	-8.0 +/- 36.0	[a]	[a]	0.2 +/- 0.4	-2.2 +/- 3.4	0.7 +/- 5.3	0.0 +/- 13.0	
02/13/03	b	9.0 +/- 23.0	-21.0 +/- 38.0	[a]	[a]	0.2 +/- 0.3	-1.7 +/- 3.5	0.0 +/- 6.1	5.6 +/- 9.3	
03/13/03	3560.0 +/- 970.0	-12.0 +/- 15.0	2.0 +/- 25.0	[a]	[a]	0.2 +/- 0.3	0.3 +/- 1.6	-1.1 +/- 3.6	4.2 +/- 5.7	
04/15/03	b	7.0 +/- 28.0	-41.0 +/- 39.0	[a]	[a]	0.1 +/- 0.2	3.2 +/- 3.2	-0.8 +/- 6.0	1.0 +/- 14.0	
05/15/03	b	1.0 +/- 17.0	4.0 +/- 26.0	[a]	[a]	0.2 +/- 0.5	-1.0 +/- 1.9	1.5 +/- 4.4	3.4 +/- 7.7	
06/12/03	1720.0 +/- 870.0	-6.0 +/- 19.0	-8.0 +/- 22.0	-0.6 +/- 4.0	0.0 +/- 0.8	0.2 +/- 0.4	-2.5 +/- 2.2	2.5 +/- 4.6	6.0 +/- 9.0	
07/10/03	b	-1.0 +/- 16.0	16.0 +/- 23.0	[a]	[a]	0.4 +/- 0.4	-1.0 +/- 1.5	-2.6 +/- 3.2	3.2 +/- 5.6	
08/13/03	b	7.0 +/- 26.0	29.0 +/- 43.0	[a]	[a]	0.0 +/- 0.3	1.6 +/- 2.7	-2.7 +/- 4.4	-5.1 +/- 9.4	
09/12/03	1390.0 +/- 870.0	-5.0 +/- 16.0	2.0 +/- 18.0	[a]	[a]	0.3 +/- 0.6	-1.5 +/- 1.7	2.5 +/- 3.4	2.4 +/- 5.8	
10/16/03	b	6.0 +/- 17.0	6.0 +/- 26.0	[a]	[a]	-0.2 +/- 0.2	-1.4 +/- 1.8	-0.5 +/- 4.0	3.2 +/- 7.3	
11/17/03	b	12.0 +/- 17.0	9.0 +/- 28.0	[a]	[a]	0.1 +/- 0.5	-9.0 +/- 1.9	-0.6 +/- 2.8	3.5 +/- 6.5	
12/16/03	800.0 +/- 460.0	2.0 +/- 11.0	15.0 +/- 19.0	[a]	[a]	-0.1 +/- 0.4	-0.1 +/- 1.1	-3.0 +/- 4.8	7.5 +/- 3.7	

\* LLD identified in ODCM

[a] Sr-89/90 analyses performed on the second quarter sample.

[b] Tritium analyses on quarterly composite.

**Table 3-12**  
**Surface Water**  
**Gamma Spectra, Strontium, Tritium**  
**[pCi/L]**

											<b>Station 08</b>	
Sampling Date	H-3	Sr-89	Sr-90	Be-7	K-40	I-131*	Cs-137	Ba-140	Th-228			
01/15/03	+/-	[a]	[a]	2.00 +/- 15.00	-14.00 +/- 26.00	0.09 +/- 0.29	-2.20 +/- 2.30	-2.30 +/- 3.10	2.90 +/- 8.20			
02/13/03	[b]	[a]	[a]	-25.00 +/- 21.00	22.00 +/- 34.00	0.02 +/- 0.20	0.60 +/- 2.50	-0.60 +/- 4.10	3.70 +/- 14.00			
03/13/03	3630.0 +/- 930.0	[a]	[a]	-5.00 +/- 18.00	-3.00 +/- 25.00	-0.01 +/- 0.05	-1.00 +/- 1.60	-1.20 +/- 3.20	7.50 +/- 6.30			
04/15/03	[b]	[a]	[a]	-16.00 +/- 18.00	-7.0 +/- 32.0	0.0 +/- 0.4	0.5 +/- 2.7	-1.4 +/- 3.5	3.0 +/- 9.3			
05/15/03	[b]	[a]	[a]	7.00 +/- 15.00	-2.0 +/- 23.0	-0.1 +/- 0.2	0.1 +/- 1.8	-2.2 +/- 3.5	-2.5 +/- 6.8			
06/12/03	2010.0 +/- 930.0	2.1 +/- 5.3	-0.2 +/- 1.1	13.00 +/- 18.00	-13.0 +/- 26.0	0.1 +/- 0.3	1.0 +/- 2.0	2.6 +/- 3.9	-1.8 +/- 7.6			
07/10/03	[b]	[a]	[a]	-4.00 +/- 15.00	-13.0 +/- 21.0	-0.1 +/- 0.0	-0.2 +/- 1.5	-1.1 +/- 3.2	-1.5 +/- 6.3			
08/13/03	[b]	[a]	[a]	13.00 +/- 17.00	-2.0 +/- 35.0	0.7 +/- 0.7	0.2 +/- 2.5	3.6 +/- 5.0	1.7 +/- 9.6			
09/12/03	1420.0 +/- 870.0	[a]	[a]	-5.00 +/- 13.00	-4.0 +/- 21.0	0.0 +/- 0.5	-0.6 +/- 1.4	-1.7 +/- 3.3	-0.2 +/- 5.3			
10/16/03	[b]	[a]	[a]	21.00 +/- 24.00	0.0 +/- 34.0	0.0 +/- 0.2	0.7 +/- 2.9	0.8 +/- 6.1	-1.0 +/- 11.0			
11/17/03	[b]	[a]	[a]	-6.00 +/- 21.00	24.0 +/- 33.0	0.3 +/- 0.5	-0.5 +/- 2.1	-2.2 +/- 4.8	4.3 +/- 7.6			
12/16/03	940.0 +/- 460.0	[a]	[a]	11.00 +/- 15.00	-9.0 +/- 19.0	0.1 +/- 0.5	-1.5 +/- 1.4	-1.3 +/- 6.7	3.1 +/- 5.4			

											<b>Station 09A</b>	
Sampling Date	H-3	Sr-89	Sr-90	Be-7	K-40	I-131*	Cs-137	Ba-140	Th-228			
01/15/03	[b]	[a]	[a]	5.00 +/- 23.00	26.00 +/- 35.00	-0.01 +/- 0.24	-0.50 +/- 2.60	4.40 +/- 5.70	4.00 +/- 11.00			
02/13/03	[b]	[a]	[a]	-7.00 +/- 22.00	2.00 +/- 36.00	-0.09 +/- 0.03	0.50 +/- 2.70	-2.30 +/- 5.60	6.00 +/- 10.00			
03/13/03	240.0 +/- 84.0	[a]	[a]	2.00 +/- 15.00	10.00 +/- 26.00	0.20 +/- 0.29	0.30 +/- 1.60	-1.50 +/- 2.80	-0.50 +/- 6.60			
04/15/03	[b]	[a]	[a]	15.00 +/- 21.00	-2.6 +/- 34.0	0.0 +/- 0.3	-1.4 +/- 2.4	3.1 +/- 5.1	-3.0 +/- 10.0			
05/15/03	[b]	[a]	[a]	-1.00 +/- 17.00	14.0 +/- 30.0	0.1 +/- 0.5	-0.9 +/- 1.7	-2.3 +/- 4.3	7.2 +/- 7.4			
06/12/03	-580.0 +/- 840.0	-9.8 +/- 4.4	0.2 +/- 1.1	7.00 +/- 23.00	2.0 +/- 25.0	0.2 +/- 0.4	1.8 +/- 2.2	3.4 +/- 4.7	1.0 +/- 8.2			
07/10/03	[b]	[a]	[a]	-1.00 +/- 16.00	0.0 +/- 23.0	0.2 +/- 0.3	-0.8 +/- 1.6	0.5 +/- 3.3	-1.7 +/- 6.5			
08/13/03	[b]	[a]	[a]	-3.00 +/- 20.00	-15.0 +/- 35.0	0.4 +/- 0.5	0.0 +/- 2.6	1.2 +/- 4.4	-2.1 +/- 8.9			
09/12/03	-230.0 +/- 810.0	[a]	[a]	-6.00 +/- 12.00	20.0 +/- 17.0	0.0 +/- 0.4	-0.4 +/- 1.4	-0.2 +/- 3.0	3.3 +/- 7.3			
10/16/03	[b]	[a]	[a]	3.00 +/- 23.00	-15.0 +/- 35.0	-0.1 +/- 0.2	-0.7 +/- 2.2	2.8 +/- 4.0	3.3 +/- 9.1			
11/17/03	[b]	[a]	[a]	-2.00 +/- 24.00	27.0 +/- 35.0	-0.3 +/- 0.3	-0.8 +/- 2.9	-1.5 +/- 4.7	-6.0 +/- 11.0			
12/16/03	-220.0 +/- 820.0	[a]	[a]	-9.00 +/- 15.00	8.0 +/- 21.0	0.7 +/- 0.7	-0.8 +/- 1.3	-4.7 +/- 6.1	1.3 +/- 6.4			

\* LLD identified in ODCM

[a] Sr-89/90 analyses performed on the second quarter sample.

[b] Tritium analyses on quarterly composite.

**Table 3-13**  
**Sediment Silt**  
**Gamma Spectra, and Strontium**  
**[pCi/Kg]**

Sample Date	Sr-89	Sr-90	Be-7	K-40	Mn-54
<b>02/20/2003</b>					
Station 08	[a]	[a]	-210.0 +/- 310.0	16700.0 +/- 1000.0	20.0 +/- 31.0
Station 09A	[a]	[a]	140.0 +/- 220.0	11020.0 +/- 800.0	-23.0 +/- 22.0
Station 11	[a]	[a]	-20.0 +/- 210.0	16520.0 +/- 780.0	17.0 +/- 22.0
<b>09/08/2003</b>					
Station 08	100.0 +/- 110.0	41.0 +/- 86.0	90.0 +/- 190.0	5590.0 +/- 570.0	11.0 +/- 20.0
Station 09A	100.0 +/- 130.0	31.0 +/- 95.0	30.0 +/- 160.0	10480.0 +/- 560.0	-4.0 +/- 13.0
Station 11	100.0 +/- 150.0	30.0 +/- 110.0	10.0 +/- 17.0	17510.0 +/- 700.0	-4.0 +/- 17.0

Sample Date	Co-58	Co-60	Cs-134*	Cs-137*	Th-228
<b>02/20/2003</b>					
Station 08	-35.0 +/- 30.0	-3.0 +/- 25.0	2.0 +/- 46.0	-10.0 +/- 30.0	2070.0 +/- 140.0
Station 09A	-25.0 +/- 23.0	-4.0 +/- 21.0	-15.0 +/- 19.0	36.0 +/- 35.0	774.0 +/- 95.0
Station 11	3.0 +/- 23.0	10.0 +/- 22.0	3.0 +/- 76.0	133.0 +/- 34.0	1672.0 +/- 97.0
<b>09/08/2003</b>					
Station 08	-5.0 +/- 17.0	20.0 +/- 19.0	-68.0 +/- 74.0	1.0 +/- 22.0	837.0 +/- 80.0
Station 09A	-22.0 +/- 15.0	3.0 +/- 13.0	51.0 +/- 52.0	3.0 +/- 14.0	360.0 +/- 56.0
Station 11	-7.0 +/- 19.0	9.0 +/- 16.0	4.0 +/- 16.0	0.0 +/- 17.0	1069.0 +/- 73.0

\* LLD Identified in ODCM

[a] Sr-89/90 analyses performed annually.

**Table 3-14**  
**Shoreline Soil**  
**Gamma Spectra, and Strontium**  
**[pCi/Kg]**

Sample Date	Sr-89	Sr-90	Be-7	K-40	Mn-54
<b>02/20/2003</b>					
Station 08	[a]	[a]	80.0 +/- 220.0	2360.0 +/- 520.0	-20.0 +/- 18.0
 Sample Date					
<b>09/08/2003</b>					
Station 08	130.0 +/- 130.0	35.0 +/- 92.0	250.0 +/- 220.0	2280.0 +/- 330.0	-8.0 +/- 15.0
 Sample Date					
<b>02/20/2003</b>					
Station 08	11.0 +/- 21.0	7.0 +/- 21.0	-3.0 +/- 24.0	199.0 +/- 46.0	239.0 +/- 91.0
 Sample Date					
<b>09/08/2003</b>					
Station 08	-1.0 +/- 14.0	3.0 +/- 13.0	-18.0 +/- 58.0	233.0 +/- 31.0	284.0 +/- 60.0

\* LLD Identified in ODCM

[a] Sr-89/90 analyses performed annually.

**Table 3-15**  
**Fish**  
**Gamma Spectra**  
**[pCi/Kg]**

									<b>Fish [a]</b> <b>Station 08</b>	
Sampling Date	K-40	Mn-54*	Fe-59*	Co-58*	Co-60*	Zn-65*	Cs-134*	Cs-137*		
03/04/03	1710.0 +/- 560.0	-5.0 +/- 24.0	62.0 +/- 53.0	0.0 +/- 28.0	-3.0 +/- 23.0	-7.0 +/- 53.0	9.0 +/- 26.0	37.0 +/- 30.0		
09/10/03	1900.0 +/- 670.0	23.0 +/- 26.0	-20.0 +/- 100.0	-4.0 +/- 28.0	-4.0 +/- 23.0	15.0 +/- 67.0	9.0 +/- 30.0	13.0 +/- 29.0		

									<b>Fish [a]</b> <b>Station 25</b>	
Sampling Date	K-40	Mn-54*	Fe-59*	Co-58*	Co-60*	Zn-65*	Cs-134*	Cs-137*		
03/05/03	1540.0 +/- 710.0	3.0 +/- 25.0	-50.0 +/- 67.0	10.0 +/- 24.0	9.0 +/- 31.0	18.0 +/- 69.0	11.0 +/- 30.0	-28.0 +/- 36.0		
09/10/03	1430.0 +/- 550.0	0.0 +/- 20.0	10.0 +/- 100.0	24.0 +/- 27.0	7.0 +/- 25.0	-29.0 +/- 63.0	-5.0 +/- 28.0	5.0 +/- 20.0		

									<b>Catfish [b]</b> <b>Station 08</b>	
Sampling Date	K-40	Mn-54*	Fe-59*	Co-58*	Co-60*	Zn-65*	Cs-134*	Cs-137*		
03/04/03	1210.0 +/- 450.0	9.0 +/- 26.0	-32.0 +/- 55.0	-12.0 +/- 25.0	-6.0 +/- 26.0	-24.0 +/- 53.0	0.0 +/- 22.0	17.0 +/- 24.0		
09/10/03	1420.0 +/- 560.0	8.0 +/- 25.0	42.0 +/- 99.0	2.0 +/- 35.0	5.0 +/- 27.0	-21.0 +/- 65.0	9.0 +/- 24.0	-6.0 +/- 28.0		

									<b>Catfish [b]</b> <b>Station 25</b>	
Sampling Date	K-40	Mn-54*	Fe-59*	Co-58*	Co-60*	Zn-65*	Cs-134*	Cs-137*		
03/05/03	1730.0 +/- 720.0	-7.0 +/- 32.0	-47.0 +/- 62.0	3.0 +/- 27.0	-8.0 +/- 31.0	17.0 +/- 64.0	11.0 +/- 41.0	-1.0 +/- 29.0		
09/10/03	970.0 +/- 720.0	20.0 +/- 22.0	20.0 +/- 120.0	1.0 +/- 40.0	-14.0 +/- 31.0	11.0 +/- 48.0	1.0 +/- 31.0	29.0 +/- 29.0		

\* LLD Identified in ODCM

[a] Non-bottom dwelling species of gamefish.

{b} Bottom dwelling species of fish.

## 4. DISCUSSION OF RESULTS

Data from the radiological analyses of environmental media collected during 2003 and tabulated in Section 3, are discussed below. Except for TLDs, Framatome ANP DE&S Environmental Laboratory analyzed all samples throughout the year. The procedures and specifications followed for these analyses are as required in the Framatome ANP DE&S Environmental Laboratory quality assurance manuals and laboratory procedures. In addition to internal quality control measurements performed by each laboratory, they also participate in an Interlaboratory Comparison Program. Participation in this program ensures that independent checks on the precision and accuracy of the measurements of radioactive material in environmental samples are performed. The results of the Interlaboratory Comparison Programs are provided in Appendix B.

The predominant radioactivity detected throughout 2003 was that from external sources, such as fallout from nuclear weapons tests and naturally occurring radionuclides. Naturally occurring nuclides such as Be-7, K-40, and Th-228 were detected in numerous samples. Th-228 results were variable and are generally at levels higher than plant related radionuclides.

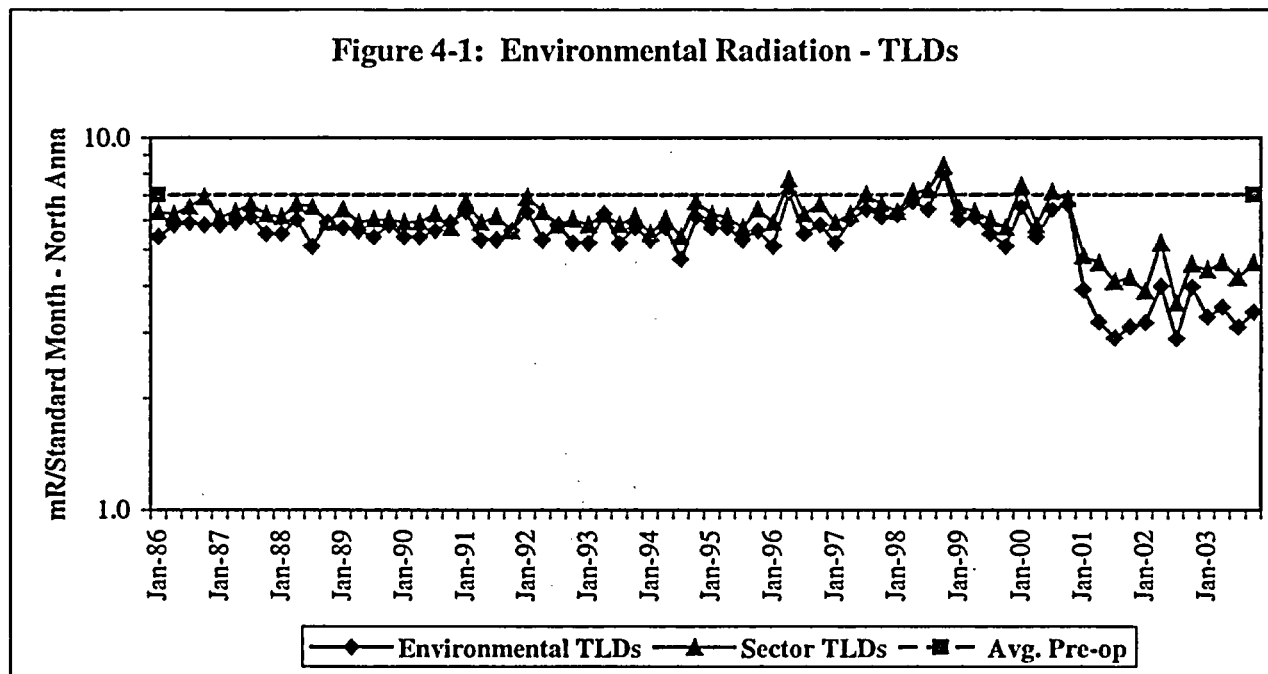
The following is a discussion and summary of the results of the environmental measurements taken during the 2003 reporting period.

### *4.1 Gamma Exposure Rate*

A thermoluminescent dosimeter (TLD) is an inorganic crystal used to detect ambient radiation. TLDs are placed in two concentric rings around the station. The inner ring is located at the site boundary, and the outer ring is located at approximately five miles from the station. TLDs are also placed in special interest areas, such as population areas and nearby residences. Additional TLDs serve as controls. Ambient radiation comes from naturally occurring radioisotopes in the air and soil, radiation from cosmic origin, fallout from nuclear weapons testing, station effluents and direct radiation from the station.

The results of the analyses are presented in Table 3-2. Figure 4-1 shows a historical trend of TLD exposure rate measurements. Control and indicator averages indicate a steady relationship. Two dosimeters made of CaF and LiF sensitive elements are deployed at each sampling location. These TLDs replaced the previously used CaSO<sub>4</sub>:Dy in Teflon TLDs. The dose trend with the replacement TLDs is lower than that of the previously used TLDs.

Figure 4-1: Environmental Radiation - TLDs

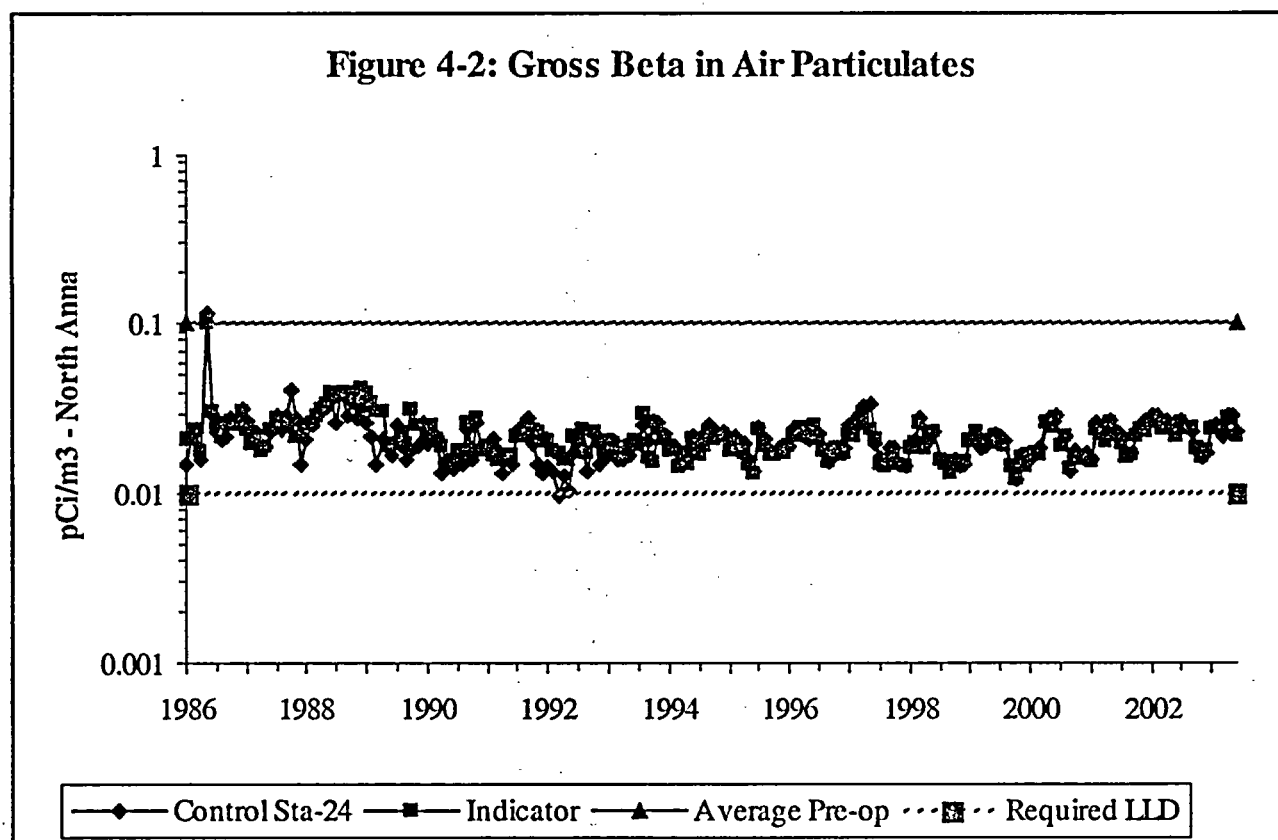


Sector TLDs are deployed quarterly at thirty-two locations in the environs of the North Anna site. Two badges are placed at each location. The average level of the 32 locations (two badges at each location) was 4.4 mR/standard month with a range of 1.1 to 19.3 mR/standard month. The highest quarterly average reading and highest single quarter average for any single location were obtained at location SSW-19/51. These values were 14.2 mR/standard month and 14.5 mR/standard month, respectively. This location is on site directly across the access road from the Independent Spent Fuel Storage Facility inside the Owner Controlled area. The higher values can thus be attributed to the spent fuel stored in the ISFSI. Quarterly and annual TLDs are also located at each of the twelve environmental air sampling stations. For the eleven locations within 10 miles of the station the average quarterly reading was 3.4 mR/standard month with a range of 1.0 to 5.6 mR/standard month. The average annual reading for these locations was 3.0 mR/standard month with a range of from 1.6 to 5.4 mR/standard month. The control location showed a quarterly average of 2.9 mR/standard month with a range of 2.5 to 3.4 mR/standard month. Its annual reading was 3.0 mR/standard month. Eight other TLDs, designated C-1 thru C-8 were collected quarterly from four locations and showed an average reading of 3.0 mR/standard month with a range of 2.0 to 4.0 mR/standard month. During the pre-operational period (starting in 1977) the doses were measured between 4.3 and 8.8 mR/standard month.

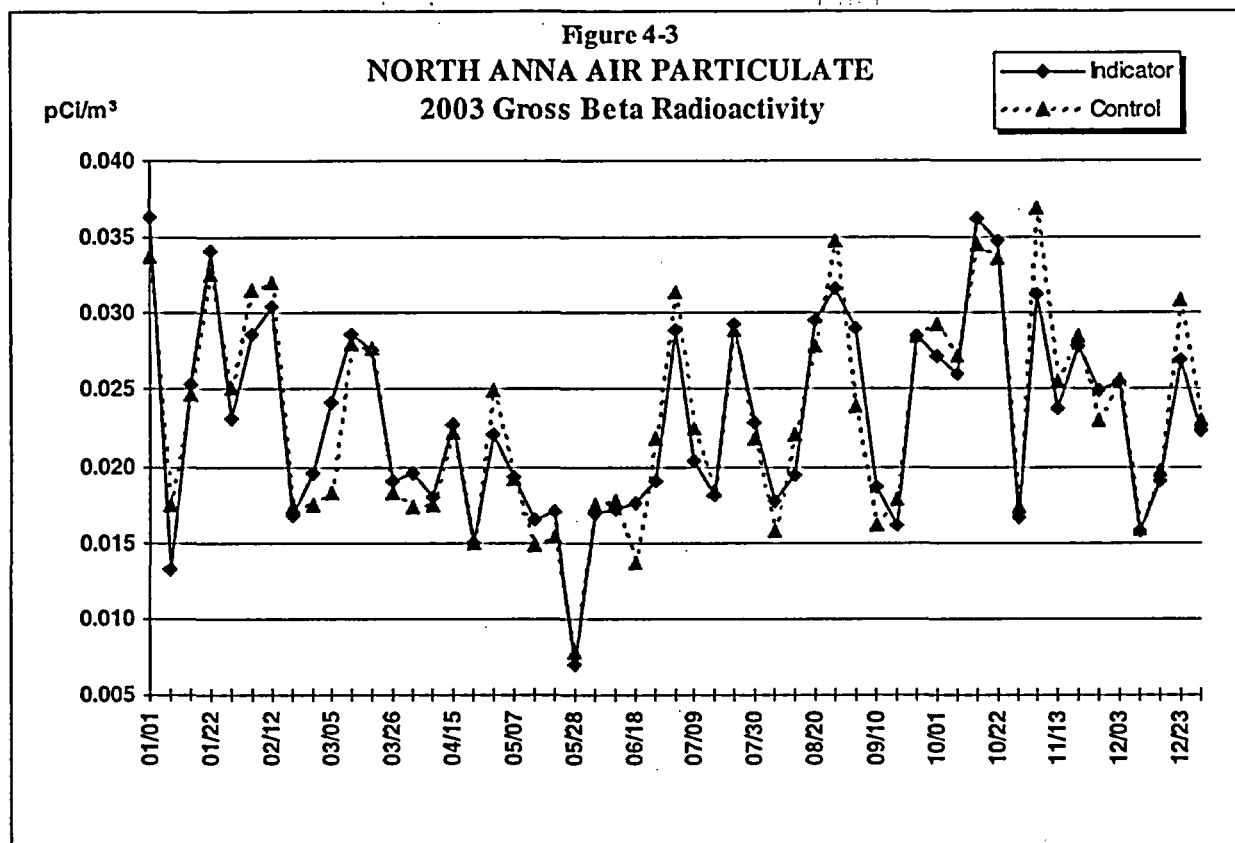
## 4.2 Airborne Gross Beta

Results of the weekly gross beta analyses are presented in Table 3-3. A review of the results, shown in a historical plot in Figure 4-2, indicates gross beta activity at levels similar to that seen over the last decade. Inner and outer ring monitoring locations continue to show no significant variation in measured activities (see Figure 4-3). This indicates that any station contribution is not measurable.

Gross beta activity found during the pre-operational and early operating period of North Anna Power Station was higher because of nuclear weapons testing. During that time, nearly 740 nuclear weapons were tested worldwide. In 1985 weapons testing ceased, and with the exception of the Chernobyl accident in 1986, airborne gross beta results have remained steady. During the preoperational period of July 1, 1974 through March 31, 1978 gross beta activities ranged from a low of 0.005 pCi/m<sup>3</sup> to a high of 0.75 pCi/m<sup>3</sup>.







### 4.3 Airborne Radioiodine

Charcoal cartridges are used to collect airborne radioiodine. Once a week the samples are collected and analyzed. The results of the analyses are presented in Table 3-4. All results are below the lower limit of detection with no positive activity detected. These results are similar to pre-operational data and the results of samples taken prior to and after the 1986 accident in the Soviet Union at Chernobyl.

### 4.4 Air Particulate Gamma and Strontium Analyses

The air particulate filters that are utilized for the weekly gross beta analyses are composited by location and analyzed quarterly by gamma spectrometry. The results are listed in Table 3-5. The results indicate the presence of naturally occurring Be-7, which is produced by cosmic processes. Examination of pre-operational data indicates comparable measurements of Be-7, as would be expected. No other positive results were seen. These analyses indicate the lack of station effects.

Strontium-89 and 90 analyses were performed on the second quarter composites of air particulate filters from all twelve monitoring stations. The results are listed in Table 3-5. There was no detection of these fission products at any of the

indicator or control stations.

#### **4.5 Soil**

Per the sampling frequency defined in the North Anna ODCM, soil samples are collected every three years. Results are normally reported in Table 3-6. The last sampling period for soil was 2001.

#### **4.6 Precipitation**

A sample of rain water was collected monthly at on-site station 01A and analyzed for gross beta activity. The results are presented in Table 3-7. Nine of twelve precipitation samples showed positive results in 2003. The average annual gross beta activity was 7.6 pCi/liter with a range from 3.1 to 15.4 pCi/liter. Semi-annual composites were prepared and analyzed for gamma emitting isotopes. No positive indications of gamma emitting radioisotopes were observed in the semi-annual composite samples for 2003. These results are comparable to those measured since 1986. During the pre-operational period gross beta activity in rain water was expressed in nCi per square meter of the collector surface, thus a direct comparison can not be made to the 2003 period. During the pre-operational period, tritium was measured in over half of the few quarterly composites made. The tritium activity ranged from 100 to 330 pCi/liter.

#### **4.7 Cow Milk**

Analysis of milk samples is generally the most sensitive indicator of fission product existence in the terrestrial environment. This, in combination with the fact that consumption of milk is significant, results in this pathway usually being the most critical from the plant release viewpoint. This pathway also shows measurable amounts of nuclear weapons testing fallout. Therefore, this media needs to be evaluated very carefully when trying to determine if there is any plant effect.

Analysis results for cow milk are contained in Table 3-8. All results show a lack of detectable I-131 above the LLD of 1 pCi/l. Results of gamma ray spectroscopy indicate no detectable plant related radioactivity in the milk samples. In years past, Cs-137 has been detected sporadically. The occurrences were attributed to residual global fallout from past atmospheric weapons testing. Cs-137 was not detected at a level above the LLD in 2003.

Once each quarter a sample from each of the two collection stations is analyzed for strontium-89 and strontium-90. No positive indications of either Sr-89 or Sr-90 were observed. Sr-90 has been observed in the past. Pre-operational levels of 2.2 to 5.4 pCi/liter were measured for Sr-90. There has been a long-term activity

trend for Sr-90 showing a continuous decline. It should be noted that strontium-90 is not a part of station effluents. Its detection is the product of nuclear weapons testing fallout. This conclusion can be made based upon the fact that Sr-89 and Sr-90 have not been detected in effluents released from the station in many years, and the trend of consistent declining levels since the pre-operational period.

#### ***4.8 Food Products and Vegetation***

Twenty-five food samples were collected from five locations and analyzed by gamma spectrometry. The results of the analyses are presented in Table 3-9. As expected, naturally occurring potassium-40 was detected in all samples, cosmogenic beryllium-7 was detected in most samples, and thorium-228 was detected in some samples. Other than cesium-137, no other gamma emitters were detected. Although not detected in 2002, cesium-137 was detected in six of the twenty-five 2003 samples collected. The levels detected are consistent with those observed in food product or vegetation samples collected in previous years and the presence of cesium-137 is attributed to residual global fallout from past atmospheric weapons testing.

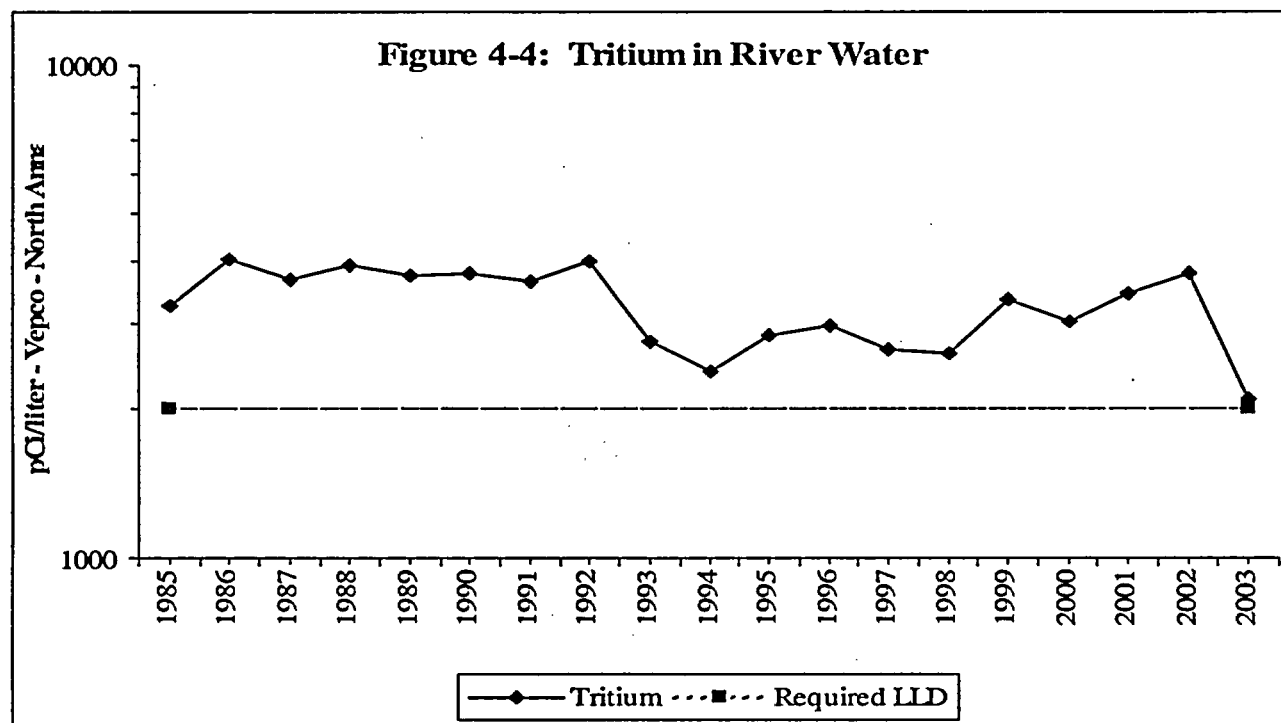
#### ***4.9 Well Water***

Ground water was sampled quarterly from the on site well at the metrology laboratory. These samples were analyzed for gamma radiation and for tritium. The second quarter sample was analyzed for strontium-89 and strontium-90. The results of these analyses are presented in Table 3-10. Consistent with past monitoring, no plant related radioactivity was detected. No gamma emitting isotopes were detected during the pre-operational period.

#### ***4.10 River Water***

A sample of water from the North Anna River was collected monthly, the analyses are presented in Table 3-11. All monthly samples are analyzed by gamma spectroscopy. The monthly samples were composited quarterly and analyzed for tritium, the third quarter samples were additionally analyzed for strontium-89 and strontium-90. No gamma emitting radioisotopes were detected in any of the

samples. There was no measured activity of strontium-89 or strontium-90. Tritium was measured in all four samples with an average annual concentration of 1868 pCi/liter and a range of 800 to 3560 pCi/liter. These levels are comparable to those observed in previous years, see Figure 4-4. No river water samples were collected during the pre-operational period.

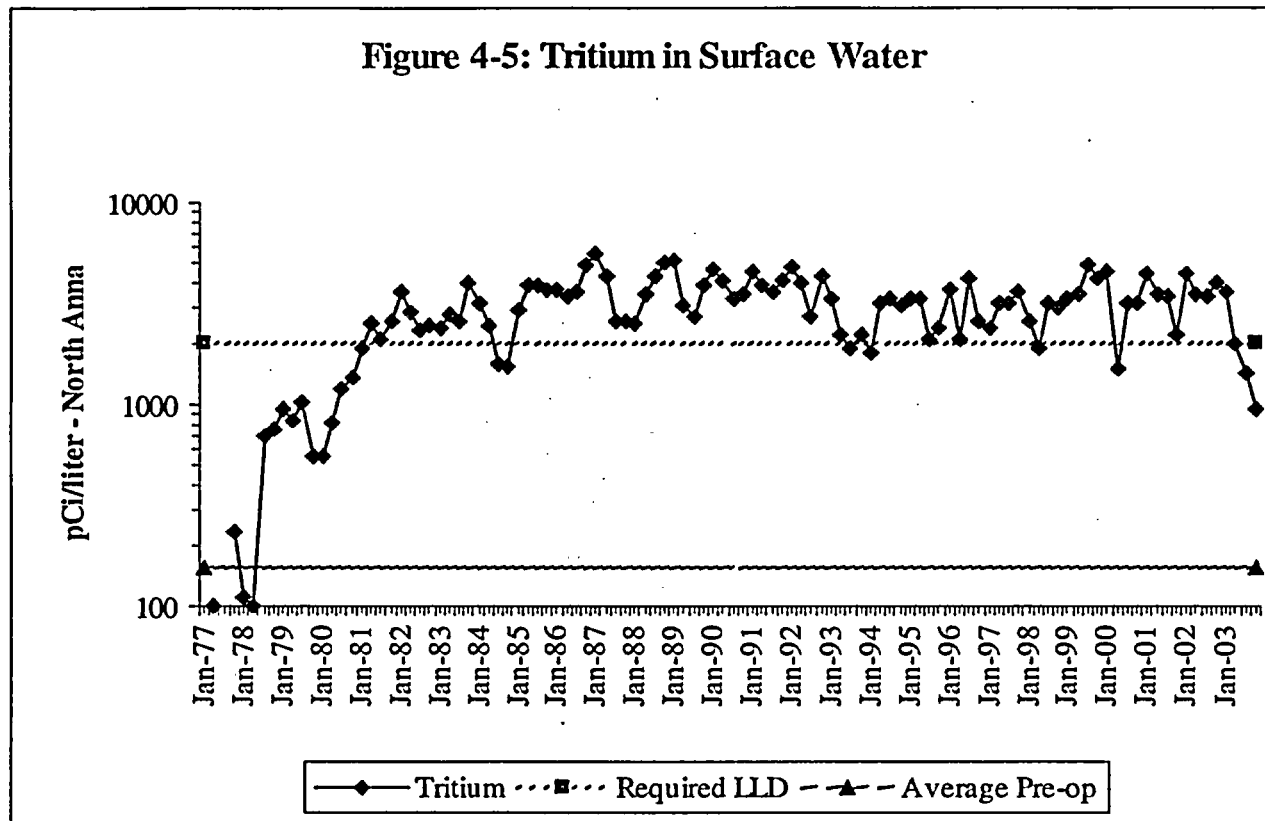


#### 4.11 Surface Water

Samples of surface water were collected monthly from two stations, an indicator station located at the discharge lagoon and a control station located 12.9 miles WNW. The samples were analyzed by gamma ray spectrometry and for iodine-131 by radiochemical separation. A quarterly composite from each station was prepared and analyzed for tritium, and the third quarter samples were additionally analyzed for strontium-89 and strontium-90. The results are presented in Table 3-12.

No gamma emitting radioisotopes, nor iodine, were detected in any of the samples. The average level of tritium activity at the indicator station was 2000 pCi/liter with a range of 940 to 3630 pCi/liter. Levels of tritium have been increasing since 1978 when the average level was below 300 pCi/liter. Levels measured at the indicator location (Station 8) are comparable to those measured since 1986, see Figure 4-5. One control station showed a positive indication of tritium at 240 pCi/liter. During the pre-operational period tritium was measured in several

samples with concentrations between 90 and 250 pCi/liter.



#### 4.12 Bottom Sediment

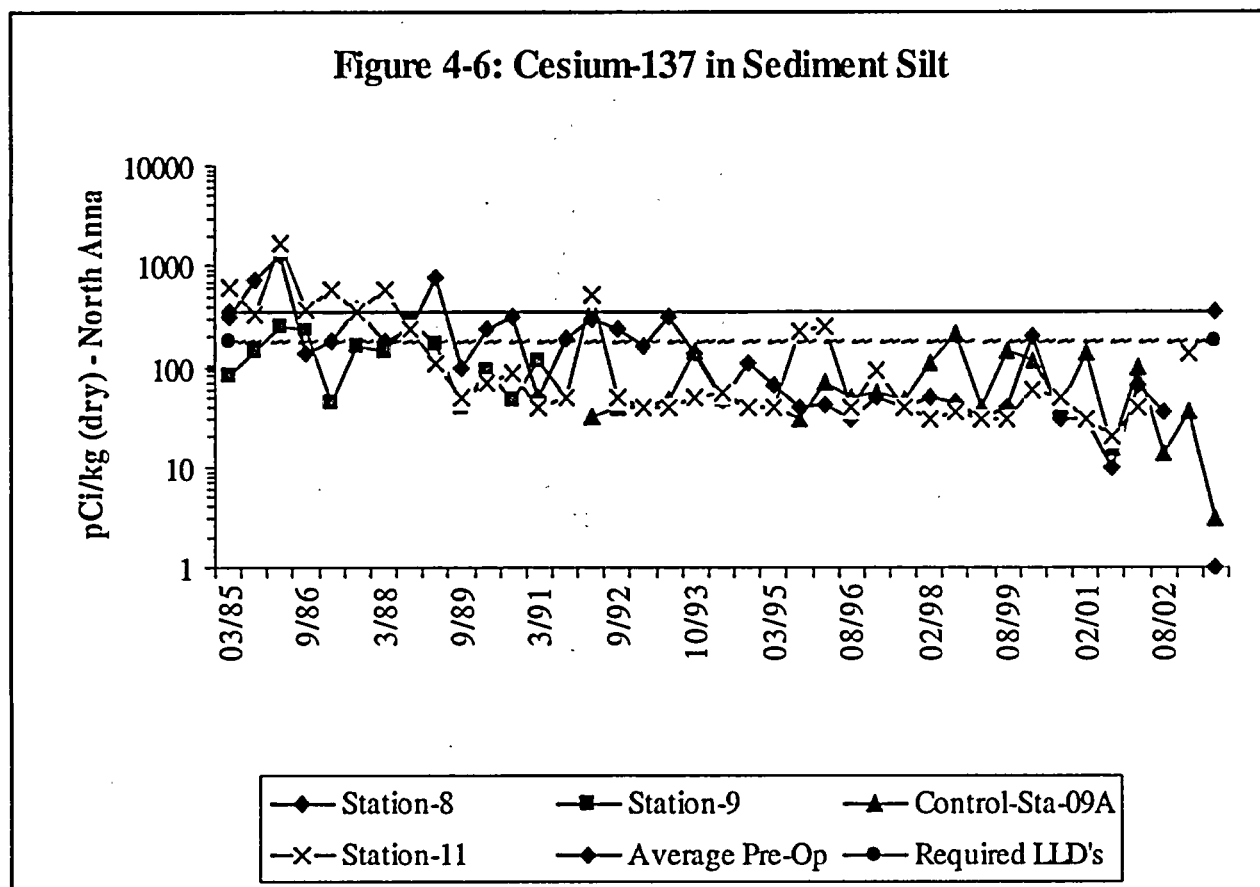
Bottom sediment or silt is sampled to evaluate any buildup of radionuclides in the environment due to the operation of the station. Buildup of radionuclides in bottom sediment could indirectly lead to increasing radioactivity levels in fish.

Sediment samples were collected during February and September from each of three locations and were analyzed by gamma spectrometry. The September samples were analyzed for strontium-89 and strontium-90. The results are presented in Table 3-13. Figure 4-6 shows the historical trend of Cs-137 in sediments.

Cesium-137 was detected in one indicator sample at 133 pCi/kg dry weight. The detection of Cs-137 in bottom sediment is historically common, with positive indications usually apparent in both indicator and control samples. The detection of Cs-137 is the result of accumulation and runoff into the lake of residual weapons testing fallout; its global presence has been well documented. During the pre-operational period sediment samples were analyzed by gamma ray

spectroscopy. Cesium-137 was measured in most of the samples with concentrations between 33 and 1210 pCi/kg (dry weight).

There was no measurable amount of strontium-89 or 90 in aquatic sediment/silt. A number of naturally occurring radioisotopes were detected in these samples at background levels.



### 4.13 Shoreline Soil

Shoreline soil/sediment, unlike bottom sediment, may provide a direct dose to humans. Buildup of radioisotopes along the shoreline may provide a source of direct exposure for those using the area for commercial and recreational uses. A sample of shoreline sediment was collected in February and September from indicator station 08. The samples were analyzed by gamma ray spectrometry. The September sample was analyzed for strontium-89 and strontium-90. The results are presented in Table 3-14.

Naturally occurring radioisotopes were detected at concentrations equivalent to normal background activities. The activities of these radioisotopes indicate a

steady trend. Cesium-137 was measured in both samples collected with an average concentration of 216 pCi/kg (dry weight). No Strontium was detected. Strontium-90 is normally detected in this media, however as discussed previously, the presence of Sr-90 and Cs-137 is attributed to accumulation of residual global fallout from past atmospheric weapons testing.

#### *4.14 Fish*

Four sample sets of fish, two from Lake Anna and two from the control station, Lake Orange, were collected during 2003 and analyzed by gamma spectroscopy. Each sample set consisted of a sample of game species and a sample of bottom-dwelling species, which were analyzed separately. The results are presented in Table 3-15. These results are the same as previously seen. No activity, except for naturally occurring K-40, was observed in this media in 2003. Only Cs-137 was measured in pre-operational environmental fish samples.

## 5. PROGRAM EXCEPTIONS

### REMP Exceptions for Scheduled Sampling and Analysis During 2003 – North Anna

Location	Description	Date of Sampling	Reason(s) for Loss/Exception
Sta. 14-16, 23, 26	Vegetation	January	Seasonal Unavailability
Sta. 14-16, 23, 26	Vegetation	February	Seasonal Unavailability
Sta. 04	Air Iodine and Particulate	02/19/03	Low volume due to sampler malfunction.
Sta. 14-16, 23, 26	Vegetation	March	Seasonal Unavailability
Sta. 14-16, 23, 26	Vegetation	April	Seasonal Unavailability
Sta. 01	Air Iodine and Particulate	06/18/03	Low volume due to breaker trip.
Sta. 01	Air Iodine and Particulate	07/16/03	Low volume due to breaker trip
Sta. 05A	Air Iodine and Particulate	08/20/03	Low volume due to sampler malfunction.
Sta. 01	Air Iodine and Particulate	09/10/03	Low volume due to breaker trip.
Sta. 01, 02, 03, 04, 05, 06, 07, 21, 23	Air Iodine and Particulate	09/24/03	Low volume due to power failure related to hurricane Isabel.
Sta. 05	Air Iodine and Particulate	10/01/03	Low volume due to power disturbance.
Sta. 14-16, 23, 26	Vegetation	October	Seasonal Unavailability
Sta. 05A	Air Iodine and Particulate	10/03/03	Low volume due to breaker trip.
Sta. 14-16, 23, 26	Vegetation	November	Seasonal Unavailability
Sta. 07	Air Iodine and Particulate	11/19/03	Low volume due to breaker trip
Sta. 14-16, 23, 26	Vegetation	December	Seasonal Unavailability
Sta. 02	Air Iodine and Particulate	12/10/03	Low volume due to blown fuse.



## REFERENCES

## *References*

1. Dominion, North Anna Power Station Technical Specifications, Units 1 and 2.
2. Dominion, North Anna Power Station Independent Spent Fuel Storage Installation Technical Specifications.
3. Dominion, Station Administrative Procedure, VPAP-2103N, "Offsite Dose Calculation Manual".
4. Virginia Electric and Power Company, North Anna Technical Procedure, HP-3051.010, "Radiological Environmental Monitoring Program".
5. Title 10 Code of Federal Regulation, Part 50 (10CFR50), "Domestic Licensing of Production and Utilization Facilities".
6. United States Nuclear Regulatory Commission Regulatory Guide 1.109, Rev. 1, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10CFR50, Appendix I", October, 1977.
7. United States Nuclear Regulatory Commission, Regulatory Guide 4.8 "Environmental Technical Specifications for Nuclear Power Plants", December, 1975.
8. USNRC Branch Technical Position, "Acceptable Radiological Environmental Monitoring Program", Rev. 1, November 1979.
9. NUREG 0472, "Radiological Effluent Technical Specifications for PWRs", Rev. 3, March 1982.
10. "Technical Specifications for North Anna Independent Spent Fuel Storage Installation (ISFSI)".
11. HASL-300, Environmental Measurements Laboratory, "EML Procedures Manual," 27<sup>th</sup> Edition, Volume 1, February 1992.
12. NUREG/CR-4007, "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," September 1984.

## **APPENDICES**

## **APPENDIX A: LAND USE CENSUS**

**Year 2003**

## LAND USE CENSUS

North Anna Power Station  
North Anna County, Virginia

*January 1 to December 31, 2003*

Direction	Distance (miles)					
	Nearest Site Boundary	Nearest Resident	Nearest Garden (> 50 m <sup>2</sup> )	Nearest Meat Animal	Nearest Milking Cow *	Nearest Milking Goat *
N	0.9	1.5	1.8	2.2		
NNE	0.9	0.9	1.6	1.5		
NE	0.8	0.9	0.9	1.4		
ENE	0.8	2.1	2.1	2.5		
E	0.8	1.3	1.3	3.5		
ESE	0.9	1.7	1.7	None		
SE	0.9	1.4	1.4	1.4		
SSE	0.9	1.0	1.3	2.8		
S	0.9	1.1	1.2	None		
SSW	1.0	1.2	None	2.0		
SW	1.1	3.1	None	None		
WSW	1.1	1.7	2.0	1.7		
W	1.1	1.5	1.9	None		
WNW	1.0	1.1	2.5	4.1		
NW	1.0	1.0	1.4	None		
NNW	0.9	1.0	2.2	2.0		

\* No milking cow or milking goat within 5.0 miles of North Anna Power Station

2002 to 2003 Land Use Census Changes			
Nearest	Direction	2002 Distance	2003 Distance
Site Boundary	No Changes		
Resident	No Changes		
Garden	ESE	3.5 mi	1.7 mi
	SSW	1.6 mi	None
	WNW	2.8 mi	2.5 mi
Meat Animal	No Changes		
Milking Cow	No Changes		
Milking Goat	No Changes		

**APPENDIX B: SUMMARY OF INTERLABORATORY COMPARISONS**

**YEAR 2003**

## **INTRODUCTION**

This appendix covers the Intercomparison Program of the Framatome ANP Environmental Laboratory. Framatome uses QA/QC samples provided by Analytics, Inc. to monitor the quality of analytical processing associated with the Radiological Environmental Monitoring Program (REMP). The suite of Analytics QA/QC samples are designed to be comparable with the pre-1996 US EPA Interlaboratory Cross-Check Program in terms of sample number, matrices, and nuclides. It was modified to more closely match the media mix presently being processed by Framatome and includes:

- milk for gamma (10 nuclides) and low-level (LL) iodine-131 analyses once per quarter,
- milk for Sr-89 and Sr-90 analyses during the 1st and 3rd quarters,
- water for gamma (10 nuclides), low-level (LL) iodine-131, and gross beta analyses during the 1st and 3rd quarters,
- water for Sr-89 and Sr-90 analyses during the 1st and 4th quarters,
- water tritium analysis during the 2nd and 4th quarters,
- air filter for gamma (9 nuclides) analyses during the 2nd and 4th quarters,
- air filter for gross beta analysis during the 1st, 3rd and 4th quarters,
- filter for Sr-90 analysis during the 2nd and 4th quarters.

In addition to the Analytics Intercomparison Program, Framatome also participates in other intercomparison programs which include radionuclides and media similar to those required by the Millstone program. These programs are the National Institute of Standards and Technology (NIST) Measurement Assurance Program (MAP), the Environmental Resource Associates (ERA) Proficiency Test (PT) Program, the Department of Energy (DOE) Quality Assessment Program (QAP), and the Mixed Analyte Performance Evaluation Program (MAPEP).

## **RESULTS**

Intercomparison program results are evaluated using Framatome's internal bias acceptance criteria as defined below:

- within 25% of the known for gross beta in water,
- within 25% of the known for samples containing both Sr-89 and Sr-90,
- within 15% of the known value for other radionuclides, or
- within two sigma of the known value.

Framatome investigates any sample analysis result that does not pass these criteria.

Analytics Intercomparison Program results are included on the pages that follow for the first quarter through the fourth quarter of 2003. A total of 102 analysis results were obtained with 102 passing acceptance criteria, a 100% success rate.

**FRAMATOME ANP 2003 ANALYTICS ENVIRONMENTAL CROSS CHECK PROGRAM  
PERFORMANCE EVALUATION**

Sample Number	Quarter/ Year	Sample Media	Nuclide	Units	Reported Values	Known Values	Ratio Framatome/ Analytics	Evaluation
E3597-162	1st/03	Water	Gross Alpha	pCi/L	55	61	0.90	Agreement
E3597-162	1st/03	Water	Gross Beta	pCi/L	146	186	0.78	Agreement
E3598-162	1st/03	Water	I-131	pCi/L	68	70	0.97	Agreement
E3598-162	1st/03	Water	I-131LL	pCi/L	68	70	0.97	Agreement
E3598-162	1st/03	Water	Ce-141	pCi/L	163	168	0.97	Agreement
E3598-162	1st/03	Water	Cr-51	pCi/L	243	238	1.02	Agreement
E3598-162	1st/03	Water	Cs-134	pCi/L	83	88	0.94	Agreement
E3598-162	1st/03	Water	Cs-137	pCi/L	188	195	0.96	Agreement
E3598-163	1st/03	Water	Co-58	pCi/L	44	42	1.05	Agreement
E3598-162	1st/03	Water	Mn-54	pCi/L	61	63	0.97	Agreement
E3598-162	1st/03	Water	Fe-59	pCi/L	48	46	1.04	Agreement
E3598-162	1st/03	Water	Zn-65	pCi/L	88	90	0.98	Agreement
E3598-162	1st/03	Water	Co-60	pCi/L	156	157	0.99	Agreement
E3599-162	1st/03	Filter	Gross Alpha	pCi	52	49	1.06	Agreement
E3599-162	1st/03	Filter	Gross Beta	pCi	157	148	1.06	Agreement
E3600-162	1st/03	Milk	I-131	pCi/L	73	74	0.99	Agreement
E3600-162	1st/03	Milk	I-131LL	pCi/L	73	74	0.99	Agreement
E3600-162	1st/03	Milk	Ce-141	pCi/L	170	173	0.98	Agreement
E3600-162	1st/03	Milk	Cr-51	pCi/L	244	246	0.99	Agreement
E3600-162	1st/03	Milk	Cs-134	pCi/L	86	90	0.96	Agreement
E3600-162	1st/03	Milk	Cs-137	pCi/L	196	200	0.98	Agreement
E3600-163	1st/04	Milk	Co-58	pCi/L	44	47	0.94	Agreement
E3600-162	1st/03	Milk	Mn-54	pCi/L	61	64	0.95	Agreement
E3600-162	1st/03	Milk	Fe-59	pCi/L	47	47	1.00	Agreement
E3600-162	1st/03	Milk	Zn-65	pCi/L	96	93	1.03	Agreement
E3600-162	1st/03	Milk	Co-60	pCi/L	162	162	1.00	Agreement
E3601-162	1st/03	Milk	Sr-89	pCi/L	121	133	0.91	Agreement
E3601-162	1st/03	Milk	Sr-90	pCi/L	13	12	1.08	Agreement
E3608-162	1st/03	Water	Sr-89	pCi/L	104	114	0.91	Agreement
E3608-162	1st/03	Water	Sr-90	pCi/L	11	10	1.10	Agreement



**FRAMATOME ANP 2003 ANALYTICS ENVIRONMENTAL CROSS CHECK PROGRAM  
PERFORMANCE EVALUATION**

Sample Number	Quarter/ Year	Sample Media	Nuclide	Units	Reported Values	Known Values	Ratio Framatome/ Analytics	Evaluation
E3704-162	2nd/03	Water	H-3	pCi/L	10643	11953	0.89	Agreement
E3705-162	2nd/03	Filter	Gross Alpha	pCi/L	20	21	0.95	Agreement
E3705-162	2nd/03	Filter	Gross Beta	pCi/L	116	115	1.01	Agreement
E3706-162	2nd/03	Filter	Ce-141	pCi/Filter	149	154	0.97	Agreement
E3706-162	2nd/03	Filter	Cr-51	pCi/Filter	134	130	1.03	Agreement
E3706-162	2nd/03	Filter	Cs-134	pCi/Filter	54	56	0.96	Agreement
E3706-162	2nd/03	Filter	Cs-137	pCi/Filter	135	125	1.08	Agreement
E3706-162	2nd/03	Filter	Co-58	pCi/Filter	53	50	1.06	Agreement
E3706-162	2nd/03	Filter	Mn-54	pCi/Filter	110	101	1.09	Agreement
E3706-162	2nd/03	Filter	Fe-59	pCi/Filter	60	54	1.11	Agreement
E3706-162	2nd/03	Filter	Zn-65	pCi/Filter	110	99	1.11	Agreement
E3706-162	2nd/03	Filter	Co-60	pCi/Filter	71	72	0.99	Agreement
E3707-162	2nd/03	Filter	Sr-89	pCi/Filter	78	87	0.90	Agreement
E3707-162	2nd/03	Filter	Sr-90	pCi/Filter	24	24	1.00	Agreement
E3708-162	2nd/03	Milk	I-131	pCi/L	109	103	1.06	Agreement
E3708-162	2nd/03	Milk	I-131LL	pCi/L	104	103	1.01	Agreement
E3708-162	2nd/03	Milk	Ce-141	pCi/L	283	283	1.00	Agreement
E3708-162	2nd/03	Milk	Cr-51	pCi/L	239	239	1.00	Agreement
E3708-162	2nd/03	Milk	Cs-134	pCi/L	98	103	0.95	Agreement
E3708-162	2nd/03	Milk	Cs-137	pCi/L	232	230	1.01	Agreement
E3708-162	2nd/03	Milk	Co-58	pCi/L	92	93	0.99	Agreement
E3708-162	2nd/03	Milk	Mn-54	pCi/L	186	186	1.00	Agreement
E3708-162	2nd/03	Milk	Fe-59	pCi/L	100	99	1.01	Agreement
E3708-162	2nd/03	Milk	Zn-65	pCi/L	181	181	1.00	Agreement
E3708-162	2nd/03	Milk	Co-60	pCi/L	134	132	1.02	Agreement

**FRAMATOME ANP 2003 ANALYTICS ENVIRONMENTAL CROSS CHECK PROGRAM  
PERFORMANCE EVALUATION**

Sample Number	Quarter/ Year	Sample Media	Nuclide	Units	Reported Values	Known Values	Ratio Framatome/ Analytics	Evaluation
E3866-162	3rd/03	Water	Gross Alpha	pCi/L	37	36	1.03	Agreement
E3866-162	3rd/03	Water	Gross Beta	pCi/L	264	246	1.07	Agreement
E3867-162	3rd/03	Water	I-131	pCi/L	69	76	0.91	Agreement
E3867-162	3rd/03	Water	I-131LL	pCi/L	78	76	1.03	Agreement
E3867-162	3rd/03	Water	Ce-141	pCi/L	78	81	0.96	Agreement
E3867-162	3rd/03	Water	Cr-51	pCi/L	198	221	0.90	Agreement
E3867-162	3rd/03	Water	Cs-134	pCi/L	108	113	0.96	Agreement
E3867-162	3rd/03	Water	Cs-137	pCi/L	85	84	1.01	Agreement
E3867-162	3rd/03	Water	Co-58	pCi/L	92	94	0.98	Agreement
E3867-162	3rd/03	Water	Mn-54	pCi/L	93	88	1.06	Agreement
E3867-162	3rd/03	Water	Fe-59	pCi/L	74	75	0.99	Agreement
E3867-162	3rd/03	Water	Zn-65	pCi/L	170	166	1.02	Agreement
E3867-162	3rd/03	Water	Co-60	pCi/L	118	117	1.01	Agreement
E3868-162	3rd/03	Filter	Gross Alpha	pCi	30	28	1.07	Agreement
E3868-162	3rd/03	Filter	Gross Beta	pCi	197	189	1.04	Agreement
E3869-162	3rd/03	Milk	I-131	pCi/L	66	74	0.89	Agreement
E3869-162	3rd/03	Milk	I-131LL	pCi/L	74	74	1.00	Agreement
E3869-162	3rd/03	Milk	Ce-141	pCi/L	90	86	1.05	Agreement
E3869-162	3rd/03	Milk	Cr-51	pCi/L	228	233	0.98	Agreement
E3869-162	3rd/03	Milk	Cs-134	pCi/L	123	119	1.03	Agreement
E3869-162	3rd/03	Milk	Cs-137	pCi/L	94	88	1.07	Agreement
E3869-162	3rd/03	Milk	Co-58	pCi/L	99	99	1.00	Agreement
E3869-162	3rd/03	Milk	Mn-54	pCi/L	101	93	1.09	Agreement
E3869-162	3rd/03	Milk	Fe-59	pCi/L	84	79	1.06	Agreement
E3869-162	3rd/03	Milk	Zn-65	pCi/L	178	176	1.01	Agreement
E3869-162	3rd/03	Milk	Co-60	pCi/L	129	123	1.05	Agreement
E3870-162	3rd/03	Milk	Sr-89	pCi/L	80	100	0.80	Agreement
E3870-162	3rd/03	Milk	Sr-90	pCi/L	11	14	0.79	Agreement

**FRAMATOME ANP 2003 ANALYTICS ENVIRONMENTAL CROSS CHECK PROGRAM  
PERFORMANCE EVALUATION**

Sample Number	Quarter/ Year	Sample Media	Nuclide	Units	Reported Values	Known Values	Ratio Framatome/ Analytics	Evaluation
E3937-162	4th/03	Water	H-3	pCi/L	2307	2290	1.01	Agreement
E3938-162	4th/03	Water	Sr-89	pCi/L	99	100	0.99	Agreement
E3938-162	4th/03	Water	Sr-90	pCi/L	11	10	1.10	Agreement
E3939-162	4th/03	Filter	Gross Beta	pCi	50	43	1.16	Agreement
E3940-162	4th/03	Filter	Ce-141	pCi	110	100	1.10	Agreement
E3940-162	4th/03	Filter	Cr-51	pCi	171	153	1.12	Agreement
E3940-162	4th/03	Filter	Cs-134	pCi	75	74	1.01	Agreement
E3940-162	4th/03	Filter	Cs-137	pCi	75	71	1.06	Agreement
E3940-162	4th/03	Filter	Co-58	pCi	64	61	1.05	Agreement
E3940-162	4th/03	Filter	Mn-54	pCi	103	95	1.08	Agreement
E3940-162	4th/03	Filter	Fe-59	pCi	64	56	1.14	Agreement
E3940-162	4th/03	Filter	Zn-65	pCi	117	108	1.08	Agreement
E3940-162	4th/03	Filter	Co-60	pCi	82	85	0.96	Agreement
E3941-162	4th/03	Filter	Sr-90	pCi	11	11	1.00	Agreement
E3942-162	4th/03	Milk	I-131	pCi/L	84	90	0.93	Agreement
E3942-162	4th/03	Milk	I-131LL	pCi/L	91	90	1.01	Agreement
E3942-162	4th/03	Milk	Ce-141	pCi/L	191	202	0.95	Agreement
E3942-162	4th/03	Milk	Cr-51	pCi/L	275	280	0.98	Agreement
E3942-162	4th/03	Milk	Cs-134	pCi/L	135	135	1.00	Agreement
E3942-162	4th/03	Milk	Cs-137	pCi/L	126	129	0.98	Agreement
E3942-162	4th/03	Milk	Co-58	pCi/L	107	111	0.96	Agreement
E3942-162	4th/03	Milk	Mn-54	pCi/L	173	173	1.00	Agreement
E3942-162	4th/03	Milk	Fe-59	pCi/L	106	102	1.04	Agreement
E3942-162	4th/03	Milk	Zn-65	pCi/L	203	197	1.03	Agreement
E3942-162	4th/03	Milk	Co-60	pCi/L	148	155	0.95	Agreement