

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

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VIRGINIA ELECTRIC AND POWER COMPANY (DOMINION ENERGY VIRGINIA)
NORTH ANNA POWER STATION UNIT NOS. 1 AND 2
INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)
ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

In accordance with North Anna Units 1 and 2 Technical Specification 5.6.2 and the North Anna Independent Spent Fuel Storage Installation Technical Specification 5.5.2, enclosed is the 2021 Annual Radiological Environmental Operating Report. The Radiological Environmental Operating Report provides the details associated with the Radiological Environmental Monitoring Program.

If you have any questions or require additional information, please contact Mr. Marcus A. Hofmann at (540) 894-2100.

Very truly yours,



Lisa Hilbert
Site Vice President

Enclosure

Commitments made in this letter: None

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Dominion Energy
North Anna Power Station
Radiological Environmental Monitoring Program
January 1, 2021 to December 31, 2021



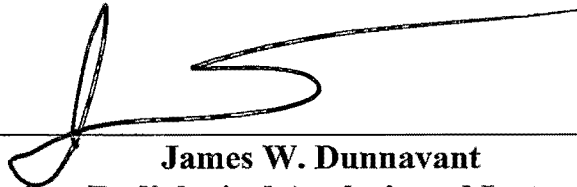
Prepared by
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Annual Radiological Environmental Operating Report

North Anna Power Station

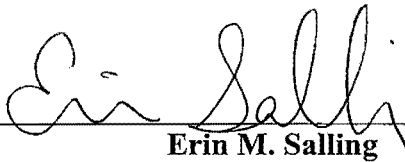
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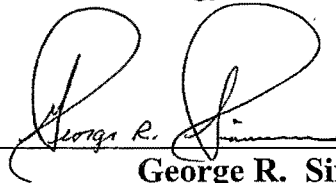
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1. EXECUTIVE SUMMARY

This document is a detailed report of the 2021 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 5.5.2. Radioactivity levels from January 1 through December 31, 2021, in water, silt, shoreline sediment, 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 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 are monitored within a 25-mile radius of the station. North Anna Power Station (NAPS) 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. Control samples are collected from areas that are beyond the measurable influence of North Anna Power Station (NAPS) 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 (NAPS), 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, Fukushima Daiichi or natural variation.

Mirion Technologies provided thermoluminescent dosimetry (TLD) services and Teledyne Brown Engineering Environmental Services 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 equipment used for radiological environmental monitoring 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 2021 airborne results were similar to previous years. Fallout or natural radioactivity levels remained at levels consistent with past years' results.

Water and aquatic exposure pathway samples include precipitation, surface, river and well water, silt and shoreline sediments, and fish. The average tritium activity in surface water for 2021 was 2658 pCi/liter. No other plant related isotopes were reported in any surface or river water. River water collected from the North Anna River, 5.8 miles downstream of the site had an average tritium level of 2610 pCi/liter. No plant related isotopes were detected in quarterly precipitation samples. Silt samples indicated the presence of naturally

occurring potassium-40 and thorium and uranium decay daughters at levels consistent with the natural background. Plant related isotope, Cs-137, was not identified in any indicator sample during the reporting period. The detection of Cs-137 in bottom sediment is historically common with positive indication usually apparent in both indicator and control samples. Shoreline soil, which may provide a direct exposure pathway, indicated the presence of potassium-40 and thorium and uranium decay daughters also at levels consistent with natural levels. No plant related isotope was detected in the indicator or control locations in shoreline soil. No plant related isotope was detected in fish samples from either Lake Anna or the control location, Lake Orange.

Soil samples, which are collected every three years from twelve stations, were not collected in 2021. During the preoperational phase Cs-137 was routinely detected and was attributed to fallout. Levels during this phase varied by location and date and ranged from 88 to 1390 pCi/Kg. The average was 645 pCi/kg.

The terrestrial exposure pathway includes milk and food/vegetation products. No milk samples were obtained during the reporting period since the last operating dairy farm within the sampling area closed on 01/01/2018 rendering milk samples unavailable. No plant related isotope was detected in any vegetation sample. Low levels of Cs-137 have been detected intermittently in past years due to weapons testing, Chernobyl, and Fukushima.

The direct exposure pathway measures environmental radiation doses by use of thermoluminescent dosimeters (TLDs). TLD results have remained essentially constant over the years.

During 2021, 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 total body dose calculated for a hypothetical individual at the station site boundary due to liquid and gaseous effluents released from the station during 2021 was 0.357 millirem. For reference, this dose may be compared to the 620 millirem average annual exposure to every person in the United States from natural and man-made sources. Natural background sources in the environment provide approximately 50% of radiation exposure to man, while medical uses provide approximately 48%. By comparison, 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 2021 North Anna Power Station operational Radiological Environmental Monitoring Program (REMP).

The North Anna Power Station of Virginia Electric and Power Company (Dominion Energy) 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 has a gross electrical output of 1029 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 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 the North Anna Power Station Offsite Dose Calculation Manual (ODCM).

North Anna Power Station is responsible for collecting the various indicator and control environmental samples. Mirion Technologies is utilized for processing the TLDs. Teledyne Brown Engineering Environmental Services (TBE) is utilized 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. The pre-operational data is compared with data collected during the operational phase to assist in evaluating any radiological impact of station operation.

Occasionally samples of environmental 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 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 2021 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 2021 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 TBE for North Anna Power Station during the year 2021.

TABLE 2-1
 North Anna Power Station – 2021
 RADIOLOGICAL SAMPLING STATION
 DISTANCE AND DIRECTION FROM UNIT NO. 1

Sample Media	Location	Station	Distance	Direction	Degrees	Collection	Remarks
						Frequency	
Environmental 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 Dr)	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	0.36	S	173°	Quarterly	

TABLE 2-1
 North Anna Power Station – 2021
 RADIOLOGICAL SAMPLING STATION
 DISTANCE AND DIRECTION FROM UNIT NO. 1

Sample Media	Location	Station	Distance	Direction	Degrees	Collection Frequency	Remarks
Environmental	Elk Creek Church	S-18/50	1.55	S	178°	Quarterly	
Thermoluminescent Dosimetry (TLD)	NAPS Access Rd.	SSW-19/51	0.24	SSW	197°	Quarterly	
	Route 618	SSW-20/52	5.30	SSW	205°	Quarterly	
	500kv Tower	SW-21/53	0.60	SW	218°	Quarterly	
	Route 700	SW-22/54	3.96	SW	232°	Quarterly	
	NAPS SE Switchyard	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 - Laydown Area	NW-29/61	0.52	NW	321°	Quarterly	
	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	
	Orange, VA	C-3/4	22.00	NW	325°	Quarterly	Control
	Mineral, VA	C-5/6	7.10	WSW	243°	Quarterly	
	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	
	Biology Lab	01A	0.64	SE	138°	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 Power Station – 2021
 RADIOLOGICAL SAMPLING STATION
 DISTANCE AND DIRECTION FROM UNIT NO. 1

Sample Media	Location	Station	Distance	Direction	Degrees	Collection	Remarks
						Frequency	
Airborne Particulate and Radioiodine	End of Route 685	21	1.00	WNW	301°	Weekly	
	Route 700	22	1.00	WSW	242°	Weekly	
	"Aspen Hills"	23	0.93	SSE	158°	Weekly	
	Orange, VA	24	22.00	NW	325°	Weekly	Control
Surface Water	Waste Heat Treatment Facility (Second Cooling Lagoon)	08	3.37	SSE	148°	Monthly	
	Lake Anna (upstream) (Route 669 Bridge)	09A	12.90	WNW	295°	Monthly	Control
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	
	Lake Anna (upstream) (Route 669 Bridge)	09A	12.90	WNW	295°	Semi-Annually	Control
	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	
Soil	Route 752	05	4.20	NNE	20°	Once/3 years	
	Sturgeon's Creek Marina Levy, VA	05A 06	2.04 4.70	N ESE	11° 115°	Once/3 years Once/3 years	

TABLE 2-1
 North Anna Power Station – 2021
 RADIOLOGICAL SAMPLING STATION
 DISTANCE AND DIRECTION FROM UNIT NO. 1

Sample Media	Location	Station	Distance	Direction	Degrees	Collection	Remarks
						Frequency	
	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
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 (Vegetation)	Stagecoach Road	14B	1.22	NNE	40°	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

SAMPLE MEDIA	FREQUENCY	ANALYSIS	LLD	REPORT UNITS
Thermoluminescent Dosimetry (TLD) (84 TLDs)	Quarterly	Gamma Dose	2 mR+2mR	mR/std. Month
(12 TLDs)	Annually	Gamma Dose	2 mR+2mR	mR/std. Month
Airborne Radioiodine	Weekly	I-131	0.07	pCi/m ³
Airborne Particulate	Weekly	Gross Beta	0.01	pCi/m ³
	Quarterly (a)	Gamma Isotopic		pCi/m ³
		Cs-134	0.05	
		Cs-137	0.06	
	2 nd Quarter Composite	Sr-89	(b)	pCi/m ³
		Sr-90	(b)	
Surface Water	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 nd Quarter Composite	Sr-89	(b)	pCi/L
		Sr-90	(b)	
River Water	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 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

(d) LLD applied are those for water samples. However, since this is a semi-annual composite no LLD is applied for these nuclides due to their short half-lives.

TABLE 2-2
North Anna Power Station
SAMPLE ANALYSIS PROGRAM

SAMPLE MEDIA	FREQUENCY	ANALYSIS	LLD	REPORT UNITS
River Water	Quarterly(a)	Tritium (H-3)	2000	pCi/L
	2 nd 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	10(c)	
		Cs-134	15	
		Cs-137	18	
		Ba-140	60	
		La-140	15	
		Quarterly(a)	Tritium (H-3)	2000
	2 nd Quarter	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	Gross Beta	4	pCi/L
	Semi-Annual Composite	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	(d)	
		Cs-134	15	
		Cs-137	18	
		Ba-140	(d)	
		La-140	(d)	
		Shoreline Soil	Semi-Annually	Gamma Isotopic
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 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

(d) LLD applied are those for water samples. However, since this is a semi-annual composite no LLD is applied for these nuclides due to their short half-lives.

TABLE 2-2
North Anna Power Station
SAMPLE ANALYSIS PROGRAM

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

*LLDs indicate those levels to which environmental samples are required to be analyzed. Actual analysis of samples may be lower than the 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
- (d) LLD applied are those for water samples. However, since this is a semi-annual composite no LLD is applied for these nuclides due to their short half-lives.

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

Map Designation	Environmental Station Identification	Map Designation	Environmental Station Identification
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-5/6	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, Shoreline Soil	19/51 21/53	SSW-19/51 SW-21/53
9A	09A-Water sample, Sediment	23/55	WSW-23/55
11	11-River Water, Sediment		
14B	14B-Vegetation	16/48	SSE-16/48
15	15-Vegetation	14/46	SE-14/46
16	16-Vegetation	22/54	SW-22/54
21 (a)	21,WNW-27/59	26/58	W-26/58
22 (a)	22,WSW-24/56	28/60	WNW-28/60
23 (a)	23-SSE-15/47,Vegetation	32/64	NNW-32/64
24 (a)(b)	24,C-3/4	8/40	ENE-8/40
25 (c)	25-Fish	4/36	NNE-4/36
26	26-Vegetation	10/42	E-10/42

(a) Indicates air sample station, annual and quarterly TLD, Triennial soil.
(b) In Orange
(c) In Lake Orange

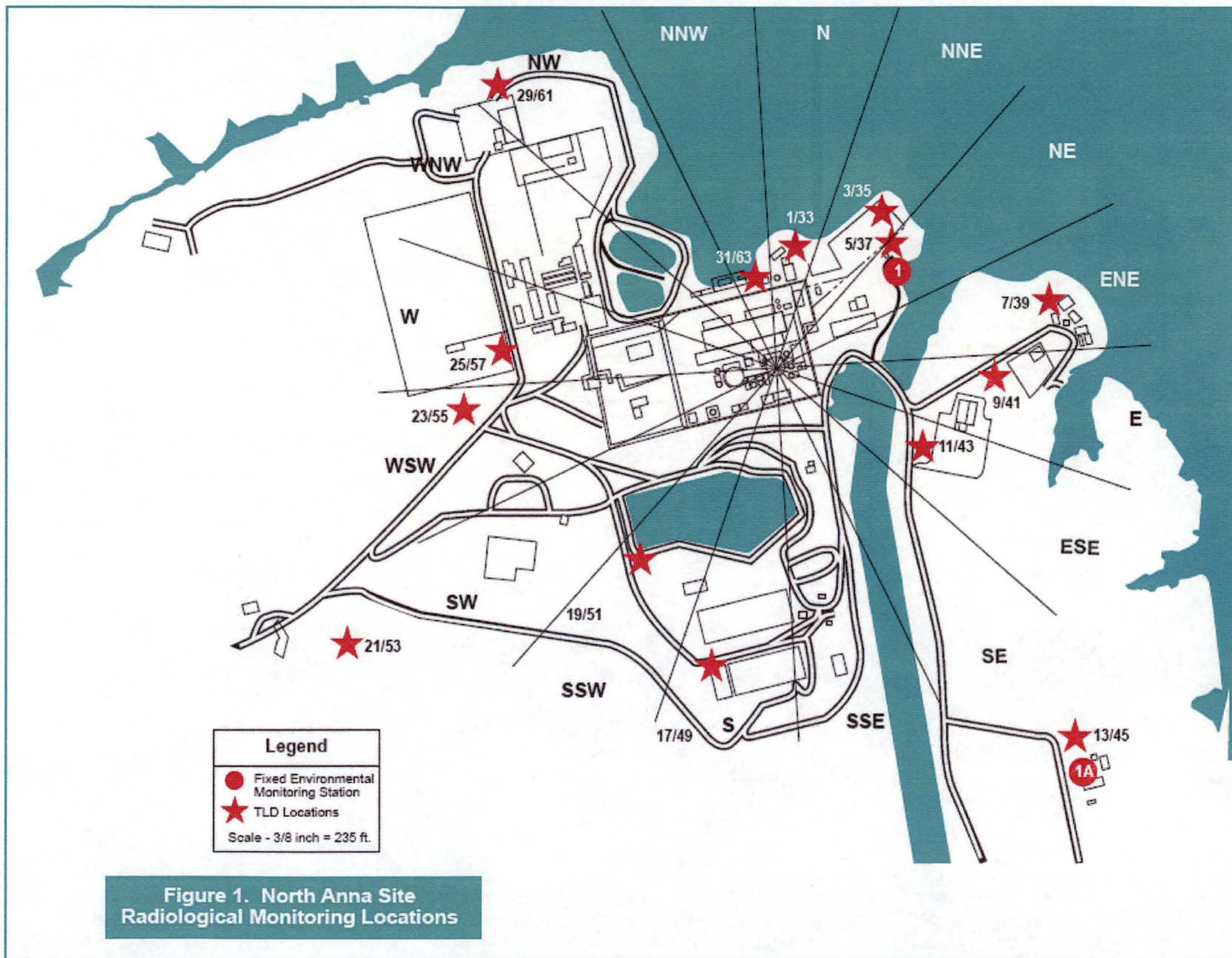
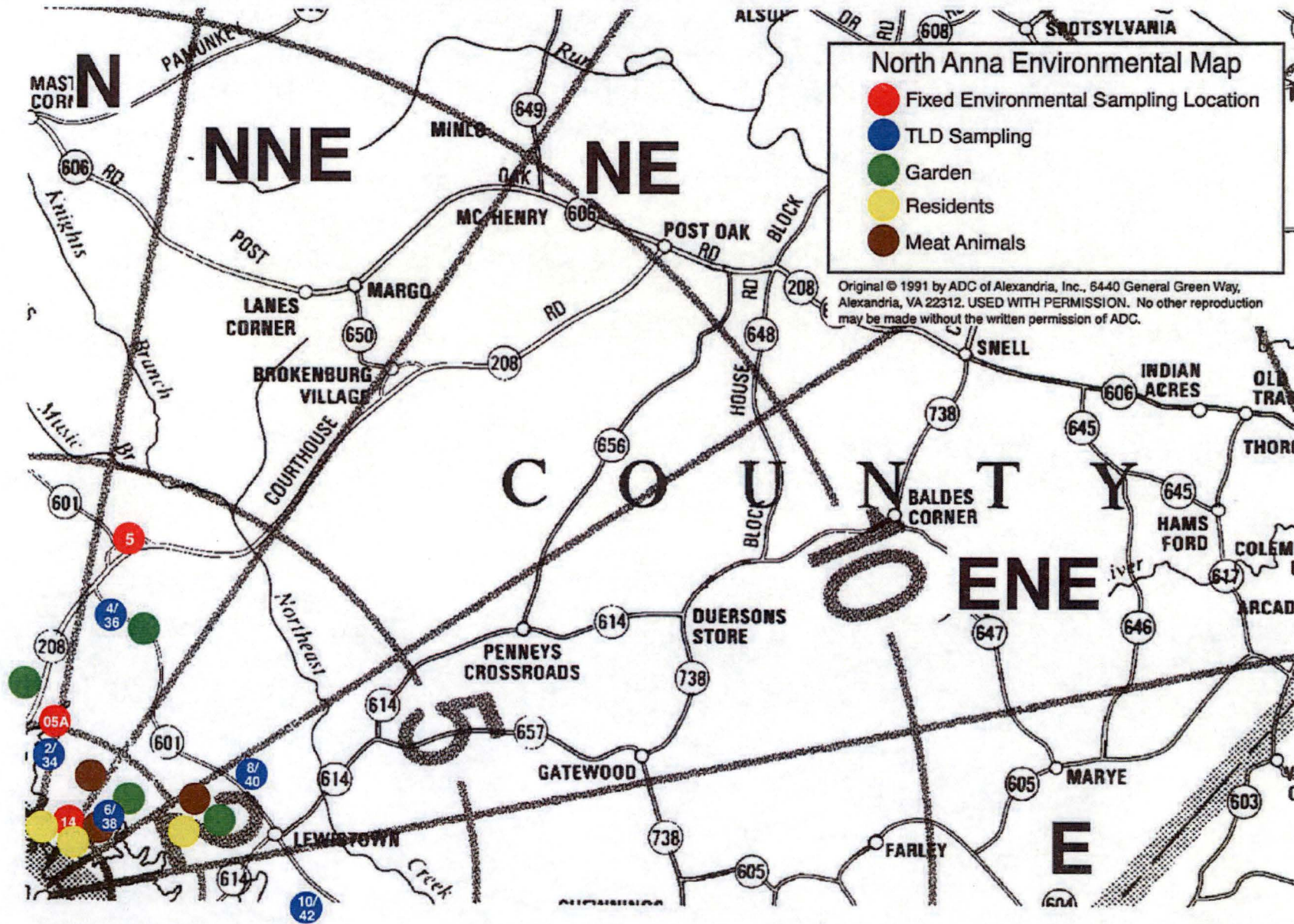
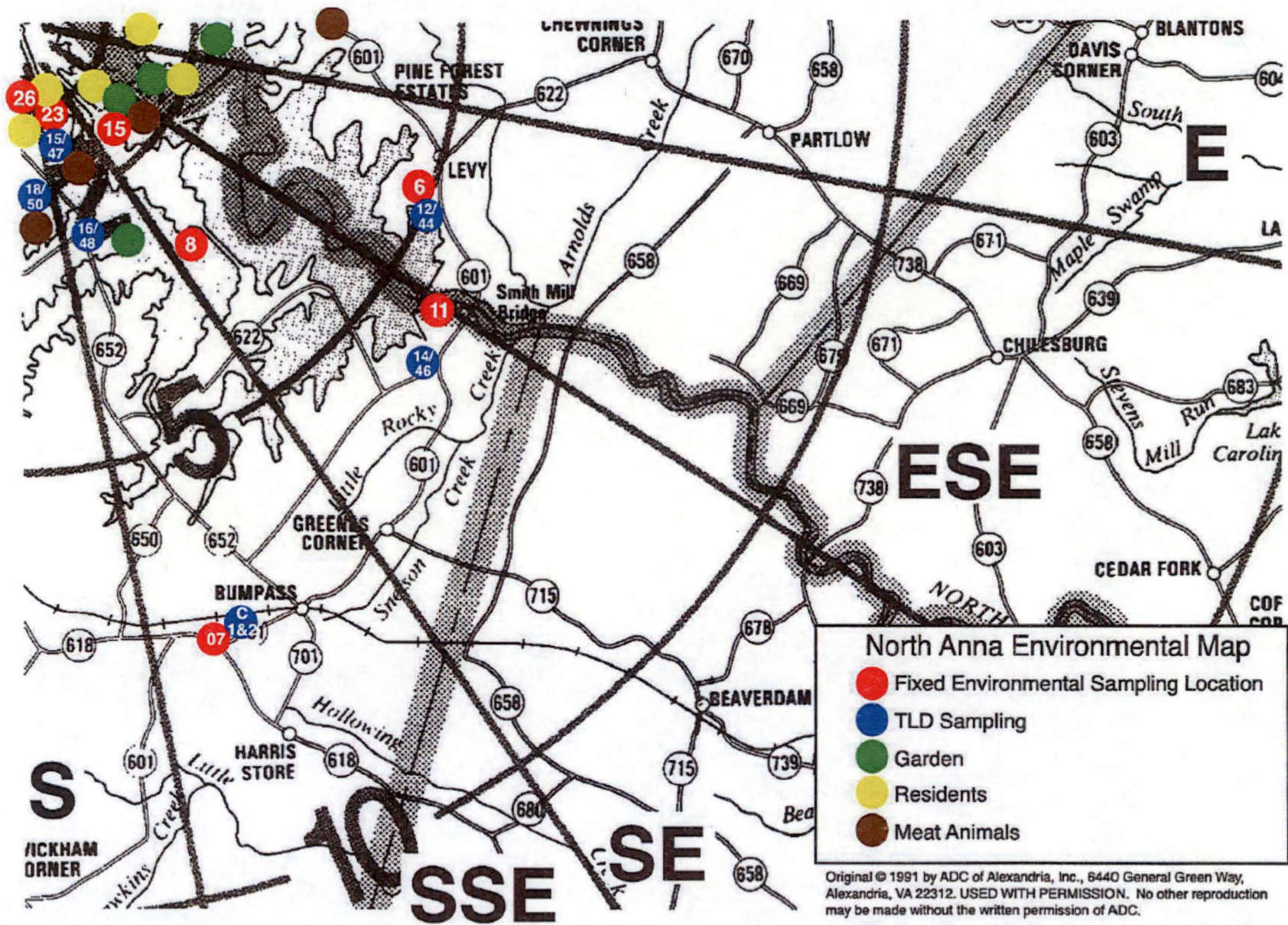
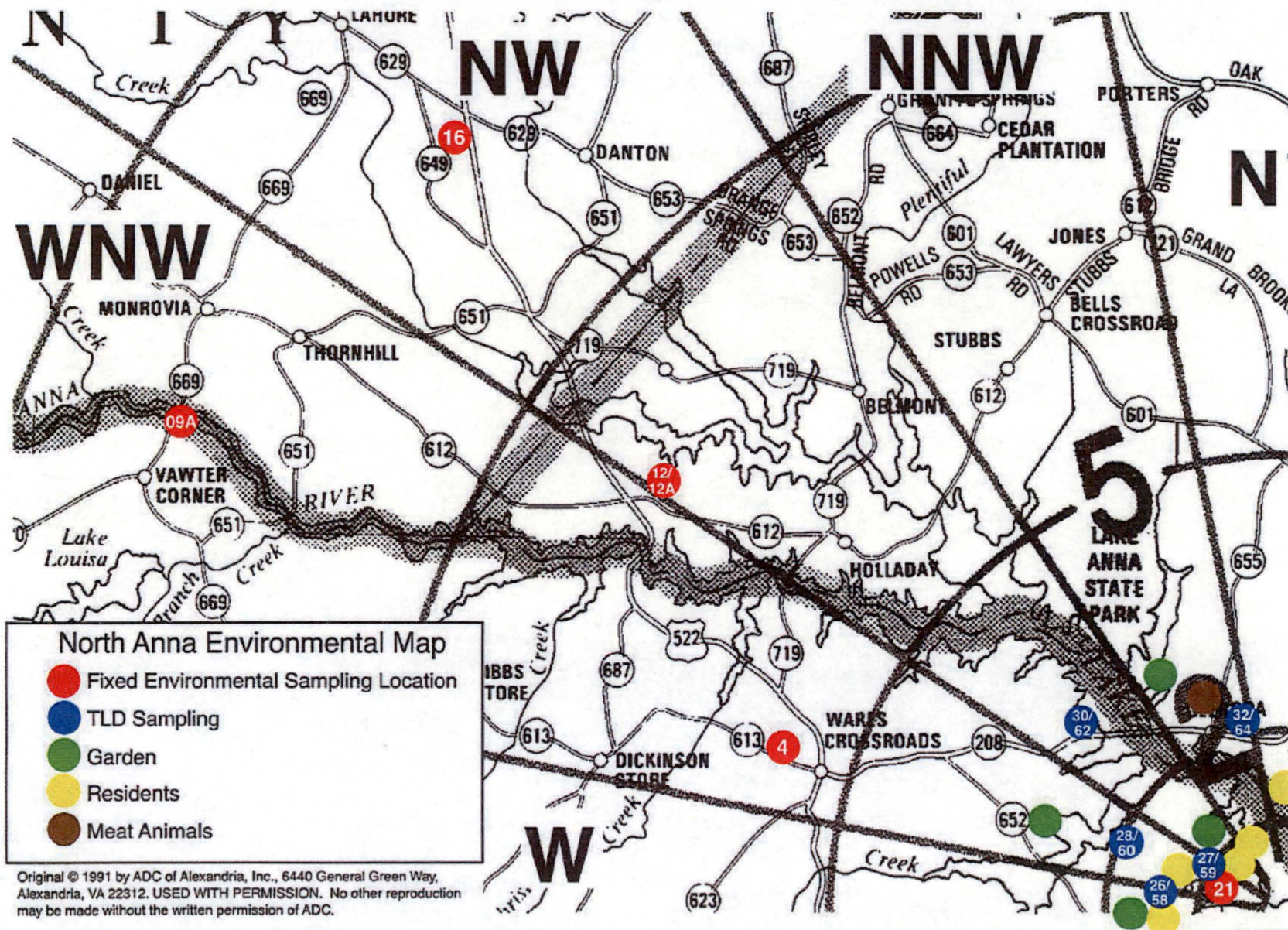


Figure 1. North Anna Site Radiological Monitoring Locations

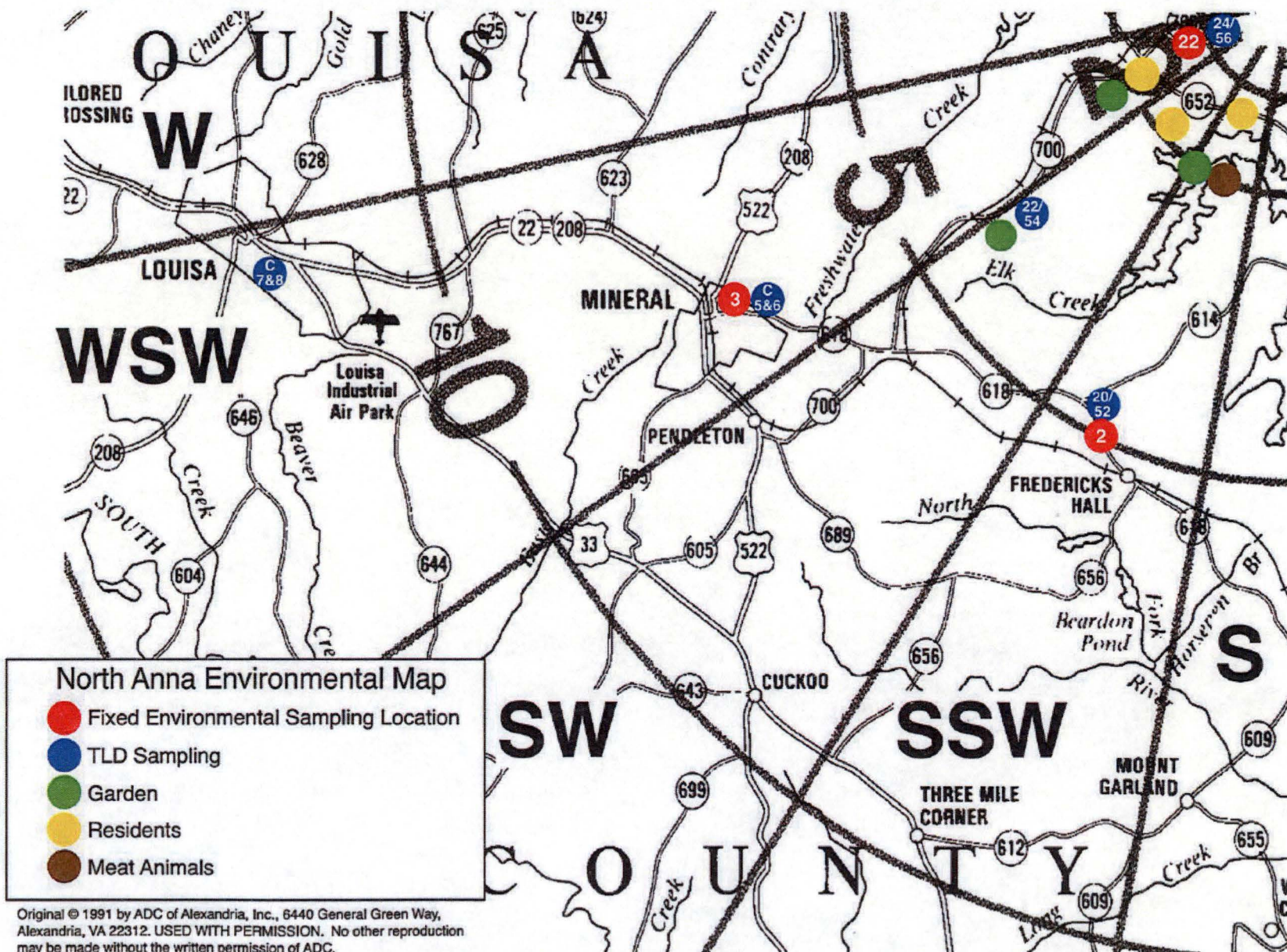


CB3280G





CB3281E



CB3283D

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. The LLD listed value is taken from the ODCM. For radioanalytic analyses, the values listed in the columns indicated as "Mean/Range" include any results above the Minimum Detectable Concentration, MDC. Results are considered true positives when the measured value exceeds both the MDC and the 2σ error. For TLDs the mean and range include all values.

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.

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				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	
Direct Radiation (mR.std. Month) (Sector TLDs)	Gamma Dose	255	2	3.7 (256/256) (1.0-8.0)	29/61	0.52 Mi. NW	6.4 (8/8) (4.7-8.0)	3.1 (16/16) (1.7-5.0)	0
** C3/4, -7/8 used for control locations									
Direct Radiation (mR.std. Month) (Pre-operational TLDs)	Gamma Dose	32	2	2.4 (16/16) (1.3-3.3)	C-7/8	11.54 Mi. WSW	3.5 (8/8) (2.3-5.0)	3.1 (16/16) (1.7-5.0)	0
** C3/4, -7/8 used for control locations									
Direct Radiation (mR.std. Month) (Emergency Sector TLDs)	Gamma Dose	40	2	4.3 (40/40) (2.3-8.0)	EPSP 9/10	0.37 Mi. ENE	6.3 (8/8) (4.3-8.0)	3.1 (16/16) (1.7-5.0)	0
** C3/4, -7/8 used for control locations									
Direct Radiation (mR.std. Month) (Environmental TLDs)	Gamma Dose	48	2	3.0 (44/44) (1.3-5.0)	STA-23	0.93 Mi. SSE	4.2 (4/4) (3.3-5)	2.9 (4/4) (2.3-4.0)	0
Direct Radiation (mR.std. Month) (Annual TLDs)	Gamma Dose	12	2	1.8 (11/11) (0.8-2.5)	STA-01/23	0.2 Mi. NE/ 0.93 Mi. SSE	2.5 (1/1) (2.5)	1.5 (1/1) (1.5)	0
Air Particulate (10e ⁻³ pCi/m ³)	GR-B	678	0.01	16.3 (624/624) (5.5-33.6)	01	0.20 Mi. NE	17.9 (52/52) (5.5-29.1)	17.4 (52/52) (8.1-30.2)	0
	GAMMA BE-7	52 52	-	136.9 (48/48) (102.9-163.9)	22	1.00 Mi. WSW	146.2 (4/4) (120.9-163.9)	137.9 (4/4) (127.3-145.7)	0
	Cs-134	52	0.05	(0/48)	N/A	N/A	N/A	(0/4)	0
	Cs-137	52	0.06	(0/48)	N/A	N/A	N/A	(0/4)	0
	Sr-89	52	0.01	(0/48)	N/A	N/A	N/A	(0/4)	0
	Sr-90	52	0.01	(0/48)	N/A	N/A	N/A	(0/4)	0
Air Iodine (10e ⁻³ pCi/m ³)	I-131	678	0.07	(0/624)	N/A	N/A	N/A	(0/52)	0

* LLD identified in ODCM

** C-3/4,-7/8 used as control locations

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				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	
Soil*** (pCi/kg dry wt.)	GAMMA	0							
	K-40	0	-	N/A	N/A	N/A	N/A	N/A	0
	CS-134	0	150	N/A	N/A	N/A	N/A	N/A	0
	CS-137	0	180	N/A	N/A	N/A	N/A	N/A	0
	Ra-226	0	-	N/A	N/A	N/A	N/A	N/A	0
	Th-228	0	-	N/A	N/A	N/A	N/A	N/A	0
	Th-232	0	-	N/A	N/A	N/A	N/A	N/A	0
	Sr-89	0	-	N/A	N/A	N/A	N/A	N/A	0
	Sr-90	0	-	N/A	N/A	N/A	N/A	N/A	0
***Soil samples are obtained triennially.									
Precipitation (pCi/liter)	GR-B	10	4	4.7 (10/10) (1.7-8.6)	0/1A	0.64 MI. SE	4.7 (10/10) (1.7-8.6)	N/A	0
	H-3	11	2000	(0/11)	N/A	N/A	N/A	N/A	0
	GAMMA	2							
	Ba-7	2	-	(0/2)	N/A	N/A	N/A	N/A	0
	Mn-54	2	15	(0/2)	N/A	N/A	N/A	N/A	0
	Fe-59	2	30	(0/2)	N/A	N/A	N/A	N/A	0
	Co-58	2	15	(0/2)	N/A	N/A	N/A	N/A	0
	Co-60	2	15	(0/2)	N/A	N/A	N/A	N/A	0

* LLD identified in ODCM

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				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	
Precipitation (cont'd) (pCi/liter)	Zn-65	2	30	(0/2)	N/A	N/A	N/A	N/A	0
	Zr-95	2	30	(0/2)	N/A	N/A	N/A	N/A	0
	Nb-95	2	15	(0/2)	N/A	N/A	N/A	N/A	0
	Cs-134	2	15	(0/2)	N/A	N/A	N/A	N/A	0
	Cs-137	2	18	(0/2)	N/A	N/A	N/A	N/A	0
	Ba-140	2	60	(0/2)	N/A	N/A	N/A	N/A	0
	La-140	2	15	(0/2)	N/A	N/A	N/A	N/A	0
	I-131	2	10	(0/2)	N/A	N/A	N/A	N/A	0
	Th-228	2	-	(0/2)	N/A	N/A	N/A	N/A	0
Fruits & Vegetables (pCi/kg wet wt.)	GAMMA	35							
	Be-7	35	-	1410 (28/28) (346.3-2804)	14B	1.22 Mi. NNE	1644 (7/7) (346.3-2804)	1714 (6/7) (220.9-2861)	0
	K-40	35	-	5117 (28/28) (2132-9218)	15	1.37 Mi. SE	6267 (7/7) (4198-9218)	6260 (7/7) (3063-12940)	0
	I-131	35	60	(0/28)	N/A	N/A	N/A	(0/7)	0
	Cs-134	35	60	(0/28)	N/A	N/A	N/A	(0/7)	0
	Cs-137	35	80	(0/28)	N/A	N/A	N/A	(0/7)	0

* LLD identified in ODCM

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				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	
Fruits & Vegetables (cont'd) (pCi/kg wet wt.)	Th-228	35	-	89.57 (16/28) (32.39-198.4)	23	0.93 Mi. SSE	140.7 (6/7) (52.96-198.4)	89.9 (3/7) (66.78-111.6)	0
	Th-232	35	-	236.0 (2/28) (220.8-251.1)	23	0.93 Mi. SSE	236.0 (2/7) (220.8-251.1)	(0/7)	0
Well Water (pCi/liter)	H-3	4	2000	(0/4)	N/A	N/A	N/A	N/A	0
	GAMMA	4							
	Mn-54	4	15	(0/4)	N/A	N/A	N/A	N/A	0
	Fe-59	4	30	(0/4)	N/A	N/A	N/A	N/A	0
	Co-58	4	15	(0/4)	N/A	N/A	N/A	N/A	0
	Co-60	4	15	(0/4)	N/A	N/A	N/A	N/A	0
	Zn-65	4	30	(0/4)	N/A	N/A	N/A	N/A	0
	Zr-95	4	30	(0/4)	N/A	N/A	N/A	N/A	0
	Nb-95	4	15	(0/4)	N/A	N/A	N/A	N/A	0
	I-131	4	10	(0/4)	N/A	N/A	N/A	N/A	0
	Cs-134	4	15	(0/4)	N/A	N/A	N/A	N/A	0
	Cs-137	4	18	(0/4)	N/A	N/A	N/A	N/A	0
	Ba-140	4	60	(0/4)	N/A	N/A	N/A	N/A	0
	La-140	4	15	(0/4)	N/A	N/A	N/A	N/A	0

* LLD identified in ODCM

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				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	
Well Water (cont'd) (pCi/liter)	Sr-89	1	-	(0/1)	N/A	N/A	N/A	N/A	0
	Sr-90	1	-	(0/1)	N/A	N/A	N/A	N/A	0
River Water (pCi/liter)	H-3	4	2000	2610 (4/4) (1580-4030)	11	5.80 MI. SE	2610 (4/4) (1580-4030)	N/A	0
	GAMMA	12							
	Mn-54	12	15	(0/12)	N/A	N/A	N/A	N/A	0
	Fe-59	12	30	(0/12)	N/A	N/A	N/A	N/A	0
	Co-58	12	15	(0/12)	N/A	N/A	N/A	N/A	0
	Co-60	12	15	(0/12)	N/A	N/A	N/A	N/A	0
	Zn-65	12	30	(0/12)	N/A	N/A	N/A	N/A	0
	Zr-95	12	30	(0/12)	N/A	N/A	N/A	N/A	0
	Nb-95	12	15	(0/12)	N/A	N/A	N/A	N/A	0
	I-131	12	1	(0/12)	N/A	N/A	N/A	N/A	0
	Cs-134	12	15	(0/12)	N/A	N/A	N/A	N/A	0
	Cs-137	12	18	(0/12)	N/A	N/A	N/A	N/A	0
	Ba-140	12	60	(0/12)	N/A	N/A	N/A	N/A	0
	La-140	12	15	(0/12)	N/A	N/A	N/A	N/A	0

* LLD identified in ODCM

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				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	
River Water (cont'd) (pCi/liter)	Sr-89	1	-	(0/1)	N/A	N/A	N/A	N/A	0
	Sr-90	1	-	(0/1)	N/A	N/A	N/A	N/A	0
Surface Water (pCi/liter)	H-3	8	2000	2658 (4/4) (2110-3570)	08	3.37 Mi. SSE	2658 (4/4) (2110-3570)	(0/4)	0
	GAMMA	24							
	Mn-54	24	15	(0/12)	N/A	N/A	N/A	(0/12)	0
	Fe-59	24	30	(0/12)	N/A	N/A	N/A	(0/12)	0
	Co-58	24	15	(0/12)	N/A	N/A	N/A	(0/12)	0
	Co-60	24	15	(0/12)	N/A	N/A	N/A	(0/12)	0
	Zn-65	24	30	(0/12)	N/A	N/A	N/A	(0/12)	0
	Zr-95	24	30	(0/12)	N/A	N/A	N/A	(0/12)	0
	Nb-95	24	30	(0/12)	N/A	N/A	N/A	(0/12)	0
	I-131	24	1	(0/12)	N/A	N/A	N/A	(0/12)	0
	Cs-134	24	15	(0/12)	N/A	N/A	N/A	(0/12)	0
	Cs-137	24	18	(0/12)	N/A	N/A	N/A	(0/12)	0
	Ba-140	24	60	(0/12)	N/A	N/A	N/A	(0/12)	0
La-140	24	15	(0/12)	N/A	N/A	N/A	(0/12)	0	

* LLD identified in ODCM

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				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	
Surface Water (cont'd) (pCi/liter)	Sr-89	2	-	(0/1)	N/A	N/A	N/A	(0/1)	0
	Sr-90	2	-	(0/1)	N/A	N/A	N/A	(0/1)	0
Sediment Silt (pCi/kg dry wt.)	GAMMA	6	-	10842 (4/4) (1537-19930)	11	5.80 Mi. SE	19500 (2/2) (19070-19930)	14280 (2/2) (13300-15260)	0
	K-40	6	-						
	Cs-134	6	150	(0/4)	N/A	N/A	N/A	(0/2)	0
	Cs-137	6	180	(0/4)	N/A	N/A	N/A	(0/2)	0
	Ra-226	6	-	2588 (1/4) (2588)	11	5.80 Mi. SE	2588 (1/2) (2588)	(0/2)	0
	Th-228	6	-	757.2 (3/4) (89.72-1373)	11	5.80 Mi. SE	1091 (2/2) (809-1373)	208.3 (2/2) (198.1-218.4)	0
	Th-232	6	-	1256 (2/4) (824.3-1687)	11	5.80 Mi. SE	1256 (2/2) (824.3-1687)	(0/2)	0
	Sr-89 (Annually)	3	-	(0/2)	N/A	N/A	N/A	(0/1)	0
	Sr-90 (Annually)	3	-	(0/2)	N/A	N/A	N/A	(0/1)	0
Shoreline Soil (pCi/kg dry wt.)	GAMMA	2	-	1388 (1/2) (1388)	08	3.37 Mi. SSE	1388 (1/2) (1388)	N/A	0
	K-40	2	-						
	Cs-134	2	150	(0/2)	N/A	N/A	N/A	N/A	0
	Cs-137	2	180	(0/2)	N/A	N/A	N/A	N/A	0
	Ra-226	2	-	873.6 (1/2) (873.6)	08	3.37 Mi. SSE	873.6 (1/2) (873.6)	NA	0
	Th-228	2	-	79.56 (1/2) (79.56)	08	3.37 Mi. SSE	79.56 (1/2) (79.56)	NA	0

* LLD identified in ODCM

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				Mean (Range)	Number	Distance Direction	Mean (Range)	Mean (Range)	
Shoreline Soil (cont'd) (pCi/kg dry wt.)	Th-232	2	-	(0/2)	N/A	N/A	N/A	N/A	0
	Sr-89 (Annually)	1	-	(0/1)	N/A	N/A	N/A	N/A	0
	Sr-90 (Annually)	1	-	(0/1)	N/A	N/A	N/A	N/A	0
Fish - Other (pCi/kg wet wt.)	GAMMA	8	-						
	K-40	8	-	1351 (4/4) (1044-1704)	08	3.37 MI. SSE	1351 (4/4) (1044-1704)	920.3 (4/4) (321.9-1436)	0
	Mn-54	8	130	(0/4)	N/A	N/A	N/A	(0/4)	0
	Fe-59	8	260	(0/4)	N/A	N/A	N/A	(0/4)	0
	Co-58	8	130	(0/4)	N/A	N/A	N/A	(0/4)	0
	Co-60	8	130	(0/4)	N/A	N/A	N/A	(0/4)	0
	Zn-65	8	260	(0/4)	N/A	N/A	N/A	(0/4)	0
	Cs-134	8	130	(0/4)	N/A	N/A	N/A	(0/4)	0
	Cs-137	8	150	(0/4)	N/A	N/A	N/A	(0/4)	0

* LLD identified in ODCM

3.2 Analytical Results of 2021 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 (2σ) 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 true positives when the measured value exceeds both the MDC and the 2σ error.

Because of counting statistics, negative values, zeros and numbers below the Minimum Detectable Level (MDL) are statistically valid pieces of data¹. For clarity of this report only detectable results are presented. TBE'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
5. Air Particulate Strontium
6. Soil
7. Precipitation
8. Cow Milk
9. Food Products and Vegetation
10. Well Water
11. River Water
12. Surface Water
13. Bottom Sediment/Silt
14. Shoreline Soil
15. Fish

¹ 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
 QUARTERLY
 GAMMA EXPOSURE RATE
 (mR/Std. Month) \pm 2 Sigma

Station	First Quarter 12/29/2020- 3/31/2021	Second Quarter 3/31/2021- 6/29/2021	Third Quarter 6/29/2021- 9/28/2021	Fourth Quarter 9/28/2021- 12/28/2021	Quarterly Average* (+/-) 2 S.D.
N-1	5.3	4.7	4.3	3.3	4.5 (+/-) 1.7
N-33	5.7	4.7	4.3	3.3	
N-2	3.0	2.7	2.3	2.0	2.5 (+/-) 0.9
N-34	3.0	2.7	2.3	1.7	
NNE-3	6.3	5.3	5.0	3.3	5.0 (+/-) 2.4
NNE-35	6.7	5.3	4.3	3.7	
NNE-4	4.7	4.0	3.3	2.7	3.7 (+/-) 1.6
NNE-36	4.7	4.0	3.0	3.0	
NE-5	5.0	4.0	4.0	2.7	3.9 (+/-) 1.8
NE-37	5.0	4.3	3.7	2.7	
NE-6	3.7	3.3	2.7	2.0	2.9 (+/-) 1.2
NE-38	3.3	3.3	2.7	2.3	
ENE-7	6.0	5.3	4.7	3.0	4.7 (+/-) 2.1
ENE-39	5.7	5.0	4.0	3.7	
ENE-8	2.3	2.3	1.0	1.3	1.8 (+/-) 1.0
ENE-40	2.3	2.3	1.7	1.3	
E-9	6.0	4.7	4.3	3.0	4.4 (+/-) 1.9
E-41	5.3	4.3	4.3	3.3	
E-10	4.3	4.3	4.3	2.7	3.5 (+/-) 1.6
E-42	4.0	3.3	3.0	2.3	
ESE-11	5.0	4.0	4.7	3.3	4.1 (+/-) 1.4
ESE-43	4.7	4.0	4.3	3.0	
ESE-12	4.7	4.3	4.3	3.0	4.0 (+/-) 1.5
ESE-44	4.0	4.7	4.3	2.7	
SE-13	5.3	3.0	3.7	2.7	3.8 (+/-) 1.9
SE-45	4.3	4.3	4.0	2.7	
SE-14	6.7	6.0	5.7	4.3	5.7 (+/-) 2.4
SE-46	7.7	6.0	5.3	4.0	
SSE-15	5.7	5.0	4.0	3.3	4.5 (+/-) 2.0
SSE-47	5.7	4.7	5.0	3.0	
SSE-16	3.3	3.0	2.0	2.3	2.5 (+/-) 1.4
SSE-48	3.3	3.0	1.7	1.7	
S-17	5.3	3.7	3.7	3.3	4.2 (+/-) 1.8
S-49	5.7	4.7	4.0	3.3	

*Average of collocated TLDs

TABLE 3-2
 QUARTERLY
 GAMMA EXPOSURE RATE
 (mR/Std. Month) \pm 2 Sigma

Station	First Quarter 12/29/2020- 3/31/2021	Second Quarter 3/31/2021- 6/29/2021	Third Quarter 6/29/2021- 9/28/2021	Fourth Quarter 9/28/2021- 12/28/2021	Quarterly Average* (+/-) 2 S.D.
S-18	3.3	2.0	1.7	1.7	2.1 (+/-) 1.3
S-50	2.7	2.0	2.0	1.3	
SSW-19	7.3	6.3	5.3	4.3	5.7 (+/-) 2.4
SSW-51	7.0	6.0	5.7	4.0	
SSW-20	2.3	2.3	1.7	1.7	2.1 (+/-) 1.3
SSW-52	3.3	2.3	1.7	1.3	
SW-21	4.0	3.3	3.3	3.0	3.4 (+/-) 1.3
SW-53	4.3	4.0	3.0	2.3	
SW-22	4.7	4.0	3.3	3.0	3.5 (+/-) 1.7
SW-54	4.7	3.0	3.3	2.3	
WSW-23	5.0	5.3	4.7	3.3	4.4 (+/-) 1.8
WSW-55	4.7	5.0	4.7	2.7	
WSW-24	4.3	3.3	3.0	2.7	3.4 (+/-) 1.3
WSW-56	4.0	4.0	3.0	2.7	
W-25	7.3	6.7	5.0	4.7	6.1 (+/-) 2.4
W-57	7.3	7.0	5.3	4.3	
W-26	3.3	2.3	2.0	1.7	2.3 (+/-) 1.2
W-58	3.0	2.7	2.0	1.7	
WNW-27	3.3	3.0	2.3	2.0	2.6 (+/-) 1.2
WNW-59	3.0	3.0	2.7	1.7	
WNW-28	3.0	3.0	2.7	1.7	2.5 (+/-) 1.1
WNW-60	3.0	3.0	2.0	2.0	
NW-29	7.7	6.7	6.3	4.7	6.4 (+/-) 2.2
NW-61	6.0	6.0	6.3	5.3	
NW-30	2.3	2.3	1.0	1.0	1.6 (+/-) 1.4
NW-62	2.7	1.7	1.0	1.0	
NNW-31	4.7	3.3	3.0	2.3	3.3 (+/-) 1.6
NNW-53	4.3	3.3	2.7	2.7	
NNW-32	3.7	3.0	2.7	2.0	3.1 (+/-) 1.7
NNW-64	4.7	3.7	2.7	2.7	
				Mean	3.7 (+/-) 2.9

(a) TLD was missing and unable to be analyzed.
 *Average of collocated TLDs

TABLE 3-2
 QUARTERLY
 GAMMA EXPOSURE RATE
 (mR/Std. Month) \pm 2 Sigma

Station	First Quarter 12/29/2020- 3/31/2021	Second Quarter 3/31/2021- 6/29/2021	Third Quarter 6/29/2021- 9/28/2021	Fourth Quarter 9/28/2021- 12/28/2021	Quarterly Average* (+/-) 2 S.D.
C-1	3.3	3.0	2.3	2.3	2.8 (+/-) 1.1
C-2	3.3	3.3	2.7	2.0	
C-3**	3.7	3.7	1.7	2.0	2.8 (+/-) 1.6
C-4**	3.3	3.0	3.0	2.0	
C-5	2.7	2.0	1.7	1.3	1.9 (+/-) 1.0
C-6	2.3	2.3	1.3	1.7	
C-7**	5.0	3.7	3.7	2.3	3.5 (+/-) 1.7
C-8**	4.0	3.7	3.0	2.7	
				Indicator Mean	2.4 (+/-) 1.3
				Control Mean	3.1 (+/-) 1.7
EP5A-01***	4.7	3.3	4.0	2.7	3.8 (+/-) 1.8
EP5A-02***	5.3	4.0	3.3	3.0	
EP5F-03***	4.3	3.7	3.7	2.7	3.5 (+/-) 1.5
EP5F-04***	4.3	4.0	3.3	2.3	
EP5R-05***	6.0	4.3	5.0	3.3	4.8 (+/-) 1.9
EP5R-06***	6.0	5.0	4.7	3.7	
EP5J-07***	4.0	2.7	2.7	2.3	3.1 (+/-) 1.7
EP5J-08***	4.7	3.3	2.7	2.3	
EP5P-09***	8.0	6.7	6.0	4.3	6.3 (+/-) 2.6
EP5P-10***	8.0	6.3	6.3	5.0	
				Mean	4.3 (+/-) 3.0

*Average of collocated TLDs

** Control Location

***Emergency Plan TLDs.

TABLE 3-2
 QUARTERLY
 GAMMA EXPOSURE RATE
 (mR/Std. Month) \pm 2 Sigma

Station	First Quarter 12/29/2020- 3/31/2021	Second Quarter 3/31/2021- 6/29/2021	Third Quarter 6/29/2021- 9/28/2021	Fourth Quarter 9/28/2021- 12/28/2021	Quarterly Average* (+/-) 2 S.D.	Annual TLD
STA-01	5.0	4.3	3.3	3.0	3.9 (+/-) 1.8	2.5
STA-02	3.0	2.0	2.0	1.3	2.1 (+/-) 1.4	0.8
STA-03	2.7	2.0	1.3	1.7	1.9 (+/-) 1.1	0.8
STA-04	2.3	2.7	2.0	1.3	2.1 (+/-) 1.1	1.2
STA-05	3.3	3.0	2.3	2.3	2.7 (+/-) 1.0	1.1
STA-05A	2.7	3.0	2.3	1.7	2.4 (+/-) 1.1	1.2
STA-06	4.7	4.7	4.0	2.7	4.0 (+/-) 1.9	2.3
STA-07	3.3	3.0	3.0	1.7	2.8 (+/-) 1.5	1.5
STA-21	3.0	3.3	2.7	1.7	2.7 (+/-) 1.4	1.8
STA-22	4.3	4.3	3.7	3.0	3.8 (+/-) 1.3	1.9
STA-23	5.0	4.7	3.7	3.3	4.2 (+/-) 1.6	2.5
STA-24**	4.0	3.0	2.3	2.3	2.9 (+/-) 1.6	1.5
				Mean Indicator Locations	3.0 (+/-) 2.1	1.6 (+/-) 1.3

*Average of collocated TLDs

** Control

TABLE 3-3
AIR PARTICULATES
GROSS BETA RADIOACTIVITY
(10⁻³ pCi/m³)

PERIOD ENDING	LOCATIONS															
	01		02		03		04		05		06		07		21	
	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)
01/05/21	11.30	2.510	9.920	2.450	9.880	2.500	9.920	2.490	8.770	2.390	8.510	2.370	9.860	2.450	7.500	2.300
01/12/21	12.90	2.600	12.10	2.580	13.80	2.640	17.50	2.840	15.80	2.760	14.50	2.720	14.10	2.690	15.80	2.750
01/19/21	22.50	3.290	18.20	3.050	22.00	3.280	21.10	3.230	14.30	2.860	18.20	3.030	20.50	3.160	24.10	3.340
01/26/21	11.70	2.440	11.10	2.400	15.70	2.660	15.20	2.630	14.80	2.630	15.50	2.670	11.40	2.420	14.70	2.620
02/03/21	5.460	2.020	6.560	2.090	7.750	2.150	7.740	2.170	7.150	2.130	6.690	2.100	10.00	2.300	8.770	2.220
02/10/21	15.90	2.950	13.80	2.840	17.90	3.060	18.20	3.070	14.80	2.900	15.90	2.960	16.20	2.970	16.20	2.970
02/16/21	17.80	3.200	16.10	3.370	16.40	3.130	21.00	3.370	14.90	2.990	17.70	3.580	17.30	3.310	18.10	3.220
02/24/21	24.10	3.020	15.90	2.660	14.40	2.550	18.60	2.770	15.80	2.670	17.30	2.740	19.50	2.840	19.30	2.810
03/02/21	10.80	2.750	10.70	2.750	12.80	2.880	6.330	2.450	7.920	2.560	9.590	2.670	10.60	2.740	13.80	2.950
03/09/21	15.60	2.750	13.20	2.620	15.20	2.730	15.80	2.770	13.30	2.630	16.70	2.810	12.40	2.570	15.00	2.720
03/16/21	17.30	2.820	14.00	2.640	13.90	2.660	16.00	2.770	15.30	2.700	14.50	2.650	13.40	2.610	17.00	2.800
03/23/21	16.50	2.970	11.10	2.670	19.20	3.110	11.10	2.670	14.80	2.870	12.30	2.750	13.30	2.790	17.70	3.030
03/31/21	15.20	2.680	10.60	2.430	12.50	2.500	10.00	2.370	11.20	2.450	12.90	2.550	12.90	2.550	11.50	2.480
04/06/21	23.30	3.480	14.80	3.030	18.40	3.280	16.70	3.170	17.20	3.180	18.60	3.250	17.50	3.190	18.20	3.220
04/13/21	16.00	2.740	16.00	2.730	17.30	2.810	18.40	2.870	13.40	2.570	16.80	2.770	15.60	2.710	17.60	2.820
04/20/21	9.140	2.320	8.490	2.280	9.600	2.350	8.880	2.310	8.340	2.290	7.510	2.230	8.350	2.270	10.70	2.420
04/27/21	23.20	3.300	15.20	2.890	20.80	3.180	18.00	3.040	12.40	2.740	18.80	3.080	16.80	2.980	18.00	3.040
05/04/21	20.80	3.110	17.00	2.920	17.70	2.950	18.60	3.000	14.80	2.800	17.40	2.940	22.10	3.180	18.30	2.990
05/11/21	10.10	2.500	11.80	2.690	13.40	2.680	12.40	2.740	7.760	2.320	11.00	2.630	9.430	2.440	10.40	2.590
05/18/21	13.50	2.670	13.00	2.660	11.90	2.600	15.40	2.790	15.00	2.780	15.20	2.790	18.00	2.930	17.20	2.890
05/25/21	18.40	3.000	15.50	2.840	20.90	3.120	20.20	3.080	19.30	3.040	24.10	3.280	22.80	3.210	14.30	2.770
06/02/21	13.70	2.460	11.00	2.320	13.90	2.470	12.90	2.410	13.80	2.460	14.80	2.510	12.80	2.410	14.80	2.520
06/09/21	13.50	2.990	14.40	3.030	11.20	2.840	11.00	2.830	11.50	2.850	12.00	2.890	13.50	2.980	13.20	2.960
06/15/21	11.40	2.710	8.430	2.560	9.050	2.590	7.730	2.510	8.600	2.570	9.660	2.630	11.50	2.740	6.640	2.440
06/22/21	19.70	3.020	16.00	2.810	17.00	2.870	14.40	2.730	18.30	2.940	16.90	2.870	22.60	3.160	18.90	2.980
06/29/21	7.630	2.310	9.110	2.400	8.310	2.300	8.700	2.350	9.020	2.390	10.00	2.450	9.940	2.450	11.30	2.530

TABLE 3-3
AIR PARTICULATES
GROSS BETA RADIOACTIVITY
(10⁻³ pCi/m³)

PERIOD ENDING	LOCATIONS															
	01		02		03		04		05		06		07		21	
	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	
07/06/21	10.20	2.480	7.120	2.290	11.20	2.590	9.970	2.490	9.200	2.460	9.340	2.430	8.720	2.390	9.740	2.450
07/14/21	12.70	2.580	13.50	2.610	11.00	2.480	14.20	2.650	12.30	2.540	10.40	2.440	15.90	2.740	14.90	2.690
07/20/21	16.80	3.290	16.40	3.290	16.20	3.280	15.70	3.240	18.40	3.410	13.00	3.110	17.40	3.340	14.50	3.180
07/27/21	21.60	3.130	17.30	2.920	18.80	3.000	21.30	3.120	21.60	3.150	20.90	3.110	16.90	2.900	23.10	3.210
08/03/21	25.20	3.230	19.90	2.970	20.30	2.990	22.30	3.090	18.40	2.890	19.50	2.950	20.70	3.010	18.30	2.890
08/10/21	20.20	2.990	19.70	2.950	20.50	3.000	17.10	2.810	14.60	2.660	21.70	3.060	20.50	2.990	20.00	2.970
08/17/21	14.50	2.770	11.30	2.600	7.770	2.390	9.170	2.470	10.50	2.550	8.770	2.440	13.70	2.730	10.80	2.570
08/25/21	15.70	2.660	12.30	2.490	12.60	2.500	13.10	2.530	8.670	2.300	12.30	2.500	14.10	2.580	15.80	2.670
08/31/21	25.60	3.720	20.00	3.440	20.50	3.470	21.10	3.500	20.50	3.470	20.10	3.440	23.10	3.590	17.90	3.330
09/07/21	17.50	2.800	14.50	2.640	16.90	2.770	11.40	2.460	15.60	2.700	12.10	2.500	14.60	2.640	16.30	2.730
09/14/21	27.50	3.420	20.60	3.090	22.20	3.170	23.00	3.210	18.90	3.000	22.10	3.150	24.80	3.290	23.30	3.230
09/21/21	22.00	3.210	17.30	2.980	22.70	3.240	22.00	3.200	21.00	3.180	19.00	3.080	22.10	3.220	21.10	3.170
09/28/21	19.70	3.130	16.30	2.940	15.10	2.820	13.80	2.770	15.40	2.890	17.50	3.000	20.10	3.140	16.50	2.950
10/05/21	28.80	3.530	25.20	3.390	31.80	3.750	30.00	3.650	30.60	3.640	29.10	3.570	27.50	3.500	11.70	2.680
10/12/21	12.40	2.670	9.570	2.500	7.440	2.380	11.30	2.600	9.310	2.480	10.30	2.540	10.90	2.570	7.110	2.350
10/19/21	21.80	3.160	20.50	3.100	8.300	2.430	21.80	3.170	22.90	3.230	20.80	3.130	20.00	3.090	20.60	3.110
10/26/21	28.70	3.450	33.60	3.660	27.30	3.380	33.10	3.640	32.40	3.600	30.00	3.500	30.10	3.500	29.40	3.490
11/02/21	7.880	2.480	9.900	2.610	8.200	2.500	7.270	2.450	8.740	2.540	10.10	2.620	6.320	2.380	11.00	2.670
11/09/21	17.80	2.970	16.40	2.900	16.70	2.920	14.10	2.780	17.00	2.930	19.30	3.050	14.20	2.780	11.80	2.650
11/16/21	25.90	3.380	21.40	3.160	24.40	3.300	17.00	2.950	22.50	3.200	21.60	3.160	21.80	3.180	22.20	3.200
11/23/21	21.00	3.170	19.90	3.120	17.60	3.000	18.90	3.060	21.00	3.190	18.50	3.060	18.60	3.050	21.50	3.190
11/30/21	18.70	2.930	16.20	2.800	15.70	2.770	13.30	2.630	18.60	2.920	15.20	2.740	20.70	3.030	11.20	2.520
12/07/21	28.60	3.530	22.60	3.260	23.60	3.310	16.40	2.950	25.40	3.400	26.80	3.460	22.50	3.260	25.60	3.400
12/14/21	22.30	3.180	20.20	3.080	16.20	2.880	23.30	3.230	20.00	3.060	21.60	3.140	21.40	3.140	22.70	3.200
12/21/21	19.70	3.150	18.00	3.070	14.40	2.880	24.20	3.370	15.70	2.960	19.80	3.170	19.00	3.120	16.80	3.010
12/28/21	29.10	3.590	30.70	3.640	25.60	3.410	32.00	3.690	29.20	3.560	24.40	3.360	25.70	3.420	20.60	3.180
Mean	17.87	2.946	15.47	2.831	16.04	2.856	16.32	2.868	15.71	2.834	16.29	2.878	16.80	2.897	16.22	2.867

TABLE 3-3
AIR PARTICULATES
GROSS BETA RADIOACTIVITY
(10⁻³ pCi/m³)

PERIOD ENDING	LOCATIONS									
	22		23		24*	01A		05A		
	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	
01/05/21	12.10	2.580	10.10	2.470	12.90 ± 2.650	9.980	2.440	9.310	2.430	
01/12/21	13.00	2.600	17.10	2.830	14.50 ± 2.750	12.90	2.600	16.60	2.800	
01/19/21	20.90	3.220	20.00	3.160	24.70 ± 3.310	19.00	3.130	21.60	3.240	
01/26/21	14.90	2.630	13.50	2.550	13.90 ± 2.570	12.70	2.500	12.30	2.480	
02/03/21	5.590	2.030	7.540	2.150	8.120 ± 2.190	7.280	2.140	6.890	2.110	
02/10/21	17.10	3.010	16.20	2.970	18.20 ± 3.070	15.70	2.940	15.70	2.950	
02/16/21	19.20	3.270	16.20	3.130	22.00 ± 3.340	16.60	3.130	19.60	3.230	
02/24/21	17.10	2.700	21.80	2.920	19.70 ± 2.860	18.20	2.750	15.70	2.660	
03/02/21	8.730	2.620	9.240	2.650	10.60 ± 2.740	10.20	2.720	9.150	2.650	
03/09/21	10.60	2.470	14.10	2.670	11.50 ± 2.520	13.80	2.650	13.50	2.640	
03/16/21	14.00	2.640	17.10	2.810	14.90 ± 2.680	17.50	2.830	14.10	2.620	
03/23/21	9.600	2.580	12.90	2.770	14.20 ± 2.860	15.90	2.940	12.00	2.710	
03/31/21	10.70	2.430	9.550	2.360	12.60 ± 2.520	11.50	2.480	9.810	2.370	
04/06/21	17.90	3.210	19.10	3.290	18.10 ± 3.230	19.40	3.270	14.50	3.020	
04/13/21	15.00	2.690	17.60	2.820	21.10 ± 2.990	15.90	2.730	15.90	2.710	
04/20/21	7.450	2.210	9.540	2.350	10.10 ± 2.400	10.30	2.480	9.610	2.370	
04/27/21	16.00	2.940	19.90	3.140	16.60 ± 2.970	17.30	3.010	18.40	3.060	
05/04/21	18.50	3.000	20.30	3.090	16.90 ± 2.910	18.80	3.010	16.30	2.880	
05/11/21	10.40	2.510	11.70	2.670	10.60 ± 2.480	10.90	2.550	10.30	2.480	
05/18/21	15.70	2.800	17.20	2.880	16.50 ± 2.880	14.40	2.720	14.10	2.730	
05/25/21	16.00	2.870	20.20	3.080	20.90 ± 3.110	14.10	2.760	19.60	3.060	
06/02/21	12.20	2.380	12.70	2.410	13.70 ± 2.470	13.00	2.460	13.80	2.470	
06/08/21	11.60	2.880	14.10	3.030	13.50 ± 2.980	11.30	2.990	13.60	2.980	
06/15/21	9.980	2.630	10.20	2.650	8.840 ± 2.580	9.580	2.600	8.760	2.580	
06/22/21	17.80	2.920	18.10	2.940	20.60 ± 3.140	18.50	2.950	17.90	2.920	
06/29/21	7.530	2.290	11.00	2.500	10.30 ± 2.400	10.20	2.480	10.10	2.450	

*Control Station

TABLE 3-3
AIR PARTICULATES
GROSS BETA RADIOACTIVITY
(10⁻³ pCi/m³)

PERIOD ENDING	LOCATIONS									
	22		23		24*		01A		05A	
	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)	(+/-)
07/06/21	9.950	2.470	10.20	2.490	9.560	2.460	6.410	2.230	12.90	2.650
07/14/21	13.40	2.720	17.70	2.820	15.40	2.700	15.10	2.850	16.60	2.750
07/20/21	12.50	3.050	15.10	3.210	18.80	3.440	13.60	3.110	15.90	3.270
07/27/21	17.70	2.940	18.70	2.990	22.20	3.180	19.30	3.010	20.00	3.070
08/03/21	19.20	2.940	16.10	2.770	18.60	2.900	22.90	3.120	21.20	3.030
08/10/21	18.80	2.910	18.30	2.880	20.30	2.980	21.00	3.030	23.70	3.150
08/17/21	12.40	2.650	12.60	2.670	11.80	2.630	11.90	2.620	12.50	2.670
08/25/21	13.10	2.530	8.710	2.290	15.10	2.640	13.60	2.550	16.10	2.690
08/31/21	19.20	3.400	21.60	3.530	24.40	3.650	26.20	3.750	21.40	3.510
09/07/21	18.00	2.820	13.60	2.580	12.50	2.530	16.20	2.730	13.10	2.560
09/14/21	27.50	3.420	26.30	3.370	24.60	3.260	22.20	3.180	25.80	3.320
09/21/21	19.50	3.090	20.40	3.140	21.10	3.290	23.10	3.260	20.40	3.150
09/28/21	16.80	3.110	17.90	3.010	18.10	2.920	16.40	2.930	15.10	2.860
10/05/21	26.90	3.470	31.30	3.670	30.20	3.740	27.70	3.490	28.10	3.530
10/12/21	10.50	2.560	10.20	2.540	9.390	2.400	10.10	2.530	11.60	2.620
10/19/21	19.90	3.070	21.00	3.130	19.80	3.100	18.80	3.010	15.90	2.830
10/26/21	26.90	3.370	32.40	3.610	24.70	3.250	27.00	3.370	23.60	3.250
11/02/21	7.110	2.430	8.650	2.530	10.80	2.650	8.420	2.510	8.120	2.500
11/09/21	14.00	2.770	17.70	2.970	18.80	3.100	15.50	2.860	17.40	2.950
11/16/21	20.30	3.110	23.50	3.260	23.40	3.260	21.70	3.180	23.00	3.220
11/23/21	22.50	3.240	17.50	2.990	22.90	3.180	20.10	3.130	12.80	2.760
11/30/21	16.00	2.790	18.70	2.930	16.20	2.800	12.30	2.580	15.70	2.770
12/07/21	22.50	3.250	28.00	3.510	22.90	3.270	22.10	3.230	22.90	3.280
12/14/21	20.70	3.110	23.00	3.210	23.30	3.220	23.90	3.260	19.70	3.050
12/21/21	19.20	3.130	19.70	3.150	23.00	3.320	18.50	3.090	20.30	3.190
12/28/21	28.00	3.520	33.50	3.760	30.10	3.600	20.80	3.210	25.00	3.380
Mean	15.81	2.846	17.10	2.910	17.37	2.924	16.15	2.867	16.11	2.858

Mean all Indicator locations 16.33 2.871

*Control Station

TABLE 3-4
AIRBORNE IODINE
(10⁻³ pCi/m³)

PERIOD ENDING	LOCATIONS							
	01	02	03	04	05	06	07	21
01/05/21	< 26.07	< 26.39	< 11.37	< 26.82	< 26.53	< 17.34	< 20.73	< 20.62
01/12/21	< 18.25	< 9.434	< 18.19	< 18.19	< 18.28	< 8.584	< 18.80	< 18.51
01/19/21	< 19.51	< 19.24	< 9.151	< 19.58	< 19.37	< 18.92	< 19.02	< 19.09
01/26/21	< 18.20	< 18.23	< 18.07	< 18.01	< 8.522	< 12.13	< 28.93	< 28.93
02/03/21	< 21.17	< 21.17	< 21.04	< 9.907	< 21.17	< 9.240	< 20.31	< 20.31
02/10/21	< 26.43	< 26.47	< 12.40	< 26.47	< 26.47	< 12.48	< 27.29	< 27.24
02/16/21	< 24.11	< 12.26	< 24.31	< 24.21	< 23.54	< 13.91	< 26.93	< 25.50
02/24/21	< 19.79	< 20.01	< 19.67	< 19.79	< 10.30	< 13.64	< 32.37	< 32.12
03/02/21	< 19.65	< 19.61	< 10.02	< 19.61	< 19.61	< 18.99	< 18.99	< 8.892
03/09/21	< 18.99	< 19.02	< 18.99	< 11.05	< 26.34	< 26.34	< 26.34	< 26.30
03/16/21	< 18.02	< 17.99	< 9.334	< 18.18	< 17.89	< 23.06	< 23.18	< 23.18
03/23/21	< 18.75	< 15.66	< 18.72	< 18.72	< 18.66	< 7.580	< 16.11	< 16.11
03/31/21	< 27.24	< 27.07	< 26.66	< 25.81	< 26.00	< 26.04	< 26.04	< 10.94
04/06/21	< 17.31	< 17.46	< 17.83	< 12.52	< 26.12	< 26.07	< 26.01	< 25.96
04/13/21	< 9.269	< 22.02	< 22.02	< 22.02	< 21.87	< 16.15	< 16.24	< 16.24
04/20/21	< 16.30	< 16.32	< 16.32	< 16.35	< 11.02	< 8.832	< 14.91	< 14.93
04/27/21	< 27.04	< 27.00	< 27.00	< 27.00	< 11.32	< 17.92	< 17.92	< 17.92
05/04/21	< 12.19	< 29.08	< 29.08	< 29.08	< 29.08	< 35.49	< 35.55	< 35.55
05/11/21	< 28.51	< 29.92	< 28.36	< 12.64	< 28.02	< 29.27	< 27.90	< 29.27
05/18/21	< 17.88	< 18.01	< 18.01	< 18.01	< 8.253	< 15.89	< 15.81	< 10.57
05/25/21	< 27.78	< 27.74	< 27.69	< 26.93	< 22.60	< 27.02	< 26.97	< 26.93
06/02/21	< 19.83	< 9.539	< 19.86	< 19.86	< 19.83	< 23.21	< 23.21	< 23.28
06/08/21	< 14.23	< 21.10	< 21.10	< 21.10	< 21.06	< 22.95	< 22.95	< 22.91
06/15/21	< 12.16	< 12.28	< 12.28	< 12.28	< 10.29	< 26.26	< 11.03	< 26.31
06/22/21	< 23.23	< 23.11	< 23.15	< 17.33	< 17.33	< 8.866	< 17.30	< 17.36
06/29/21	< 21.29	< 21.21	< 20.71	< 24.42	< 24.68	< 24.72	< 24.72	< 10.40

TABLE 3-4
AIRBORNE IODINE
(10⁻³ pCi/m³)

PERIOD ENDING	LOCATIONS							
	01	02	03	04	05	06	07	21
07/06/21	< 14.34	< 14.39	< 12.39	< 14.57	< 14.67	< 11.16	< 11.14	< 11.10
07/14/21	< 21.27	< 21.18	< 21.18	< 7.064	< 16.69	< 16.74	< 16.82	< 16.84
07/20/21	< 18.09	< 18.20	< 18.20	< 18.20	< 9.353	< 18.92	< 22.48	< 22.48
07/27/21	< 13.52	< 13.55	< 13.55	< 20.75	< 8.747	< 20.86	< 20.82	< 20.75
08/03/21	< 12.09	< 12.07	< 12.07	< 12.07	< 12.05	< 8.964	< 19.70	< 19.70
08/10/21	< 18.66	< 18.59	< 18.66	< 18.59	< 8.445	< 15.42	< 15.40	< 15.40
08/17/21	< 14.31	< 8.460	< 14.38	< 14.36	< 14.36	< 15.82	< 13.35	< 15.87
08/25/21	< 13.77	< 13.80	< 13.77	< 13.77	< 7.067	< 28.88	< 28.75	< 12.06
08/31/21	< 14.15	< 14.12	< 14.12	< 14.12	< 14.12	< 18.39	< 18.39	< 18.39
09/07/21	< 23.20	< 9.749	< 23.25	< 23.25	< 23.25	< 9.332	< 20.47	< 20.51
09/14/21	< 21.82	< 25.81	< 25.85	< 25.85	< 25.68	< 36.10	< 36.29	< 36.41
09/21/21	< 11.75	< 11.73	< 11.71	< 11.71	< 11.79	< 8.340	< 18.23	< 18.26
09/28/21	< 10.84	< 25.72	< 24.98	< 25.23	< 25.67	< 14.69	< 14.67	< 14.64
10/05/21	< 26.97	< 27.30	< 28.15	< 25.42	< 29.79	< 29.74	< 29.63	< 29.02
10/12/21	< 13.97	< 13.99	< 14.04	< 13.99	< 13.94	< 14.70	< 14.70	< 14.72
10/19/21	< 17.09	< 17.12	< 17.12	< 17.12	< 17.21	< 19.91	< 47.47	< 47.30
10/26/21	< 14.48	< 34.47	< 34.41	< 34.41	< 34.35	< 32.06	< 32.06	< 13.51
11/02/21	< 17.83	< 8.638	< 17.86	< 17.86	< 17.86	< 10.58	< 10.54	< 10.58
11/09/21	< 27.93	< 11.73	< 27.97	< 27.97	< 27.97	< 19.24	< 19.24	< 16.09
11/16/21	< 8.774	< 8.744	< 8.744	< 8.759	< 8.683	< 27.12	< 27.31	< 27.35
11/23/21	< 29.22	< 29.27	< 29.27	< 29.27	< 15.08	< 18.95	< 28.09	< 27.99
11/30/21	< 21.82	< 21.78	< 21.78	< 11.50	< 11.50	< 11.50	< 11.50	< 11.54
12/07/21	< 10.52	< 10.56	< 10.56	< 10.56	< 8.864	< 5.948	< 13.07	< 13.07
12/14/21	< 10.30	< 21.68	< 21.68	< 21.68	< 21.60	< 14.04	< 14.09	< 14.09
12/21/21	< 27.29	< 27.29	< 27.29	< 27.29	< 11.48	< 12.89	< 12.84	< 12.84
12/28/21	< 12.20	< 28.88	< 28.83	< 28.88	< 28.78	< 19.98	< 19.98	< 20.01

TABLE 3-4
AIRBORNE IODINE
(10^{-3} pCi/m³)

PERIOD ENDING	LOCATIONS				
	22	23	24*	01A	05A
01/05/21	< 20.62	< 20.69	< 29.65	< 29.08	< 29.54
01/12/21	< 18.51	< 18.64	< 22.93	< 22.10	< 22.22
01/19/21	< 16.20	< 19.26	< 31.77	< 33.13	< 32.90
01/26/21	< 28.88	< 28.83	< 15.92	< 15.89	< 15.95
02/03/21	< 20.31	< 20.31	< 14.67	< 14.67	< 14.67
02/10/21	< 27.24	< 27.29	< 28.76	< 28.66	< 28.71
02/16/21	< 25.30	< 25.66	< 14.42	< 14.83	< 14.45
02/24/21	< 32.02	< 32.02	< 21.59	< 21.09	< 21.49
03/02/21	< 19.03	< 18.99	< 68.60	< 68.74	< 68.60
03/09/21	< 21.82	< 21.86	< 9.153	< 21.82	< 21.82
03/16/21	< 23.22	< 10.58	< 23.06	< 23.23	< 22.94
03/23/21	< 16.13	< 16.11	< 12.76	< 12.67	< 12.60
03/31/21	< 12.25	< 12.23	< 12.21	< 12.35	< 12.21
04/06/21	< 20.37	< 20.46	< 20.46	< 10.30	< 20.42
04/13/21	< 13.68	< 16.27	< 24.09	< 24.39	< 24.13
04/20/21	< 14.88	< 14.93	< 10.27	< 10.65	< 10.27
04/27/21	< 17.95	< 8.391	< 14.67	< 14.67	< 14.65
05/04/21	< 35.55	< 14.91	< 28.62	< 28.67	< 28.62
05/11/21	< 26.96	< 28.09	< 11.04	< 27.01	< 26.55
05/18/21	< 15.72	< 15.75	< 20.85	< 20.41	< 20.70
05/25/21	< 24.48	< 24.44	< 10.20	< 24.48	< 24.53
06/02/21	< 23.28	< 10.59	< 18.94	< 19.36	< 18.97
06/08/21	< 11.79	< 23.05	< 24.03	< 25.59	< 11.37
06/15/21	< 26.08	< 26.12	< 14.42	< 14.24	< 14.42
06/22/21	< 20.70	< 20.77	< 21.49	< 20.70	< 17.28
06/29/21	< 26.39	< 26.30	< 25.33	< 26.57	< 11.05

*Control Station

TABLE 3-4
AIRBORNE IODINE
(10^{-3} pCi/m³)

PERIOD ENDING	LOCATIONS				
	22	23	24*	01A	05A
07/06/21	< 11.16	< 11.22	< 17.60	< 17.36	< 17.51
07/14/21	< 27.21	< 25.71	< 25.52	< 27.79	< 10.70
07/20/21	< 22.43	< 22.43	< 24.71	< 24.31	< 24.61
07/27/21	< 17.24	< 17.24	< 17.36	< 14.45	< 17.33
08/03/21	< 19.70	< 19.70	< 19.07	< 19.14	< 19.07
08/10/21	< 12.97	< 15.45	< 17.28	< 17.37	< 17.28
08/17/21	< 15.82	< 15.82	< 62.75	< 62.53	< 62.75
08/25/21	< 28.75	< 28.79	< 14.45	< 14.37	< 14.43
08/31/21	< 8.383	< 18.42	< 18.69	< 18.80	< 18.76
09/07/21	< 20.47	< 20.47	< 18.79	< 18.66	< 18.69
09/14/21	< 36.41	< 15.27	< 24.34	< 24.68	< 24.43
09/21/21	< 18.23	< 18.26	< 28.43	< 26.93	< 27.07
09/28/21	< 7.584	< 14.59	< 16.76	< 17.58	< 17.58
10/05/21	< 27.26	< 27.35	< 28.73	< 27.07	< 12.45
10/12/21	< 8.677	< 14.72	< 17.95	< 18.82	< 18.82
10/19/21	< 47.22	< 47.30	< 24.24	< 23.86	< 23.49
10/26/21	< 32.17	< 32.17	< 32.00	< 32.16	< 32.79
11/02/21	< 10.56	< 10.56	< 22.14	< 22.10	< 22.14
11/09/21	< 19.24	< 19.24	< 17.08	< 16.48	< 16.48
11/16/21	< 27.35	< 11.47	< 23.19	< 23.15	< 22.91
11/23/21	< 28.04	< 28.04	< 11.34	< 11.76	< 11.86
11/30/21	< 17.62	< 17.59	< 14.77	< 17.65	< 17.59
12/07/21	< 13.03	< 13.07	< 42.15	< 42.23	< 42.38
12/14/21	< 8.302	< 14.09	< 7.505	< 7.544	< 7.505
12/21/21	< 12.84	< 12.84	< 16.93	< 16.87	< 16.93
12/28/21	< 20.05	< 9.697	< 15.99	< 16.19	< 15.99

*Control Station

TABLE 3-5
AIR PARTICULATES
(10⁻³ pCi/m³)

GAMMA SPECTRA - QTR 1 (12/29/20 - 03/31/21)

LOCATION	Be-7		Cs-134	Cs-137
	(+/-)			
01	132.50	20.240	< 0.9252	< 0.7726
02	129.70	21.310	< 0.9714	< 0.9978
03	130.50	20.150	< 1.2100	< 0.8862
04	146.70	32.250	< 1.6110	< 1.5980
05	118.60	23.160	< 1.2640	< 1.3640
06	150.40	27.890	< 1.6010	< 1.7190
07	120.50	20.790	< 0.8627	< 0.6031
21	141.60	23.310	< 1.1720	< 0.9743
22	120.90	19.710	< 0.8343	< 0.7145
23	140.70	22.860	< 0.8584	< 1.0300
24*	137.00	25.380	< 1.4250	< 1.3130
01A	140.40	20.060	< 1.2890	< 0.6576
05A	140.00	27.320	< 1.4150	< 1.4670

GAMMA SPECTRA AND STRONTIUM 89/90- QTR 2 (03/31/21 - 06/29/21)

LOCATION	Be-7		Cs-134	Cs-137	Sr-89	Sr-90
	(+/-)					
01	142.50	20.450	< 0.8384	< 0.8369	< 6.8000	< 2.7500
02	130.10	22.610	< 1.4190	< 1.2610	< 8.4200	< 2.9500
03	144.40	20.890	< 0.6890	< 0.7664	< 8.6700	< 2.5000
04	131.10	24.060	< 1.1630	< 1.1680	< 9.2700	< 3.2800
05	131.90	21.640	< 0.8973	< 0.7334	< 8.9400	< 3.1400
06	141.60	29.450	< 1.7080	< 1.4440	< 9.4500	< 3.6800
07	146.40	23.640	< 1.0840	< 1.2680	< 9.4900	< 3.2600
21	152.40	23.680	< 1.1490	< 0.7219	< 9.3300	< 3.7900
22	163.90	25.340	< 1.6510	< 1.1400	< 8.5000	< 2.6000
23	149.20	20.500	< 0.9818	< 0.7270	< 9.3300	< 2.2900
24*	141.50	28.220	< 1.0850	< 1.2460	< 9.2700	< 2.7700
01A	128.30	20.600	< 0.8586	< 0.7901	< 9.4400	< 3.3700
05A	151.10	22.530	< 1.1550	< 1.0510	< 8.8200	< 2.7800

* Control Location

TABLE 3-5
AIR PARTICULATES
(10^{-3} pCi/m³)

GAMMA SPECTRA - QTR 3 (06/29/21 - 09/28/21)

LOCATION	Be-7 (+/-)		Cs-134	Cs-137
01	161.10	31.170	< 1.3740	< 1.3240
02	125.50	17.590	< 0.9080	< 0.8975
03	140.00	21.370	< 0.6540	< 0.8632
04	122.20	21.900	< 1.3660	< 1.2610
05	102.90	26.810	< 1.8430	< 1.6340
06	133.20	22.900	< 1.0730	< 0.8908
07	139.30	22.440	< 1.2390	< 0.9453
21	124.10	22.400	< 1.0480	< 1.0030
22	154.20	22.810	< 1.1480	< 0.6358
23	110.10	18.220	< 1.1090	< 0.9386
24*	127.30	20.780	< 0.9887	< 1.0630
01A	148.00	21.940	< 0.8929	< 0.9770
05A	128.50	24.090	< 1.4840	< 1.1890

GAMMA SPECTRA - QTR 4 (09/28/21 - 12/28/21)

LOCATION	Be-7 (+/-)		Cs-134	Cs-137	Annual Mean Be-7 (+/-)	
	01	131.90			20.570	< 1.0580
02	128.00	20.300	< 1.0360	< 0.9777	128.33	20.453
03	142.60	28.500	< 1.7020	< 1.4280	139.38	22.728
04	151.10	22.700	< 1.0570	< 1.0670	137.78	25.228
05	153.80	24.000	< 1.8070	< 1.5680	126.80	23.903
06	134.00	22.170	< 1.0880	< 0.9351	139.80	25.603
07	114.50	18.520	< 1.0460	< 0.8470	130.18	21.348
21	131.20	21.990	< 1.2230	< 1.5220	137.33	22.845
22	145.60	28.950	< 1.5040	< 1.3980	146.15	24.203
23	159.10	23.220	< 0.9680	< 0.8052	139.78	21.200
24*	145.70	25.240	< 1.3760	< 1.3090	137.88	24.905
01A	111.40	20.470	< 1.0510	< 0.9918	132.03	20.768
05A	152.50	28.170	< 1.9510	< 1.6150	143.03	25.528

Mean of All Indicator Locations 136.88 23.076

* Control Location

TABLE 3-6
Soil
(pCi/kg dry wt.)

LOCATION	COLLECTION DATE	Sr-89	Sr-90	K-40 (+/-)	Cs-134	Cs-137 (+/-)	Ra-226 (+/-)
01							
02							
03							
04							
05							
06							
07							
21							
22							
23							
24*							
05A							

Soil sampled on Triennial basis. Not required in 2021

Mean

LOCATION	COLLECTION DATE	Th-228 (+/-)	Th-232 (+/-)
01			
02			
03			
04			
05			
06			
07			
21			
22			
23			
24*			
05A			

Mean

* Control Location

TABLE 3-7
Precipitation
(pCi/L)

LOCATION 01A

COLLECTION DATE	Gr-B		H-3	RainFall (inches)
	(+/-)			
01/26/21	4.8	1.4	< 915	1.82
02/24/21	2.6	1.0	< 954	4.30
03/31/21	3.1	1.0	< 937	3.07
04/27/21	2.9	1.1	< 942	3.44
05/25/21	(a)		(a)	0.41
06/29/21	1.7	0.9	< 963	5.34
07/27/21	8.6	1.7	< 718	2.40
08/31/21	4.2	1.3	< 925	4.99
09/28/21	7.6	1.6	< 745	2.54
10/26/21	6.7	1.5	< 925	3.26
11/30/21	5.3	1.3	< 970	1.81
12/28/21	(a)		< 935	0.36
Mean	4.7	1.3	-	Total 33.74

a) Sample unable to be analyzed (insufficient volume).

TABLE 3-7
Precipitation
(pCi/L)

LOCATION 01A

COLLECTION DATE	Be-7	Mn-54	Fe-59	Co-58	Co-60	Zn-65	Zr-95
06/29/21	< 35.02	< 1.383	< 9.689	< 2.772	< 1.312	< 2.897	< 5.213
12/28/21	< 40.10	< 1.456	< 10.63	< 3.016	< 1.282	< 3.110	< 5.945
Mean	-	-	-	-	-	-	-

COLLECTION DATE	Nb-95	Cs-134	Cs-137	Ba-140	La-140	I-131	Th-228
06/29/21	< 3.216	< 1.374	< 1.239	< 827.1	< 283.8	< 5325	< 2.212
12/28/21	< 3.436	< 1.288	< 1.165	< 1226	< 413.5	< 10800	< 3.284
Mean	-	-	-	-	-	-	-

TABLE 3-8
MILK
(pCi/L)

<u>LOCATION</u>	<u>COLLECTION DATE</u>	<u>K-40</u> (±)	<u>Sr-89</u>	<u>Sr-90</u>	<u>I-131*</u>	<u>Cs-134*</u>	<u>Cs-137*</u>	<u>Ba-140*</u>	<u>La-140*</u>
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*Milk samples could not be obtained in 2021 due the lack of dairy farms within the sampling area.

* LLD identified in ODCM

TABLE 3-9
Food and Vegetation
(pCi/kg wet wt.)

		LOCATION 14B									
COLLECTION DATE	Be-7		K-40		I-131**	Cs-134**	Cs-137**	Th-228			
	{+/-}		{+/-}					{+/-}			
04/13/21	346.3	135.8	7301	480.9	< 48.50	< 23.97	< 21.42	40.32	28.51		
05/11/21	839.4	259.7	4465	694.3	< 52.90	< 32.31	< 29.47	66.94	48.41		
06/08/21	1908	254.2	4967	544.5	< 37.10	< 24.36	< 25.85	63.53	30.83		
07/14/21	888.0	276.3	6503	1009	< 37.80	< 47.97	< 50.09	< 79.52			
08/10/21	2045	442.1	3225	679.2	< 51.30	< 42.94	< 36.96	92.54	53.82		
09/14/21	2804	349.3	6098	648.2	< 50.10	< 38.74	< 33.76	< 63.90			
10/12/21	2675	518.2	4664	908.4	< 31.10	< 40.95	< 42.14	< 77.67			
Mean	1644	319.4	5318	708.9	-	-	-	65.83	40.39		

		LOCATION 15									
COLLECTION DATE	Be-7		K-40		I-131**	Cs-134**	Cs-137**	Th-228			
	{+/-}		{+/-}					{+/-}			
04/13/21	1095	145.7	4198	293.4	< 46.10	< 15.29	< 13.78	36.46	21.83		
05/11/21	883.4	339.5	5036	802.3	< 50.20	< 33.97	< 26.90	62.00	43.06		
06/08/21	855.3	210.7	4932	549.8	< 37.90	< 26.67	< 26.41	< 37.70			
07/14/21	1085	263.4	8139	1070	< 26.40	< 36.18	< 41.39	77.35	52.53		
08/10/21	1190	315.5	6899	855.5	< 43.10	< 29.70	< 31.95	< 65.65			
09/14/21	535.5	406.2	9218	935.2	< 39.70	< 35.30	< 35.26	< 63.52			
10/12/21	2180	343.8	5449	727.8	< 39.80	< 37.89	< 27.36	< 66.14			
Mean	1118	289.3	6267	747.7	-	-	-	58.60	39.14		

		LOCATION 16*									
COLLECTION DATE	Be-7		K-40		I-131**	Cs-134**	Cs-137**	Th-228			
	{+/-}		{+/-}					{+/-}			
04/13/21	1314	145.5	5575	373.6	< 50.00	< 16.97	< 13.34	< 22.84			
05/11/21	< 293.4		3427	538.5	< 47.30	< 27.54	< 23.24	< 53.42			
06/08/21	220.9	204.1	3063	355.6	< 44.40	< 20.33	< 18.17	< 25.56			
07/14/21	1870	273.1	7189	501.8	< 34.60	< 23.14	< 21.69	86.78	35.85		
08/10/21	1179	324.7	7055	782.0	< 50.60	< 34.46	< 33.73	111.6	51.10		
09/14/21	2961	338.9	12940	858.6	< 51.20	< 36.88	< 36.18	91.26	46.54		
10/12/21	2737	485.6	4572	838.9	< 24.10	< 49.97	< 31.39	< 75.22			
Mean	1714	295.3	6260	607.0	-	-	-	89.88	44.50		

*Control Station
** LLD identified in ODCM

TABLE 3-9
Food and Vegetation
(pCi/kg wet wt.)

LOCATION 23

COLLECTION DATE	Be-7		K-40		I-131**	Cs-134**	Cs-137**	Ac-228		Th-228		Th-232	
	(+/-)		(+/-)					(+/-)		(+/-)		(+/-)	
04/13/21	1629	184.8	5818	403.7	< 51.40	< 19.34	< 16.95	< 78.35	52.96	23.54	< 78.29		
05/11/21	787.9	257.5	5208	627.3	< 43.50	< 32.57	< 33.26	< 116.0	142.3	50.61	< 115.9		
06/08/21	1143	254.6	5203	508.6	< 44.40	< 31.81	< 23.30	< 146.9	147.4	47.08	251.1	58.22	
07/14/21	1871	217.9	5017	455.6	< 32.10	< 26.90	< 19.82	177.1	123.9	198.4	38.21	220.8	58.52
08/10/21	1926	338.2	5290	728.7	< 39.00	< 48.03	< 40.35	< 170.6	196.0	63.51	< 170.5		
09/14/21	1161	397.0	5686	655.8	< 43.50	< 38.09	< 32.48	457.5	121.9	107.0	44.30	< 198.9	
10/12/21	1841	361.9	4331	655.1	< 31.50	< 38.61	< 33.34	< 174.6	< 67.87		< 174.5		
Mean	1480	287.1	5222	576.1	-	-	-	317.3	122.9	140.7	44.21	238.0	57.37

LOCATION 26

COLLECTION DATE	Be-7		K-40		I-131**	Cs-134**	Cs-137**	Th-228	
	(+/-)		(+/-)					(+/-)	
04/13/21	1094	187.8	2980	395.8	< 50.00	< 25.07	< 21.61	32.39	28.53
05/11/21	799.8	325.2	4742	625.7	< 39.80	< 42.61	< 39.56	56.47	48.87
06/08/21	2034	288.1	5503	588.7	< 36.00	< 27.14	< 26.04	61.00	32.99
07/14/21	1058	370.7	3932	722.1	< 34.70	< 38.19	< 36.98	< 58.97	
08/10/21	1025	300.0	2132	448.1	< 40.70	< 33.27	< 29.62	< 52.28	
09/14/21	1299	268.9	4058	560.5	< 51.40	< 34.81	< 31.80	< 61.21	
10/12/21	2488	387.9	2285	547.0	< 38.60	< 39.31	< 35.15	< 65.87	
Mean	1400	304.1	3662	555.1	-	-	-	49.95	36.80

All Indicator Mean	Be-7		K-40		I-131**	Cs-134**	Cs-137**	Ac-228		Th-228		Th-232	
	(+/-)		(+/-)					(+/-)		(+/-)		(+/-)	
	1410	300.0	5117	647.0	-	-	-	317.3	122.9	89.57	40.91	238.0	57.37

** LLD identified in ODCM

TABLE 3-10
WELL WATER
(pCi/L)

LOCATION	COLLECTION DATE	H-3	Sr-89	Sr-90	Mn-54	Fe-59	Co-58	Co-60	Zn-65
01A	03/31/21	< 862	(a)	(a)	< 2.08	< 4.23	< 2.10	< 2.00	< 4.54
	06/29/21	< 841	< 3.45	< 0.865	< 9.00	< 17.0	< 9.08	< 7.52	< 17.2
	09/28/21	< 744	(a)	(a)	< 8.11	< 15.5	< 7.22	< 7.90	< 12.5
	12/28/21	< 926	(a)	(a)	< 6.36	< 11.5	< 7.92	< 7.57	< 15.7
	Mean	-	-	-	-	-	-	-	-

LOCATION	COLLECTION DATE	Zr-95	Nb-95	I-131	Cs-134	Cs-137	Ba-140	La-140
01A	03/31/21	< 3.79	< 2.98	< 3.59	< 2.27	< 2.21	< 10.4	< 3.55
	06/29/21	< 13.8	< 10.3	< 9.54	< 9.26	< 7.85	< 33.9	< 11.4
	09/28/21	< 11.4	< 7.93	< 9.94	< 8.11	< 7.55	< 26.8	< 12.3
	12/28/21	< 11.6	< 8.60	< 9.72	< 7.81	< 6.78	< 31.1	< 10.0
	Mean	-	-	-	-	-	-	-

(a) Sr-89/90 analyses performed on the second quarter sample.

TABLE 3-11
River Water
(pCi/L)

LOCATION 11

COLLECTION DATE	H-3		Sr-89	Sr-90	Mn-54*	Fe-59*	Co-58*	Co-60*	Zn-65*
	(±)								
01/12/21	(a)		(b)	(b)	< 5.462	< 12.81	< 4.974	< 4.373	< 11.59
02/16/21	(a)		(b)	(b)	< 5.332	< 9.643	< 4.713	< 6.686	< 11.90
03/16/21	4030	833.0	(b)	(b)	< 5.846	< 9.126	< 4.698	< 6.334	< 10.70
04/13/21	(a)		(b)	(b)	< 5.636	< 12.23	< 4.785	< 5.646	< 7.840
05/11/21	(a)		(b)	(b)	< 4.540	< 11.90	< 5.618	< 6.664	< 10.41
06/15/21	2620	583.0	< 4.220	< 0.907	< 5.939	< 10.29	< 7.292	< 7.403	< 14.75
07/14/21	(a)		(b)	(b)	< 5.422	< 10.31	< 5.189	< 6.160	< 10.97
08/17/21	(a)		(b)	(b)	< 5.826	< 12.14	< 5.547	< 5.096	< 12.05
09/14/21	2210	582.0	(b)	(b)	< 4.546	< 10.23	< 4.682	< 4.787	< 7.161
10/12/21	(a)		(b)	(b)	< 2.457	< 4.623	< 2.278	< 2.622	< 5.380
11/16/21	(a)		(b)	(b)	< 5.862	< 11.79	< 5.016	< 4.728	< 10.89
12/14/21	1580	683.0	(b)	(b)	< 4.982	< 9.706	< 4.604	< 5.995	< 7.412
Mean	2610	670.3	-	-	-	-	-	-	-
	Nb-95*		Zr-95*	I-131*	Cs-134*	Cs-137*	Ba-140*	La-140*	
01/12/21	< 6.526		< 8.879	< 0.897	< 5.854	< 5.960	< 26.25	< 9.952	
02/16/21	< 5.957		< 9.935	< 0.773	< 6.639	< 6.770	< 22.41	< 9.409	
03/16/21	< 6.067		< 9.645	< 0.709	< 6.802	< 5.521	< 22.98	< 6.198	
04/13/21	< 5.742		< 10.03	< 0.808	< 6.470	< 6.070	< 18.12	< 8.434	
05/11/21	< 3.913		< 8.205	< 0.764	< 5.340	< 5.056	< 19.82	< 7.676	
06/15/21	< 5.208		< 11.41	< 0.471	< 7.194	< 6.956	< 21.67	< 7.879	
07/14/21	< 7.281		< 9.017	< 0.636	< 6.632	< 6.403	< 21.53	< 7.428	
08/17/21	< 6.508		< 10.16	< 0.885	< 5.852	< 5.275	< 20.34	< 8.560	
09/14/21	< 5.223		< 7.394	< 0.695	< 4.992	< 4.995	< 22.35	< 7.306	
10/12/21	< 2.451		< 3.981	< 0.293	< 2.604	< 2.574	< 10.04	< 3.216	
11/16/21	< 5.696		< 7.310	< 0.760	< 5.300	< 5.857	< 18.76	< 6.721	
12/14/21	< 6.023		< 9.953	< 0.402	< 5.275	< 4.457	< 19.74	< 4.745	
Mean	-		-	-	-	-	-	-	

* LLD identified in ODCM.

(a) Tritium analyses on quarterly composite.

(b) Sr-89/90 performed on 2nd quarter composite sample.

TABLE 3-12
Surface Water
(pCWL)

LOCATION 08

COLLECTION DATE	H-3		Sr-89	Sr-90	Mn-54*	Fe-59*	Co-58*	Co-60*	Zn-65*
	(±/-)								
01/12/21	(a)		(b)	(b)	< 4.744	< 9.440	< 5.193	< 5.089	< 10.31
02/16/21	(a)		(b)	(b)	< 5.202	< 12.48	< 4.647	< 6.201	< 8.795
03/16/21	3570	809.0	(b)	(b)	< 5.123	< 9.162	< 5.370	< 6.379	< 9.004
04/13/21	(a)		(b)	(b)	< 6.146	< 16.57	< 6.227	< 8.633	< 17.52
05/11/21	(a)		(b)	(b)	< 5.537	< 12.97	< 6.050	< 5.235	< 12.48
06/15/21	2600	586.0	< 4.280	< 0.823	< 5.290	< 11.16	< 5.277	< 6.219	< 12.82
07/14/21	(a)		(b)	(b)	< 4.306	< 11.90	< 5.511	< 6.839	< 10.25
08/17/21	(a)		(b)	(b)	< 4.923	< 10.95	< 5.072	< 7.067	< 11.43
09/14/21	2350	601.0	(b)	(b)	< 5.045	< 9.829	< 4.444	< 5.002	< 8.307
10/12/21	(a)		(b)	(b)	< 2.482	< 5.292	< 2.495	< 2.835	< 4.929
11/18/21	(a)		(b)	(b)	< 6.611	< 12.43	< 6.520	< 5.680	< 12.79
12/14/21	2110	715.0	(b)	(b)	< 5.469	< 10.53	< 5.587	< 4.114	< 10.29
Mean	2658	677.8	-	-	-	-	-	-	-
	Nb-95*	Zr-95*	I-131*	Cs-134*	Cs-137*	Ba-140*	La-140*		
01/12/21	< 6.135	< 9.134	< 0.803	< 5.941	< 5.996	< 22.22	< 10.54		
02/16/21	< 4.313	< 8.985	< 0.836	< 6.603	< 6.278	< 18.78	< 6.597		
03/16/21	< 2.958	< 8.575	< 0.840	< 5.716	< 6.066	< 19.26	< 6.251		
04/13/21	< 6.902	< 7.265	< 0.943	< 5.386	< 6.059	< 21.67	< 7.266		
05/11/21	< 5.413	< 11.27	< 0.627	< 6.238	< 5.761	< 23.76	< 6.585		
06/15/21	< 6.120	< 9.773	< 0.574	< 6.084	< 6.874	< 23.21	< 7.660		
07/14/21	< 5.780	< 9.532	< 0.777	< 7.272	< 6.723	< 24.06	< 7.985		
08/17/21	< 5.347	< 10.76	< 0.889	< 6.610	< 6.464	< 20.37	< 8.556		
09/14/21	< 5.008	< 7.307	< 0.679	< 4.296	< 4.608	< 20.00	< 6.362		
10/12/21	< 2.261	< 4.120	< 0.730	< 2.790	< 2.502	< 9.721	< 3.713		
11/18/21	< 5.245	< 11.12	< 0.816	< 7.482	< 5.266	< 24.16	< 8.148		
12/14/21	< 5.069	< 8.382	< 0.824	< 5.214	< 4.717	< 17.88	< 6.814		
Mean	-	-	-	-	-	-	-		

* LLD identified in ODCM.

(a) Tritium analyses on quarterly composite.

(b) Sr-89/90 performed on 2nd quarter composite sample.

TABLE 3-12
Surface Water
(pCi/L)

LOCATION 09A**

COLLECTION DATE	H-3	Sr-89	Sr-90	Mn-54*	Fe-59*	Co-58*	Co-60*	Zn-65*
01/12/21	(a)	(b)	(b)	< 5.045	< 9.934	< 3.817	< 5.891	< 7.664
02/16/21	(a)	(b)	(b)	< 7.402	< 13.09	< 7.237	< 9.113	< 16.60
03/16/21	< 975	(b)	(b)	< 5.600	< 12.53	< 4.810	< 5.748	< 13.37
04/13/21	(a)	(b)	(b)	< 5.625	< 8.096	< 6.393	< 6.535	< 9.570
05/11/21	(a)	(b)	(b)	< 5.644	< 9.202	< 5.834	< 6.901	< 11.77
06/15/21	< 685	< 4.450	< 0.819	< 5.381	< 14.03	< 5.228	< 4.529	< 9.524
07/14/21	(a)	(b)	(b)	< 5.156	< 11.17	< 6.016	< 5.081	< 12.67
08/17/21	(a)	(b)	(b)	< 4.454	< 12.90	< 4.335	< 4.684	< 13.48
09/14/21	< 710	(b)	(b)	< 4.392	< 9.377	< 4.497	< 6.001	< 10.89
10/12/21	(a)	(b)	(b)	< 1.658	< 2.956	< 1.636	< 1.989	< 3.539
11/16/21	(a)	(b)	(b)	< 6.378	< 9.069	< 5.723	< 7.010	< 9.624
12/14/21	< 950	(b)	(b)	< 4.320	< 10.230	< 3.676	< 4.830	< 9.707
Mean	-	-	-	-	-	-	-	-
	Nb-95*	Zr-95*	I-131*	Cs-134*	Cs-137*	Ba-140*	La-140*	
01/12/21	< 4.381	< 8.069	< 0.867	< 4.718	< 4.079	< 25.72	< 7.173	
02/16/21	< 6.289	< 10.28	< 0.921	< 7.806	< 5.700	< 20.98	< 7.321	
03/16/21	< 5.732	< 10.68	< 0.756	< 6.423	< 6.949	< 22.93	< 6.275	
04/13/21	< 5.826	< 9.084	< 0.743	< 6.654	< 5.626	< 21.21	< 6.822	
05/11/21	< 5.856	< 11.33	< 0.693	< 6.757	< 6.036	< 17.99	< 8.381	
06/15/21	< 5.465	< 10.99	< 0.594	< 7.165	< 5.247	< 24.64	< 7.143	
07/14/21	< 4.662	< 9.861	< 0.343	< 6.740	< 6.105	< 22.40	< 8.316	
08/17/21	< 5.165	< 9.592	< 0.820	< 5.446	< 4.749	< 19.68	< 6.360	
09/14/21	< 4.691	< 8.345	< 0.824	< 5.004	< 4.726	< 20.47	< 7.483	
10/12/21	< 1.482	< 2.546	< 0.788	< 1.692	< 1.755	< 7.422	< 2.615	
11/16/21	< 6.649	< 12.36	< 0.499	< 6.817	< 6.362	< 21.40	< 6.864	
12/14/21	< 4.293	< 6.543	< 0.715	< 5.592	< 4.534	< 17.12	< 4.779	
Mean	-	-	-	-	-	-	-	

* LLD identified in ODCM.

**Control location.

(a) Tritium analyses on quarterly composite.

(b) Sr-89/90 performed on 2nd quarter composite sample.

TABLE 3-13
Sediment Silt
(pCi/kg dry wt.)

LOCATION	COLLECTION DATE	Sr-89		Sr-90		K-40		Cs-134		Cs-137		Ra-226	
						(+/-)						(+/-)	
08	04/08/21	(a)		(a)		2031	692.6	< 52.48		< 54.22		< 984.8	
09A*	04/08/21	(a)		(a)		15260	1742	< 83.37		< 84.54		< 1474	
11	04/08/21	(a)		(a)		19930	1578	< 72.71		< 80.99		< 994.1	
08	10/06/21	< 1580		< 40.30		1537	450.4	< 39.52		< 44.47		< 847.5	
09A*	10/06/21	< 720.0		< 44.80		13300	1375	< 62.04		< 47.28		< 1337	
11	10/06/21	< 1530		< 38.70		19070	1859	< 117.1		< 109.3		2568	2039
	Indicator Mean	-		-		10642	1145	-		-		2568	2039
	Control Mean	-		-		14280	1559	-		-		-	-

LOCATION	COLLECTION DATE	Th-228		Th-232	
		(+/-)		(+/-)	
08	04/08/21	< 97.18		< 297.7	
09A*	04/08/21	218.4	113.2	< 352.2	
11	04/08/21	809.0	132.4	824.3	196.6
08	10/06/21	89.72	70.21	< 193.8	
09A*	10/06/21	198.1	109.6	< 292.7	
11	10/06/21	1373	243.4	1687	238.0
	Indicator Mean	757.2	148.7	1256	217.3
	Control Mean	208.3	111.4	-	-

(a) Sr-89/90 analyses performed annually.
* Control location, Background location

TABLE 3-14
Shoreline Soil
(pCi/kg dry wt.)

		LOCATIONS									
LOCATION	COLLECTION DATE	Sr-89		Sr-90		K-40		Cs-134*	Cs-137*	Ra-226	
						(+/-)				(+/-)	
08	04/08/21	(a)		(a)		1388	412.8	< 35.98	< 32.25	873.6	531.2
08	10/06/21	< 816.0		< 47.50		< 1063.0		< 45.71	< 37.80	< 999.3	
	Mean	-		-		1388	412.8	-	-	873.6	531.2
LOCATION	COLLECTION DATE	Th-228		Th-232							
08	04/08/21	79.56	46.91	< 139.0							
08	10/06/21	< 103.4		< 222.0							
	Mean	79.56	46.91	-							

* LLD identified on ODCM

(a) Sr-89/90 analyses performed annually.

TABLE 3-15
Fish
(pCi/kg wet wt.)

LOCATION	Fish Type	COLLECTION		K-40 (+/-)	Mn-54*	Fe-59*	Co-58*	Co-60*	Zn-65*
		DATE							
08	(a)	05/05/21	1704	658.5	< 49.68	< 91.86	< 52.48	< 46.44	< 77.56
	(b)	05/05/21	1458	618.3	< 43.70	< 54.38	< 50.98	< 45.96	< 76.84
	(a)	11/01/21	1044	495.9	< 41.82	< 84.76	< 40.00	< 38.78	< 85.08
	(b)	11/01/21	1238	673.5	< 46.08	< 75.88	< 43.63	< 42.77	< 84.00
25**	(a)	05/11/21	1436	859.0	< 68.35	< 147.0	< 80.70	< 78.90	< 153.7
	(b)	05/11/21	1055	657.0	< 55.23	< 128.7	< 52.39	< 73.44	< 112.6
	(a)	11/05/21	808.1	361.1	< 25.00	< 50.26	< 24.29	< 27.18	< 52.30
	(b)	11/05/21	381.9	315.8	< 25.76	< 50.22	< 21.75	< 24.85	< 51.28
		Mean	1141	579.9	-	-	-	-	-
		Indicator Mean	1351	611.6	-	-	-	-	-
		Control Mean	920.3	548.2	-	-	-	-	-

LOCATION	Fish Type	COLLECTION		Cs-134*	Cs-137*
		DATE			
08	(a)	05/05/21	< 50.24	< 52.30	
	(b)	05/05/21	< 41.40	< 43.96	
	(a)	11/01/21	< 41.24	< 44.30	
	(b)	11/01/21	< 45.52	< 42.82	
25**	(a)	05/11/21	< 89.76	< 76.27	
	(b)	05/11/21	< 51.74	< 40.88	
	(a)	11/05/21	< 27.38	< 25.50	
	(b)	11/05/21	< 24.95	< 24.28	
		Mean	-	-	
		Indicator Mean	-	-	
		Control Mean	-	-	

* LLD identified in ODCM

**Control Station

(a) Non-bottom dwelling species of gametfish.

(b) Bottom dwelling species of fish.

4. DISCUSSION OF RESULTS

Data from the radiological analyses of environmental media collected during 2021 and tabulated in Section 3, are discussed below. Except for TLDs, Teledyne Brown Engineering analyzed all samples throughout the year. The procedures and specifications followed for these analyses are as required in the TBE 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 2021 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, Th-228 and Th-232 were detected in numerous samples. Th-228 & Th-232 results were variable and are generally at levels higher than plant related radionuclides. In the past, Cs-137, a plant related nuclide, has been detected in soil and aquatic sediment samples at levels corresponding to levels associated with fallout from nuclear weapons tests.

The following is a discussion and summary of the results of the environmental measurements taken during the 2021 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 the 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 CaSO₄:Dy in Teflon TLDs in January 2001. The dose with the replacement TLDs is lower than that of the previously used TLDs. This will continue to be monitored.

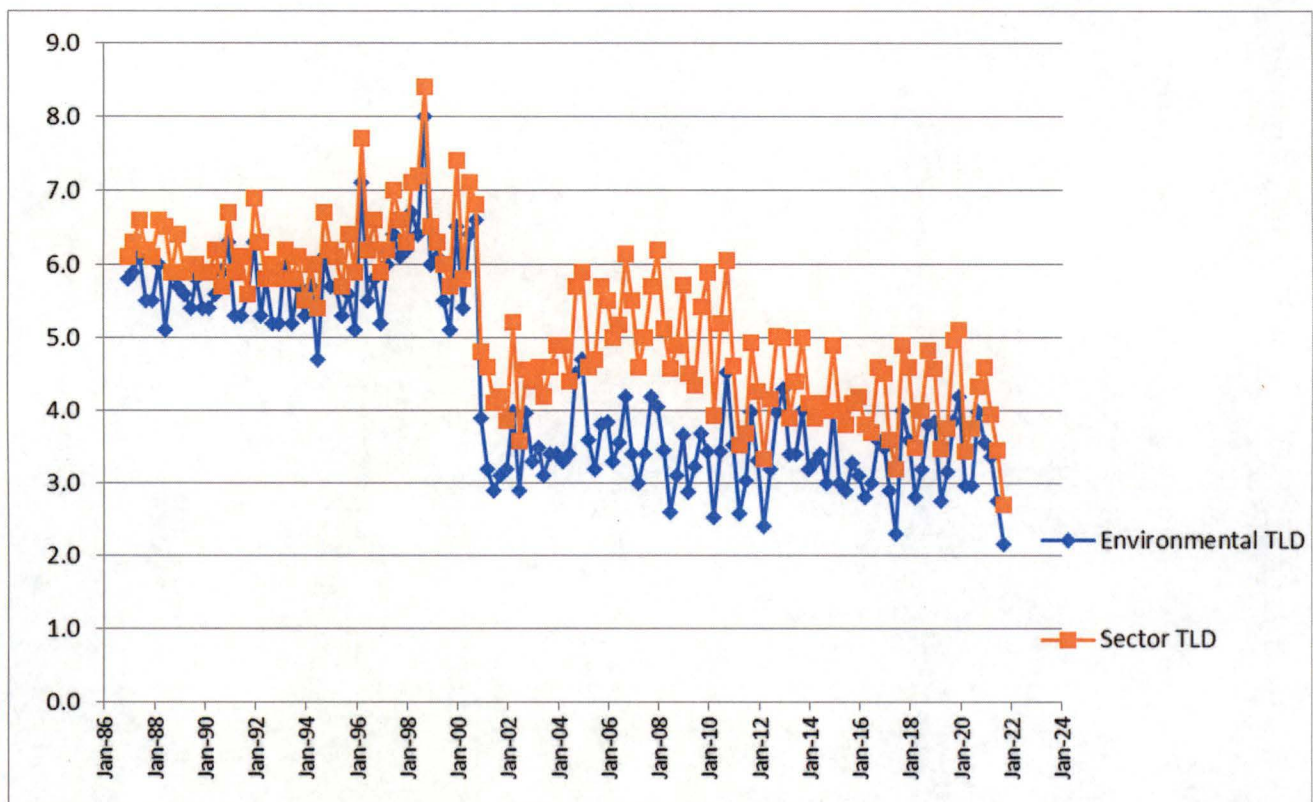


Figure 4-1 TLD (mrem/Standard Month)

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 these 32 sector TLD locations (two badges at each location) was 3.7 mR/standard month with a range of 1.0 to 8.0 mR/standard month. The highest quarterly average reading for any single location was obtained at location NW-29/61. This value was 6.4 mR/standard month. This location is on site on the Laydown Area north gate. Quarterly and annual TLDs are also located at twelve environmental air sampling stations. For the eleven indicator locations within 10 miles of the station the average quarterly reading was 3.0 mR/standard month with a range of 1.3 to 5.0 mR/standard month. The average annual reading for these locations was 1.6 mR/standard month with a range from .8 to 2.5 mR/standard month. The control location showed a quarterly average of 2.9 mR/standard month with a range of 2.3 to 4.0 mR/standard month. Its annual reading was 1.5 mR/standard month. 10 emergency sector TLDs, which are all located onsite had a quarterly average of 4.3 mR/standard month with EPSP-9/10 having the highest quarterly average of 6.3 mR/standard month. Eight other TLDs, designated C-1 thru C-8, which were pre-operational controls, were collected quarterly from four locations. Stations C-3/4 and C-7/8 are designated controls. These had a quarterly average of 3.1 mR/standard month, while Station C-1/2 and C-5/6 had a quarterly average of 2.4 mR/standard month with a range of 1.3 to 3.3 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 historical plot in Figure 4-2, indicates gross beta activity levels have remained relatively unchanged. The drop indicated in 2009 is a function of a return to the vendor used from 1988 until 2001. 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/m³ to a high of 0.75 pCi/m³.

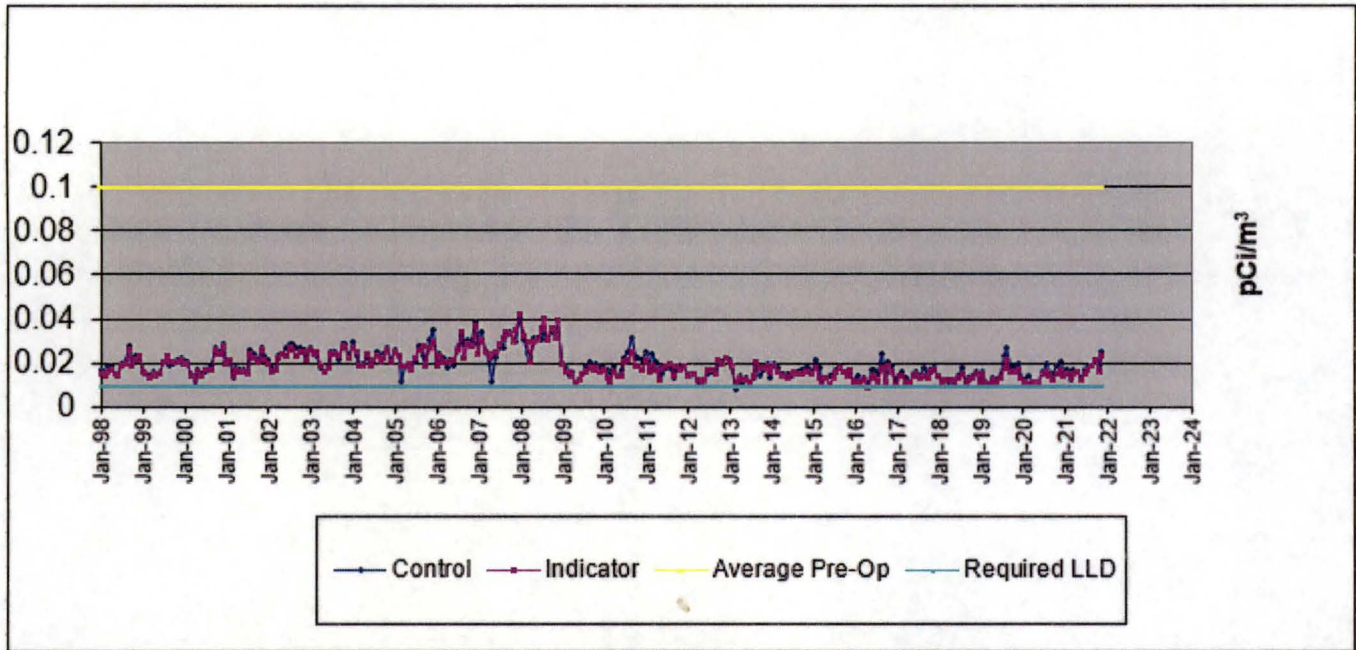


Figure 4-2 Historical Gross Beta in Air Particulates

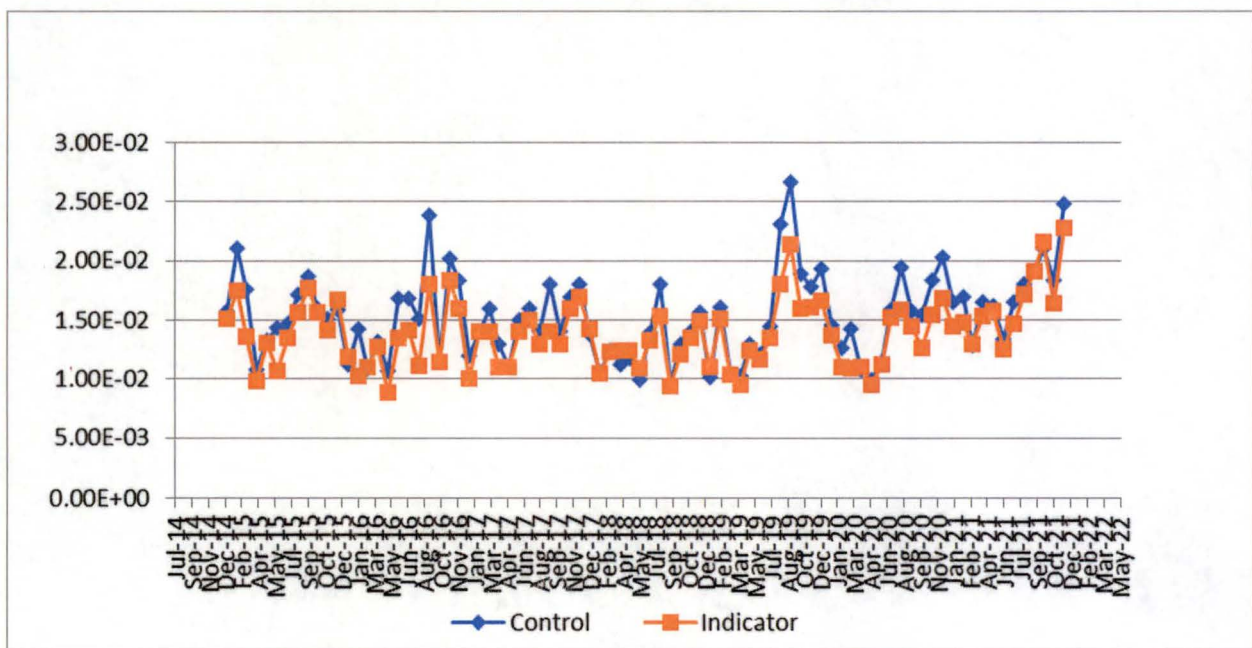


Figure 4-3 2021 Gross Beta in Air Particulates (pCi/m³)

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. 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 and the effect of the Fukushima Daiichi event.

4.4 Air Particulate Gamma

The air particulate filters that are utilized for the weekly gross beta analyses are composited by location and analyzed quarterly by gamma spectroscopy. 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. The results of these analyses indicate the lack of station effects on the environment.

4.5 Air Particulate Strontium

Strontium-89 and 90 analyses are performed on the second quarter composites of air particulate filters from all monitoring stations. There has been no detection of these fission products at any of the indicator or control stations in recent years.

4.6 Soil

Soil samples, which are collected every three years from twelve stations, were not due to be collected during the reporting period.

4.7 Precipitation

A sample of rain water was collected monthly, when available, at on-site station 01A and analyzed for gross beta activity and H-3. The results are presented in Table 3-7. Eleven precipitation samples were obtained in 2021. There was insufficient volume to obtain a sample in May 2021. In December 2021, a sample was obtained but the available sample volume was only sufficient to perform tritium analysis. The gross beta analysis was not completed for the December 2021 sample. Semi-annual composites are prepared and analyzed for gamma emitting isotopes in accordance with program requirements. No plant related isotopes were reported in any precipitation water sample at the indicator location. Naturally occurring gamma emitting radioisotopes were not detected. No positive H-3 result was reported. 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 cannot be made to the 2021 period. During the pre-operational period, tritium was measured in over half of the few quarterly composites made. This tritium activity ranged from 100 to 330 pCi/liter.

4.8 Cow Milk

Milk samples were unavailable during the reporting period due to the closure of the final operating dairy within the sampling area on 1/1/18.

4.9 Food Products and Vegetation

Food/vegetation samples were collected from five locations and analyzed by gamma spectroscopy. The results of the analyses are presented in Table 3-9. Low levels of Cs-137, attributable to fallout, have been seen periodically in vegetation samples. As expected, naturally occurring potassium-40 and cosmogenic beryllium-7 were detected in most samples, naturally occurring thorium-228 and thorium-232 were detected in some samples. No plant related isotopes were identified in any vegetation sample during 2021.

4.10 Well Water

Water was sampled quarterly from the onsite well at the metrology laboratory. These samples were analyzed for gamma radiation and for tritium. The second quarter sample was analyzed by vendor for Sr-89, Sr-90, H-3, I-131, and gamma emitters. The results of these analyses are presented in Table 3-10. No plant related isotopes were detected. No gamma emitting isotopes were detected during the pre-operational period.

4.11 River Water

Samples of water from the North Anna River were collected monthly. The analyses are presented in Table 3-11. All monthly samples are analyzed by gamma spectroscopy. The monthly samples are composited quarterly and analyzed for tritium. Additionally, the second quarter samples are analyzed for strontium-89 and strontium-90 in accordance with program requirements. There has been no detection of these fission products at any of the indicator or control stations in recent years.

No gamma emitting radioisotopes were positively identified 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 2610 pCi/liter and a range of 1580 to 4030 pCi/liter, see Figure 4-4. No river water samples were collected during the pre-operational period.

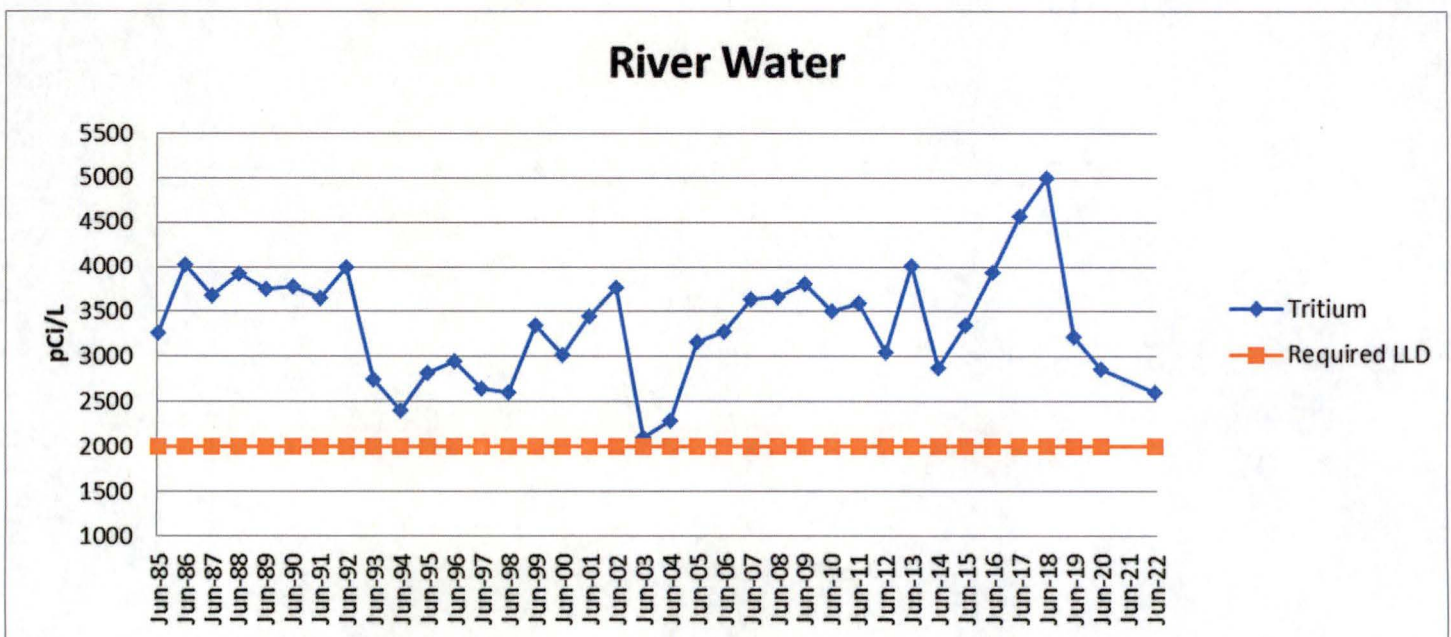


Figure 4-4 Tritium in River water

4.12 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 spectroscopy and for iodine-131 by radiochemical separation. A quarterly composite from each station was prepared and analyzed for tritium. Additionally, the second quarter samples are analyzed for strontium-89 and strontium-90. There has been no positive indication of these fission products at any of the indicator or control stations in recent years. The results are presented in Table 3-12.

No non-naturally occurring gamma emitting radioisotopes, including iodine were detected in any of the samples. Tritium was not detected in any sample at the control location. The average level of tritium activity at the indicator location was 2658 pCi/L with a range of 2110 to 3570 pCi/L.

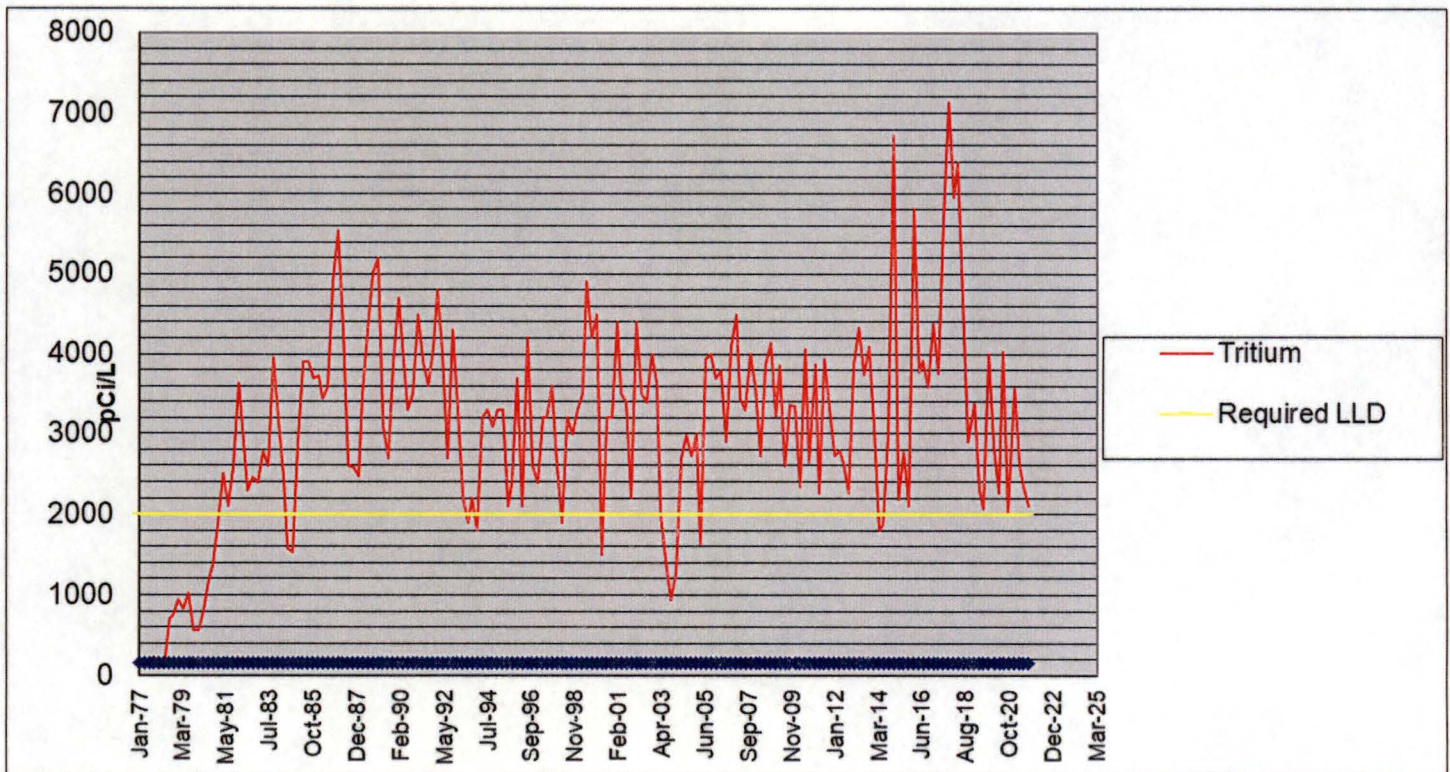


Figure 4.5 Tritium in Surface Water

4.13 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 April and October from each of three locations and were analyzed by gamma spectroscopy. The October samples were analyzed for strontium-89 and strontium-90. The results are presented in Table 3-13.

No plant related isotopes were detected in 2021. 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 also analyzed by gamma spectroscopy. Figure 4-6 shows the historical trend of Cs-137 in sediments.

Neither Strontium-89 nor Strontium-90 was detected in any samples of aquatic sediment/silt in 2021. Strontium-90 has been detected occasionally in the past at both the indicator and control locations and is attributable to fallout from past bomb tests. A number of naturally occurring radioisotopes were detected in these samples at background levels.

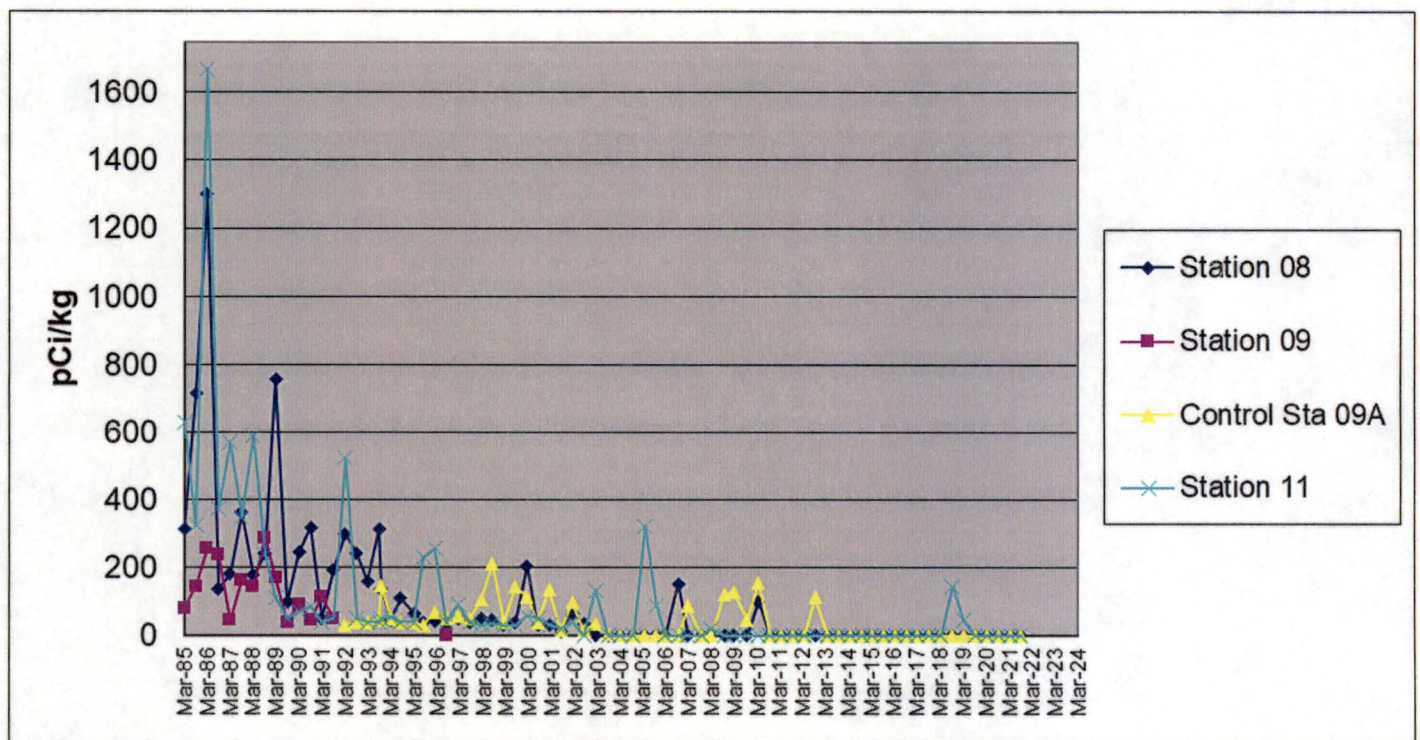


Figure 4-6 Cs-137 in Sediment/Silt

4.14 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. Samples of shoreline soil were collected in April and October from indicator station 08. The samples were analyzed by gamma spectroscopy. The October 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. No plant related isotopes were detected in any indicator samples analyzed. Strontium-90 is often 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.

4.15 Fish

Four sample sets of fish, two from Lake Anna and two from the control station, Lake Orange, were collected during 2021 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. Naturally occurring K-40 was detected in all samples. No plant related isotopes were detected. Cs-137 was measured in pre-operational environmental fish samples.

5. PROGRAM EXCEPTIONS

REMP Exceptions for Scheduled Sampling and Analysis during 2021 – North Anna

Location	Description	Date of Sampling	Reason(s) for Loss/Exception
14B,15,16,23,26	Vegetation	01/12/21	Seasonal unavailability
14B,15,16,23,26	Vegetation	02/10/21	Seasonal unavailability
14B,15,16,23,26	Vegetation	03/09/21	Seasonal unavailability
01A	Precipitation	05/25/21	Insufficient volume to collect sample
14B,15,16,23,26	Vegetation	11/09/21	Seasonal unavailability
01A	Precipitation	11/30/21	Unable to meet required minimum sample volume
14B,15,16,23,26	Vegetation	12/14/21	Seasonal unavailability
01A	Precipitation	12/28/21	Sample volume insufficient to perform scheduled analysis for gross beta.
* N/A	Vendor ICP Analysys	First Half 2020	See below

The vendor (Teledyne Brown Eng.) did not perform Interlaboratory Comparison Program analysis for Milk (I-131, Gamma, Sr-89 and Sr-90) and Air Particulate (Gamma, Sr-89, Sr-90) in the first half of 2020. These analyses are required by Dominions VPAP-2103N (semi-annually). The reason provided by the vendor was “there were unforeseen circumstances between Teledyne Brown’s business office and the independent lab Eckert& Ziegler the ICP provider”. Analysis was performed in Sept. 0f 2020 for the above listed and again in December of 2020.

*** This entry is included in the 2021 report as it was inadvertently omitted from the 2020 Environmental Operating Report.**

REFERENCES

Dominion, North Anna Power Station Technical Specifications, Units 1 and 2.

Dominion, North Anna Power Station Independent Spent Fuel Storage Installation Technical Specifications.

Dominion, Station Administrative Procedure, VPAP-2103N, "Offsite Dose Calculation Manual".

Virginia Electric and Power Company, North Anna Technical Procedure, HP-3051.010, "Radiological Environmental Monitoring Program".

Title 10 Code of Federal Regulation, Part 50 (10CFR50), "Domestic Licensing of Production and Utilization Facilities".

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.

United States Nuclear Regulatory Commission, Regulatory Guide 4.8 "Environmental Technical Specifications for Nuclear Power Plants", December 1975.

USNRC Branch Technical Position, "Acceptable Radiological Environmental Monitoring Program", Rev. 1, November 1979.

NUREG 0472, "Radiological Effluent Technical Specifications for PWRs", Rev. 3, March 1982.

HASL-300, Environmental Measurements Laboratory, "EML Procedures Manual," 27th Edition, Volume 1, February 1992.

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 2021

LAND USE CENSUS
North Anna Power Station
Louisa County, Virginia
January 1 to December 31, 2021

<i>Direction</i>	<i>Distance (miles)</i>					
	<i>Nearest Site Boundary</i>	<i>Nearest Resident</i>	<i>Nearest Garden (> 50m²)</i>	<i>Nearest Meat Animal</i>	<i>Nearest Milch Cow</i>	<i>Nearest Milch Goat</i>
<i>N</i>	0.87	1.3	2.75	NONE	<i>NONE</i>	<i>NONE</i>
<i>NNE</i>	0.85	0.9	3.25	1.6	<i>NONE</i>	<i>NONE</i>
<i>NE</i>	0.82	0.9	1.6	1.6	<i>NONE</i>	<i>NONE</i>
<i>ENE</i>	0.81	2.37	2.4	2.49	<i>NONE</i>	<i>NONE</i>
<i>E</i>	0.83	1.25	2.05	3.5	<i>NONE</i>	<i>NONE</i>
<i>ESE</i>	0.85	1.7	1.7	NONE	<i>NONE</i>	<i>NONE</i>
<i>SE</i>	0.88	1.4	1.4	1.4	<i>NONE</i>	<i>NONE</i>
<i>SSE</i>	0.91	1.0	2.66	1.6	<i>NONE</i>	<i>NONE</i>
<i>S</i>	0.94	1.03	1.48	2.0	<i>NONE</i>	<i>NONE</i>
<i>SSW</i>	1.01	1.11	2.00	2.0	<i>NONE</i>	<i>NONE</i>
<i>SW</i>	1.06	1.65	3.96	NONE	<i>NONE</i>	<i>NONE</i>
<i>WSW</i>	1.09	1.62	2.26	NONE	<i>NONE</i>	<i>NONE</i>
<i>W</i>	1.06	1.5	1.93	NONE	<i>NONE</i>	<i>NONE</i>
<i>WNW</i>	1.02	1.1	2.67	NONE	<i>NONE</i>	<i>NONE</i>
<i>NW</i>	0.97	0.98	1.09	NONE	<i>NONE</i>	<i>NONE</i>
<i>NNW</i>	0.90	1.0	1.33	2.3	<i>NONE</i>	<i>NONE</i>

2020 to 2021 Land Use Census Changes

Nearest	Direction	2020 Distance	2021 Distance
Resident	SSW	1.27	1.11
Site Boundary	NONE		
Garden	E	1.75	2.05
	WSW	1.77	2.26
Meat Animal	N	4.03	NONE
	WNW	4.98	NONE
Milch Cow	NONE		
Milch Goat	NONE		

APPENDIX B: SUMMARY OF INTERLABORATORY COMPARISONS

YEAR 2021

Summary of Results – Inter-laboratory Comparison Program (ICP)

The TBE Laboratory analyzed Performance Evaluation (PE) samples of air particulate (AP), air iodine, milk, soil, vegetation, and water matrices for various analytes. The PE samples supplied by Analytics Inc., Environmental Resource Associates (ERA) and Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP), were evaluated against the following pre-set acceptance criteria:

A. Analytics Evaluation Criteria

Analytics' evaluation report provides a ratio of TBE's result and Analytics' known value. Since flag values are not assigned by Analytics, TBE evaluates the reported ratios based on internal QC requirements based on the DOE MAPEP criteria.

B. ERA Evaluation Criteria

ERA's evaluation report provides an acceptance range for control and warning limits with associated flag values. ERA's acceptance limits are established per the US EPA, National Environmental Laboratory Accreditation Conference (NELAC), state-specific Performance Testing (PT) program requirements or ERA's SOP for the Generation of Performance Acceptance Limits, as applicable. The acceptance limits are either determined by a regression equation specific to each analyte or a fixed percentage limit promulgated under the appropriate regulatory document.

C. DOE Evaluation Criteria

MAPEP's evaluation report provides an acceptance range with associated flag values. MAPEP defines three levels of performance:

- Acceptable (flag = "A") - result within $\pm 20\%$ of the reference value
- Acceptable with Warning (flag = "W") - result falls in the $\pm 20\%$ to $\pm 30\%$ of the reference value
- Not Acceptable (flag = "N") - bias is greater than 30% of the reference value

Note: The Department of Energy (DOE) Mixed Analyte Performance Evaluation Program (MAPEP) samples are created to mimic conditions found at DOE sites which do not resemble typical environmental samples obtained at commercial nuclear power facilities.

For the TBE laboratory, 146 out of 154 analyses performed met the specified acceptance criteria. Seven analyses did not meet the specified acceptance criteria and were addressed through the TBE Corrective Action Program. *NOTE: One analysis (soil for Tc-99) that did not meet acceptance criteria was performed for TBE information and is not on the list of required ICP analyses. A summary is found below:*

1. The ERA MRAD March 2021 Water Fe-55 result was evaluated as *Not Acceptable*. The reported value for Fe-55 was 579 pCi/L and the known result was 275 pCi/L (acceptance range 162 - 400). When reviewing the original sample data, it was found that the carrier yield was 52.6% (lower than typical water samples). Looking at the etched plate that was counted, it appeared that some loss of sample could have occurred. The sample was logged for reanalysis and used as the workgroup duplicate. The results were acceptable at 197 and 221 respectively. Yields were 97.4% and 105.7% and the plated samples were centered with no apparent loss of sample. The loss of sample during plating resulted in a low yield which produced an artificially high sample result. (NCR 21-01)

2. The MAPEP February 2021 AP Gross Alpha result was evaluated as *Not Acceptable*. The reported value was 0.371 Bq/sample and the known result was 1.77 Bq/sample (acceptance range 0.53 - 3.01). A similar failure had occurred several years prior due to the filter being placed with the wrong side up on the detector. At that time, a small dot was placed on the top of the filter prior to removal from the package to indicate the correct side for counting. The current sample was still in the detector when the result was received (dot side facing the detector). The sample was recounted with a similar result and was flipped and recounted. The flipped result was 0.661 Bq/sample, within the acceptable range. Because TBE cannot rely on receiving correct packaging from the provider, MAPEP AP cross-checks will be counted on both sides going forward. *NOTE: The August sample had the same packaging issue (upside down).* (NCR 21-02)
3. The MAPEP February 2021 soil Ni-63 was evaluated as *Not Acceptable*. The reported value was 310 Bq/kg and the known result was 689 (acceptance range 482 - 896). All workgroup QC was reviewed with no anomalies. The analytical procedure had been revised prior to this analysis to eliminate added interferences. The sample yield was >100%, indicative of incomplete separation from interferences, leading to a lower result. The procedure was again revised after acceptable results were obtained. (NCR 21-03)
4. The ERA October 2021 water Gross Beta result was evaluated as *Not Acceptable*. The reported value was 63.0 pCi/L and the known was 55.7 (acceptance range 38.1 - 62.6) or 113% of the known. The 2-sigma error was 6.8, placing the reported result well within the acceptable range. All QA was reviewed with no anomalies. A follow-up Quick Response cross-check was analyzed with a 120% ratio (see item 7). (NCR 21-10)
5. The ERA October 2021 water Tritium result was evaluated as *Not Acceptable*. The reported value was 13,800 pCi/L and the known was 17,200 (acceptance range 15,000 - 18,900). The 2-sigma error was 1,430, placing the result within the acceptable range. TBE's internal QC acceptance is 70% - 130%, while ERA's for this sample was 87% - 110%. All QA was reviewed with no anomalies. A Quick Response follow-up cross-check was analyzed with a result of 17,500 pCi/L (known 17,800 pCi/L). (NCR 21-11)
6. The MAPEP August 2021 soil Ni-63 result was evaluated as *Not Acceptable*. The reported value was 546 Bq/kg and the known result was 1,280 Bq/kg (acceptance range 896 - 1,664). All QC was reviewed and no anomalies found. The procedure revision to remove added MAPAP interferences was ineffective for this sample. No client soil matrix samples were analyzed for Ni-63 in 2020 or 2021. The root cause investigation is still ongoing at this time. (NCR 21-13)
7. The ERA December 2021 Quick Response water Gross Beta result was evaluated as *Not Acceptable*. The reported value was 47.6 pCi/L and the known was 39.8 pCi/L or 120% of the known (acceptance range of 26.4 - 47.3). The 2-sigma error was 6.1, placing the reported result well within the acceptable range. All QA was reviewed with no anomalies. The original sample was recounted on a different detector with a result of 40.3 ± 6.27 pCi/L. The "failure" of this sample and the RAD-127 was due to the narrow upper acceptance ranges assigned (119% and 112%) (NCR 21-14)

The Inter-Laboratory Comparison Program provides evidence of "in control" counting systems and methods, and that the laboratories are producing accurate and reliable data.

**Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services**

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value ^(a)	Ratio of TBE to Analytics Result	Evaluation ^(b)			
September 2021	E13472	Milk	Sr-89	pCi/L	86.4	85.4	0.78	W			
			Sr-90	pCi/L	11.9	14.0	0.85	A			
September 2021	E13473	Milk	Ce-141	pCi/L	118	114	1.03	A			
			Co-58	pCi/L	118	118	0.98	A			
			Co-60	pCi/L	142	145	0.98	A			
			Cr-51	pCi/L	244	238	1.03	A			
			Cs-134	pCi/L	81	93.1	0.87	A			
			Cs-137	pCi/L	105	112	0.94	A			
			Fe-59	pCi/L	105	102	1.03	A			
			I-131	pCi/L	85.1	85.6	0.76	W			
			Mn-54	pCi/L	128	128	1.00	A			
			Zn-65	pCi/L	158	153	1.03	A			
			E13474	Charcoal	I-131	pCi	85.2	90.9	0.94	A	
			September 2021	E13475	AP	Ce-141	pCi	128	135	0.94	A
						Co-58	pCi	148	139	1.07	A
Co-60	pCi	183				171	1.07	A			
Cr-51	pCi	322				278	1.16	A			
Cs-134	pCi	118				110	1.08	A			
Cs-137	pCi	147				132	1.12	A			
Fe-59	pCi	131				120	1.09	A			
Mn-54	pCi	161				151	1.06	A			
Zn-65	pCi	202	180	1.12	A						
September 2021	E13476	Soil	Ce-141	pCi/g	0.215	0.219	0.98	A			
			Co-58	pCi/g	0.208	0.226	0.92	A			
			Co-60	pCi/g	0.277	0.277	1.00	A			
			Cr-51	pCi/g	0.388	0.452	0.86	A			
			Cs-134	pCi/g	0.157	0.178	0.88	A			
			Cs-137	pCi/g	0.270	0.284	0.95	A			
			Fe-59	pCi/g	0.218	0.195	1.12	A			
			Mn-54	pCi/g	0.239	0.246	0.97	A			
Zn-65	pCi/g	0.312	0.293	1.06	A						
September 2021	E13477	AP	Sr-89	pCi	85.6	68.3	1.25	W			
			Sr-90	pCi	12.6	11.2	1.13	A			

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

**Analytics Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services**

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value ^(a)	Ratio of TBE to Analytics Result	Evaluation ^(b)
September 2021	E13472	Milk	Sr-89	pCi/L	66.4	85.4	0.78	W
			Sr-90	pCi/L	11.9	14.0	0.85	A
	E13473	Milk	Ce-141	pCi/L	118	114	1.03	A
			Co-58	pCi/L	116	118	0.98	A
			Co-60	pCi/L	142	145	0.98	A
			Cr-51	pCi/L	244	238	1.03	A
			Cs-134	pCi/L	81	93.1	0.87	A
			Cs-137	pCi/L	105	112	0.94	A
			Fe-59	pCi/L	105	102	1.03	A
			I-131	pCi/L	65.1	85.8	0.76	W
			Mn-54	pCi/L	128	128	1.00	A
			Zn-65	pCi/L	158	153	1.03	A
	E13474	Charcoal	I-131	pCi	85.2	90.9	0.94	A
	E13475	AP	Ce-141	pCi	128	135	0.94	A
			Co-58	pCi	148	139	1.07	A
			Co-60	pCi	183	171	1.07	A
			Cr-51	pCi	322	278	1.16	A
			Cs-134	pCi	118	110	1.08	A
			Cs-137	pCi	147	132	1.12	A
			Fe-59	pCi	131	120	1.09	A
			Mn-54	pCi	161	151	1.06	A
	E13476	Soil	Ce-141	pCi/g	0.215	0.219	0.98	A
			Co-58	pCi/g	0.208	0.226	0.92	A
			Co-60	pCi/g	0.277	0.277	1.00	A
			Cr-51	pCi/g	0.388	0.452	0.86	A
			Cs-134	pCi/g	0.157	0.178	0.88	A
			Cs-137	pCi/g	0.270	0.284	0.95	A
			Fe-59	pCi/g	0.218	0.195	1.12	A
			Mn-54	pCi/g	0.239	0.246	0.97	A
	E13477	AP	Sr-89	pCi	85.8	68.3	1.25	W
Sr-90			pCi	12.8	11.2	1.13	A	

(a) The Analytics known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) Analytics evaluation based on TBE internal QC limits:

A = Acceptable - reported result falls within ratio limits of 0.80-1.20

W = Acceptable with warning - reported result falls within 0.70-0.80 or 1.20-1.30

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.30

**DOE's Mixed Analyte Performance Evaluation Program (MAPEP)
Teledyne Brown Engineering Environmental Services**

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value ^(a)	Acceptance Range	Evaluation ^(b)
February 2021	21-GrF44	AP	Gross Alpha	Bq/sample	0.371	1.77	0.53 - 3.01	N ⁽²⁾
			Gross Beta	Bq/sample	0.731	0.65	0.325 - 0.974	A
	21-MaS44	Soil	Ni-63	Bq/kg	310	689.0	482 - 896	N ⁽³⁾
			Tc-99	Bq/kg	457	638	447 - 829	W
	21-MaSU44	Urine	Cs-134	Bq/L	2.34	2.73	1.91 - 3.55	A
			Cs-137	Bq/L	2.54	2.71	1.90 - 3.52	A
			Co-57	Bq/L	0.4100		(1)	A
			Co-60	Bq/L	2.24	2.44	1.71 - 3.17	A
			Mn-54	Bq/L	2.03	2.03	1.42 - 2.84	A
			K-40	Bq/L	52.8	54.0	38 - 70	A
			U-234	Bq/L	0.108	0.0877	0.0614 - 0.114	W
			U-238	Bq/L	0.101	0.091	0.064 - 0.118	A
			Zn-65	Bq/L	1.08	1.34	(2)	A
	21-MaW44	Water	Ni-63	Bq/L	6.7	8.2	5.7 - 10.7	A
			Tc-99	Bq/L	3.850	4.01	2.81 - 5.21	A
	21-RdV44	Vegetation	Cs-134	Bq/sample	3.13	3.80	2.5 - 4.7	A
			Cs-137	Bq/sample	4.64	4.69	3.28 - 6.10	A
			Co-57	Bq/sample	5.25	5.05	3.54 - 6.57	A
			Co-60	Bq/sample	2.88	2.99	2.09 - 3.89	A
			Mn-54	Bq/sample	5.02	5.25	3.68 - 6.83	A
			Sr-90	Bq/sample	0.631	0.673	0.471 - 0.875	A
Zn-65			Bq/sample	-0.233		(1)	A	
August 2021	21-GrF45	AP	Gross Alpha	Bq/sample	0.388	0.960	0.288 - 1.832	A
			Gross Beta	Bq/sample	0.595	0.553	0.277 - 0.930	A
	21-MaS45	Soil	Ni-63	Bq/kg	546	1280	898 - 1664	N ⁽³⁾
			Tc-99	Bq/kg	453	777	544 - 1010	N ⁽³⁾
	21-MaSU45	Urine	Cs-134	Bq/L	3.10	3.62	2.53 - 4.71	A
			Cs-137	Bq/L	0.093		(1)	A
			Co-57	Bq/L	0.844	0.87	0.608 - 1.125	A
			Co-60	Bq/L	0.0535		(1)	A
			Mn-54	Bq/L	0.459	0.417	(2)	A
			K-40	Bq/L	48.8	54.0	38 - 70	A
			U-234	Bq/L	0.133	0.118	0.081 - 0.151	A
			U-238	Bq/L	0.137	0.121	0.085 - 0.157	A
			Zn-65	Bq/L	0.339	0.420	(2)	A
	21-MaW45	Water	Ni-63	Bq/L	33.5	39.5	27.7 - 51.4	A
			Tc-99	Bq/L	3.5	3.7	2.80 - 4.82	A
	21-RdV45	Vegetation	Cs-134	Bq/sample	3.42	4.34	3.04 - 5.64	W
			Cs-137	Bq/sample	2.14	2.21	1.55 - 2.87	A
			Co-57	Bq/sample	4.08	4.66	3.28 - 6.06	A
			Co-60	Bq/sample	2.81	3.51	2.48 - 4.56	A
			Mn-54	Bq/sample	0.035		(1)	A
			Sr-90	Bq/sample	1.15	1.320	0.92 - 1.72	A
Zn-65			Bq/sample	2.05	2.43	1.70 - 3.16	A	

(a) The MAPEP known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation

(b) DOE/MAPEP evaluation:

A = Acceptable - reported result falls within ratio limits of 0.20-1.20

W = Acceptable with warning - reported result falls within 0.70-0.60 or 1.20-1.50

N = Not Acceptable - reported result falls outside the ratio limits of < 0.70 and > 1.50

(1) False positive test

(2) Sensitivity evaluation

(3) See NCR 21-02

(4) See NCR 21-03

(5) See NCR 21-13

(6) Tc-99 cross-checks done for TBE information only - not required

**ERA Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services**

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value ⁽¹⁾	Acceptance Limits	Evaluation ⁽²⁾	
March 2021	MRAD-34	Water	Am-241	pCi/L	175	157	108 - 201	A	
			Fe-55	pCi/L	579	275	162 - 400	N ⁽³⁾	
			Pu-238	pCi/L	181	171	103 - 222	A	
			Pu-239	pCi/L	153	142	87.9 - 175	A	
		Soil	Sr-90	pCi/kg	6570	9180	2880 - 14,300	A	
			AP	Fe-55	pCi/filter	107	121	44.2 - 193	A
				U-234	pCi/filter	25.99	25.5	18.9 - 29.9	A
				U-238	pCi/filter	24.7	25.3	19.1 - 30.2	A
April 2021	RAD-125	Water	Ba-133	pCi/L	92.3	90.5	76.2 - 99.8	A	
			Cs-134	pCi/L	62.9	70.5	57.5 - 77.8	A	
			Cs-137	pCi/L	181	188	151 - 187	A	
			Co-60	pCi/L	22.5	20.9	17.7 - 25.8	A	
			Zn-65	pCi/L	183	177.0	159 - 208	A	
			GR-A	pCi/L	30.8	30.2	15.4 - 39.4	A	
			GR-B	pCi/L	60.1	67.5	46.8 - 74.2	A	
			U-Nat	pCi/L	38.45	38.9	30.0 - 40.8	A	
			H-3	pCi/L	13,400	14,600	12,800 - 16,100	A	
			Sr-89	pCi/L	64.5	63.5	51.4 - 71.5	A	
			Sr-90	pCi/L	22.8	23.0	16.5 - 27.0	A	
			I-131	pCi/L	28.2	28.7	22.2 - 31.4	A	
			September 2021	MRAD-35	Water	Am-241	pCi/L	66	63.7
Fe-55	pCi/L	179				246	145 - 358	A	
Pu-238	pCi/L	102				114	68.5 - 148	A	
Pu-239	pCi/L	32				34.3	21.2 - 42.3	A	
Soil	Sr-90	pCi/kg			6160	8090	1,900 - 9,490	A	
	AP	Fe-55			pCi/filter	493	548	200 - 874	A
		Pu-238			pCi/filter	28	28.5	21.5 - 35.0	A
		Pu-239			pCi/filter	21	21.8	16.1 - 26.1	A
		U-234			pCi/filter	7.95	7.78	5.75 - 9.09	A
		U-238			pCi/filter	8.0	7.69	5.81 - 9.17	A
October 2021	RAD-127	Water	Ba-133	pCi/L	82.8	87.5	73.6 - 96.2	A	
			Cs-134	pCi/L	64.0	70.1	57.1 - 77.1	A	
			Cs-137	pCi/L	145	156	140 - 174	A	
			Co-60	pCi/L	83.2	85.9	77.3 - 96.8	A	
			Zn-65	pCi/L	133	145	130 - 171	A	
			GR-A	pCi/L	76.0	68.7	35.0 - 82.5	A	
			GR-B	pCi/L	63.0	55.7	38.1 - 82.6	N ⁽⁴⁾	
			U-Nat	pCi/L	52.88	55.5	45.3 - 81.1	A	
			H-3	pCi/L	13,800	17,200	15,000 - 18,900	N ⁽³⁾	
			Sr-89	pCi/L	54.9	61.0	49.1 - 88.9	A	
			Sr-90	pCi/L	24.8	29.3	21.3 - 34.0	A	
			I-131	pCi/L	27.4	28.4	21.9 - 31.1	A	
			December 2021	QR 120121Y	Water	GR-B	pCi/L	47.6	39.8
H-3	pCi/L	17,500				17,800	15,600 - 19,600	A	

(a) The ERA known value is equal to 100% of the parameter present in the standard as determined by gravimetric and/or volumetric measurements made during standard preparation.

(b) ERA evaluation:

A = Acceptable - Reported value falls within the Acceptance Limits

N = Not Acceptable - Reported value falls outside of the Acceptance Limits

(1) See NCR 21-01

(2) See NCR 21-10

(3) See NCR 21-11

(4) See NCR 21-14