VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

April 27, 2017

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

Serial No. 17-116
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, 2016 through December 31, 2016, which includes environmental monitoring for the Surry ISFSI.

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

Sincerely,

Douglas C. Lawrence
Director Safety & Licensing
Surry Power Station

Attachment

Commitments made in this letter: None

IE25
NMSS26

NRR
NMSS

Serial No. 17-116
Docket Nos.: 50-280
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72-2
72-55

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Serial No. 17-116
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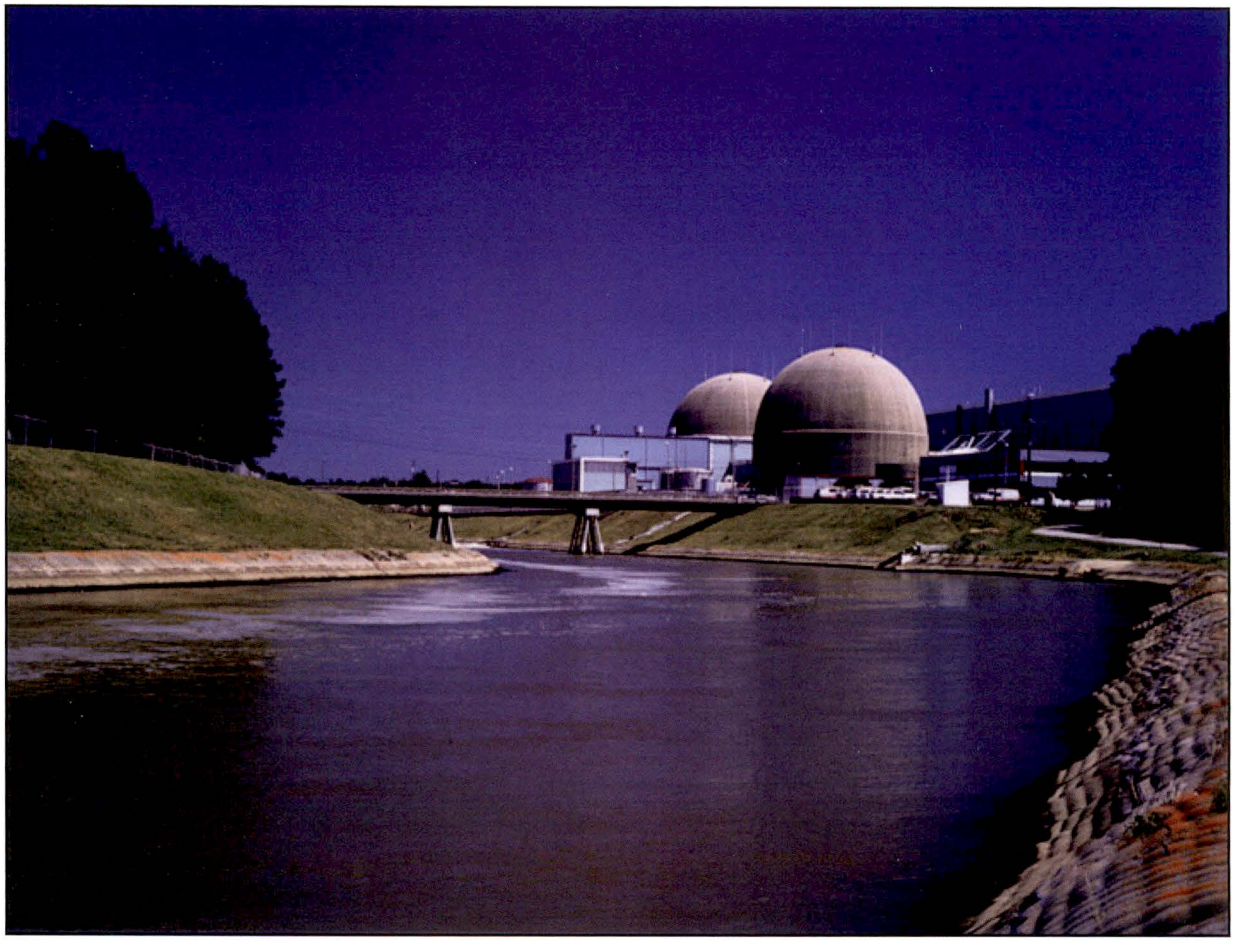
ATTACHMENT 1

2016 Annual Radiological Environmental Operating Report

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

Surry Power Station



2016 Annual Radiological Environmental Operating Report

Dominion®

Dominion

Surry Power Station

Radiological Environmental Monitoring Program

January 1, 2016 to December 31, 2016

Annual Radiological Environmental Operating Report

Surry Power Station

January 1, 2016 to December 31, 2016

Prepared by: P. F. Blount

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Approved by: Lee Ragland

T. L. Ragland
Manager Radiological Protection and Chemistry

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PREFACE

This report is submitted as required by Technical Specification 6.6.B.2, Annual Radiological Environmental 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 2016 Surry Power Station Radiological Environmental Monitoring Program (REMP). Radioactivity levels from January 1 through December 31, 2016, 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 2016 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 and thorium-232 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. The cesium-137 activity was present in the control location and is attributable to global fallout from past nuclear weapons testing and nuclear accidents such as Chernobyl. Shoreline sediment, which may provide a direct exposure pathway, contained no station related radionuclides. Naturally occurring radionuclides potassium, radium and thorium were detected at average environmental levels. The terrestrial exposure pathway includes milk and food products. Iodine-131 was not detected in any 2016 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 man-made radionuclides were detected in food product samples. Consistent with historical data, naturally occurring potassium-40 was detected in milk. Naturally occurring potassium-40 was detected in food products. The direct exposure pathway measures environmental radiation doses using TLDs. TLD results have remained relatively constant over the years.

During 2016, 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 2016 was 0.022 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 2016 Surry Power Station operational Radiological Environmental Monitoring Program (REMP). The Dominion 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 2016 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 2016 sampling program for Surry Power Station. All samples listed in Table 2-1 are taken at indicator locations except those labeled "control." Dominion 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 - 2016

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 - 2016

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)	1.3	NNW	341°	Semi-Annually	

Table 2-1

SURRY - 2016

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	
	Williams	(WMS)	27.5	S	175°	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 - 2016

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 - 2016

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 - 2016

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 ar 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

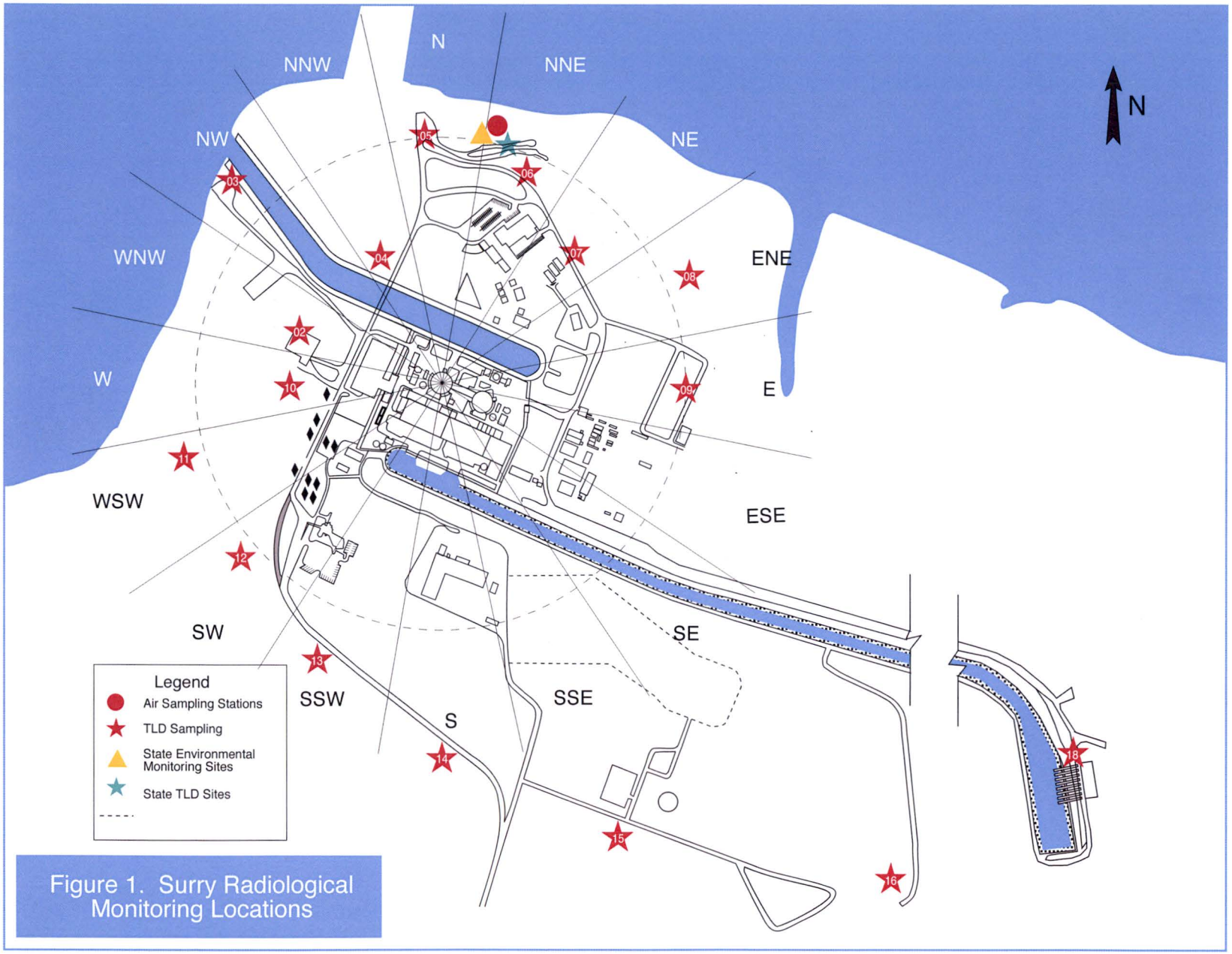
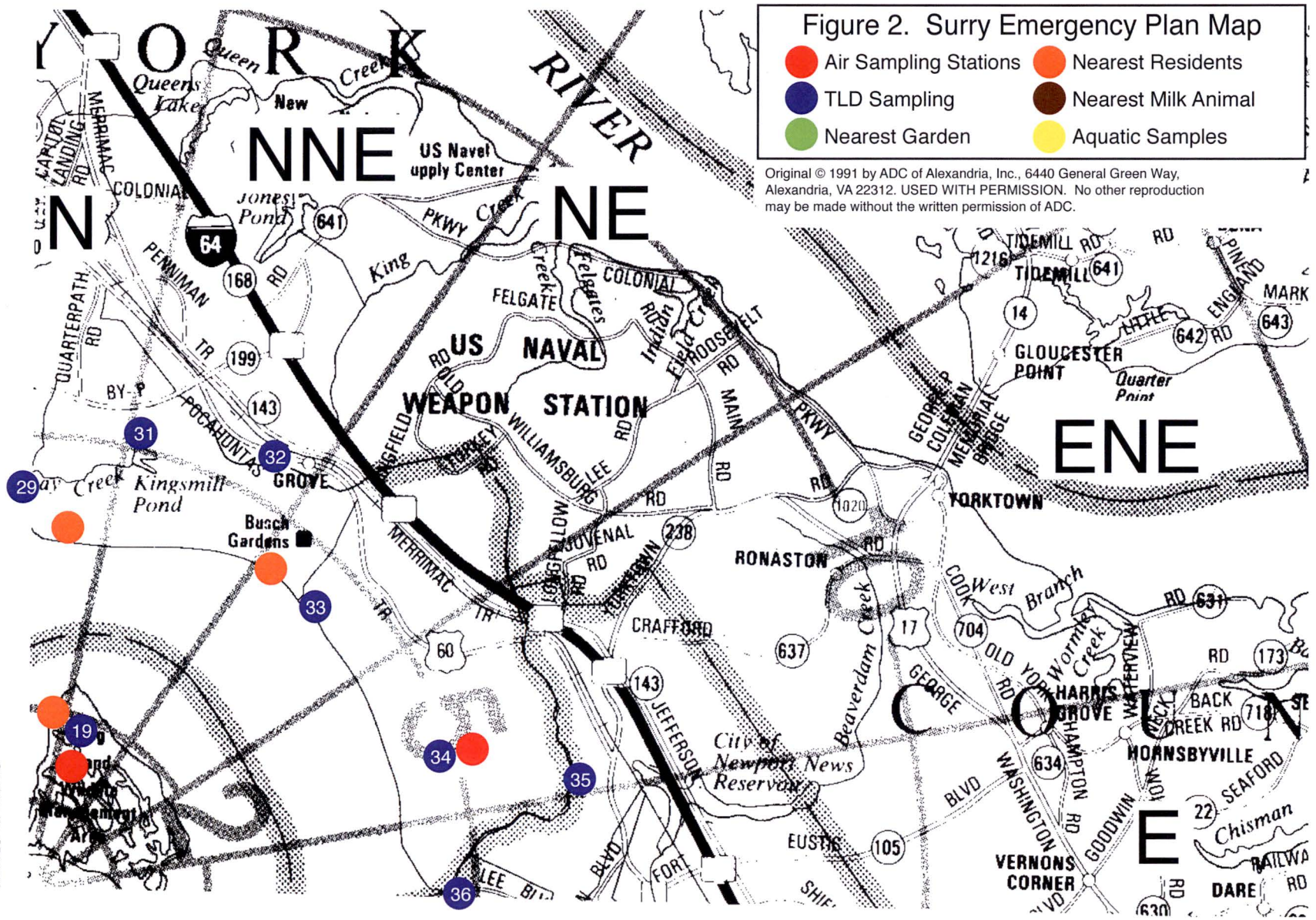


Figure 1. Surry Radiological Monitoring Locations

Graphics No. SV645F



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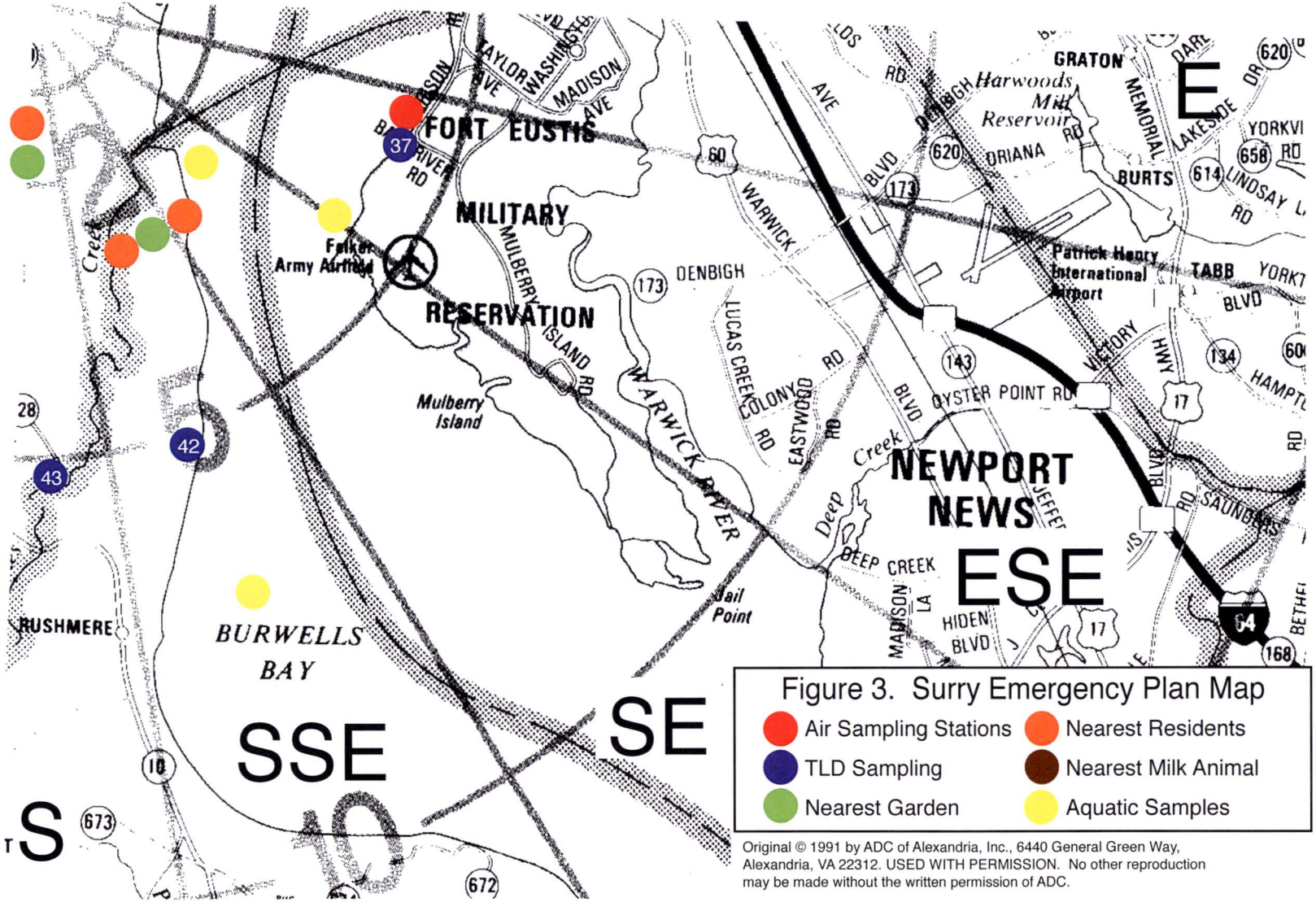

Figure 3. Surry Emergency Plan Map

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

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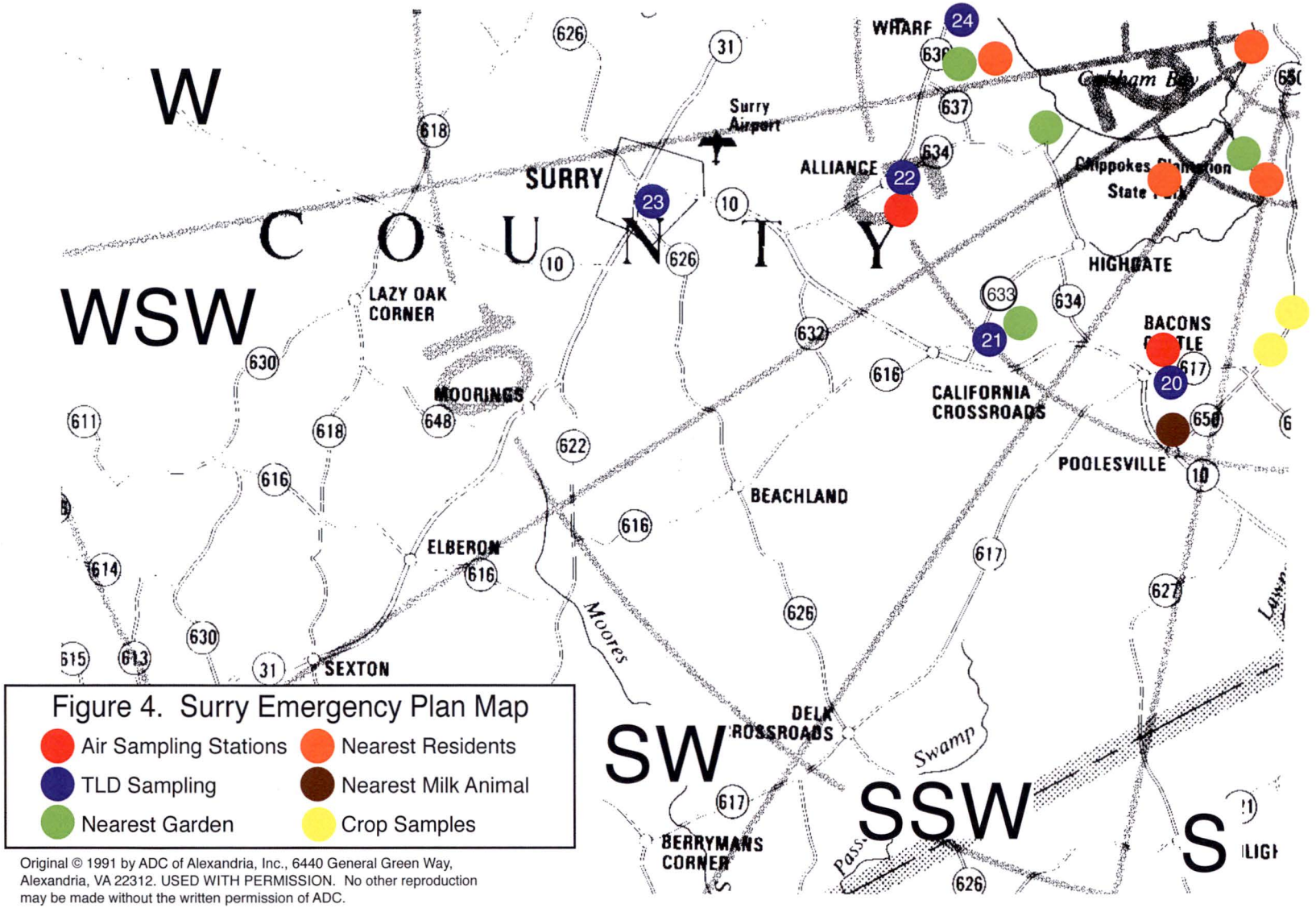


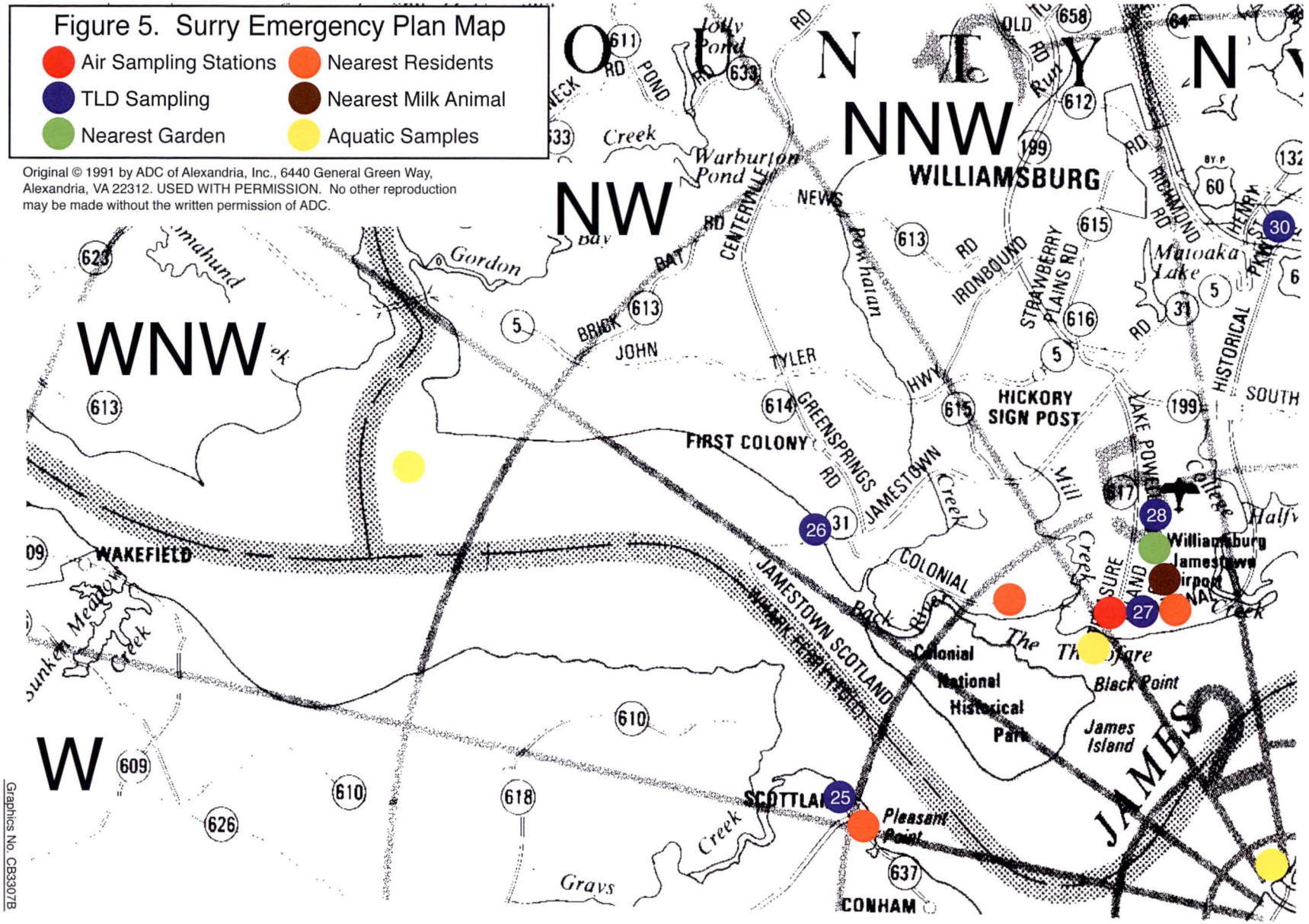
Figure 4. Surry Emergency Plan Map

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

Graphics No. CB3310A

Figure 5. Surry Emergency Plan Map

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



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 - 2016
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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
Air Particulate *(1E-3 pCi/m3)*	**Gross Beta**	416	10	**13.9 (363/364) (4.74 - 34.1)**	**BC**	**4.5 mi SSW**	**16.2 (52/52) (5.1 - 33.1)**	**12.2 (52/52) (5.3 - 22.3)**	0
	Gamma	32							
	Be-7	32		**140.6 (28/28) (86.7 - 218)**	**ALL**	**5.1 mi WSW**	**160.3 (4/4) (115 - 218)**	**131.8 (4/4) (99.0 - 163)**	0
	K-40	32		**15.6 (2/28) (14.9 - 16.3)**	**CP**	**3.8 mi NNW**	**16.3 (1/4) (16.3 - 16.3)**	< LLD	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**	416	70	< LLD	N/A		< LLD	< LLD	0
Milk *(pCi/Liter)*	**Strontium**	4							
	Sr-89	4		< LLD	N/A		< LLD	< LLD	0
	Sr-90	4		**1.59 (3/4) (1.33 - 1.79)**	**CP**	**3.7 mi NNW**	**1.59 (3/4) (1.33 - 1.79)**	< LLD	0
	Gamma	36							
	K-40	36		**1349 (24/24) (1080 - 1530)**	**CP**	**3.7 mi NNW**	**1355 (12/12) (1080 - 1530)**	**1562 (11/12) (1270 - 1850)**	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
	La-140	36	15	< 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
Food Products	**Gamma**	3							
(pCi/kg wet)	K-40	3		**11120 (3/3) (4730 - 22900)**	**Slade**	**3.2 mi S**	**22900 (1/1) (22900-22900)**	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	**H-3**	12	2000	< LLD	N/A		< LLD	N/A	0
(pCi/Liter)	**Gamma**	12							
	K-40	12		**66.8 (1/12) (66.8 - 66.8)**	**CS**	**0.3 mi E**	**66.8 (1/12) (66.8 - 66.8)**	N/A	0
	Ra-226	12		**113 (1/12) (113 - 113)**	**SS**	**0.1 mi E**	**113 (1/12) (113 - 113)**	N/A	0
	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 *(pCi/Liter)*	**H-3**	8	2000	< LLD	N/A		< LLD	< LLD	0
	Gamma	24							
	K-40	24		**84.0 (5/12) (59.3 - 112)**	**SD**	**0.4 mi NW**	**84.0 (5/12) (59.3 - 112)**	**67.8 (2/12) (65.2 - 70.3)**	0
	Ra-226	24		**253 (1/12) (253 - 253)**	**SD**	**0.4 mi NW**	**253 (1/12) (253 - 253)**	< LLD	0
	Th-228	24		< LLD	N/A		< LLD	**9.11 (1/12) (9.11 - 9.11)**	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	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
River Water *(pCi/Liter)*	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**	4							
	Be-7	4		**3170 (1/2) (3170 - 3170)**	**SD**	**1.3 mi NNW**	**3170 (1/2) (3170 - 3170)**	< LLD	0
	K-40	4		**15700 (2/2) (10000-21400)**	**CHIC**	**11.2 mi WNW**	**17200 (2/2) (15900-18500)**	**17200 (2/2) (15900-18500)**	0
	Cs-134	4	150	< LLD	N/A		< LLD	< LLD	0
	Cs-137	4	180	< LLD	**CHIC**	**11.2 mi WNW**	**226 (2/2) (219 - 233)**	**226 (2/2) (219 - 233)**	0
	Ra-226	4		**2255 (2/2) (1910 - 2600)**	**CHIC**	**11.2 mi WNW**	**2620 (2/2) (2510 - 2730)**	**2620 (2/2) (2510 - 2730)**	0
	Th-228	4		**1209 (2/2) (818 - 1600)**	**CHIC**	**11.2 mi WNW**	**1745 (2/2) (1700 - 1790)**	**1745 (2/2) (1700 - 1790)**	0
	Th-232	4		**1088 (2/2) (786 - 1390)**	**CHIC**	**11.2 mi WNW**	**1240 (2/2) (1200 - 1280)**	**1240 (2/2) (1200 - 1280)**	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 *(pCi/kg dry)*	K-40	4		**5805 (2/2) (3650 - 7960)**	**HIR**	**0.6 mi N**	**5805 (2/2) (3650 - 7960)**	**1910 (2/2) (1820 - 2000)**	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**	**1390 (1/2) (1390 - 1390)**	**1390 (1/2) (1390 - 1390)**	0
	Th-228	4		**1920 (1/2) (1920 - 1920)**	**HIR**	**0.6 mi N**	**1920 (1/2) (1920 - 1920)**	**1090 (2/2) (930 - 1250)**	0
	Th-232	4		**1550 (1/2) (1550 - 1550)**	**HIR**	**0.6 mi N**	**1550 (1/2) (1550 - 1550)**	**1015 (2/2) (790 - 1240)**	0
Fish *(pCi/kg wet)*	**Gamma**	4							
	K-40	4		**2548 (4/4) (1810 - 3170)**	**SD**	**1.3 mi NNW**	**2548 (4/4) (1810 - 3170)**	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		**770 (5/6) (581 - 1090)**	**POS**	**6.4 mi SSE**	**844 (2/2) (597 - 1090)**	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		**630 (2/4) (548 - 712)**	**JI**	**3.9 mi NW**	**712 (1/2) (712 - 712)**	**675 (1/2) (675 - 675)**	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		**1180 (1/1) (1180 - 1180)**	**SD**	**1.3 mi NNW**	**1180 (1/1) (1180 - 1180)**	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 2016 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.

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. Cow 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 – 2016

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

$MDD_A = 3 \times \sigma_A = 3 \times 2.8 = 8.8\ (10)$ 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,[a] $F_Q = M_Q - B_Q$ (mrem)				Annual Baseline, B_A (mrem)	Annual Monitoring Data, M_A (mrem)	Annual Facility Dose,[b] $F_A = M_A - B_A$ (mrem)
		1	2	3	4	1	2	3	4			
2	19.8	19.7	19.4	20.3	18.8	ND	ND	ND	ND	79.7	78.3	ND
3	19.1	19.4	17.9	19.7	19.7	ND	ND	ND	ND	76.1	76.7	ND
4	17.7	17.0	16.4	18.8	18.2	ND	ND	ND	ND	71.0	70.4	ND
5	18.9	18.8	19.7	20.3	19.4	ND	ND	ND	ND	74.7	78.3	ND
6	18.4	17.9	17.3	19.7	19.1	ND	ND	ND	ND	73.5	74.0	ND
7	18.6	17.9	19.1	18.8	18.8	ND	ND	ND	ND	74.1	74.6	ND
8	16.9	17.0	15.8	17.3	17.6	ND	ND	ND	ND	67.8	67.6	ND
9	23.1	22.8	23.4	23.7	23.1	ND	ND	ND	ND	92.4	92.8	ND
10	18.2	17.6	17.0	19.4	17.6	ND	ND	ND	ND	73.0	71.6	ND
11	16.0	16.7	16.1	16.7	16.1	ND	ND	ND	ND	63.3	65.5	ND
12	16.6	15.8	16.1	17.0	16.7	ND	ND	ND	ND	66.5	65.5	ND
13	18.5	18.2	17.3	19.1	19.1	ND	ND	ND	ND	73.8	73.7	ND
14	17.8	18.2	15.5	19.4	18.5	ND	ND	ND	ND	70.9	71.6	ND
15	18.4	18.2	16.4	18.5	18.8	ND	ND	ND	ND	74.0	71.9	ND
16	16.9	17.3	15.8	17.3	17.6	ND	ND	ND	ND	67.1	67.9	ND
18	14.3	14.9	13.7	15.2	15.2	ND	ND	ND	ND	56.5	58.8	ND
19	15.4	15.5	14.3	15.8	16.1	ND	ND	ND	ND	61.6	61.6	ND
20	14.3	14.3	13.7	14.6	14.9	ND	ND	ND	ND	57.1	57.3	ND
21	15.0	14.9	14.6	16.1	15.8	ND	ND	ND	ND	59.3	61.3	ND
22	13.0	13.0	12.7	13.3	13.7	ND	ND	ND	ND	52.0	52.8	ND
23	17.8	18.2	16.1	18.2	18.5	ND	ND	ND	ND	71.5	71.0	ND
24	14.7	14.9	15.8	14.9	15.2	ND	ND	ND	ND	58.3	60.7	ND
25	18.1	17.6	20.6	18.2	18.2	ND	ND	ND	ND	71.7	74.6	ND
26	16.8	15.2	15.8	16.4	15.5	ND	ND	ND	ND	68.7	62.8	ND
27	14.6	14.6	13.3	15.8	14.9	ND	ND	ND	ND	58.2	58.5	ND
28	14.1	14.3	13.0	15.2	14.6	ND	ND	ND	ND	56.3	57.0	ND
29	13.1	13.3	12.7	13.3	13.3	ND	ND	ND	ND	52.5	52.8	ND
30	14.4	15.5	14.0	15.5	14.3	ND	ND	ND	ND	57.1	59.2	ND
31	12.2	12.1	11.2	12.1	12.4	ND	ND	ND	ND	49.3	47.9	ND
32	15.2	15.2	14.0	15.5	m	ND	ND	ND	N/A	61.1	59.5	ND
33	14.0	14.3	12.1	14.9	14.9	ND	ND	ND	ND	56.2	56.1	ND
34	15.9	15.8	14.3	17.6	16.4	ND	ND	ND	ND	63.3	64.0	ND
35	18.3	18.8	18.5	20.6	19.7	ND	ND	ND	ND	72.0	77.7	ND
36	18.5	18.5	19.1	20.0	18.2	ND	ND	ND	ND	73.1	75.8	ND
37	15.3	15.2	13.7	16.4	15.8	ND	ND	ND	ND	61.4	61.0	ND
38	21.0	20.6	19.7	21.2	20.9	ND	ND	ND	ND	84.3	82.5	ND
39	14.8	14.9	14.9	15.5	14.6	ND	ND	ND	ND	58.9	59.8	ND
40	16.1	16.1	16.7	17.6	16.1	ND	ND	ND	ND	63.8	66.4	ND
41	21.7	21.8	20.0	22.4	21.8	ND	ND	ND	ND	87.2	86.1	ND
42	16.2	17.0	15.5	16.7	16.7	ND	ND	ND	ND	64.4	65.8	ND
43	14.3	15.2	13.3	14.6	14.3	ND	ND	ND	ND	57.0	57.3	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

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 - 2016

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS SS	HIR	BC	ALL	CP	BASF	FE	NN-C
January 05	11.3 ± 2.69	11.2 ± 2.69	12.8 ± 2.81	10.7 ± 2.64	12.8 ± 2.80	12.5 ± 2.75	14.7 ± 2.85	15.5 ± 2.87
January 12	9.41 ± 2.56	10.9 ± 2.64	11.6 ± 2.71	11.5 ± 2.66	10.4 ± 2.65	9.23 ± 2.54	12.9 ± 2.75	11.1 ± 2.62
January 19	16.6 ± 2.81	15.0 ± 2.72	17.6 ± 2.93	17.0 ± 2.83	18.4 ± 2.95	17.6 ± 2.85	16.9 ± 2.79	15.8 ± 2.72
January 26	13.4 ± 2.50	14.6 ± 2.56	13.7 ± 2.56	12.4 ± 2.41	13.4 ± 2.56	14.0 ± 2.53	12.9 ± 2.45	12.0 ± 2.37
February 02	17.4 ± 2.96	19.2 ± 3.06	20.7 ± 3.17	18.9 ± 2.99	19.4 ± 3.11	18.6 ± 3.01	17.7 ± 2.95	18.4 ± 2.99
February 09	11.0 ± 2.45	12.5 ± 2.54	9.48 ± 2.43	12.2 ± 2.52	12.9 ± 2.62	9.45 ± 2.57	12.3 ± 2.52	11.5 ± 2.46
February 16	14.5 ± 2.76	12.4 ± 2.65	14.6 ± 2.82	13.5 ± 2.69	12.3 ± 2.69	14.7 ± 2.77	12.2 ± 2.63	13.4 ± 2.66
February 22	11.1 ± 2.87	12.3 ± 2.95	10.5 ± 2.88	10.5 ± 2.81	11.9 ± 2.98	10.8 ± 2.85	13.1 ± 3.00	11.3 ± 2.86
March 01	9.08 ± 2.25	10.9 ± 2.35	10.5 ± 2.39	11.2 ± 2.38	9.82 ± 2.34	8.44 ± 2.20	10.4 ± 2.35	9.26 ± 2.24
March 08	12.5 ± 2.66	15.0 ± 2.82	13.7 ± 2.79	13.1 ± 2.70	14.8 ± 2.85	15.7 ± 2.86	14.0 ± 2.76	13.7 ± 2.73
March 15	13.8 ± 2.78	13.1 ± 2.76	13.0 ± 2.79	15.1 ± 2.86	17.1 ± 3.02	16.2 ± 2.92	14.6 ± 2.82	11.7 ± 2.65
March 22	11.1 ± 2.49	10.3 ± 2.43	10.1 ± 2.46	11.5 ± 2.50	12.5 ± 2.59	11.3 ± 2.49	13.2 ± 2.61	10.6 ± 2.43
March 29	7.96 ± 2.53	9.69 ± 2.65	9.24 ± 2.64	8.35 ± 2.54	11.4 ± 2.80	11.3 ± 2.71	7.58 ± 2.49	9.14 ± 2.58
Qtr. Avg. ± 2 s.d.	**12.2 ± 5.7**	**12.9 ± 5.2**	**12.9 ± 6.7**	**12.8 ± 5.7**	**13.6 ± 6.0**	**13.1 ± 6.6**	**13.3 ± 5.2**	**12.6 ± 5.4**
April 05	9.76 ± 2.54	9.03 ± 2.52	12.2 ± 2.73	11.1 ± 2.62	12.7 ± 2.77	11.5 ± 2.64	9.90 ± 2.54	10.6 ± 2.58
April 12	11.2 ± 2.64	12.5 ± 2.72	12.1 ± 5.12	13.1 ± 2.73	13.3 ± 2.79	13.0 ± 2.71	13.2 ± 2.71	11.6 ± 2.61
April 19	12.6 ± 2.61	12.7 ± 2.63	14.5 ± 2.77	10.5 ± 2.49	13.7 ± 2.74	13.1 ± 2.68	13.4 ± 2.70	11.0 ± 2.53
April 25	12.2 ± 3.00	14.7 ± 3.16	16.3 ± 3.29	13.4 ± 3.07	13.0 ± 3.09	14.4 ± 3.12	13.0 ± 3.04	9.31 ± 2.81
May 03	11.1 ± 2.35	10.5 ± 2.32	13.9 ± 2.55	11.8 ± 2.39	12.3 ± 2.46	13.0 ± 2.46	10.8 ± 2.33	13.8 ± 2.48
May 10	6.16 ± 2.26	5.49 ± 2.21	7.54 ± 2.39	5.17 ± 2.19	6.93 ± 2.35	6.25 ± 2.27	4.74 ± 2.17	5.33 ± 2.17
May 17	6.83 ± 2.22	6.57 ± 2.19	5.11 ± 2.12	7.31 ± 2.24	8.18 ± 2.33	7.53 ± 2.25	6.70 ± 2.19	5.96 ± 2.11
May 24	9.10 ± 2.54	9.63 ± 2.57	10.6 ± 2.69	11.1 ± 2.66	12.6 ± 2.80	10.7 ± 2.65	12.2 ± 2.72	9.46 ± 2.54
May 31	14.4 ± 2.90	14.2 ± 2.89	16.4 ± 3.06	15.1 ± 2.92	17.5 ± 3.13	13.5 ± 2.83	15.5 ± 2.96	14.0 ± 2.85
June 07	7.77 ± 2.34	6.30 ± 2.23	8.88 ± 2.43	8.42 ± 2.35	8.83 ± 2.43	7.67 ± 2.29	6.64 ± 2.21	7.97 ± 2.29
June 13	15.4 ± 3.04	12.8 ± 2.88	19.3 ± 3.33	18.2 ± 3.20	17.5 ± 3.21	16.1 ± 3.10	16.6 ± 3.13	13.7 ± 2.94
June 20	7.66 ± 2.21	8.67 ± 2.27	11.7 ± 2.51	8.51 ± 2.25	9.65 ± 2.38	9.37 ± 2.31	9.76 ± 2.34	9.86 ± 2.32
June 28	13.7 ± 2.59	12.5 ± 2.52	19.0 ± 2.91	13.8 ± 2.58	11.9 ± 2.53	12.8 ± 2.53	14.3 ± 2.61	10.5 ± 2.39
Qtr. Avg. ± 2 s.d.	**10.6 ± 6.0**	**10.4 ± 6.2**	**12.9 ± 8.5**	**11.3 ± 7.0**	**12.2 ± 6.4**	**11.5 ± 5.9**	**11.3 ± 7.2**	**10.2 ± 5.5**

TABLE 3-3: GROSS BETA CONCENTRATION IN FILTERED AIR

Surry Nuclear Power Station, Surry County, Virginia - 2016

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS SS	HIR	BC	ALL	CP	BASF	FE	NN
July 05	10.7 ± 2.45	11.3 ± 2.48	17.0 ± 2.85	12.3 ± 2.51	13.5 ± 2.62	12.9 ± 2.55	10.5 ± 2.39	14.9 ± 2.64
July 12	9.23 ± 2.32	10.3 ± 2.40	15.6 ± 2.77	11.1 ± 2.44	12.8 ± 2.60	12.3 ± 2.54	10.3 ± 2.40	10.8 ± 2.43
July 19	13.7 ± 2.84	12.5 ± 2.79	21.4 ± 3.31	11.2 ± 2.70	15.7 ± 3.09	13.4 ± 2.93	14.3 ± 2.87	13.7 ± 2.83
July 26	20.5 ± 3.14	20.9 ± 3.16	32.4 ± 3.76	24.2 ± 3.33	23.2 ± 3.34	24.4 ± 3.32	18.9 ± 3.03	22.3 ± 3.19
August 02	12.7 ± 2.46	17.3 ± 2.74	12.8 ± 2.51	12.2 ± 2.43	14.6 ± 2.64	15.2 ± 2.63	13.8 ± 2.52	14.5 ± 2.56
August 09	13.8 ± 2.65	12.1 ± 2.56	20.5 ± 3.08	13.7 ± 2.66	16.3 ± 2.89	13.4 ± 2.66	12.5 ± 2.6	11.9 ± 2.54
August 15	7.20 ± 2.81	5.75 ± 2.71	9.51 ± 3.02	6.53 ± 2.75	7.62 ± 2.92	8.03 ± 2.87	6.86 ± 2.86	5.77 ± 2.68
August 22	11.9 ± 2.62	9.49 ± 2.46	12.6 ± 2.67	9.96 ± 2.45	12.3 ± 2.65	11.2 ± 2.54	11.6 ± 2.56	10.5 ± 2.47
August 29	9.39 ± 2.34	12.5 ± 2.54	17.9 ± 2.89	11.8 ± 2.49	13.3 ± 2.63	13.9 ± 2.62	13.1 ± 2.57	12.4 ± 2.51
September 06	15.5 ± 2.48	15.3 ± 2.47	19.4 ± 2.73	17.4 ± 2.57	17.0 ± 2.60	17.7 ± 2.67	16.3 ± 2.51	15.0 ± 2.42
September 13	18.8 ± 2.89	19.6 ± 2.93	30.4 ± 3.50	22.6 ± 3.08	25.7 ± 3.29	21.0 ± 3.02	24.7 ± 3.21	16.9 ± 2.80
September 20	9.06 ± 2.45	10.2 ± 2.53	11.6 ± 2.65	12.2 ± 2.63	10.6 ± 2.58	11.6 ± 2.60	8.50 ± 2.41	10.0 ± 2.48
September 27	11.0 ± 2.46	10.6 ± 2.44	11.7 ± 2.53	10.5 ± 2.40	9.55 ± 2.40	11.7 ± 2.51	9.84 ± 2.42	8.27 ± 2.27
Qtr. Avg. ± 2 s.d.	**12.6 ± 7.8**	**12.9 ± 8.6**	**17.9 ± 14.1**	**13.5 ± 10.0**	**14.8 ± 10.1**	**14.4 ± 8.8**	**13.2 ± 9.5**	**12.8 ± 8.3**
October 04	10.5 ± 2.39	11.0 ± 2.42	15.1 ± 2.72	11.1 ± 2.41	11.5 ± 2.49	12.8 ± 2.51	7.89 ± 2.20	9.71 ± 2.29
October 11	10.8 ± 2.44	11.5 ± 2.48	12.2 ± 2.63	8.52 ± 2.36	12.0 ± 2.85	7.05 ± 2.28	6.25 ± 2.24	5.71 ± 2.18
October 18	14.0 ± 2.82	14.3 ± 2.83	20.8 ± 3.18	6.21 ± 2.26	16.7 ± 2.96	14.8 ± 2.80	12.9 ± 2.71	12.0 ± 2.63
October 25	10.7 ± 2.39	17.6 ± 2.80	20.3 ± 3.07	15.1 ± 2.73	15.1 ± 2.78	17.0 ± 2.85	14.3 ± 2.68	11.8 ± 2.51
November 01	16.4 ± 2.95	20.0 ± 3.16	24.5 ± 3.36	19.2 ± 3.01	17.8 ± 3.01	18.4 ± 2.98	19.0 ± 3.02	13.0 ± 2.67
November 8	0.30 ± 1.75	19.6 ± 2.99	25.4 ± 3.40	19.0 ± 3.02	22.0 ± 3.24	18.5 ± 3.01	18.4 ± 3.02	17.1 ± 2.91
November 15	17.4 ± 3.01	12.7 ± 2.74	20.0 ± 3.13	16.4 ± 2.88	15.7 ± 2.89	13.1 ± 2.67	15.7 ± 2.84	12.3 ± 2.61
November 22	34.1 ± 3.76	23.0 ± 3.27	33.1 ± 3.79	24.5 ± 3.35	20.0 ± 3.18	25.5 ± 3.40	22.4 ± 3.26	19.6 ± 3.10
November 29	25.9 ± 3.43	16.1 ± 2.95	22.6 ± 3.35	21.8 ± 3.26	21.2 ± 3.25	18.0 ± 3.04	18.2 ± 3.07	13.3 ± 2.76
December 05	21.0 ± 3.25	16.2 ± 2.97	23.8 ± 3.45	19.0 ± 3.13	15.7 ± 2.98	18.4 ± 3.08	17.7 ± 3.06	15.1 ± 2.85
December 12	13.4 ± 2.71	8.45 ± 2.39	11.8 ± 2.64	11.3 ± 2.58	9.88 ± 2.51	10.3 ± 2.52	10.1 ± 2.51	7.45 ± 2.32
December 19	20.5 ± 3.02	12.7 ± 2.58	21.7 ± 3.11	16.3 ± 2.78	14.6 ± 2.72	18.1 ± 2.88	15.2 ± 2.74	16.3 ± 2.76
December 26	24.4 ± 3.23	19.2 ± 2.96	22.1 ± 3.16	15.8 ± 2.77	19.7 ± 3.04	19.3 ± 2.96	17.7 ± 2.90	17.4 ± 2.88
Qtr. Avg. ± 2 s.d.	**18.3 ± 14.5**	**15.6 ± 8.5**	**21.0 ± 11.4**	**15.7 ± 10.5**	**16.3 ± 7.6**	**16.3 ± 9.3**	**15.1 ± 9.4**	**13.1 ± 8.0**
Ann. Avg. ± 2 s.d.	**14.2 ± 12.8**	**13.5 ± 9.0**	**18.5 ± 13.6**	**14.2 ± 10.4**	**15.0 ± 9.1**	**14.6 ± 9.3**	**13.6 ± 9.6**	**12.5 ± 8.1**

November 8: SS had <Minimum Detectable Activity

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

Surry Power Station, Surry County, Virginia - 2016

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS							
	SS	HIR	BC	ALL	CP	BASF	FE	NN-C
January 05	10.1 ± 26.2	10.1 ± 26.4	10.2 ± 26.6	9.97 ± 26.0	-10.9 ± 26.2	-10.7 ± 25.7	-10.6 ± 25.4	-10.4 ± 25.0
January 12	-5.48 ± 17.5	-5.45 ± 17.5	-5.52 ± 17.7	-5.38 ± 17.2	-2.32 ± 23.3	-2.27 ± 22.8	-2.25 ± 22.7	-2.2 ± 22.3
January 19	9.40 ± 14.1	9.42 ± 14.1	9.74 ± 14.6	9.35 ± 14.0	11.3 ± 21.4	11.0 ± 20.7	10.9 ± 20.5	10.7 ± 20.3
January 26	-1.64 ± 5.82	-4.22 ± 14.9	-4.33 ± 15.3	-4.17 ± 14.8	-4.36 ± 15.5	10.9 ± 20.6	10.7 ± 20.3	10.5 ± 19.9
February 02	20.4 ± 21.1	20.4 ± 21.1	20.8 ± 21.5	19.9 ± 20.6	-10.7 ± 19.2	-10.4 ± 18.7	-10.3 ± 18.5	-10.3 ± 18.4
February 09	1.22 ± 34.4	1.22 ± 34.3	1.27 ± 3.58	1.21 ± 34.2	2.98 ± 35.9	3.24 ± 39.0	2.87 ± 34.5	2.84 ± 34.1
February 16	11.6 ± 20.6	11.6 ± 20.7	11.9 ± 21.1	11.5 ± 20.5	-2.60 ± 18.1	-2.51 ± 17.5	-2.51 ± 17.5	-2.45 ± 17.0
February 22	1.56 ± 23.4	1.56 ± 23.4	1.59 ± 23.9	1.54 ± 23.1	-1.10 ± 27.9	-1.06 ± 27.0	-1.06 ± 27.0	-1.05 ± 26.6
March 01	-6.25 ± 18.2	-6.25 ± 18.2	-6.45 ± 18.8	-6.25 ± 18.2	16.7 ± 19.4	16.1 ± 18.7	16.3 ± 19.0	15.9 ± 18.5
March 08	-4.06 ± 6.14	-10.6 ± 15.9	-10.8 ± 16.3	-10.5 ± 15.8	-3.17 ± 16.8	-3.09 ± 16.4	-3.09 ± 16.4	-3.06 ± 16.2
March 15	6.04 ± 15.2	6.10 ± 15.3	6.20 ± 15.6	6.03 ± 15.1	0.97 ± 13.5	0.94 ± 13.1	0.94 ± 13.1	0.94 ± 13.0
March 22	-6.00 ± 10.7	-5.97 ± 10.7	-6.09 ± 10.9	-5.94 ± 10.6	-7.35 ± 10.8	-7.22 ± 10.6	-7.25 ± 10.7	-7.13 ± 10.5
March 29	-22.0 ± 24.2	-22.1 ± 24.3	-22.3 ± 24.5	-21.8 ± 24.0	6.65 ± 32.0	6.41 ± 30.8	6.40 ± 30.8	6.35 ± 30.5
April 05	-9.00 ± 32.4	-9.11 ± 32.8	-9.17 ± 33.0	-8.96 ± 32.3	-5.28 ± 29.7	-5.11 ± 28.8	-5.11 ± 28.8	-5.08 ± 28.6
April 12	-12.6 ± 19.4	-12.6 ± 19.5	-28.3 ± 43.7	-12.4 ± 19.1	5.72 ± 12.9	5.51 ± 12.4	5.46 ± 12.3	5.42 ± 12.2
April 19	-0.36 ± 27.3	-0.36 ± 27.6	-0.37 ± 28	-0.36 ± 27.4	-13.4 ± 25.0	-13.1 ± 24.6	-13.2 ± 24.6	-12.9 ± 24.2
April 25	2.24 ± 10.7	2.25 ± 10.7	2.29 ± 10.9	2.23 ± 10.7	-1.22 ± 16.3	-1.19 ± 15.9	-1.19 ± 15.9	-1.18 ± 15.8
May 03	-2.63 ± 13.6	-2.37 ± 13.7	-2.41 ± 13.9	-2.35 ± 13.6	6.30 ± 16.2	6.12 ± 15.8	6.11 ± 15.7	6.00 ± 15.5
May 10	-6.16 ± 11.3	-6.16 ± 11.3	-6.30 ± 11.6	-6.12 ± 11.2	16.3 ± 13.6	16.0 ± 13.3	15.9 ± 13.3	15.6 ± 13.0
May 17	2.21 ± 19.4	2.20 ± 19.3	2.23 ± 19.6	2.18 ± 19.2	-4.09 ± 19.9	-3.99 ± 19.4	-3.99 ± 19.4	-3.88 ± 18.9
May 24	17.4 ± 37.7	17.3 ± 37.6	17.9 ± 38.8	15.8 ± 37.7	16.1 ± 38.6	15.8 ± 37.7	6.65 ± 14.4	6.48 ± 15.5
May 31	-19.4 ± 45.4	-19.4 ± 45.4	-19.9 ± 46.5	-19.3 ± 45.0	-2.89 ± 38.0	-2.78 ± 36.6	-2.81 ± 36.9	-1.16 ± 15.2
June 07	-7.91 ± 21.9	-7.86 ± 21.7	-7.94 ± 22.0	-7.73 ± 21.4	4.37 ± 30.9	4.21 ± 29.7	4.19 ± 29.6	4.14 ± 29.2
June 13	-5.06 ± 29.6	-5.06 ± 29.6	-7.04 ± 43.7	-5.03 ± 29.4	-5.13 ± 30.0	-6.86 ± 42.6	-6.86 ± 42.6	-6.75 ± 41.9
June 20	3.36 ± 20.9	3.36 ± 20.9	3.43 ± 21.3	3.32 ± 20.7	-22.3 ± 41.7	-21.6 ± 40.4	-21.5 ± 40.4	-8.24 ± 15.4
June 28	9.20 ± 25.0	9.19 ± 25.0	9.44 ± 25.7	9.08 ± 24.7	1.51 ± 17.8	1.47 ± 17.2	1.46 ± 17.2	1.45 ± 17.0

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

Surry Power Station, Surry County, Virginia - 2016

1.0E-3 pCi/m3 ± 2 Sigma

COLLECTION DATE	SAMPLING LOCATIONS							
	SS	HIR	BC	ALL	CP	BASF	FE	NN-C
July 05	-25.3 ± 40.5	-25.2 ± 40.4	-25.7 ± 41.2	-24.6 ± 39.5	-27.0 ± 34.4	-26.5 ± 33.7	-26.2 ± 33.4	-25.9 ± 33.0
July 12	-11.4 ± 18.4	-11.5 ± 18.5	-11.8 ± 18.9	-11.4 ± 18.3	-14.0 ± 22.5	13.7 ± 22.0	13.6 ± 21.8	13.5 ± 21.7
July 19	3.44 ± 19.3	3.47 ± 19.5	3.53 ± 19.8	3.45 ± 19.4	-29.7 ± 25.8	-29.2 ± 25.5	-27.7 ± 24.1	-27.5 ± 23.9
July 26	-7.17 ± 24.9	2.02 ± 17.0	-7.32 ± 25.4	-7.14 ± 24.8	2.06 ± 17.3	-7.05 ± 24.5	1.97 ± 16.6	1.95 ± 16.4
August 02	-27.8 ± 29.0	-27.9 ± 29.1	-28.5 ± 29.7	-27.9 ± 29.0	-19.7 ± 24.3	-19.1 ± 23.6	-18.9 ± 23.3	-7.29 ± 8.99
August 09	8.06 ± 21.2	8.09 ± 21.3	8.29 ± 21.8	8.10 ± 21.3	0.73 ± 25.2	0.70 ± 24.4	0.70 ± 24.4	0.69 ± 24.0
August 15	-11.3 ± 41.2	-11.2 ± 41.1	-11.5 ± 42.2	-11.2 ± 40.8	5.72 ± 36.7	5.54 ± 35.6	56.9 ± 36.6	5.43 ± 34.9
August 22	-6.27 ± 16.0	-6.27 ± 16.0	-6.31 ± 16.1	-6.11 ± 15.5	2.57 ± 13.0	2.50 ± 12.7	2.49 ± 12.6	2.45 ± 12.4
August 29	0.73 ± 11.2	0.73 ± 11.2	0.74 ± 11.4	0.72 ± 11.1	4.48 ± 9.46	4.38 ± 9.24	4.36 ± 9.19	4.30 ± 9.08
September 06	13.9 ± 26.1	13.9 ± 26.1	14.2 ± 26.6	13.7 ± 25.7	-4.66 ± 21.7	-4.73 ± 22.0	-4.47 ± 20.8	-4.41 ± 20.5
September 13	-4.52 ± 19.4	-4.52 ± 19.4	-4.64 ± 19.9	-4.51 ± 19.4	2.77 ± 15.9	2.71 ± 15.5	2.72 ± 15.5	2.67 ± 15.3
September 20	-19.3 ± 18.3	-19.3 ± 18.3	-19.7 ± 18.7	-19.1 ± 18.1	7.36 ± 21.0	7.19 ± 20.5	7.18 ± 20.5	2.74 ± 7.82
September 27	-2.01 ± 15.4	-2.01 ± 15.4	-2.04 ± 15.7	-1.97 ± 15.1	-6.66 ± 15.0	-6.53 ± 14.7	-6.62 ± 14.9	-6.41 ± 14.5
October 04	-3.77 ± 23.5	-3.77 ± 23.5	-3.87 ± 24.1	-3.72 ± 23.2	-2.23 ± 20.1	-2.14 ± 19.3	-2.16 ± 19.5	-0.82 ± 7.38
October 11	-0.44 ± 13.4	-0.45 ± 13.4	-0.48 ± 14.4	-0.46 ± 14.0	9.37 ± 20.1	8.21 ± 17.6	8.27 ± 17.7	8.14 ± 17.4
October 18	2.93 ± 14.6	2.91 ± 14.5	2.95 ± 14.6	2.81 ± 14.0	-1.26 ± 14.9	-1.21 ± 14.4	-1.23 ± 14.5	-1.20 ± 14.2
October 25	1.27 ± 9.94	1.28 ± 10.0	1.37 ± 10.7	1.34 ± 10.4	-1.86 ± 11.6	-1.82 ± 11.3	-1.81 ± 11.3	-1.77 ± 11.0
November 01	19.8 ± 35.7	19.9 ± 35.9	19.8 ± 35.7	19.1 ± 34.5	-13.0 ± 34.1	-12.6 ± 33.1	-12.6 ± 33.2	-12.5 ± 32.7
November 8	-2.14 ± 21.1	-2.16 ± 21.3	-2.32 ± 22.9	-2.25 ± 22.1	-8.43 ± 20.0	-8.19 ± 19.4	-8.23 ± 19.5	-8.03 ± 19.1
November 15	0.46 ± 17.2	0.46 ± 17.2	0.46 ± 17.2	0.45 ± 16.7	-12.6 ± 18.9	-12.1 ± 18.2	-12.3 ± 18.4	-4.64 ± 6.97
November 22	-14.4 ± 25.7	-14.4 ± 25.6	-14.8 ± 26.5	-14.4 ± 25.7	11.0 ± 24.2	10.7 ± 23.6	10.7 ± 23.7	10.6 ± 23.4
November 29	5.15 ± 23.5	5.16 ± 23.5	5.30 ± 24.2	5.20 ± 23.7	9.19 ± 18.4	9.01 ± 18.0	9.08 ± 18.2	8.85 ± 17.7
December 05	5.58 ± 22.3	5.58 ± 22.3	5.71 ± 22.8	5.55 ± 22.2	-2.91 ± 19.6	-2.82 ± 19.0	-2.84 ± 19.2	-2.75 ± 18.6
December 12	-0.42 ± 9.60	-0.41 ± 9.51	-0.42 ± 9.72	-0.42 ± 9.55	-0.89 ± 7.72	-0.88 ± 7.62	-0.88 ± 7.64	-0.86 ± 7.51
December 19	1.99 ± 10.6	1.97 ± 10.5	2.01 ± 10.7	1.97 ± 10.5	5.50 ± 13.3	5.40 ± 13.1	5.44 ± 13.2	5.28 ± 12.8
December 26	-9.99 ± 13.0	-9.93 ± 12.9	-10.2 ± 13.2	-9.86 ± 12.8	8.05 ± 14.4	7.79 ± 13.9	7.85 ± 14.0	7.81 ± 13.9

TABLE 3-5: GAMMA EMITTER CONCENTRATION IN FILTERED AIR

Surry Power Station, Surry County, Virginia - 2016

1.0E-3 pCi/m3 ± 2 Sigma

SAMPLING LOCATIONS	NUCLIDE	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	AVERAGE ± 2 SIGMA
SS	Cs-134	0.69 ± 0.72	-0.22 ± 0.90	0.50 ± 0.79	0.76 ± 0.61	
	Cs-137	0.00 ± 0.68	-0.79 ± 0.88	0.46 ± 0.77	0.28 ± 0.50	
	Be-7	124 ± 22.2	192 ± 34.2	136 ± 31.4	133 ± 23.2	146 ± 61.8
HIR	Cs-134	0.26 ± 0.65	0.93 ± 1.03	0.63 ± 0.87	0.23 ± 0.64	
	Cs-137	-0.37 ± 0.50	0.79 ± 0.96	-0.62 ± 0.62	-0.11 ± 0.81	
	Be-7	126 ± 21.5	134 ± 35.2	144 ± 28.4	125 ± 27.1	132 ± 17.6
	K-40		14.9 ± 12.8			14.9 ± 12.8
BC	Cs-134	-0.03 ± 0.77	0.66 ± 0.86	1.22 ± 1.33	0.64 ± 0.82	
	Cs-137	-0.34 ± 0.69	-0.16 ± 0.93	-0.19 ± 1.24	0.57 ± 0.65	
	Be-7	122 ± 33.5	156 ± 36.2	132 ± 36.5	162 ± 27.0	143 ± 38.2
ALL	Cs-134	0.33 ± 0.87	0.37 ± 0.76	0.00 ± 0.72	-0.12 ± 1.21	
	Cs-137	-0.16 ± 0.80	0.00 ± 0.71	0.13 ± 0.66	-0.21 ± 1.10	
	Be-7	115 ± 30.3	169 ± 26.9	218 ± 33.4	139 ± 32.7	160 ± 88.8
CP	Cs-134	0.86 ± 0.80	-0.05 ± 0.63	0.04 ± 0.98	0.01 ± 0.78	
	Cs-137	-0.51 ± 0.68	-0.60 ± 0.61	-0.21 ± 0.83	-0.03 ± 0.67	
	Be-7	112 ± 24.8	140 ± 23.3	146 ± 28.6	142 ± 26.7	135 ± 31.1
	K-40			16.3 ± 12.7		16.3 ± 12.7
BASF	Cs-134	0.11 ± 1.13	0.81 ± 1.19	1.74 ± 1.41	0.53 ± 0.87	
	Cs-137	-0.30 ± 1.15	0.99 ± 1.08	0.08 ± 1.12	-0.32 ± 0.77	
	Be-7	154 ± 39.1	170 ± 36.5	142 ± 37.6	115 ± 32.7	145 ± 46.4
FE	Cs-134	0.66 ± 0.92	-0.51 ± 0.75	2.01 ± 0.89	0.45 ± 1.05	
	Cs-137	0.88 ± 0.79	-0.22 ± 0.80	0.22 ± 0.75	0.43 ± 0.92	
	Be-7	146 ± 30.4	149 ± 27.6	108 ± 25.7	86.7 ± 32.6	122 ± 60.5
NN-C	Cs-134	-0.33 ± 0.75	1.68 ± 0.82	-0.35 ± 0.87	-0.32 ± 0.74	
	Cs-137	0.31 ± 0.80	0.18 ± 0.69	0.39 ± 0.67	0.04 ± 0.61	
	Be-7	115 ± 24.8	163 ± 28.3	150 ± 30.3	99.0 ± 20.9	132 ± 59.6

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

Surry Power Station, Surry County, Virginia - 2016

pCi/Liter ± 2 Sigma

NUCLIDE	EPPS	COLONIAL PARKWAY	WILLIAMS-C
JANUARY			
Cs-134	-9.41 ± 5.60	-5.36 ± 6.09	-0.93 ± 4.68
Cs-137	5.08 ± 6.12	-1.62 ± 4.57	5.42 ± 4.78
Ba-140	16.2 ± 25.1	13.7 ± 27.1	-6.81 ± 20.8
La-140	-1.27 ± 7.46	2.07 ± 6.45	-0.67 ± 6.64
I-131	-0.16 ± 0.12	-0.13 ± 0.16	-0.16 ± 0.12
K-40	1180 ± 200	1080 ± 211	1420 ± 194
FEBRUARY			
Cs-134	2.03 ± 4.06	-0.41 ± 6.18	-1.67 ± 4.34
Cs-137	-2.10 ± 5.17	0.71 ± 6.02	0.53 ± 4.49
Ba-140	-1.72 ± 22.8	1.49 ± 24.5	2.01 ± 17.9
La-140	-3.08 ± 5.60	3.97 ± 8.24	0.16 ± 5.48
I-131	-0.15 ± 0.25	0.21 ± 0.45	-0.12 ± 0.24
K-40	1400 ± 202	1200 ± 199	1420 ± 191
MARCH			
Cs-134	-5.63 ± 4.38	3.35 ± 4.56	-0.56 ± 4.28
Cs-137	-3.04 ± 4.99	3.25 ± 4.83	1.81 ± 4.74
Ba-140	-1.38 ± 19.3	-2.92 ± 18.3	-3.97 ± 18.7
La-140	3.24 ± 5.21	-1.46 ± 5.64	0.71 ± 4.73
I-131	-0.19 ± 0.36	0.08 ± 0.46	-0.11 ± 0.28
K-40	1220 ± 163	1460 ± 203	1270 ± 159
Sr-89		3.02 ± 2.84	
Sr-90		0.28 ± 0.20	
APRIL			
Cs-134	-5.42 ± 5.42	-2.11 ± 5.44	
Cs-137	4.56 ± 7.33	-0.41 ± 6.01	
Ba-140	6.38 ± 23.3	4.67 ± 24.3	
La-140	4.09 ± 7.58	1.66 ± 6.61	
I-131	0.12 ± 0.30	0.03 ± 0.14	
K-40	1180 ± 222	1450 ± 204	

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

Surry Power Station, Surry County, Virginia - 2016

pCi/Liter ± 2 Sigma

NUCLIDE	EPPS	COLONIAL PARKWAY	LOVER RETREAT-C
MAY			
Cs-134	-5.17 ± 6.25	0.30 ± 5.89	-7.60 ± 5.53
Cs-137	-1.87 ± 5.36	1.04 ± 6.25	1.96 ± 5.00
Ba-140	4.19 ± 23.5	15.7 ± 21.4	-19.7 ± 29.9
La-140	-1.51 ± 5.20	6.80 ± 6.96	4.98 ± 7.06
I-131	-0.14 ± 0.33	-0.26 ± 0.34	-0.27 ± 0.43
K-40	1490 ± 248	1520 ± 201	1680 ± 185
JUNE			
Cs-134	0.11 ± 3.97	-2.50 ± 3.99	-5.42 ± 3.50
Cs-137	1.10 ± 4.07	-2.21 ± 3.39	-0.74 ± 3.41
Ba-140	9.93 ± 22.8	6.39 ± 20.9	4.20 ± 17.0
La-140	-5.56 ± 6.15	-5.93 ± 5.16	3.95 ± 4.64
I-131	-0.08 ± 0.35	0.52 ± 0.46	0.24 ± 0.34
K-40	1500 ± 192	1410 ± 152	1580 ± 153
Sr-89		4.17 ± 2.92	
Sr-90		1.65 ± 0.48	
JULY			
Cs-134	-7.61 ± 5.13	0.54 ± 5.02	-3.69 ± 4.10
Cs-137	-4.08 ± 5.21	0.37 ± 5.17	0.79 ± 3.79
Ba-140	6.09 ± 20.5	13.4 ± 21.4	3.18 ± 19.7
La-140	1.76 ± 5.94	0.81 ± 6.36	3.99 ± 5.09
I-131	0.21 ± 0.22	0.08 ± 0.25	-0.08 ± 0.17
K-40	1330 ± 189	1410 ± 202	1850 ± 174
AUGUST			
Cs-134	-16.3 ± 6.45	-3.26 ± 4.28	-9.45 ± 6.36
Cs-137	-1.55 ± 6.15	0.57 ± 4.57	1.81 ± 6.27
Ba-140	1.06 ± 26.4	-7.71 ± 16.8	12.6 ± 28.4
La-140	2.98 ± 7.72	1.19 ± 4.84	-0.88 ± 6.62
I-131	0.02 ± 0.42	0.14 ± 0.57	0.07 ± 0.45
K-40	1450 ± 231	1300 ± 159	1450 ± 232

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

Surry Power Station, Surry County, Virginia - 2016

pCi/Liter ± 2 Sigma

NUCLIDE	EPPS	COLONIAL PARKWAY	LOVER RETREAT-C
SEPTEMBER			
Cs-134	-2.66 ± 5.42	-3.13 ± 4.52	1.42 ± 6.51
Cs-137	-3.58 ± 5.74	-1.08 ± 4.72	2.12 ± 7.09
Ba-140	0.56 ± 30.2	2.95 ± 21.9	13.2 ± 32.6
La-140	-8.14 ± 9.17	-6.71 ± 8.05	-3.84 ± 9.88
I-131	-0.08 ± 0.22	0.02 ± 0.36	-0.22 ± 0.29
K-40	1280 ± 212	1530 ± 170	1760 ± 218
Sr-89		3.43 ± 2.34	
Sr-90		1.79 ± 0.50	
OCTOBER			
Cs-134	0.43 ± 8.67	13.9 ± 7.67 **A**	18.1 ± 8.71 **A**
Cs-137	1.86 ± 5.86	5.69 ± 5.68	4.68 ± 7.42
Ba-140	18.9 ± 26.9	10.1 ± 24.5	11.1 ± 28.2
La-140	5.57 ± 6.45	2.86 ± 7.98	0.35 ± 9.01
I-131	0.06 ± 0.27	0.24 ± 0.49	0.48 ± 0.41
K-40	1470 ± 178	1360 ± 136	1650 ± 205
NOVEMBER			
Cs-134	-0.23 ± 4.71	-0.18 ± 6.37	38.2 ± 7.75 **A**
Cs-137	-5.66 ± 4.76	1.40 ± 5.25	-1.08 ± 5.32
Ba-140	12.4 ± 22.4	-29.0 ± 27.0	-1.17 ± 24.7
La-140	7.86 ± 7.74	-3.34 ± 7.51	0.33 ± 5.76
I-131	0.16 ± 0.39	0.14 ± 0.49	0.22 ± 0.39
K-40	1400 ± 188	1230 ± 195	1680 ± 154
DECEMBER			
Cs-134	-7.82 ± 6.58	-8.33 ± 4.95	-4.48 ± 5.52
Cs-137	2.65 ± 7.00	2.46 ± 4.13	2.69 ± 5.45
Ba-140	3.44 ± 27.0	8.38 ± 18.9	2.38 ± 20.2
La-140	0.98 ± 4.89	-1.86 ± 6.93	-5.54 ± 6.37
I-131	0.08 ± 0.40	0.12 ± 0.38	-0.13 ± 0.40
K-40	1210 ± 209	1310 ± 186	1420 ± 213
Sr-89		1.61 ± 2.53	
Sr-90		1.33 ± 0.53	

A: Compound/analyte not detected. Peak not identified.

TABLE 3-7: GAMMA EMITTER CONCENTRATION IN FOOD PRODUCTS

Surry Power Station, Surry County, Virginia - 2016

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	SAMPLE TYPE	ISOTOPE			
			Cs-134	**Cs-137**	**I-131**	**K-40**
BROCK FARM	11/10/2016	Corn	1.33 ± 10.1	0.53 ± 10.9	-3.27 ± 13.9	4730 ± 460
			Cs-134	**Cs-137**	**I-131**	**K-40**
	11/10/2016	Peanuts	3.66 ± 13.7	3.63 ± 15.2	0.34 ± 17.3	5730 ± 545
			Cs-134	**Cs-137**	**I-131**	**K-40**
SLADE FARM	11/10/2016	Soybeans	-8.15 ± 19.7	6.33 ± 18.6	-3.54 ± 23.8	22900 ± 1210

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

Surry Power Station, Surry County, Virginia - 2016

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SS	3/1/2016	-0.08 ± 2.79	2.96 ± 3.53	2.26 ± 7.08	-0.38 ± 3.54	-5.70 ± 7.02
	6/6/2016	3.16 ± 2.71	-1.56 ± 2.78	1.05 ± 5.78	1.26 ± 2.82	-5.99 ± 5.59
	9/5/2016	-0.73 ± 3.06	0.52 ± 3.16	-2.95 ± 5.87	1.26 ± 2.68	-1.71 ± 7.52
	12/5/2016	0.12 ± 3.00	0.91 ± 3.39	-0.99 ± 5.01	0.68 ± 3.50	0.06 ± 7.28
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/1/2016	-3.66 ± 3.21	2.87 ± 5.44	-0.09 ± 0.25	-3.10 ± 3.57	-1.31 ± 3.15
	6/6/2016	1.15 ± 2.75	-4.99 ± 4.97	0.10 ± 0.27	-5.90 ± 2.79	1.15 ± 2.97
	9/5/2016	5.46 ± 3.70	-0.29 ± 5.09	-3.73 ± 5.64	2.01 ± 3.33	0.39 ± 3.19
	12/5/2016	1.89 ± 3.38	7.00 ± 5.62	0.17 ± 0.42	2.35 ± 3.29	0.09 ± 3.02
		Ba-140	**La-140**	**H-3**	**Ra-226**	
	3/1/2016	-2.18 ± 14.7	-5.09 ± 5.11	227 ± 880		
	6/6/2016	-2.14 ± 15.7	-3.30 ± 5.81	108 ± 533	113 ± 106	
	9/5/2016	-14.3 ± 16.4	-2.94 ± 4.84	228 ± 570		
	12/5/2016	13.6 ± 11.1	-2.07 ± 3.75	404 ± 531		
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
HIR	3/1/2016	-0.72 ± 2.99	1.50 ± 2.91	1.93 ± 5.59	-0.96 ± 2.43	-9.33 ± 6.71
	6/7/2016	-1.15 ± 2.66	0.57 ± 2.71	2.82 ± 6.46	0.24 ± 2.51	-7.25 ± 6.16
	9/6/2016	0.92 ± 2.67	1.18 ± 2.82	4.58 ± 5.25	-0.45 ± 2.76	-0.40 ± 6.13
	12/5/2016	-1.61 ± 3.69	-0.82 ± 3.97	0.00 ± 8.04	2.02 ± 4.88	-3.55 ± 8.48
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/1/2016	-1.38 ± 3.04	0.30 ± 5.59	-0.24 ± 0.27	0.61 ± 3.00	-0.36 ± 3.31
	6/7/2016	-0.04 ± 2.59	-1.52 ± 4.84	0.08 ± 0.20	1.29 ± 2.92	-0.04 ± 3.00
	9/6/2016	0.63 ± 2.79	0.93 ± 4.52	-2.87 ± 4.96	-1.39 ± 2.80	-2.57 ± 2.85
	12/5/2016	0.98 ± 4.29	1.37 ± 6.82	0.38 ± 0.43	-6.00 ± 4.93	0.07 ± 3.93
		Ba-140	**La-140**	**H-3**		
	3/1/2016	7.89 ± 13.4	-1.53 ± 3.75	813 ± 944		
	6/7/2016	9.52 ± 15.4	-0.13 ± 4.28	31.9 ± 526		
	9/6/2016	-12.7 ± 13.0	3.01 ± 4.30	-205 ± 543		
	12/5/2016	-6.38 ± 15.90	-2.81 ± 5.29	170 ± 505		

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

Surry Power Station, Surry County, Virginia - 2016

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
CS	3/1/2016	2.80 ± 3.71	-1.72 ± 3.90	-2.19 ± 6.21	-0.72 ± 3.75	-4.16 ± 7.94
	6/6/2016	1.48 ± 2.89	1.39 ± 2.76	1.98 ± 6.64	1.23 ± 2.84	-4.60 ± 5.83
	9/5/2016	1.47 ± 2.60	2.23 ± 2.55	1.48 ± 5.20	-0.37 ± 2.45	-2.04 ± 6.04
	12/5/2016	-2.58 ± 3.72	-1.10 ± 3.90	3.72 ± 7.13	0.81 ± 3.55	-12.9 ± 9.40
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	3/1/2016	-1.25 ± 3.87	-3.47 ± 6.14	-0.28 ± 0.23	0.18 ± 3.56	3.03 ± 3.53
	6/6/2016	0.36 ± 2.87	2.41 ± 4.93	0.34 ± 0.33	0.83 ± 2.67	1.01 ± 2.97
	9/5/2016	-1.82 ± 2.89	-5.06 ± 4.75	2.60 ± 5.50	2.45 ± 2.82	-1.10 ± 2.72
	12/5/2016	-3.42 ± 3.38	0.60 ± 5.81	0.22 ± 0.39	1.90 ± 3.77	0.65 ± 3.62
		Ba-140	**La-140**	**H-3**	**K-40**	
	3/1/2016	17.8 ± 16.3	-1.67 ± 5.52	395 ± 946		
	6/6/2016	-0.71 ± 15.0	-4.09 ± 5.13	485 ± 569	66.8 ± 54.8	
	9/5/2016	9.16 ± 13.8	0.03 ± 4.77	12.4 ± 557		
	12/5/2016	-1.56 ± 15.4	-2.29 ± 4.97	-117 ± 498		

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

Surry Power Station, Surry County, Virginia - 2016

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SD	1/12/2016	-2.08 ± 2.81	0.79 ± 2.71	0.13 ± 5.70	0.42 ± 2.81	0.68 ± 6.15
	2/9/2016	-0.53 ± 3.01	-0.54 ± 2.89	-0.86 ± 4.78	-0.71 ± 2.58	-3.51 ± 6.56
	3/1/2016	0.99 ± 3.89	2.56 ± 4.71	11.3 ± 7.83	-3.28 ± 4.08	-6.43 ± 9.00
	4/11/2016	-1.25 ± 2.41	3.00 ± 2.68	-2.22 ± 4.46	-1.08 ± 2.26	-12.0 ± 5.82
	5/10/2016	3.20 ± 4.36	2.53 ± 4.39	1.24 ± 6.15	1.59 ± 4.34	-10.1 ± 10.2
	6/6/2016	-0.86 ± 2.22	-0.01 ± 2.46	0.75 ± 5.53	0.39 ± 2.12	-6.63 ± 5.52
	7/4/2016	2.80 ± 2.79	-2.78 ± 3.20	0.84 ± 6.05	-0.57 ± 2.57	-4.74 ± 6.66
	8/2/2016	1.23 ± 2.69	-2.24 ± 3.21	-2.46 ± 6.10	0.44 ± 3.07	2.62 ± 5.93
	9/5/2016	-0.12 ± 3.47	-0.51 ± 3.21	3.15 ± 6.55	-2.62 ± 3.54	-3.44 ± 7.00
	10/3/2016	-2.13 ± 4.66	0.01 ± 4.83	5.79 ± 8.75	0.92 ± 4.30	-1.23 ± 11.3
	11/1/2016	0.29 ± 2.54	-3.07 ± 3.25	0.00 ± 0.00	-1.29 ± 2.60	-3.30 ± 7.37
	12/5/2016	-0.28 ± 4.37	-1.94 ± 4.39	-2.29 ± 8.86	-1.72 ± 5.34	-14.1 ± 10.8
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	1/12/2016	0.80 ± 2.65	1.57 ± 4.69	1.34 ± 4.56	-1.52 ± 3.39	-1.30 ± 3.12
	2/9/2016	0.17 ± 3.38	0.26 ± 5.44	0.61 ± 3.82	-5.85 ± 3.29	-1.90 ± 3.05
	3/1/2016	-2.14 ± 3.72	1.29 ± 6.43	-1.45 ± 5.93	1.79 ± 4.52	0.97 ± 4.35
	4/11/2016	0.84 ± 2.69	0.75 ± 4.65	-1.19 ± 5.62	1.52 ± 2.94	-1.16 ± 3.05
	5/10/2016	1.36 ± 4.56	5.48 ± 7.85	0.03 ± 5.67	0.83 ± 4.68	1.73 ± 4.74
	6/6/2016	0.15 ± 2.63	-0.21 ± 4.62	-0.21 ± 5.32	0.17 ± 2.49	1.26 ± 2.64
	7/4/2016	-0.97 ± 3.51	2.34 ± 6.08	-2.59 ± 5.50	1.79 ± 2.68	-1.06 ± 3.18
	8/2/2016	0.65 ± 3.35	-0.91 ± 5.02	3.07 ± 5.55	3.33 ± 3.01	0.40 ± 3.48
	9/5/2016	2.61 ± 3.65	4.01 ± 6.08	1.19 ± 5.80	-0.12 ± 3.12	-2.02 ± 3.32
	10/3/2016	4.05 ± 5.51	-7.64 ± 7.97	0.34 ± 6.05	-0.07 ± 5.01	-3.66 ± 4.96
	11/1/2016	-0.12 ± 3.00	2.01 ± 5.36	5.99 ± 5.22	0.42 ± 3.10	0.76 ± 2.83
	12/5/2016	2.16 ± 3.59	6.87 ± 6.50	-5.70 ± 5.96	-5.64 ± 4.54	1.68 ± 4.15
		Ba-140	**La-140**	**H-3**	**K-40**	**Ra-226**
	1/12/2016	-5.33 ± 13.7	0.88 ± 3.83		74.2 ± 55.2	
	2/9/2016	-6.33 ± 11.5	1.47 ± 3.57		59.3 ± 56.8	
	3/1/2016	10.00 ± 18.6	2.97 ± 5.15	55.1 ± 806		
	4/11/2016	-3.91 ± 13.9	0.74 ± 3.69			
	5/10/2016	9.56 ± 20.2	-0.97 ± 4.76			
	6/6/2016	-1.58 ± 14.4	-1.34 ± 3.91	-330 ± 542		
	7/4/2016	6.41 ± 15.2	-4.05 ± 4.87			
	8/2/2016	-4.8 ± 14.4	0.87 ± 4.40			
	9/5/2016	2.09 ± 15.60	0.63 ± 5.18	-351 ± 521	109 ± 79.2	253 ± 125
	10/3/2016	0.40 ± 20.1	1.32 ± 7.11		112 ± 99.6	
	11/1/2016	-6.87 ± 14.5	-1.72 ± 3.91		65.6 ± 47.3	
	12/5/2016	4.58 ± 17.0	0.80 ± 6.29	360 ± 564		

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

Surry Power Station, Surry County, Virginia - 2016

pCi/Liter ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPES				
		Mn-54	**Co-58**	**Fe-59**	**Co-60**	**Zn-65**
SW-C	1/12/2016	-1.19 ± 3.84	0.60 ± 3.15	-0.64 ± 5.63	1.44 ± 4.04	-1.82 ± 7.60
	2/9/2016	1.21 ± 2.69	-2.88 ± 3.64	1.23 ± 6.48	0.47 ± 3.18	-3.94 ± 7.84
	3/1/2016	2.63 ± 2.96	-0.09 ± 2.86	-1.05 ± 5.38	0.14 ± 3.18	-7.55 ± 6.82
	4/12/2016	1.63 ± 2.71	-0.08 ± 3.01	4.10 ± 6.18	2.10 ± 3.80	-0.78 ± 6.69
	5/10/2016	-0.51 ± 3.36	-1.41 ± 3.25	-2.14 ± 7.06	2.46 ± 3.52	-4.84 ± 7.46
	6/7/2016	0.81 ± 2.46	-0.54 ± 2.35	-1.06 ± 4.70	-0.66 ± 2.22	-2.18 ± 6.30
	7/5/2016	1.60 ± 3.02	-1.31 ± 3.46	2.62 ± 6.65	-3.73 ± 2.77	-1.90 ± 8.12
	8/2/2016	-2.42 ± 2.67	-3.48 ± 3.47	0.87 ± 6.71	1.03 ± 3.87	-9.46 ± 6.64
	9/6/2016	-0.50 ± 2.72	0.04 ± 2.70	3.57 ± 5.95	0.98 ± 2.66	-1.94 ± 5.61
	10/4/2016	-2.39 ± 5.65	-0.84 ± 4.79	-12.8 ± 8.86	-0.67 ± 5.22	-0.06 ± 11.3
	11/1/2016	-1.33 ± 3.07	-2.01 ± 3.39	1.30 ± 6.42	0.27 ± 3.13	-7.51 ± 6.93
	12/5/2016	-3.27 ± 4.91	-4.53 ± 4.21	1.38 ± 7.08	1.45 ± 4.28	-3.63 ± 10.0
		Nb-95	**Zr-95**	**I-131**	**Cs-134**	**Cs-137**
	1/12/2016	0.98 ± 4.02	-2.21 ± 6.28	0.64 ± 5.89	-2.26 ± 4.65	-0.72 ± 3.65
	2/9/2016	0.73 ± 3.36	-3.80 ± 5.38	0.19 ± 4.69	-5.85 ± 3.68	0.02 ± 3.26
	3/1/2016	-1.18 ± 3.22	1.22 ± 5.82	0.17 ± 5.35	-5.87 ± 3.81	0.99 ± 3.10
	4/12/2016	2.29 ± 2.73	0.31 ± 4.38	0.72 ± 4.74	0.22 ± 3.05	-1.32 ± 3.21
	5/10/2016	2.23 ± 3.14	3.66 ± 5.56	-1.73 ± 4.45	-2.88 ± 3.96	-1.93 ± 3.75
	6/7/2016	1.38 ± 2.51	2.75 ± 4.34	5.12 ± 5.50	-2.33 ± 2.96	0.41 ± 2.55
	7/5/2016	1.23 ± 3.58	-1.88 ± 6.03	1.54 ± 5.10	-0.32 ± 3.27	0.18 ± 3.39
	8/2/2016	-0.52 ± 2.98	0.86 ± 6.59	-0.93 ± 6.10	-11.9 ± 4.12	-2.49 ± 3.43
	9/6/2016	-0.23 ± 2.71	0.96 ± 4.64	-1.21 ± 4.82	-6.74 ± 3.10	-1.32 ± 2.76
	10/4/2016	-7.32 ± 6.25	-1.03 ± 8.13	-6.25 ± 6.48	-3.49 ± 5.40	0.66 ± 5.64
	11/1/2016	-0.34 ± 3.61	1.57 ± 4.52	-1.65 ± 5.89	-1.30 ± 3.45	0.34 ± 3.54
	12/5/2016	-0.03 ± 4.06	-1.09 ± 7.09	0.88 ± 5.81	-5.42 ± 4.62	1.84 ± 4.25
		Ba-140	**La-140**	**H-3**	**K-40**	**Th-228**
	1/12/2016	5.57 ± 17.1	0.00 ± 4.11			
	2/9/2016	-8.39 ± 13.5	0.79 ± 5.24		65.2 ± 53.6	
	3/1/2016	-6.10 ± 14.6	2.27 ± 4.26	-145 ± 791		
	4/12/2016	9.96 ± 14.6	-3.18 ± 4.49			9.11 ± 7.46
	5/10/2016	-3.64 ± 13.1	-5.97 ± 4.36			
	6/7/2016	1.77 ± 13.0	2.19 ± 4.33	-130 ± 561		
	7/5/2016	-7.16 ± 15.4	-2.85 ± 5.50			
	8/2/2016	2.92 ± 15.9	2.09 ± 5.08			
	9/6/2016	5.78 ± 13.2	0.46 ± 4.43	-229 ± 528	70.3 ± 63.5	
	10/4/2016	6.29 ± 19.2	1.09 ± 6.50			
	11/1/2016	-12.3 ± 16.6	-0.48 ± 5.85			
	12/5/2016	-11.0 ± 17.4	3.07 ± 5.90	882 ± 897		

TABLE 3-10: GAMMA EMITTER CONCENTRATIONS IN SILT

Surry Power Station, Surry County, Virginia - 2016

pCi/kg (dry) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Cs-134	**Cs-137**	**K-40**	**Th-228**	**Th-232**
SD	3/7/2016	-32.1 ± 40.9	-8.05 ± 44.1	10000 ± 1560	818 ± 143	786 ± 194
	9/7/2016	83.3 ± 73.4 **B**	143 ± 89.1 **B**	21400 ± 2650	1600 ± 289	1390 ± 305
		Ra-226	**Be-7**			
	3/7/2016	1910 ± 1310				
	9/7/2016	2600 ± 2260	3170 ± 967			
		Cs-134	**Cs-137**	**K-40**	**Th-228**	**Th-232**
CHIC-C	3/7/2016	-30.0 ± 78.2	233 ± 123	15900 ± 2640	1700 ± 228	1280 ± 347
	9/6/2016	353 ± 77.3 **A**	219 ± 83.7	18500 ± 1700	1790 ± 206	1200 ± 279
		Ra-226				
	3/7/2016	2510 ± 2420				
	9/6/2016	2730 ± 2010				

A: Compound/analyte not detected. Peak not identified.
B: <LLD

TABLE 3-11: GAMMA EMITTER CONCENTRATIONS IN SHORELINE SEDIMENT

Surry Power Station, Surry County, Virginia - 2016

pCi/kg (dry) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE				
		Cs-134	**Cs-137**	**K-40**	**Ra-226**	**Th-228**
HIR	2/2/2016	-20.8 ± 37.2	-0.68 ± 30.0	7960 ± 1240		
	8/2/2016	362.0 ± 62.9 **A**	41.5 ± 46.8	3650 ± 963	3010 ± 1270 **A**	1920 ± 171
		Th-232				
	2/2/2016					
	8/2/2016	1550 ± 213				
		Cs-134	**Cs-137**	**K-40**	**Ra-226**	**Th-228**
CHIC-C	2/2/2016	9.24 ± 43.4	-12.6 ± 46.9	2000 ± 775		1250 ± 150.0
	8/2/2016	-25.5 ± 31.9	-4.16 ± 28.8	1820 ± 512	1390 ± 1130	930 ± 88.2
		Th-232				
	2/2/2016	1240 ± 311				
	8/2/2016	790 ± 177				

A: Compound/analyte not detected. Peak not identified.

TABLE 3-12: GAMMA EMITTER CONCENTRATION IN FISH

Surry Power Station, Surry County, Virginia - 2016

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATION	COLLECTION DATE	SAMPLE TYPE	ISOTOPE			
			K-40	**Mn-54**	**Co-58**	**Fe-59**
SD	4/6/2016	Catfish	3170 ± 1250	26.8 ± 53.4	-21.6 ± 44.5	32.9 ± 85.2
	4/6/2016	Game fish	2000 ± 978	-64.3 ± 61.3	10.1 ± 60.0	13.0 ± 108
	10/5/2016	Catfish	1810 ± 560	-6.02 ± 24.7	20.0 ± 21.9	-4.10 ± 42.3
	10/5/2016	Game fish	2850 ± 1010	-19.7 ± 48.3	-38.6 ± 51.7	22.4 ± 81.1
			Co-60	**Zn-65**	**Cs-134**	**Cs-137**
	4/6/2016	Catfish	0.90 ± 55.2	-17.2 ± 98.6	-15.9 ± 53.0	23.0 ± 35.1
	4/6/2016	Game fish	4.10 ± 51.2	-2.31 ± 111	-45.2 ± 55.3	16.7 ± 57.3
	10/5/2016	Catfish	-3.45 ± 19.9	-39.8 ± 56.6	6.97 ± 25.8	0.03 ± 26.1
	10/5/2016	Game fish	18.5 ± 46.6	-140 ± 107	5.85 ± 53.6	-17.7 ± 41.4

TABLE 3-13: GAMMA EMITTER CONCENTRATIONS IN OYSTERS

Surry Power Station, Surry County, Virginia - 2016

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE			
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
POS	3/8/2016	30.2 ± 38.2	-7.12 ± 56.0	88.6 ± 114	16.0 ± 28.6
	9/7/2016	16.4 ± 31.2	-19.8 ± 31.6	29.2 ± 60.5	8.68 ± 24.0
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/8/2016	-27.1 ± 95.8	-32.1 ± 43.2	0.72 ± 43.9	597 ± 588
	9/7/2016	-26.0 ± 71.9	18.7 ± 44.8	21.4 ± 31.5	1090 ± 648
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
MP	3/8/2016	20.1 ± 40.1	2.99 ± 42.0	48.5 ± 129	-1.82 ± 36.6
	9/8/2016	4.42 ± 32.4	-7.83 ± 30.5	-27.6 ± 69.5	1.06 ± 24.3
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/8/2016	-37.8 ± 83.4	-10.6 ± 45.0	-26.9 ± 41.9	
	9/8/2016	-99.4 ± 70.5	33.3 ± 35.5	2.16 ± 31.0	680 ± 581
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
LC	3/8/2016	-10.9 ± 30.2	-1.64 ± 43.9	21.5 ± 90.7	-3.78 ± 20.3
	9/8/2016	18.1 ± 29.3	-9.52 ± 32.3	-57.9 ± 61.1	6.22 ± 24.7
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/8/2016	-66.0 ± 77.8	3.16 ± 33.4	9.61 ± 27.5	581 ± 447
	9/8/2016	4.92 ± 71.6	52.7 ± 42.6 **B**	-2.57 ± 31.1	900 ± 545

B: <LLD

TABLE 3-14: GAMMA EMITTER CONCENTRATIONS IN CLAMS

Surry Power Station, Surry County, Virginia - 2016

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE			
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
JI	3/8/2016	9.22 ± 44.2	-33.5 ± 53.0	-61.1 ± 155	-10.6 ± 54.0
	9/7/2016	13.2 ± 30.9	4.13 ± 30.6	17.7 ± 69.2	24.4 ± 28.9
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/8/2016	-129 ± 127	-47.1 ± 53.3	-7.53 ± 40.8	
	9/7/2016	-9.94 ± 80.0	-16.1 ± 41.3	-4.27 ± 30.4	712 ± 625
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
SD	3/8/2016	22.5 ± 39.2	8.54 ± 54.6	37.4 ± 109	18.5 ± 39.5
	9/7/2016	18.1 ± 31.8	27.5 ± 35.2	4.84 ± 61.3	12.0 ± 33.4
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/8/2016	-96.6 ± 114	-13.0 ± 44.8	19.0 ± 41.7	
	9/7/2016	-13.5 ± 63.0	38.1 ± 50.6	3.88 ± 37.1	548 ± 524
		Mn-54	**Co-58**	**Fe-59**	**Co-60**
CHIC-C	3/7/2016	-10.7 ± 34.7	-32.1 ± 46.9	-12.9 ± 90.0	6.79 ± 34.8
	9/6/2016	30.8 ± 34.5	4.19 ± 25.9	16.9 ± 78.2	-9.92 ± 28.7
		Zn-65	**Cs-134**	**Cs-137**	**K-40**
	3/7/2016	-77.4 ± 83.0	-6.25 ± 34.0	32.6 ± 33.4	
	9/6/2016	39.6 ± 85.3	6.58 ± 32.5	-23.9 ± 36.0	675 ± 551

TABLE 3-15: GAMMA EMITTER CONCENTRATIONS IN CRABS

Surry Power Station, Surry County, Virginia - 2016

pCi/kg (wet) ± 2 Sigma

SAMPLING LOCATIONS	COLLECTION DATE	ISOTOPE			
		K-40	**Mn-54**	**Co-58**	**Fe-59**
SD	6/7/2016	1180 ± 762	16.3 ± 28.0	11.4 ± 31.8	-5.99 ± 67.2
		Co-60	**Zn-65**	**Cs-134**	**Cs-137**
		9.06 ± 29.5	-12.4 ± 89.0	3.58 ± 39.8	13.3 ± 35.9

4. DISCUSSION OF RESULTS

Data from the radiological analyses of environmental media collected during 2016 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 2016 was from external sources, such as fallout from nuclear weapons tests (cesium-137) and naturally occurring radionuclides. Naturally occurring nuclides such as beryllium-7, potassium-40, radium-226, thorium-228 and thorium-232 were detected in numerous samples.

The following is a discussion and summary of the results of the environmental measurements taken during the 2016 reporting period.

4.1 Gamma Exposure Rate

A thermoluminescent dosimeter (TLD) is an inorganic crystal used to detect ambient radiation. Two TLDs, made of CaF and LiF elements and specifically designed for environmental monitoring, 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 2016. The results of the TLD analysis shown in Table 3.2 comply with Section 7 of ANSI/HPS N13.37-2014 in order 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

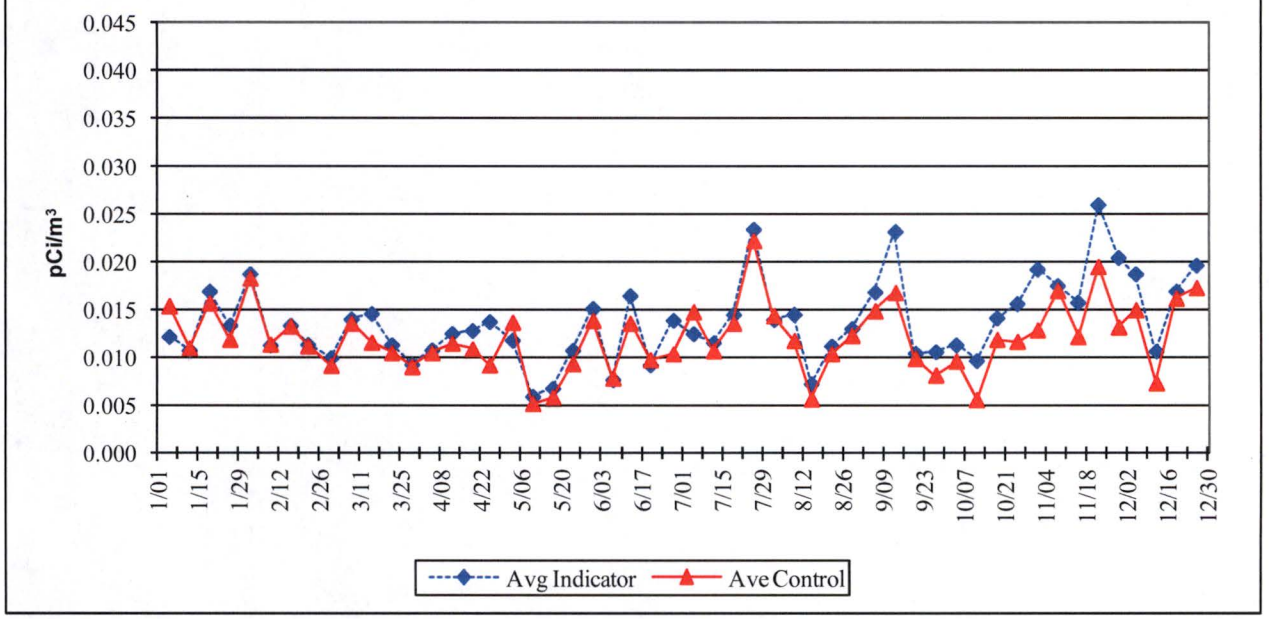
ANSI Standard. This includes normalizing results to a standard 91 day quarterly monitoring period, determination of the baseline background dose for each monitoring location and determination of the smallest facility-related dose that can be detected above the baseline background.

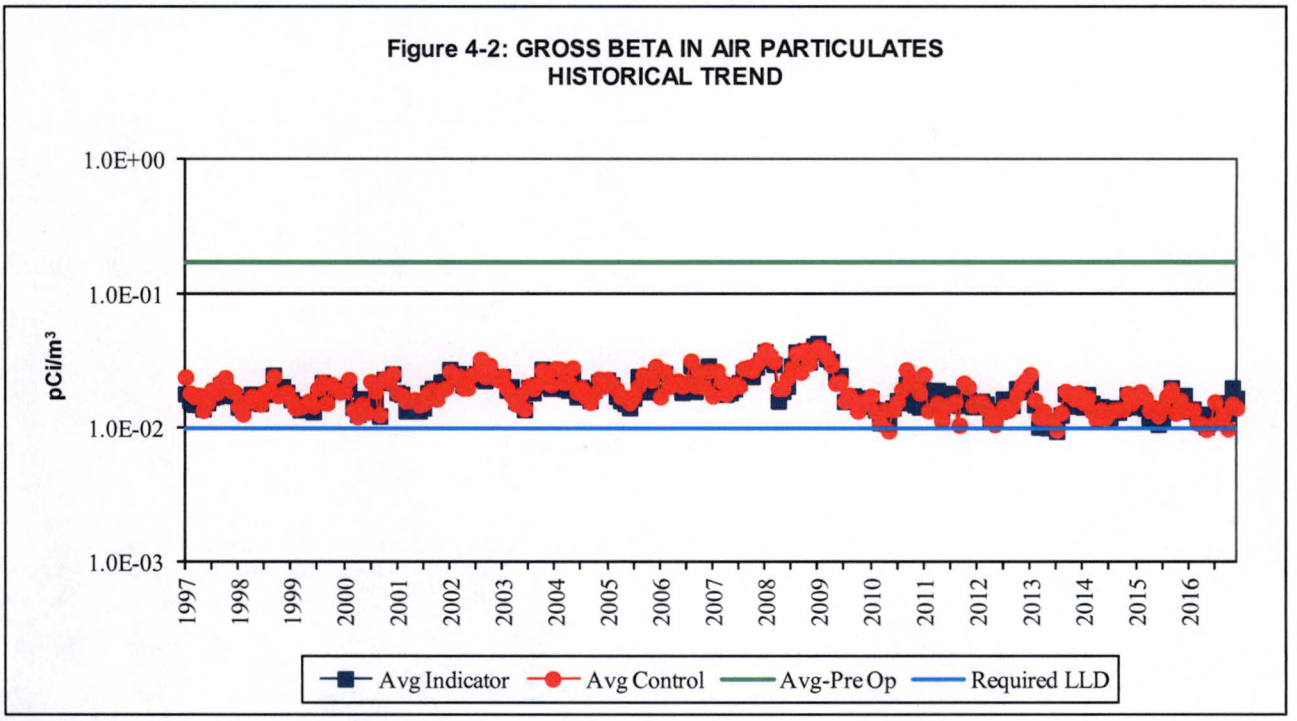
4.2 Airborne Gross Beta

Air is continuously sampled by passing it 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 4-1 and 4-2). A slight separation was observed in the fourth quarter between the indicator and control location trend data points. Data from Figure 4-1 and 4-2 indicates that any station contribution 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.

Figure 4-1: 2016 GROSS BETA IN AIR PARTICULATES





4.3 Airborne Radioiodine

Air is also continuously sampled for radioiodines by passing it 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. These results are similar to pre-operational data and the results of samples taken prior to and after the 1986 accident in the Soviet Union at Chernobyl and the Fukushima Daiichi nuclear incident in 2011.

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 Cow Milk

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

Results of gamma spectroscopy indicate no detectable station related radioactivity in the milk samples. 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. Cs-137 was not detected at a level above the LLD in 2016.

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 three of the composite samples at an average concentration of 1.59 pCi/L. Sr-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 samples were collected and analyzed by gamma spectroscopy. The results of the analyses are presented in Table 3-7. As expected, naturally occurring potassium-40 was detected in all samples. The average concentration is consistent with that observed in previous years. No station related radioactivity was detected.

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 for tritium. The results of these analyses are presented in Table 3-8. Consistent with past monitoring, no station related radioactivity was detected. No gamma emitting isotopes were detected during the pre-operational period.

4.8 River Water

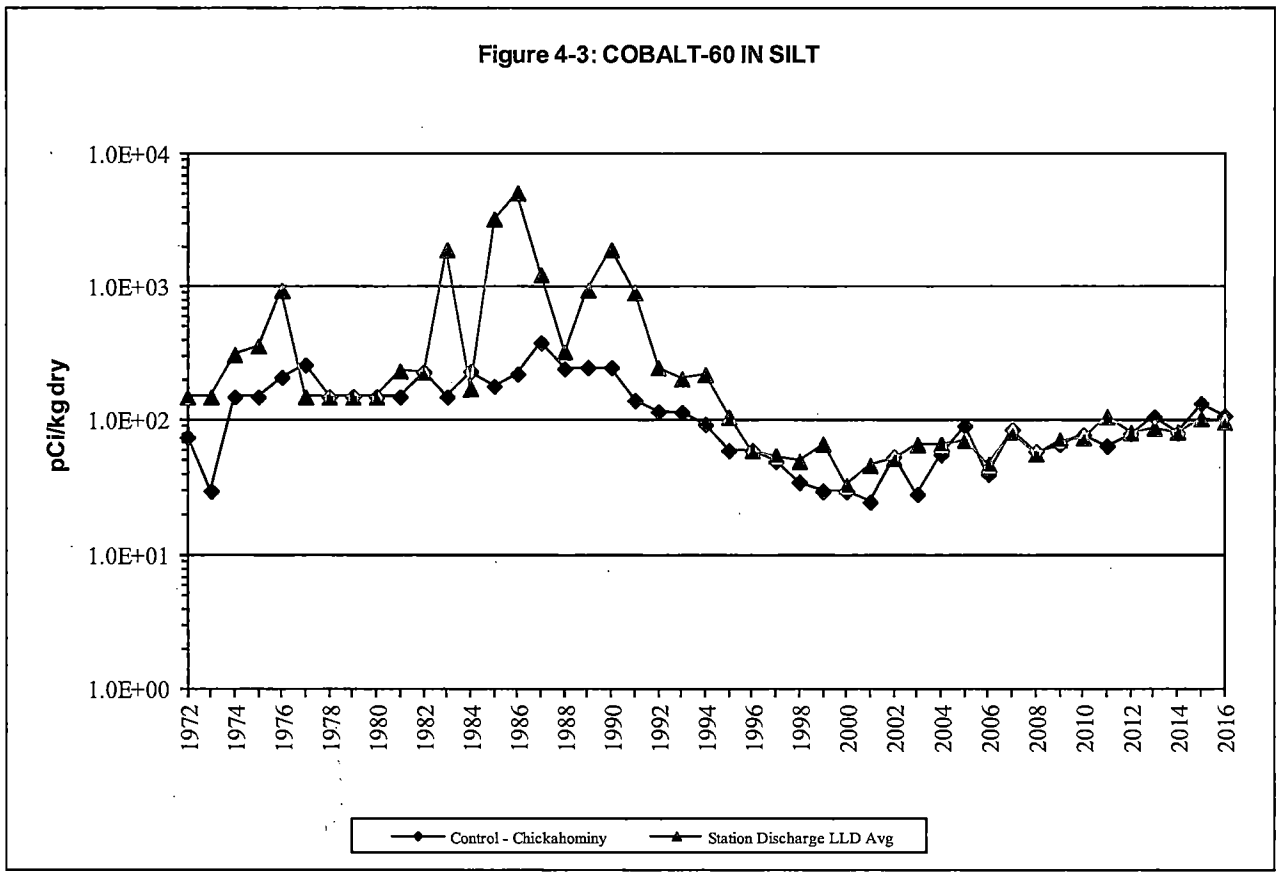
Samples of the James River water are collected monthly and the results are presented in Table 3-9. All samples are analyzed by gamma spectroscopy. The monthly samples are also composited and analyzed for tritium on a quarterly basis. Tritium was not detected and, with the exception of natural products, no other gamma emitters were detected. The naturally occurring radionuclides detected were potassium-40, radium-226 and thorium-228. 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.

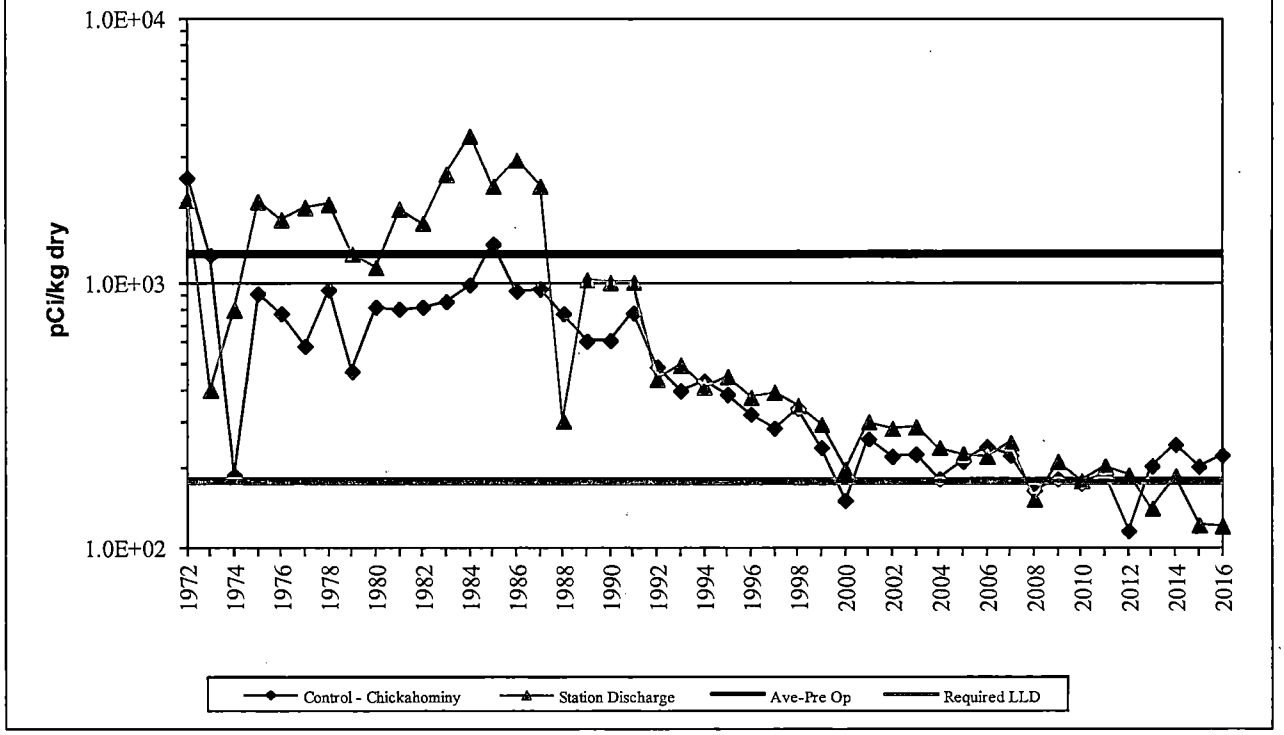
Samples of silt are collected from two locations, one upstream and one downstream of the station. The results of the gamma spectroscopy analyses are presented in Table 3-10. Naturally occurring beryllium-7, potassium-40, radium-226, thorium-228 and thorium-232 were detected. Historically, cobalt-60 has been detected in samples obtained from the indicator location (SD). Cobalt-60 has not been detected since 2003. Trend graphs of cobalt-60 and cesium-137 in silt appear in Figures 4-3 and 4-4.

The concentrations of cesium-137 detected indicate a continual decreasing trend as seen for over two decades. The detection of cesium-137 in both control and indicator samples and decreasing levels indicate that the presence of cesium-137 is the result of accumulation and runoff into the river of residual weapons testing fallout. Its global presence has been well documented. During the pre-operational period, cesium-137 was detected in silt samples with an average concentration as indicated in Figure 4-4. At the control location, cesium-137 was detected with an average concentration of 226 pCi/kg. This is the second consecutive year that cesium-137 was not detected in the indicator location. The cesium-137 concentrations in silt continue to decline and fluctuate around the REMP lower limit of detection (LLD) concentration, which could account for the non-detect. This trend will continue to be closely monitored.



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 2016.

Figure 4-4: CESIUM-137 IN SILT



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 and thorium-232 were detected at concentrations equivalent to normal background activities. The activities of these radionuclides indicate a steady trend. There were no radionuclides attributable to the operation of the station found 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 the same as 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 except for naturally occurring potassium-40. No station related radioactivity has been detected in this media since 1991. The absence of station related radionuclides is attributable to the replacement of steam generators in 1982 and past improvements made to liquid effluent treatment systems.

4.13 Clams

Clams are analyzed from three different locations. The results of the gamma spectroscopy analyses are presented in Table 3-14. Like oysters, no station related radioactivity was detected.

4.14 Crabs

A crab sample was collected in June 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 were detected in the sample. This is consistent with pre-operational data and data collected over the past decade.

5. PROGRAM EXCEPTIONS

There was one REMP exception for scheduled sampling and analysis during 2016. The control milk sample for the month of April was unavailable because Williams dairy closed its operation. Another control sampling location was successfully identified. The new location is Lover Retreat Dairy and sampling for this location was initiated in May 2016.

There was one exception to the Interlaboratory Comparison Program (ICP) for 2016. A gross beta analysis was not performed for the Air Filter (AP) geometry in the second half of 2016. The Department of Energy, under the Mixed Analyte Performance Evaluation Program (MAPEP), has historically provided this sample to Teledyne Brown Engineering, Inc. (TBE). In the second half of 2016, TBE was notified by MAPEP that they were no longer supplying the AP geometry due to MAPEP funding issues. TBE did not request a replacement sample from other ICP sample providers for the balance of 2016. TBE has made arrangements with Eckert & Ziegler Analytics, Inc. to provide the AP geometry going forward.

6. CONCLUSIONS

The results of the 2016 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 2016.

- **Airborne Exposure Pathway** - Analysis of charcoal cartridge samples for radioiodines indicated no positive activity was detected. Quarterly gamma isotopic analyses of the composite particulate samples identified only naturally occurring beryllium-7 and potassium-40. Air particulate gross beta concentrations at all of the indicator locations for 2016 trend well with the control location. A slight separation between indicator and control location trend data points was observed in the fourth quarter. Observation of this will continue into 2017.

- **Milk** - Milk samples are an important indicator measuring the effect of radioactive iodine and radionuclides in airborne releases. Cesium-137 and iodine-131 were not detected in any of the thirty-five 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 three samples at an average concentration of 1.59 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 samples. In the past, cesium-137 had occasionally been detected in these samples and is attributable to global fallout from past nuclear weapons testing. Cesium-137 was not detected in any of the three samples collected in 2016.

- **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 the naturally occurring gamma emitting radionuclides potassium-40, radium-226 and thorium-228 were detected. Tritium was not detected.

- **Silt** - Cesium-137 was detected in the control sample and not in the indicator sample. The presence of cesium-137 is attributable to residual weapons testing fallout and its presence has been well documented. Cobalt-60 has not been detected since 2003.

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

Aquatic Biota

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

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

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

REFERENCES

References

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

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.

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4. United States Nuclear Regulatory Commission Branch Technical Position, "Acceptable Radiological Environmental Monitoring Program", Rev. 1, November 1979.

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 2016

*LAND USE CENSUS**

Surry Power Station, Surry County, Virginia

January 1 to December 31, 2016 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	2.3 @ 221°	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 2016

INTRODUCTION

This appendix covers the Interlaboratory Comparison Program (ICP) of Teledyne Brown Engineering (TBE). TBE use QA/QC samples provided by Eckert & Ziegler Analytics, Inc., Environmental Resource Associates (ERA) and the Mixed Analyte Performance Evaluation Program (MAPEP) to monitor the quality of analytical processing associated with the REMP. Each provider has a documented Quality Assurance program and the capability to prepare Quality Control materials traceable to the National Institute of Standards and Technology (NIST). The providers supply the samples to TBE, and upon receipt, the laboratories perform the analyses in a normal manner. The results are then 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.

The accuracy of each result reported to Eckert & Ziegler Analytics, Inc. is measured by the ratio of the TBE result to the known value. Accuracy for all other results is based on statistically derived acceptance ranges calculated by the providers. An investigation is undertaken whenever the ratio or reported result fell outside of the acceptance range.

RESULTS

The TBE ICP results are included in the following tables for the first through the fourth quarters of 2016. Some analyses did not meet the acceptance criteria. TBE initiated non-conformance reports (NCRs) to document and address the analyses. The results of the NCRs are as follows.

1. NCR 16-26, Eckert & Ziegler Analytics milk sample E11476 failed Sr-90. The TBE value of 15.0 pCi/L was higher than the known value of 11.4 pCi/L. The resultant ratio was 1.32 failing above the high acceptance limit of 1.30. The QA data, yield, and associated raw data of the analysis were reviewed and found to be acceptable. It is believed the laboratory technician did not rinse the filtering apparatus properly and some cross contamination from an internal laboratory spike sample may have been transferred to the Analytics sample. The sequence of filtering samples would have placed the Analytics sample on the same filtering apparatus as the internal laboratory spike sample. Additional training has been given to the laboratory technician on how to properly rinse the filtering apparatus. Additional

clarifying language on cleaning filtering apparatus has been added to laboratory procedure TBE-2019 Radiostrontium Ion Exchange.

2. NCR 16-34, ERA water sample RAD-107 failed H-3. The TBE value of 918 pCi/L was lower than the known value of 9,820 pCi/L, failing below the lower acceptance limit of 8,540. The result of 918 pCi/L was incorrectly reported due to a data entry issue. The actual TBE value was 9,180 pCi/L, and if reported correctly, would have been within the acceptable range of 8,540 – 10,800 pCi/L. The data entry error was missed during the review process. TBE will perform additional review of data entry into the ERA database.
3. NCR 16-35, Eckert & Ziegler Analytics milk sample E11699 failed Sr-90. The TBE value of 14.7pCi/L was higher than the known value of 10. The resultant ratio was 1.47, failing above the high acceptance limit of 1.30. The cause was determined to be an incorrect volume entry in the Laboratory Information Management System. A lower volume of 0.6L, the typical sample volume, was entered instead of the actual 1.2L volume used for this sample. If the correct volume of 1.2L had been entered, the result would have had an acceptable ratio of 1.22. The laboratory manager will specify the sample aliquot going forward to avoid any future confusion.

ECKERT & ZIEGLER ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM

TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES

Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
February 2016	A31519(3)	AP	Sr-89	µCi/cc	2.04	2.46	0.83	A
			Sr-90	µCi/cc	2.08	2.68	0.78	A
March 2016	E11476	Milk	Sr-89	pCi/L	97	86.7	1.12	A
			Sr-90	pCi/L	15	11.4	1.32	N(2)
	E11477	Milk	1-131	pCi/L	85.9	82.2	1.05	A
			Ce-141	pCi/L	106	98.4	1.08	A
			Cr-51	pCi/L	255	243	1.05	A
			Cs-134	pCi/L	134	130	1.03	A
			Cs-137	pCi/L	174	161	1.08	A
			Co-58	pCi/L	123	117	1.05	A
			Mn-54	pCi/L	141	117	1.21	W
			Fe-59	pCi/L	152	131	1.16	A
			Zn-65	pCi/L	193	179	1.08	A
			Co-60	pCi/L	259	244	1.06	A
	E11184	AP	Ce-141	pCi	69	81.1	0.85	A
			Cr-51	pCi	242	201	1.20	W
			Cs-134	pCi	98.1	107.0	0.92	A
			Cs-137	pCi	136	133	1.02	A
			Co-58	pCi	91.9	97	0.95	A
			Mn-54	pCi	98.6	96.2	1.02	A
			Fe-59	pCi	98.8	108	0.91	A
			Zn-65	pCi	131	147	0.89	A
			Co-60	pCi	209	201	1.04	A
	E11478	Charcoal	1-131	pCi	85.3	88.3	0.97	A
	E11185	Water	Fe-55	pCi/L	1800	1666	1.08	A
June 2016	E11537	Milk	Sr-89	pCi/L	94.4	94.4	1.00	A
			Sr-90	pCi/L	13.4	15.4	0.87	A
	E11538	Milk	1-131	pCi/L	96.8	94.5	1.02	A
			Ce-141	pCi/L	129	139	0.93	A
			Cr-51	pCi/L	240	276	0.87	A
			Cs-134	pCi/L	157	174	0.90	A
			Cs-137	pCi/L	117	120	0.98	A
			Co-58	pCi/L	131	142	0.92	A
			Mn-54	pCi/L	128	125	1.02	A
			Fe-59	pCi/L	132	122	1.08	A
			Zn-65	pCi/L	235	235	1.00	A
			Co-60	pCi/L	169	173	0.98	A

(a) Teledyne Brown Engineering reported result.

(b) 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.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) 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.

(2) NCR 16-26 was initiated

(3) Sample results provided by Eckert & Ziegler are from another utility's cross check program.

ECKERT & ZIEGLER ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
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Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
June 2016	E11540	Filter	Ce-141	pCi	105	99.8	1.05	A
			Cr-51	pCi	216	198	1.09	A
			Cs-134	pCi	113	125	0.90	A
			Cs-137	pCi	94.5	86.6	1.09	A
			Co-58	pCi	101	102	0.99	A
			Mn-54	pCi	88.8	90.2	0.98	A
			Fe-59	pCi	82.0	87.5	0.94	A
			Zn-65	pCi	174	169	1.03	A
			Co-60	pCi	143	124	1.15	A
	E11539	Charcoal	I-131	pCi	86.1	89.4	0.96	A
September 2016	E11609	Milk	Sr-89	pCi/L	89.9	90.9	0.99	A
			Sr-90	pCi/L	13.3	13.7	0.97	A
	E11610	Milk	I-131	pCi/L	80.4	71.9	1.12	A
			Ce-141	pCi/L	81.3	93.2	0.87	A
			Cr-51	pCi/L	198	236	0.84	A
			Cs-134	pCi/L	122	136	0.90	A
			Cs-137	pCi/L	119	119	1.00	A
			Co-58	pCi/L	92.2	97.4	0.95	A
			Mn-54	pCi/L	156	152	1.03	A
			Fe-59	pCi/L	97.5	90.6	1.08	A
			Zn-65	pCi/L	189	179	1.06	A
			Co-60	pCi/L	131	135	0.97	A
	E11612	Filter	Ce-141	pCi	67.5	63.6	1.06	A
			Cr-51	pCi	192	161.0	1.19	A
			Cs-134	pCi	91.4	92.6	0.99	A
			Cs-137	pCi	93.9	80.8	1.16	A
			Co-58	pCi	66.0	66.4	0.99	A
			Mn-54	pCi	104	104	1.00	A
			Fe-59	pCi	60.5	61.8	0.98	A
			Zn-65	pCi	140	122	1.15	A
			Co-60	pCi	119	91.9	1.29	W
	E11611	Charcoal	I-131	pCi	52.4	59.9	0.87	A
December 2016	E11699	Milk	Sr-89	pCi/L	95.2	74.2	1.28	W
			Sr-90	pCi/L	14.7	10	1.47	N (2)

Footnotes are on page 3 of 3.

ECKERT & ZIEGLER ANALYTICS ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
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Month/Year	Identification Number	Matrix	Nuclide	Units	Reported Value (a)	Known Value (b)	Ratio (c) TBE/Analytics	Evaluation (d)
December 2016	E11700	Milk	I-131	pCi/L	97.5	97.4	1.00	A
			Ce-141	pCi/L	136	143	0.95	A
			Cr-51	pCi/L	247	280	0.88	A
			Cs-134	pCi/L	164	178	0.92	A
			Cs-137	pCi/L	120	126	0.95	A
			Co-58	pCi/L	139	146	0.95	A
			Mn-54	pCi/L	126	129	0.98	A
			Fe-59	pCi/L	114	125	0.91	A
			Zn-65	pCi/L	237	244	0.97	A
			Co-60	pCi/L	168	178	0.94	A
	11702	Filter	Ce-141	pCi	91.7	97.7	0.94	A
			Cr-51	pCi	210	192	1.09	A
			Cs-134	pCi	122	122	1.00	A
			Cs-137	pCi	93.9	86.4	1.09	A
			Co-58	pCi	92.0	100	0.92	A
			Mn-54	pCi	93.7	88.5	1.06	A
			Fe-59	pCi	84.9	85.4	0.99	A
			Zn-65	pCi	176	167	1.05	A
			Co-60	pCi	151	122	1.24	W
	E11701	Charcoal	I-131	pCi	95.6	98.0	0.98	A
	E11730	Filter	Sr-89	pCi	79.7	92.0	0.87	A
			Sr-90	pCi	10.0	12.5	0.80	A

N (1) Milk, Sr-90 - The failure was due to cross-contamination of laboratory apparatus. NCR 16-26

N (2) Milk, Sr-90 - The failure was due to sample volume data entry error. NCR 16-35

(a) Teledyne Brown Engineering reported result.

(b) 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.

(c) Ratio of Teledyne Brown Engineering to Analytics results.

(d) 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
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Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Range	Evaluation (c)
March 2016	16-GrF34	Filter	Gr-A	Bq/sample	0.608	1.20	0.36 - 2.04	A
			Gr-B	Bq/sample	0.806	0.79	0.40 - 1.19	A

(a) Teledyne Brown Engineering reported result.

(b) 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.

(c) DOE/MAPEP evaluation: A=acceptable, W=acceptable with warning, N=not acceptable.

ERA ENVIRONMENTAL RADIOACTIVITY CROSS CHECK PROGRAM
TELEDYNE BROWN ENGINEERING ENVIRONMENTAL SERVICES
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Month/Year	Identification Number	Media	Nuclide	Units	Reported Value (a)	Known Value (b)	Acceptance Limits	Evaluation (c)
May 2016	RAD-105	Water	Sr-89	pCi/L	48.9	48.2	37.8 - 55.6	A
			Sr-90	pCi/L	25.0	28.5	20.7 - 33.1	A
			Ba-133	pCi/L	53.1	58.8	48.7 - 64.9	A
			Cs-134	pCi/L	40.9	43.3	34.6 - 47.6	A
			Cs-137	pCi/L	85	78	70.6 - 88.9	A
			Co-60	pCi/L	108.0	102.0	91.8 - 114	A
			Zn-65	pCi/L	226	214	193 - 251	A
			Gr-A	pCi/L	38.9	62.7	32.9 - 77.8	A
			Gr-B	pCi/L	41.9	39.2	26.0 - 46.7	A
			I-131	pCi/L	24.1	26.6	22.1 - 31.3	A
			U-Nat	pCi/L	4.68	4.64	3.39 - 5.68	A
			H-3	pCi/L	7720	7840	6790 - 8620	A
November 2016	RAD-107	Water	Sr-89	pCi/L	43	43.3	33.4 - 50.5	A
			Sr-90	pCi/L	30	33.6	24.6 - 38.8	A
			Ba-133	pCi/L	47.8	54.9	45.4 - 60.7	A
			Cs-134	pCi/L	72.9	81.8	67.0 - 90.0	A
			Cs-137	pCi/L	189	210	189 - 233	A
			Co-60	pCi/L	58.4	64.5	58.0 - 73.4	A
			Zn-65	pCi/L	243	245	220 - 287	A
			Gr-A	pCi/L	37.2	68.4	35.9 - 84.5	A
			Gr-B	pCi/L	35.1	33.9	22.1 - 41.6	A
			I-131	pCi/L	23.5	26.3	21.9 - 31.0	A
			U-Nat	pCi/L	49.2	51.2	41.6 - 56.9	A
			H-3	pCi/L	918	9820	8540 - 10800	N (3)

N (3) Water, H-3 - The failure was due to a data entry error. NCR 16-34

(a) Teledyne Brown Engineering reported result.

(b) 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.

(c) ERA evaluation: A=acceptable. Reported result falls within the Warning Limits. NA=not acceptable. Reported result falls outside of the Control Limits. CE=check for Error. Reported result falls within the Control Limits and outside of the Warning Limit.