VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

APR 29 2019

United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Serial No. 19-186
S&L/TSC R0
Docket Nos. 50-280
50-281
72-2
72-55
License Nos. DPR-32
DPR-37
SNM-2501

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY POWER STATION UNITS 1 AND 2
INDEPENDENT SPENT FUEL STORAGE INSTALLATION
ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT

Surry Units 1 and 2 Technical Specification 6.6.B.2 requires the submittal of an Annual Radiological Environmental Operating Report (AREOR) for Surry Power Station. Surry Independent Spent Fuel Storage Installation (ISFSI) Technical Specification Appendix C, Item 1.3.1 requires that the Surry ISFSI be included in the environmental monitoring for Surry Power Station. Accordingly, enclosed is the Surry Power Station AREOR for the period of January 1, 2018 through December 31, 2018, which includes environmental monitoring for the Surry ISFSI.

If you have any further questions, please contact Lee Ragland at 757-365-2010.

Sincerely,

Robert M. Garver II
Director Safety & Licensing
Surry Power Station

Attachment

Commitments made in this letter: None

IE25
NMSS26
NRR
NMSS

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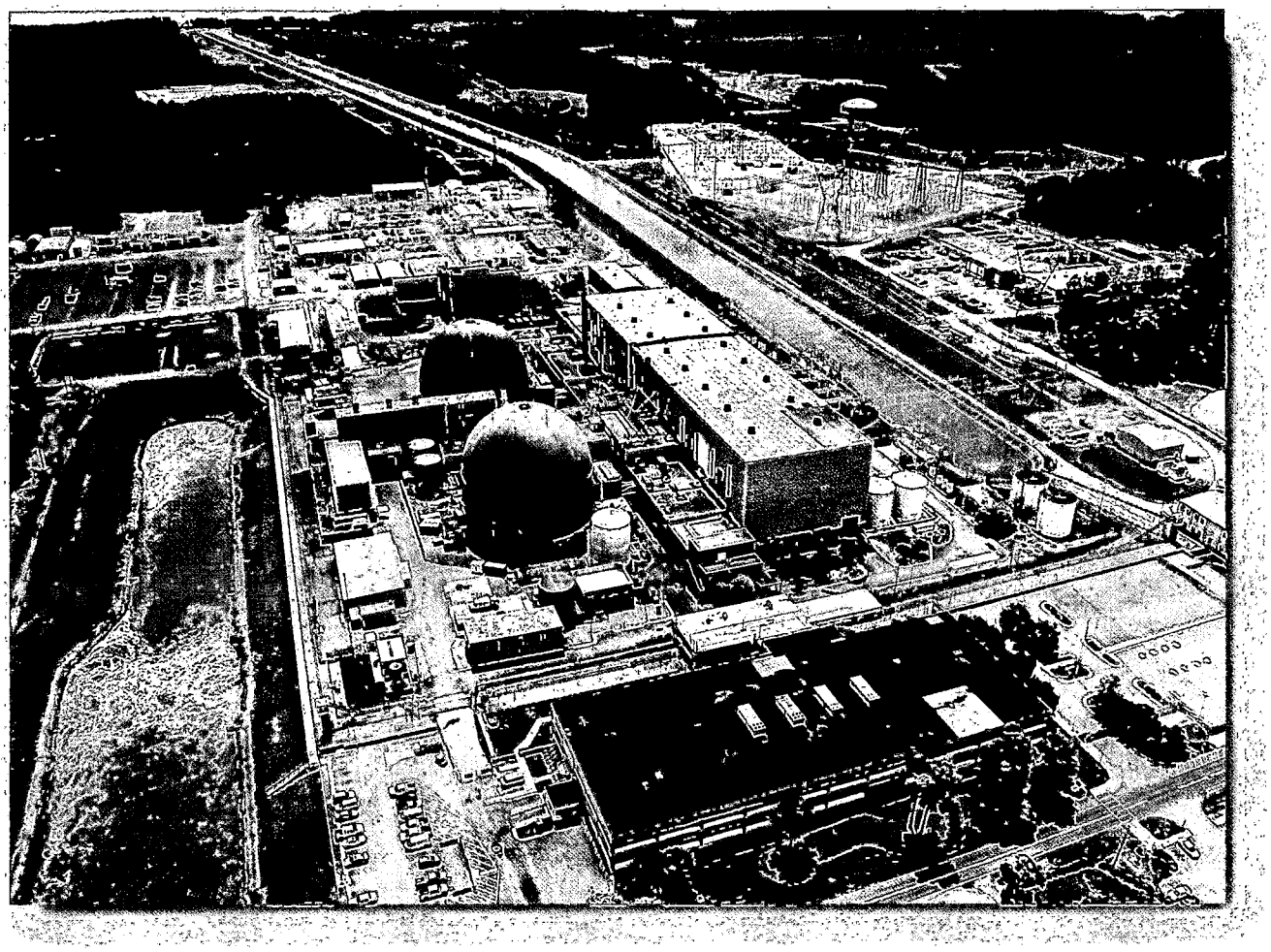
Serial No. 19-186
Docket Nos.: 50-280
50-281
72-2
72-55

ATTACHMENT 1

2018 Annual Radiological Environmental Operating Report

SURRY POWER STATION UNITS 1 AND 2
VIRGINIA ELECTRIC AND POWER COMPANY



2018 Annual Radiological Environmental Operating Report

Surry Power Station

Dominion Energy

Dominion Energy

Surry Power Station

Radiological Environmental Monitoring Program

January 1, 2018 to December 31, 2018

Annual Radiological Environmental Operating Report

Surry Power Station

January 1, 2018 to December 31, 2018

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PREFACE

This report is submitted as required by Technical Specification 6.6.B.2, Annual Radiological Environment Operating Report, for Surry, Units 1 and 2, Virginia Electric and Power Company Docket Nos. 50-280 and 50-281, and the Surry Independent Spent Fuel Storage Installation (ISFSI) Technical Specifications, Appendix C, Item 1.3.1.

1. EXECUTIVE SUMMARY

This document is a detailed report of the 2018 Surry Power Station Radiological Environmental Monitoring Program (REMP). Radioactivity levels from January 1 through December 31, 2018, in air, water, silt, shoreline sediment, milk, aquatic biota, food products and direct exposure pathways have been analyzed, evaluated and summarized. The REMP is designed to confirm that radiological effluent releases are As Low As (is) Reasonably Achievable (ALARA), no undue environmental effects occur and the health and safety of the public are protected. The program also detects any unexpected environmental processes that could allow radiation accumulations in the environment or food pathway chains.

Radiation and radioactivity in the environment are monitored within a 20-mile radius of the station. Surry Power Station personnel collect a variety of samples within this area. A number of sampling locations for each medium are selected using available meteorological, land use, and water use data. Two types of samples are obtained. The first type, control samples, is collected from areas that are beyond the measurable influence of Surry Power Station or any other nuclear facility. These samples represent normal background radiation levels. Background radiation levels 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 control sample values and the pre-operational baseline to determine if changes in radioactivity levels are attributable to station operations, or natural variation, or other causes such as the Chernobyl and Fukushima Daiichi accidents that released radioactive material to the environment.

Teledyne Brown Engineering, Inc. (TBE) provides radioanalyses for this program and Mirion Technologies provides thermoluminescent dosimetry (TLD) 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 United States Nuclear Regulatory Commission (USNRC) requires that equipment used for radiological environmental monitoring must be able to detect specified minimum Lower Limits of Detection (LLDs). This ensures that analyses are as accurate as possible. The USNRC also mandates a reporting level for 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, aquatic, terrestrial and direct radiation exposure. The airborne exposure pathway includes radioactive airborne iodine and particulates. The 2018 airborne results were similar to previous years. No station related radioactivity was detected and natural radioactivity levels remained at levels consistent with past years' results. Aquatic exposure pathway samples include well and river water, silt and shoreline sediments, crabs, fish, clams and oysters. Naturally occurring radionuclides such as beryllium-7, potassium-40, radium-226, thorium-228, thorium-232 and actinium-228 were detected at average environmental levels. No man-made radionuclides were detected in well water. This trend is consistent throughout the operational environmental monitoring program. No man-made radionuclides were detected in river water. Silt samples indicated the presence of cesium-137 and naturally occurring radionuclides. Cesium-137 concentrations were present in indicator location samples at nominal background levels. No other man-made radionuclides were detected. These background levels are attributable to fallout from historic weapons testing and nuclear accidents such as Chernobyl. Naturally occurring potassium-40, beryllium-7, radium-226 thorium-228 and thorium-232 were detected at average environmental levels. Shoreline sediment, which may provide a direct exposure pathway, contained no station related radionuclides. Naturally occurring radionuclides potassium-40, actinium-228, radium-226 thorium-228 and thorium-232 were detected at average environmental levels. The terrestrial exposure pathway includes milk and food products. Iodine-131 was not detected in any 2018 milk samples and has not been detected in milk prior to or since the 1986 Chernobyl accident. Strontium-90 was detected in milk and this activity is attributable to past atmospheric nuclear weapons testing. No other man-made radionuclides were detected in milk samples. Consistent with historical data, naturally occurring potassium-40 was detected in milk. No man-made radionuclides were detected in food product samples. Naturally occurring potassium-40 was detected in food product samples. The direct exposure pathway measures environmental radiation dose using TLDs. TLD results have remained relatively constant over the years.

During 2018, as in previous years, the operation of Surry Power Station has 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 2018 was 0.048 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 sources in the environment provide approximately 50% of radiation exposure to man, while nuclear power contributes less than 0.1%. These results demonstrate compliance with federal and state regulations and also demonstrate the adequacy of radioactive effluent controls at Surry Power Station.

2. PROGRAM DESCRIPTION

2.1 Introduction

This report documents the 2018 Surry Power Station operational Radiological Environmental Monitoring Program (REMP). Dominion Energy's Surry Power Station is located on the Gravel Neck peninsula adjacent to the James River, approximately 25 miles upstream of the Chesapeake Bay. 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 is designed with a nominal gross electrical output of 910 megawatts electric (MWe). Unit 1 achieved commercial operation on December 22, 1972, and Unit 2 on May 1, 1973.

The United States Nuclear Regulatory Commission regulations (10CFR50.34a) require that nuclear power plants be designed, constructed and operated to keep levels of radioactive material in effluents to unrestricted areas As Low As (is) Reasonably Achievable. To ensure these criteria are met, the operating license for Surry Power Station includes Technical Specifications that address the release of radioactive effluents. In-plant monitoring is used to ensure that these 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 station environs is also included in Surry Power Station Technical Specifications.

Dominion personnel are responsible for collecting the various indicator and control environmental samples. Mirion Technologies is responsible for processing the TLDs. Teledyne Brown Engineering is responsible for sample analyses. The results of the analyses are used to determine if changes in radioactivity levels may be attributable to station operations. Measured values are compared with control values, which vary with time due to external events, such as cosmic ray bombardment, nuclear weapons test fallout and seasonal variations of naturally occurring radionuclides. Data collected prior to station operation is used to indicate the degree of natural variation to be expected. This pre-operational data is compared with data collected during the operational phase to assist in evaluating any radiological impact of station operation.

Occasionally, samples of environmental media may show the presence of man-made radionuclides. As a method of referencing the measured radionuclide concentrations in the sample media to a dose consequence to man, the data is compared to the reporting level concentrations listed in the USNRC Regulatory Guide 4.8, "Environmental Technical Specifications for Nuclear Power Plants", (December, 1975) and VPAP-2103S, Offsite Dose Calculation Manual (Surry). 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 REMP for 2018 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 2018 sampling program for Surry Power Station. All samples listed in Table 2-1 are taken at indicator locations except those labeled "control location." Dominion Energy personnel collect all samples listed in Table 2-1.

Table 2-2 summarizes the analysis program conducted by Teledyne Brown Engineering and Mirion Technologies for Surry Power Station. All samples, with the exception of the TLDs, are shipped to Teledyne Brown Engineering, located in Knoxville, TN, for analysis. The TLDs are shipped to Mirion Technologies, located in Irvine, CA, for processing.

The Surry Radiological Monitoring Locations maps (Figures 1 – 5) denote sample locations for Surry Power Station. The locations are color coded to designate sample types.

Table 2-1

SURRY - 2018

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM UNIT NO. 1

Sample Media	Location	Station	Distance Miles	Direction	Degrees	Collection Frequency	Remarks
Environmental	Control	(00)	-	-	-	Quarterly	Onsite (Stored in a lead shield outside the protected area)
TLDs	West North West	(02)	0.2	WNW	293°	Quarterly	Site Boundary
	Surry Station Discharge	(03)	0.4	NW	321°	Quarterly	Site Boundary
	North North West	(04)	0.2	NNW	329°	Quarterly	Site Boundary
	North	(05)	0.3	N	4°	Quarterly	Site Boundary
	North North East	(06)	0.3	NNE	28°	Quarterly	Site Boundary
	North East	(07)	0.3	NE	44°	Quarterly	Site Boundary
	East North East	(08)	0.4	ENE	67°	Quarterly	Site Boundary
	East	(09)	0.3	E	89°	Quarterly	Site Boundary
	West	(10)	0.1	W	271°	Quarterly	Site Boundary
	West South West	(11)	0.4	WSW	252°	Quarterly	Site Boundary
	South West	(12)	0.3	SW	228°	Quarterly	Site Boundary
	South South West	(13)	0.3	SSW	201°	Quarterly	Site Boundary
	South	(14)	0.4	S	182°	Quarterly	Site Boundary
	South South East	(15)	0.6	SSE	157°	Quarterly	Site Boundary
	South East	(16)	0.9	SE	135°	Quarterly	Site Boundary
	Station Intake	(18)	1.6	ESE	115°	Quarterly	Site Boundary
	Hog Island Reserve	(19)	2.0	NNE	26°	Quarterly	Near Resident
	Bacon's Castle	(20)	4.5	SSW	202°	Quarterly	Apx. 5 mile
	Route 633	(21)	4.9	SW	227°	Quarterly	Apx. 5 mile
	Alliance	(22)	5.1	WSW	247°	Quarterly	Apx. 5 mile
	Surry	(23)	7.7	WSW	256°	Quarterly	Population Center
	Route 636 and 637	(24)	4.0	W	270°	Quarterly	Apx. 5 mile
	Scotland Wharf	(25)	5.0	WNW	284°	Quarterly	Apx. 5 mile
	Jamestown	(26)	6.3	NW	308°	Quarterly	Apx. 5 mile
	Colonial Parkway	(27)	3.8	NNW	333°	Quarterly	Apx. 5 mile
	Route 617 and 618	(28)	4.9	NNW	340°	Quarterly	Apx. 5 mile
	Kingsmill	(29)	4.6	N	2°	Quarterly	Apx. 5 mile
	Williamsburg	(30)	7.8	N	0°	Quarterly	Population Center
	Kingsmill North	(31)	5.5	NNE	12°	Quarterly	Apx. 5 mile
	Budweiser	(32)	5.8	NNE	27°	Quarterly	Population Center
	Water Plant	(33)	5.0	NE	46°	Quarterly	Apx. 5 mile

Table 2-1

SURRY - 2018

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM UNIT NO. 1

Sample Media	Location	Station	Distance Miles	Direction	Degrees	Collection Frequency	Remarks
Environmental	BASF	(34)	5.1	ENE	70°	Quarterly	Apx. 5 mile
TLDs	Lee Hall	(35)	7.1	ENE	75°	Quarterly	Population Center
	Goose Island	(36)	5.1	E	90°	Quarterly	Apx. 5 mile
	Fort Eustis	(37)	4.9	ESE	104°	Quarterly	Apx. 5 mile
	Newport News	(38)	19.3	SE	130°	Quarterly	Population Center
	James River Bridge	(39)	17.1	SE	142°	Quarterly	Control Location
	Benn's Church	(40)	17.0	SSE	159°	Quarterly	Control Location
	Smithfield	(41)	13.4	SSE	167°	Quarterly	Control Location
	Rushmere	(42)	5.3	SSE	156°	Quarterly	Apx. 5 mile
	Route 628	(43)	5.1	S	177°	Quarterly	Apx. 5 mile
Air Charcoal	Surry Station	(SS)	0.3	NNE	18°	Weekly	Site boundary location with highest D/Q
and Particulate	Hog Island Reserve	(HIR)	2.0	NNE	26°	Weekly	
	Bacon's Castle	(BC)	4.5	SSW	202°	Weekly	
	Alliance	(ALL)	5.1	WSW	247°	Weekly	
	Colonial Parkway	(CP)	3.8	NNW	333°	Weekly	
	BASF	(BASF)	5.1	ENE	70°	Weekly	
	Fort Eustis	(FE)	4.9	ESE	104°	Weekly	
	Newport News	(NN)	19.3	SE	130°	Weekly	Control Location
River Water	Surry Station Discharge	(SD)	0.4	NW	323°	Monthly	
	Scotland Wharf	(SW)	4.9	WNW	284°	Monthly	Control Location
Well Water	Surry Station	(SS)	0.1	SW	227°	Quarterly	Onsite
	Hog Island Reserve	(HIR)	2.0	NNE	28°	Quarterly	
	Construction Site	(CS)	0.3	E	87°	Quarterly	
Shoreline	Hog Island Reserve	(HIR)	0.6	N	7°	Semi-Annually	
Sediment	Chickahominy River	(CHIC)	11.2	WNW	301°	Semi-Annually	Control Location
Silt	Chickahominy River	(CHIC)	11.2	WNW	300°	Semi-Annually	Control Location
	Surry Station Discharge	(SD)	0.5	NW	315°	Semi-Annually	
	Surry Station Intake	(SI)	1.8	ESE	112°	Semi-Annually	

Table 2-1

SURRY - 2018

RADIOLOGICAL SAMPLING STATIONS

DISTANCE AND DIRECTION FROM UNIT NO. 1

Sample Media	Location	Station	Distance Miles	Direction	Degrees	Collection Frequency	Remarks
Milk	Colonial Parkway	(CP)	3.7	NNW	336°	Monthly	
	Beachy Farm	(BF)	12.0	SW	220°	Monthly	Control Location
	Lover Retreat	(LRD)	30.6	NNW	5°	Monthly	Control Location
	Epps	(EPPS)	4.8	SSW	200°	Monthly	
Oysters	Point of Shoals	(POS)	6.4	SSE	157°	Semi-Annually	
	Mulberry Point	(MP)	4.9	ESE	124°	Semi-Annually	
	Lawne's Creek	(LC)	2.4	SE	131°	Semi-Annually	
Clams	Chickahominy River	(CHIC)	11.2	WNW	300°	Semi-Annually	Control Location
	Surry Station Discharge	(SD)	1.3	NNW	341°	Semi-Annually	
	Jamestown Island	(JI)	3.9	NW	324°	Semi-Annually	
Fish	Surry Station Discharge	(SD)	1.3	NNW	341°	Semi-Annually	
Crabs	Surry Station Discharge	(SD)	1.3	NNW	341°	Annually	
Crops (Corn, Peanuts, Soybeans)	Brock's Farm	(BROCK)	3.8	S	183°	Annually	
	Slade's Farm	(SLADE)	3.2	S	179°	Annually	

Table 2-2

SURRY - 2018

SAMPLE ANALYSIS PROGRAM

SAMPLE MEDIA	FREQUENCY	ANALYSIS	LLD*	REPORT UNITS
Thermoluminescent Dosimetry (TLD)	Quarterly	Gamma Dose	2	mR/Std. Month
Air Iodine	Weekly	I-131	0.07	pCi/m^3
Air Particulate	Weekly	Gross Beta	0.01	pCi/m^3
	Quarterly (a)	Gamma Isotopic		pCi/m^3
		Cs-134	0.05	
		Cs-137	0.06	
River Water	Quarterly Composite of monthly sample	Tritium (H-3)	2000	pCi/L
	Monthly	I-131	10	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	
Well Water	Quarterly	Tritium (H-3)	2000	pCi/L
		I-131	1	
		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	

Footnotes located at end of table.

Table 2-2

SURRY - 2018

SAMPLE ANALYSIS PROGRAM

SAMPLE MEDIA	FREQUENCY	ANALYSIS	LLD*	REPORT UNITS
Shoreline Sediment	Semi-Annually	Gamma Isotopic		pCi/kg - dry
		Cs-134	150	
		Cs-137	180	
Silt	Semi-Annually	Gamma Isotopic		pCi/kg - dry
		Cs-134	150	
		Cs-137	180	
Milk	Monthly	I-131	1	pCi/L
		Gamma Isotopic		pCi/L
		Cs-134	15	
		Cs-137	18	
		Ba-140	60	
		La-140	15	
	Quarterly Composite of CP monthly sample	Sr-89	NA	pCi/L
		Sr-90	NA	
Oysters	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	
Clams	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	
Crabs	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	

Footnotes located at end of table.

Table 2-2

SURRY - 2018

SAMPLE ANALYSIS PROGRAM

SAMPLE MEDIA	FREQUENCY	ANALYSIS	LLD*	REPORT UNITS
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	Annually	Gamma Isotopic		pCi/kg - wet
		I-131	60	
		Cs-134	60	
		Cs-137	80	

Note: This table is not a complete listing of nuclides that can be detected and reported. Other peaks that are measurable and identifiable, together with the above nuclides, are also identified and reported.

* LLD is the Lower Limit of Detection as defined and required in the USNRC Branch Technical Position on an Acceptable Radiological Environmental Monitoring Program, Revision 1, November 1979. LLDs indicate those concentrations to which environmental samples are required to be analyzed. Actual analysis of samples may be lower than these listed values.

(a) Quarterly composites of each location's weekly air particulate samples are analyzed for gamma emitters.

NA None assigned

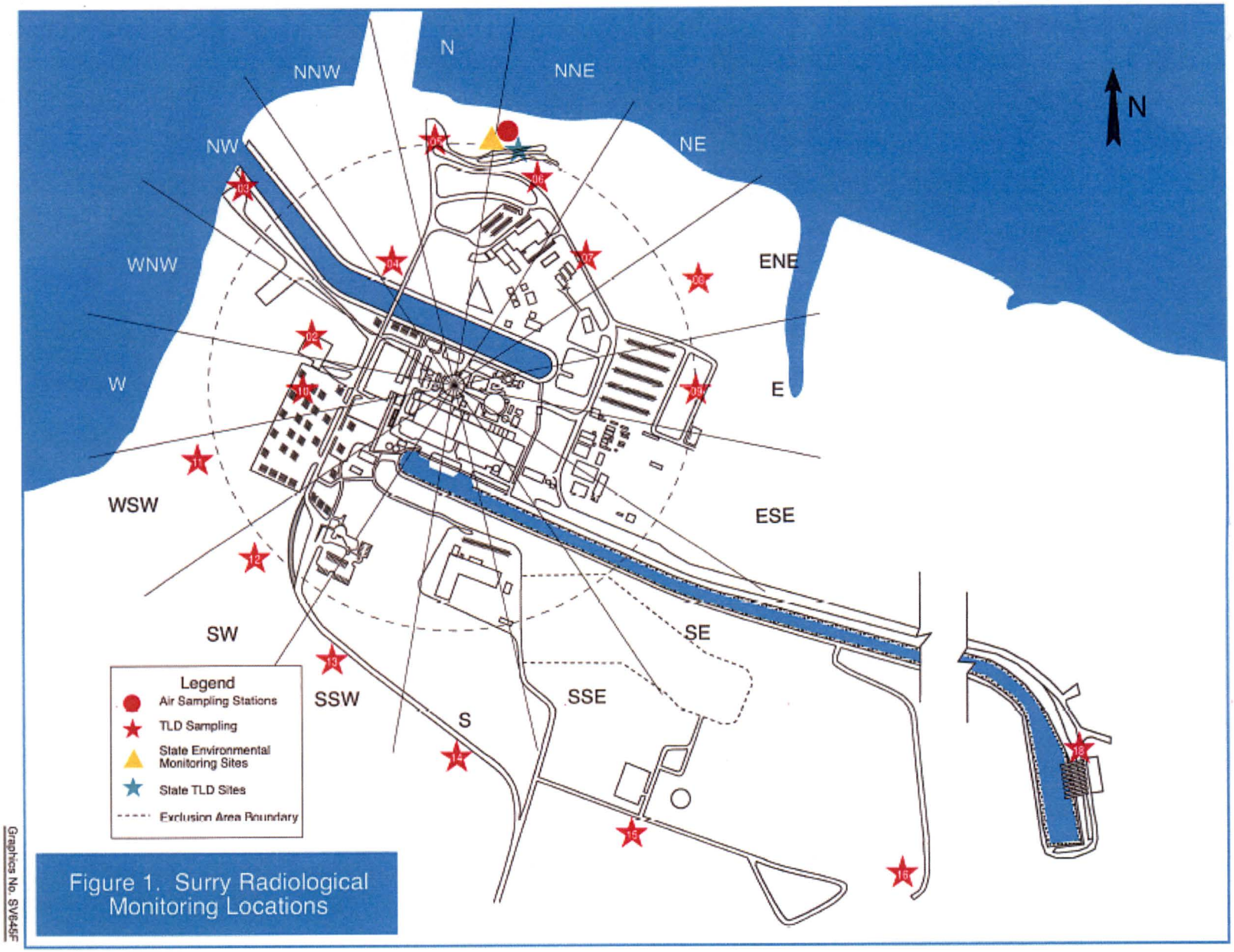

Figure 1. Surry Radiological Monitoring Locations

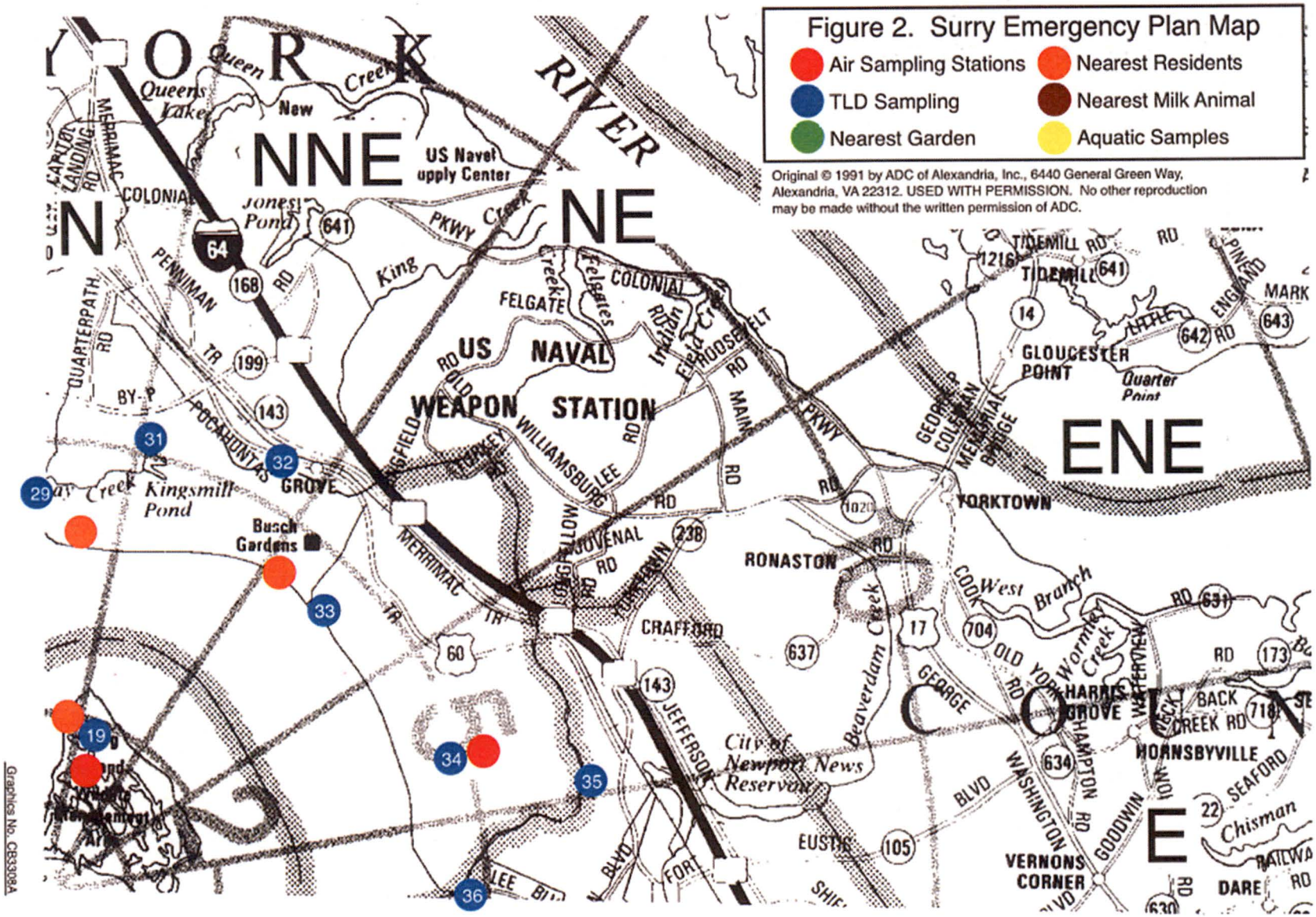
Figure 2. Surry Emergency Plan Map
Air Sampling Stations
Nearest Residents
TLD Sampling
Nearest Milk Animal
Nearest Garden
Aquatic Samples
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RIVER
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CRAFFORD
HORNSBYVILLE
VERNONS CORNER
City of Newport News Reservoir
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Jones Pond
Queens Lake
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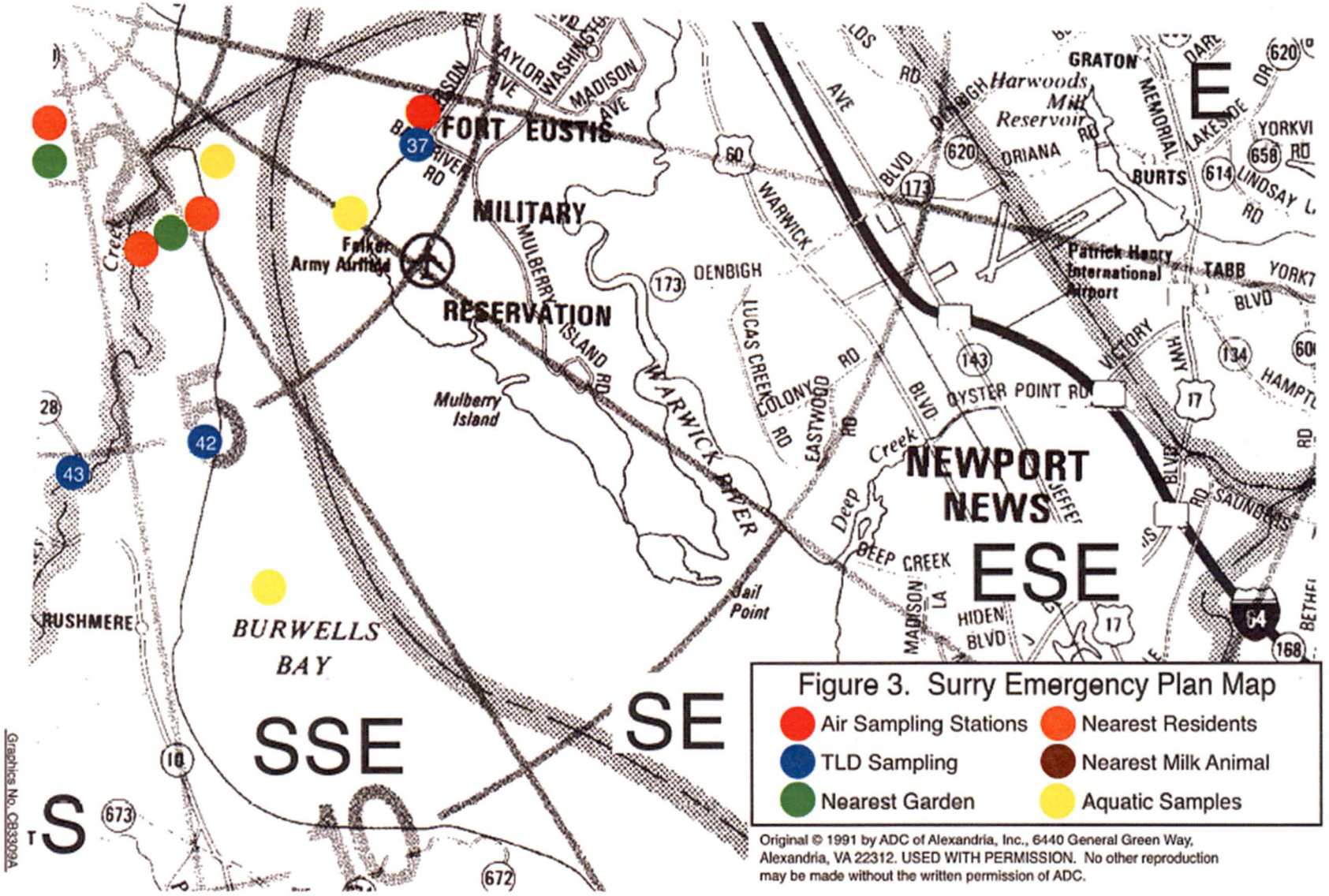

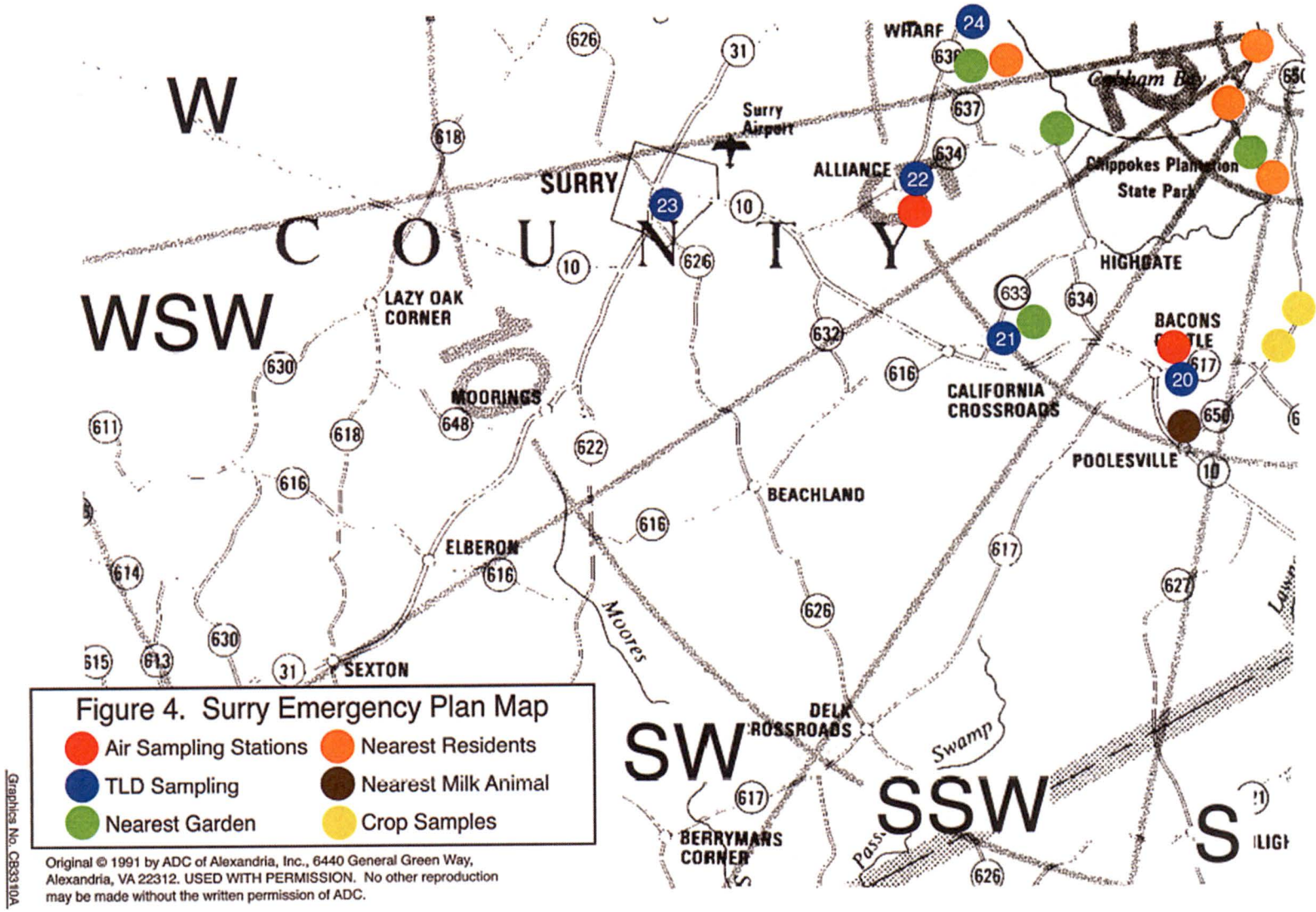

Figure 4. Surry Emergency Plan Map

- Air Sampling Stations
- Nearest Residents
- TLD Sampling
- Nearest Milk Animal
- Nearest Garden
- Crop Samples

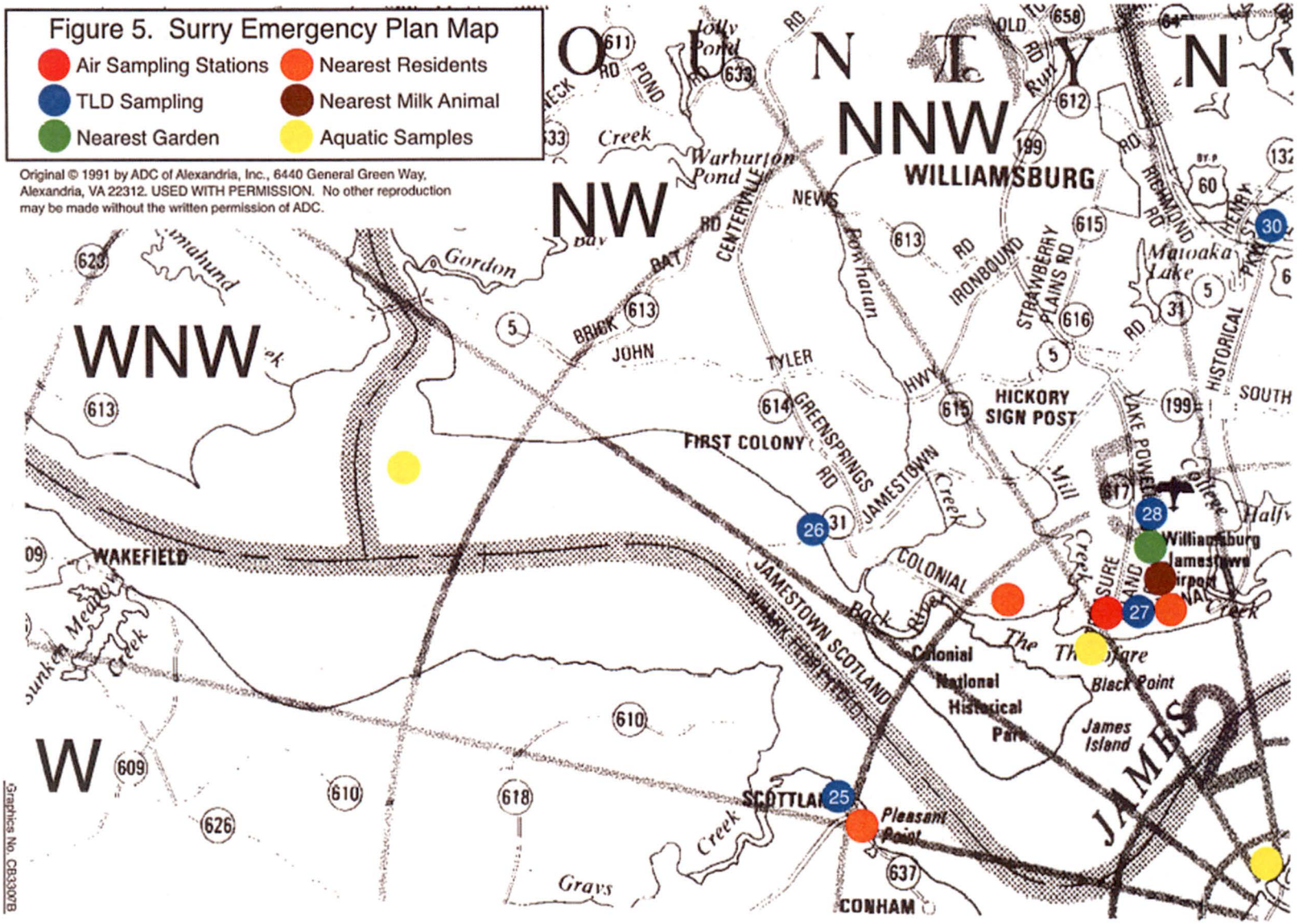
Figure 5. Surry Emergency Plan Map
Air Sampling Stations
Nearest Residents
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Nearest Milk Animal
Nearest Garden
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Gordon Creek
Warburton Pond
Jolly Pond
Mill Creek
Gravs Creek
Sunken Meadow Creek
Rock Creek
Matoaka Lake
Graphics No. CB3307B

3. ANALYTICAL RESULTS

3.1 Summary of Results

In accordance with the Surry 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", Revision 1, November 1979. A more detailed analysis of the data is given in Section 4.

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

Surry Power Station, Surry County, Virginia - 2018
Docket No. 50-280-281 Page 1 of 7

Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Direct Radiation *TLD (mR/ Std Month)*	**Gamma**	164	2	**5.6 (152/152) (4.0 - 8.3)**	**STA-9**	**0.3 mi E**	**7.7 (4/4) (7.3 - 8.3)**	**5.9 (12/12) (4.8 - 7.6)**	0
Air Particulate *(1E-3 pCi/m3)*	**Gross Beta**	424	10	**13.5 (370/371) (3.21 - 28.1)**	**BASF**	**5.1 mi ENE**	**14.9 (53/53) (5.2 - 28.1)**	**13.3 (53/53) (4.7 - 22.2)**	0
	Gamma	32							
	Be-7	32		**136 (28/28) (88.5 - 208)**	**HIR**	**2.0 mi NNE**	**163 (4/4) (111 - 208)**	**139 (4/4) (107 - 187)**	0
	K-40	32		< LLD	N/A		< LLD	**17.9 (1/28) (17.9 - 17.9)**	0
	Cs-134	32	50	< LLD	N/A		< LLD	< LLD	0
	Cs-137	32	60	< LLD	N/A		< LLD	< LLD	0
Air Iodine *(1E-3 pCi/m3)*	**I-131**	424	70	< LLD	N/A		< LLD	< LLD	0
Milk *(pCi/Liter)*	**Strontium**	4							
	Sr-89	4		< LLD	N/A		< LLD	< LLD	0
	Sr-90	4		**1.36 (2/4) (1.24 - 1.48)**	**CP**	**3.7 mi NNW**	**1.36 (2/4) (1.24 - 1.48)**	< LLD	0
	Gamma	36							
	K-40	36		**1270 (22/24) (1050 - 1500)**	**EPPS**	**4.8 mi SSW**	**1325 (12/12) (1050 - 1500)**	**1519 (10/12) (1090 - 1890)**	0
	Th-228	36		< LLD	N/A		< LLD	< LLD	0
	I-131	36	1	< LLD	N/A		< LLD	< LLD	0
	Cs-134	36	15	< LLD	N/A		< LLD	< LLD	0
	Cs-137	36	18	< LLD	N/A		< LLD	< LLD	0
	Ba-140	36	60	< LLD	N/A		< LLD	< LLD	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Milk *(pCi/Liter)*	**Gamma**	36							
	La-140	36	15	< LLD	N/A		< LLD	< LLD	0
Food Products *(pCi/kg wet)*	**Gamma**	3							
	K-40	3		**9620 (3/3) (4450 - 18200)**	**Slade**	**3.2 mi S**	**18300 (1/1) (18300 - 18300)**	N/A	0
	Be-7	3		< LLD	N/A		< LLD	N/A	0
	Th-228	3		< LLD	N/A		< LLD	N/A	0
	I-131	3	60	< LLD	N/A		< LLD	N/A	0
	Cs-134	3	60	< LLD	N/A		< LLD	N/A	0
	Cs-137	3	80	< LLD	N/A		< LLD	N/A	0
Well Water *(pCi/Liter)*	**H-3**	12	2000	< LLD	N/A		< LLD	N/A	0
	Gamma	12							
	Mn-54	12	15	< LLD	N/A		< LLD	N/A	0
	Co-58	12	15	< LLD	N/A		< LLD	N/A	0
	Fe-59	12	30	< LLD	N/A		< LLD	N/A	0
	Co-60	12	15	< LLD	N/A		< LLD	N/A	0
	Zn-65	12	30	< LLD	N/A		< LLD	N/A	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Well Water *(pCi/Liter)*	Nb-95	12	15	< LLD	N/A		< LLD	N/A	0
	Zr-95	12	30	< LLD	N/A		< LLD	N/A	0
	I-131	12	1	< LLD	N/A		< LLD	N/A	0
	Cs-134	12	15	< LLD	N/A		< LLD	N/A	0
	Cs-137	12	18	< LLD	N/A		< LLD	N/A	0
	Ba-140	12	60	< LLD	N/A		< LLD	N/A	0
	La-140	12	15	< LLD	N/A		< LLD	N/A	0
River Water *(pCi/Liter)*	**H-3**	8	2000	< LLD	N/A		< LLD	< LLD	0
	Gamma	24							
	K-40	24		**88.9 (2/12) (62.8 - 115)**	**SD**	**0.4 mi NW**	**88.9 (2/12) (62.8 - 115)**	**127 (1/12) (127 - 127)**	0
	Ra-226	24		< LLD	N/A		< LLD	< LLD	0
	Th-228	24		**20.9 (1/12) (20.9 - 20.9)**	**SD**	**0.4 mi NW**	**20.9 (1/12) (20.9 - 20.9)**	< LLD	0
	Mn-54	24	15	< LLD	N/A		< LLD	< LLD	0
	Co-58	24	15	< LLD	N/A		< LLD	< LLD	0
	Fe-59	24	30	< LLD	N/A		< LLD	< LLD	0
	Co-60	24	15	< LLD	N/A		< LLD	< LLD	0
	Zn-65	24	30	< LLD	N/A		< LLD	< LLD	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Distance Direction	Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
River Water *(pCi/Liter)*	Nb-95	24	15	< LLD	N/A		< LLD	< LLD	0
	Zr-95	24	30	< LLD	N/A		< LLD	< LLD	0
	I-131	24	10	< LLD	N/A		< LLD	< LLD	0
	Cs-134	24	15	< LLD	N/A		< LLD	< LLD	0
	Cs-137	24	18	< LLD	N/A		< LLD	< LLD	0
	Ba-140	24	60	< LLD	N/A		< LLD	< LLD	0
	La-140	24	15	< LLD	N/A		< LLD	< LLD	0
Silt *(pCi/kg dry)*	**Gamma**	6							
	Be-7	6		**2140 (1/2) (1030 - 3270)**	**SI**	**1.8 mi ESE**	**2695 (3/4) (2120 - 3270)**	<LLD	0
	K-40	6		**17000 (4/4) (16600-17400)**	**SI**	**1.8 mi ESE**	**17000 (4/4) (16600-17400)**	**18100 (2/2) (16700-19500)**	0
	Cs-134	6	150	< LLD	N/A		< LLD	< LLD	0
	Cs-137	6	180	**161 (4/4) (52 - 161)**	**SD**	**1.3 mi NNW**	**186 (4/4) (91 - 281)**	< LLD	0
	Ra-226	6		**3527 (3/4) (3230 - 3970)**	**SI**	**1.8 mi ESE**	**3970 (3/4) (3970 - 3970)**	**3100 (2/2) (2440 - 3760)**	0
	Th-228	6		**1460 (4/4) (1440 - 1480)**	**SI**	**1.8 mi ESE**	**1460 (4/4) (1440 - 1480)**	**1600 (2/2) (1510 - 1690)**	0
	Th-232	6		**1058 (3/4) (774 - 1330)**	**SI**	**1.8 mi ESE**	**1330 (3/4) (1330 - 1330)**	**1405 (2/2) (1310 - 1500)**	0
	Ac-228	6		**1280 (1/4) (1280 - 1280)**	**SI**	**1.8 mi ESE**	**1280 (1/4) (1280 - 1280)**	<LLD	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Shoreline Sediment *(pCi/kg dry)*	K-40	4		**8635 (2/2) (7520 - 9750)**	**HIR**	**0.6 mi N**	**8635 (2/2) (7520 - 9750)**	**2540 (2/2) (1200 - 3880)**	0
	Cs-134	4	150	< LLD	N/A		< LLD	< LLD	0
	Cs-137	4	180	< LLD	N/A		< LLD	< LLD	0
	Ra-226	4		< LLD	**CHIC**	**11.2 mi WNW**	**1450 (1/2) (1450 - 1450)**	**1450 (1/2) (1450 - 1450)**	0
	Th-228	4		**187 (2/2) (134 - 240)**	**HIR**	**0.6 mi N**	**187 (2/2) (134 - 240)**	**994 (1/2) (994 - 994)**	0
	Th-232	4		< LLD	**CHIC**	**11.2 mi WNW**	**1260 (1/2) (1260 - 1260)**	**1260 (1/2) (1260 - 1260)**	0
Fish *(pCi/kg wet)*	**Gamma**	4							
	K-40	4		**1873 (4/4) (1240 - 2320)**	**SD**	**1.3 mi NNW**	**1873 (4/4) (1240 - 2320)**	N/A	0
	Mn-54	4	130	< LLD	N/A		< LLD	N/A	0
	Co-58	4	130	< LLD	N/A		< LLD	N/A	0
	Fe-59	4	260	< LLD	N/A		< LLD	N/A	0
	Co-60	4	130	< LLD	N/A		< LLD	N/A	0
	Zn-65	4	260	< LLD	N/A		< LLD	N/A	0
	Cs-134	4	130	< LLD	N/A		< LLD	N/A	0
	Cs-137	4	150	< LLD	N/A		< LLD	N/A	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Oysters *(pCi/kg wet)*	**Gamma**	6							
	K-40	6		**736 (3/6) (736 - 736)**	**MP**	**4.9 mi ESE**	**736 (3/6) (736 - 736)**	N/A	0
	Mn-54	6	130	< LLD	N/A		< LLD	N/A	0
	Fe-59	6	260	< LLD	N/A		< LLD	N/A	0
	Co-58	6	130	< LLD	N/A		< LLD	N/A	0
	Co-60	6	130	< LLD	N/A		< LLD	N/A	0
	Zn-65	6	260	< LLD	N/A		< LLD	N/A	0
	Cs-134	6	130	< LLD	N/A		< LLD	N/A	0
	Cs-137	6	150	< LLD	N/A		< LLD	N/A	0
Clams *(pCi/kg wet)*	**Gamma**	6							
	K-40	6		< LLD	N/A		< LLD	< LLD	0
	Mn-54	6	130	< LLD	N/A		< LLD	< LLD	0
	Co-58	6	130	< LLD	N/A		< LLD	< LLD	0
	Fe-59	6	260	< LLD	N/A		< LLD	< LLD	0
	Co-60	6	130	< LLD	N/A		< LLD	< LLD	0
	Zn-65	6	260	< LLD	N/A		< LLD	< LLD	0
	Cs-134	6	130	< LLD	N/A		< LLD	< LLD	0
	Cs-137	6	150	< LLD	N/A		< LLD	< LLD	0

TABLE 3-1: RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM SUMMARY

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Medium or Pathway Sampled (Units)	Analysis Type	Analysis Total No.	LLD	Indicator Locations Mean Range	Location with Highest Mean Name	Location with Highest Mean Distance Direction	Location with Highest Mean Mean Range	Control Locations Mean Range	Non-Routine Reported Measurements
Crabs *(pCi/kg wet)*	**Gamma**	1							
	K-40	1		**1400 (1/1) (1400 - 1400)**	**SD**	**1.3 mi NNW**	**1400 (1/1) (1400 - 1400)**	N/A	0
	Mn-54	1	130	< LLD	N/A		< LLD	N/A	0
	Co-58	1	130	< LLD	N/A		< LLD	N/A	0
	Fe-59	1	260	< LLD	N/A		< LLD	N/A	0
	Co-60	1	130	< LLD	N/A		< LLD	N/A	0
	Zn-65	1	260	< LLD	N/A		< LLD	N/A	0
	Cs-134	1	130	< LLD	N/A		< LLD	N/A	0
	Cs-137	1	150	< LLD	N/A		< LLD	N/A	0

3.2 Analytical Results of 2018 REMP Samples

Radiological analyses of environmental media characteristically approach and frequently fall below the detection limits of state-of-the-art measurement methods. 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 positive when the measured value exceeds 2σ uncertainty, unless otherwise noted. MDC is noted in the footnote in several tables. The term <MDC means the value is less than its Minimum Detectable Concentration and is therefore, not considered a positive value or result. Positive values or results are indicated by **bold** text.

Teledyne Brown Engineering 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 Surry ODCM.

Data are given according to sample type as indicated below.

1. Gamma Exposure Rate
2. Air Particulates, Weekly Gross Beta Radioactivity
3. Air Particulates, Weekly I-131
4. Air Particulates, Quarterly Gamma Spectroscopy
5. Animal Milk
6. Food Products
7. Well Water
8. River Water
9. Silt
10. Shoreline Sediment
11. Fish
12. Oysters
13. Clams
14. Crabs

TABLE 3-2: GAMMA EXPOSURE RATE

Surry Power Station, Surry County, Virginia – 2018

$MDD_Q = 3 \times \sigma_Q = 3 \times 1.0 = 5$ Note: IF $MDD_Q < 5$ mR, THEN MDD_Q rounded to 5 mR (ANSI N13.37)

$MDD_A = 3 \times \sigma_A = 3 \times 2.3 = 10$ Note: IF $MDD_A < 10$ mR, THEN MDD_A rounded to 10 mR (ANSI N13.37)

Monitoring Location	Quarterly Baseline, B_Q Baseline, (mrem)	Normalized Quarterly Monitoring Data, M_Q (mrem per standard quarter)				Quarterly Facility Dose, $F_Q = M_Q - B_Q$ (mrem)				Annual Baseline, B_A (mrem)	Annual Monitoring Data, M_A (mrem)	Annual Facility Dose, $F_A = M_A - B_A$ (mrem)
		1	2	3	4	1	2	3	4			
2	19.8	18.9	19.8	20.1	19.2	ND	ND	ND	ND	79.2	78.0	ND
3	19.2	18.6	19.8	20.5	18.6	ND	ND	ND	ND	76.9	77.4	ND
4	17.9	17.1	19.4	19.8	16.7	ND	ND	ND	ND	71.7	72.9	ND
5	19.0	18.0	19.8	20.5	18.0	ND	ND	ND	ND	76.0	76.2	ND
6	18.4	17.7	18.9	19.0	17.3	ND	ND	ND	ND	73.8	73.0	ND
7	18.7	17.7	19.4	19.0	17.3	ND	ND	ND	ND	74.6	73.4	ND
8	17.0	16.8	17.7	17.2	15.8	ND	ND	ND	ND	68.4	67.5	ND
9	23.2	21.9	23.5	24.8	22.0	ND	ND	ND	ND	92.8	92.2	ND
10	18.1	16.8	19.4	18.7	17.0	ND	ND	ND	ND	72.5	71.9	ND
11	16.1	15.3	16.5	17.2	15.5	ND	ND	ND	ND	64.2	64.5	ND
12	16.6	15.9	17.7	17.6	15.2	ND	ND	ND	ND	66.4	66.4	ND
13	18.6	18.0	19.4	18.0	18.3	ND	ND	ND	ND	74.5	73.6	ND
14	17.9	16.8	18.5	20.1	17.7	ND	ND	ND	ND	71.6	73.1	ND
15	18.5	17.7	18.9	19.0	18.0	ND	ND	ND	ND	74.1	73.7	ND
16	17.0	16.2	18.1	18.7	16.4	ND	ND	ND	ND	67.7	69.4	ND
18	14.5	14.1	15.0	15.8	14.8	ND	ND	ND	ND	58.0	59.7	ND
19	15.5	14.7	16.1	15.9	14.8	ND	ND	ND	ND	62.1	61.5	ND
20	14.3	13.8	14.6	14.8	13.9	ND	ND	ND	ND	57.4	57.0	ND
21	15.1	13.8	15.7	16.6	14.8	ND	ND	ND	ND	60.5	60.9	ND
22	13.2	12.6	13.8	14.8	12.7	ND	ND	ND	ND	52.7	53.8	ND
23	18.1	17.7	19.7	18.8	17.6	ND	ND	ND	ND	72.3	73.7	ND
24	14.8	14.1	15.3	16.2	15.1	ND	ND	ND	ND	59.2	60.8	ND
25	18.1	17.7	18.9	18.8	17.6	ND	ND	ND	ND	72.3	73.0	ND
26	15.7	15.0	15.7	16.6	14.8	ND	ND	ND	ND	62.9	62.1	ND
27	14.7	14.4	14.9	14.4	14.2	ND	ND	ND	ND	58.7	58.0	ND
28	14.2	13.5	14.6	15.1	13.6	ND	ND	ND	ND	56.8	56.8	ND
29	13.2	12.6	14.2	14.4	12.7	ND	ND	ND	ND	52.9	53.8	ND
30	14.4	13.8	15.3	15.1	13.6	ND	ND	ND	ND	57.7	57.9	ND
31	12.3	12.0	13.0	13.7	12.1	ND	ND	ND	ND	49.2	50.7	ND
32	15.2	14.7	15.3	15.5	14.0	ND	ND	ND	ND	60.7	59.5	ND
33	14.2	14.4	15.3	16.8	14.0	ND	ND	ND	ND	57.1	60.6	ND
34	16.0	15.6	18.1	17.9	15.5	ND	ND	ND	ND	64.1	67.1	ND
35	18.6	18.0	19.3	20.8	18.6	ND	ND	ND	ND	74.4	76.7	ND
36	18.6	18.0	20.1	20.8	18.3	ND	ND	ND	ND	74.4	77.2	ND
37	15.4	15.0	16.5	17.6	14.9	ND	ND	ND	ND	61.7	64.0	ND
38	20.9	19.8	21.6	21.9	19.5	ND	ND	ND	ND	83.6	82.9	ND
39	14.9	14.7	16.5	15.8	14.3	ND	ND	ND	ND	59.7	61.3	ND
40	16.2	15.3	16.9	17.2	15.8	ND	ND	ND	ND	64.7	65.2	ND
41	21.8	20.7	22.8	22.6	21.1	ND	ND	ND	ND	87.3	87.2	ND
42	16.4	15.6	16.9	17.6	16.1	ND	ND	ND	ND	65.5	66.2	ND
43	14.3	13.8	15.3	14.7	14.0	ND	ND	ND	ND	57.3	57.8	ND

[a]ND = Not detected, where $M_Q < (B_Q + MDD_Q)$

[b]ND = Not detected, where $M_A < (B_A + MDD_A)$

d = Damaged TLDs; m = Missing TLDs; v = Vendor reports TLD not received

N/A = Missing or Damaged TLD Reading Not Available for Calculation

Note: Table formatted in accordance with ANSI/HPS N13.37-2014, Environmental Dosimetry - Criteria for system Design and Implementation.

TABLE 3-3: GROSS BETA CONCENTRATION IN FILTERED AIR

Surry Nuclear Power Station, Surry County, Virginia - 2018

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS							
	SS	HIR	BC	ALL	CP	BASF	FE	NN-C
January 02	16.8 ± 2.77	19.3 ± 2.90	18.6 ± 2.86	18.9 ± 2.83	18.9 ± 2.83	20.1 ± 2.87	19.4 ± 2.87	19.9 ± 2.92
January 09	19.3 ± 3.12	19.5 ± 3.15	18.6 ± 3.15	19.4 ± 3.13	17.2 ± 3.00	19.6 ± 3.10	19.4 ± 3.11	19.4 ± 3.12
January 16	11.2 ± 2.49	11.8 ± 2.54	14.5 ± 2.80	16.1 ± 2.85	12.1 ± 2.60	13.7 ± 2.72	15.7 ± 2.88	13.2 ± 2.70
January 23	20.3 ± 3.02	25.6 ± 3.32	23.2 ± 3.21	26.3 ± 3.30	25.1 ± 3.24	26.2 ± 3.28	24.0 ± 3.21	22.2 ± 3.07
January 29	8.34 ± 2.68	8.95 ± 2.69	9.16 ± 2.67	6.68 ± 2.43	6.61 ± 2.46	6.75 ± 2.44	7.99 ± 2.55	9.70 ± 2.65
February 05	7.74 ± 2.36	8.45 ± 2.40	8.86 ± 2.55	9.08 ± 2.49	9.54 ± 2.52	10.7 ± 2.57	8.68 ± 2.50	8.37 ± 2.46
February 12	11.8 ± 2.62	11.7 ± 2.58	13.2 ± 2.66	13.3 ± 2.60	13.4 ± 2.63	13.5 ± 2.62	13.3 ± 2.66	13.2 ± 2.63
February 19	12.6 ± 2.66	14.8 ± 2.76	11.0 ± 2.58	12.4 ± 2.62	12.6 ± 2.61	11.6 ± 2.55	12.4 ± 2.63	11.0 ± 2.55
February 26	8.44 ± 2.47	9.31 ± 2.50	7.54 ± 2.41	10.2 ± 2.54	6.98 ± 2.31	9.17 ± 2.44	10.6 ± 2.58	10.0 ± 2.51
March 06	14.8 ± 2.57	19.7 ± 2.80	17.2 ± 2.72	17.8 ± 2.92	17.1 ± 2.64	20.2 ± 2.79	18.8 ± 2.75	18.0 ± 2.68
March 12	12.4 ± 2.95	12.7 ± 2.94	8.63 ± 2.74	9.56 ± 2.73	10.4 ± 2.79	14.6 ± 3.05	12.5 ± 2.97	11.9 ± 2.91
March 20	15.2 ± 2.50	14.6 ± 2.43	13.1 ± 2.37	16.1 ± 2.50	14.6 ± 2.42	16.2 ± 2.49	17.6 ± 2.61	14.2 ± 2.41
March 26	8.36 ± 2.48	6.09 ± 2.26	8.25 ± 2.45	7.49 ± 2.36	9.71 ± 2.53	12.4 ± 2.68	9.54 ± 2.55	11.8 ± 2.71
Qtr. Avg. ± 2 s.d.	**12.9 ± 8.4**	**14.0 ± 11.2**	**13.2 ± 9.9**	**14.1 ± 11.3**	**13.4 ± 10.4**	**15.0 ± 10.7**	**14.6 ± 9.9**	**14.1 ± 8.8**
April 03	12.4 ± 2.42	11.3 ± 2.31	8.10 ± 2.15	11.1 ± 2.30	9.50 ± 2.21	15.3 ± 2.49	9.28 ± 2.18	12.6 ± 2.38
April 10	17.8 ± 2.85	17.8 ± 2.80	20.1 ± 2.95	18.6 ± 2.84	17.2 ± 2.76	18.1 ± 2.80	19.7 ± 2.91	17.0 ± 2.78
April 17	15.0 ± 2.81	16.2 ± 2.83	13.3 ± 2.71	11.4 ± 2.55	14.6 ± 2.74	15.6 ± 2.79	12.8 ± 2.66	13.8 ± 2.70
April 24	12.6 ± 2.72	11.3 ± 2.61	13.7 ± 2.79	10.3 ± 2.55	9.45 ± 2.49	12.7 ± 2.68	12.0 ± 2.66	15.0 ± 2.81
May 01	12.2 ± 2.74	12.8 ± 2.73	11.5 ± 2.70	11.8 ± 2.67	13.5 ± 2.77	11.9 ± 2.65	10.4 ± 2.59	12.5 ± 2.71
May 08	16.7 ± 2.75	16.7 ± 2.70	17.1 ± 2.84	16.1 ± 2.73	19.2 ± 2.90	17.6 ± 2.82	17.5 ± 2.84	14.8 ± 2.67
May 15	15.9 ± 3.02	17.3 ± 3.06	16.9 ± 3.02	15.4 ± 2.87	14.8 ± 2.85	18.6 ± 3.04	14.6 ± 2.87	16.3 ± 2.95
May 22	6.59 ± 2.34	6.88 ± 2.33	5.89 ± 2.31	4.47 ± 2.15	6.78 ± 2.31	6.52 ± 2.31	3.21 ± 2.07	6.48 ± 2.30
May 29	10.9 ± 2.57	12.8 ± 2.65	10.7 ± 2.57	8.24 ± 2.35	9.88 ± 2.45	12.4 ± 2.60	7.03 ± 2.29	10.0 ± 2.48
June 04	7.95 ± 3.00	7.79 ± 2.94	6.36 ± 2.88	6.04 ± 2.77	7.68 ± 2.89	5.21 ± 2.68	4.15 ± 2.64	4.70 ± 2.67
June 12	12.4 ± 2.56	11.8 ± 2.49	11.7 ± 2.54	13.1 ± 2.57	13.0 ± 2.56	14.8 ± 2.68	14.4 ± 2.67	13.5 ± 2.62
June 18	13.3 ± 2.87	15.0 ± 2.94	12.1 ± 2.81	13.1 ± 2.83	12.2 ± 2.74	15.5 ± 2.97	16.7 ± 3.05	15.4 ± 2.96
June 26	13.4 ± 2.56	11.9 ± 2.44	11.5 ± 2.43	9.78 ± 2.28	8.23 ± 2.18	11.7 ± 2.39	9.54 ± 2.28	12.4 ± 2.42
Qtr. Avg. ± 2 s.d.	**12.9 ± 6.4**	**13.0 ± 6.9**	**12.2 ± 8.3**	**11.5 ± 7.9**	**12.0 ± 7.6**	**13.5 ± 8.2**	**11.6 ± 10.0**	**12.7 ± 7.3**

TABLE 3-3: GROSS BETA CONCENTRATION IN FILTERED AIR

Surry Nuclear Power Station, Surry County, Virginia - 2018

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS SS	HIR	BC	ALL	CP	BASF	FE	NN
July 03	**15.8** ± 2.97	**19.4** ± 3.12	**14.1** ± 2.89	**14.4** ± 2.83	**15.9** ± 2.90	**17.4** ± 2.96	**14.2** ± 2.83	**14.7** ± 2.85
July 10	1.61 ± 1.90 **B**	**14.9** ± 2.76	**14.1** ± 2.77	**11.7** ± 2.56	**11.8** ± 2.56	**14.6** ± 2.73	**12.7** ± 2.64	**13.4** ± 2.66
July 17	**18.2** ± 2.96	**18.4** ± 2.92	**16.9** ± 2.90	**17.1** ± 2.85	**27.7** ± 3.38	**20.8** ± 3.04	**16.9** ± 2.99	**17.1** ± 2.87
July 23	**10.5** ± 2.57	**13.0** ± 2.70	**11.8** ± 2.68	**12.7** ± 2.77	**11.1** ± 2.56	**13.9** ± 2.75	**9.44** ± 2.47	**11.7** ± 2.61
July 30	**8.39** ± 2.37	**11.2** ± 2.52	**10.4** ± 2.52	**10.9** ± 2.48	**10.5** ± 2.47	**11.1** ± 2.51	**9.87** ± 2.45	**9.07** ± 2.41
August 06	**7.62** ± 2.31	**8.99** ± 2.36	**7.60** ± 2.32	**5.71** ± 2.13	**7.18** ± 2.23	**6.87** ± 2.17	**6.45** ± 2.15	**7.32** ± 2.22
August 13	**17.1** ± 2.73	**16.7** ± 2.66	**19.0** ± 2.90	**15.6** ± 2.65	**15.3** ± 2.64	**17.5** ± 2.80	**13.3** ± 2.56	**16.3** ± 2.74
August 20	**19.8** ± 3.10	**19.2** ± 3.00	**19.3** ± 2.99	**18.3** ± 2.87	**16.6** ± 2.80	**22.0** ± 3.06	**17.0** ± 2.80	**16.0** ± 2.76
August 27	**16.1** ± 2.55	**17.7** ± 2.62	**19.0** ± 2.75	**15.8** ± 2.51	**17.9** ± 2.64	**17.9** ± 2.63	**15.2** ± 2.48	**18.4** ± 2.66
September 04	**11.5** ± 2.25	**14.7** ± 2.41	**12.8** ± 2.34	**13.4** ± 2.31	**12.2** ± 2.25	**16.9** ± 2.48	**12.3** ± 2.24	**10.4** ± 2.13
September 11	**10.2** ± 2.38	**14.4** ± 2.59	**13.0** ± 2.58	**12.9** ± 2.52	**9.96** ± 2.34	**14.8** ± 2.67	**10.6** ± 2.40	**12.7** ± 2.53
September 18	**5.05** ± 2.27	**8.25** ± 2.43	**7.41** ± 2.43	**5.63** ± 2.25	**5.56** ± 2.24	**6.66** ± 2.33	**3.61** ± 2.12	**4.79** ± 2.19
September 24	**14.9** ± 2.88	**16.1** ± 2.91	**16.7** ± 3.00	**16.6** ± 2.92	**14.7** ± 2.81	**16.6** ± 2.93	**15.9** ± 2.89	**13.9** ± 2.79
Qtr. Avg. ± 2 s.d.	**12.9 ± 9.4**	**14.8 ± 7.3**	**14.0 ± 8.1**	**13.1 ± 7.9**	**13.6 ± 11.2**	**15.2 ± 9.3**	**12.1 ± 8.1**	**12.8 ± 8.0**
October 02	**12.1** ± 2.39	**13.9** ± 2.45	**13.7** ± 2.48	**13.2** ± 2.41	**13.2** ± 2.39	**14.6** ± 2.45	**12.1** ± 2.32	**13.5** ± 2.39
October 09	**18.8** ± 2.94	**20.1** ± **2.99**	**21.3** ± 3.08	**18.9** ± 2.88	**19.2** ± 2.89	**28.1** ± 3.32	**20.0** ± 2.97	**20.3** ± 3.00
October 16	**10.8** ± 2.57	**12.6** ± 2.66	**8.80** ± 2.46	**8.48** ± 2.38	**9.46** ± 2.45	**10.9** ± 2.73	**10.7** ± 2.68	**11.8** ± 2.60
October 23	**12.9** ± 2.59	**13.7** ± 2.62	**12.7** ± 2.61	**12.7** ± 2.54	**11.0** ± 2.44	**12.0** ± 2.49	**12.9** ± 2.56	**14.3** ± 2.62
October 30	**8.30** ± 2.35	**10.7** ± 2.46	**8.69** ± 2.41	**8.16** ± 2.32	**7.79** ± 2.30	**9.37** ± 2.40	**8.40** ± 2.36	**9.67** ± 2.45
November 06	**12.4** ± 2.55	**12.8** ± 2.54	**12.2** ± 2.55	**11.6** ± 2.48	**11.6** ± 2.48	**13.5** ± 2.56	**13.4** ± 2.58	**10.6** ± 2.41
November 13	**9.71** ± 2.55	**11.8** ± 2.63	**12.9** ± 2.75	**11.9** ± 2.64	**11.1** ± 2.59	**14.4** ± 2.77	**12.9** ± 2.70	**12.4** ± 2.67
November 20	**16.4** ± 2.81	**16.5** ± 2.79	**18.3** ± 2.94	**15.5** ± 2.75	**18.2** ± 2.89	**19.6** ± 2.94	**15.0** ± 2.71	**14.2** ± 2.68
November 27	**13.4** ± 2.65	**16.9** ± 2.83	**17.3** ± 2.90	**16.0** ± 2.79	**15.7** ± 2.77	**20.1** ± 2.99	**17.4** ± 2.86	**17.5** ± 2.86
December 04	**10.8** ± 2.53	**12.1** ± 2.59	**15.9** ± 2.85	**10.9** ± 2.52	**14.6** ± 2.72	**13.9** ± 2.67	**13.5** ± 2.66	**12.7** ± 2.62
December 11	**10.4** ± 2.63	**13.9** ± 2.80	**12.6** ± 2.80	**13.7** ± 2.79	**13.6** ± 2.97	**17.1** ± 3.02	**14.2** ± 2.97	**12.6** ± 2.73
December 18	**19.5** ± 3.11	**21.3** ± 3.18	**21.8** ± 3.30	**14.5** ± 2.97	**21.6** ± 3.20	**22.9** ± 3.25	**19.8** ± 3.11	**20.9** ± 3.17
December 24	**8.86** ± 2.77	**11.2** ± 2.88	**8.74** ± 2.80	**7.26** ± 2.67	**10.6** ± 2.87	**11.6** ± 2.92	**10.8** ± 2.87	**10.3** ± 2.84
January 02	**13.7** ± 2.29	**13.3** ± 2.25	**12.9** ± 2.27	**13.3** ± 2.25	**13.5** ± 2.26	**14.8** ± 2.31	**12.9** ± 2.21	**13.4** ± 2.26

A=<MDC; B = Visual inspection indicated very little particulate material on filter.

Qtr. Avg. ± 2 s.d.	**12.7 ± 6.9**	**14.3 ± 6.4**	**14.1 ± 8.6**	**12.6 ± 6.4**	**13.7 ± 7.8**	**15.9 ± 10.3**	**13.9 ± 6.6**	**13.9 ± 6.9**

TABLE 3-4: IODINE-131 CONCENTRATION IN FILTERED AIR

Surry Power Station, Surry County, Virginia - 2018

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS							
	SS	HIR	BC	ALL	CP	BASF	FE	NN-C
January 02	-0.98 ± 17.7	-0.98 ± 17.7	-0.98 ± 17.8	-0.96 ± 17.3	-5.03 ± 10.9	-4.96 ± 10.8	-5.04 ± 11.0	-5.08 ± 11.0
January 09	24.3 ± 20.5	24.4 ± 20.6	24.9 ± 21.0	24.2 ± 20.5	-10.3 ± 19.0	-10.1 ± 18.7	-10.2 ± 18.8	-10.2 ± 18.9
January 16	6.22 ± 16.1	6.30 ± 16.3	6.67 ± 17.2	6.53 ± 16.9	-4.57 ± 17.3	-4.60 ± 17.4	-4.71 ± 17.8	-4.60 ± 17.4
January 23	-5.87 ± 17.9	-6.03 ± 18.5	-6.07 ± 18.6	-5.90 ± 18.1	-4.40 ± 17.9	-4.35 ± 17.7	-4.43 ± 18.0	-4.30 ± 17.5
January 29	9.55 ± 16.9	9.51 ± 16.8	9.32 ± 16.5	9.02 ± 15.9	3.39 ± 21.7	3.32 ± 21.3	3.36 ± 21.5	3.32 ± 21.2
February 05	12.6 ± 16.6	12.6 ± 16.5	13.5 ± 17.7	13.0 ± 17.1	6.39 ± 19.7	6.30 ± 19.4	6.46 ± 19.9	6.38 ± 19.7
February 12	-12.1 ± 18.7	-11.9 ± 18.4	-11.9 ± 18.4	-11.5 ± 17.8	-1.71 ± 11.1	-1.69 ± 11.0	-1.73 ± 11.2	-1.70 ± 11.0
February 19	-3.96 ± 19.1	-3.91 ± 18.9	-3.98 ± 19.3	-3.89 ± 18.8	0.41 ± 11.6	0.41 ± 11.5	0.42 ± 11.7	0.42 ± 11.7
February 26	-5.96 ± 16.8	-5.88 ± 16.6	-5.96 ± 16.8	-5.81 ± 16.4	-4.10 ± 10.1	-4.07 ± 10.0	-4.15 ± 10.2	-4.08 ± 10.0
March 06	-8.49 ± 14.5	-8.33 ± 14.2	-8.51 ± 14.6	-9.33 ± 16.0	1.30 ± 9.50	1.28 ± 9.38	1.30 ± 9.54	1.28 ± 9.38
March 12	-8.54 ± 19.2	-8.40 ± 18.9	-8.60 ± 19.3	-8.30 ± 18.7	-10.3 ± 12.8	-10.3 ± 12.8	-10.6 ± 13.1	-10.4 ± 12.8
March 20	-0.28 ± 12.5	-0.27 ± 12.2	-0.28 ± 12.4	-0.27 ± 12.1	7.35 ± 14.3	2.57 ± 5.00	7.47 ± 14.5	7.38 ± 14.4
March 26	19.4 ± 17.9 **A**	19.0 ± 17.5 **A**	19.2 ± 17.6 **A**	18.8 ± 17.3 **A**	1.42 ± 11.7	1.40 ± 11.5	1.45 ± 11.9	1.45 ± 11.9
April 03	-6.50 ± 14.7	-6.33 ± 14.3	-6.45 ± 14.6	-6.32 ± 14.3	0.66 ± 9.03	0.64 ± 8.75	0.65 ± 8.89	0.65 ± 8.88
April 10	17.9 ± 20.6	17.4 ± 20.0	17.6 ± 20.3	17.3 ± 19.9	-0.63 ± 12.7	-0.62 ± 12.5	-0.63 ± 12.7	-0.63 ± 12.7
April 17	-8.65 ± 17.4	-8.46 ± 17.0	-8.62 ± 17.3	-8.41 ± 16.9	-0.43 ± 11.5	-0.43 ± 11.4	-0.44 ± 11.6	-0.43 ± 11.5
April 24	-15.6 ± 21.9	-15.3 ± 21.4	-15.6 ± 21.9	1.93 ± 16.2	1.92 ± 16.1	-6.31 ± 8.85	1.93 ± 16.2	1.58 ± 13.3
May 01	0.58 ± 3.82	0.67 ± 4.43	0.69 ± 4.54	0.67 ± 4.43	1.51 ± 2.83	3.52 ± 6.61	3.56 ± 6.70	3.54 ± 6.65
May 08	2.78 ± 8.11	7.67 ± 22.4	8.22 ± 24.0	7.97 ± 23.3	2.98 ± 10.5	5.49 ± 19.3	5.56 ± 19.5	5.47 ± 19.3
May 15	-9.62 ± 29.9	-9.44 ± 29.3	-9.47 ± 29.4	-9.14 ± 28.4	-12.2 ± 18.0	-12.2 ± 17.9	-12.4 ± 18.2	-12.3 ± 18.0
May 22	4.31 ± 28.7	4.25 ± 28.3	4.36 ± 29.0	4.20 ± 28.0	3.73 ± 16.9	3.76 ± 17.0	3.74 ± 16.9	3.71 ± 16.8
May 29	10.4 ± 25.6	10.3 ± 25.1	10.5 ± 25.6	10.1 ± 24.7	1.11 ± 6.10	1.10 ± 6.09	1.12 ± 6.16	1.11 ± 6.13
June 04	-4.93 ± 20.4	-4.83 ± 20.0	-4.91 ± 20.3	-4.73 ± 19.6	-4.06 ± 25.4	-1.66 ± 10.4	-4.01 ± 25.1	-3.98 ± 24.9
June 12	-9.97 ± 10.3	-9.78 ± 10.1	-10.0 ± 10.3	-9.79 ± 10.1	3.09 ± 8.82	3.11 ± 8.89	3.13 ± 8.95	3.11 ± 8.89
June 18	1.10 ± 19.1	1.08 ± 18.8	1.10 ± 19.1	1.08 ± 18.7	-1.11 ± 22.4	-1.12 ± 22.7	-1.13 ± 22.8	-1.12 ± 22.6
June 26	7.25 ± 12.9	7.12 ± 12.7	7.14 ± 12.7	6.92 ± 12.3	5.75 ± 10.2	2.12 ± 21.1	2.14 ± 21.2	0.89 ± 8.80

A: <MDC

TABLE 3-4: IODINE-131 CONCENTRATION IN FILTERED AIR

Surry Power Station, Surry County, Virginia - 2018

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS							
	SS	HIR	BC	ALL	CP	BASF	FE	NN-C
July 03	-4.46 ± 19.2	-4.39 ± 18.9	-4.49 ± 19.3	-4.34 ± 18.6	-5.87 ± 28.4	-5.81 ± 28.1	-5.91 ± 28.5	-5.87 ± 28.4
July 10	16.0 ± 23.4	15.6 ± 22.8	16.0 ± 23.4	15.4 ± 22.6	-23.1 ± 22.7	-23.1 ± 22.7	-23.3 ± 22.9	-22.9 ± 22.5
July 17	-1.39 ± 22.7	-1.35 ± 22.1	-1.39 ± 22.8	-1.35 ± 22.1	8.42 ± 28.6	8.34 ± 28.3	8.98 ± 30.5	8.38 ± 28.4
July 23	-1.31 ± 9.83	-1.29 ± 9.63	-1.32 ± 9.89	-1.34 ± 10.0	2.38 ± 6.13	2.37 ± 6.11	2.40 ± 6.19	2.38 ± 6.12
July 30	2.69 ± 19.7	2.65 ± 19.4	2.72 ± 19.9	2.62 ± 19.2	6.72 ± 14.6	6.69 ± 14.5	6.75 ± 14.6	6.77 ± 14.7
August 06	10.4 ± 22.3	10.2 ± 21.8	10.5 ± 22.4	10.1 ± 21.6	2.84 ± 22.8	2.76 ± 22.1	2.77 ± 22.2	2.77 ± 22.3
August 13	-2.87 ± 11.7	-2.79 ± 11.4	-3.00 ± 12.2	-2.90 ± 11.8	-19.6 ± 16.8	-19.8 ± 17.0	-19.8 ± 17.0	-19.8 ± 17.0
August 20	-1.30 ± 11.4	-1.26 ± 11.0	-1.25 ± 11.0	-1.21 ± 10.6	0.79 ± 16.1	0.78 ± 15.8	0.78 ± 15.8	0.79 ± 15.9
August 27	18.4 ± 16.8 **A**	18.0 ± 16.5 **A**	18.5 ± 16.9 **A**	18.0 ± 16.5 **A**	7.70 ± 12.2	7.66 ± 12.1	7.68 ± 12.2	7.60 ± 12.1
September 04	-1.05 ± 7.20	-1.03 ± 7.05	-1.05 ± 7.21	-1.01 ± 6.94	-13.8 ± 13.6	-13.5 ± 13.3	-13.6 ± 13.4	-13.5 ± 13.4
September 11	-3.99 ± 23.3	-3.90 ± 22.7	-4.03 ± 23.5	-3.91 ± 22.8	2.44 ± 8.55	5.87 ± 20.6	5.84 ± 20.5	5.84 ± 20.5
September 18	-5.72 ± 15.5	-5.54 ± 15.0	-5.72 ± 15.5	-5.52 ± 14.9	-5.13 ± 12.3	-5.14 ± 12.3	-5.15 ± 12.3	-5.07 ± 12.1
September 24	-2.16 ± 19.9	-2.10 ± 19.4	-2.16 ± 19.9	-1.75 ± 16.1	1.27 ± 24.8	1.27 ± 24.8	1.27 ± 24.8	1.27 ± 24.9
October 02	-1.69 ± 6.50	-1.65 ± 6.34	-1.68 ± 6.49	-1.64 ± 6.31	-2.87 ± 5.26	-2.83 ± 5.19	-2.83 ± 5.19	-2.80 ± 5.14
October 9	-0.85 ± 10.7	-0.84 ± 10.6	-0.85 ± 10.7	-0.82 ± 10.3	5.70 ± 12.7	5.68 ± 12.6	5.77 ± 12.8	5.78 ± 12.8
October 16	-13.0 ± 32.5	-12.9 ± 32.1	-13.1 ± 32.7	-6.53 ± 16.3	0.39 ± 22.3	0.44 ± 24.6	0.43 ± 24.1	0.39 ± 22.3
October 23	-3.31 ± 12.5	-3.27 ± 12.4	-3.35 ± 12.7	-3.22 ± 12.2	14.4 ± 18.5	14.4 ± 18.5	14.4 ± 18.5	5.99 ± 7.68
October 30	2.97 ± 25.0	1.23 ± 10.3	3.03 ± 25.5	2.95 ± 24.8	-11.1 ± 16.1	-11.1 ± 16.0	-11.2 ± 16.2	-11.2 ± 16.2
November 06	-4.53 ± 12.7	-4.45 ± 12.5	-4.56 ± 12.8	-4.46 ± 12.5	7.91 ± 17.2	7.79 ± 17.0	7.87 ± 17.1	7.86 ± 17.1
November 13	12.7 ± 15.9	12.5 ± 15.6	12.8 ± 16.0	12.5 ± 15.6	-0.25 ± 6.30	-0.21 ± 5.23	-0.25 ± 6.29	-0.25 ± 6.27
November 20	-4.05 ± 21.0	-4.01 ± 20.8	-4.11 ± 21.3	-4.01 ± 20.8	21.0 ± 34.9	20.6 ± 34.3	20.8 ± 34.6	20.9 ± 34.7
November 27	6.35 ± 8.79	6.28 ± 8.70	6.44 ± 8.93	6.30 ± 8.73	-4.08 ± 14.5	-4.06 ± 14.4	-4.07 ± 14.4	-4.05 ± 14.4
December 04	5.53 ± 11.2	5.46 ± 11.0	5.59 ± 11.3	5.45 ± 11.0	-2.77 ± 14.4	-2.29 ± 11.9	-2.75 ± 14.3	-2.75 ± 14.3
December 11	1.39 ± 16.2	1.37 ± 15.9	1.41 ± 16.5	1.37 ± 15.9	21.5 ± 28.4	20.1 ± 26.5	21.2 ± 28.0	19.6 ± 25.9
December 18	-22.0 ± 28.3	-21.7 ± 27.9	-22.6 ± 29.1	-23.3 ± 29.9	-4.15 ± 31.6	-4.12 ± 31.4	-4.14 ± 31.5	-4.14 ± 31.5
December 24	-15.7 ± 29.4	-6.48 ± 12.2	-15.9 ± 29.9	-15.7 ± 29.5	13.7 ± 23.7	13.6 ± 23.5	13.6 ± 23.5	13.5 ± 23.4
January 2	-1.49 ± 12.6	-1.48 ± 12.5	-1.51 ± 12.8	-1.47 ± 12.4	-22.2 ± 19.5	-21.9 ± 19.2	-21.9 ± 19.2	-22.1 ± 19.4

A: <MDC

TABLE 3-5: GAMMA EMITTER CONCENTRATION IN FILTERED AIR

Surry Power Station, Surry County, Virginia - 2018

1.0E-3 pCi/m3 ± 2 Sigma

SAMPLING LOCATIONS	NUCLIDE	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	AVERAGE ± 2 SIGMA
SS	Cs-134	-0.76 ± 1.06	0.23 ± 0.63	-0.05 ± 0.79	-0.17 ± 0.80	
	Cs-137	-0.04 ± 0.83	0.05 ± 0.63	0.14 ± 0.52	-0.39 ± 0.70	
	Be-7	**174** ± 36.4	**148** ± 23.8	**116** ± 25.3	**88.9** ± 19.4	132 ± 74.2
HIR	Cs-134	-0.22 ± 1.18	-0.25 ± 1.17	-0.56 ± 1.35	-0.18 ± 0.68	
	Cs-137	-0.42 ± 0.93	-0.45 ± 0.99	-0.40 ± 1.07	0.25 ± 0.54	
	Be-7	**208** ± 39.4	**176** ± 31.4	**155** ± 34.7	**111** ± 21.8	163 ± 81.3
BC	Cs-134	-1.18 ± 0.96	0.81 ± 0.93	-0.03 ± 1.17	-0.15 ± 0.62	
	Cs-137	0.04 ± 0.82	-0.25 ± 0.65	-0.05 ± 1.11	0.21 ± 0.58	
	Be-7	**142** ± 40.4	**128** ± 24.5	**164** ± 45.3	**96.2** ± 20.2	133 ± 56.8
ALL	Cs-134	-0.36 ± 0.62	-0.46 ± 0.85	-0.52 ± 0.86	-0.05 ± 0.75	
	Cs-137	0.47 ± 0.59	0.32 ± 0.74	0.14 ± 0.74	-0.08 ± 0.65	
	Be-7	**163** ± 23.9	**132** ± 24.9	**101** ± 26.0	**96.5** ± 20.7	123 ± 61.8
CP	Cs-134	0.16 ± 1.14	-0.03 ± 0.73	0.03 ± 0.88	-0.49 ± 0.66	
	Cs-137	-0.93 ± 0.85	0.01 ± 0.52	0.00 ± 0.70	0.12 ± 0.72	
	Be-7	**124** ± 36.0	**156** ± 22.7	**126** ± 27.8	**91.7** ± 22.5	124 ± 52.5
BASF	Cs-134	-0.35 ± 1.07	0.48 ± 0.78	-0.29 ± 1.23	-0.57 ± 0.64	
	Cs-137	0.17 ± 0.70	0.02 ± 0.66	-0.04 ± 1.02	0.24 ± 0.65	
	Be-7	**156** ± 37.9	**179** ± 31.2	**122** ± 34.5	**145** ± 24.7	151 ± 47.4
FE	Cs-134	-0.36 ± 1.09	-0.11 ± 0.74	-0.29 ± 1.17	-0.11 ± 0.60	
	Cs-137	0.17 ± 0.71	-0.89 ± 0.72	0.33 ± 1.16	-0.03 ± 0.53	
	Be-7	**159** ± 38.7	**125** ± 24.2	**126** ± 36.4	**88.5** ± 19.2	125 ± 57.6
NN-C	Cs-134	-0.76 ± 0.98	0.39 ± 1.15	-0.73 ± 1.09	-0.19 ± 0.79	
	Cs-137	-0.17 ± 0.89	-0.31 ± 0.99	0.37 ± 1.09	0.60 ± 0.62	
	Be-7	**187** ± 36.2	**151** ± 32.7	**111** ± 41.1	**107** ± 20.6	139 ± 75.3
	K-40				**17.9** ± 13.7	18 13.7

A: < MDC

TABLE 3-6: GAMMA EMITTER AND STRONTIUM CONCENTRATIONS IN MILK

Surry Power Station, Surry County, Virginia - 2018

pCi/Liter ± 2 Sigma

NUCLIDE	EPPS	COLONIAL PARKWAY	LOVERS RETREAT-C
JANUARY			
Cs-134	-1.30 ± 5.36	-0.16 ± 6.41	± B
Cs-137	1.82 ± 5.09	4.76 ± 6.00	± B
Ba-140	0.89 ± 15.6	1.99 ± 19.1	± B
La-140	-1.39 ± 5.96	3.12 ± 4.93	± B
I-131	0.37 ± 0.45	-0.17 ± 0.43	± B
K-40	**1,330** ± 200	**1,250** ± 171	± B
FEBRUARY			
Cs-134	2.83 ± 4.81	-0.64 ± 4.84	± B
Cs-137	-1.19 ± 3.92	2.14 ± 4.87	± B
Ba-140	6.72 ± 16.6	10.2 ± 17.8	± B
La-140	-2.07 ± 3.68	-0.15 ± 4.92	± B
I-131	0.36 ± 0.53	0.11 ± 0.30	± B
K-40	**1390** ± 156	**1230** ± 161	± B
MARCH			
Cs-134	0.95 ± 4.84	2.26 ± 7.75	5.02 ± 6.52
Cs-137	1.05 ± 4.82	1.94 ± 6.16	1.01 ± 5.24
Ba-140	-1.72 ± 16.0	25.2 ± 25.1	-4.40 ± 25.3
La-140	-3.76 ± 6.54	0.89 ± 4.62	-4.56 ± 8.33
I-131	0.45 ± 0.48	0.00 ± 0.54	-0.06 ± 0.37
K-40	**1390** ± 215	**1180** ± 200	**1430** ± 224
Sr-89		3.23 ± 2.10 **A**	
Sr-90		0.29 ± 0.49	
APRIL			
Cs-134	-1.73 ± 3.71	0.15 ± 2.77	0.81 ± 4.61
Cs-137	-1.29 ± 3.80	0.81 ± 3.36	-1.80 ± 4.38
Ba-140	7.69 ± 12.9	1.74 ± 11.3	-3.88 ± 15.8
La-140	0.49 ± 4.32	-0.59 ± 3.66	0.35 ± 3.51
I-131	-0.39 ± 0.48	-0.02 ± 0.42	-0.59 ± 0.36
K-40	**1210** ± 138	**1140** ± 114	**1500** ± 178

A: <MDC

B: Milking animal (goat) is seasonally unavailable to produce milk.

TABLE 3-6: GAMMA EMITTER AND STRONTIUM CONCENTRATIONS IN MILK

Surry Power Station, Surry County, Virginia - 2018

pCi/Liter ± 2 Sigma

NUCLIDE	EPPS	COLONIAL PARKWAY	LOVERS RETREAT-C
MAY			
Cs-134	0.53 ± 4.96	-9.08 ± 4.89	1.50 ± 4.28
Cs-137	-0.42 ± 4.03	3.04 ± 4.93	-1.58 ± 3.86
Ba-140	-12.4 ± 17.9	6.07 ± 18.4	-16.6 ± 18.1
La-140	0.65 ± 4.45	0.86 ± 6.59	0.52 ± 6.40
I-131	0.05 ± 0.31	-0.15 ± 0.27	-0.12 ± 0.45
K-40	**1050** ± 144	**1260** ± 181	**1540** ± 174
JUNE			
Cs-134	1.19 ± 4.33	0.03 ± 4.85	0.69 ± 4.60
Cs-137	-0.53 ± 4.29	1.46 ± 4.97	1.34 ± 4.58
Ba-140	-5.22 ± 22.0	3.12 ± 15.0	-10.40 ± 20.5
La-140	-1.49 ± 4.77	-2.45 ± 4.80	-1.68 ± 7.06
I-131	-0.15 ± 0.29	0.13 ± 0.30	0.03 ± 0.26
K-40	**1150** ± 161	**1130** ± 159	**1550** ± 186
Sr-89		2.52 ± 2.66	
Sr-90		0.54 ± 0.43 **A**	
JULY			
Cs-134	1.03 ± 2.78	-1.00 ± 3.47	-2.72 ± 3.32
Cs-137	0.15 ± 2.98	2.85 ± 2.91	-0.01 ± 2.96
Ba-140	1.78 ± 14.6	-1.62 ± 15.0	-5.91 ± 15.0
La-140	2.70 ± 4.66	0.28 ± 4.94	-0.44 ± 4.11
I-131	0.04 ± 0.55	0.24 ± 0.44	-0.04 ± 0.33
K-40	**1420** ± 136	**1280** ± 119	**1550** ± 120
AUGUST			
Cs-134	3.42 ± 4.86	2.18 ± 4.14	0.11 ± 5.64
Cs-137	-1.44 ± 4.19	1.67 ± 4.04	2.82 ± 6.01
Ba-140	-4.50 ± 16.7	23.0 ± 17.2 **A**	-17.2 ± 20.4
La-140	2.90 ± 5.90	-1.52 ± 4.60	-1.24 ± 8.49
I-131	0.02 ± 0.31	0.27 ± 0.40	0.06 ± 0.34
K-40	**1330** ± 152	**1360** ± 149	**1890** ± 237

A: <MDC

TABLE 3-6: GAMMA EMITTER AND STRONTIUM CONCENTRATIONS IN MILK

Surry Power Station, Surry County, Virginia - 2018

pCi/Liter ± 2 Sigma

NUCLIDE	EPPS	COLONIAL PARKWAY	LOVERS RETREAT/ BEACHY FARM-C
SEPTEMBER			
Cs-134	-1.67 ± 4.29	4.32 ± 5.50	2.28 ± 5.50
Cs-137	-0.36 ± 4.86	3.33 ± 5.46	-1.81 ± 4.72
Ba-140	-3.98 ± 20.8	18.3 ± 25.2	-11.3 ± 24.5
La-140	2.24 ± 5.04	-1.24 ± 5.98	2.22 ± 7.48
I-131	0.02 ± 0.37	0.27 ± 0.53	-0.33 ± 0.42
K-40	**1410** ± 159	**1210** ± 200	**1720** ± 200
Sr-89		3.67 ± 2.96 **A**	
Sr-90		**1.24** ± 0.67	
OCTOBER			
Cs-134	1.22 ± 4.09	-1.06 ± 3.61	-0.93 ± 5.43
Cs-137	3.95 ± 3.59 **A**	0.76 ± 4.63	-2.83 ± 4.72
Ba-140	-6.30 ± 16.9	3.13 ± 19.3	-20.9 ± 21.8
La-140	-2.26 ± 4.78	-4.36 ± 5.53	-5.08 ± 6.13
I-131	0.34 ± 0.29 **A**	-0.04 ± 0.41	0.15 ± 0.38
K-40	**1500** ± 142	**1200** ± 162	**1690** ± 174
NOVEMBER			
Cs-134	-0.77 ± 3.87	0.53 ± 5.12	1.82 ± 3.81
Cs-137	2.84 ± 3.47	-0.75 ± 5.28	0.78 ± 4.11
Ba-140	-10.8 ± 17.7	6.67 ± 22.1	5.58 ± 15.1
La-140	-2.24 ± 4.82	-3.06 ± 5.11	-1.98 ± 5.15
I-131	-0.05 ± 0.33	-0.07 ± 0.23	-0.09 ± 0.50
K-40	**1390** ± 130	**1180** ± 194	**1090** ± 156
DECEMBER			
Cs-134	-1.13 ± 4.98	2.92 ± 5.17	-3.07 ± 3.96
Cs-137	0.46 ± 4.86	-3.27 ± 4.62	-1.60 ± 4.02
Ba-140	1.69 ± 22.3	23.0 ± 20.8 **A**	9.30 ± 17.1
La-140	-2.33 ± 7.50	-1.02 ± 4.84	-1.44 ± 3.86
I-131	0.01 ± 0.26	0.14 ± 0.35	-0.01 ± 0.24
K-40	**1330** ± 191	**1160** ± 158	**1230** ± 158
Sr-89		3.02 ± 1.99 **A**	
Sr-90		**1.48** ± 0.70	

A: <MDC

TABLE 3-7: GAMMA EMITTER CONCENTRATION IN FOOD PRODUCTS

Surry Power Station, Surry County, Virginia - 2018

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	SAMPLE TYPE	ISOTOPE			
			Cs-134	**Cs-137**	**I-131**	**K-40**
BROCK FARM	11/12/2018	Peanuts	7.83 ± 17.8	8.74 ± 19.6	1.63 ± 30.6	**6110** ± 729
			Cs-134	**Cs-137**	**I-131**	**K-40**
	11/12/2018	Corn	-9.29 ± 13.9	5.79 ± 15.0	15.1 ± 23.3	**4450** ± 636
			Cs-134	**Cs-137**	**I-131**	**K-40**
SLADE FARM	12/11/2018	Soybeans	1.92 ± 14.8	8.63 ± 12.2	-2.10 ± 16.6	**18300** ± 792

TABLE 3-8: GAMMA EMITTER AND TRITIUM CONCENTRATIONS IN WELL WATER

Surry Power Station, Surry County, Virginia - 2018

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SS	3/6/2018	1.41 ± 3.45	-1.13 ± 3.06	8.49 ± 5.96 **A**	-2.67 ± 3.26	0.35 ± 7.78
	6/4/2018	-3.50 ± 3.18	-0.78 ± 3.01	1.14 ± 6.52	-2.58 ± 3.35	-3.73 ± 6.77
	9/4/2018	-0.26 ± 3.52	-3.70 ± 3.47	2.03 ± 7.11	0.64 ± 3.70	-0.07 ± 8.38
	12/11/2018	-2.54 ± 3.64	1.89 ± 3.63	0.20 ± 7.44	5.20 ± 4.15	-0.63 ± 7.82
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/6/2018	-0.53 ± 3.22	-0.50 ± 5.54	0.01 ± 0.27	-0.39 ± 3.55	-0.03 ± 3.63
	6/4/2018	-1.82 ± 3.29	-0.41 ± 6.06	-0.39 ± 0.33	-1.93 ± 3.48	3.45 ± 3.36 **A**
	9/4/2018	0.32 ± 3.27	-4.19 ± 6.72	-0.26 ± 0.50	-1.73 ± 4.67	0.35 ± 3.67
	12/11/2018	0.29 ± 3.02	-2.91 ± 4.94	-0.14 ± 0.46	-0.02 ± 4.18	-0.90 ± 3.47
		Ba-140	**La-140**	**H-3**		
	3/6/2018	-3.59 ± 9.95	-0.25 ± 4.58	-5.33 ± 609		
	6/4/2018	9.76 ± 15.7	-2.72 ± 4.37	-398 ± 633		
	9/4/2018	19.6 ± 19.6	-1.10 ± 6.88	-133 ± 697		
	12/11/2018	13.8 ± 18.3	1.68 ± 5.08	-179 ± 456		
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
HIR	3/6/2018	-0.76 ± 3.30	-1.41 ± 4.12	-4.67 ± 6.91	-1.41 ± 3.05	-5.07 ± 8.07
	6/4/2018	-0.56 ± 3.48	0.95 ± 3.60	4.80 ± 6.69	-0.003 ± 3.53	-4.48 ± 7.89
	9/4/2018	0.04 ± 2.96	-1.24 ± 3.07	2.44 ± 6.27	1.09 ± 3.05	3.69 ± 6.39
	12/11/2018	-2.34 ± 3.20	-1.08 ± 3.12	2.67 ± 6.67	3.40 ± 4.11	-1.69 ± 9.57
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/6/2018	-0.84 ± 4.11	2.63 ± 6.68	-0.08 ± 0.22	2.73 ± 3.80	-4.71 ± 4.88
	6/4/2018	1.08 ± 3.36	4.34 ± 5.46	-0.18 ± 0.40	0.38 ± 3.63	-0.68 ± 3.59
	9/4/2018	4.30 ± 3.12 **A**	3.11 ± 5.15	0.01 ± 0.23	0.76 ± 3.16	-1.45 ± 2.85
	12/11/2018	0.83 ± 4.12	-1.23 ± 4.57	0.20 ± 0.49	5.27 ± 3.82 **A**	0.19 ± 3.49
		Ba-140	**La-140**	**H-3**		
	3/6/2018	-5.86 ± 17.4	-2.32 ± 5.84	518 ± 640		
	6/4/2018	2.65 ± 17.9	-1.23 ± 6.62	242 ± 654		
	9/4/2018	2.33 ± 15.0	-3.18 ± 4.77	499 ± 716		
	12/11/2018	12.5 ± 15.5	3.36 ± 5.33	-103 ± 473		

A: < MDC Value

TABLE 3-8: GAMMA EMITTER AND TRITIUM CONCENTRATIONS IN WELL WATER

Surry Power Station, Surry County, Virginia - 2018

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
TC	3/6/2018	0.33 ± 3.39	-2.56 ± 3.74	-0.46 ± 7.50	1.31 ± 3.99	1.77 ± 10.1
	6/4/2018	-1.88 ± 2.67	0.63 ± 2.95	4.27 ± 5.09	2.94 ± 2.30 **A**	6.37 ± 6.01 **A**
	9/3/2018	3.17 ± 2.98	1.45 ± 2.95	6.97 ± 6.54 **A**	1.34 ± 3.15	-0.53 ± 7.55
	12/11/2018	-1.56 ± 3.27	-0.47 ± 3.63	0.45 ± 8.08	2.47 ± 4.39	-3.14 ± 7.42
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/6/2018	5.78 ± 4.31 **A**	1.63 ± 6.80	-0.34 ± 0.26	0.26 ± 4.20	-5.99 ± 4.20
	6/4/2018	7.58 ± 3.54 **B**	2.95 ± 5.03	0.09 ± 0.30	0.73 ± 2.88	-1.46 ± 2.97
	9/3/2018	-0.12 ± 3.41	-1.78 ± 6.11	-0.29 ± 0.39	-1.69 ± 3.10	1.32 ± 3.08
	12/11/2018	1.03 ± 3.75	1.96 ± 6.13	-0.29 ± 0.44	-2.30 ± 3.84	1.19 ± 3.98
		Ba-140	**La-140**	**H-3**		
	3/6/2018	-7.89 ± 14.7	-3.74 ± 5.17	238 ± 617		
	6/4/2018	0.04 ± 14.2	5.39 ± 4.58 **A**	-85.8 ± 646		
	9/3/2018	3.11 ± 13.7	-5.62 ± 4.75	583 ± 733		
	12/11/2018	-0.61 ± 16.5	-0.73 ± 5.91	-108 ± 471		

A: < MDC Value

TABLE 3-9: GAMMA EMITTER AND TRITIUM CONCENTRATIONS IN RIVER WATER

Surry Power Station, Surry County, Virginia - 2018

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SD	1/2/2018	-0.90 ± 3.51	-2.57 ± 2.95	-1.88 ± 6.46	-2.28 ± 3.68	-9.72 ± 10.4
	2/5/2018	0.64 ± 4.98	1.24 ± 5.39	0.88 ± 10.5	0.93 ± 4.54	10.3 ± 10.1
	3/6/2018	0.38 ± 4.11	1.25 ± 4.25	-5.00 ± 8.31	2.42 ± 4.01	-7.46 ± 9.39
	4/10/2018	0.16 ± 2.92	-0.26 ± 2.54	0.89 ± 7.47	1.30 ± 3.35	-1.73 ± 7.87
	5/1/2018	2.71 ± 2.48	-0.10 ± 2.80	-1.20 ± 4.73	-0.56 ± 2.75	-3.58 ± 5.56
	6/4/2018	-0.27 ± 3.17	0.46 ± 2.89	6.61 ± 7.44	-0.60 ± 4.14	-7.44 ± 8.32
	7/9/2018	-0.71 ± 2.14	-2.27 ± 2.37	-4.18 ± 4.91	-0.26 ± 2.43	-2.53 ± 5.31
	8/6/2018	-1.46 ± 3.29	-1.77 ± 3.36	1.79 ± 6.80	-0.60 ± 3.34	-10.3 ± 8.56
	9/3/2018	-1.19 ± 3.41	-0.81 ± 3.30	5.46 ± 7.78	1.61 ± 3.62	2.04 ± 8.37
	10/9/2018	0.76 ± 2.58	-0.41 ± 2.52	6.85 ± 5.27	1.36 ± 2.21	-6.22 ± 5.97
	11/19/2018	-1.43 ± 3.22	-1.24 ± 2.90	2.63 ± 6.63	1.61 ± 3.07	-4.28 ± 6.77
	12/11/2018	0.87 ± 3.94	-1.43 ± 4.06	-2.18 ± 8.58	3.16 ± 3.39	-2.84 ± 8.83
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	1/2/2018	-2.43 ± 4.15	1.16 ± 4.60	-3.58 ± 3.72	-2.86 ± 3.46	0.78 ± 3.72
	2/5/2018	1.21 ± 4.64	-11.2 ± 7.73	-0.70 ± 5.37	1.04 ± 5.12	-1.05 ± 4.92
	3/6/2018	-1.58 ± 3.13	0.27 ± 5.71	-0.95 ± 4.53	4.70 ± 5.00	2.00 ± 3.99
	4/10/2018	-2.78 ± 3.28	0.64 ± 4.53	-1.36 ± 3.08	-3.17 ± 3.58	-1.41 ± 2.56
	5/1/2018	0.46 ± 2.54	3.65 ± 4.60	-1.33 ± 5.41	0.36 ± 3.02	0.41 ± 3.16
	6/4/2018	-0.24 ± 3.98	-2.73 ± 6.09	-3.31 ± 5.15	-2.14 ± 3.66	2.06 ± 3.35
	7/9/2018	0.59 ± 2.59	0.67 ± 4.45	0.37 ± 5.48	-0.36 ± 2.90	1.60 ± 2.50
	8/6/2018	0.88 ± 3.02	5.60 ± 5.86	-2.62 ± 5.85	-1.73 ± 3.36	1.40 ± 3.34
	9/3/2018	0.90 ± 3.91	-2.46 ± 6.24	-0.94 ± 5.82	2.10 ± 3.78	-4.34 ± 3.72
	10/9/2018	0.65 ± 2.74	2.51 ± 4.75	3.03 ± 5.01	-1.82 ± 3.11	-0.66 ± 2.63
	11/19/2018	3.16 ± 3.23	-0.90 ± 5.72	-5.63 ± 5.76	-2.09 ± 3.28	0.58 ± 3.22
	12/11/2018	-4.21 ± 3.81	-3.14 ± 6.01	3.32 ± 4.72	-0.74 ± 3.74	0.71 ± 3.59
		Ba-140	**La-140**	**H-3**	**K-40**	**Th-228**
	1/2/2018	0.27 ± 10.9	-1.94 ± 4.40		**115.0** ± 79.6	
	2/5/2018	-7.45 ± 19.1	-1.03 ± 6.38			
	3/6/2018	-1.58 ± 13.7	-2.13 ± 5.69	159 ± 125 **A**		
	4/10/2018	-0.26 ± 12.6	-1.77 ± 4.79			
	5/1/2018	-3.63 ± 14.5	1.24 ± 4.09			
	6/4/2018	6.19 ± 15.3	-0.24 ± 5.81	542 ± 593		
	7/9/2018	3.35 ± 13.7	-3.00 ± 3.69			
	8/6/2018	-14.7 ± 16.6	3.76 ± 5.96			
	9/3/2018	-1.18 ± 17.4	0.89 ± 5.86	118 ± 664	**62.8** ± 45.1	**20.9** ± 14.7
	10/9/2018	-0.61 ± 12.7	-0.48 ± 4.13			
	11/19/2018	-10.2 ± 16.1	1.56 ± 5.44			
	12/11/2018	-6.13 ± 19.0	-5.73 ± 8.07	95.0 ± 598		

A: < MDC

TABLE 3-9: GAMMA EMITTER AND TRITIUM CONCENTRATIONS IN RIVER WATER

Surry Power Station, Surry County, Virginia - 2018

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPES				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SW-C	1/2/2018	3.10 ± 3.51	0.31 ± 3.66	-0.85 ± 7.26	1.45 ± 4.31	-0.65 ± 8.13
	2/5/2018	0.92 ± 4.35	0.11 ± 3.78	2.94 ± 6.35	3.58 ± 3.94	-13.0 ± 8.77
	3/6/2018	1.91 ± 3.97	-2.72 ± 3.16	-0.36 ± 6.40	0.84 ± 3.80	-12.6 ± 10.5
	4/10/2018	-1.25 ± 2.66	1.80 ± 2.51	3.38 ± 6.10	1.44 ± 3.25	-1.71 ± 7.15
	5/1/2018	0.93 ± 1.64	0.45 ± 1.81	1.32 ± 3.46	1.46 ± 1.88	3.69 ± 3.70
	6/4/2018	-0.19 ± 2.74	2.17 ± 2.88	-0.54 ± 5.52	0.63 ± 3.43	-2.37 ± 6.70
	7/10/2018	-0.18 ± 2.12	0.84 ± 2.44	1.42 ± 5.55	1.43 ± 2.54	-3.80 ± 5.50
	8/6/2018	-3.21 ± 3.36	-1.81 ± 2.96	7.42 ± 6.95 **A**	0.44 ± 3.41	4.03 ± 6.68
	9/4/2018	-0.43 ± 2.94	2.48 ± 2.78	-3.44 ± 6.21	0.78 ± 3.06	-4.51 ± 7.26
	10/9/2018	-1.34 ± 2.84	-1.49 ± 2.87	-0.15 ± 6.25	-1.09 ± 3.05	-7.46 ± 7.32
	11/20/2018	0.46 ± 2.97	-1.90 ± 3.16	-0.77 ± 6.53	0.59 ± 3.23	-0.24 ± 5.44
	12/11/2018	-2.25 ± 3.18	1.04 ± 3.81	-4.57 ± 5.86	1.93 ± 2.99	-7.94 ± 7.78
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	1/2/2018	-0.15 ± 3.38	1.25 ± 5.98	1.62 ± 3.99	3.82 ± 4.41	-3.27 ± 4.09
	2/5/2018	-1.18 ± 4.22	4.26 ± 6.94	0.47 ± 5.46	-0.68 ± 4.55	-0.67 ± 3.43
	3/6/2018	0.41 ± 3.57	-3.90 ± 5.78	-1.55 ± 5.21	3.67 ± 4.48	0.91 ± 3.48
	4/10/2018	0.12 ± 2.78	3.30 ± 4.80	-1.49 ± 2.68	1.53 ± 3.09	-1.30 ± 2.58
	5/1/2018	1.05 ± 2.10	-1.44 ± 3.41	0.49 ± 3.67	-0.70 ± 1.78	-0.06 ± 1.97
	6/4/2018	0.77 ± 2.94	4.04 ± 5.21	-5.10 ± 5.93	0.45 ± 3.15	-0.55 ± 3.28
	7/10/2018	1.29 ± 2.35	-0.07 ± 3.98	2.77 ± 4.58	1.87 ± 2.67	-0.23 ± 2.52
	8/6/2018	-0.31 ± 4.14	0.42 ± 6.28	-2.88 ± 5.98	1.90 ± 3.51	0.88 ± 3.61
	9/4/2018	-0.53 ± 3.17	5.79 ± 4.87 **A**	2.32 ± 5.54	0.91 ± 3.25	-0.23 ± 3.03
	10/9/2018	1.13 ± 2.97	-0.44 ± 4.54	7.66 ± 5.03 **A**	2.44 ± 3.28	-1.89 ± 3.27
	11/20/2018	0.89 ± 3.16	-0.47 ± 5.30	-2.37 ± 5.15	-1.71 ± 3.20	0.47 ± 3.18
	12/11/2018	-1.62 ± 3.40	1.65 ± 4.90	-0.21 ± 4.96	-0.06 ± 2.63	-1.04 ± 3.36
		Ba-140	**La-140**	**H-3**	**K-40**	
	1/2/2018	0.22 ± 13.6	-0.81 ± 3.88			
	2/5/2018	10.7 ± 16.9	-0.19 ± 5.83		**127** ± 87.9	
	3/6/2018	-3.20 ± 15.7	-3.18 ± 4.83	73.9 ± 120		
	4/10/2018	-0.01 ± 8.66	1.55 ± 3.34			
	5/1/2018	5.81 ± 9.70	-0.07 ± 2.84			
	6/4/2018	-0.57 ± 16.5	0.06 ± 3.83	147 ± 554		
	7/10/2018	4.57 ± 12.5	0.48 ± 4.19			
	8/6/2018	-4.03 ± 15.5	2.19 ± 6.20			
	9/4/2018	-3.32 ± 16.2	0.63 ± 5.10	470 ± 695		
	10/9/2018	-2.46 ± 13.8	-0.99 ± 5.06			
	11/20/2018	-0.07 ± 15.6	-2.44 ±			
	12/11/2018	-14.5 ± 15.7	-1.01 ± 5.41	-59.6 ± 597		

A: < MDC

TABLE 3-10: GAMMA EMITTER CONCENTRATIONS IN SILT

Surry Power Station, Surry County, Virginia - 2018

pCi/kg (dry) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Cs-134	**Cs-137**	**K-40**	**Th-228**	**Th-232**
SD	3/19/2018	96.2 ± 72.4 **A**	**281** ± 131	**17700** ± 2390	**1670** ± 187	**1070** ± 281
	9/4/2018	325.0 ± 65.8 **B**	90.5 ± 47.4 **A**	**12200** ± 1740	**863** ± 101	**774** ± 219
		Ra-226	**Be-7**			
	3/19/2018	**3380** ± 2220				
	9/4/2018	**3230** ± 1520	**1030** ± 747			
		Cs-134	**Cs-137**	**K-40**	**Th-228**	**Th-232**
CHIC-C	3/19/2018	62.3 ± 76.4	114 ± 72.3 **A**	**19500** ± 2230	**1690** ± 152	**1500** ± 265
	9/5/2018	-1.65 ± 59.9	115 ± 65.0 **A**	**16700** ± 2380	**1510** ± 219	**1310** ± 282
		Ra-226	**Be-7**			
	3/19/2018	**3760** ± 2180				
	9/5/2018	**2440** ± 2230	610 ± 482 **A**			
		Cs-134	**Cs-137**	**K-40**	**Th-228**	**Th-232**
SI	5/3/2018	154 ± 113 **B**	51.8 ± 78.7	**16600** ± 2460	**1440** ± 183	
	9/4/2018	65.4 ± 71.7	**222** ± 112	**17400** ± 2280	**1480** ± 181	**1330** ± 355
		Ra-226	**Be-7**	**Ac-228**		
	5/3/2018		**2120** ± 916	**1280** ± 596		
	9/4/2018	**3970** ± 2070	**3270** ± 1370			

A: < MDC

B: The analyte was not detected. Peak not identified, but forced activity concentration exceeds MDC and 2 sigma.

TABLE 3-11: GAMMA EMITTER CONCENTRATIONS IN SHORELINE SEDIMENT

Surry Power Station, Surry County, Virginia - 2018

pCi/kg (dry) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Cs-134	**Cs-137**	**K-40**	**Ra-226**	**Th-228**
HIR	2/5/2018	32.7 ± 30.9 **A**	-11.3 ± 28.8	**7520** ± 1010	±	**134** ± 74.0
	8/6/2018	8.23 ± 29.4	-0.60 ± 23.5	**9750** ± 1170	±	**240** ± 74.9
		Th-232	**Ac-228**			
		±	±			
		±	**156** ± 142			
		Cs-134	**Cs-137**	**K-40**	**Ra-226**	**Th-228**
CHIC-C	2/5/2018	58.8 ± 51.9 **A**	29.1 ± 36.2	**3880** ± 995	**1450** ± 1160	**994** ± 127
	8/6/2018	20.2 ± 30.8	49.8 ± 31.4 **A**	**1200** ± 540		
		Th-232				
		1260 ± 171				

A: < MDC

TABLE 3-12: GAMMA EMITTER CONCENTRATION IN FISH

Surry Power Station, Surry County, Virginia - 2018

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATION	COLLECTION DATE	SAMPLE TYPE	ISOTOPE			
			K-40	**Mn-54**	**Co-58**	**Fe-59**
SD	4/3/2018	Catfish	**2320** ± 706	2.73 ± 21.5	3.07 ± 30.6	11.7 ± 61.9
		Game fish	**2220** ± 523	-5.84 ± 20.0	21.1 ± 23.4	-10.6 ± 50.6
	10/9/2018	Catfish	**1240** ± 661	-9.06 ± 41.8	4.93 ± 56.0	-5.86 ± 116
		Game fish	**1710** ± 1060	51.2 ± 55.8	11.6 ± 51.4	64.6 ± 135
			Co-60	**Zn-65**	**Cs-134**	**Cs-137**
	4/3/2018	Catfish	-15.3 ± 24.7	-27.4 ± 54.3	-6.43 ± 25.7	28.0 ± 25.3 **A**
		Game fish	12.7 ± 22.6	-46.4 ± 43.4	-3.06 ± 22.2	-5.95 ± 19.8
	10/9/2018	Catfish	18.2 ± 32.6	-40.3 ± 112	-5.12 ± 44.3	-9.05 ± 36.9
		Game fish	-11.0 ± 48.2	15.3 ± 104	2.34 ± 52.0	23.0 ± 44.7

A: < MDC

TABLE 3-13: GAMMA EMITTER CONCENTRATIONS IN OYSTERS

Surry Power Station, Surry County, Virginia - 2018

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE			
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
POS	3/28/2018	-5.85 ± 18.9	-2.76 ± 24.6	-18.2 ± 59.1	-12.4 ± 20.2
	9/12/2018	3.32 ± 40.3	-2.95 ± 39.7	17.4 ± 74.6	9.46 ± 41.0
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/28/2018	-25.8 ± 49.2	2.89 ± 23.2	4.83 ± 21.2	**527** ± 453
	9/12/2018	-81.4 ± 84.7	6.12 ± 39.4	5.81 ± 40.1	
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
MP	3/15/2018	7.34 ± 30.0	-32.1 ± 37.3	-9.74 ± 97.9	26.9 ± 31.4
	9/12/2018	-2.64 ± 23.6	3.88 ± 25.8	-21.0 ± 59.7	-15.0 ± 26.3
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/15/2018	27.4 ± 67.4	4.03 ± 34.1	17.3 ± 28.9	
	9/12/2018	-22.8 ± 55.9	8.13 ± 25.6	8.99 ± 27.5	**736** ± 512
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
SHI	3/28/2018	-11.6 ± 23.5	2.93 ± 25.7	-2.42 ± 52.9	-6.28 ± 21.5
	9/5/2018	0.76 ± 30.3	25.5 ± 38.1	-19.0 ± 73.0	22.8 ± 35.9
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/28/2018	-49.4 ± 48.2	14.7 ± 24.5	-12.3 ± 23.6	**716** ± 461
	9/5/2018	-51.9 ± 88.9	-16.3 ± 36.9	-8.47 ± 32.0	

TABLE 3-14: GAMMA EMITTER CONCENTRATIONS IN CLAMS

Surry Power Station, Surry County, Virginia - 2018

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE			
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
JI	3/23/2018	-18.0 ± 26.5	11.2 ± 29.9	5.70 ± 75.6	-14.3 ± 22.1
	9/5/2018	-10.8 ± 48.6	-14.8 ± 51.4	37.5 ± 97.5	27.6 ± 36.8
		Zn-65	**Cs-134**	**Cs-137**	
	3/23/2018	-22.5 ± 54.3	22.1 ± 26.8	-11.1 ± 28.8	
	9/5/2018	-84.1 ± 10.2	16.8 ± 43.1	9.84 ± 49.6	
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
SD	3/19/2018	15.4 ± 37.3	10.2 ± 45.2	27.8 ± 91.0	47.2 ± 33.1 **A**
	9/4/2018	2.20 ± 26.9	7.71 ± 28.1	-0.07 ± 47.7	-3.20 ± 23.0
		Zn-65	**Cs-134**	**Cs-137**	
	3/19/2018	-49.9 ± 74.2	31.1 ± 36.1	1.86 ± 32.5	
	9/4/2018	-29.3 ± 56.3	3.45 ± 23.6	20.0 ± 22.6	
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
CHIC-C	3/19/2018	-2.80 ± 23.0	-11.3 ± 27.1	-40.4 ± 66.8	23.3 ± 23.1 **A**
	9/5/2018	2.13 ± 19.7	6.09 ± 18.2	-13.5 ± 44.0	2.36 ± 14.8
		Zn-65	**Cs-134**	**Cs-137**	
	3/19/2018	-36.5 ± 47.1	6.81 ± 20.8	-2.13 ± 21.2	
	9/5/2018	20.4 ± 40.2	-7.63 ± 16.1	-0.04 ± 14.0	

A: < MDC

TABLE 3-15: GAMMA EMITTER CONCENTRATIONS IN CRABS

Surry Power Station, Surry County, Virginia - 2018

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE			
		K-40	**Mn-54**	**Co-58**	**Fe-59**
SD	6/26/2018	**1400** ± 585	-3.32 ± 22.9	10.4 ± 26.1	80.2 ± 52.5 **A**
		Co-60	**Zn-65**	**Cs-134**	**Cs-137**
	6/26/2018	-4.48 ± 30.2	-17.2 ± 61.0	-8.79 ± 26.9	-13.5 ± 27.6

A: <MDC

4. DISCUSSION OF RESULTS

Data from the radiological analyses of environmental media collected during 2018 and tabulated in Section 3, are discussed below. The procedures and specifications followed in the laboratory for these analyses are as required in the Teledyne Brown Engineering quality assurance manuals and laboratory procedures. In addition to internal quality control measures performed by the laboratories, 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 Program are provided in Appendix B.

The predominant radioactivity detected throughout 2018 was from external sources, such as fallout from nuclear weapons tests (cesium-137) and naturally occurring radionuclides. Naturally occurring nuclides such as beryllium-7, radium-226, thorium-228, thorium-232 and potassium-40 were detected in numerous samples.

The following is a discussion and summary of the results of the environmental measurements taken during the 2018 reporting period.

4.1 Gamma Exposure Rate

A thermoluminescent dosimeter (TLD) is an inorganic crystal used to detect ambient radiation. These TLDs are made of CaF and LiF compounds and are specifically designed for environmental monitoring. Three TLDs are deployed at each sampling location. TLDs are placed in two concentric rings around the station. The inner ring is located in the vicinity of 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 centers 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.

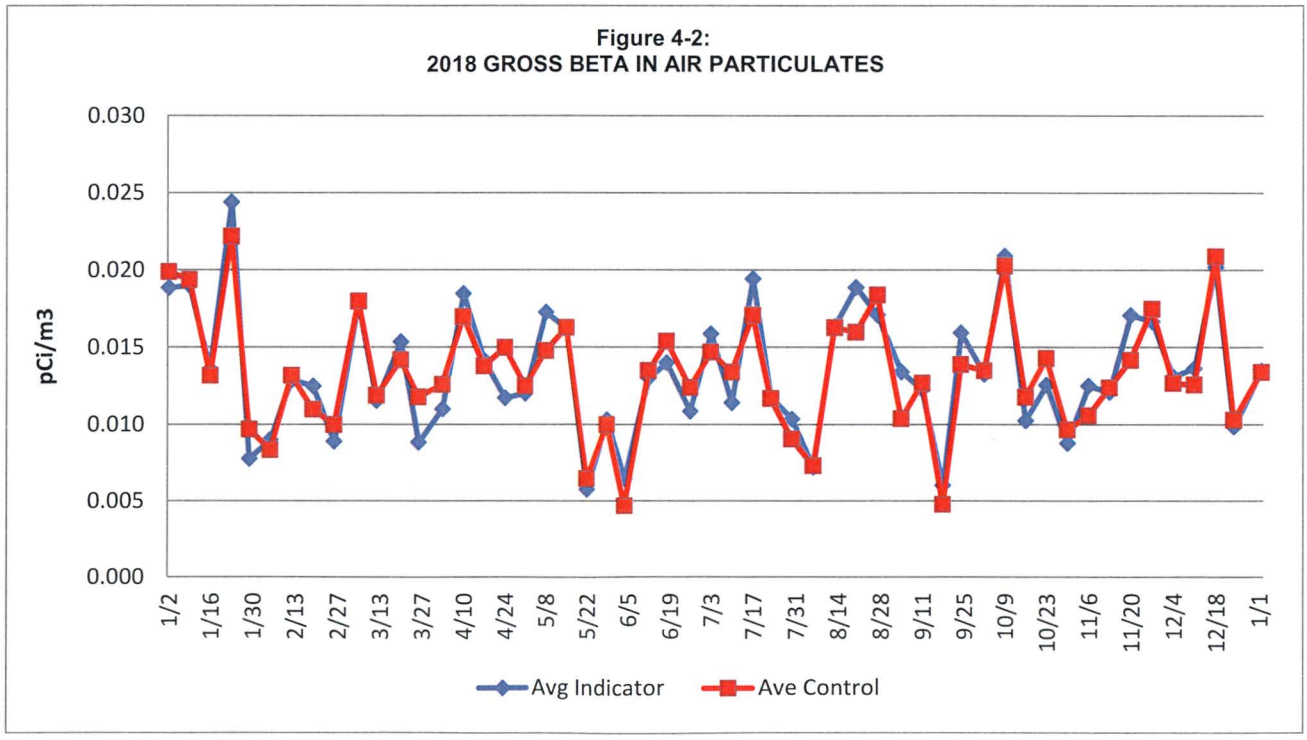
The results of the TLD analyses are presented in Table 3-2. There was no detectable external dose to members of the public from Surry Power Station in 2018. The results of the TLD analyses shown in Table 3-2 comply with Section 7 of ANSI/HPS N13.37-2014 to ensure accurate environmental results. The long-term integrity of each field monitoring location is accomplished by a thorough, documented evaluation of the location for changes that could impact data quality in accordance with Section 7.1 of the ANSI Standard. Since off-site processing of TLDs is used, extraneous dose received prior to and after removal from the field is quantified in compliance with Section 7.2 of the ANSI Standard. Data analysis for

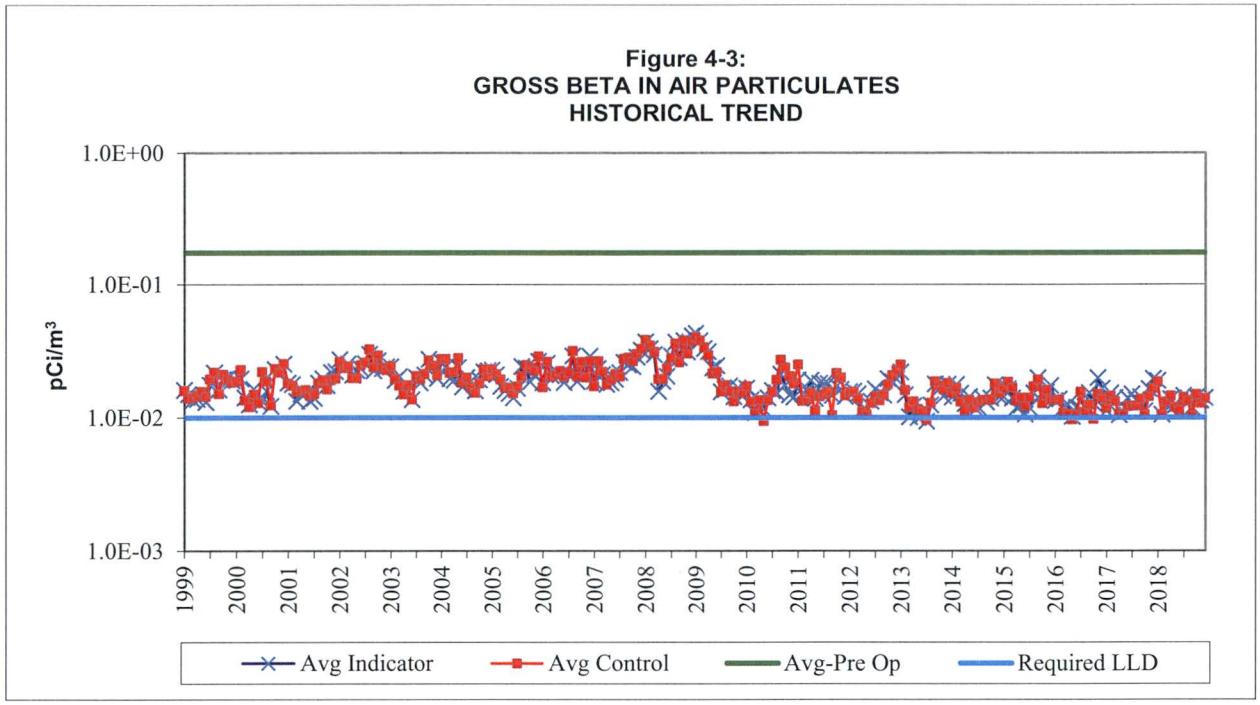
Table 3-2 was performed in accordance with Section 7.3 of the ANSI Standard. This includes normalizing results to a standard 91 day quarterly monitoring period, determination of the baseline background dose for each monitoring location and determination of the smallest facility-related dose that can be detected above the baseline background.

4.2 Airborne Gross Beta

Air is continuously sampled by passing through glass fiber particulate filters. The filters collect airborne particulate radionuclides. Once a week the samples are collected and analyzed for gross beta activity. Results of the weekly gross beta analyses are presented in Table 3-3. A review of the results from control and indicator locations continues to show no significant variation in measured activities (see Figure 4-2 and 4-3). Data, as recorded in Figures 4-2 and 4-3, indicate that any contribution from station related activities is not measurable.

Gross beta activity found during the pre-operational and early operating period of Surry 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.





4.3 Airborne Radioiodine

Air is also continuously sampled for radioiodines by passing air through charcoal cartridges. Once a week, the charcoal cartridge samples are collected and analyzed. The results of the analyses are presented in Table 3-4. All results are below the lower limit of detection. No positive iodine-131 was detected in air samples in 2018.

4.4 Air Particulate Gamma

The air particulate filters from 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 potassium-40 and beryllium-7, which are produced by cosmic processes. No man-made radionuclides were identified. These analyses confirm no effects from station effluents.

4.5 Animal Milk

Analysis of milk samples is generally the most sensitive indicator of fission product existence in the terrestrial environment. This, in combination with the fact that the consumption of milk is significant, results in this pathway often being the most critical as it relates to station radiological effluents. This pathway also shows measurable amounts of nuclear weapons testing fallout. Therefore, this media needs to be carefully evaluated when determining the effects from station effluents.

Results of gamma spectroscopy indicate no detectable station related radioactivity was identified in milk samples in 2018. The results of the analyses are presented in Table 3-6. In years past, cesium-137 had been detected sporadically. The occurrences were attributed to residual global fallout from past atmospheric weapons testing.

At the request of the Commonwealth of Virginia, a quarterly composite sample is prepared from the monthly milk samples from the Colonial Parkway collection station. The composite samples are analyzed for strontium-89 and strontium-90. No strontium-89 was detected in the four composites analyzed. Strontium-90 was detected in two of the four composite samples, with an average concentration of 1.36 pCi/L. Strontium-90 is not a component of the station radiological effluents and is a product of nuclear weapons testing fallout, which has been well documented.

4.6 Food Products

Three food product samples (corn, peanuts, and soybeans) were collected and analyzed by gamma spectroscopy. The results of the analyses are presented in Table 3-7. As expected, only naturally occurring potassium-40 was detected in all samples. No station related radioactivity was detected in this pathway.

4.7 Well Water

Well water is not considered to be affected by station operations because there are no discharges made to this pathway. However, Surry Power Station monitors well water quarterly at three indicator locations and analyzes for gamma radiation and tritium. The results of these analyses are presented in Table 3-8. No station related radioactivity was detected. Historically, during the pre-operational period, no gamma emitting isotopes were detected.

4.8 River Water

Samples of the James River water are collected monthly and the results are presented in Table 3-9. All samples are analyzed by gamma spectroscopy. The monthly samples are also composited and analyzed for tritium on a quarterly basis. No positive tritium was detected. Only naturally occurring potassium-40 and thorium-228 radionuclides were detected. No station related radioactivity was detected.

4.9 Silt

Silt is sampled to evaluate any buildup of radionuclides in the environment due to the operation of the station. Sampling of this pathway provides a good indication of the dispersion effects of effluents to the river. Buildup of radionuclides in silt could indirectly lead to increasing radioactivity levels in clams, oysters, crabs and fish.

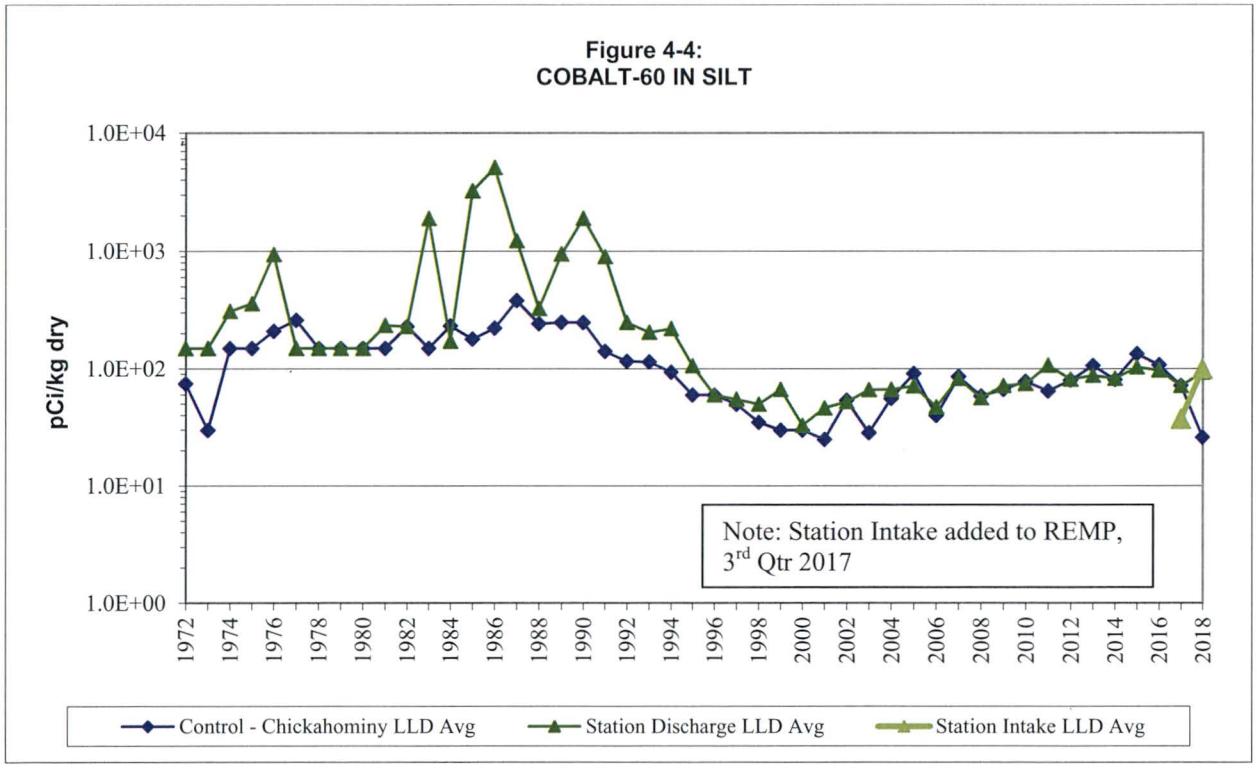
Samples of silt are collected from three locations, one upstream, one downstream of the station and one in the dredge area of the station intake. The station intake silt sample was added in third quarter of 2017 to provide data for future station intake dredging operations. The results of the gamma spectroscopy analyses are presented in Table 3-10. Naturally occurring beryllium-7, potassium-40, radium-226, thorium-228, thorium-232 and actinium-228 were detected. Historically, cobalt-60 has been detected in samples obtained from the station discharge indicator location. Cobalt-60 has not been detected since 2003. A trend graph of cesium-137 and cobalt-60 concentrations is presented in Figures 4-4 and 4-5.

The trend graph, as displayed in Figure 4-5, identifies an overall decreasing trend in concentration for cesium-137, as seen for three decades. The trended data is an average of the semi-annual sample analysis results. The average concentration in the control samples continues to indicate a decreasing trend. The average concentration in indicator sample, station discharge, indicates an overall decreasing trend; however, an increase in concentration was observed in 2018. The location will continue to be carefully monitored. The station intake indicator sample was added to the REMP in 2017. The additional sample location is in the dredge channel area at the station intake. The dredge channel is approximately 150' wide and 1750' in length. This location was added to support future station intake channel dredging operations. The trend for the station intake is currently being established and carefully monitored.

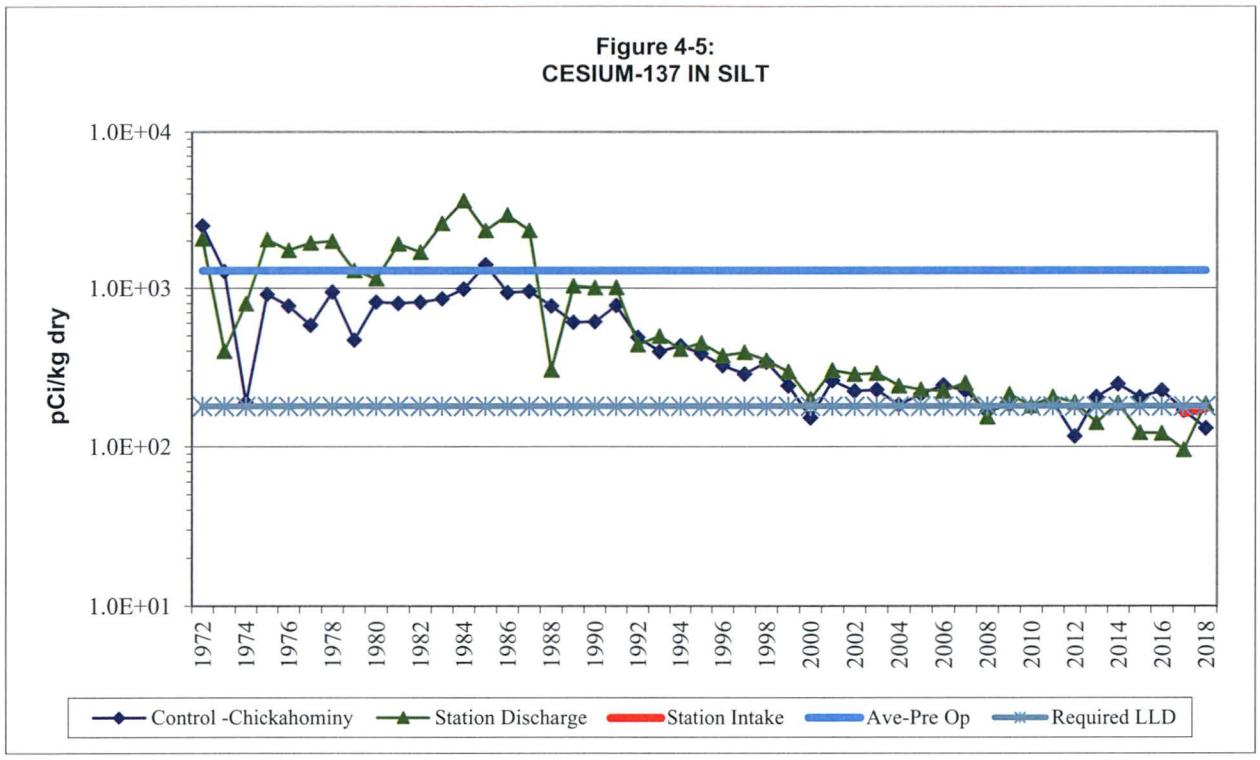
The presence of cesium-137 is indicative of the accumulation, through runoff, of cesium-137 into the James River from residual weapons testing fallout. Its global presence has been well documented. Samples collected from the James River, during the pre-operational period, indicated the presence of cesium-137. The pre-operational average cesium-137 concentration is indicated in Figure 4-5.

The highest silt indicator location in 2018 is the station discharge, with an average cesium-137 concentration of 186 pCi/kg. This concentration is consistent with aquatic sediment samples collected in control locations of the James River.

Figure 4-4:
COBALT-60 IN SILT



Chickahominy had detectable activity in 1982 and 1984 through 1994. Other years were <MDC, Minimum Detectable Concentration. Station Discharge was <MDC activity 1996 through 1998 and 2004 through 2018.



4.10 Shoreline Sediment

Shoreline sediment, unlike river silt, may provide a direct dose to humans. Buildup of radionuclides along the shoreline may provide a source of direct exposure for those using the area for commercial and recreational uses. The results are presented in Table 3-11.

The naturally occurring radionuclides potassium-40, radium-226, thorium-228, thorium-232 and actinium-228 were detected at concentrations equivalent to normal background activities. There were no radionuclides attributable to the operation of the station detected in any shoreline sediment samples.

4.11 Fish

The radioactivity measured in fish sampled from the station discharge canal and analyzed by gamma spectroscopy is presented in Table 3-12. These results are similar to those seen over the last decade. No activity was observed in this media except for naturally occurring potassium-40.

4.12 Oysters

Oysters were collected from three different locations. The results of the oyster analyses are presented in Table 3-13. There were no gamma emitting radionuclides detected in oysters sampled. No station related radioactivity has been detected in this media since 1991.

4.13 Clams

Clams are analyzed from three different locations. The results of the gamma spectroscopy analyses are presented in Table 3-14. There were no gamma emitting radionuclides detected in clams sampled.

4.14 Crabs

An annual crab sample was collected from the station discharge canal and analyzed by gamma spectroscopy. The results of the analysis are presented in Table 3-15. Other than naturally occurring potassium-40, no other gamma emitting radionuclides related to station effluents were detected in the sample. This is consistent with pre-operational data and data collected over the past decade.

5. PROGRAM EXCEPTIONS

There were three exceptions from the REMP sampling schedule in 2018. The three exceptions are detailed below:

1. Milk samples were unavailable from the control location, Lover Retreat Dairy, during the months of January and February of 2018. The farmer provided advanced notification that the animals would be birthing during this period and the milk produced by them would be needed for nursing their young. Milk samples from all indicator locations were available and obtained in 2018. In accordance with the REMP, deviations are permitted from required sampling schedules if specimens are unobtainable due to seasonal unavailability.

2. The Surry Site (SS) environmental air sample patch was invalid for collection period 7/3/2018 – 7/10/2018. A visual inspection identified very little particulate material was deposited on the patch. Teledyne Brown Engineering (TBE) was notified, documented their observation and validated through analysis that the sample is invalid. TBE removed the sample from the quarterly composite group.

3. The Colonial Parkway (CP) milk sample from August 6, 2018 was used up during I-131 low level analysis and not available for the quarterly composite. The composite is composed of July and September samples only.

6. CONCLUSIONS

The results of the 2018 Radiological Environmental Monitoring Program for Surry Power Station have been presented in previous sections. This section presents conclusions for each pathway.

- **Direct Radiation Exposure Pathway** - There was no detectable external dose to members of the public from Surry Power Station in 2018.

- **Airborne Exposure Pathway** – Radioiodine analysis of charcoal cartridge samples indicated that no positive activity was detected. Quarterly gamma isotopic analyses of the composite particulate samples identified only naturally occurring beryllium-7 and potassium-40. All indicator locations for air particulate gross beta concentrations trend well with the control locations. The effluent data was reviewed for the period of interest and concluded the station contribution is not measurable.

- **Milk** - Milk samples are an important indicator measuring the effect of radioactive iodine and radionuclides in airborne releases. No positive cesium-137 or iodine-131 activity was detected in any of the thirty-four samples. Naturally occurring potassium-40 was detected at a similar level when compared to the averages of the previous years.

  Strontium-90 was detected in two samples at an average concentration of 1.36 pCi/L. Strontium-90 is not a component of station effluents, but rather, a product of nuclear weapons testing fallout.

- **Food Products** - As expected, naturally occurring potassium-40 was detected in all three food product samples. In the past, cesium-137 had occasionally been detected in these samples and is attributable to global fallout from past nuclear weapons testing. No positive cesium-137 activity was detected in food product samples in 2018.

- **Well Water** - Well water sample analyses indicated there was no radioactivity attributable to the operation of the station. This trend is consistent throughout the monitoring period.

- **River Water** - River water samples were analyzed for gamma emitting radionuclides and tritium. Only naturally occurring potassium-40 was detected. No positive tritium activity was detected.

- **Silt** – No radioactivity attributable to the operation of the station was detected in the control location. Only naturally occurring radionuclides were present.

  The indicator sample with the highest average concentration of cesium-137 during 2018 is the station discharge sample, with an average concentration of 186 pCi/kg. This concentration is consistent with aquatic sediment samples collected in control locations of the James River. The presence of cesium-137 is attributable to residual weapons testing fallout.

- **Shoreline Sediment** - There were no radionuclides attributable to the operation of Surry Power Station identified in any sample. Naturally occurring radionuclides were detected at concentrations equivalent to normal background activities.

Aquatic Biota

- **Fish** - As expected, naturally occurring potassium-40 was detected. There were no other positive gamma emitting radionuclides detected in any of the fish samples.

- **Oysters** – Other than naturally occurring potassium-40, there were no other positive gamma emitting radionuclides detected in any of the oyster samples.

- **Clams** - No positive gamma emitting radionuclides were detected in any of the clam samples.

- **Crabs** – Naturally occurring potassium-40 was detected. No other positive gamma emitting radionuclides were detected.

REFERENCES

References

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2. 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.

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

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5. Dominion, Station Administrative Procedure, VPAP-2103S, "Offsite Dose Calculation Manual (Surry)".

6. Virginia Electric and Power Company, Surry Power Station Technical Specifications, Units 1 and 2.

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

8. NUREG/CR-4007, "Lower Limit of Detection: Definition and Elaboration of a Proposed Position for Radiological Effluent and Environmental Measurements," September 1984.

9. NCRP Report No. 160, "Ionizing Radiation Exposure of the Population of the United States," March 2009.

10. Position paper on "Implementation of ANSI/HPS N13.37-2014 Environmental Dosimetry Criteria at Surry Power Station", November 2016 by John M. Sukosky, CHP.

APPENDICES

APPENDIX A: LAND USE CENSUS

Year 2018

*LAND USE CENSUS**

Surry Power Station, Surry County, Virginia

January 1 to December 31, 2018 Page 1 of 1

Sector	Direction	Nearest Resident	Nearest Garden**	Nearest Cow	Nearest Goat
A	N	4.1 @ 10°	(a)	(a)	(a)
B	NNE	1.9 @ 32°	(a)	(a)	(a)
C	NE	4.7 @ 35°	(a)	(a)	(a)
D	ENE	(a)	(a)	(a)	(a)
E	E	(a)	(a)	(a)	(a)
F	ESE	(a)	(a)	(a)	(a)
G	SE	2.8 @ 142°	(a)	(a)	(a)
H	SSE	2.7 @ 158°	2.7 @ 158°	(a)	(a)
J	S	1.7 @ 181°	2.0 @ 183°	(a)	(a)
K	SSW	1.9 @ 192°	1.9 @ 192°	4.8 @ 200°	(a)
L	SW	1.23 @ 216°	4.7 @ 228°	(a)	(a)
M	WSW	0.4 @ 244°	3.6 @ 245°	(a)	(a)
N	W	3.1 @ 260°	3.4 @ 260°	(a)	(a)
P	WNW	4.9 @ 283°	(a)	(a)	(a)
Q	NW	4.6 @ 321°	(a)	(a)	(a)
R	NNW	3.8 @ 338°	4.4 @ 334°	3.7 @ 336°	(a)

* *Locations are listed by miles and degrees heading relative to true north from center of Unit #1 Containment.*

** *Area greater than 50 m^2 and contains broadleaf vegetation.*

(a) None

APPENDIX B: SUMMARY OF INTERLABORATORY COMPARISONS

Year 2018

INTRODUCTION

The TBE Laboratory analyzed Performance Evaluation (PE) samples of air particulate, 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 USEPA, 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 ± 20% of the reference value
- Acceptable with Warning (flag = "W") - result falls in the ± 20% to ± 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.

The results are reported to the provider for evaluation. The suite of QA/QC samples is designed to provide sample media and radionuclide combinations that are offered by the providers and included in the REMP and typically includes:

- milk for gamma nuclides and low-level iodine-131 analyses,
- milk for Sr-89 and Sr-90 analyses,
- water for gamma nuclides, low-level iodine-131, and gross beta analyses,
- water for tritium, Sr-89, and Sr-90 analyses,
- cartridge for I-131 analyses,
- air filter for gamma nuclide, gross beta, and Sr-90 analyses.

RESULTS

For the TBE laboratory, 164 out of 172 analyses performed met the specified acceptance criteria. Six analyses did not meet the specified acceptance criteria for the following reasons and were addressed through the TBE Corrective Action Program.

1. TBE was unable to report the February 2018 DOE MAPEP vegetation Sr-90 result due to QC failure and limited sample amount. (NCR 18-09)

2. The Analytics September 2018 milk Fe-59 result was evaluated as *Not Acceptable* (Ratio of TBE to known result at 133%). The reported value was 158 ± 17.6 pCi/L and the known value was 119 ± 19.9 pCi/L. No cause for the failure could be determined. TBE has passed 24 of the previous 27 milk cross-check results since 2012. This sample was run in duplicate on a different detector with comparable results (162 +/- 16 pCi/L). *NOTE: TBE's 4th Qtr result passed at 105%* (NCR 18-20)

3. The Analytics September milk I-131 result was evaluated as *Not Acceptable* (Ratio of TBE to known result at 143%). Due to a personnel change in the gamma prep lab, the sample was not prepped/counted in a timely manner such as to accommodate the I-131 8-day half-life. Analysts have been made aware of the urgency for this analysis and it will be monitored more closely by QA. *NOTE: TBE's 4th Qtr result passed at 101%* (NCR 18-24)

4. The Analytics September soil Cr-51 result was evaluated as *Not Acceptable* (Ratio of TBE to known result at 131%). As with #3 above, the sample was not prepped/counted in a timely manner such as to accommodate the Cr-51 27-day half-life. The same corrective action applies here as in #3. (NCR 18-21)

5. The MAPEP November vegetation Sr-90 result of 0.338 Bq/sample was evaluated as Not Acceptable (Lower acceptable range was 0.554 Bq/sample). It appears that there has been incomplete dissolution of Sr-90 due to the composition of the MAPEP vegetation "matrix". To resolve this issue, the TBE-2018 procedure has been modified to add H_2O_2 to assist in breaking down the organic material that comprises this "matrix". This corrective action will be monitored closely by QA. (NCR 18-25).

6. The ERA November 2018 water Sr-90 sample was evaluated as *Not Acceptable*. TBE's initial reported result of 36.8 pCi/L exceeded the upper acceptance range (22.9 – 36.4 pCi/L). After reviewing the data for this sample, it was discovered that there was a typographical error at the time the results were entered at the ERA website. The correct result in LIMS of 36.2 should have been submitted instead. This result is within ERA's acceptance limits. In addition to the typo error, ERA's very stringent upper acceptance limit of 116% is not a reflection of TBE's ability to successfully perform this analysis. (NCR 18-23)

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]
March 2018	E12133	Milk	Sr-89	pCi/L	76.1	90.1	0.84	A
			Sr-90	pCi/L	12.2	12.5	0.98	A
	E12134	Milk	Ce-141	pCi/L	77.8	77.0	1.01	A
			Co-58	pCi/L	105	114	0.92	A
			Co-60	pCi/L	181	187	0.97	A
			Cr-51	pCi/L	298	326	0.92	A
			Cs-134	pCi/L	150	180	0.84	A
			Cs-137	pCi/L	164	172	0.95	A
			Fe-59	pCi/L	140	139	1.01	A
			I-131	pCi/L	105	108.0	0.97	A
			Mn-54	pCi/L	133	131	1.01	A
			Zn-65	pCi/L	242	244	0.99	A
	E12135	Charcoal	I-131	pCi	93.7	95.4	0.98	A
	E12136	AP	Ce-141	pCi	92.6	85.3	1.09	A
			Co-58	pCi	130	126	1.03	A
			Co-60	pCi	237	207	1.14	A
			Cr-51	pCi	411	361	1.14	A
			Cs-134	pCi	194	199	0.98	A
			Cs-137	pCi	200	191	1.05	A
			Fe-59	pCi	160	154	1.04	A
			Mn-54	pCi	152	145	1.05	A
			Zn-65	pCi	267	271	0.99	A
	E12137	Water	Fe-55	pCi/L	1990	1700	1.17	A
	E12138	Soil	Ce-141	pCi/g	0.148	0.118	1.26	W
			Co-58	pCi/g	0.171	0.174	0.98	A
			Co-60	pCi/g	0.297	0.286	1.04	A
			Cr-51	pCi/g	0.537	0.498	1.08	A
			Cs-134	pCi/g	0.274	0.275	1.00	A
			Cs-137	pCi/g	0.355	0.337	1.05	A
			Fe-59	pCi/g	0.243	0.212	1.15	A
			Mn-54	pCi/g	0.228	0.201	1.14	A
			Zn-65	pCi/g	0.395	0.374	1.06	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]
June 2018	E12205	Milk	Sr-89	pCi/L	74.9	84.6	0.89	A
			Sr-90	pCi/L	10.5	11.4	0.92	A
	E12206	Milk	Ce-141	pCi/L	89.2	82.2	1.08	A
			Co-58	pCi/L	94.8	89	1.07	A
			Co-60	pCi/L	125	113	1.10	A
			Cr-51	pCi/L	256	239	1.07	A
			Cs-134	pCi/L	112	114	0.99	A
			Cs-137	pCi/L	107	98.8	1.08	A
			Fe-59	pCi/L	95.9	86.0	1.12	A
			I-131	pCi/L	69.8	71.9	0.97	A
			Mn-54	pCi/L	138	130	1.06	A
			Zn-65	pCi/L	186	157	1.18	A
	E12207	Charcoal	I-131	pCi	69.6	72.2	0.96	A
	E12208	AP	Ce-141	pCi	151	165	0.92	A
			Co-58	pCi	174	178	0.98	A
			Co-60	pCi	290	227	1.28	W
			Cr-51	pCi	452	478	0.95	A
			Cs-134	pCi	215	227	0.95	A
			Cs-137	pCi	206	198	1.04	A
			Fe-59	pCi	180	172	1.05	A
			Mn-54	pCi	265	260	1.02	A
			Zn-65	pCi	280	315	0.89	A
	E12209	Water	Fe-55	pCi/L	1790	1740	1.03	A
	E12210	AP	Sr-89	pCi	77.8	90.3	0.86	A
			Sr-90	pCi	9.54	12.2	0.78	W

(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 2018	E12271	Milk	Sr-89	pCi/L	79.4	81.7	0.97	A
			Sr-90	pCi/L	12.2	14.8	0.82	A
	E12272	Milk	Ce-141	pCi/L	152	128	1.19	A
			Co-58	pCi/L	161	144	1.12	A
			Co-60	pCi/L	208	190	1.10	A
			Cr-51	pCi/L	244	265	0.92	A
			Cs-134	pCi/L	124	123	1.01	A
			Cs-137	pCi/L	166	147	1.13	A
			Fe-59	pCi/L	158	119	1.32	N(1)
			I-131	pCi/L	83.1	58.2	1.43	N(2)
			Mn-54	pCi/L	191	167	1.14	A
			Zn-65	pCi/L	229	201	1.14	A
	E12273	Charcoal	I-131	pCi	83.0	80.7	1.03	A
	E12274	AP	Ce-141	pCi	101	85.6	1.18	A
			Co-58	pCi	92.7	96.0	0.97	A
			Co-60	pCi	142	127	1.12	A
			Cr-51	pCi	218	177	1.23	W
			Cs-134	pCi	81.2	81.9	0.99	A
			Cs-137	pCi	99.0	98.5	1.01	A
			Fe-59	pCi	93.7	79.7	1.18	A
			Mn-54	pCi	116	112	1.04	A
			Zn-65	pCi	139	134	1.04	A
	E12302	Water	Fe-55	pCi/L	2120	1820	1.17	A
	E12276	Soil	Ce-141	pCi/g	0.259	0.221	1.17	A
			Co-58	pCi/g	0.279	0.248	1.12	A
			Co-60	pCi/g	0.367	0.328	1.12	A
			Cr-51	pCi/g	0.597	0.457	1.31	N (3)
			Cs-134	pCi/g	0.261	0.212	1.23	W
			Cs-137	pCi/g	0.376	0.330	1.14	A
			Fe-59	pCi/g	0.248	0.206	1.20	A
			Mn-54	pCi/g	0.317	0.289	1.10	A
			Zn-65	pCi/g	0.407	0.347	1.17	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

*(1) See **NCR 18-20***

*(2) See **NCR 18-24***

*(3) See **NCR 18-21***

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]
December 2018	E12313	Milk	Sr-89	pCi/L	71.9	91.9	0.78	W
			Sr-90	pCi/L	12.1	13.3	0.91	A
	E12314	Milk	Ce-141	pCi/L	124	133	0.93	A
			Co-58	pCi/L	110	119	0.93	A
			Co-60	pCi/L	202	212	0.95	A
			Cr-51	pCi/L	292	298	0.98	A
			Cs-134	pCi/L	146	171	0.85	A
			Cs-137	pCi/L	118	121	0.98	A
			Fe-59	pCi/L	120	114	1.05	A
			I-131	pCi/L	94.2	93.3	1.01	A
			Mn-54	pCi/L	151	154	0.98	A
			Zn-65	pCi/L	266	264	1.01	A
	E12315	Charcoal	I-131	pCi	94.8	89.9	1.05	A
	E12316A	AP	Ce-141	pCi	92.3	94.0	0.98	A
			Co-58	pCi	73.4	83.8	0.88	A
			Co-60	pCi	137	150	0.91	A
			Cr-51	pCi	202	210	0.96	A
			Cs-134	pCi	115	121	0.95	A
			Cs-137	pCi	85.0	85.4	1.00	A
			Fe-59	pCi	83.1	80.8	1.03	A
			Mn-54	pCi	104	109	0.96	A
			Zn-65	pCi	168	187	0.90	A
	E12317	Water	Fe-55	pCi/L	2110	1840	1.15	A
	E12318	AP	Sr-89	pCi	81.1	83.0	0.98	A
			Sr-90	pCi	11.4	12.0	0.95	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 2018	18-MaS38	Soil	Ni-63	Bq/kg	9.94		*(1)*	A
			Sr-90	Bq/kg	0.846		*(1)*	A
	18-MaW38	Water	Am-241	Bq/L	0.785	0.709	0.496 - 0.922	A
			Ni-63	Bq/L	12.6	14.0	9.8 - 18.2	A
			Pu-238	Bq/L	0.0214	0.023	*(2)*	A
			Pu-239/240	Bq/L	0.544	0.600	0.420 - 0.780	A
	18-RdF38	AP	U-234/233	Bq/sample	0.111	0.124	0.087 - 0.161	A
			U-238	Bq/sample	0.123	0.128	0.090 - 0.166	A
	18-RdV38	Vegetation	Cs-134	Bq/sample	2.46	3.23	2.26 - 4.20	W
			Cs-137	Bq/sample	3.14	3.67	2.57 - 4.77	A
			Co-57	Bq/sample	4.12	4.42	3.09 - 5.75	A
			Co-60	Bq/sample	1.86	2.29	1.60 - 2.98	A
			Mn-54	Bq/sample	2.21	2.66	1.86 - 3.46	A
			Sr-90	Bq/sample				NR[3]
			Zn-65	Bq/sample	-0.201		*(1)*	A
November 2018	18-MaS39	Soil	Ni-63	Bq/kg	703	765	536 - 995	A
			Sr-90	Bq/kg	137	193	*135 - 251*	W
	18-MaW39	Water	Am-241	Bq/L	0.0363		*(1)*	A
			Ni-63	Bq/L	6.18	7.0	4.9 - 9.1	A
			Pu-238	Bq/L	0.73	0.674	0.472 - 0.876	A
			Pu-239/240	Bq/L	0.89	0.928	0.650 - 1.206	A
	18-RdF39	AP	U-234/233	Bq/sample	0.159	0.152	0.106 - 0.198	A
			U-238	Bq/sample	0.162	0.158	0.111 - 0.205	A
	18-RdV39	Vegetation	Cs-134	Bq/sample	1.85	1.94	1.36 - 2.52	A
			Cs-137	Bq/sample	2.5	2.36	1.65 - 3.07	A
			Co-57	Bq/sample	3.53	3.31	2.32 - 4.30	A
			Co-60	Bq/sample	1.6	1.68	1.18 - 2.18	A
			Mn-54	Bq/sample	2.61	2.53	1.77 - 3.29	A
			Sr-90	Bq/sample	0.338	0.791	0.554 - 1.028	N[4]
			Zn-65	Bq/sample	1.32	1.37	*0.96 - 1.78*	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 0.80-1.20

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

NR = No result reported

(1) False positive test

(2) Sensitivity evaluation

*(3) See **NCR 18-09***

*(4) See **NCR 18-25***

ERA Environmental Radioactivity Cross Check Program
Teledyne Brown Engineering Environmental Services

Month/Year	Identification Number	Matrix	Nuclide	Units	TBE Reported Value	Known Value [a]	Acceptance Limits	Evaluation [b]
March 2018	MRAD-28	AP	GR-A	pCi/sample	65.7	43.4	22.7 - 71.5	A
			GR-B	pCi/sample	57.2	52	31.5 - 78.6	A
April 2018	RAD-113	Water	Ba-133	pCi/L	91.2	91.5	77.1 - 101	A
			Cs-134	pCi/L	70.4	75.9	62.0 - 83.5	A
			Cs-137	pCi/L	122	123	111 - 138	A
			Co-60	pCi/L	64.8	64.3	57.9 - 73.2	A
			Zn-65	pCi/L	98.6	86.7	78.0 - 104	A
			GR-A	pCi/L	32.8	28.6	14.6 - 37.5	A
			GR-B	pCi/L	62.9	73.7	51.4 - 81.1	A
			U-Nat	pCi/L	6.7	6.93	5.28 - 8.13	A
			H-3	pCi/L	17100	17200	15000 - 18900	A
			Sr-89	pCi/L	38.6	48.8	38.3 - 56.2	A
			Sr-90	pCi/L	27.1	26.5	19.2 - 30.9	A
			I-131	pCi/L	26.7	24.6	20.4 - 29.1	A
September 2018	MRAD-29	AP	GR-A	pCi/sample	49.7	55.3	28.9 - 91.1	A
		AP	GR-B	pCi/sample	75.3	86.5	52.4 - 131	A
October 2018	RAD-115	Water	Ba-133	pCi/L	15.2	16.3	11.9 - 19.4	A
			Cs-134	pCi/L	85.9	93.0	76.4 - 102	A
			Cs-137	pCi/L	229	235	212 - 260	A
			Co-60	pCi/L	81.9	80.7	72.6 - 91.1	A
			Zn-65	pCi/L	348	336	302 - 392	A
			GR-A	pCi/L	38.9	60.7	31.8 - 75.4	A
			GR-B	pCi/L	36.5	41.8	27.9 - 49.2	A
			U-Nat	pCi/L	17.48	20.9	16.8 - 23.4	A
			H-3	pCi/L	2790	2870	2410 - 3170	A
			I-131	pCi/L	26.9	27.2	22.6 - 32.0	A
			Sr-89	pCi/L	57.2	56.9	45.5 - 64.6	A
			Sr-90	pCi/L	36.8	31.4	22.9- 36.4	N[1]

(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 18-23***