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May 14, 2019

U. S. Nuclear Regulatory Commission
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Calvert Cliffs Nuclear Power Plant; Unit Nos. 1 & 2;
Renewed Facility Operating License Nos. DPR-53 and DPR-69
Docket Nos. 50-317 & 50-318

Independent Spent Fuel Storage Installation;
Material License No. SNM-2505
NRC Docket No. 72-8

Subject: Annual Radiological Environmental Operating Report

References:
1. Calvert Cliffs Nuclear Power Plant Technical Specification 5.6.2
2. Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specification 6.2

In accordance with References 1 and 2, Calvert Cliffs Nuclear Power Plant is submitting the Annual Radiological Environmental Operating Report (Attachment 1).

There are no regulatory commitments contained in this correspondence.

Should you have questions regarding this matter, please contact me at (410) 495-5219 or Mr. Ed Schinner at (410) 495-5210.

Respectfully,

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LDS/lmd

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NMSS26
NRR
NMSS

Attachment: (1) Annual Radiological Environmental Operating Report for the Calvert Cliffs Nuclear Power Plant Units 1 and 2 and the Independent Spent Fuel Storage Installation

cc: NRC Regional Administrator, Region 1
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ATTACHMENT (1)

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR THE

CALVERT CLIFFS NUCLEAR POWER PLANT

UNITS 1 AND 2

AND THE INDEPENDENT SPENT FUEL STORAGE INSTALLATION

Calvert Cliffs Nuclear Power Plant

May 14, 2019

ANNUAL RADIOLOGICAL ENVIRONMENTAL OPERATING REPORT FOR THE CALVERT CLIFFS NUCLEAR POWER PLANT UNITS 1 AND 2 AND THE INDEPENDENT SPENT FUEL STORAGE INSTALLATION

January 1 - December 31, 2018

A. M. Barnett
M. Prosceo

EXELON GENERATION, LLC

MAY 2019

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

I. SUMMARY

During 2018, Calvert Cliffs Nuclear Power Plant (CCNPP) Units 1 and 2, a total of 3099 radiological analyses were performed and the analytical results reviewed. Most of these analyses were performed to satisfy the requirements of the Offsite Dose Calculation Manual (ODCM) (Ref. 6), the Technical Specifications (Ref. 5) and the Independent Spent Fuel Storage Installation (ISFSI) Technical Specifications (Ref. 10).

Some of these samples, although not required by either the ODCM or the Technical Specifications, were collected to maintain historical continuity of the CCNPP Radiological Environmental Monitoring Program (REMP) that started in 1970. The entire monitoring program in place around CCNPP is divided into three parts: the original REMP, the ISFSI monitoring program, and the Non-ODCM Radiological Environmental Monitoring.

Changes were made in the ODCM (Ref. 6) effective June 12, 2018. Radioiodine charcoal cartridges at Meteorological Station (SFA1), NNW of the ISFSI (SFA3), and SSE of the ISFSI (SFA4) reported in the E-5 table of this appendix were moved into the REMP. The data after June 12, 2018 and onward is provided in the B-5 table of this report.

Effective September 11, 2018 some of the additional samples (non-ODCM required) were discontinued, specifically, air sampling and water monitoring locations at Long Beach (A6), Taylors Island (A7, WW1), and Cambridge (A8). Ambient radiation continues to be monitored at Long Beach and Taylors Island locations under the ODCM (Ref. 6). TLDs placed around the Resin storage areas and locations as denoted in tables E-9 and E10 were discontinued effective September 11, 2018.

A total of 816 radiochemical analyses were performed on 766 environmental samples and 540 thermoluminescent dosimeters (TLDs) were analyzed for ambient radiation exposure rates as part of the original REMP. These analyses were performed to satisfy the requirements of the ODCM (Ref. 6) and the Technical Specifications (Ref. 5).

For the ISFSI monitoring program, 332 radiochemical analyses were performed on 297 environmental samples, 155 of which were in common with the original REMP. In addition, 474 TLDs, 24 in common with the original REMP, were analyzed for ambient radiation exposure rates. These analyses were performed to satisfy the requirements of the ODCM (Ref. 6) and the ISFSI Technical Specifications (Ref. 10).

In addition, 369 analyses were performed on 346 additional environmental samples, and 354 additional TLDs were analyzed for ambient radiation exposure rates.

And lastly, 267 radiochemical analyses were performed on 227 quality assurance samples and 126 quality assurance TLDs were analyzed as part of an internal and external quality assurance program associated with Teledyne Brown Engineering. Laboratory intercomparison samples obtained from Environmental Resource Associates (ERA) and Analytics' Inc. were also analyzed.

Samples collected from the aquatic environment included bay water, fish, oysters, and shoreline sediment. Bay water was analyzed for tritium and gamma emitters. Fish, oysters, and shoreline sediments were analyzed for gamma emitting radionuclides.

Monitoring the atmospheric environment involved sampling the air at various locations surrounding CCNPP and the ISFSI. Air particulates and gaseous iodine were collected on glass fiber filters and charcoal cartridges, respectively. The particulate filters were analyzed for beta activity and gamma emitting nuclides. The charcoal cartridges were analyzed for airborne gaseous radioiodine.

Samples from the terrestrial environment consisted of vegetation and soil samples collected and analyzed for gamma emitters. Vegetation samples for the original REMP were also analyzed for I-131.

Measurements of direct radiation, as required by the ODCM, were performed by analyzing TLDs from forty-two locations surrounding CCNPP and the ISFSI.

Natural radioactivity was detected in essentially all 3099 radiological analyses performed. Low levels of man-made fission products were also observed in 8 of these analyses for the CCNPP REMP. All of these observations were attributed to fallout from past atmospheric weapons testing. Detailed discussions about the results of these analyses are contained in the body of this report.

To assess the plant's contribution to the radiation levels of the ambient environment, dose calculations were performed using 2018 data from the plant's effluent releases, 2018 on-site meteorological data, and appropriate pathways. The results of these dose calculations indicate:

a. a maximum thyroid dose of 4.41×10^{-4} mrem via liquid and gaseous pathways, which is about 0.001% of the acceptable limit of 75 mrem/yr as specified in 40CFR190 "Environmental Radiation Protection Standards for Nuclear Power Operations" and 10CFR72.104, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste";

b. a maximum whole body dose of 4.98×10^{-4} mrem via liquid and gaseous pathways, which is about 0.002% of the acceptable limit of 25 mrem/yr as specified in both 40CFR190 and 10CFR72.104; and

c. a maximum calculated dose to all other organs via liquid and gaseous pathways was equal to 1.16×10^{-3} mrem. This dose is about 0.005% of the allowable limit of 25 mrem/yr as specified in both 40CFR190 and 10CFR72.104.

Thus, it is concluded based upon the levels of radioactivity observed and the various dose calculations performed, that CCNPP Units 1 and 2 and the ISFSI did not cause any significant radiological impact on the surrounding environment.

II. CALVERT CLIFFS NUCLEAR POWER PLANT RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

II.A. INTRODUCTION

The REMP has been conducted in the vicinity of CCNPP since the summer of 1970. The Calvert Cliffs site is an operating nuclear generating station consisting of two pressurized water reactors. Unit 1 achieved criticality on October 7, 1974 and commenced commercial operation in May 1975. Unit 2 achieved criticality on November 30, 1976 and went into commercial operation April 1, 1977. The location of the plant in relation to local metropolitan areas is shown on Figure A-1.

Results of the monitoring program for the pre-operational period have been reported in a series of documents (Ref. 1-4). The results from previous operational periods are contained in annual reports submitted to the Nuclear Regulatory Commission (NRC) as required.

Results of the monitoring program for the current operational period are included in this report. The report presents the content of the REMP (Table 1), the sampling locations (Appendix A), the summary of the analytical results (Table 2), a compilation of the analytical data (Appendix B), the results of the Interlaboratory Comparison Program and the Quality Assurance Program (Appendix C), the results of the Land Use Survey (Appendix D), and a compilation of the analytical data for extra samples collected (Appendix E). Interpretation of the data and conclusions are presented in the body of the report.

The environmental surveillance data collected during this reporting period were compared with that generated in previous periods whenever possible to evaluate the environmental radiological impact of CCNPP Units 1 and 2.

II.B. PROGRAM

II.B.1 Objectives

The objectives of the REMP for the Calvert Cliffs Nuclear Power Plant are:

a. To verify that radioactivity and ambient radiation levels attributable to plant operation are within the limits specified in the ODCM (Ref. 6) and the Environmental Radiation Protection Standards as stated in 40CFR190,

b. To detect any measurable buildup of long-lived radionuclides in the environment,

c. To monitor and evaluate ambient radiation levels, and

d. To determine whether any statistically significant increase occurs in the concentration of radionuclides in important pathways.

II.B.2 Sample Collection

The locations of the individual sampling stations are listed in Table A-1 and shown in Figures A 2 and A-3. All samples were collected by contractors to, or personnel of Exelon Generation according to Procedures (Ref. 7, 12 and 15).

II.B.3 Data Interpretation

Many results in environmental monitoring occur at or below the minimum detectable activity (MDA). In this report, all results at or below the relevant MDA are reported as being "less than" the MDA value.

II.B.4 Program Exceptions

A loss of sample occurred at CCNPP Route 765, Lusby (sample code A4) between August 14th and August 21st due to human performance error. This program exception was entered into the site's Corrective Action Program and supervisor stop work check-in criteria was implemented to mitigate reoccurrence.

Direct radiation dosimeters were found missing from ODCM (Ref. 6) sampling locations during this operating period. Direct radiation dosimeters were missing from the pole across from Appeal School sampling location (sample code DR16) in the 1st quarter and from the Route 765 Giovanni's Tavern (Knotty Pine) sampling location (sample code DR03) in the 4th quarter of this operating period. No substitute samples were collected. New dosimeters were deployed at these locations for the purposes of monitoring direct radiation per the ODCM (Ref. 6), and these program exceptions were entered into the site's Corrective Action Program.

II.C. RESULTS AND DISCUSSIONS

All the environmental samples collected during the year were analyzed using Exelon Industrial Services laboratory procedures (Ref. 8) except for Tritium which was analyzed by Teledyne Brown Engineering (Ref. 14). The analytical results for this reporting period are presented in Appendix B and are also summarized in Table 2. For discussion, the analytical results are divided into four categories. The categories are Aquatic Environment, Atmospheric Environment, Terrestrial Environment, and Direct Radiation. These categories are further divided into subcategories according to sample type (e.g., Bay Water, Aquatic Organisms, etc., for the Aquatic Environment).

II.C.1 Aquatic Environment

The aquatic environment surrounding the plant was monitored by analyzing samples of bay water, aquatic organisms, and shoreline sediment. These samples were obtained from various sampling locations on the Chesapeake Bay near the plant.

II.C.1.a Bay Water

Monthly bay water samples were taken from two locations during the year. These locations are the Intake Area (sample code WA1) and the Discharge Area (sample code WA2). Composite samples were obtained from each location for the entire sampling period. These samples were analyzed for tritium and gamma emitters.

The tritium analyses, performed on quarterly composites of the monthly bay water samples, revealed one result for tritium at the Intake Area (sample code WA1) in the second quarterly sample collected from 04/02/2018 to 06/29/2018 at 313 ± 132 pCi/L.

Figure 1 compares tritium observed in the plant discharge and intake with annual effluent releases as reported in the Radioactive Effluent Release Report.

Monthly analyses of bay water samples from both locations for gamma emitters exhibited no detectable concentrations of any plant-related radionuclides.

II.C.1.b Aquatic Organisms

Twelve samples of aquatic organisms were obtained from four locations during the year. Samples of fish, when in season, are normally collected from the Discharge Area (sample codes IA1 and IA2) and from the Patuxent River (sample codes IA4 and IA5). As shown in Table B-2, two species of fish were sampled at both the plant discharge and the control point in the Patuxent River. Oyster samples were obtained quarterly from Camp Conoy (sample code IA3) and Kenwood Beach (IA6).

Figure 2 compares K-40 and Ag-110m observed in oysters from Camp Conoy (IA3) with annual effluent releases of Ag-110m as reported in the Radioactive Effluent Release Report. As seen in Figure 2, Ag-110m has not been detected in environmental samples in over ten years. While there are still sources of Ag-110m in the plant, significant improvements made to the reactor coolant system chemistry control program and the liquid radwaste system have dramatically reduced the concentration of Ag-110m in plant effluents.

Edible portion of the fish and oyster samples were analyzed for gamma emitters.

Gamma spectrometric analyses of the fish exhibited naturally occurring K-40 but no detectable concentrations of any plant-related radionuclides. Oyster samples likewise exhibited naturally occurring K-40 but no detectable concentrations of any plant-related radionuclides.

II.C.1.c Shoreline Sediment

Semiannual shoreline sediment samples are taken from one location during the year. This location is Shoreline at Barge Road (sample code WB1). The semiannual shoreline sediment samples obtained from this location were analyzed for gamma emitters.

Gamma spectrometric analyses of these samples exhibited naturally occurring radionuclides, but no detectable concentration of any plant-related radionuclides.

FIGURE 1
Tritium in Chesapeake Bay Water

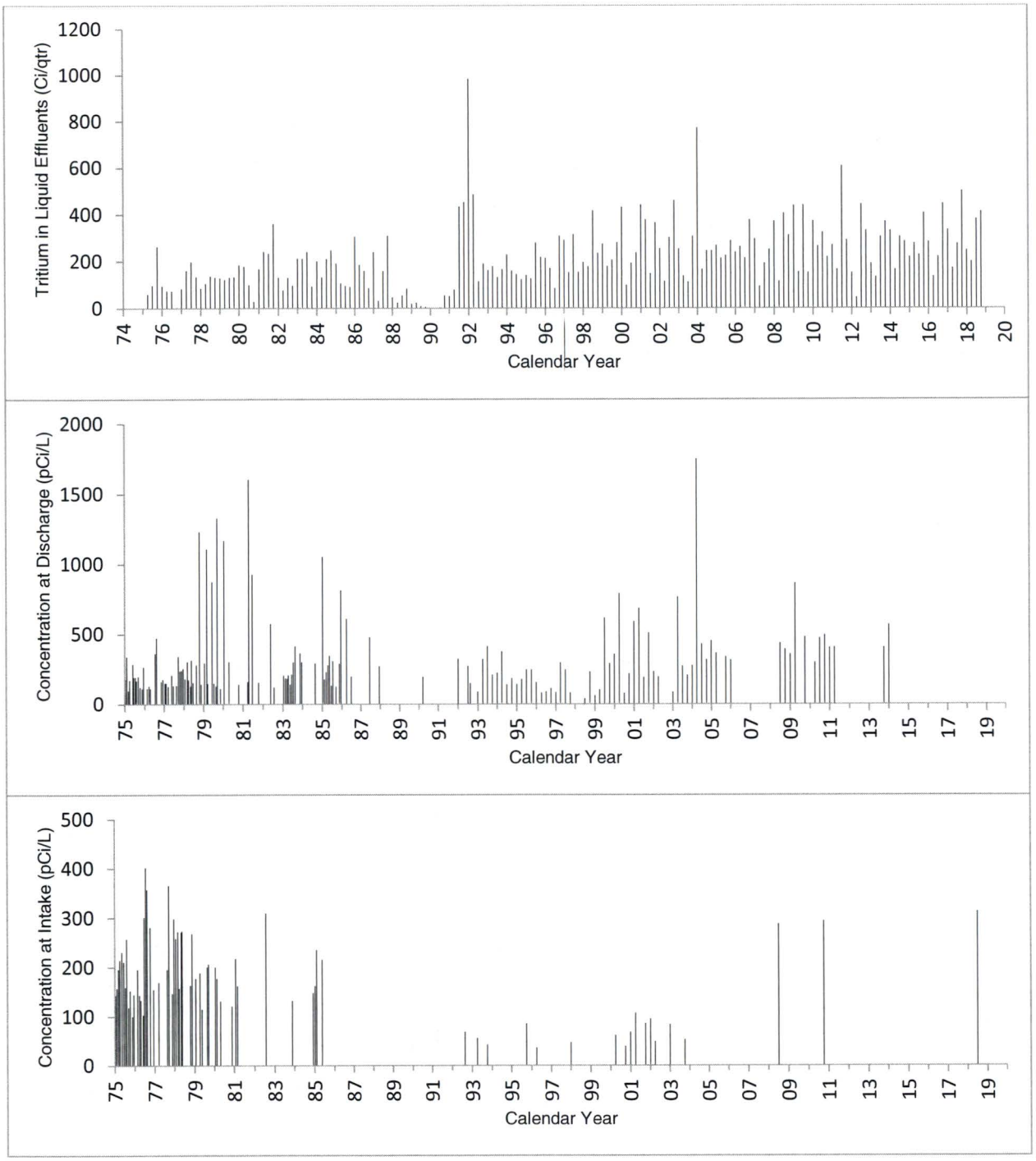
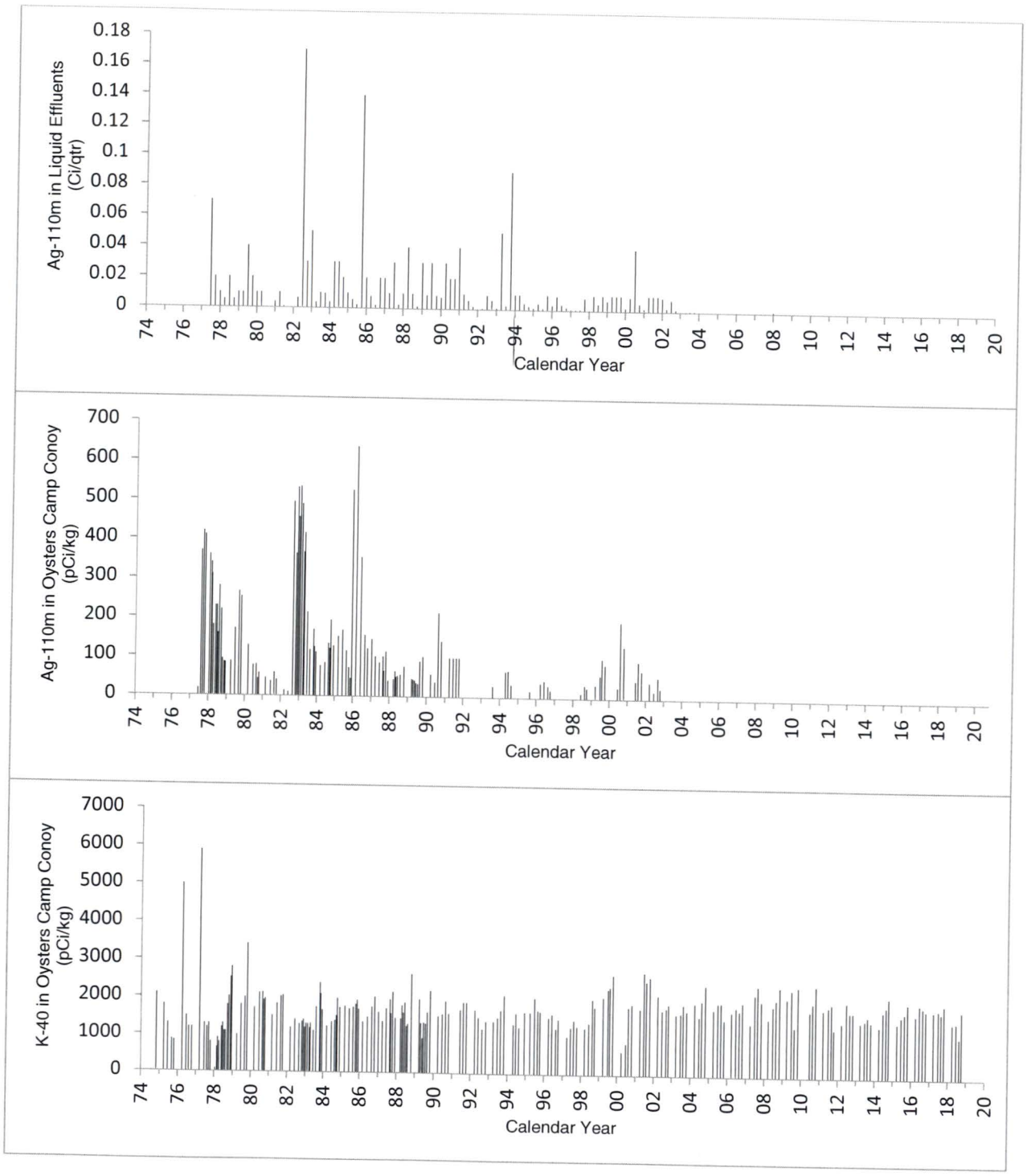


FIGURE 2
Silver-110m and Potassium-40 in Chesapeake Bay Oysters



II.C.2 Atmospheric Environment

The atmospheric environment was monitored by analyzing air particulate filters and charcoal cartridges (for trapping radioiodine species). These samples were collected from five locations surrounding the plant. These locations are On Site before the Entrance to Camp Conoy (sample code A1), Camp Conoy Road at the Emergency Siren (sample code A2), Bay Breeze Road (sample code A3), Route 765 at Lusby (sample code A4), and at the Emergency Operations Facility (sample code A5). Effective June 12, 2018 the ODCM (Ref. 6) air particulate filters and charcoal cartridges from three locations, Meteorological Station (sample code SFA1), NNW of ISFSI (sample code SFA3), and SSE of ISFSI (sample code SFA4) were included in the REMP monitoring program as well as the ISFSI monitoring program for a total of eight air particulate filters and charcoal cartridges.

II.C.2.a Air Particulate Filters

Weekly composite air particulate filter samples were collected from the five original locations during the year. These samples were analyzed for beta activity and gamma emitters were in trend with historical data.

Effective June 12, 2018 the ODCM was revised to recategorize three locations from the ISFSI, to be in common with the REMP air sampling locations for the weekly analyses of beta activity on air particulate filters. The samples collected from Meteorological Station (sample code SFA1), NNW of ISFSI (sample code SFA3), and SSE of ISFSI (sample code SFA4) were in trend with historical data and showed values characteristic of background levels. The values ranged from 0.8×10^{-2} to 3.5×10^{-2} pCi/m^3 for the indicator locations and at the control location, A5, Emergency Operations Facility values ranged from 0.9×10^{-2} to 3.7×10^{-2} pCi/m^3. The location with the highest overall mean of 1.9×10^{-2} pCi/m^3 was the control location, A5, Emergency Operations Facility.

Gamma spectrometric analyses of monthly composited air particulate samples exhibited no detectable concentrations of any plant-related radionuclides in any of these samples. Beginning with the second quarter, samples were composited on a quarterly basis and continued to show no detectable plant related radionuclides. Naturally occurring radionuclides, such as Be-7, were detected in nearly all samples.

Figure 3 depicts the historical trends of both natural and manmade beta activity for location A4, Route 765 at Lusby including the impact of Sr-90 due to significant events such as weapons testing in the 1970's and early 1980's as well as the fallout resulting from the accident event at Chernobyl in 1986.

II.C.2.b Air Iodine

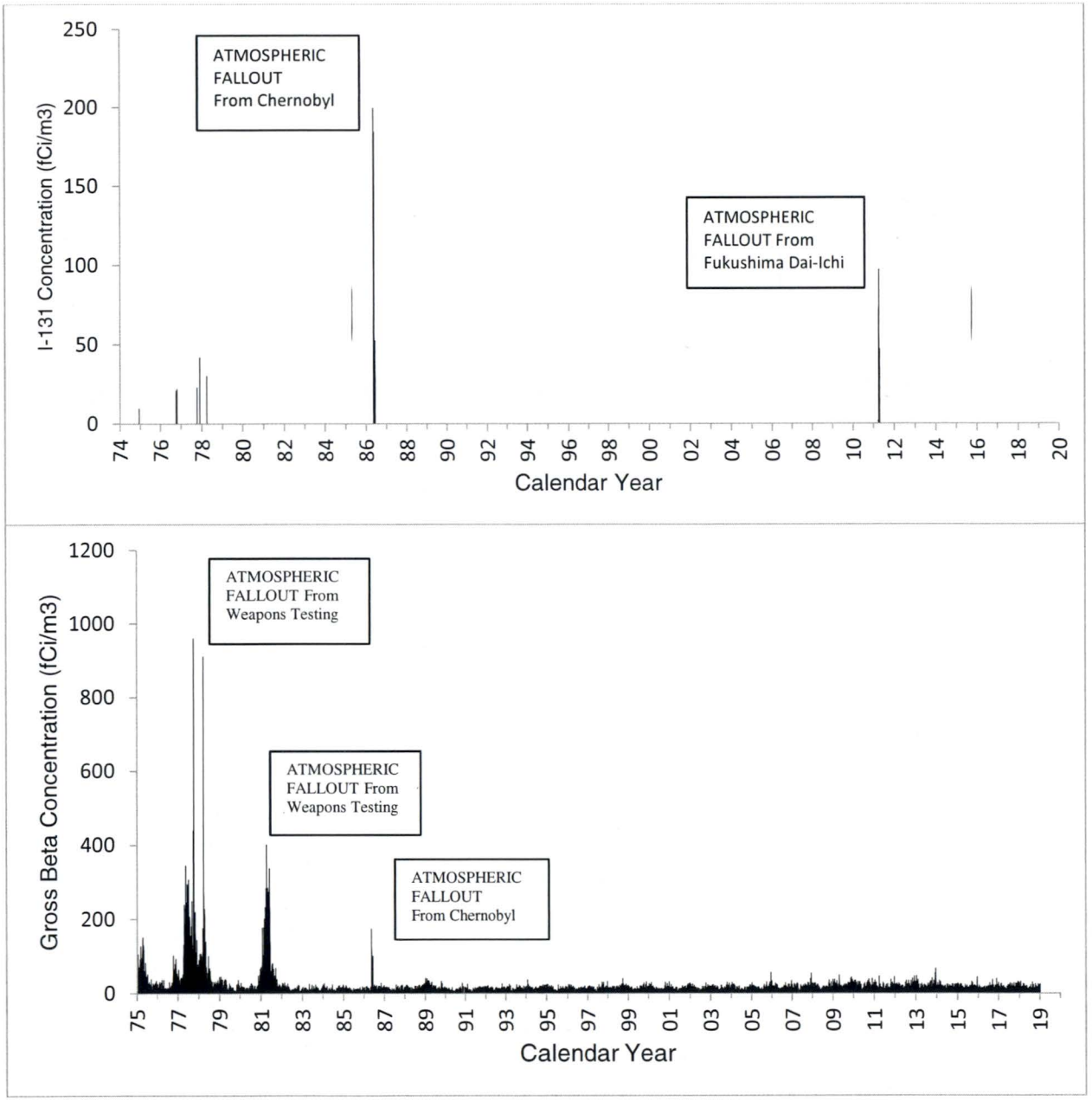
Weekly composited charcoal cartridges (for trapping radioiodine species) were collected from the five original locations during the year. These samples were analyzed for radioiodine species. and exhibited no detectable concentrations of I-131during the year.

Effective June 12, 2018 the ODCM was revised to recategorize three locations from non REMP to REMP air sampling locations for the radioiodine analyses of charcoal cartridges. No detectable concentrations of I-131 were exhibited from these locations at any time during the year.

Figure 3 depicts the historical trends of manmade radioiodine activity for location A4, Route 765 at Lusby including the impact I-131 due to significant events such as the fallout resulting from the accident event at Chernobyl in 1986 and the accident event at Fukushima Daiichi in 2011.

FIGURE 3
Nuclear Fallout in the Calvert Cliffs Area

SURFACE AIR VAPORS, LUSBY, MD (A4)



II.C.3 Terrestrial Environment

The terrestrial environment was monitored by analyzing samples of vegetation collected monthly, when available, from various sampling locations near the plant during the normal growing season.

II.C.3.a Vegetation

Vegetation samples were collected from three locations during the year. These locations are On Site before the Entrance to Camp Conoy (sample codes IB4, IB5, and IB6), the Emergency Operations Facility (sample codes IB7, IB8, and IB9), and the Garden Plot at the Meteorological Station (sample codes IB10, IB11, and IB12). These samples were analyzed for gamma emitters, including analyses for I-131.

All samples showed detectable amounts of naturally occurring K-40 and Be-7. No plant related radionuclides were found in any of these samples.

II.C.4 Direct Radiation

Direct radiation is measured by a network of TLDs in each overland sector surrounding the Plant both at the plant boundary and at 4 miles from the Plant.

TLDs were collected quarterly from twenty-three locations surrounding the plant. The twenty indicator locations are On Site Along the Cliffs (sample code DR01), Route 765 Auto Dump (sample code DR02), Giovanni's Tavern (sample code DR03), Route 765 across from White Sands (sample code DR04), John's Creek (sample code DR05), Lusby (sample code DR06), On Site before the Entrance to Camp Conoy (sample code DR07), On Site at Emergency Siren (sample code DR08), Bay Breeze Road (sample code DR09), Decatur and Calvert Beach Roads (sample code DR10), Dirt Road off Mackall and Parran Roads (sample code DR11), Mackall and Bowen Roads (sample code DR12), Wallville (sample code DR13), Rodney Point (sample code DR14), Mill Bridge and Turner Roads (sample code DR15), Appeal School (sample code DR16), Cove Point and Little Cove Point Roads (sample code DR17), Cove Point (sample code DR18), Long Beach (sample code DR19), and On Site Near Shore (sample code DR20). The three control locations are the Emergency Operations Facility (sample code DR21), Solomons Island (sample code DR22), and Taylors Island, Anderson's Property (sample code DR23).

The mean 90 day ambient radiation was reported in the first quarter of 2018. In June of 2018 the site adopted the requirements of the updated ANSI 13.34 standard which measures mean 91 day ambient radiation. The mean 91 day ambient radiation measured at the indicator locations was 11.75 mR and ranged from 9.29 to 16.56 mR as reported in Table 2. The control locations showed a mean 91day measurement of 13.19 mR with ranges from 11.11 to 17.25 mR. The location with the highest overall mean of 15.38 was Taylors Island, Anderson's Property (sample code DR23) which ranged from 14.40 to 17.25 mR. Figure 4-a depicts the long-term trend of mean TLD exposure for the 4-mile, Control Location, and On-Site TLDs. Figure 4-b depicts quarterly exposure at each TLD location in 2018, with the locations ranked by increasing

exposure. From these graphs, it is seen that there is a slight bias towards higher exposure at the control locations. This is due to the higher background radiation at DR23 (Taylor's Island, 7.8 miles from CCNPP). This slight bias is due to normal variations in background radiation levels and is consistent with pre-operational data. For example, in figure 4a this trend can be observed in the first calendar year of the graph, 1973, which was a year prior the first criticality of Unit 1 (October 7, 1974).

FIGURE 4-a
Mean TLD Gamma Dose, Calvert Cliffs Nuclear Power Plant

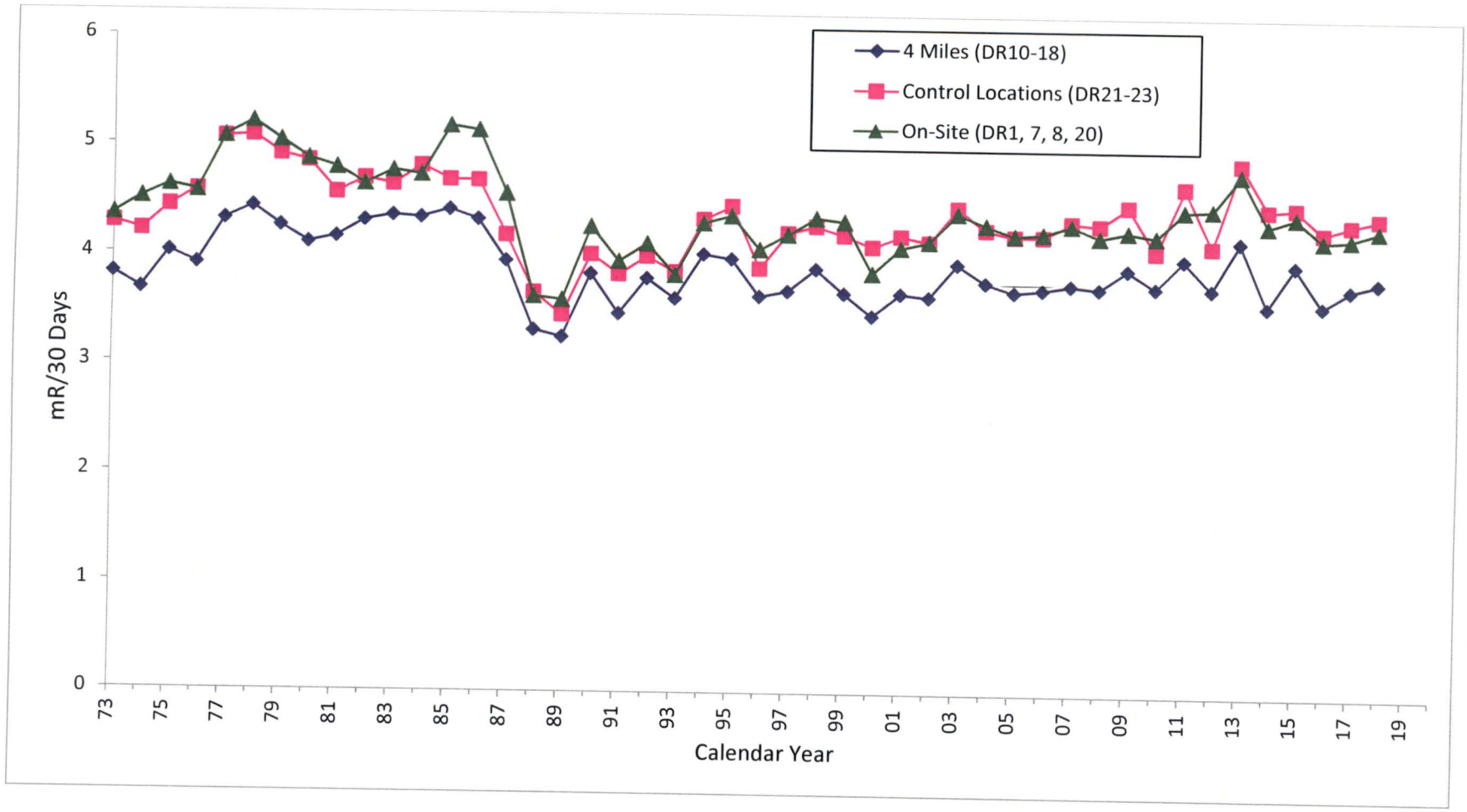
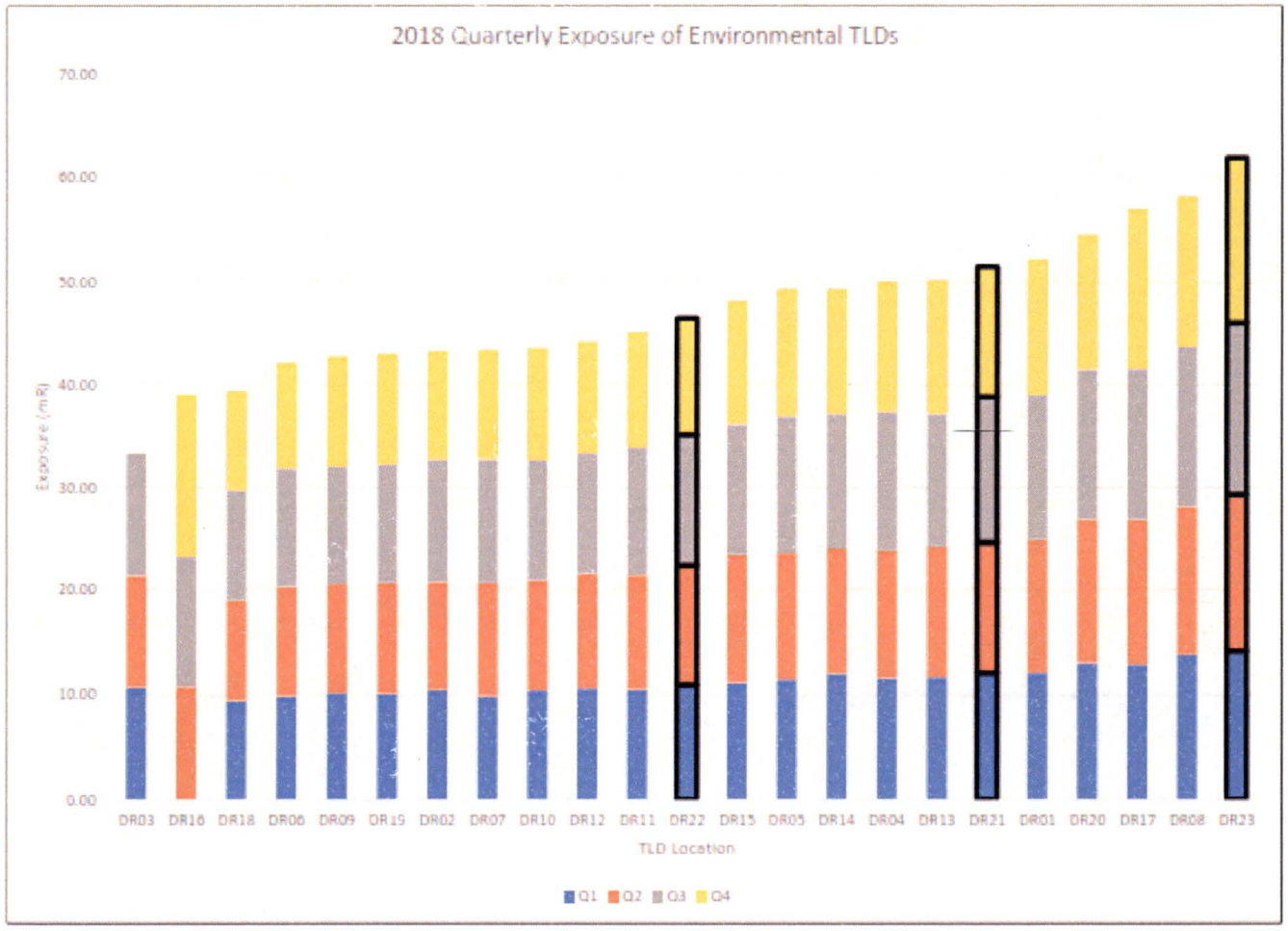


FIGURE 4-b
2018 Quarterly TLD Gamma Dose per Location, Calvert Cliffs Nuclear Power Plant



NOTE: Control Locations are highlighted by bold outline.

II.D. CONCLUSION

No man-made fission or activation by-products attributable to plant operations were observed in the environment surrounding the plant during the year.

Historical trends for tritium in bay water, Ag-110m and K-40 in oyster samples, nuclear fallout in the Calvert Cliffs area, and TLD data are depicted in Figures 1 through 4. As can be seen from these figures, the plant made no adverse radiological contributions to the surrounding environment.

To assess the plant's contribution to the ambient radiation levels of the surrounding environment, dose calculations were performed using the plant's 2018 effluent release data, on site meteorological data (see X/Q and D/Q values presented in Figures 5 and 6), and appropriate pathways. The results of these dose calculations indicate:

Gaseous Pathways

A maximum thyroid dose of 1.81×10^{-4} mrem to a child via the plume, ground, vegetable, and inhalation pathways at 1.5 miles SE of the containments at Calvert Cliffs. This is about 0.0002% of the acceptable limit of 75 mrem/yr as specified in 40CFR190 and 10CFR72.104.

A maximum whole body gamma dose of 1.80×10^{-4} mrem to a child at 1.5 miles SE of the containments at Calvert Cliffs. This is about 0.001% of the acceptable dose limit of 25 mrem/yr as specified in 40CFR190 and 10CFR72.104.

A maximum dose to any other organ, in this case the skin, of 1.83×10^{-4} mrem to a child at 1.5 miles SE of the containments at Calvert Cliffs. This is about 0.0007% of the acceptable dose limit of 25 mrem/yr as specified in 40CFR190 and 10CFR72.104.

Liquid Pathways

A maximum thyroid dose of 2.60×10^{-4} mrem to a teenager for all liquid pathways, which is about 0.0003% of the acceptable dose limit of 75 mrem/yr as specified in 40CFR190 and 10CFR72.104.

A maximum whole body dose of 3.18×10^{-4} mrem to a teenager via all liquid pathways, which is about 0.0013 % of the acceptable dose limit of 25 mrem/yr as stated in 40CFR190 and 10CFR72.104.

A maximum dose to any other organ, in this case GI Tract, of 9.80×10^{-4} mrem to an adult for all pathways, which is 0.004% of the acceptable dose limit of 25 mrem/yr specified in 40CFR190 and 10CFR72.104.

Gaseous and Liquid Pathways Combined

A maximum thyroid dose of 4.41×10^{-4} mrem via liquid and gaseous pathways, which is about 0.0006% of the acceptable limit of 75 mrem/yr as specified in 40CFR190 and 10CFR72.104.

A maximum whole body dose of 4.98×10^{-4} mrem via liquid and gaseous pathways, which is about 0.002% of the acceptable limit of 25 mrem/yr as specified in 40CFR190 and 10CFR72.104.

A maximum calculated dose to all other organs via liquid and gaseous pathways is equal to 1.16×10^{-3} mrem. This dose was about 0.005% of the allowable limit of 25 mrem/yr as specified in 40CFR190 and 10CFR72.104.

In all cases, the calculated doses are a small fraction of the applicable limits specified in 40CFR190 and 10CFR72.104.

Therefore, it is concluded that the operation of Calvert Cliffs Units 1 and 2 produced radioactivity and ambient radiation levels significantly below the limits of the ODCM, 40CFR190, and 10CFR72.104. There was no significant buildup of plant-related radionuclides in the environment due to the operation of the CCNPP in 2018.

FIGURE 5

Atmospheric Dispersion Around CCNPP Average Relative Air Concentrations (X/Q)

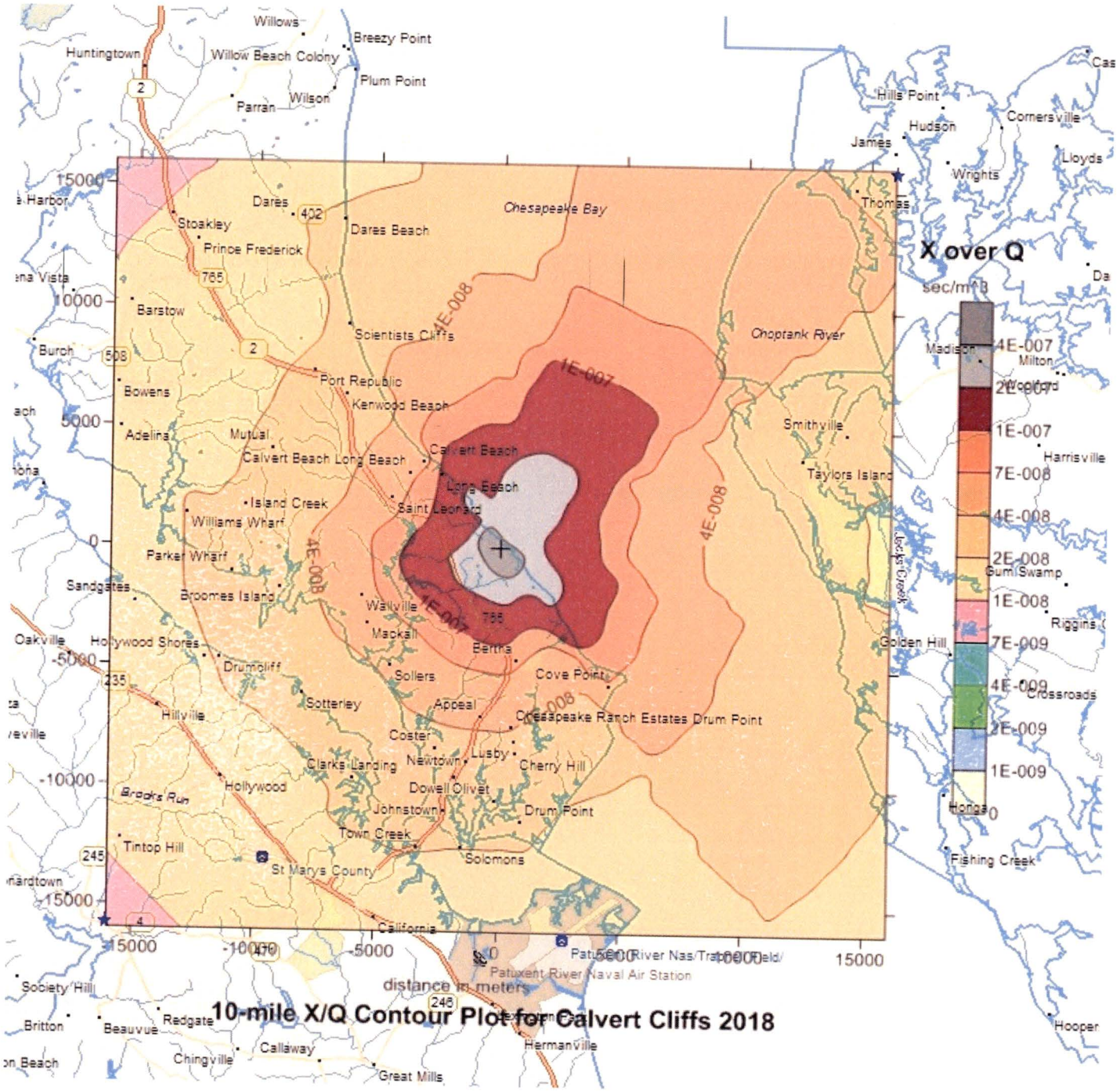


FIGURE 6

Atmospheric Dispersion Around CCNPP Average Relative Ground Deposition (D/Q)

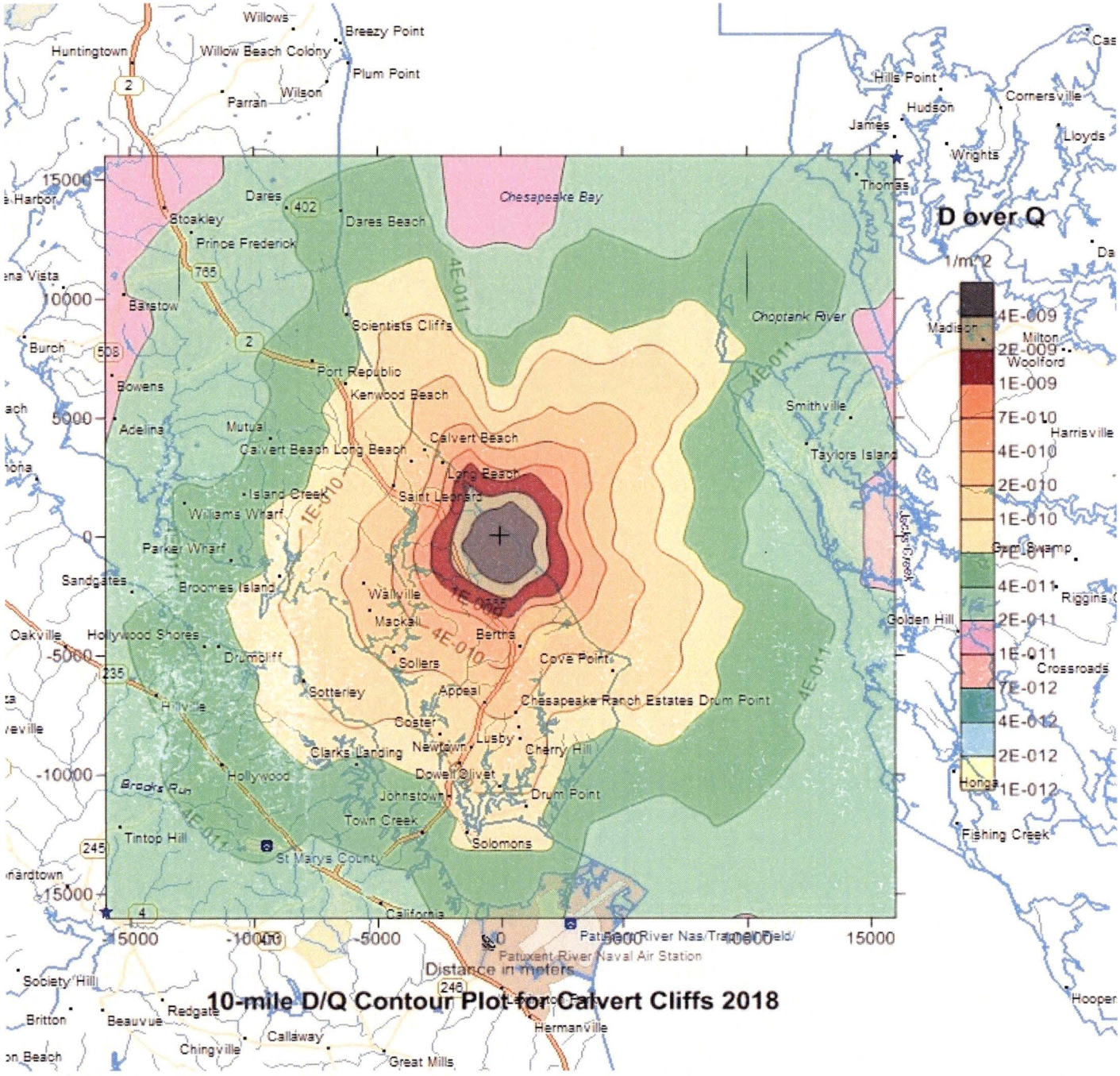


Table 1

Synopsis of 2018 Calvert Cliffs Nuclear Power Plant Radiological Environmental Monitoring Program

Sample Type	Sampling Frequency[1]	Number of Locations	Number Collected	Analysis	Analysis Frequency[1]	Number Analyzed
Aquatic Environment						
Bay Water, Surface Water	MC	2	24	Gamma	MC	24
				H-3	QC	8
Fish[2]	A	2	4	Gamma	A	4
Oysters	Q	2	8	Gamma	Q	8
Shoreline Sediment	SA	1	2	Gamma	SA	2
Atmospheric Environment						
Air Iodine[3,6]	W	8	347	I-131	W	346
Air Particulates[4,7]	W	8	347	Gross Beta	W	346
				Gamma	MC	20
				Gamma	QC	24
Direct Radiation						
Ambient Radiation	Q	23	540	TLD	Q	540
Terrestrial Environment						
Vegetation[5]	M	3	34	Gamma	M	34

[1] W=weekly, M=monthly, Q=quarterly, SA=semiannual, A=annual, C=composite
[2] Once in Season, July through September
[3] The collection device contains charcoal
[4] Beta counting is performed after >72 hour decay, Gamma spectroscopy performed on monthly composites of weekly samples through April 2018 and then quarterly thereafter, i.e. Q2, Q3, Q4.
[5] Monthly during growing season when available
[6] Effective June 12th2018, the ODCM was changed to move three sites formerly non-Tech Spec into the REMP Tech Specs
[7] Effective June 12th 2018, the ODCM was changed to recategorize three sites for the ISFSI program to be in common with the REMP Tech Specs.

Table 2

Annual Summary of Radioactivity in the Environs of the Calvert Cliffs Nuclear Power Plant Units 1 and 2

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Indicator Locations Mean (F)/Range[1]	Location with Highest Annual Mean Name/Distance & Direction[2]	Highest Annual Mean (F) / Range[1]	Control Locations Mean (F)/Range
Aqueous Environment						
Bay Water, Surface Water (pCi/L)	Tritium (8)	200	313 (1/1) (313)	Intake Area WA1 0.2km N	313 (1/1) (313)	--
Atmospheric Environment						
Air Particulates (10^{-2} pCi/m^3)	Gross Beta (346)	0.5	1.8 (294/294) (0.8-3.5)	EOF A5 19.3 km WNW	1.9 (52/52) (0.9-3.7)	1.9 (52/52) (0.9-3.7)
Direct Radiation [3]						
Ambient Radiation (mR/91 days)	TLD (540)	--	11.75 (468/468) (9.29-16.56)	Taylors Island DR23 12.6 km ENE	15.38 (24/24) (14.40-17.25)	13.19 (72/72) (11.11-17.25)

[1] Mean and range based upon detectable measurements only. Fraction (F) of detectable measurements at specified location is indicated in parentheses.
[2] Distance and direction from the central point between the two containment buildings.
[3] Effective June 12, 2018 the ANSI 13.37 was adopted and data is normalized to mR/91 days from this point on. Prior to June 12, 2018 i.e. First quarter 2018 direct radiation was normalized to mR/90days.

III. INDEPENDENT SPENT FUEL STORAGE INSTALLATION RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

III.A. INTRODUCTION

In August 1990 BGE initiated a program of additional radiological environmental monitoring around the site for the Independent Spent Fuel Storage Installation (ISFSI). The first dry fuel storage canister was loaded into the ISFSI in November of 1993 with more canisters being loaded in subsequent years. During 2018, four additional canisters of spent fuel were transferred to the ISFSI.

Results of the monitoring program for the ISFSI for the current period are included in this report.

This report presents the content of the ISFSI REMP (Table 3), the ISFSI sampling locations (Appendix A), the summary of the analytical results of the period (Table 4), and a compilation of the analytical data for the period (Appendix B). Interpretation of the data and conclusions are presented in the body of the report.

The ISFSI monitoring program is as described in this section of the report.

The results were compared with that generated during the previous ISFSI pre-operational periods (Ref.11) and the current and previous CCNPP REMP periods. These results are discussed in more detail in Section III. C.

III.B. PROGRAM

III.B.1 Objectives

The objectives of the radiological environmental monitoring program for the ISFSI are:

a. To satisfy the community concern regarding the impact of the ISFSI on the environment,

b. To verify that radioactivity and ambient radiation levels attributable to operation of the ISFSI are within the limits specified in the Environmental Radiation Protection Standards as stated in 40CFRPart190 and 10CFR72.104,

c. To detect any measurable buildup of long-lived radionuclides in the environment due to the ISFSI,

d. To monitor and evaluate ambient radiation levels around the ISFSI, and

e. To determine whether any statistically significant increase occurs in the concentration of radionuclides near the ISFSI.

III.B.2 Sample Collection

The locations of the individual sampling sites are listed in Table A-2 and shown in Figures A-4 and A-5. All samples were collected by Exelon Industrial Services personnel according to Exelon Industrial Services Laboratory Procedures (Ref. 7).

III.B.3 Data Interpretation

Many results in environmental monitoring occur at or below the minimum detectable activity (MDA). In this report, all results at or below the relevant MDA are reported as being "less than" the MDA value.

III.B.4 Program Exceptions

A loss of sample occurred at CCNPP Visitors Center (sample code SFA2) between January 29th and February 6th due to vane failure of the pump. A new pump was installed and normal sampling operation resumed however there was a further loss of data for February 6th to February 13th due to fuse failure. An additional lost sample occurred at CCNPP Visitors Center (sample code SFA2) between November 12th and November 19th due to water having gotten into the rotometer invalidating any volume calculation. All program exception have been entered into the site's Corrective Action Program.

Direct radiation dosimeters were lost in transit for the ISFSI location (sample code SFDR08) in the 2nd quarter of this operating period. No substitute samples were collected. New dosimeters were replaced at these locations for the purposes of monitoring direct radiation per the ODCM (Ref. 6), and these program exceptions were entered into the site's Corrective Action Program.

III.C. RESULTS AND DISCUSSIONS

All the environmental samples collected were analyzed using Exelon Industrial Services laboratory procedures (Ref. 8). The analytical results for this reporting period are presented in Appendix B and are also summarized for the period in Table 4. For discussion, the analytical results are divided into three categories. The categories are the Atmospheric Environment, the Terrestrial Environment, and Direct Radiation. These categories are further divided into subcategories according to sample type (e.g., Vegetation and Soil for Terrestrial Environment).

III.C.1 Atmospheric Environment

The atmospheric environment was monitored by analyzing air particulate filters. These samples were collected from five locations surrounding the ISFSI.

No source of airborne radioiodine exists for the ISFSI. Airborne radioiodine is, therefore, not considered in assessing the radiological impact of the ISFSI.

III.C.1.a Air Particulate Filters

Weekly composite air particulate filter samples were collected from five locations during the period. These locations are On Site before the Entrance to Camp Conoy (sample code A1; in common with the CCNPP REMP), Meteorological Station (SFA1), CCNPP Visitor's Center (SFA2), NNW of the ISFSI (SFA3), and SSE of the ISFSI (SFA4). These samples were analyzed for beta radioactivity and gamma emitting radionuclides. Effective June 12, 2018 the ODCM (Ref. 6) was updated to include Meteorological Station (SFA1), NNW of the ISFSI (SFA3), and SSE of the ISFSI (SFA4) samples in common with the CCNPP REMP.

Weekly analyses for beta activity on air particulate filters collected from all five locations showed values characteristic of levels routinely observed in the REMP. These values ranged from 0.8×10^{-2} to 3.5×10^{-2} pCi/m^3 for the indicator locations and $0.7 \times 10^{-2}$to 3.6×10^{-2} pCi/m^3 for the control location at SFA2, Visitor's Center. The location with the highest overall mean of 1.9×10^{-2} pCi/m^3 was A1, Entrance to Camp Conoy.

Gamma spectrometric analyses of monthly composited air particulate samples was changed in May 2018 to quarterly composites. Samples analyzed exhibited no detectable concentrations of any plant-related radionuclides in any of these samples. Naturally occurring radionuclides, such as Be-7, were detected in nearly all samples.

III.C.2 Terrestrial Environment

The terrestrial environment was monitored by analyzing samples of vegetation and soil collected quarterly from the vicinity of the air sampling locations for the ISFSI.

III.C.2.a Vegetation

Vegetation samples were collected quarterly from five locations during the year. These locations are: Meteorological Station (sample code SFB1), CCNPP Visitor's Center (sample code SFB2), NNW of the ISFSI (sample code SFB3), SSE of the ISFSI (sample code SFB4), and On Site before the Entrance to Camp Conoy (sample code SFB5).

Vegetation samples were analyzed for gamma emitting radionuclides. No detectable concentrations of plant-related radionuclides were found in any of these samples. Naturally occurring radionuclides such as K-40 were detected in all samples.

III.C.2.b Soils

Soil samples were collected quarterly from five locations surrounding the ISFSI in the vicinity of the air samplers. These locations are: Meteorological Station (sample code SFS1), CCNPP Visitor's Center (sample code SFS2), NNW of the ISFSI (sample code SFS3), SSE of the ISFSI (sample code SFS4), and On Site before the Entrance to Camp Conoy (sample code SFS5).

Soil samples were analyzed for gamma emitting radionuclides. Cesium-137 was detected in seven quarterly samples from two indicator locations and one control location. The Cs-137 concentrations ranged from 48 ± 25 to 92 ± 26 pCi/kg. While the presence of Cs 137 in these

samples may be plant-related, this range is consistent with that found to be due to the residual fallout from past atmospheric nuclear weapons testing. The activities of this radionuclide are well below the federal limits established in 40CFR190 and 10CFR72.104. These are comparable to those observed in previous annual reporting periods for the CCNPP REMP and in the earlier pre-operational data for the ISFSI. No detectable concentrations of plant-related radionuclides were found in any of these samples. Naturally occurring radionuclides such as K-40 were also detected in all these samples.

III.C.3 Direct Radiation

Direct radiation is measured by a network of TLDs surrounding the ISFSI. These TLDs are collected quarterly from nineteen locations surrounding the ISFSI, plus one control TLD location at the Visitor's Center (sample code SFDR07). The locations include On Site before the Entrance to Camp Conoy (sample code DR07, common to both the CCNPP REMP Program and the ISFSI Program) and the Meteorological Station (sample code DR30, previously a location maintained for historical continuity.) The other sampling locations are: SW of ISFSI, (sample code SFDR01); NNW of ISFSI, (sample code SFDR02); North of ISFSI, (sample code SFDR03); NE of ISFSI, (sample code SFDR04); East of ISFSI, (sample code SFDR05); ESE of ISFSI, (sample code SFDR06); NNW of ISFSI, (sample code SFDR08); SSE of ISFSI, (sample code SFDR09); NW of ISFSI, (sample code SFDR10); WNW of ISFSI, (sample code SFDR11); WSW of ISFSI, (sample code SFDR12); South of ISFSI, (sample code SFDR13); SE of ISFSI, (sample code SFDR14); ENE of ISFSI, (sample code SFDR15); SSW of ISFSI, (sample code SFDR16); NNE of ISFSI, (sample code SFDR17) and West of ISFSI, (sample code SFDR18). Sampling locations are shown on Figures A-4 and A-5.

The mean 90-day ambient radiation was reported in the first quarter of 2018. In June of 2018 the site adopted the requirements of the updated ANSI 13.34 standard which measures mean 91-day ambient radiation. The mean 91-day ambient radiation measured at the ISFSI indicator locations was 30.45 mR and ranged from 10.01 to 69.51 mR as reported in Table 4. The control location showed a 91 day mean of 13.23 mR and ranged from 12.47 to 14.10 mR. The location with the highest overall mean of 62.32 mR with a range of 51.17 to 69.51 mR was SFDR14, SE of ISFSI. These readings are consistent with those expected from the storage of spent fuel in the ISFSI.

A comparison of the average monthly radiation levels per calendar year of the ISFSI TLD data from the indicator locations with the ISFSI control location at the Visitor's Center, SFDR7, can be seen in Figure 7.

III.D. CONCLUSION

Low levels of Cs-137 were observed in the environment surrounding the ISFSI during the period. Due to the lack of Cs-134 in any samples and lack of Cs-137 in vegetation, the Cs-137 observations were attributed to fallout from past atmospheric weapons testing. No plant-related radionuclides were observed in the environs of the ISFSI.

In general, the results in the following tables continue the historical trends previously observed at the official sites of the CCNPP REMP.

FIGURE 7
Mean TLD Gamma Dose, ISFSI

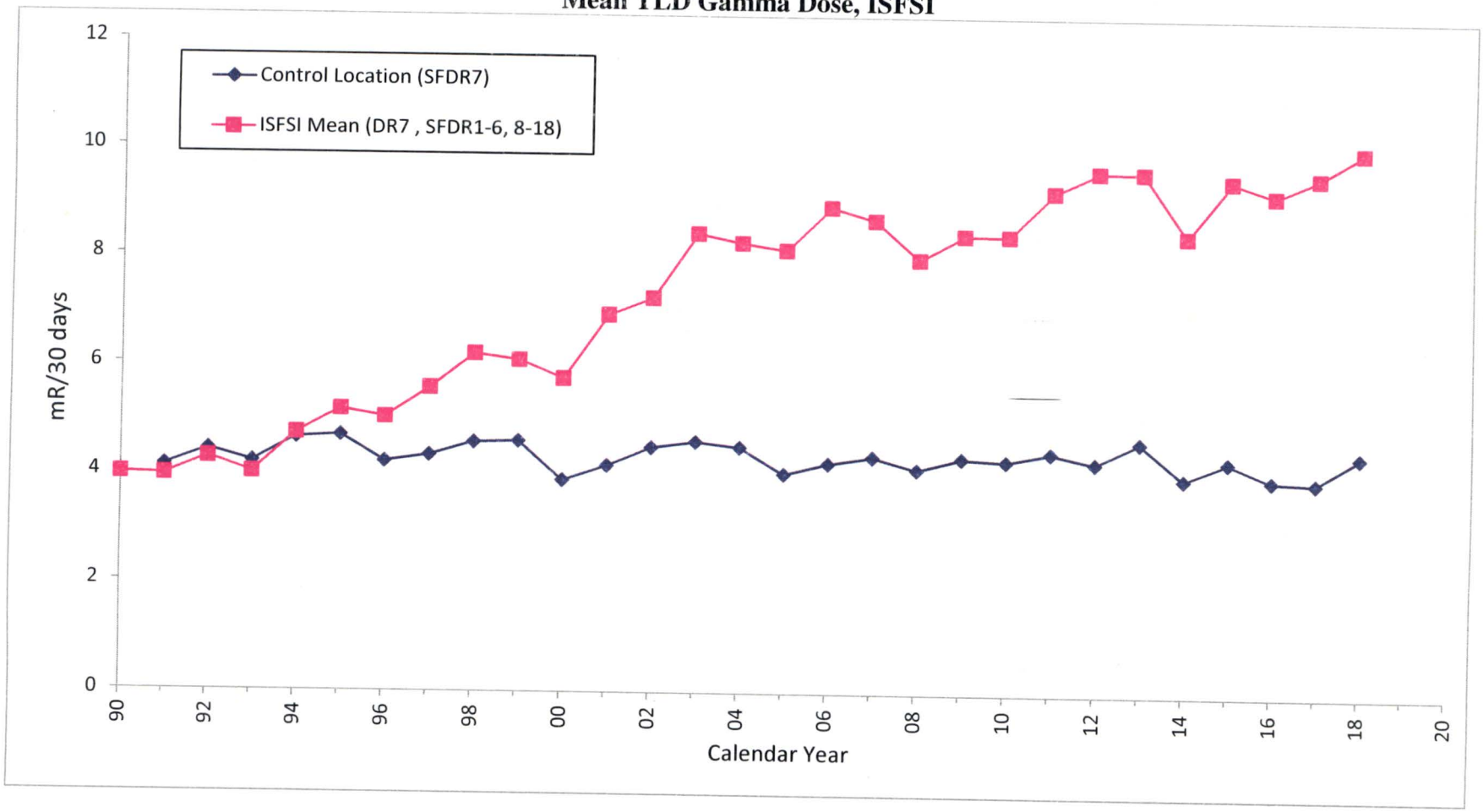


Table 3

Synopsis of 2018 Calvert Cliffs Nuclear Power Plant Independent Spent Fuel Storage Installation Radiological Environmental Monitoring Program

Sample Type	Sampling Frequency[1]	Number of Locations	Number Collected	Analysis	Analysis Frequency[1]	Number Analyzed
Atmospheric Environment						
Air Particulates[2]	W	5	257	Gross Beta	W	257
				Gamma	MC	20
				Gamma	QC	15
Direct Radiation						
Ambient Radiation	Q	20	474	TLD	Q	474
Terrestrial Environment						
Vegetation	Q	5	20	Gamma	Q	20
Soil	Q	5	20	Gamma	Q	20

[1] W=weekly, M=monthly, Q=quarterly, SA=semiannual, A=annual, C=composite

[2] Beta counting is performed after >72 hour decay, Gamma spectroscopy performed on monthly composites of weekly samples through April 2018 and then quarterly thereafter, i.e. Q2, Q3, Q4.

Table 4

Annual Summary of Radioactivity in the Environs of the Calvert Cliffs Nuclear Power Plant Independent Spent Fuel Storage Installation

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Indicator Locations Mean (F)/Range[1]	Location with Highest Annual Mean Name/Distance & Direction[2]	Highest Annual Mean (F) / Range[1]	Control Locations Mean (F)/Range
Atmospheric Environment						
Air Particulates (10^{-2} pCi/m^3)	Gross Beta (257)	0.5	1.8 (208/208) (0.8-3.5)	Entrance to Camp Conoy A1 0.7 km S	1.9 (52/52) (0.9-3.5)	1.8 (49/49) (0.7-3.6)
Direct Radiation						
Ambient Radiation (mR/91 days)[3]	TLD (474)	--	30.45 (450/450) (10.01-69.51)	SE of ISFSI SFDR14 0.1 km SE	62.32 (24/24) (51.17-69.51)	13.23 (24/24) (12.47-14.10)
Terrestrial Environment						
Soil (pCi/kg)	Gamma (20) Cs-137	17	73 (6/16) (48-92)	Entrance to Camp Conoy SFS5 0.7 km ESE	75 (3/4) (48-92)	52 (1/4) --

[1] Mean and range based upon detectable measurements only. Fraction (F) of detectable measurements at specified location is indicated in parentheses.
[2] Distance and direction from the central point between the two containment buildings.
[3] Effective June 12, 2018 the ANSI 13.37 was adopted and data is normalized to mR/91 days from this point on. Prior to June 12, 2018 i.e.first quarter 2018 direct radiation was normalized to mR/90days.

IV. REFERENCES

(1) Cohen, L. K., "Preoperational Environmental Radioactivity Monitoring Program at Calvert Cliffs Units 1 and 2", NUS No. 882 Semiannual Report January-June 1971, December 1971; NUS No. 1025 Annual Report 1971, March 1973.

(2) Cohen, L. K., "Preoperational Environmental Radioactivity Monitoring Program at Calvert Cliffs Units 1 and 2", NUS No. 1137 Annual Report 1972, December 1973.

(3) Cohen, L. K. and Malmberg, M.S., "Preoperational Environmental Radioactivity Monitoring Program at Calvert Cliffs Units 1 and 2", NUS No. 1188, Annual Report 1973, October 1974.

(4) Malmberg, M. S., "Preoperational Environmental Radioactivity Monitoring Program at Calvert Cliffs Units 1 and 2", NUS No. 1333, Data Summary Report, September 1970 to September 1974, July 1975

(5) Calvert Cliffs Nuclear Power Plant, Units 1 and 2, License Nos. DPR-53 and DPR-69, Technical Specification 5.6.2; Annual Radiological Environmental Operating Report.

(6) CY-CA-170-301 Current Revision, Offsite Dose Calculation Manual for the Calvert Cliffs Nuclear Power Plant.

(7) Exelon Industrial Services Sampling Procedures
a. CY-ES-201, Air Iodine and Air Particulate Sampling
b. CY-ES-200, TLD Annealing and Readout
c. CY-ES-203, Sample Collection for Gamma Counting: Soil, Vegetation, and Water

(8) Exelon Industrial Services Analytical Procedures
a. CY-ES-200, TLD Annealing and Readout
b. CY-ES-204, Sample Preparation for Gamma and Beta Counting
c. CY-ES-205, Gamma Counting Using the HPGe Detector with the Genie PC Counting System
d. CY-ES-206, Operation of the Tennelec SFE Proportional Counter

(9) Land Use Census Around Calvert Cliffs Nuclear Power Plant, September 2018

(10) Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specifications, Appendix A to Materials License SNM-2505

(11) Baltimore Gas and Electric Company, Radiological Environmental Monitoring Program Pre-Operational Report for the Calvert Cliffs Independent Spent Fuel Storage Installation, August 1990 - November 1993, February 1994.

(12) CY-AA-110-200, Current Revision, Sampling

(13) CY-AA-170-1000, Radiological Environmental Monitoring Program (REMP) and Meteorological Program Implementation.

(14) Teledyne Browne Engineering, (TBE) 2018 Analysis Procedures Current Revisions
a. TBE-2007 Gamma Emitting Radioisotope Analysis
b. TBE-2011 Tritium Analysis in Drinking Water by Liquid Scintillation

(15) Normandeau Associates, Inc. (NAI) Sampling Procedures Current Revisions
a. Procedure No. ER21 Collection of Fish Samples for Radiological Analysis (Calvert Cliffs Nuclear Power Plant)
b. Procedure No. ER22 Collection of Oyster Samples for Radiological Analysis (Calvert Cliffs Nuclear Power Plant)

APPENDIX A

Sample Locations for the REMP and the ISFSI

Appendix A contains information concerning the environmental samples which were collected during this operating period.

Sample locations and specific information about individual locations for the CCNPP REMP are given in Table A-1. Figure A-1 shows the location of the CCNPP in relation to Southern Maryland and the Chesapeake Bay. Figures A-2 and A-3 show the locations of the power plant sampling sites in relation to the plant site at different degrees of detail.

Sample locations and specific information about individual locations for the ISFSI radiological environmental monitoring program are given in Table A-2. Figures A-4 and A-5 show the locations of the ISFSI sampling sites in relation to the plant site at different degrees of detail.

TABLE OF CONTENTS - SAMPLING LOCATIONS

TABLE A-1

Locations of Environmental Sampling Stations for the Calvert Cliffs Nuclear Power Plant

Station	Description	Distance[1] (KM)	Distance[1] (Miles)	Direction[1] (Sector)
A1[2]	On Site Before Entrance to Camp Conoy	0.7	0.4	S
A2	Camp Conoy Rd, at emergency siren	2.5	1.6	SSE
A3	Bay Breeze Rd	2.6	1.6	SE
A4	Route 765, Lusby	2.9	1.8	SSW
A5[3]	Emergency Operations Facility	19.3	12.0	WNW
DR01	On Site, along Cliffs	0.6	0.4	NW
DR02	Route 765, Auto Dump	2.7	1.7	WNW
DR03	Route 765, Giovanni's Tavern (Knotty Pine)	2.3	1.4	W
DR04	Route 765, across from Vera's Beach Club	2.0	1.2	WSW
DR05	Route 765, John's Creek	2.4	1.5	SW
DR06	Route 765, Lusby	2.9	1.8	SSW
DR07[2]	On Site Before Entrance to Camp Conoy	0.7	0.4	S
DR08	Camp Conoy Rd at Emergency Siren	2.5	1.6	SSE
DR09	Bay Breeze Rd	2.6	1.6	SE
DR10	Calvert Beach Rd and Decatur Street	6.4	4.0	NW
DR11	Dirt road off Mackall & Parren Rd	6.6	4.1	WNW
DR12	Mackall & Bowen Rds	6.7	4.2	W
DR13	Mackall Rd, near Wallville	6.1	3.8	WSW
DR14	Rodney Point	6.4	4.0	SW
DR15	Mill Bridge & Turner Rds	6.2	3.9	SSW
DR16	Across from Appeal School	6.5	4.0	S
DR17	Cove Point & Little Cove Point Rds	5.9	3.7	SSE
DR18	Cove Point	7.1	4.4	SE
DR19	Long Beach	4.4	2.7	NW
DR20	On site, near shore	0.4	0.2	NNW
DR21	Emergency Operations Facility (EOF)	19.3	12.0	WNW
DR22	Solomons Island	12.5	7.8	S
DR23	Taylors Island, Anderson's Property	12.6	7.8	ENE
IA1, IA2	Discharge Area	0.3	0.2	N
IA3	Camp Conoy	0.9	0.6	E
IA4, IA5	Patuxent River	0.0	0.0	Various
IA6	Kenwood Beach	10.7	6.7	NNW
IB10	Meteorological Station	0.7	0.4	SW
IB11	Meteorological Station	0.7	0.4	SW
IB12	Meteorological Station	0.7	0.4	SW
IB4	On site, before entrance to Camp Conoy	0.7	0.4	S
IB5	On site, before entrance to Camp Conoy	0.7	0.4	S
IB6	On site, before entrance to Camp Conoy	0.7	0.4	S
IB7	Emergency offsite facility	19.3	12.0	WNW
IB8	Emergency offsite facility	19.3	12.0	WNW
IB9	Emergency offsite facility	19.3	12.0	WNW
SFA1[2]	Meteorological Station	0.4	0.2	NW
SFA3[2]	NNW of ISFSI	0.1	0.1	NNW
SFA4[2]	SSE of ISFSI	0.8	0.5	SSE
WA1	Intake area	0.2	0.1	NNE
WA2	Discharge area	0.3	0.2	N
WB1	Shoreline at Barge Rd.	0.6	0.4	ESE

[1] Distance and direction from the central point between the two containment buildings
[2] Common to both the REMP and ISFSI monitoring program

Figure A-1

Map of Southern Maryland and Chesapeake Bay Showing Location of Calvert Cliffs Nuclear Power Plant

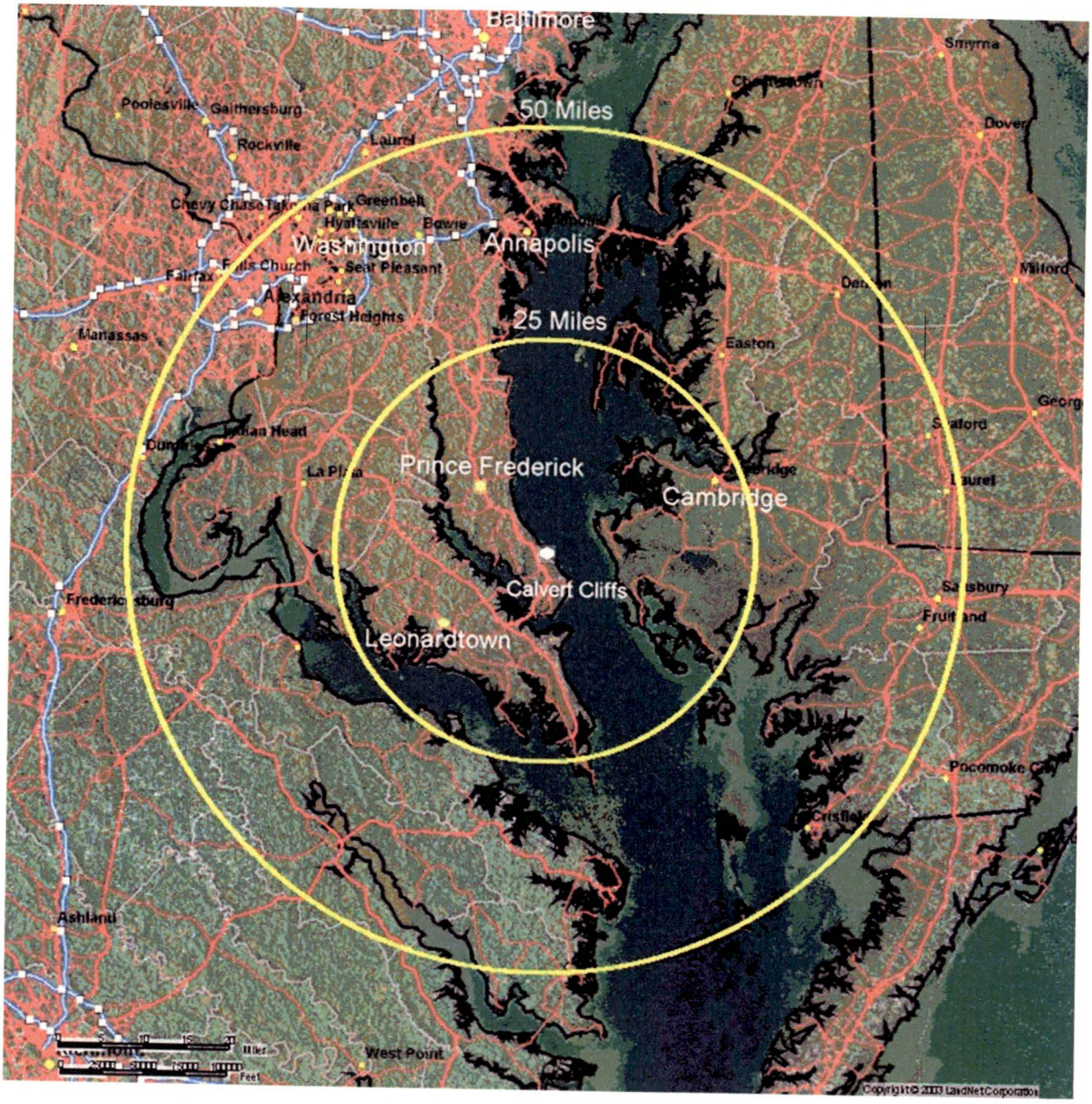


Figure A-2

Calvert Cliffs Nuclear Power Plant Sampling Locations
0-2 Miles

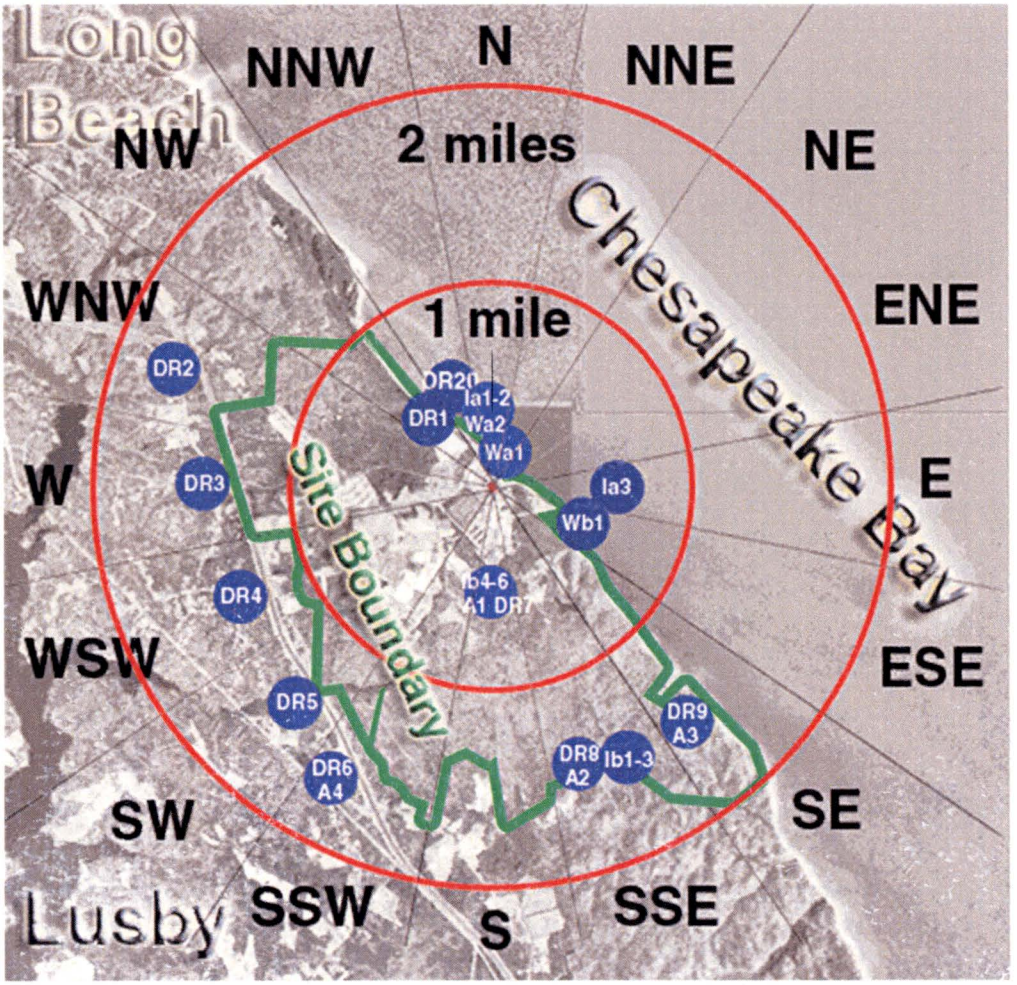


Figure A-3

Calvert Cliffs Nuclear Power Plant Sampling Locations
0-10 Miles

Table A-2

Locations of Environmental Sampling Stations for the Independent Spent Fuel Storage Installation at Calvert Cliffs

Station	Description	Distance[1] (KM)	Direction[1] (Sector)
	Air Particulate		
A1[2]	On Site Before Entrance to Camp Conoy	0.7	S
SFA1[2]	Meteorological Station	0.4	NW
SFA2	CCNPP Visitor's Center	0.7	NNE
SFA3[2]	NNW of ISFSI	0.1	NNW
SFA4[2]	SSE of ISFSI	0.1	SSE
	Direct Radiation		
DR07[2]	On Site Before Entrance to Camp Conoy	0.7	S
DR30	Meteorological Station	0.4	NW
SFDR01	SW of ISFSI	0.1	SW
SFDR02	NNW of ISFSI	0.1	N
SFDR03	North of ISFSI	0.1	N
SFDR04	NE of ISFSI	0.1	NE
SFDR05	East of ISFSI	0.1	E
SFDR06	ESE of ISFSI	0.1	ESE
SFDR07	CCNPP Visitor's Center	0.7	NNE
SFDR08	NNW of ISFSI	0.1	NNW
SFDR09	SSE of ISFSI	0.1	SSE
SFDR10	NW of ISFSI	0.1	NW
SFDR11	WNW ISFSI	0.1	WNW
SFDR12	WSW of ISFSI	0.1	WSW
SFDR13	South of ISFSI	0.1	S
SFDR14	SE of ISFSI	0.1	SE
SFDR15	ENE of ISFSI	0.1	ENE
SFDR16	SSW of ISFSI	0.1	SW
SFDR17	NNE of ISFSI	0.1	NNE
SFDR18	West of ISFSI	0.1	W
	Vegetation		
SFB1	ISFSI Vegetation Met Station	0.4	NW
SFB2	ISFSI Vegetation Visitors Center	0.7	NNE
SFB3	ISFSI Vegetation NNW of ISFSI	0.1	NNW
SFB4	ISFSI vegetation SSE of ISFSI	0.1	SSE
SFB5	On Site Before Entrance to Camp Conoy	0.7	ESE
	Soil		
SFS1	ISFSI Soil Meteorological Station	0.4	NW
SFS2	ISFSI Soil CCNPP Visitors Center	0.7	NNE
SFS3	ISFSI Soil NNW of ISFSI	0.1	NNW
SFS4	ISFSI Soil SSE of ISFSI	0.1	SSE
SFS5	ISFSI Soil On Site Before entrance to Camp Conoy	0.7	ESE

[1] Distance and direction from the central point of the ISFSI
[2] Common to both the REMP and ISFSI monitoring program

Figure A-4

Independent Spent Fuel Storage Installation Sampling Locations

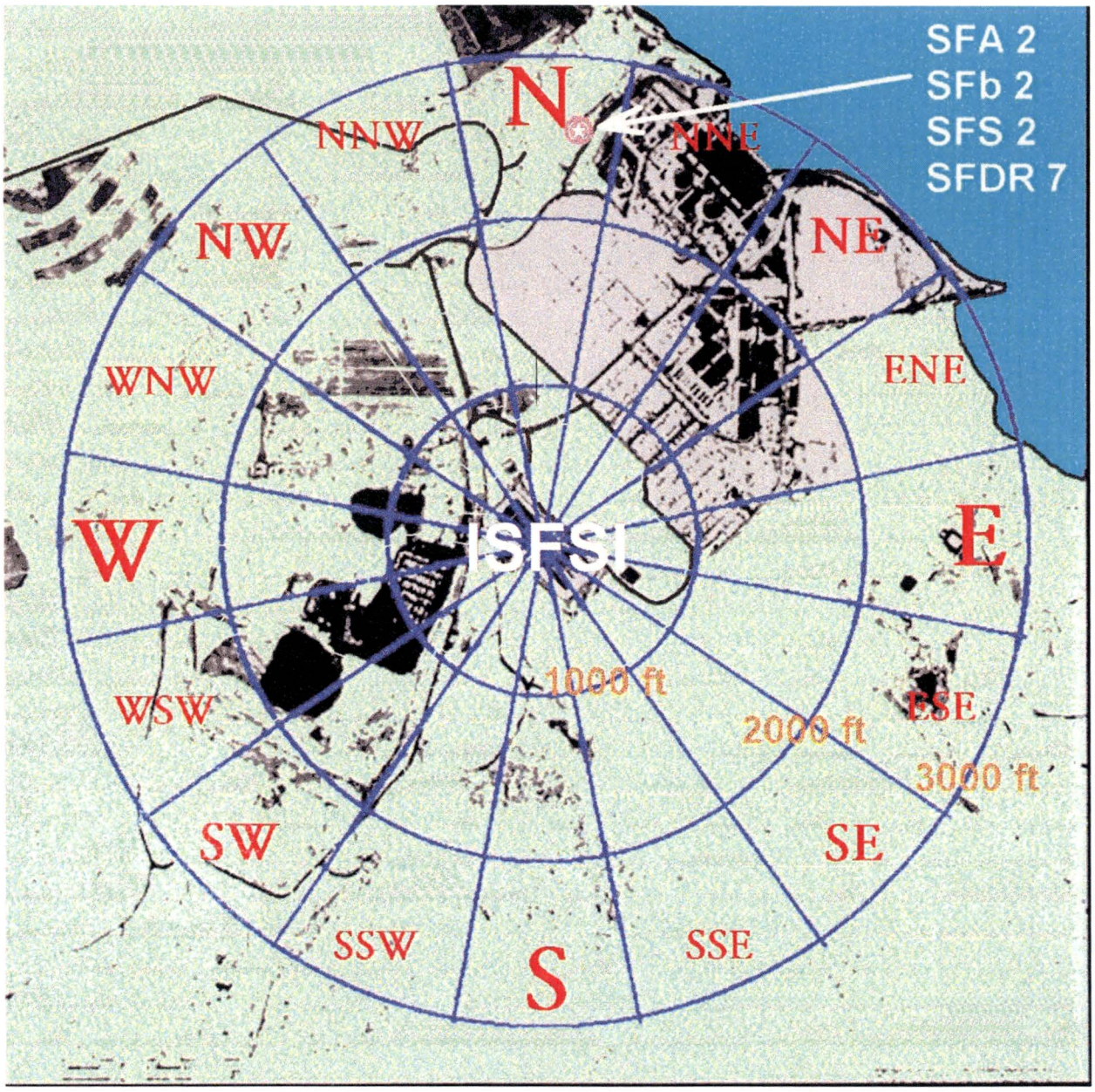
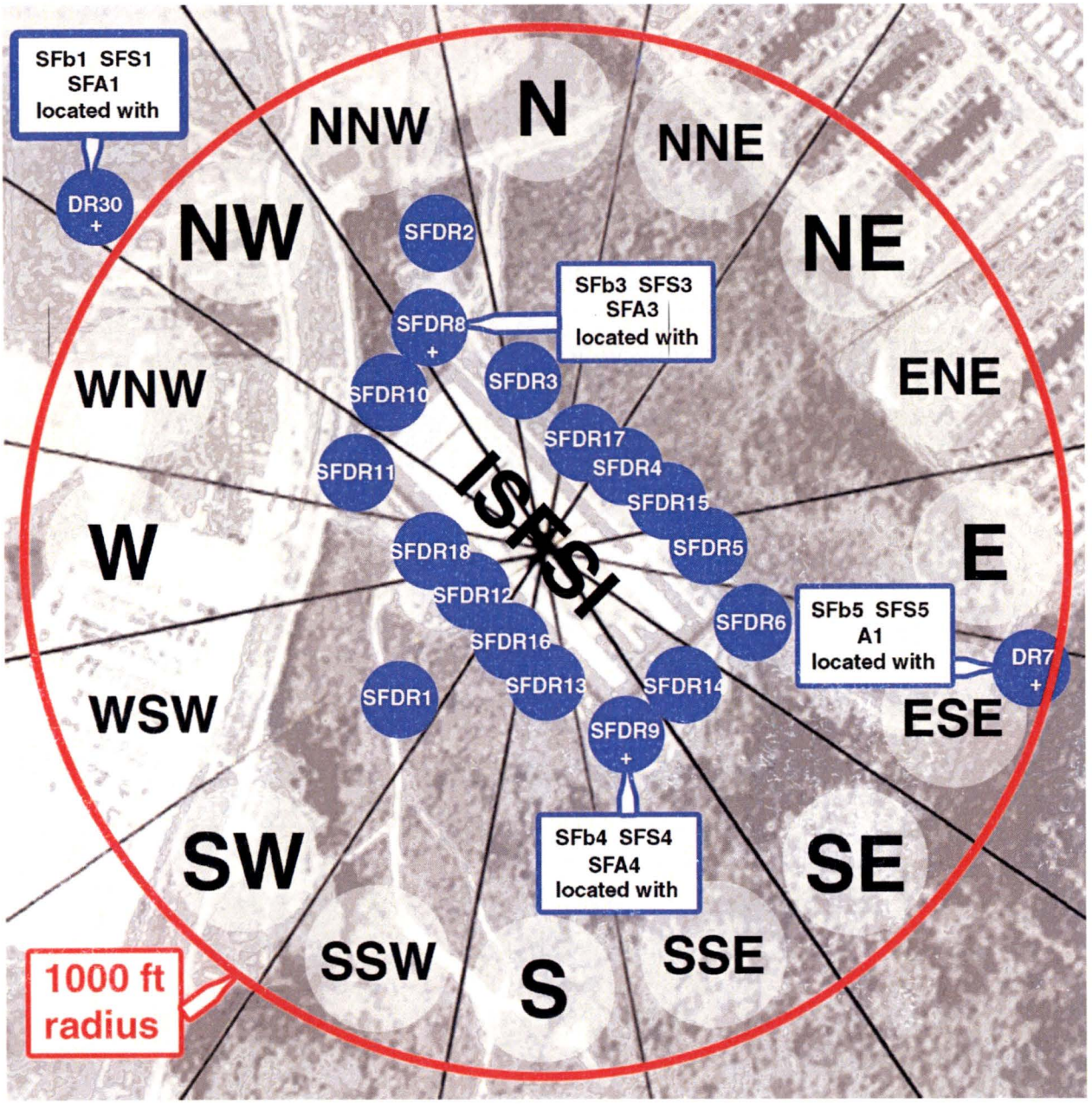


Figure A-5

Enlarged Map of the Independent Spent Fuel Storage Installation Sampling Locations



APPENDIX B
Analysis Results for the REMP and the ISFSI

Appendix B is a presentation of the analytical results for the CCNPP and the ISFSI radiological environmental monitoring programs.

TABLE OF CONTENTS - ANALYTICAL RESULTS

Table B-1

Concentration of Tritium and Gamma Emitters in Bay Water
(Results in units of pCi/L +/- 2σ)

Sample Code	Sample Date	Gamma Emitters	H-3[1]
WA1			
Intake Vicinity	2/2/2018	*	
	3/2/2018	*	
	4/2/2018	*	<183
	5/2/2018	*	
	5/31/2018	*	
	6/29/2018	*	313 +/- 132
	7/31/2018	*	
	8/31/2018	*	
	9/27/2018	*	<195
	10/31/2018	*	
	11/29/2018	*	
	12/31/2018	*	<191
WA2			
Discharge Vicinity	2/2/2018	*	
	3/2/2018	*	
	4/2/2018	*	<179
	5/2/2018	*	
	5/31/2018	*	
	6/29/2018	*	<190
	7/31/2018	*	
	8/31/2018	*	
	9/27/2018	*	<195
	10/31/2018	*	
	11/29/2018	*	
	12/31/2018	*	<189

[1] Quarterly composite of monthly samples.
* All Non-Natural Gamma Emitters <MDA

Table B-2

Concentration of Gamma Emitters in the Flesh of Edible Fish
(Results in units of pCi/kg (wet) +/- 2σ)

Sample Code	Sample Date	Sample Type	Gamma Emitters
IA1 Discharge Area	8/15/2018	Perch	*
IA2 Discharge Area	8/15/2018	Striped bass	*
IA4[1] Patuxent River	8/15/2018	Perch	*
IA5[1] Patuxent River	8/15/2018	Striped bass	*

[1] Control Location
* All Non-Natural Gamma Emitters <MDA

Table B-3

Concentration of Gamma Emitters in Oyster Samples
(Results in units of pCi/kg (wet) +/- 2σ)

Sample Code	Sample Date	Gamma Emitters
IA3		
Camp Conoy	3/29/2018	*
	6/13/2018	*
	8/15/2018	*
	10/3/2018	*
IA6[1]		
Kenwood Beach	3/29/2018	*
	6/13/2018	*
	8/15/2018	*
	10/3/2018	*

[1] Control Location
* All Non-Natural Gamma Emitters <MDA

Table B-4

Concentration of Gamma Emitters in Shoreline Sediment
(Results in units of pCi/kg (dry) +/- 2σ)

Sample Code	Sample Date	Gamma Emitters
WB1		
Shoreline at Barge Rd.	4/3/2018	*
	10/11/2018	*

* All Non-Natural Gamma Emitters <MDA

Table B-5

Concentration of Iodine-131 in Filtered Air
(Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Start Date	Stop Date	A1 Entrance to Camp Conoy	A2 Camp Conoy Siren	A3 Bay Breeze Rd	A4 Route 765 at Lusby	A5[1] EOF
1/2/2018	1/9/2018	*	*	*	*	*
1/9/2018	1/16/2018	*	*	*	*	*
1/16/2018	1/22/2018	*	*	*	*	*
1/22/2018	1/29/2018	*	*	*	*	*
1/29/2018	2/6/2018	*	*	*	*	*
2/6/2018	2/13/2018	*	*	*	*	*
2/13/2018	2/20/2018	*	*	*	*	*
2/20/2018	2/26/2018	*	*	*	*	*
2/26/2018	3/5/2018	*	*	*	*	*
3/5/2018	3/13/2018	*	*	*	*	*
3/13/2018	3/20/2018	*	*	*	*	*
3/20/2018	3/26/2018	*	*	*	*	*
3/26/2018	4/3/2018	*	*	*	*	*
4/3/2018	4/9/2018	*	*	*	*	*
4/9/2018	4/17/2018	*	*	*	*	*
4/17/2018	4/23/2018	*	*	*	*	*
4/23/2018	5/1/2018	*	*	*	*	*
5/1/2018	5/8/2018	*	*	*	*	*
5/8/2018	5/14/2018	*	*	*	*	*
5/14/2018	5/21/2018	*	*	*	*	*
5/21/2018	5/29/2018	*	*	*	*	*
5/29/2018	6/4/2018	*	*	*	*	*
6/4/2018	6/11/2018	*	*	*	*	*
6/11/2018	6/19/2018	*	*	*	*	*
6/19/2018	6/25/2018	*	*	*	*	*
6/25/2018	7/3/2018	*	*	*	*	*
7/3/2018	7/10/2018	*	*	*	*	*
7/10/2018	7/17/2018	*	*	*	*	*
7/17/2018	7/23/2018	*	*	*	*	*
7/23/2018	7/30/2018	*	*	*	*	*
7/30/2018	8/6/2018	*	*	*	*	*
8/6/2018	8/14/2018	*	*	*	*	*
8/14/2018	8/21/2018	*	*	*	2	*
8/21/2018	8/27/2018	*	*	*	*	*
8/27/2018	9/4/2018	*	*	*	*	*
9/4/2018	9/11/2018	*	*	*	*	*
9/11/2018	9/17/2018	*	*	*	*	*
9/17/2018	9/24/2018	*	*	*	*	*
9/24/2018	10/1/2018	*	*	*	*	*

Table B-5

Concentration of Iodine-131 in Filtered Air
(Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Start Date	Stop Date	A1 Entrance to Camp Conoy	A2 Camp Conoy Siren	A3 Bay Breeze Rd	A4 Route 765 at Lusby	A5[1] EOF
10/1/2018	10/10/2018	*	*	*	*	*
10/10/2018	10/15/2018	*	*	*	*	*
10/15/2018	10/22/2018	*	*	*	*	*
10/22/2018	10/29/2018	*	*	*	*	*
10/29/2018	11/6/2018	*	*	*	*	*
11/6/2018	11/12/2018	*	*	*	*	*
11/12/2018	11/19/2018	*	*	*	*	*
11/19/2018	11/26/2018	*	*	*	*	*
11/26/2018	12/3/2018	*	*	*	*	*
12/3/2018	12/10/2018	*	*	*	*	*
12/10/2018	12/18/2018	*	*	*	*	*
12/18/2018	12/26/2018	*	*	*	*	*
12/26/2018	12/31/2018	*	*	*	*	*

[1] Control Location
[2] NCR, Lost Sample
* All Non-Natural Gamma Emitters <MDA

Table B-5 - Continued

Concentration of Iodine-131 in Filtered Air - Continued
(Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Start Date	Stop Date [1]	SFA1 MET Station	SFA3 NNW of ISFSI	SFA4 SSE of ISFSI
6/11/2018	6/19/2018	*	*	*
6/19/2018	6/25/2018	*	*	*
6/25/2018	7/3/2018	*	*	*
7/3/2018	7/10/2018	*	*	*
7/10/2018	7/17/2018	*	*	*
7/17/2018	7/23/2018	*	*	*
7/23/2018	7/30/2018	*	*	*
7/30/2018	8/6/2018	*	*	*
8/6/2018	8/14/2018	*	*	*
8/14/2018	8/21/2018	*	*	*
8/21/2018	8/27/2018	*	*	*
8/27/2018	9/4/2018	*	*	*
9/4/2018	9/11/2018	*	*	*
9/11/2018	9/17/2018	*	*	*
9/17/2018	9/24/2018	*	*	*
9/24/2018	10/1/2018	*	*	*
		*	*	*
10/1/2018	10/10/2018	*	*	*
10/10/2018	10/15/2018	*	*	*
10/15/2018	10/22/2018	*	*	*
10/22/2018	10/29/2018	*	*	*
10/29/2018	11/6/2018	*	*	*
11/6/2018	11/12/2018	*	*	*
11/12/2018	11/19/2018	*	*	*
11/19/2018	11/26/2018	*	*	*
11/26/2018	12/3/2018	*	*	*
12/3/2018	12/10/2018	*	*	*
12/10/2018	12/18/2018	*	*	*
12/18/2018	12/26/2018	*	*	*
12/26/2018	12/31/2018	*	*	*

[1] Effective June 12, 2018, the ODCM was changed to move three sites formerly non-Tech Spec into the REMP Tech Specs

* All Non-Natural Gamma Emitters <MDA

Table B-6

Concentration of Beta Emitters in Air Particulates
(Results in units of 10^{-2} pCi/m^3 +/- 2σ)

Start Date	Stop Date	A1 Entrance to Camp Conoy	A2 Camp Conoy Siren	A3 Bay Breeze Rd	A4 Route 765 at Lusby	A5[1] EOF
1/2/2018	1/9/2018	2.2 +/- 0.1	2.5 +/- 0.2	2.1 +/- 0.1	1.9 +/- 0.1	2.2 +/- 0.1
1/9/2018	1/16/2018	1.8 +/- 0.1	2.5 +/- 0.3	1.8 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1
1/16/2018	1/22/2018	3.5 +/- 0.2	3.3 +/- 0.2	3.3 +/- 0.2	3.3 +/- 0.2	3.7 +/- 0.2
1/22/2018	1/29/2018	1.5 +/- 0.1	1.6 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1
1/29/2018	2/6/2018	1.6 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1	1.8 +/- 0.1	1.6 +/- 0.1
2/6/2018	2/13/2018	2.0 +/- 0.1	1.8 +/- 0.1	2.1 +/- 0.1	1.9 +/- 0.1	2.0 +/- 0.1
2/13/2018	2/20/2018	2.1 +/- 0.1	1.8 +/- 0.1	2.1 +/- 0.1	2.0 +/- 0.1	2.1 +/- 0.1
2/20/2018	2/26/2018	1.0 +/- 0.1	1.0 +/- 0.1	1.2 +/- 0.1	1.0 +/- 0.1	1.2 +/- 0.1
2/26/2018	3/5/2018	2.5 +/- 0.1	2.6 +/- 0.2	2.9 +/- 0.2	2.6 +/- 0.2	2.6 +/- 0.1
3/5/2018	3/13/2018	1.3 +/- 0.1	1.3 +/- 0.1	1.5 +/- 0.1	1.3 +/- 0.1	1.5 +/- 0.1
3/13/2018	3/20/2018	2.3 +/- 0.1	2.5 +/- 0.1	2.5 +/- 0.2	2.5 +/- 0.1	2.5 +/- 0.1
3/20/2018	3/26/2018	1.1 +/- 0.1	1.1 +/- 0.1	1.4 +/- 0.1	1.1 +/- 0.1	1.2 +/- 0.1
3/26/2018	4/3/2018	1.5 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1
4/3/2018	4/9/2018	2.0 +/- 0.1	2.1 +/- 0.1	1.9 +/- 0.1	2.0 +/- 0.1	2.1 +/- 0.1
4/9/2018	4/17/2018	1.9 +/- 0.1	1.8 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1	2.1 +/- 0.1
4/17/2018	4/23/2018	1.5 +/- 0.1	1.4 +/- 0.1	1.6 +/- 0.1	1.4 +/- 0.1	1.6 +/- 0.1
4/23/2018	5/1/2018	1.6 +/- 0.1	1.7 +/- 0.1	1.7 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1
5/1/2018	5/8/2018	2.3 +/- 0.1	2.1 +/- 0.1	2.3 +/- 0.1	2.2 +/- 0.1	2.3 +/- 0.1
5/8/2018	5/14/2018	1.8 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1	1.7 +/- 0.1	2.0 +/- 0.1
5/14/2018	5/21/2018	0.9 +/- 0.1	0.8 +/- 0.1	0.9 +/- 0.1	0.9 +/- 0.1	1.0 +/- 0.1
5/21/2018	5/29/2018	1.3 +/- 0.1	1.3 +/- 0.1	1.4 +/- 0.1	1.3 +/- 0.1	1.2 +/- 0.1
5/29/2018	6/4/2018	1.0 +/- 0.1	0.9 +/- 0.1	0.9 +/- 0.1	0.9 +/- 0.1	0.9 +/- 0.1
6/4/2018	6/11/2018	1.5 +/- 0.1	1.4 +/- 0.1	1.5 +/- 0.1	1.4 +/- 0.1	1.6 +/- 0.1
6/11/2018	6/19/2018	1.6 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1
6/19/2018	6/25/2018	1.6 +/- 0.1	1.4 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1	1.5 +/- 0.1
6/25/2018	7/3/2018	2.0 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1	2.0 +/- 0.1
7/3/2018	7/10/2018	1.5 +/- 0.1	1.5 +/- 0.1	1.5 +/- 0.1	1.3 +/- 0.1	1.5 +/- 0.1
7/10/2018	7/17/2018	2.3 +/- 0.1	2.2 +/- 0.1	2.3 +/- 0.1	2.4 +/- 0.1	2.3 +/- 0.1
7/17/2018	7/23/2018	1.3 +/- 0.1	1.3 +/- 0.1	1.2 +/- 0.1	1.2 +/- 0.1	1.3 +/- 0.1
7/23/2018	7/30/2018	1.6 +/- 0.1	1.4 +/- 0.1	1.5 +/- 0.1	1.5 +/- 0.1	1.7 +/- 0.1
7/30/2018	8/6/2018	1.4 +/- 0.1	1.3 +/- 0.1	1.2 +/- 0.1	1.2 +/- 0.1	1.4 +/- 0.1
8/6/2018	8/14/2018	2.7 +/- 0.1	2.6 +/- 0.1	2.9 +/- 0.1	3.0 +/- 0.1	2.8 +/- 0.1
8/14/2018	8/21/2018	2.6 +/- 0.1	2.4 +/- 0.1	2.6 +/- 0.1	[2]	2.7 +/- 0.1
8/21/2018	8/27/2018	2.5 +/- 0.2	2.1 +/- 0.1	2.2 +/- 0.1	1.9 +/- 0.1	2.2 +/- 0.1
8/27/2018	9/4/2018	2.5 +/- 0.1	2.4 +/- 0.1	2.6 +/- 0.1	2.4 +/- 0.1	2.6 +/- 0.1
9/4/2018	9/11/2018	2.5 +/- 0.2	1.6 +/- 0.1	1.7 +/- 0.1	1.4 +/- 0.1	1.4 +/- 0.1
9/11/2018	9/17/2018	1.0 +/- 0.1	1.0 +/- 0.1	1.0 +/- 0.1	0.9 +/- 0.1	1.0 +/- 0.1
9/17/2018	9/24/2018	1.6 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1	1.5 +/- 0.1	1.7 +/- 0.1
9/24/2018	10/1/2018	1.8 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.1

Table B-6

Concentration of Beta Emitters in Air Particulates
(Results in units of 10^{-2} pCi/m^3 +/- 2σ)

Start Date	Stop Date	A1 Entrance to Camp Conoy	A2 Camp Conoy Siren	A3 Bay Breeze Rd	A4 Route 765 at Lusby	A5[1] EOF
10/1/2018	10/10/2018	2.9 +/- 0.1	2.8 +/- 0.1	3.0 +/- 0.1	2.6 +/- 0.1	2.9 +/- 0.1
10/10/2018	10/15/2018	1.1 +/- 0.1	1.2 +/- 0.1	1.0 +/- 0.1	1.1 +/- 0.1	1.0 +/- 0.1
10/15/2018	10/22/2018	2.1 +/- 0.1	2.0 +/- 0.1	2.1 +/- 0.1	2.0 +/- 0.1	2.2 +/- 0.1
10/22/2018	10/29/2018	1.3 +/- 0.1	1.2 +/- 0.1	1.3 +/- 0.1	1.2 +/- 0.1	1.3 +/- 0.1
10/29/2018	11/6/2018	1.7 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1
11/6/2018	11/12/2018	2.0 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1
11/12/2018	11/19/2018	2.1 +/- 0.1	1.9 +/- 0.1	2.1 +/- 0.1	1.8 +/- 0.1	2.1 +/- 0.1
11/19/2018	11/26/2018	2.5 +/- 0.1	2.6 +/- 0.1	2.6 +/- 0.1	2.6 +/- 0.1	2.6 +/- 0.1
11/26/2018	12/3/2018	1.8 +/- 0.1	1.7 +/- 0.1	1.7 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1
12/3/2018	12/10/2018	1.7 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.1	1.7 +/- 0.1	1.7 +/- 0.1
12/10/2018	12/18/2018	2.3 +/- 0.1	2.5 +/- 0.1	2.1 +/- 0.1	2.3 +/- 0.1	2.5 +/- 0.1
12/18/2018	12/26/2018	2.0 +/- 0.1	2.0 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1
12/26/2018	12/31/2018	2.5 +/- 0.2	2.6 +/- 0.2	2.6 +/- 0.2	2.5 +/- 0.2	2.6 +/- 0.2

[1] Control Location
[2] NCR, Lost Sample

Table B-6 - Continued

Concentration of Beta Emitters in Air Particulates
(Results in units of 10^{-2} pCi/m^3 +/- 2σ)

Start Date	Stop Date	SFA1[3] MET Station	SFA2[1] Visitors Center	SFA3[3] NNW of ISFSI	SFA4[3] SSE of ISFSI
1/2/2018	1/9/2018	2.1 +/- 0.1	2.3 +/- 0.1	2.2 +/- 0.1	2.1 +/- 0.1
1/9/2018	1/16/2018	1.7 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1
1/16/2018	1/22/2018	3.3 +/- 0.2	3.6 +/- 0.2	3.5 +/- 0.2	3.5 +/- 0.2
1/22/2018	1/29/2018	1.6 +/- 0.1	1.5 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1
1/29/2018	2/6/2018	1.6 +/- 0.1	[2]	1.7 +/- 0.1	1.6 +/- 0.1
2/6/2018	2/13/2018	1.8 +/- 0.1	[2]	1.8 +/- 0.1	1.8 +/- 0.1
2/13/2018	2/20/2018	1.9 +/- 0.1	1.7 +/- 0.1	1.9 +/- 0.1	1.9 +/- 0.1
2/20/2018	2/26/2018	1.1 +/- 0.1	1.0 +/- 0.1	0.9 +/- 0.1	1.1 +/- 0.1
2/26/2018	3/5/2018	2.4 +/- 0.1	2.5 +/- 0.1	2.5 +/- 0.1	2.3 +/- 0.1
3/5/2018	3/13/2018	1.3 +/- 0.1	1.4 +/- 0.1	1.4 +/- 0.1	1.3 +/- 0.1
3/13/2018	3/20/2018	2.3 +/- 0.1	2.3 +/- 0.2	2.4 +/- 0.1	2.3 +/- 0.1
3/20/2018	3/26/2018	1.0 +/- 0.1	1.1 +/- 0.1	1.2 +/- 0.1	1.2 +/- 0.1
3/26/2018	4/3/2018	1.5 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1	1.5 +/- 0.1
4/3/2018	4/9/2018	2.2 +/- 0.2	2.2 +/- 0.1	2.1 +/- 0.1	1.9 +/- 0.1
4/9/2018	4/17/2018	1.8 +/- 0.1	1.9 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1
4/17/2018	4/23/2018	1.5 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1	1.5 +/- 0.1
4/23/2018	5/1/2018	1.6 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1	1.6 +/- 0.1
5/1/2018	5/8/2018	2.5 +/- 0.1	2.4 +/- 0.1	2.3 +/- 0.1	2.2 +/- 0.1
5/8/2018	5/14/2018	1.8 +/- 0.1	1.7 +/- 0.1	1.9 +/- 0.1	1.7 +/- 0.1
5/14/2018	5/21/2018	0.9 +/- 0.1	0.7 +/- 0.1	0.9 +/- 0.1	1.0 +/- 0.1
5/21/2018	5/29/2018	1.3 +/- 0.1	1.3 +/- 0.1	1.5 +/- 0.1	1.3 +/- 0.1
5/29/2018	6/4/2018	0.9 +/- 0.1	0.8 +/- 0.1	0.8 +/- 0.1	0.9 +/- 0.1
6/4/2018	6/11/2018	1.4 +/- 0.1	1.5 +/- 0.1	1.4 +/- 0.1	1.5 +/- 0.1
6/11/2018	6/19/2018	1.7 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1
6/19/2018	6/25/2018	1.6 +/- 0.1	1.6 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1
6/25/2018	7/3/2018	2.0 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	1.9 +/- 0.1
7/3/2018	7/10/2018	1.3 +/- 0.1	1.6 +/- 0.1	1.3 +/- 0.1	1.2 +/- 0.1
7/10/2018	7/17/2018	2.3 +/- 0.1	2.2 +/- 0.1	2.3 +/- 0.1	2.5 +/- 0.1
7/17/2018	7/23/2018	1.4 +/- 0.1	1.2 +/- 0.1	1.2 +/- 0.1	1.2 +/- 0.1
7/23/2018	7/30/2018	1.4 +/- 0.1	1.6 +/- 0.1	1.5 +/- 0.1	1.5 +/- 0.1
7/30/2018	8/6/2018	1.3 +/- 0.1	1.3 +/- 0.1	1.3 +/- 0.1	1.3 +/- 0.1
8/6/2018	8/14/2018	2.7 +/- 0.1	2.8 +/- 0.1	2.9 +/- 0.1	2.8 +/- 0.1
8/14/2018	8/21/2018	2.4 +/- 0.1	2.5 +/- 0.1	2.4 +/- 0.1	2.4 +/- 0.1
8/21/2018	8/27/2018	2.0 +/- 0.1	2.2 +/- 0.1	2.0 +/- 0.1	2.2 +/- 0.1
8/27/2018	9/4/2018	2.4 +/- 0.1	2.5 +/- 0.1	2.3 +/- 0.1	2.2 +/- 0.1

Table B-6 - Continued

Concentration of Beta Emitters in Air Particulates
(Results in units of 10^{-2} pCi/m^3 +/- 2σ)

Start Date	Stop Date	SFA1[3] MET Station	SFA2[1] Visitors Center	SFA3[3] NNW of ISFSI	SFA4[3] SSE of ISFSI
9/4/2018	9/11/2018	1.5 +/- 0.1	1.7 +/- 0.1	1.4 +/- 0.1	1.4 +/- 0.1
9/11/2018	9/17/2018	0.9 +/- 0.1	1.0 +/- 0.1	0.9 +/- 0.1	1.0 +/- 0.1
9/17/2018	9/24/2018	1.5 +/- 0.1	1.5 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1
9/24/2018	10/1/2018	1.7 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1	1.7 +/- 0.1
10/1/2018	10/10/2018	2.6 +/- 0.1	2.7 +/- 0.1	2.6 +/- 0.1	2.6 +/- 0.1
10/10/2018	10/15/2018	1.2 +/- 0.1	1.2 +/- 0.2	1.1 +/- 0.1	1.3 +/- 0.2
10/15/2018	10/22/2018	1.9 +/- 0.1	1.9 +/- 0.1	1.9 +/- 0.1	2.0 +/- 0.1
10/22/2018	10/29/2018	1.3 +/- 0.1	1.4 +/- 0.1	1.3 +/- 0.1	1.3 +/- 0.1
10/29/2018	11/6/2018	1.5 +/- 0.1	1.7 +/- 0.1	1.5 +/- 0.1	1.7 +/- 0.1
11/6/2018	11/12/2018	1.8 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1
11/12/2018	11/19/2018	2.0 +/- 0.1	[2]	2.0 +/- 0.1	1.9 +/- 0.1
11/19/2018	11/26/2018	2.4 +/- 0.1	2.5 +/- 0.1	2.5 +/- 0.1	2.5 +/- 0.1
11/26/2018	12/3/2018	1.8 +/- 0.1	1.8 +/- 0.1	1.9 +/- 0.1	1.8 +/- 0.1
12/3/2018	12/10/2018	1.6 +/- 0.1	1.8 +/- 0.1	1.7 +/- 0.1	1.6 +/- 0.1
12/10/2018	12/18/2018	2.3 +/- 0.1	2.5 +/- 0.1	2.6 +/- 0.1	2.3 +/- 0.1
12/18/2018	12/26/2018	1.8 +/- 0.1	2.0 +/- 0.1	2.1 +/- 0.1	1.9 +/- 0.1
12/26/2018	12/31/2018	2.4 +/- 0.2	2.7 +/- 0.2	2.6 +/- 0.2	2.6 +/- 0.2

[1] Control Location
[2] Sampler malfunction/low flow
[3] Effective June 12th, 2018, the ODCM was changed to recategorize three sites for the ISFSI program to be in common with the REMP Tech Specs.

Table B-7

Concentration of Gamma Emitters in Air Particulates
(Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Sample Date [2]	A1 Entrance to Camp Conoy	A2 Camp Conoy Siren	A3 Bay Breeze Rd	A4 Route 765 at Lusby	A5[1] EOF
1/29/2018	*	*	*	*	*
2/26/2018	*	*	*	*	*
4/3/2018	*	*	*	*	*
5/1/2018	*	*	*	*	*
7/3/2018	*	*	*	*	*
10/1/2018	*	*	*	*	*
12/31/2018	*	*	*	*	*

Sample Date[2]	SFA1 MET Station	SFA2[1] Visitors Center	SFA3 NNW of ISFSI	SFA4 SSE of ISFSI
1/29/2018	*	*	*	*
2/26/2018	*	*	*	*
4/3/2018	*	*	*	*
5/1/2018	*	*	*	*
7/3/2018[3]	*	*	*	*
10/1/2018	*	*	*	*
12/31/2018	*	*	*	*

[1] Control Location
[2] Monthly filter composites January through April and effective in May changed to quarterly composites For quarters 2, 3, and 4 2018.,
[3] Effective June 12, 2018, the ODCM was updated to include SFA1, SFA3, and SFA4 in both CCNPP REMP and ISFSI
* All Non-Natural Gamma Emitters <MDA

Table B-8a

Concentration of Gamma Emitters in Vegetation Samples
(Results in units of pCi/kg (wet) +/- 2σ)

Sample Code	Sample Date	Sample Type	Gamma Emitters
IB4			
Camp Conoy Entrance	6/19/2018	Kale	*
	7/17/2018	Cabbage	*
	8/14/2018	Cabbage	*
	9/17/2018	Leafy portion of Peppers	*
IB5			
Camp Conoy Entrance	6/19/2018	Cabbage	*
	7/17/2018	Kale	*
	8/14/2018	Collards	*
	9/17/2018	Collards	*
IB6			
Camp Conoy Entrance	6/19/2018	Collards	*
	7/17/2018	Tree Leaves	*
	8/14/2018	Kale	*
	9/17/2018	Kale	*
IB7[1]			
EOF	6/19/2018	Kale	*
	7/17/2018	Kale	*
	8/14/2018	Cabbage	*
IB8[1]			
EOF	6/19/2018	Cabbage	*
	7/17/2018	Cabbage	*
	8/14/2018	Collards	*
	9/17/2018	Leafy portion of Peppers	*
IB9[1]			
EOF	6/19/2018	Collards	*
	7/17/2018	Collards	*
	8/14/2018	Leafy portion of Peppers	*
	9/17/2018	Tree Leaves	*
IB10			
Meteorological Station	6/19/2018	Kale	*
	7/17/2018	Kale	*
	8/14/2018	Cabbage	*

Table B-8a

Concentration of Gamma Emitters in Vegetation Samples
(Results in units of pCi/kg (wet) +/- 2σ)

Sample Code	Sample Date	Sample Type	Gamma Emitters
IB11			
Meteorological Station	6/19/2018	Cabbage	*
	7/17/2018	Collards	*
	8/14/2018	Collards	*
	9/17/2018	Leafy portion of Peppers	*
IB12			
Meteorological Station	6/19/2018	Collards	*
	7/17/2018	Cabbage	*
	8/14/2018	Leafy portion of Peppers	*
	9/17/2018	Eggplant Leaves	*

[1] Control Location
* All Non-Natural Gamma Emitters <MDA

Table B-8b

Concentration of Gamma Emitters in Vegetation From Locations Around the ISFSI (Results in units of pCi/kg (wet) +/- 2σ)

Sample Code	Sample Date	Gamma Emitters
SFB1		
MET Station	3/13/2018	*
	5/29/2018	*
	8/27/2018	*
	11/19/2018	*
SFB2[1]		
Visitor's Center	3/13/2018	*
	5/29/2018	*
	8/27/2018	*
	11/19/2018	*
SFB3		
NNW of ISFSI	3/13/2018	*
	5/29/2018	*
	8/27/2018	*
	11/19/2018	*
SFB4		
SSE of ISFSI	3/13/2018	*
	5/29/2018	*
	8/27/2018	*
	11/19/2018	*
SFB5		
On Site Before Entrance to Camp Conoy	3/13/2018	*
	5/29/2018	*
	8/27/2018	*
	11/19/2018	*

[1] Control Location
* All Non-Natural Gamma Emitters <MDA

Table B-9

Concentration of Gamma Emitters in Soil Samples From Locations Around the ISFSI (Results in units of pCi/kg (dry) +/- 2σ

Sample Code	Sample Date	Cs-137	Gamma Emitters
SFS1			
MET station	3/13/2018	[1]	*
	5/29/2018	[1]	*
	8/27/2018	[1]	*
	11/19/2018	[1]	*
SFS2[2]			
Visitors Center	3/13/2018	[1]	*
	5/29/2018	52 +/- 36	*
	8/27/2018	[1]	*
	11/19/2018	[1]	*
SFS3			
NNW of ISFSI	3/13/2018	[1]	*
	5/29/2018	78 +/- 35	*
	8/27/2018	52 +/- 31	*
	11/19/2018	85 +/- 55	*
SFS4			
SSE of ISFSI	3/13/2018	[1]	*
	5/29/2018	[1]	*
	8/27/2018	[1]	*
	11/19/2018	[1]	*
SFS5			
Entrance to Camp			
Conoy	3/13/2018	48 +/- 25	*
	5/29/2018	92 +/- 26	*
	8/27/2018	86 +/- 25	*
	11/19/2018	[1]	*

[1] This isotope <MDA
[2] Control Location
* All Non-Natural Gamma Emitters <MDA

Table B-10

Typical MDA Ranges for Gamma Spectrometry

Selected Nuclides	Air Particulates (10^{-2} pCi/m^3)	Bay Water, Surface Water, Drinking Water (pCi/L)	Fish (pCi/kg) Wet	Ground water (pCi/L)	Milk (pCi/L)	Oysters (pCi/kg)	Shoreline Sediment (pCi/kg)Dry	Soil (pCi/kg) Dry	Vegetation (pCi/L) Wet
Na-22	0.03 - 0.47	3.1 - 5.1	9.6 - 25.7	3.6 - 5.2	5 - 7.3	5.9 - 23.6	27.1 - 74.8	33.9 - 90.3	11.1 - 32.3
K-40	0.16 – 8.09	32.2 - 58.8	69.2 - 212	41.4 - 63	40.4 - 61.7	70.8 - 204	300 - 749	308 - 744	91.8 - 270
Cr-51	1.31 – 11.0	27.6 - 43.3	74 - 267	29.4 - 39.8	36.9 - 52.5	25.8 - 285	477 - 1303	507 - 1486	29.2 - 327
Mn-54	0.03 – 0.52	3 - 4.6	6.9 - 36.2	3.2 - 4.8	3.9 - 5.6	9.4 - 21.7	27.0 - 69.9	32.7 - 82.6	8.9 - 28.2
Co-58	0.05 – 0.73	3.1 - 4.7	8.6 - 38.6	3.2 - 4.8	4.1 - 5.7	7.4 - 30	38.6 - 96.8	38.1 - 109	8.2 - 30.5
Fe-59	0.21 – 2.35	6.8 - 10.4	26.8 - 97.6	7.1 - 10.8	10.1 - 14.3	14.3 - 87.1	96.7 - 271	100 - 283	18.5 - 73.9
Co-60	0.03 – 0.48	3.1 - 4.7	10.2 - 33.3	3.3 - 4.9	4.5 - 6.5	10 - 21.9	26.2 - 72	31.1 - 82.5	10.1 - 29.8
Zn-65	0.08 – 1.33	6.5 - 10.3	22.5 - 82.3	7.2 - 12	10.1 - 15.2	23.1 - 54	81 - 196	86.9 - 240	22.2 - 68.2
Nb-95	0.14 – 1.07	3.4 - 5.3	9 - 33.5	3.6 - 5.2	4.5 - 6.2	5.3 - 31.1	64.7 - 155	62.1 - 183	6.9 - 38.9
Zr-95	0.10 – 1.01	5.3 - 8.2	15.1 - 42.8	5.8 - 8	7.1 - 9.6	10.2 - 38.9	66.7 - 166	77.4 - 192	14.2 - 53.7
Ru-106	0.30 – 396	25.8 - 40.9	65.3 - 170	28.6 - 40.8	33.6 - 47.6	42.7 - 159	226 - 560	292 - 699	77.4 - 236
Ag-110m	0.03 – 0.43	2.9 - 4.5	7.8 - 20.2	3.2 - 4.5	3.7 - 5.2	5.1 - 18.3	26.7 - 65.1	35.2 - 90	8.3 - 26.4
I-131[1]	1.85 – 137	1.7 - 10.5	0 - 466	5.1 - 8.8	0.4 - 11.1	0 - 1046	294 - 4372	0 - 3833	0 - 583
Cs-134	0.03 – 0.40	2.9 - 4.4	7.7 - 30.1	3.2 - 4.6	3.6 - 5.3	8.5 - 21.4	41.6 - 66.6	44.5 - 84.4	10.2 - 27.5
Cs-137	0.03 – 0.43	3.2 - 4.9	7.7 - 36.6	3.5 - 5	4 - 5.7	9.7 - 21.4	42 - 59.7	40.6 - 87.2	11.2 - 29.3
Ba-140	1.01 - 17.2	5.1 - 14.2	0 - 145	5.8 - 9.7	7.8 - 28	0 - 199	274 - 1006	44.9 - 1198	0 - 175
La-140	1.01 - 17.2	6.1 - 10.6	0 - 142.5	5.8 - 9.7	6.3 - 10.9	0 - 199	274 - 1006	45.0 - 1198	0 - 174
Ce-144	0.12 – 2.05	16.2 - 30.9	39.4 - 110	19.8 - 26.6	22.7 - 37.2	27.3 - 112	128 - 314	187 - 435	42 - 127

[1] This MDA range for I-131 on a charcoal cartridge is typically 3.94 x 10^{-3} to 6.10 x 10^{-2} pCi/m^3

Table B-11
Typical LLDs for Gamma Spectrometry

Selected Nuclides	Air Particulates 10-3 pCi/m3	Bay Water, Surface Water, Drinking Water pCi/L	Fish pCi/kg (wet)	Ground water pCi/L	Milk pCi/L	Oysters pCi/kg (wet)	Soil pCi/kg (dry)	Vegetation pCi/kg (dry)
Na-22	2.9	2.9	22	2.9	6	22	24	35
Cr-51	12	17	88	17	30	88	110	162
Mn-54	2.1	2.4	17	2.4	5	17	18	27
Co-58	2	2.4	16	2.4	5	16	17	25
Fe-59	4.6	5.2	37	5.2	11	37	38	60
Co-60	2.7	2.8	22	2.8	6	22	21	33
Zn-65	2.8	5.6	23	5.6	12	23	54	66
Nb-95	1.9	2.2	15	2.2	4	15	18	25
Zr-95	3.3	3.8	27	3.8	8	27	29	44
Ru-106	17	20	135	20	39	135	146	223
Ag-110m	1.8	2.1	14	2.1	4	14	16	25
Te-129m	20	26	149	26	50	149	180	265
I-131	1.5*	2**	11	2	4**	11	14	20
Cs-134	1.9	2.2	15	2.2	4	15	20	24
Cs-137	1.8	2.3	15	2.3	5	15	17	27
Ba-140	6.1	7.3	48	7.3	5	48	54	80
La-140	3.4	4.1	26	4.1	5	26	25	41
Ce-144	5.5	12	43	12	20	43	75	101

* The LLD for I-131 measured on a charcoal cartridge is 2.0 $x10^{-3}$ pCi/m^3
** The LLD for Low Level I-131 measured in drinking water and milk is 0.3 pCi/L

Table B-12

Direct Radiation
(Results in Units of mR/91 days +/- 2σ)

Site Code	Location	First Quarter[1]	Second Quarter	Third Quarter	Fourth Quarter
DR01	On Site, along Cliffs	12.24 +/- 0.79	12.54 +/- 1.24	12.72 +/- 1.00	14.12 +/- 1.38
DR02	Route 765, Auto Dump	10.62 +/- 1.10	10.02 +/- 1.02	10.83 +/- 0.57	11.43 +/- 0.60
DR03	Route 765, Giovanni's Tavern (Knotty Pine)	10.84 +/- 1.14	10.43 +/- 1.04	10.82 +/- 1.14	*
DR04	Route 765, across from Vera's Beach Club	11.75 +/- 0.73	11.96 +/- 0.48	12.26 +/- 1.28	13.45 +/- 1.07
DR05	Route 765, John's Creek	11.61 +/- 1.07	11.83 +/- 1.18	12.10 +/- 0.78	13.19 +/- 0.70
DR06	Route 765 at Lusby	10.04 +/- 0.72	10.14 +/- 0.68	10.48 +/- 1.33	10.95 +/- 0.79
DR07	Entrance to Camp Conoy	10.01 +/- 0.83	10.54 +/- 0.80	10.93 +/- 0.50	11.35 +/- 0.68
DR08	Camp Conoy Rd at Emergency Siren	14.03 +/- 1.10	13.99 +/- 0.95	14.02 +/- 1.46	15.51 +/- 1.42
DR09	Bay Breeze Rd	10.30 +/- 0.78	10.19 +/- 0.50	10.35 +/- 0.64	11.42 +/- 0.63
DR10	Calvert Beach Rd and Decatur Street	10.56 +/- 0.80	10.25 +/- 0.43	10.62 +/- 0.91	11.64 +/- 0.99
DR11	Dirt road off Mackall & Parren Rd	10.64 +/- 1.01	10.66 +/- 0.96	11.28 +/- 1.32	12.05 +/- 0.85
DR12	Mackall & Bowen Rds	10.76 +/- 0.87	10.66 +/- 0.72	10.64 +/- 1.12	11.65 +/- 0.30
DR13	Mackall Rd, near Wallville	11.83 +/- 1.17	12.29 +/- 0.58	11.71 +/- 0.19	13.83 +/- 0.96

Table B-12

Direct Radiation
(Results in Units of mR/91 days +/- 2σ)

Site Code	Location	First Quarter[1]	Second Quarter	Third Quarter	Fourth Quarter
DR14	Rodney Point	12.17 +/- 1.01	11.70 +/- 0.83	11.89 +/- 1.37	12.98 +/- 0.62
DR15	Mill Bridge & Turner Rds	11.18 +/- 0.33	11.96 +/- 0.90	11.54 +/- 1.10	12.84 +/- 1.28
DR16	Across from Appeal School	*	10.82 +/- 0.61	11.29 +/- 0.18	15.93 +/- 2.81
DR17	Cove Point & Little Cove Point Rds	13.08 +/- 1.74	13.62 +/- 0.71	13.24 +/- 0.89	16.56 +/- 1.40
DR18	Cove Point	9.60 +/- 1.10	9.29 +/- 1.02	9.75 +/- 0.74	10.29 +/- 0.61
DR19	Long Beach	10.25 +/- 1.00	10.29 +/- 0.68	10.49 +/- 0.71	11.48 +/- 1.38
DR20	On site, near shore	13.23 +/- 0.83	13.49 +/- 0.83	13.18 +/- 0.98	14.02 +/- 0.88
DR21[2]	EOF	12.26 +/- 0.75	12.25 +/- 0.74	12.86 +/- 1.05	13.54 +/- 0.19
DR22[2]	Solomons Island	11.11 +/- 0.91	11.13 +/- 0.95	11.57 +/- 0.95	12.10 +/- 0.73
DR23[2]	Taylors Island	14.40 +/- 1.49	14.83 +/- 1.20	15.03 +/- 0.90	17.25 +/- 1.65
DR30	MET Station	11.20 +/- 1.12	11.52 +/- 0.58	11.27 +/- 1.16	14.76 +/- 1.87
SFDR01	SW of ISFSI	14.87 +/- 1.76	16.30 +/- 0.74	16.42 +/- 1.75	17.56 +/- 1.59
SFDR02	NNW of ISFSI	17.94 +/- 2.34	17.87 +/- 2.53	18.95 +/- 2.23	19.46 +/- 1.41
SFDR03	North of ISFSI	34.77 +/- 5.30	30.11 +/- 3.37	26.27 +/- 2.95	40.92 +/- 16.08
SFDR04	NE of ISFSI	32.49 +/- 5.01	33.18 +/- 4.48	34.55 +/- 4.46	34.97 +/- 5.40
SFDR05	East of ISFSI	24.18 +/- 4.29	23.90 +/- 5.30	23.82 +/- 4.68	24.01 +/- 1.45

Table B-12

Direct Radiation
(Results in Units of mR/91 days +/- 2σ)

Site Code	Location	First Quarter[1]	Second Quarter	Third Quarter	Fourth Quarter
SFDR06	ESE of ISFSI	19.91 +/- 2.44	21.02 +/- 1.99	19.04 +/- 2.49	20.55 +/- 2.16
SFDR07[2]	Visitor's Center	12.56 +/- 1.15	12.47 +/- 1.26	13.79 +/- 0.68	14.10 +/- 0.96
SFDR08	NNW of ISFSI	24.13 +/- 4.11	*	22.93 +/- 2.23	26.34 +/- 3.96
SFDR09	SSE of ISFSI	48.74 +/- 7.89	43.34 +/- 7.20	39.04 +/- 3.83	42.94 +/- 4.29
SFDR10	NW of ISFSI	29.61 +/- 3.02	31.04 +/- 5.61	22.69 +/- 1.80	25.88 +/- 2.05
SFDR11	WNW ISFSI	22.39 +/- 2.71	23.64 +/- 2.01	22.68 +/- 1.63	25.82 +/- 2.61
SFDR12	WSW of ISFSI	39.12 +/- 7.06	37.03 +/- 3.93	41.95 +/- 9.78	48.55 +/- 15.69
SFDR13	South of ISFSI	30.51 +/- 3.00	28.49 +/- 0.88	27.05 +/- 6.22	42.08 +/- 8.29
SFDR14	SE of ISFSI	69.51 +/- 27.04	62.17 +/- 41.41	51.17 +/- 2.10	66.41 +/- 1.38
SFDR15	ENE of ISFSI	27.75 +/- 5.60	25.70 +/- 4.94	25.04 +/- 4.79	27.84 +/- 6.73
SFDR16	SSW of ISFSI	45.00 +/- 5.03	45.97 +/- 9.57	46.79 +/- 10.46	53.07 +/- 15.42
SFDR17	NNE of ISFSI	36.06 +/- 8.08	39.05 +/- 5.52	35.89 +/- 4.08	43.77 +/- 12.18
SFDR18	West of ISFSI	39.86 +/- 5.75	43.15 +/- 6.16	36.97 +/- 4.47	42.22 +/- 6.22

[1] mR/90days as customary prior to adopting ANSI 13.34
[2] Control Location
* TLD missing

APPENDIX C

Quality Assurance Program

Appendix C is a summary of Exelon Industrial Services (EIS) laboratory's quality assurance program. It consists of Table C-1 which is a compilation of the results of the EIS laboratory's participation in an interlaboratory comparison program with Environmental Resource Associates (ERA) located in Arvada, Colorado and Eckert and Ziegler Analytics, Inc. (EZA) located in Atlanta, Georgia. It also includes Table C-2, which is a compilation of the results of the EIS laboratory's participation in a split sample program with Teledyne Brown Engineering located in Knoxville, Tennessee, and Table C-3, which is a list of typical MDAs achieved by Teledyne Brown for Gamma Spectroscopy.

All the EIS laboratory's results contained in Table C-1 agree with the interlaboratory's comparison results within the range of $\pm 2\sigma$ of each other. In addition, all the sets of intercomparison results in the table are in full agreement when they were further evaluated using the NRC Resolution Test Criteria[1]. The uncertainties for the EIS laboratory's results and Analytics' results are $\pm 2\sigma$ while the ERA laboratory's uncertainty is based on USEPA guidelines[2].

All the results contained in Table C-2 agree within the range of $\pm 2\sigma$ of each other with their respective EIS Laboratory original, replicate and/or Teledyne Brown Engineering's split laboratory samples. The comparison of a soil sample SFS3 collected on 5/29/18 was in full agreement with the split laboratory sample positive for Cs-137 at 77.8 ± 35.3pCi/kg and 106 ± 53.6pCi/kg respectively. The replicate analysis showed no Cs 137 observed however the MDA value of 110pCi/kg was within the acceptable range of the positive results of the original and split sample in accordance with the NRC Radiochemical Acceptance Criteria for Split Samples [1]. Other samples whose nature generally preclude sample splitting are marked "**" in the Split Analysis column.

[1] NRC Inspection Manual, Inspection Procedure 84750, March 15, 1994
[2] National Standards for Water Proficiency Testing Studies Criteria Document, December 1998

TABLE OF CONTENTS - ANALYTICAL RESULTS

Table C-1

Results of Participation in Cross Check Programs

Sample Date	Sample Type and Units	Isotope Observed	Reported Laboratory's Results	Cross Check Lab Results
03/15/18	Air Iodine - pCi	I-131	85.2 +/- 6.0	94.3
03/15/18	Milk - pCi/L	Co-60	192 +/- 13.0	187
		Mn-54	140 +/- 15.0	131
		Fe-59	148 +/- 20.0	139
		Co-58	118 +/- 16.0	114
		Cr-51	317 +/- 89.0	326
		Zn-65	264 +/- 33.0	244
		I-131	106 +/- 18.0	108
		Cs-134	178 +/- 11.0	180
		Cs-137	176 +/- 17.0	172
		Ce-141	80.0 +/- 15.0	77.0
03/15/18	Water - pCi/L	Gross Beta	272 +/- 488	275
04/09/18	Water - pCi/L	Co-60	70.0 +/- 4.0	64.3
		Zn-65	95.9 +/- 10.0	86.7
		I-131	24.1 +/- 7.0	24.6
		Ba-133	88.0 +/- 4.0	91.5
		Cs-137	131 +/- 6.0	123
		Cs-134	81.1 +/- 3.0	75.9
06/07/18	Air Filter - pCi	Fe-59	173 +/- 30.0	155
		Co-58	158 +/- 14.0	160
		Cr-51	437 +/- 70.0	160
		Ce-141	153 +/- 10.0	148
		Cs-137	179 +/- 14.0	178
		Cs-134	193 +/- 10.0	204
		Zn-65	268 +/- 30.0	283
		Mn-54	236 +/- 15.0	233
		Co-60	200 +/- 12.0	204

Table C-1

Results of Participation in Cross Check Programs

Sample Date	Sample Type and Units	Isotope Observed	Reported Laboratory's Results	Cross Check Lab Results
06/07/18	Water - pCi/L	Mn-54	132 +/- 13.0	135
		Fe-59	97.4 +/- 16.0	89.7
		Co-58	87.9 +/- 13.0	92.9
		Co-60	112 +/- 24.0	118
		Zn-65	171 +/- 24.0	164
		I-131	77.0 +/- 33.0	74.1
		Cs-134	101 +/- 8.0	119
		Cs-137	106 +/- 13.0	103
		Ce-141	90.4 +/- 14.0	85.8
		Cr-51	259 +/- 90.0	249
06/07/18	Water - pCi/L	Gross Beta	216 +/- 4.4	251
07/09/18	Water - pCi/L	H-3	216 +/- 11.6	204
09/13/18	Air Filter - pCi/m^3	Gross Beta	220 +/- 3.1	211
09/18/18	Air Filter - pCi	Cs-134	870 +/- 23.5	921
		Zn-65	696 +/- 49.2	660
		Co-60	1178 +/- 28.2	1130
		Cs-137	403 +/- 20.7	373
		Am-241	52.3 +/- 18.5	64.1
10/05/18	Water - pCi/L	Co-60	80.2 +/- 4.0	80.7
		Zn-65	318 +/- 8.0	336
		Cs-134	87.9 +/- 3.3	93.0
		Cs-137	223 +/- 8.2	235
		Ba-133	13.4 +/- 3.6	16.3
		I-131	28.1 +/- 4.0	27.2

Table C-1

Results of Participation in Cross Check Programs

Sample Date	Sample Type and Units	Isotope Observed	Reported Laboratory's Results	Cross Check Lab Results
12/06/18	Air Filter - pCi	Fe-59	97.9 +/- 10.1	83.4
		Cr-51	226 +/- 33.2	217
		Ce-141	97.9 +/- 6.4	97.0
		Cs-137	98.8 +/- 8.4	88.2
		Cs-134	112 +/- 5.6	125
		Zn-65	201 +/- 19.0	193
		Co-60	158 +/- 8.1	155
		Co-58	85.7 +/- 7.9	86.5
		Mn-54	123 +/- 9.0	112
12/06/18	Air Iodine - pCi	I-131	86.2 +/- 8.0	89.7
12/06/18	Milk - pCi/L	Ce-141	145 +/- 19.0	133
		Mn-54	178 +/- 23.3	154
		Cs-134	193 +/- 15.2	171
		I-131	95.8 +/- 16.1	93.3
		Co-60	215 +/- 17.6	212
		Co-58	123 +/- 19.8	119
		Cr-51	372 +/- 105.1	298
		Fe-59	127 +/- 23.6	114
		Cs-137	141 +/- 21.3	121
		Zn-65	242 +/- 41.0	264
12/06/18	Water - pCi/L	Gross Beta	257 +/- 4.4	295

[1] See discussion at the beginning of the Appendix

Table C-2

Results of Quality Assurance Program

Sample Type and Location	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Iodine - A1	01/01/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	01/01/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	01/01/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	01/01/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	01/01/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	01/01/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	01/16/18	Gross Beta	pCi/m^3	1.8 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A2	01/16/18	Gross Beta	pCi/m^3	2.5 +/- 0.3	2.7 +/- 0.3	**
Air Filter - A3	01/16/18	Gross Beta	pCi/m^3	1.8 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A4	01/16/18	Gross Beta	pCi/m^3	1.8 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A5	01/16/18	Gross Beta	pCi/m^3	1.9 +/- 0.1	1.9 +/- 0.1	**
Air Filter - SFA1	01/16/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA2	01/16/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.8 +/- 0.1	**
Air Filter - SFA3	01/16/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.9 +/- 0.1	**
Air Filter - SFA4	01/16/18	Gross Beta	pCi/m^3	1.8 +/- 0.1	1.8 +/- 0.1	**
Air Iodine - A1	01/16/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	01/16/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	01/16/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	01/16/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	01/16/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	01/16/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A1	02/06/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	02/06/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	02/06/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	02/20/18	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.1 +/- 0.1	**
Air Filter - A2	02/20/18	Gross Beta	pCi/m^3	1.8 +/- 0.1	2.0 +/- 0.1	**
Air Filter - A3	02/20/18	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.2 +/- 0.1	**
Air Filter - A4	02/20/18	Gross Beta	pCi/m^3	2.0 +/- 0.1	2.2 +/- 0.1	**
Air Filter - A5	02/20/18	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.2 +/- 0.1	**
Air Filter - SFA1	02/20/18	Gross Beta	pCi/m^3	1.9 +/- 0.1	2.0 +/- 0.1	**
Air Filter - SFA2	02/20/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.8 +/- 0.1	**

Table C-2

Results of Quality Assurance Program

Sample Type and Location	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - SFA3	02/20/18	Gross Beta	pCi/m^3	1.9 +/- 0.1	2.0 +/- 0.1	**
Air Filter - SFA4	02/20/18	Gross Beta	pCi/m^3	1.9 +/- 0.1	1.9 +/- 0.1	**
Air Filter - A1	03/05/18	Gross Beta	pCi/m^3	2.5 +/- 0.1	2.5 +/- 0.2	**
Air Filter - A2	03/05/18	Gross Beta	pCi/m^3	2.6 +/- 0.2	2.7 +/- 0.2	**
Air Filter - A3	03/05/18	Gross Beta	pCi/m^3	2.9 +/- 0.2	2.9 +/- 0.2	**
Air Filter - A4	03/05/18	Gross Beta	pCi/m^3	2.6 +/- 0.2	2.7 +/- 0.2	**
Air Filter - A5	03/05/18	Gross Beta	pCi/m^3	2.6 +/- 0.1	2.6 +/- 0.2	**
Air Filter - SFA1	03/05/18	Gross Beta	pCi/m^3	2.4 +/- 0.1	2.4 +/- 0.1	**
Air Filter - SFA2	03/05/18	Gross Beta	pCi/m^3	2.5 +/- 0.1	2.6 +/- 0.1	**
Air Filter - SFA3	03/05/18	Gross Beta	pCi/m^3	2.5 +/- 0.1	2.5 +/- 0.1	**
Air Filter - SFA4	03/05/18	Gross Beta	pCi/m^3	2.3 +/- 0.1	2.4 +/- 0.1	**
Air Iodine - A1	03/13/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	03/13/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	03/13/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	03/13/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	03/13/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	03/13/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	04/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A2	04/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A3	04/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A4	04/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A5	04/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA1	04/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA2	04/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA3	04/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA4	04/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A1	04/09/18	Gross Beta	pCi/m^3	2.0 +/- 0.1	2.0 +/- 0.1	**
Air Filter - A2	04/09/18	Gross Beta	pCi/m^3	2.1 +/- 0.1	1.9 +/- 0.1	**
Air Filter - A3	04/09/18	Gross Beta	pCi/m^3	1.9 +/- 0.1	2.0 +/- 0.1	**
Air Filter - A4	04/09/18	Gross Beta	pCi/m^3	2.0 +/- 0.1	2.0 +/- 0.1	**

Table C-2

Results of Quality Assurance Program

Sample Type and Location	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - A5	04/09/18	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.1 +/- 0.1	**
Air Filter - SFA1	04/09/18	Gross Beta	pCi/m^3	2.2 +/- 0.2	2.1 +/- 0.2	**
Air Filter - SFA2	04/09/18	Gross Beta	pCi/m^3	2.2 +/- 0.1	2.0 +/- 0.1	**
Air Filter - SFA3	04/09/18	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.0 +/- 0.1	**
Air Filter - SFA4	04/09/18	Gross Beta	pCi/m^3	1.9 +/- 0.1	1.9 +/- 0.1	**
Air Iodine - A1	04/17/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	04/17/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	04/17/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	04/17/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	04/17/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	04/17/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	05/08/18	Gross Beta	pCi/m^3	2.3 +/- 0.1	2.3 +/- 0.1	**
Air Filter - A2	05/08/18	Gross Beta	pCi/m^3	2.1 +/- 0.1	2.1 +/- 0.1	**
Air Filter - A3	05/08/18	Gross Beta	pCi/m^3	2.3 +/- 0.1	2.2 +/- 0.1	**
Air Filter - A4	05/08/18	Gross Beta	pCi/m^3	2.2 +/- 0.1	2.1 +/- 0.1	**
Air Filter - A5	05/08/18	Gross Beta	pCi/m^3	2.3 +/- 0.1	2.3 +/- 0.1	**
Air Filter - SFA1	05/08/18	Gross Beta	pCi/m^3	2.5 +/- 0.1	2.5 +/- 0.1	**
Air Filter - SFA2	05/08/18	Gross Beta	pCi/m^3	2.4 +/- 0.1	2.4 +/- 0.1	**
Air Filter - SFA3	05/08/18	Gross Beta	pCi/m^3	2.3 +/- 0.1	2.3 +/- 0.1	**
Air Filter - SFA4	05/08/18	Gross Beta	pCi/m^3	2.2 +/- 0.1	2.3 +/- 0.1	**
Air Iodine - A1	05/14/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	05/14/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	05/14/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	05/14/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	05/14/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	05/14/18	I-131	pCi/m^3	<MDA	<MDA	**
Misc ground coverage - SFB1	05/29/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Misc ground coverage - SFB3	05/29/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Soil - SFS1	05/29/18	Gamma	pCi/kg	<MDA	<MDA	<MDA

Table C-2

Results of Quality Assurance Program

Sample Type and Location	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Soil - SFS3 [1]	05/29/18	Cs-137	pCi/kg	77.8 +/- 35.3	**	106 +/- 53.6
Air Filter - A1	06/11/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A2	06/11/18	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - A3	06/11/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A4	06/11/18	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - A5	06/11/18	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.5 +/- 0.1	**
Air Filter - SFA1	06/11/18	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.5 +/- 0.1	**
Air Filter - SFA2	06/11/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.4 +/- 0.1	**
Air Filter - SFA3	06/11/18	Gross Beta	pCi/m^3	1.4 +/- 0.1	0.5 +/- 0.1	**
Air Filter - SFA4	06/11/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Bottom sediment - WBS2	06/13/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Bottom sediment - WBS4	06/13/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Cabbage - IB11	06/19/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Cabbage - IB5	06/19/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Cabbage - IB8	06/19/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Bay Water - WA1	06/29/18	Gamma	pCi/L	<MDA	<MDA	<MDA
Bay Water - WA2	06/29/18	Gamma	pCi/L	<MDA	<MDA	<MDA
Air Filter - A1	07/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A2	07/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A3	07/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A4	07/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - A5	07/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA1	07/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA2	07/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA3	07/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA
Air Filter - SFA4	07/03/18	Gamma	pCi/m^3	<MDA	<MDA	<MDA

Table C-2

Results of Quality Assurance Program

Sample Type and Location	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Iodine - A1	07/03/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	07/03/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	07/03/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	07/03/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	07/03/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	07/03/18	I-131	pCi/m^3	<MDA	<MDA	**
Gamma field - DR05	07/03/18	TLD	mR/91 days	11.8 +/- 1.2	10.6 +/- 1.5	**
Gamma field - DR06	07/03/18	TLD	mR/91 days	10.1 +/- 0.7	9.5 +/- 0.7	**
Gamma field - DR07	07/03/18	TLD	mR/91 days	10.5 +/- 0.8	9.9 +/- 0.4	**
Gamma field - DR08	07/03/18	TLD	mR/91 days	14.0 +/- 0.9	13.5 +/- 1.0	**
Gamma field - DR09	07/03/18	TLD	mR/91 days	10.2 +/- 0.5	9.7 +/- 1.0	**
Gamma field - DR10	07/03/18	TLD	mR/91 days	10.2 +/- 0.4	9.8 +/- 0.5	**
Gamma field - DR11	07/03/18	TLD	mR/91 days	10.7 +/- 1.0	10.5 +/- 0.8	**
Gamma field - DR29	07/03/18	TLD	mR/91 days	13.8 +/- 1.1	14.2 +/- 1.0	**
Gamma field – DR31	07/03/18	TLD	mR/91 days	15.1 +/- 1.1	17.1 +/- 1.0	**
Gamma field - SFDR14	07/03/18	TLD	mR/91 days	62.2 +/- 41.4	62.9 +/- 40.9	**
Gamma field - SFDR15	07/03/18	TLD	mR/91 days	25.7 +/- 4.9	24.5 +/- 4.3	**
Air Filter - A1	07/09/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A2	07/09/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.4 +/- 0.1	**
Air Filter - A3	07/09/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A4	07/09/18	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - A5	07/09/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Air Filter - SFA1	07/09/18	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - SFA2	07/09/18	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA3	07/09/18	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.4 +/- 0.1	**

Table C-2

Results of Quality Assurance Program

Sample Type and Location	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - SFA4	07/09/18	Gross Beta	pCi/m^3	1.2 +/- 0.1	1.4 +/- 0.1	**
Cabbage - IB12	07/17/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Cabbage - IB4	07/17/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Kale - IB10	07/17/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Air Iodine - A1	07/30/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	07/30/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	07/30/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	07/30/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	07/30/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	07/30/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Filter - A1	08/06/18	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.3 +/- 0.1	**
Air Filter - A2	08/06/18	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - A3	08/06/18	Gross Beta	pCi/m^3	1.2 +/- 0.1	1.3 +/- 0.1	**
Air Filter - A4	08/06/18	Gross Beta	pCi/m^3	1.2 +/- 0.1	1.1 +/- 0.1	**
Air Filter - A5	08/06/18	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.2 +/- 0.1	**
Air Filter - SFA1	08/06/18	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.2 +/- 0.1	**
Air Filter - SFA2	08/06/18	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - SFA3	08/06/18	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - SFA4	08/06/18	Gross Beta	pCi/m^3	1.3 +/- 0.1	1.2 +/- 0.1	**
Oysters - IA3	08/15/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Oysters - IA6	08/15/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Perch - IA4	08/15/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Striped bass - IA5	08/15/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Air Iodine - A1	08/27/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	08/27/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	08/27/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	08/27/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	08/27/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	08/27/18	I-131	pCi/m^3	<MDA	<MDA	**

Table C-2

Results of Quality Assurance Program

Sample Type and Location	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - A1	09/11/18	Gross Beta	pCi/m^3	2.5 +/- 0.2	2.4 +/- 0.2	**
Air Filter - A2	09/11/18	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A3	09/11/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A4	09/11/18	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - A5	09/11/18	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - SFA1	09/11/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.4 +/- 0.1	**
Air Filter - SFA2	09/11/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA3	09/11/18	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - SFA4	09/11/18	Gross Beta	pCi/m^3	1.4 +/- 0.1	1.4 +/- 0.1	**
Oysters - IA3	10/03/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Oysters - IA6	10/03/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Air Filter - A1	10/08/18	Gross Beta	pCi/m^3	2.9 +/- 0.1	2.8 +/- 0.1	**
Air Filter - A2	10/08/18	Gross Beta	pCi/m^3	2.8 +/- 0.1	2.6 +/- 0.1	**
Air Filter - A3	10/08/18	Gross Beta	pCi/m^3	3.0 +/- 0.1	2.9 +/- 0.1	**
Air Filter - A4	10/08/18	Gross Beta	pCi/m^3	2.6 +/- 0.1	2.6 +/- 0.1	**
Air Filter - A5	10/08/18	Gross Beta	pCi/m^3	2.9 +/- 0.1	2.9 +/- 0.1	**
Air Filter - SFA1	10/08/18	Gross Beta	pCi/m^3	2.6 +/- 0.1	2.4 +/- 0.1	**
Air Filter - SFA2	10/08/18	Gross Beta	pCi/m^3	2.7 +/- 0.1	2.6 +/- 0.1	**
Air Filter - SFA3	10/08/18	Gross Beta	pCi/m^3	2.6 +/- 0.1	2.5 +/- 0.1	**
Air Filter - SFA4	10/08/18	Gross Beta	pCi/m^3	2.6 +/- 0.1	2.5 +/- 0.1	**
Shoreline sediment - WB1	10/11/18	Gamma	pCi/kg	<MDA	<MDA	<MDA
Air Filter - A1	11/05/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A2	11/05/18	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A3	11/05/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A4	11/05/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Air Filter - A5	11/05/18	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.5 +/- 0.1	**
Air Filter - SFA1	11/05/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.5 +/- 0.1	**
Air Filter - SFA2	11/05/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA3	11/05/18	Gross Beta	pCi/m^3	1.5 +/- 0.1	1.6 +/- 0.1	**

Table C-2

Results of Quality Assurance Program

Sample Type and Location	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - SFA4	11/05/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Iodine - A1	11/12/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	11/12/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	11/12/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	11/12/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	11/12/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	11/12/18	I-131	pCi/m^3	<MDA	<MDA	**
Bay Water - WA1	11/29/18	Gamma	pCi/L	<MDA	<MDA	**
Bay Water - WA2	11/29/18	Gamma	pCi/L	<MDA	<MDA	<MDA
Air Filter - A1	12/10/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A2	12/10/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A3	12/10/18	Gross Beta	pCi/m^3	1.8 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A4	12/10/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Filter - A5	12/10/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA1	12/10/18	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA2	12/10/18	Gross Beta	pCi/m^3	1.8 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA3	12/10/18	Gross Beta	pCi/m^3	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA4	12/10/18	Gross Beta	pCi/m^3	1.6 +/- 0.1	1.5 +/- 0.1	**
Air Iodine - A1	12/18/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A2	12/18/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A3	12/18/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A4	12/18/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - A5	12/18/18	I-131	pCi/m^3	<MDA	<MDA	**
Air Iodine - SFA1	12/18/18	I-131	pCi/m^3	<MDA	<MDA	**
Gamma field - DR05	01/07/19	TLD	mR/91 days	13.2 +/- 0.7	12.2 +/- 1.1	**
Gamma field - DR06	01/07/19	TLD	mR/91 days	10.9 +/- 0.8	10.8 +/- 0.9	**
Gamma field - DR07	01/07/19	TLD	mR/91 days	11.3 +/- 0.7	10.7 +/- 0.4	**

Table C-2

Results of Quality Assurance Program

Sample Type and Location	Sample Date	Type of Analysis	Result Units	Original Analysis	Replicate Analysis	Split Analysis
Gamma field - DR08	01/07/19	TLD	mR/91 days	15.5 +/- 1.4	14.7 +/- 1.0	**
Gamma field - DR09	01/07/19	TLD	mR/91 days	11.4 +/- 0.6	10.9 +/- 0.8	**
Gamma field - DR10	01/07/19	TLD	mR/91 days	11.6 +/- 1.0	11.3 +/- 0.4	**
Gamma field - DR11	01/07/19	TLD	mR/91 days	12.1 +/- 0.8	11.6 +/- 0.9	**
Gamma field - DR23	01/07/19	TLD	mR/91 days	17.0 +/- 1.6	16.1 +/- 1.1	**
Gamma field - SFDR14	01/07/19	TLD	mR/91 days	65.6 +/- 1.4	66.3 +/- 41.7	**
Gamma field - SFDR15	01/07/19	TLD	mR/91 days	27.5 +/- 6.6	29.4 +/- 6.0	**

[1] See discussion at the beginning of the Appendix
** The nature of these samples precluded splitting them with an independent laboratory.

TABLE C-3

Teledyne Brown Engineering's Typical MDAs for Gamma Spectrometry

Selected Nuclides	Bay Water pCi/l	Fish pCi/kg	Shellfish pCi/kg	Sediment pCi/kg	Vegetation pCi/kg	Particulates 10^{-3}pCi/m^3
H-3	175	--	--	--	--	--
Na-22	1	8	3	12	6	5
Cr-51	12	105	4	104	50	63
Mn-54	1	9	3	12	5	4
Co-58	1	9	4	9	4	5
Fe-59	3	28	9	24	10	12
Co-60	1	9	4	12	5	6
Zn-65	2	20	8	25	10	9
Nb-95	1	12	7	14	6	9
Zr-95	2	18	8	20	9	9
Ru-106	9	75	30	90	41	40
Ag-110m	1	10	10	10	5	4
Te-129m	16	131	60	162	79	95
I-131	4	65	30	35	22	74
Cs-134	1	8	4	10	5	4
Cs-137	1	9	4	10	5	4
BaLa-140	3	32	15	25	14	36
Ce-144	7	40	16	54	26	18

APPENDIX D
Land Use Survey

Appendix D contains the results of a Land Use Survey conducted around Calvert Cliffs Nuclear Power Plant during this operating period. A table listing the raw data of this survey and a discussion of the results are included in this appendix.

Discussion

A Land Use Survey was conducted to identify, within a distance of 5 miles, the location of the nearest milk animal, the nearest residence, and the nearest garden greater than 50 m^2 in each of the nine sectors over land. A detailed description of the Land Use Survey is given in a separate document (Ref. 9). The position of the nearest residence and garden in each sector out to 5 miles is given in the adjacent table. An "*" denotes a change in this sector since the 2017 Land Use Census.

Table D-1
Land Use Survey

	Distance From Plant (miles)	
Sector	Residence	Garden
SE	1.5	1.5
SSE	1.6	4.2
S	1.6	1.6
SSW	1.5	1.6*
SW	1.1	2.4
WSW	1.2*	1.5*
W	1.3	1.9*
WNW	2.7	2.7
NW	2.0	2.1

The closest residence is situated in the SW sector and the nearest garden is in the WSW sector, and in the SE sector.

The owner of the WSW residence has changed since 2017.

The nearest gardens have changed since 2017 and now are each 1.5 miles from the plant in the SE and WSW sectors.

There are no animals producing milk for human consumption within the 5 mile radius. The closest beef cattle for meat consumption are 1.6 miles in the South sector.

Discussions with a local waterman indicate that oysters are still harvested in the vicinity of CCNPP.

APPENDIX E

Additional Samples and Analysis Results

Appendix E is a presentation of the analytical results for additional samples collected in the environs of CCNPP. These extra samples are not required by the ODCM (Ref. 6). Table E-1 lists the locations of all the additional samples and the remaining tables in this appendix provide the results. Some of these samples were collected and analyzed to maintain the historical continuity for samples and sampling pathways discontinued when the Environmental Technical Specifications were changed in March 1985.

Additional changes were made in the ODCM (Ref. 6) effective June 12, 2018. Radioiodine charcoal cartridges at Meteorological Station (SFA1), NNW of the ISFSI (SFA3), and SSE of the ISFSI (SFA4) reported in the E-5 table of this appendix were moved into the REMP. The data after June 12, 2018 and onward is provided in the B-5 table of this report.

Effective September 11, 2018 some of the additional samples were discontinued, specifically, air sampling and water monitoring locations at Long Beach (A6), Taylors Island (A7, WW1), and Cambridge (A8). Ambient radiation continues to be monitored at Long Beach and Taylors Island locations under the ODCM (Ref. 6).

Table E-4 through E-10 contain analytical results for samples taken from the various radiological pathways (i.e., aquatic, atmospheric, terrestrial, and direct radiation) surrounding the plant. In general, these results continue the historical trends previously observed in the official sites of the CCNPP REMP and ISFSI.

Table E-10 shows the direct radiation readings from TLDs placed at the perimeter of the Resin Storage Area which is a temporary waste resin storage and cask transfer area located to the west of the ISFSI facility. The TLD values are somewhat higher than those in the REMP program due to their proximity to this source of the radiation. However, when the direct radiation readings for the Resin Storage Area are compared with those from the ISFSI and Site Boundary TLDs, it is apparent that temporary storage of spent resin and cask transfers are having no significant, measurable effect on the environs surrounding CCNPP. TLDs placed around the Resin storage areas and locations as denoted in tables E-9 and E10 were discontinued effective September 11, 2018.

The NEI Industry Groundwater Protection Initiative was established to determine the potential impact nuclear power plants may have on the surrounding environment due to unplanned releases of radioactive liquids. Under the Groundwater Protection Initiative, groundwater monitoring is accomplished through routine sampling of the water table around the plant and analysis for gamma and tritium.

Groundwater samples were collected from 16 on-site piezometer tubes and three subsurface manholes in 2018. These were identified as Piezometers 11 – 30 on Figure E-1, Site Map Groundwater Monitoring Wells. Figure E-2, Site Map RW Locations, shows precipitation collection sites. A piezometer tube is a shallow monitoring well which allows access to groundwater at a depth of approximately 40 feet beneath the site. One rain water sample, RW2 on June 28, 2018 indicated Tritium near detection level with high uncertainty. A repeat analysis detected no Tritium. Of the piezometer tubes sampled, only # 11 piezometer, MH28 and MH30

showed any plant-related activity. The activity in PZ11, MH28 and MH30 was previously identified and evaluated in December of 2005. The activity consists of tritium originating from normal radiological waste discharges and was previously reported in the Annual Radioactive Release Reports. The tritium contamination is contained on site. No drinking water has been affected; the groundwater at this location does not impact any drinking water pathway. The 2018 analysis results for tritium are shown in Table E-11, and analysis results for gamma emitting radionuclides are shown in Table E-12.

TABLE OF CONTENTS - ANALYTICAL RESULTS

TABLE E-1

Locations of Non-Tech Spec Environmental Sampling Stations for Calvert Cliffs Nuclear Power Plant

Station	Description	Distance[1]		Direction[1]
		(KM)	(Miles	(Sector)
A6	Long Beach	4.4	2.7	NW
A7	Taylors Island, Anderson's Property	12.6	7.8	ENE
A8	Cambridge, U of MD Estuarine Center	32.0	19.9	NE
DR24	Route 4 and Parran Road	3.0	1.9	SW
DR25	Camp Conoy Guard House	1.0	0.6	S
DR26	Route 235 & Clarks Landing Rd.	20.5	12.7	SW
DR27	Route 231 & Route 4	23.0	14.3	NW
DR28	Taylors Island Emergency Siren #35	12.3	7.6	ENE
DR29	Taylors Island Emergency Siren #38	12.5	7.8	E
DR31	Cambridge, U of MD Estuarine Center	32.0	19.9	NE
DR32	Twining Property, Taylors Island	12.3	7.6	NE
DR33	P.A. Ransome Property, Taylors Island	14.8	9.2	ESE
DR34	Shoreline at Barge Road	0.2	0.1	NE
OSGDR1	North of Old Steam Generator Storage Facility	0.3	0.2	SW
OSGDR2	West of Old Steam Generator Storage Facility	0.3	0.2	SW
RPDR5	Resin Storage Area – North Fence Lower	0.7	0.4	SW
RPDR6	Resin Storage Area – North Fence Upper	0.7	0.4	SW
RPDR7	Resin Storage Area – West Fence Right	0.7	0.4	SW
RPDR8	Resin Storage Area – West Fence Left	0.7	0.4	SW
RPDR9	Resin Storage Area – South Fence Upper	0.7	0.4	SW
RPDR10	Resin Storage Area – South Fence Lower	0.7	0.4	SW
RPDR11	Resin Storage Area – East Fence Left	0.7	0.4	SW
RPDR12	Resin Storage Area – East Fence Right	0.7	0.4	SW
WBS2	Discharge Area	0.3	0.2	N
WBS4	Camp Conoy/Rocky Point	3.0	1.9	SE
WW1	Taylors Island, Anderson's Property	12.6	7.8	ENE

[1] Distance and direction from the central point between the two containment buildings.

Table E-2

Synopsis of 2018 Calvert Cliffs Nuclear Power Plant
Non-Tech Spec Radiological Environmental Monitoring Program

Sample Type	Sampling Frequency[1]	Number of Locations	Number Collected	Analysis	Analysis Frequency[1]	Number Analyzed
Aquatic Environment						
Bottom Sediment	Q	2	4	Gamma	Q	4
Atmospheric Environment						
Air Iodine[2, 4, 5]	W	7	226	I-131	W	226
Air Particulates[3, 5]	W	3	108	Gross Beta	W	108
				Gamma	MC QC	12 3
Direct Radiation						
Ambient Radiation[5]	Q	20	354	TLD	Q	354
Terrestrial Environment						
Ground water[5]	M	1	8	Gamma	M	8
				H-3	M	8

[1] W=weekly, M=monthly, Q=quarterly, SA=semiannual, A=annual, C=composite
[2] The collection device contains charcoal
[3] Beta counting is performed after >72 hour decay, Gamma spectroscopy performed on monthly composites of weekly samples through April 2018 and then quarterly beginning with Quarter 2.
[4] Effective June 12th2018, the ODCM was changed to move the SFA1, SFA3, and SFA4 radioiodine sample sites into the CCNPP REMP
[5] Effective September 11, 2018, Several non Tech spec sampling locations were discontinued for Air, water and direct radiation as appropriate.

Table E-3

Annual Summary for Calvert Cliffs Nuclear Power Plant Units 1 & 2
Non-Tech Spec Radiological Environmental Monitoring Program

Medium or Pathway Sampled (Unit of Measurement)	Type and Total Number of Analyses Performed	Lower Limit of Detection (LLD)	Indicator Locations Mean (F)/Range[1]	Location with Highest Annual Mean Name/Distance & Direction[2]	Highest Annual Mean (F) / Range[1]	Control Locations Mean (F)/Range
Atmospheric Environment						
Air Particulates[4] (10^{-2} pCi/m^3)	Gross Beta (108)	0.5	1.8 (72/72) (0.6-3.4)	Cambridge CA 32.0 km NE	1.8 (36/36) (0.6-3.4)	1.8 (36/36) (0.7-3.4)
Direct Radiation						
Ambient Radiation[3,4] (mR/91 days)	TLD (354)	--	15.39 (354/354) (9.04-46.10)	North Fence Upper RPDR06 km	27.00 (18/18) (17.08-46.10)	-- --

[1] Mean and range based upon detectable measurements only. Fraction (F) of detectable measurements at specified location is indicated in parentheses.
[2] Distance and direction from the central point between the two containment buildings.
[3] Effective June 12, 2018 the ANSI 13.37 was adopted and data is normalized to mR/91 days from this point on. Prior to June 12, 2018 i.e.first quarter 2018 direct radiation was normalized to mR/90days.
[4] Effective September 11, 2018, Several non Tech spec sampling locations were discontinued for Air, water and direct radiation as appropriate.

Table E-4

Concentration of Gamma Emitters in Bottom Sediment
(Results in units of pCi/kg (dry) +/- 2σ)

Sample Code	Sample Date	Gamma Emitters
WBS2		
Discharge Area	6/13/2018	*
	10/3/2018	*
WBS4[1]		
Camp Conoy/ Rocky Point	6/13/2018	*
	10/3/2018	*

[1] Control Location
* All Non-Natural Gamma Emitters <MDA

Table E-5

Concentration of Iodine-131 in Filtered Air
(Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Start Date	Stop Date	CA Cambridge	LB LONG BEACH	SFA1 MET Station	SFA2[1] Visitors Center	SFA3 NNW of ISFSI	SFA4 SSE of ISFSI	TI[1] TAYLOR'S ISLAND
1/2/2018	1/9/2018	*	*	*	*	*	*	*
1/9/2018	1/16/2018	*	*	*	*	*	*	*
1/16/2018	1/22/2018	*	*	*	*	*	*	*
1/22/2018	1/29/2018	*	*	*	*	*	*	*
1/29/2018	2/6/2018	*	*	*	2	*	*	*
2/6/2018	2/13/2018	*	*	*	2	*	*	*
2/13/2018	2/20/2018	*	*	*	*	*	*	*
2/20/2018	2/26/2018	*	*	*	*	*	*	*
2/26/2018	3/5/2018	*	*	*	*	*	*	*
3/5/2018	3/13/2018	*	*	*	*	*	*	*
3/13/2018	3/20/2018	*	*	*	*	*	*	*
3/20/2018	3/26/2018	*	*	*	*	*	*	*
3/26/2018	4/3/2018	*	*	*	*	*	*	*
4/3/2018	4/9/2018	*	*	*	*	*	*	*
4/9/2018	4/17/2018	*	*	*	*	*	*	*
4/17/2018	4/23/2018	*	*	*	*	*	*	*
4/23/2018	5/1/2018	*	*	*	*	*	*	*
5/1/2018	5/8/2018	*	*	*	*	*	*	*
5/8/2018	5/14/2018	*	*	*	*	*	*	*
5/14/2018	5/21/2018	*	*	*	*	*	*	*
5/21/2018	5/29/2018	*	*	*	*	*	*	*
5/29/2018	6/4/2018	*	*	*	*	*	*	*
6/4/2018	6/11/2018	*	*	*	*	*	*	*
6/11/2018	6/19/2018	*	*	#	*	#	#	*
6/19/2018	6/25/2018	*	*	#	*	#	#	*
6/25/2018	7/3/2018	*	*	#	*	#	#	*
7/3/2018	7/10/2018	*	*	#	*	#	#	*
7/10/2018	7/17/2018	*	*	#	*	#	#	*

Table E-5

Concentration of Iodine-131 in Filtered Air
(Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Start Date	Stop Date	CA Cambridge	LB LONG BEACH	SFA1 MET Station	SFA2[1] Visitors Center	SFA3 NNW of ISFSI	SFA4 SSE of ISFSI	TI[1] TAYLOR'S ISLAND
7/17/2018	7/23/2018	*	*	#	*	#	#	*
7/23/2018	7/30/2018	*	*	#	*	#	#	*
7/30/2018	8/6/2018	*	*	#	*	#	#	*
8/6/2018	8/14/2018	*	*	#	*	#	#	*
8/14/2018	8/21/2018	*	*	#	*	#	#	*
8/21/2018	8/27/2018	*	*					*
8/27/2018	9/4/2018	*	*	#	*	#	#	*
				#	*	#	#	
9/4/2018	9/11/2018	*	*	#	*	#	#	*
9/11/2018	9/17/2018	ND	ND	#	*	#	#	ND
9/17/2018	9/24/2018	ND	ND	#	*	#	#	ND
9/24/2018	10/1/2018	ND	ND	#	*	#	#	ND
10/1/2018	10/10/2018	ND	ND	#	*	#	#	ND
10/10/2018	10/15/2018	ND	ND	#	*	#	#	ND
10/15/2018	10/22/2018	ND	ND	#	*	#	#	ND
10/22/2018	10/29/2018	ND	ND	#	*	#	#	ND
10/29/2018	11/6/2018	ND	ND	#	*	#	#	ND
11/6/2018	11/12/2018	ND	ND	#	*	#	#	ND
11/12/2018	11/19/2018	ND	ND	#	[2]	#	#	ND
11/19/2018	11/26/2018	ND	ND	#	*	#	#	ND
11/26/2018	12/3/2018	ND	ND	#	*	#	#	ND
12/3/2018	12/10/2018	ND	ND	#	*	#	#	ND
12/10/2018	12/18/2018	ND	ND	#	*	#	#	ND
12/18/2018	12/26/2018	ND	ND	#	*	#	#	ND
12/26/2018	12/31/2018	ND	ND	#	*	#	#	ND

[1] Control Location
[2] Sampler malfunction/low flow
* <MDA
# Samples moved from Non-Technical specifications to CCNPP REMP and listed in Table B-5 of this report.
ND = No Data, samples discontinued effective 9/11/2018

Table E-6

Concentration of Beta Emitters in Air Particulates
(Results in units of 10^{-2} pCi/m^3 +/- 2σ)

Start Date	Stop Date	CA Cambridge	LB LONG BEACH	TI[1] TAYLOR'S ISLAND
1/2/2018	1/9/2018	2.1 +/- 0.1	2.0 +/- 0.1	2.1 +/- 0.1
1/9/2018	1/16/2018	1.7 +/- 0.1	1.8 +/- 0.1	1.8 +/- 0.1
1/16/2018	1/22/2018	3.4 +/- 0.2	3.4 +/- 0.2	3.4 +/- 0.2
1/22/2018	1/29/2018	1.6 +/- 0.1	1.6 +/- 0.1	1.7 +/- 0.1
1/29/2018	2/6/2018	1.6 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1
2/6/2018	2/13/2018	1.9 +/- 0.1	1.9 +/- 0.1	1.9 +/- 0.1
2/13/2018	2/20/2018	2.0 +/- 0.1	2.1 +/- 0.1	1.9 +/- 0.1
2/20/2018	2/26/2018	0.9 +/- 0.1	1.1 +/- 0.1	1.0 +/- 0.1
2/26/2018	3/5/2018	2.3 +/- 0.1	2.4 +/- 0.1	2.4 +/- 0.1
3/5/2018	3/13/2018	1.3 +/- 0.1	1.2 +/- 0.1	1.2 +/- 0.1
3/13/2018	3/20/2018	2.3 +/- 0.1	2.4 +/- 0.1	2.4 +/- 0.1
3/20/2018	3/26/2018	1.2 +/- 0.1	1.2 +/- 0.1	1.1 +/- 0.1
3/26/2018	4/3/2018	1.7 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1
4/3/2018	4/9/2018	2.1 +/- 0.1	2.0 +/- 0.1	2.2 +/- 0.1
4/9/2018	4/17/2018	1.9 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1
4/17/2018	4/23/2018	1.7 +/- 0.1	1.4 +/- 0.1	1.6 +/- 0.1
4/23/2018	5/1/2018	1.8 +/- 0.1	1.7 +/- 0.1	1.6 +/- 0.1
5/1/2018	5/8/2018	2.3 +/- 0.1	2.1 +/- 0.1	2.1 +/- 0.1
5/8/2018	5/14/2018	1.8 +/- 0.1	1.9 +/- 0.1	1.9 +/- 0.1
5/14/2018	5/21/2018	1.0 +/- 0.1	0.9 +/- 0.1	1.0 +/- 0.1
5/21/2018	5/29/2018	1.3 +/- 0.1	1.3 +/- 0.1	1.3 +/- 0.1
5/29/2018	6/4/2018	0.6 +/- 0.2	0.8 +/- 0.1	0.7 +/- 0.1
6/4/2018	6/11/2018	1.5 +/- 0.1	1.4 +/- 0.1	1.4 +/- 0.1
6/11/2018	6/19/2018	1.6 +/- 0.1	1.5 +/- 0.1	1.6 +/- 0.1
6/19/2018	6/25/2018	1.7 +/- 0.1	1.6 +/- 0.1	1.4 +/- 0.1
6/25/2018	7/3/2018	2.2 +/- 0.1	1.9 +/- 0.1	2.3 +/- 0.1
7/3/2018	7/10/2018	1.3 +/- 0.1	1.3 +/- 0.1	1.4 +/- 0.1
7/10/2018	7/17/2018	2.4 +/- 0.1	1.9 +/- 0.1	2.3 +/- 0.1
7/17/2018	7/23/2018	1.2 +/- 0.1	1.3 +/- 0.1	1.2 +/- 0.1
7/23/2018	7/30/2018	1.7 +/- 0.1	1.6 +/- 0.1	1.5 +/- 0.1
7/30/2018	8/6/2018	1.3 +/- 0.1	1.3 +/- 0.1	1.2 +/- 0.1
8/6/2018	8/14/2018	2.6 +/- 0.1	2.6 +/- 0.1	2.9 +/- 0.1
8/14/2018	8/21/2018	2.6 +/- 0.1	2.4 +/- 0.1	2.5 +/- 0.1
8/21/2018	8/27/2018	2.2 +/- 0.1	2.0 +/- 0.1	2.2 +/- 0.1
8/27/2018	9/4/2018	2.3 +/- 0.1	2.3 +/- 0.1	2.5 +/- 0.1
9/4/2018	9/11/2018[3]	1.5 +/- 0.1	1.4 +/- 0.1	1.5 +/- 0.1

[1] Control Location
[2] Sampler Malfunction; Loss of Data
[3] Samples Discontinued after June 11, 2018

Table E-7

Concentration of Gamma Emitters in Air Particulates
(Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Sample Date[2]	CA Cambridge	LB LONG BEACH	TI[1] TAYLOR'S ISLAND
1/29/2018	*	*	*
2/26/2018	*	*	*
4/3/2018	*	*	*
5/1/2018	*	*	*
7/3/2018	*	*	*

[1] Control Location
* All Non-Natural Gamma Emitters <MDA
[2] Monthly filter composites January through April. Effective in May changed to quarterly composites for Quarter 2 then samples were discontinued as of 9/11/18.

Table E-8

Concentration of Tritium and Gamma Emitters in Taylors Island Well Water (Results in units of pCi/L +/- 2σ)

Sample Date	Gamma Emitters	H-3
1/22/2018	*	<183
2/26/2018	*	<184
3/20/2018	*	<186
4/17/2018	*	<192
5/21/2018	*	<197
6/19/2018	*	<195
7/23/2018	*	<195
8/14/2018[1]	*	<200

* Non-Natural Gamma Emitters <MDA
[1] Samples discontinued effective 9/11/2018

Table E-9

Direct Radiation
(Results in units of mR/91 days +/- 2σ)

Site Code	Location	First Quarter[1]	Second Quarter	Third Quarter[2]
DR24	Rt. 4 and Parran Rd.	11.82 +/- 1.30	12.10 +/- 0.92	11.63 +/- 1.15
DR25	Camp Conoy Guard House	12.23 +/- 1.55	12.79 +/- 1.37	12.80 +/- 1.75
DR26	Rt. 235 and Clark's Landing Road	11.17 +/- 1.19	10.74 +/- 1.17	10.72 +/- 0.61
DR27	Rt. 231 and Rt. 4	*	11.37 +/- 1.04	11.75 +/- 1.16
DR28	Taylors Is. Siren #35	12.81 +/- 0.62	12.83 +/- 1.57	13.29 +/- 0.92
DR29	Taylors Is. Siren #38	13.95 +/- 0.79	13.80 +/- 1.07	14.12 +/- 1.23
DR31	Cambridge	15.03 +/- 0.74	15.30 +/- 1.47	15.31 +/- 0.72
DR32	Twining Property, Taylors Island	15.03 +/- 0.53	15.19 +/- 1.26	15.31 +/- 0.79
DR33	P. A. Ransome Property	14.42 +/- 0.84	14.41 +/- 0.71	14.77 +/- 0.47
DR34	Shoreline at Barge Rd.	9.09 +/- 0.30	9.04 +/- 1.49	12.80 +/- 0.48
OSG1	North of Old Steam Generator Storage Facility	16.66 +/- 1.72	17.17 +/- 1.30	17.28 +/- 0.31
OSG2	West of Old Steam Generator Storage Facility	14.41 +/- 2.16	14.30 +/- 1.72	13.73 +/- 0.65

[1] mR/90 days in first quarter prior to adopting ANSI standard
* Lost TLD
[2] Samples discontinued as of 9/11/18

Table E-10

Direct Radiation from Resin Storage Area
(Results in units of mR/91 days +/- 2σ)

Site Code	Location	First Quarter[1]	Second Quarter	Third Quarter[2]
RPDR05	North Fence Lower	24.10 +/- 2.43	22.94 +/- 1.17	26.02 +/- 1.01
RPDR06	North Fence Upper	17.80 +/- 1.39	17.08 +/- 0.61	46.10 +/- 3.95
RPDR07	West Fence Right	15.58 +/- 0.79	19.02 +/- 2.20	19.22 +/- 1.12
RPDR08	West Fence Left	16.84 +/- 0.78	16.68 +/- 1.90	17.22 +/- 1.09
RPDR09	South Fence Upper	14.20 +/- 1.43	14.76 +/- 1.36	14.28 +/- 1.05
RPDR10	South Fence Lower	15.87 +/- 1.59	16.55 +/- 1.94	16.39 +/- 1.15
RPDR11	East Fence Left	15.02 +/- 2.26	15.87 +/- 2.40	14.56 +/- 1.73
RPDR12	East Fence Right	14.27 +/- 1.60	14.43 +/- 1.50	14.21 +/- 1.00

[1] mR/90 days in first quarter prior to adopting ANSI standard
[2] Samples discontinued effective 9/11/2018

Table E-11

Concentration of Tritium in Groundwater
(Results in units of pCi/L +/- 2σ)
By Piezometer Tube Locations

SAMPLE DATE	PZ 11	12	13	15	19	20	21	22	23	24	25	26	27	28	29	30
1/31/2018	ND	ND	ND	ND	#	#	#	#	ND	ND	ND	ND	ND	ND	ND	ND
2/1/2018	2050 +/- 269	#	#	#	ND	ND	ND	ND	ND	#	#	ND	ND	ND	#	#
2/15/2018	1660 +/-230	#	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	#	#
3/28/2018	1260 +/- 190	#	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	#	#
4/17/2018	865 +/- 154	#	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	#	#
5/15/2018	549 +/- 141	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
8/6/2018	ND	ND	ND	ND	#	#	#	#	ND	ND	ND	ND	ND	ND	ND	ND
8/7/2018	933 +/- 165	#	#	#	ND	ND	ND	ND	ND	#	#	ND	ND	ND	#	#
12/18/2018	ND	ND	#	#	#	#	#	#	ND	#	#	ND	ND	ND	ND	ND
12/19/2018	1390 +/- 209	#	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	#	#

[#] Tritium Less than minimum Detectable Activity (<MDA)
[ND] No Data - Sample obtained as required.

Table E-11

Concentration of Tritium in Surface Water, Precipitation, and Subsurface Drainage
(Results in units of pCi/L +/- 2σ)

SAMPLE DATE	MH24	MH28	MH30	SW003	SW004	RW1	RW2	RW3	RW4
1/30/2018	ND	4220+/-493	ND	ND	ND	ND	ND	ND	ND
1/31/2018	ND	ND	2830+/-353	ND	ND	ND	ND	ND	ND
3/21/18	ND	ND	ND	ND	ND	#	#	#	#
3/29/2018	#	ND	ND	#	#	ND	ND	ND	ND
5/1/2018	ND	1620+/-230	1600+/-229	ND	ND	ND	ND	ND	ND
5/14/2018	#	ND	ND	#	#	ND	ND	ND	ND
6/28/18	ND	ND	ND	ND	ND	#	198+-/123	#	#
6/28/18 repeat analysis							#		
8/1/2018	ND	2590+/-320	1930+/-255	ND	ND	ND	ND	ND	ND
8/17/2018	ND	ND	ND	#	#	ND	ND	ND	ND
8/22/18	#	ND	ND	ND	ND	ND	ND	ND	ND
9/28/18	ND	ND	ND	ND	ND	#	#	#	#
10/22/2018	ND	ND	ND	#	#	ND	ND	ND	ND
10/30/2018	ND	3290+/-392	1060+/-183	ND	ND	ND	ND	ND	ND
12/19/18	ND	ND	ND	ND	ND	#	#	#	#
12/31/18	#	ND	ND	ND	ND	ND	ND	ND	ND

[#] Tritium Less than minimum Detectable Activity(<MDA)
[ND] No Data - Sample obtained as required.

Table E-12

Gross Concentration of Gamma Emitters in Groundwater
(Results in units of pCi/L +/- 2σ)
By Piezometer Tube Locations

Sample Date	11	12	13	15	19	20	21	22	23	24	25	26	27	28	29	30
05/15/2018	ND	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08/07/2018	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
12/19/18	*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

* All Non-Natural Gamma Emitters <MDA
ND No Data - Sample obtained as required.

Table E-12 (CONTINUED)

Gross Concentration of Gamma Emitters in Surface Water, Precipitation, and Subsurface Drainage
(Results in units of pCi/L +/- 2σ)

Sample Date	MH24	MH28	MH30	RW1	RW2	RW3	RW4	SW003	SW004
8/17/2018	ND	ND	ND	ND	ND	ND	ND	*	*
8/22/18	*	ND	ND	ND	ND	ND	ND	ND	ND

* All Non-Natural Gamma Emitters <MDA
ND No Data - Sample obtained as required.

Figure E-1

Site Map Groundwater Monitoring Wells

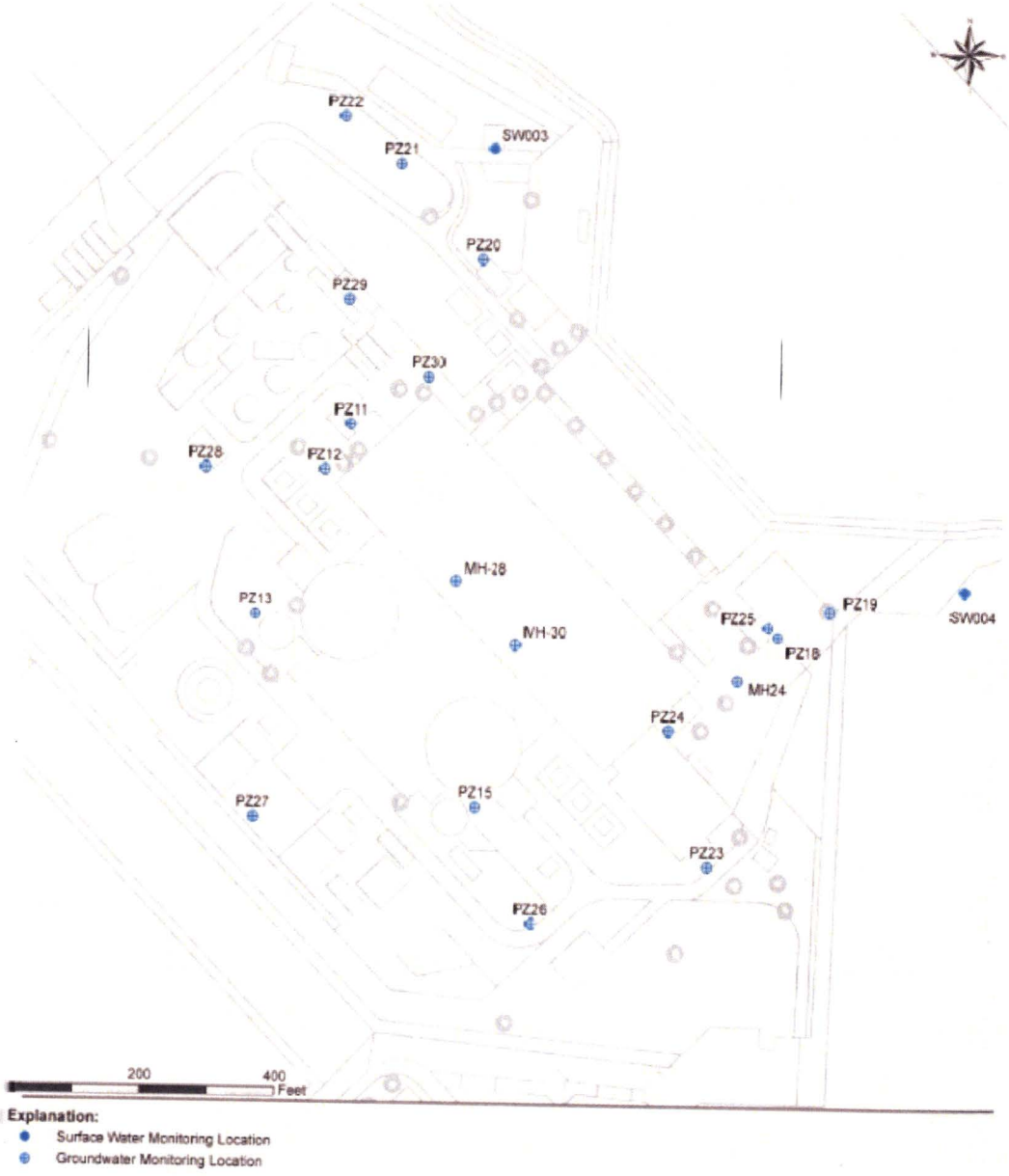


Figure 1
RGPP Monitoring Locations
Overburden Aquifer
Exelon Corporation
Clavert Cliffs Generating Station

Figure E-2

Site Map Rainwater Locations