Calvert Cliffs Nuclear Power Plant

1650 Calvert Cliffs Parkway
Lusby, Maryland 20657

CENG[SM]
a joint venture of
Constellation Energy · EDF

May 15, 2012

U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTENTION: Document Control Desk

SUBJECT: Calvert Cliffs Nuclear Power Plant; Unit Nos. 1 & 2; Docket Nos. 50-317 & 50-318
Independent Spent Fuel Storage Installation; Docket No. 72-8
Annual Radiological Environmental Operating Report

REFERENCES: (a) Calvert Cliffs Nuclear Power Plant Technical Specification 5.6.2

(b) Calvert Cliffs Independent Spent Fuel Storage Installation Technical Specification 6.2

In accordance with References (a) and (b), Calvert Cliffs Nuclear Power Plant is submitting the Annual Radiological Environmental Operating Report, for the calendar year 2011 (Attachment 1).

Should you have questions regarding this matter, please contact me at (410) 495-5219 or Mr. Larry Liden at (410) 787-5076.

Very truly yours,

Douglas E. Lauver
Director-Licensing

DEL/PSF/bjd

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: N. S. Morgan, NRC
W. M. Dean, NRC
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IE25
NMSS26

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, LLC
May 15, 2012

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, 2011

A. M. Barnett
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CONSTELLATION ENERGY
CONSTELLATION ENERGY NUCLEAR GROUP, LLC

May 2012

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I. SUMMARY

During this operating period for Calvert Cliffs Nuclear Power Plant (CCNPP) Units 1 and 2, a total of 3414 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) and the Environmental and 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 our commitments to the surrounding community and 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. The following paragraphs describe each of these parts in more detail.

A total of 659 radiochemical analyses were performed on 591 environmental samples and 534 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 Environmental Technical Specifications (Ref. 5).

For the ISFSI monitoring program, 349 radiochemical analyses were performed on 289 environmental samples, 62 of which were in common with the original REMP. In addition, 480 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, 679 analyses were performed on 594 additional environmental samples, and 474 additional TLDs were analyzed for ambient radiation exposure rates. Also, six pressurized ion chambers continuously monitored the environs around the plant for ambient radiation levels resulting in 32 monthly measurements. These additional analyses have shown to be difficult to maintain and unreliable. This sampling pathway was discontinued from the Non Technical Specifications program when the CP-234 Procedure was updated effective September 2011.

And lastly, 199 radiochemical analyses were performed on 199 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 or silver zeolite molecular sieve cartridges, respectively. The particulate filters were analyzed for beta activity and gamma emitting nuclides. The molecular sieve 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 locations surrounding CCNPP and the ISFSI.

On March 11, 2011 at 14:46, a magnitude 9.0 earthquake struck off the east coast of Japan. The Fukushima Dai-Ichi Nuclear Power Station, operated by Tokyo Electric Power Co., withstood the earthquake but lost all offsite electrical power sources to the site. Forty-one minutes later however, the plant was hit with a series of tsunamis and all onsite AC power was lost forcing the facility into a state of emergency. The Nuclear Safety Commission of Japan estimated approximately 17 million curies of iodine-131 (I-131) equivalent radioactive material was released into the air and 0.127 million curies into the sea between March 11 and April 5. I-131 was detected at the CCNPP site from the Fukushima Dai-Ichi Nuclear Power Station event in both the indicator and control air sampling locations from March 21 through April 18.

REMP samples obtained from CCNPP during 2011 identified detectable concentrations of isotopes that could be related to operation of CCNPP. Given the following facts, the detectable concentrations are not a result of CCNPP operation:

1) The quantities of radioactive airborne effluents from CCNPP during 2011 did not increase significantly compared to year 2010.
2) Prior REMP sample results have not detected the presence of these isotopes in air sample monitoring or vegetation.
3) The concentrations being detected in the indicator samples were also identified in the control samples for CCNPP.

As such, the atypical detection of these radionuclides in both indicator and control samples is credibly attributed to the trans-Pacific transport of airborne releases from Dai-Ichi, Fukushima following the March 11, 2011 Tohoku earthquake and is not related to the operations of CCNPP.

Natural radioactivity was detected in essentially all 3414 radiological analyses performed. Low levels of man-made fission products were also observed in 67 of these analyses. All of these observations were attributed to fallout from past atmospheric weapons testing or from the Fukushima Dai-Ichi material released. 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 the plant's effluent release data, on-site meteorological data, and appropriate pathways. The results of these dose calculations indicate:

a. a maximum thyroid dose of 3.32×10^{-2} mrem via liquid and gaseous pathways, which is about 0.043% of the acceptable limit of 75 mrem/yr as specified in both 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 1.11×10^{-3} mrem via liquid and gaseous pathways, which is about 0.044% of the acceptable limit of 25 mrem/yr as specified in both 40CFR190 and 10CFR72.104;

c. a maximum calculated dose to all other organs via liquid and gaseous pathways was equal to 1.92×10^{-3} mrem to the GI Tract. This dose was about 0.008% 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 during 2011.

II. CALVERT CLIFFS NUCLEAR POWER PLANT RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

II.A. INTRODUCTION

Constellation Energy (CE), previously known as Baltimore Gas and Electric Company (BGE), has been conducting a REMP in the environs of the 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 Analytics Intercomparison 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,

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 Constellation Energy according to CCNPP Procedures (Ref. 7, 8, 12).

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

There were no program exceptions during this operating period.

II.C. RESULTS AND DISCUSSIONS

All the environmental samples collected during the year were analyzed using Constellation Energy laboratory procedures (Ref. 8). 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 the Aquatic Environment, the Atmospheric Environment, the 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 and are listed in Table A-1.

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 a single positive result of 407 $\pm$ 190 pCi/L in a sample collected from WA2 on 03/31/2011. This low result is similar to those observed in past operating years.

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-110 observed in oysters from Camp Conoy (IA3) with annual effluent releases of Ag-110 as reported in the Radioactive Effluent Release Report.

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

Semi-annual shoreline sediment samples were taken from one location during the year. This location is Shoreline at Barge Road (sample code WB1). The 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

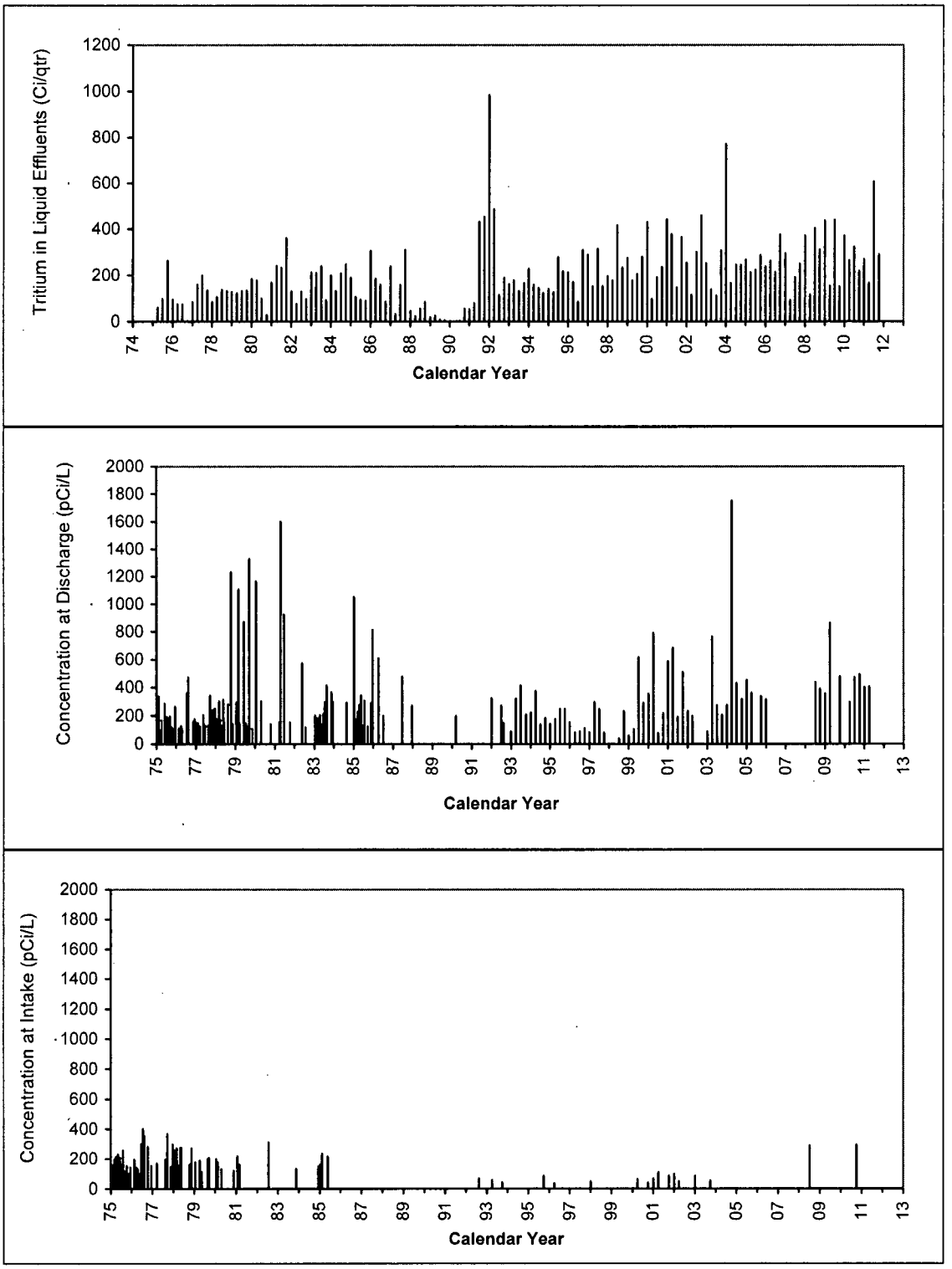
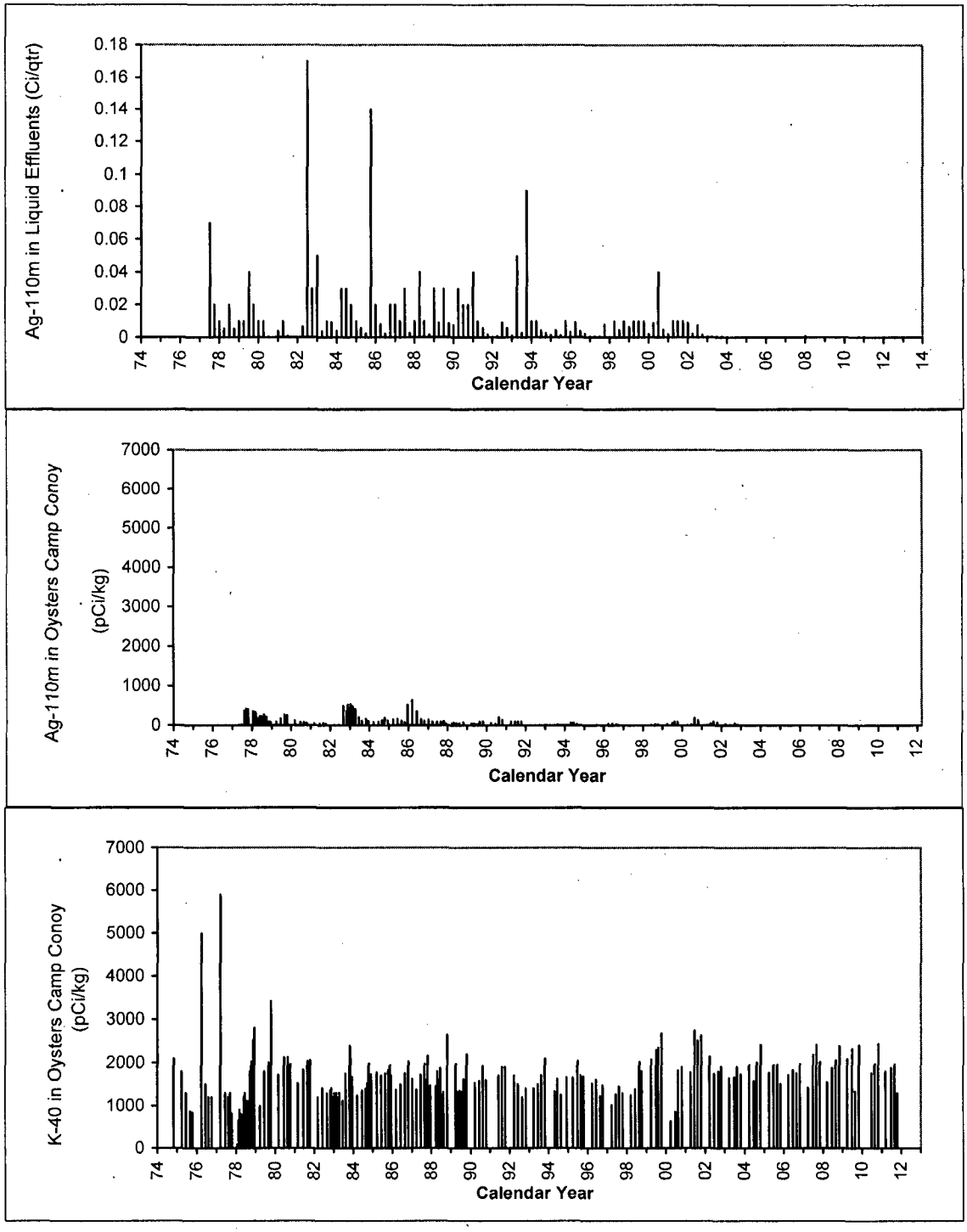


FIGURE 2
Silver-110m and Potassium-40 in Chesapeake Bay Oysters



II.C.2 Atmospheric Environment

The atmospheric environment was monitored by analyzing air particulate filters and charcoal or silver zeolite 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).

II.C.2.a Air Particulate Filters

Weekly composite air particulate filter samples were collected from the five locations during the year. These samples were analyzed for beta activity and gamma emitters.

Weekly analyses for beta activity on air particulate filters collected from all five locations showed values characteristic of background levels. The values ranged from 0.4×10^{-2} to 5.0×10^{-2} pCi/m^3 for the indicator locations and 0.8×10^{-2} to 4.6×10^{-2} pCi/m^3 at the control location. The location with the highest overall mean of 2.2×10^{-2} pCi/m^3 was A1, Entrance to Camp Conoy.

Gamma spectrometric analyses of monthly composited air particulate samples exhibited no detectable concentrations of any plant-related radionuclides. One March and two April samples did exhibit low level Cs-137 from 1.2×10^{-3} to 1.7×10^{-3} pCi/m^3 at the control location, Emergency Operations Facility (sample code EOF) and Entrance to Camp Conoy (A1) attributable to the Fukushima Dai-Ichi releases. Naturally occurring radionuclides, such as Be-7, were detected in nearly all samples.

Figure 3 depicts the historical trends of beta activity in weekly samples since 1975.

II.C.2.b Air Iodine

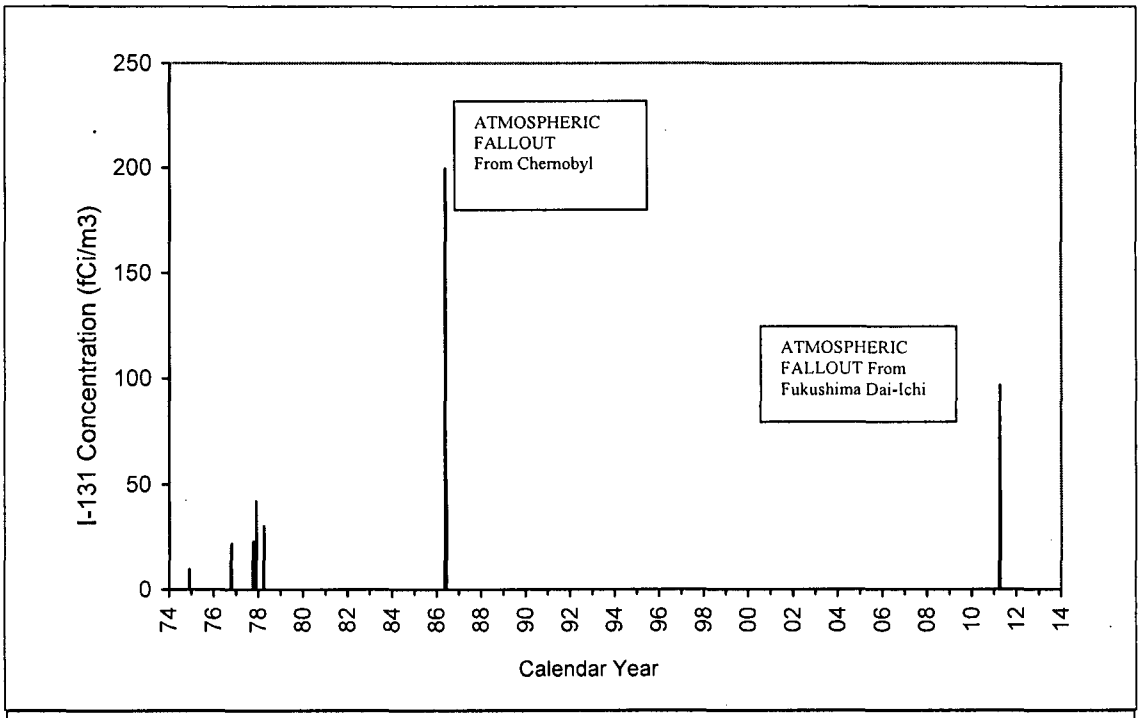
Weekly composited charcoal and silver zeolite cartridges (for trapping radioiodine species) were collected from the five locations during the year. These samples were analyzed for radioiodine species.

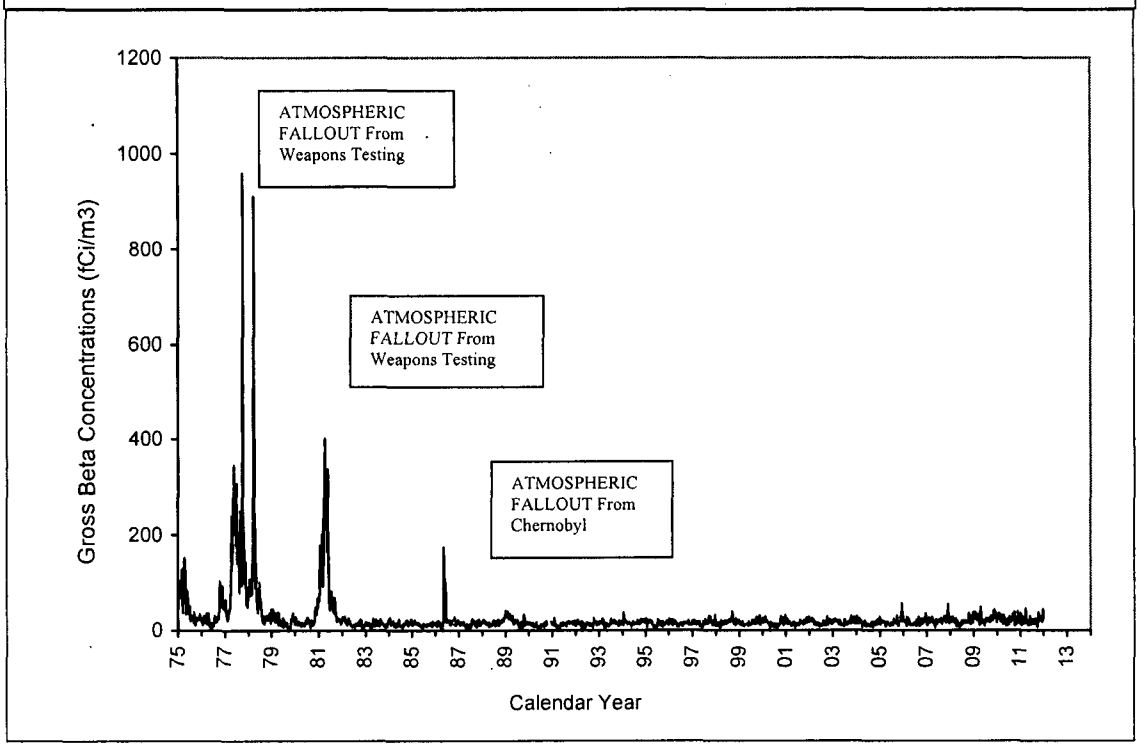
Weekly radioiodine analyses of charcoal and silver zeolite cartridges collected from all five locations exhibited low level concentrations of I-131 during the weeks of March 21 to April 18 that were attributable to the Fukushima Dai-Ichi material released.

Figure 3 depicts the historical trends of radioiodine in weekly samples since 1974.

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 Garden Plot off Bay Breeze Road (sample codes IB1, IB2, and IB3), On Site Before the Entrance to Camp Conoy (sample codes IB4, IB5, and IB6), and the Emergency Operations Facility (sample codes IB7, IB8, and IB9). 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.

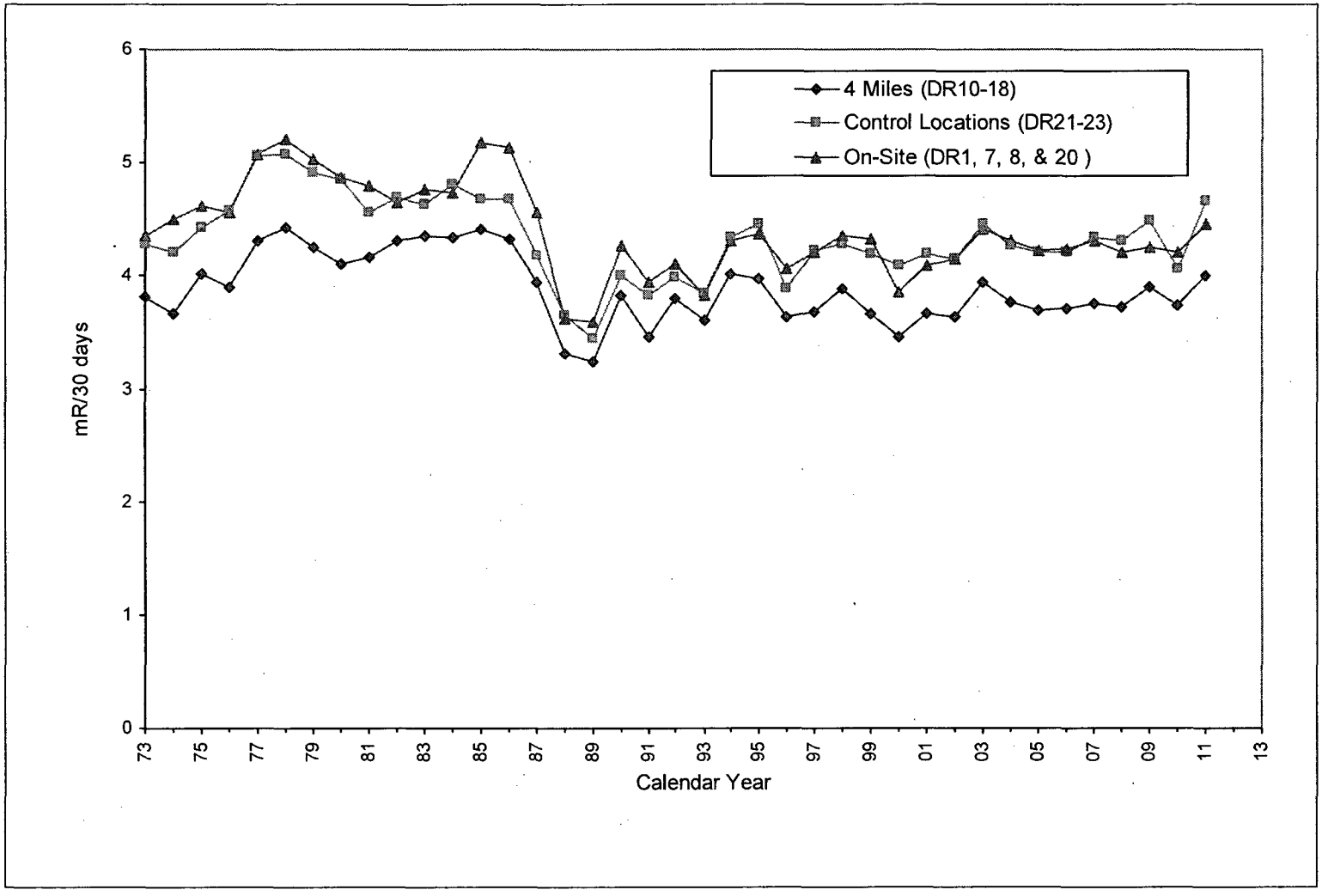
II.C.4 Direct Radiation

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 DR1), Route 765 Auto Dump (sample code DR2), Giovanni's Tavern (sample code DR3), Route 765 across from White Sands (sample code DR4), John's Creek (sample code DR5), Lusby (sample code DR6), On Site Before the Entrance to Camp Conoy (sample code DR7), On Site at Emergency Siren (sample code DR8), Bay Breeze Road (sample code DR9), 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 measured at the indicator locations was 12.43 mR and ranged from 9.34 to 18.71 mR as reported in Table 2. The control locations showed a 90 day mean of 14.00 mR with ranges from 11.18 to 20.13 mR. The location with the highest overall mean of 16.76 was DR23, Taylors Island, which ranged from 15.00 to 20.13 mR. A comparison of the means and ranges of the current TLD data with those of both the historical data and the regional data shows no plant-related contribution to the measured direct radiation exposure. Figure 4 shows the historical comparison of the average monthly radiation levels per calendar year for TLDs on site, at four miles, and at the control locations.

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



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 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 3.15×10^{-2} mrem to a child via the plume, ground, vegetable, and inhalation pathways at 1.8 km SW of the containments at Calvert Cliffs. This is about 0.042% of the acceptable limit of 75 mrem/yr as specified in 40CFR190 and 10CFR72.104;

A maximum whole body gamma dose of 4.77×10^{-4} mrem to a child at 1.8 km SW of the containments at Calvert Cliffs. This is about 0.002% 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 8.34×10^{-4} mrem to a child at 1.8 km SW of the containments at Calvert Cliffs. This is about 0.003% of the acceptable dose limit of 25 mrem/yr as specified in 40CFR190 and 10CFR72.104;

Liquid Pathways

A maximum thyroid dose of 8.33×10^{-4} mrem to an adult for all liquid pathways, which is about 0.001 % of the acceptable dose limit of 75 mrem/yr as specified in 40CFR190 and 10CFR72.104;

A maximum whole body dose of 1.06×10^{-3} mrem to an adult via all liquid pathways, which is about 0.004% 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 1.49×10^{-3} mR to an adult for all pathways, which is about 0.006 % 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 3.23×10^{-2} mrem via liquid and gaseous pathways, which is about 0.043% of the acceptable limit of 75 mrem/yr as specified in 40CFR190 and 10CFR72.104;

A maximum whole body dose of 1.11×10^{-3} mrem via liquid and gaseous pathways, which is about 0.004% 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 was equal to 1.92×10^{-3} mrem to the GI Tract. This dose was about 0.008 % 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 and 40CFR190 and 10CFR72.104, and there was no significant buildup of plant-related radionuclides in the environment due to the operation of the CCNPP.

Figure 5

Atmospheric Dispersion Around CCNPP Average Relative Air Concentrations

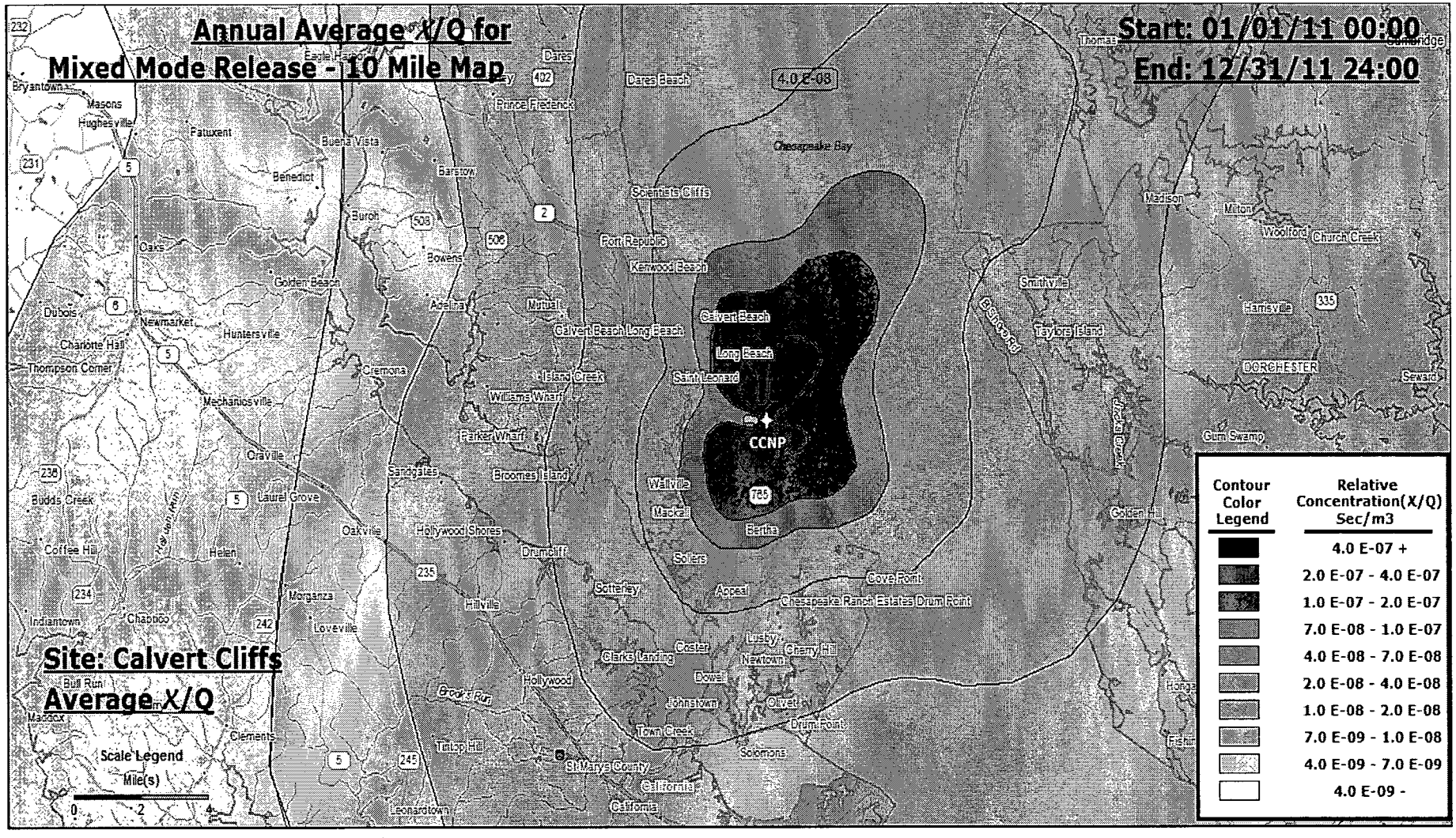


Figure 6

Atmospheric Dispersion Around CCNPP Average Relative Ground Deposition

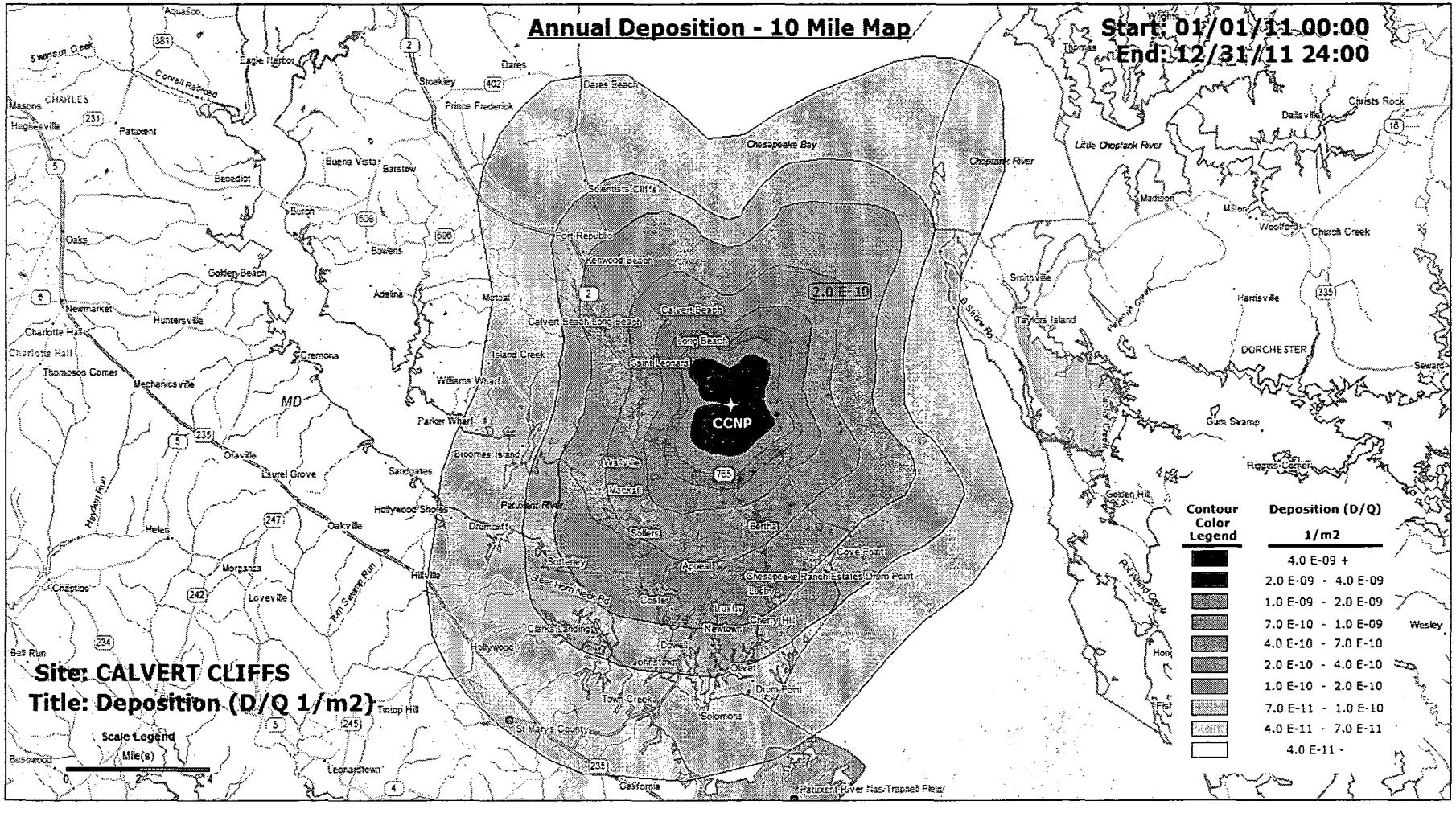


Table 1

Synopsis of 2011 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 H3	MC QC	24 8
Fish[2]	A	4	4	Gamma	A	4
Oysters	Q	2	8	Gamma	Q	8
Shoreline Sediment	SA	1	2	Gamma	SA	2
Atmospheric Environment						
Air Iodine[3]	W	5	259	I-131	W	259
Air Particulates[4]	W	5	258	Gross Beta Gamma	W MC	258 60
Direct Radiation						
Ambient Radiation	Q	23	534	TLD	Q	534
Terrestrial Environment						
Vegetation[5]	M	3	36	Gamma	M	36

[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 silver Zeolite or charcoal
[4] Beta counting is performed after >72 hour decay, Gamma spectroscopy performed on monthly composites of weekly samples
[5] Monthly during growing season when available

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
Aquatic Environment						
Bay Water, (pCi/L)	H^3 (8)	–	407(1/8) (407 +190)	Discharge Vicinity WA2 0.3 km N	407(1/8) (407 +190)	–
Atmospheric						
Air Iodine (10^{-3} pCi/m^3) [3]	I-131 (259)	2.0	7.1 (15/207) (2.3-15.0)	Entrance to Camp Conoy A1 0.7 km S	9.4 (4/51) (3.9-15.0)	8.2 (4/52) (2.6-15.3)
Air Particulates (10^{-3} pCi/m^3)	Gamma (60) Cs-137	1.8	1.1 (3/48) (1.0-1.5)	EOF 19.3 km WNW	1.7 (1/12) (0.8-1.7)	1.7 (1/12) ((0.8-1.7))
Air Particulates (10^{-2} pCi/m^3)	Gross Beta (258)	0.5	2.1 (206/206) (0.4-5.0)	Entrance to Camp Conoy A1 0.7 km S	2.2 (50/50) (0.9-5.0)	2.2 (52/52) (0.8-4.6)
Direct Radiation						
Ambient Radiation (mR/90 days)	TLD (534)	–	12.43 (462/462) (9.34-18.71)	Taylors Island DR23 12.6 km ENE	16.76 (24/24) (15.00-20.13)	14.00 (72/72) (11.18-20.13)

[1] Mean and range based upon detectable measurements only. Fraction (F) of detectable measurements at specified location is indicated in parentheses
[2] From the centerpoint of the ISFSI facility
[3] Positive I-131 results attributable to Fukushima Dai-Ichi March 2011 Releases

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 this operating period, three additional canisters of spent fuel were transferred to the ISFSI. Area was also used as a temporary storage area for additional radioactive material.

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.

REMP samples obtained from CCNPP during 2011 identified detectable concentrations of isotopes that could be related to operation of CCNPP. Given the following facts, the detectable concentrations are not a result of CCNPP operation:

1) The quantities of radioactive airborne effluents from CCNPP during 2011 did not increase significantly compared to year 2010.
2) Prior REMP sample results have not detected the presence of these isotopes in air sample monitoring or vegetation.
3) The concentrations being detected in the indicator samples were also identified in the control samples for CCNPP.

As such, the atypical detection of these radionuclides in both indicator and control samples is credibly attributed to the trans-Pacific transport of airborne releases from Dai-Ichi, Fukushima following the March 11, 2011 Tohoku earthquake and is not related to the operations of CCNPP.

The ISFSI monitoring program is as described in this section of the report. Pressurized Ion Chambers (PICs), because they duplicate direct surveillance by TLDs and because they experience problems with reliability, were excluded from the Technical Specification portion of the ISFSI monitoring program. A Commitment Change Evaluation was performed and effective June 2011, allowed all PIC monitoring references to be removed from CP234 based on this history of unreliability (Ref. 14). PIC results are given in Table E-9 but were phased out of operation ending August 2011.

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 comparisons show little deviations from these periods and are very close to the natural background levels for the region with the exception of TLDs around the north end of the ISFSI. More detailed discussions of these results are given 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 40CFR190 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 contractors to, or personnel of, Constellation Energy personnel according to Constellation Energy Laboratory Procedures (Ref. 7, 8, 12).

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

There were no program exceptions during this operating period

III.C. RESULTS AND DISCUSSIONS

All the environmental samples collected were analyzed using Constellation Energy 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.

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 6.0×10^{-2} pCi/m^3 for the indicator locations and 1.0×10^{-2} to 4.8×10^{-2} pCi/m^3 for the control location. The location with the highest overall mean of 2.4×10^{-2} pCi/m^3 was SFA3, NNW of ISFSI.

Gamma spectrometric analyses of monthly composited air particulate samples exhibited no detectable concentrations of any plant-related radionuclides in any of these samples. Low level positive results for Cs-137 were identified at SSE of ISFSI (SFA4) possibly from nearby land disturbance activities. 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). These samples were analyzed for gamma emitters.

REMP samples obtained from CCNPP during 2011 identified detectable concentrations of I-131 that could be related to operation of CCNPP. Given the following facts, the detectable concentrations are not a result of CCNPP operation:

1) The quantities of radioactive airborne effluents from CCNPP during 2011 did not increase significantly compared to year 2010.

2) Prior REMP sample results have not detected the presence of this isotope in air sample monitoring or vegetation.
3) The concentrations being detected in the indicator samples were also identified in the control samples for CCNPP.

As such, the atypical detection of I-131 in both indicator and control samples is credibly attributed to the trans-Pacific transport of airborne releases from Dai-Ichi, Fukushima following the March 11, 2011 Tohoku earthquake and is not related to the operations of CCNPP.

I-131 was detected in four of 5 quarterly samples collected on 3/22/2011. These values ranged from 80 – 225 pCi/kg for the indicator locations and 71pCi/kg for the control location. 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 both indicator and control locations. The Cs-137 concentrations ranged from 61 ± 26 to 224 ± 43 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, "Environmental Radiation Protection Standards for Nuclear Power Operations" and 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 other 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 SFDR7). The locations include On Site Before the Entrance to Camp Conoy (sample code DR7, common to both the CCNPP 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 SFDR1); NNW of ISFSI, (sample code SFDR2); North of ISFSI, (sample code SFDR3); NE of ISFSI, (sample code SFDR4); East of ISFSI, (sample code SFDR5); ESE of ISFSI, (sample code SFDR6); NNW of ISFSI, (sample code SFDR8); SSE of ISFSI, (sample code SFDR9); 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 measured at the ISFSI indicator locations was 27.70 mR and ranged from 10.19 to 57.49 mR as reported in Table 4. The control location showed a 90 day mean of 13.30 mR and ranged from 12.11 to 15.65 mR. The location with the highest overall mean of 48.67 mR with a range of 42.00 to 57.49 mR was SFDR18, West 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. The Cs-137 observations were attributed to fallout from past atmospheric weapons testing. However I-131 observed in the March Vegetation samples was attributed to the Fukushima event. No other plant-related radionuclide was 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

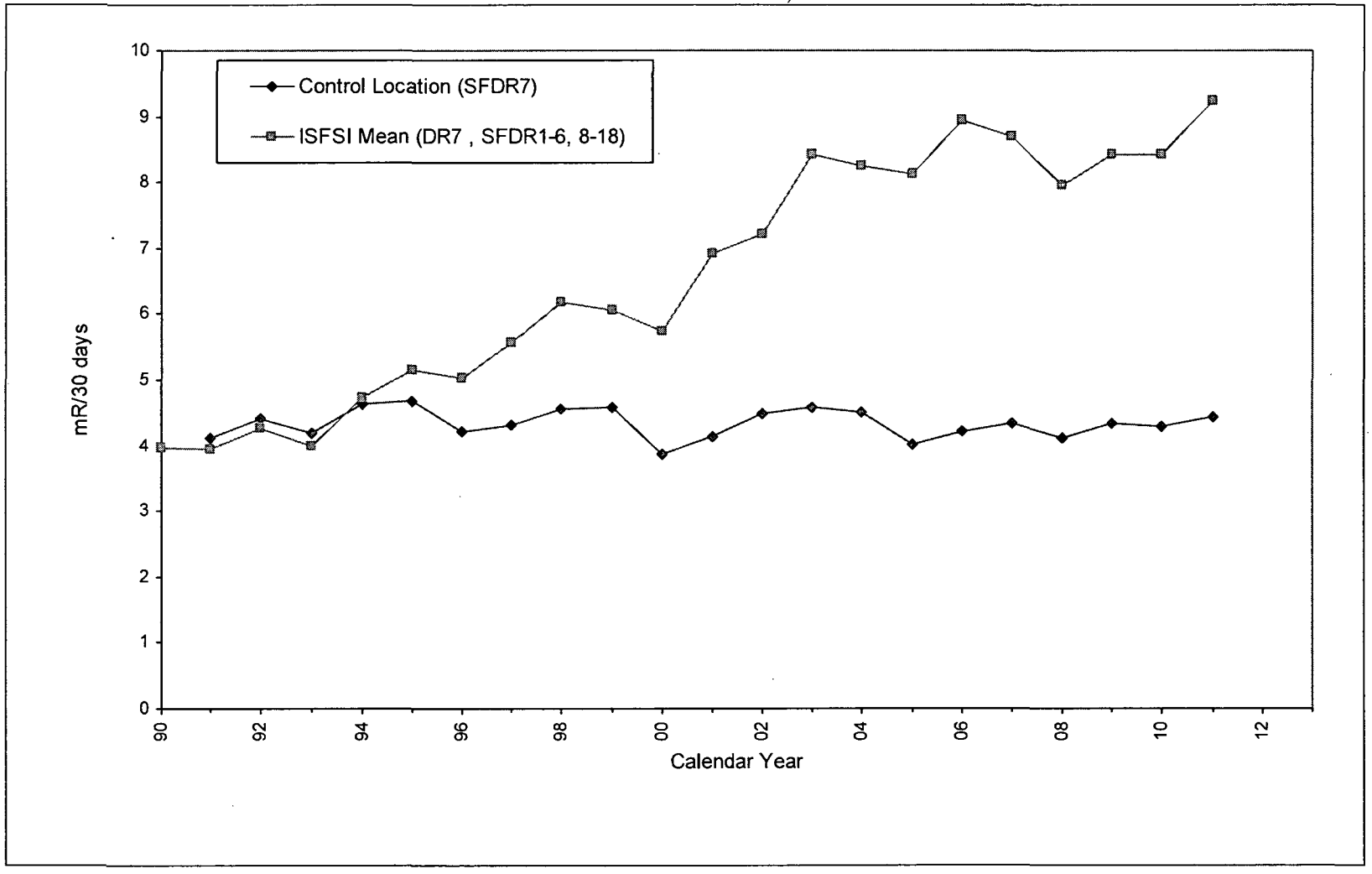


Table 3

Synopsis of 2011 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	249	Gross Beta Gamma	W MC	249 60
Direct Radiation						
Ambient Radiation	Q	20	480	TLD	Q	480
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

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^{-3} pCi/m^3)	Gamma (60) Cs-137	1.8	1.2 (3/48) (1.5-2.8)	SSE of ISFSI SFA4 0.1 km SSE	0.2 (2/48) (1.0-2.8)	1.0 (1/12) (1.0)
Air Particulates (10^{-2} pCi/m^3)	Gross Beta (249)	0.5	2.2 (199/199) (0.8-6.0)	NNW of ISFSI SFA3 0.1 km NNW	2.4 (49/49) (0.8-6.0)	2.1 (50/50) (1.0-4.8)
Direct Radiation						
Ambient Radiation (mR/90 days)	TLD (480)	--	27.70 (456/456) (10.19-57.49)	West of ISFSI SFDR18 0.1 km W	48.67 (24/24) (42.00-57.49)	13.30 (24/24) (12.11-15.65)
Terrestrial Environment						
Vegetation (pCi/kg)	Gamma (20) I-131 [3]	20	161 (3/16) (80-225)	SSE of ISFSI SFB4 0.1 km SSE	225 (1/4) 225	71 (1/4) (71)
Soil (pCi/kg)	Gamma (20) Cs-137	17	147 (7/16) (48-233)	Entrance to Camp Conoy SFS5 0.7 km ESE	215 (4/4) (189-233)	71 (3/4) (61-91)

[1] Mean and range based upon detectable measurements only. Fraction (F) of detectable measurements at specified location is indicated in parentheses
[2] From the centerpoint of the ISFSI facility
[3] Positive Iodine results attributable to Fukushima Dai-Ichi March Releases

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) Offsite Dose Calculation Manual for the Calvert Cliffs Nuclear Power Plant.

(7) CP-234, Specification and Surveillance for the Radiological Environmental Monitoring Program.

(8) Constellation Energy Laboratory Procedures Manual, Laboratory Services Section.

(9) Constellation Energy, "Land Use Survey Around Calvert Cliffs Nuclear Power Plant, August 2011."

(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) CP-501, Liquid and Steam Sampling Techniques.

(13) CNG-EV-1.01-1000, Radiological Environmental Monitoring Program (REMP).

(14) Commitment Change Form dated June 16, 2011.

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	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	Discharge Area	0.3	0.2	N
IA10	Hog Island	15.3	9.5	SSE
IA2	Discharge Vicinity	0.3	0.2	N
IA3	Camp Conoy	0.9	0.6	E
IA4	Patuxent River	0.0	0.0	Various
IA5	Patuxent river	0.0	0.0	Various
IA6	Kenwood Beach	10.7	6.7	NNW
IB1	Garden Off Bay Breeze Rd	2.6	1.6	SSE
IB2	Garden Off Bay Breeze Rd	2.6	1.6	SSE
IB3	Garden Off Bay Breeze Rd	2.6	1.6	SSE
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
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

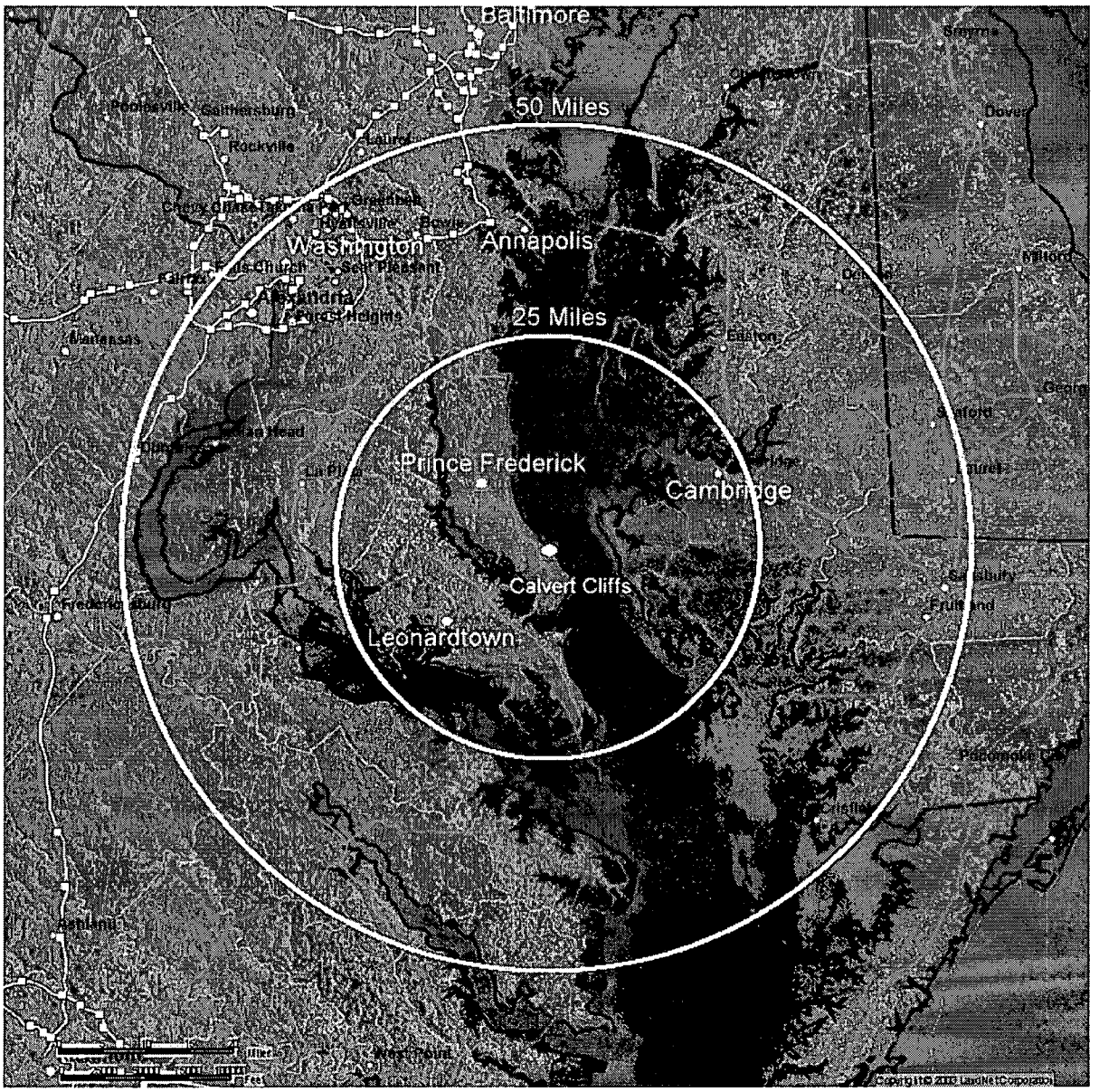


Figure A-2

Calvert Cliffs Nuclear Power Plant Sampling Locations
0-2 Miles

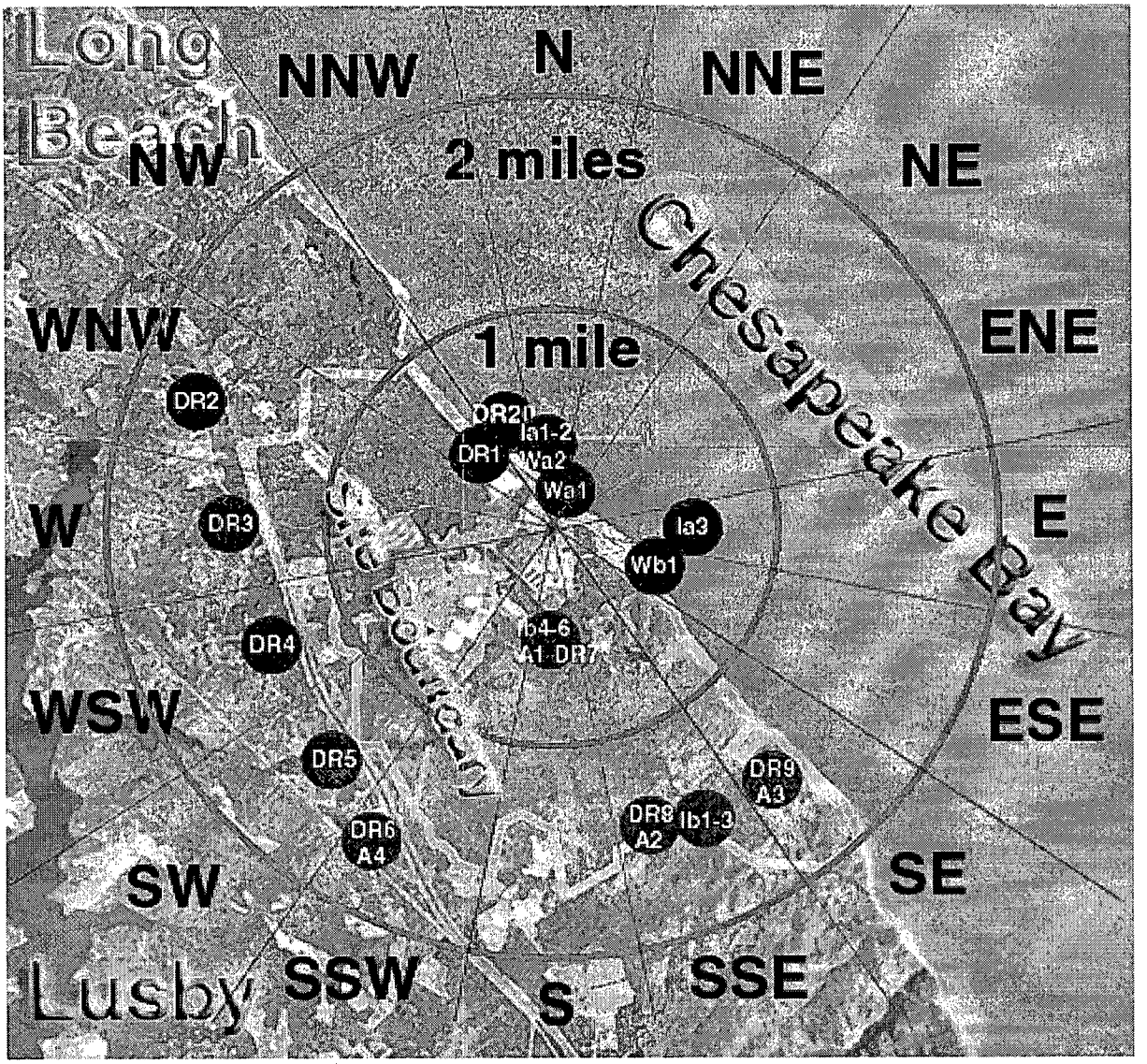


Figure A-3

Calvert Cliffs Nuclear Power Plant Sampling Locations
0-10 Miles

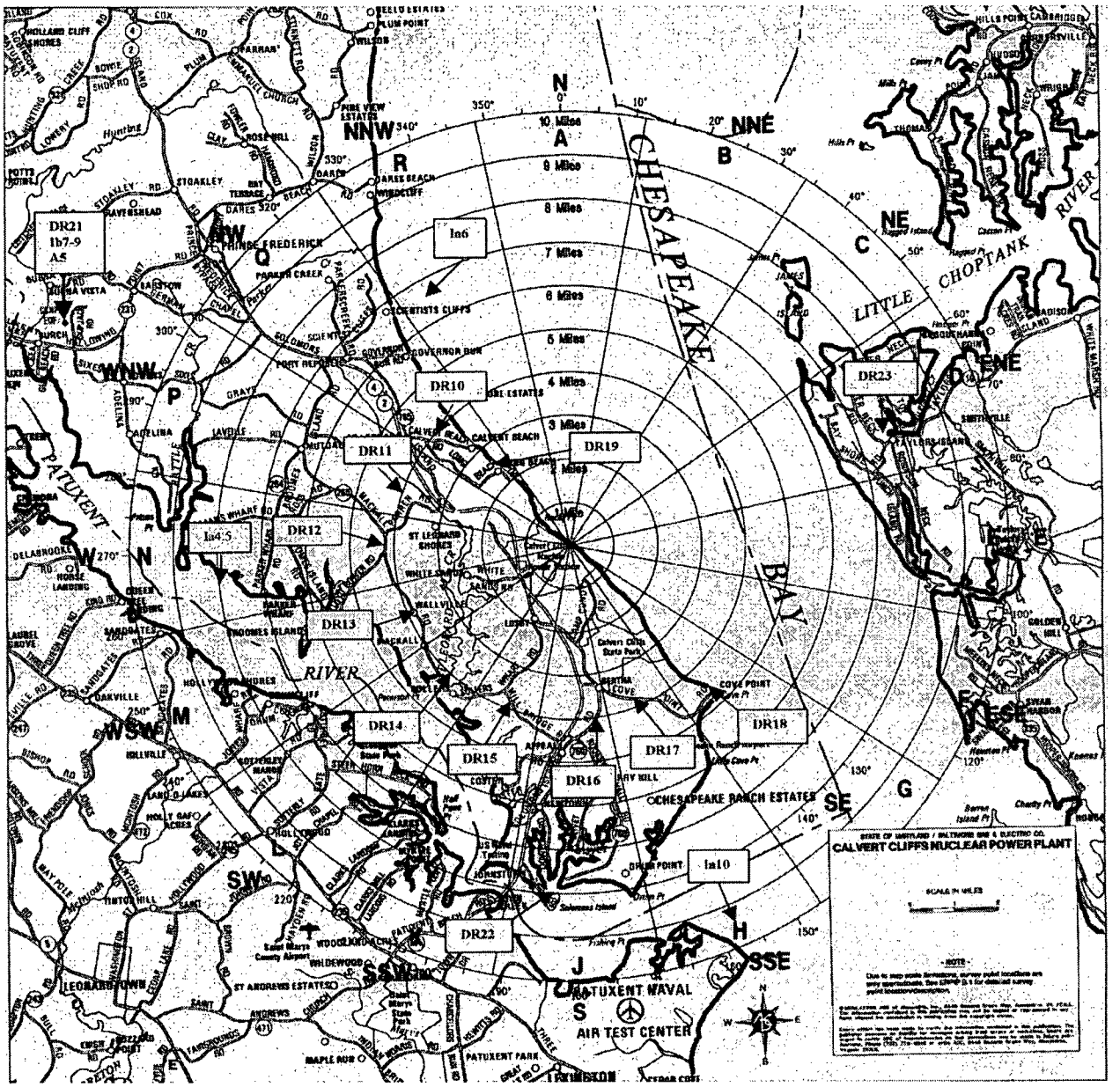


Table A-2

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	Meteorological Station	0.4	NW
SFA2	CCNPP Visitor's Center	0.7	NNE
SFA3	NNW of ISFSI	0.1	NNW
SFA4	SSE of ISFSF	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

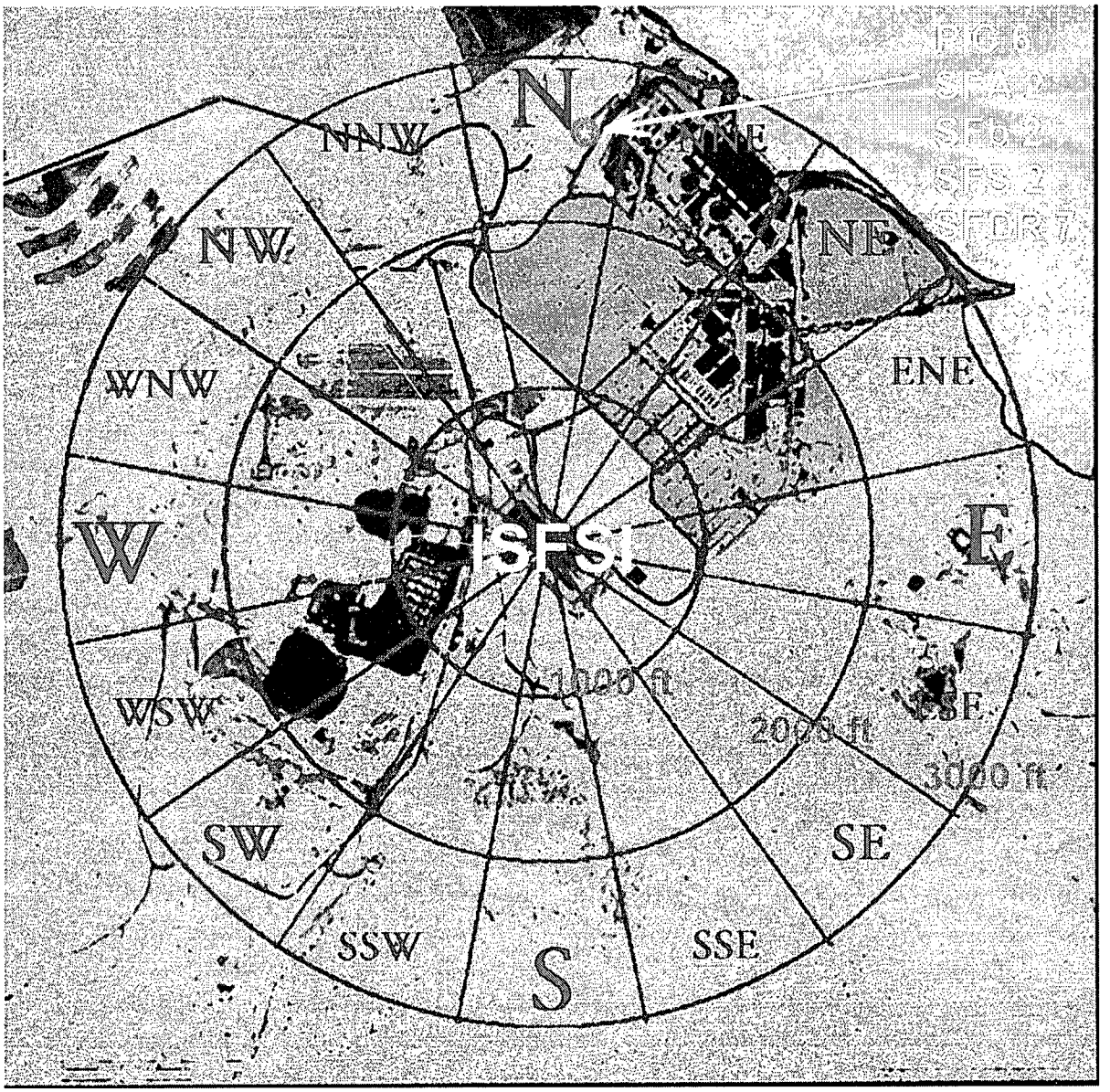
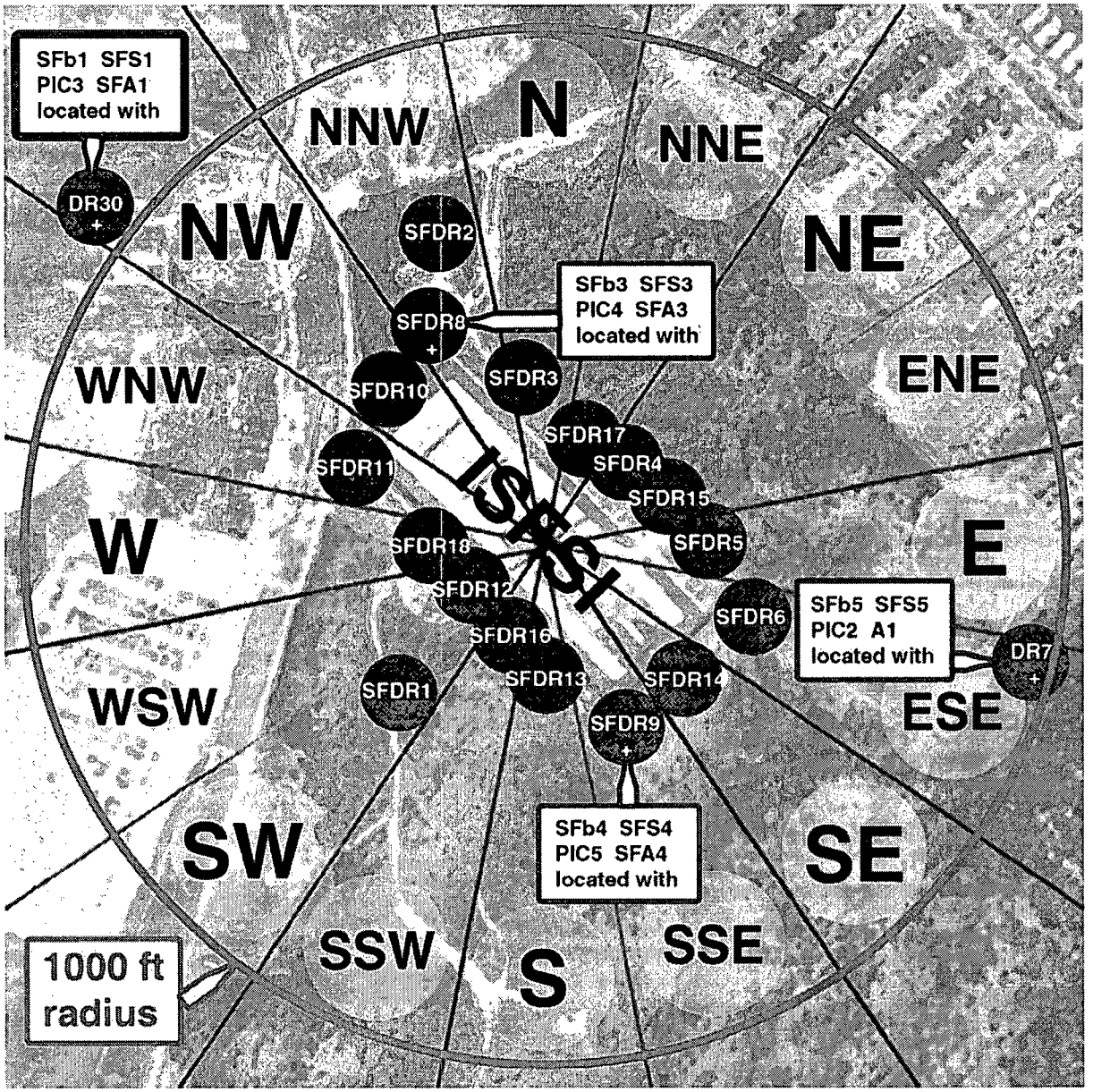


Figure A-5

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	2/2/2011	*	
	2/28/2011	*	
	3/31/2011	*	<316
	5/3/2011	*	
	5/31/2011	*	
	7/1/2011	*	<296
	8/1/2011	*	
	8/31/2011	*	
	9/29/2011	*	<310
	11/1/2011	*	
	12/1/2011	*	
	12/30/2011	*	<280
WA2			
Discharge Vicinity	2/2/2011	*	
	2/28/2011	*	
	3/31/2011	*	407 +/- 190
	5/3/2011	*	
	5/31/2011	*	
	7/1/2011	*	<296
	8/1/2011	*	
	8/31/2011	*	
	9/29/2011	*	<305
	11/1/2011	*	
	12/1/2011	*	
	12/30/2011	*	<280

[1] Quarterly composite of monthly samples.
* All Non-Natural Gamma Emitters less than Minimum Detectable Activity (<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	8/25/2011	Spot	*
IA2 Discharge Area	8/25/2011	Perch	*
IA3 Camp Conoy	9/13/2011	Perch	*
IA4[1] Patuxent River	8/25/2011	Spot	*

[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	3/15/2011	*
	6/24/2011	*
	8/25/2011	*
	10/13/2011	*
IA6[1]		
Kenwood Beach	3/15/2011	*
	6/24/2011	*
	8/25/2011	*
	10/13/2011	*

[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	3/30/2011	*
	7/6/2011	*

* 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
1/3/2011	1/10/2011	*	*	*	*	*
1/10/2011	1/17/2011	*	*	*	*	*
1/17/2011	1/24/2011	*	*	*	*	*
1/24/2011	1/31/2011	*	*	*	*	*
1/31/2011	2/7/2011	*	*	*	*	*
2/7/2011	2/14/2011	*	*	*	*	*
2/14/2011	2/21/2011	*	*	*	*	*
2/21/2011	2/28/2011	*	*	*	*	*
2/28/2011	3/7/2011	*	*	*	*	*
3/7/2011	3/14/2011	*	*	*	*	*
3/14/2011	3/21/2011	3.9 +/- 0.5	*	3.8 +/- 1.5	1.9 +/- 1.1	2.6 +/- 0.4
3/21/2011	3/28/2011	15.0 +/- 2.3	9.3 +/- 4.2	9.3 +/- 1.5	7.3 +/- 1.3	15.3 +/- 1.9
3/28/2011	4/4/2011	14.5 +/- 0.8	7.6 +/- 3.3	6.7 +/- 1.2	9.7 +/- 3.4	12.3 +/- 2.0
4/4/2011	4/11/2011	4.3 +/- 2.1	2.3 +/- 0.9	4.6 +/- 2.0	4.7 +/- 2.5	3.5 +/- 2.7
4/11/2011	4/18/2011	*	*	*	*	*
4/18/2011	4/25/2011	*	*	*	*	*
4/25/2011	5/2/2011	*	*	*	*	*
5/2/2011	5/9/2011	*	*	*	*	*
5/9/2011	5/16/2011	*	*	*	*	*
5/16/2011	5/23/2011	*	*	*	*	*
5/23/2011	5/30/2011	*	*	*	*	*
5/30/2011	6/6/2011	*	*	*	*	*
6/6/2011	6/13/2011	*	*	*	*	*
6/13/2011	6/20/2011	*	*	*	*	*
6/20/2011	6/27/2011	*	*	*	*	*
6/27/2011	7/4/2011	*	*	*	*	*
7/4/2011	7/11/2011	*	*	*	*	*
7/11/2011	7/18/2011	*	*	*	*	*
7/18/2011	7/25/2011	*	*	*	*	*
7/25/2011	8/1/2011	*	*	*	*	*
8/1/2011	8/8/2011	*	*	*	*	*
8/8/2011	8/15/2011	*	*	*	*	*
8/15/2011	8/22/2011	*	*	*	*	*
8/22/2011	8/29/2011	*	*	*	*	*

[1] Control Location

Table B-5 - Continued

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
8/29/2011	9/5/2011	*	*	*	*	*
9/5/2011	9/12/2011	ND[2]	*	*	*	*
9/12/2011	9/19/2011	*	*	*	*	*
9/19/2011	9/26/2011	*	*	*	*	*
9/26/2011	10/3/2011	*	*	*	*	*
10/3/2011	10/10/2011	*	*	*	*	*
10/10/2011	10/17/2011	*	*	*	*	*
10/17/2011	10/24/2011	*	*	*	*	*
10/24/2011	10/31/2011	*	*	*	*	*
10/31/2011	11/7/2011	*	*	*	*	*
11/7/2011	11/14/2011	*	*	*	*	*
11/14/2011	11/21/2011	*	*	*	*	*
11/21/2011	11/28/2011	*	*	*	*	*
11/28/2011	12/5/2011	*	*	*	*	*
12/5/2011	12/12/2011	*	*	*	*	*
12/12/2011	12/19/2011	*	*	*	*	*
12/19/2011	12/26/2011	*	*	*	*	*
12/26/2011	1/2/2012	*	*	*	*	*

[1] Control Location
[2] Power outage
* All Non-Natural Gamma Emitters <MDA
ND=No Data

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
1/3/2011	1/10/2011	3.5 +/- 0.2	3.6 +/- 0.3	2.9 +/- 0.3	3.6 +/- 0.2	3.3 +/- 0.2
1/10/2011	1/17/2011	1.9 +/- 0.1	1.7 +/- 0.2	1.7 +/- 0.2	1.0 +/- 0.2	1.9 +/- 0.1
1/17/2011	1/24/2011	3.0 +/- 0.2	2.9 +/- 0.3	2.7 +/- 0.4	2.6 +/- 0.3	2.8 +/- 0.2
1/24/2011	1/31/2011	2.6 +/- 0.1	2.4 +/- 0.3	4.0 +/- 0.4	3.0 +/- 0.3	2.3 +/- 0.1
1/31/2011	2/7/2011	2.0 +/- 0.1	1.7 +/- 0.3	1.6 +/- 0.3	1.3 +/- 0.2	1.8 +/- 0.1
2/7/2011	2/14/2011	2.2 +/- 0.1	2.3 +/- 0.3	2.4 +/- 0.3	2.0 +/- 0.2	2.0 +/- 0.1
2/14/2011	2/21/2011	1.8 +/- 0.1	1.7 +/- 0.3	2.4 +/- 0.3	1.9 +/- 0.2	1.8 +/- 0.1
2/21/2011	2/28/2011	1.8 +/- 0.1	1.5 +/- 0.2	2.0 +/- 0.2	1.6 +/- 0.2	1.8 +/- 0.1
2/28/2011	3/7/2011	1.3 +/- 0.1	1.7 +/- 0.3	1.5 +/- 0.3	1.4 +/- 0.2	1.6 +/- 0.1
3/7/2011	3/14/2011	1.7 +/- 0.1	1.7 +/- 0.3	2.0 +/- 0.3	1.5 +/- 0.2	1.7 +/- 0.1
3/14/2011	3/21/2011	2.2 +/- 0.1	1.7 +/- 0.3	2.7 +/- 0.3	2.1 +/- 0.2	2.2 +/- 0.1
3/21/2011	3/28/2011	5.0 +/- 0.2	4.3 +/- 0.4	4.5 +/- 0.4	4.6 +/- 0.3	4.6 +/- 0.2
3/28/2011	4/4/2011	2.8 +/- 0.2	1.8 +/- 0.2	1.5 +/- 0.2	1.8 +/- 0.3	2.5 +/- 0.2
4/4/2011	4/11/2011	2.2 +/- 0.2	1.6 +/- 0.2	1.3 +/- 0.2	2.5 +/- 0.3	2.0 +/- 0.2
4/11/2011	4/18/2011	1.6 +/- 0.1	1.0 +/- 0.2	2.3 +/- 0.2	1.8 +/- 0.3	1.6 +/- 0.1
4/18/2011	4/25/2011	1.7 +/- 0.1	1.3 +/- 0.2	1.6 +/- 0.2	1.6 +/- 0.2	2.1 +/- 0.1
4/25/2011	5/2/2011	0.9 +/- 0.1	0.7 +/- 0.2	0.7 +/- 0.2	1.0 +/- 0.3	0.9 +/- 0.1
5/2/2011	5/9/2011	1.7 +/- 0.1	1.2 +/- 0.2	1.2 +/- 0.2	1.5 +/- 0.2	1.9 +/- 0.1
5/9/2011	5/16/2011	0.9 +/- 0.1	0.8 +/- 0.2	0.9 +/- 0.2	1.1 +/- 0.2	1.1 +/- 0.1
5/16/2011	5/23/2011	1.3 +/- 0.1	1.2 +/- 0.2	1.1 +/- 0.2	1.7 +/- 0.3	1.4 +/- 0.1
5/23/2011	5/30/2011	2.4 +/- 0.1	1.6 +/- 0.2	1.9 +/- 0.2	3.0 +/- 0.3	2.4 +/- 0.1
5/30/2011	6/6/2011	2.2 +/- 0.2	1.9 +/- 0.3	2.0 +/- 0.3	2.4 +/- 0.3	2.4 +/- 0.2
6/6/2011	6/13/2011	2.9 +/- 0.2	2.5 +/- 0.3	2.5 +/- 0.2	2.6 +/- 0.3	3.1 +/- 0.2
6/13/2011	6/20/2011	1.7 +/- 0.1	1.8 +/- 0.1	1.2 +/- 0.2	1.2 +/- 0.3	1.8 +/- 0.1
6/20/2011	6/27/2011	1.5 +/- 0.1	1.6 +/- 0.1	1.5 +/- 0.2	1.3 +/- 0.2	1.7 +/- 0.1
6/27/2011	7/4/2011	1.9 +/- 0.1	1.8 +/- 0.1	1.6 +/- 0.2	1.3 +/- 0.2	2.2 +/- 0.1
7/4/2011	7/11/2011	2.2 +/- 0.1	2.3 +/- 0.1	2.1 +/- 0.2	1.9 +/- 0.3	2.8 +/- 0.2
7/11/2011	7/18/2011	1.4 +/- 0.1	1.5 +/- 0.1	1.4 +/- 0.2	1.8 +/- 0.3	1.7 +/- 0.1
7/18/2011	7/25/2011	3.0 +/- 0.2	2.9 +/- 0.2	1.7 +/- 0.2	2.4 +/- 0.3	3.6 +/- 0.2
7/25/2011	8/1/2011	2.5 +/- 0.1	2.5 +/- 0.1	1.7 +/- 0.2	2.3 +/- 0.2	2.9 +/- 0.1

[1] Control Location

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	A1 Entrance to Camp Conoy	A2 Camp Conoy Siren	A3 Bay Breeze Rd	A4 Route 765 at Lusby	A5[1] EOF
8/1/2011	8/8/2011	2.3 +/- 0.1	2.1 +/- 0.1	0.9 +/- 0.2	1.3 +/- 0.3	0.8 +/- 0.1
8/8/2011	8/15/2011	1.9 +/- 0.1	2.0 +/- 0.1	1.1 +/- 0.2	1.3 +/- 0.3	2.1 +/- 0.1
8/15/2011	8/22/2011	1.8 +/- 0.1	1.8 +/- 0.1	1.0 +/- 0.2	2.6 +/- 0.3	2.1 +/- 0.1
8/22/2011	8/29/2011	ND[2]	1.7 +/- 0.2	2.5 +/- 0.4	1.4 +/- 0.3	1.5 +/- 0.1
8/29/2011	9/5/2011	2.4 +/- 0.1	1.9 +/- 0.1	1.7 +/- 0.3	1.6 +/- 0.2	2.2 +/- 0.1
9/5/2011	9/12/2011	ND[3]	1.6 +/- 0.1	0.8 +/- 0.2	1.2 +/- 0.3	1.7 +/- 0.2
9/12/2011	9/19/2011	2.6 +/- 0.2	2.2 +/- 0.2	1.0 +/- 0.3	1.6 +/- 0.3	2.3 +/- 0.2
9/19/2011	9/26/2011	0.9 +/- 0.1	0.8 +/- 0.1	0.4 +/- 0.2	0.7 +/- 0.2	0.9 +/- 0.1
9/26/2011	10/3/2011	1.5 +/- 0.1	1.2 +/- 0.1	1.2 +/- 0.2	1.4 +/- 0.2	1.3 +/- 0.1
10/3/2011	10/10/2011	2.8 +/- 0.2	2.3 +/- 0.2	2.3 +/- 0.2	2.5 +/- 0.2	2.6 +/- 0.2
10/10/2011	10/17/2011	3.8 +/- 0.2	3.2 +/- 0.2	3.2 +/- 0.2	3.8 +/- 0.2	3.0 +/- 0.2
10/17/2011	10/24/2011	2.7 +/- 0.1	2.1 +/- 0.1	2.3 +/- 0.1	2.5 +/- 0.1	2.3 +/- 0.1
10/24/2011	10/31/2011	2.6 +/- 0.2	2.5 +/- 0.2	2.5 +/- 0.2	2.8 +/- 0.2	2.5 +/- 0.2
10/31/2011	11/7/2011	1.9 +/- 0.1	1.9 +/- 0.1	1.7 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1
11/7/2011	11/14/2011	2.8 +/- 0.2	2.6 +/- 0.1	2.3 +/- 0.1	3.0 +/- 0.2	2.8 +/- 0.2
11/14/2011	11/21/2011	2.5 +/- 0.1	2.3 +/- 0.1	2.3 +/- 0.1	2.4 +/- 0.1	2.2 +/- 0.1
11/21/2011	11/28/2011	2.3 +/- 0.1	2.2 +/- 0.1	2.2 +/- 0.1	2.5 +/- 0.1	2.2 +/- 0.1
11/28/2011	12/5/2011	1.5 +/- 0.1	1.5 +/- 0.1	1.5 +/- 0.1	1.7 +/- 0.1	1.7 +/- 0.1
12/5/2011	12/12/2011	2.2 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1	2.1 +/- 0.1	2.0 +/- 0.1
12/12/2011	12/19/2011	4.5 +/- 0.2	4.0 +/- 0.2	3.9 +/- 0.2	4.5 +/- 0.2	4.4 +/- 0.2
12/19/2011	12/26/2011	2.4 +/- 0.1	2.3 +/- 0.1	2.2 +/- 0.1	2.5 +/- 0.1	2.3 +/- 0.1
12/26/2011	1/2/2012	2.2 +/- 0.1	2.2 +/- 0.1	2.2 +/- 0.1	2.4 +/- 0.1	2.2 +/- 0.1

[1] Control Location
[2] Lost Sample due to Hurricane Irene
[3] Power outage
ND = No Data

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 MET Station	SFA2[1] Visitors Center	SFA3 NNW of ISFSI	SFA4 SSE of ISFSI
1/3/2011	1/10/2011	3.8 +/- 0.2	3.4 +/- 0.2	3.9 +/- 0.3	3.5 +/- 0.3
1/10/2011	1/17/2011	2.0 +/- 0.1	1.9 +/- 0.1	1.4 +/- 0.2	1.7 +/- 0.2
1/17/2011	1/24/2011	3.3 +/- 0.2	3.2 +/- 0.2	2.9 +/- 0.3	2.7 +/- 0.3
1/24/2011	1/31/2011	2.8 +/- 0.1	2.4 +/- 0.2	2.8 +/- 0.3	2.7 +/- 0.3
1/31/2011	2/7/2011	2.0 +/- 0.1	1.8 +/- 0.1	2.0 +/- 0.2	1.4 +/- 0.2
2/7/2011	2/14/2011	2.3 +/- 0.1	2.1 +/- 0.1	2.3 +/- 0.2	2.3 +/- 0.2
2/14/2011	2/21/2011	2.0 +/- 0.1	1.8 +/- 0.1	1.6 +/- 0.2	1.6 +/- 0.2
2/21/2011	2/28/2011	1.9 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.2	1.7 +/- 0.2
2/28/2011	3/7/2011	1.4 +/- 0.1	1.4 +/- 0.1	1.6 +/- 0.2	1.5 +/- 0.1
3/7/2011	3/14/2011	1.7 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.2	1.7 +/- 0.1
3/14/2011	3/21/2011	ND[2]	2.2 +/- 0.1	2.6 +/- 0.2	2.4 +/- 0.1
3/21/2011	3/28/2011	ND[2]	4.8 +/- 0.2	4.7 +/- 0.3	4.1 +/- 0.2
3/28/2011	4/4/2011	2.6 +/- 0.1	2.3 +/- 0.2	2.4 +/- 0.2	2.1 +/- 0.1
4/4/2011	4/11/2011	1.8 +/- 0.2	2.0 +/- 0.2	2.3 +/- 0.3	1.9 +/- 0.1
4/11/2011	4/18/2011	1.7 +/- 0.1	1.4 +/- 0.1	1.5 +/- 0.2	1.7 +/- 0.1
4/18/2011	4/25/2011	2.2 +/- 0.1	1.9 +/- 0.1	ND[3]	1.8 +/- 0.1
4/25/2011	5/2/2011	0.9 +/- 0.1	1.0 +/- 0.1	1.2 +/- 0.3	1.0 +/- 0.1
5/2/2011	5/9/2011	1.9 +/- 0.1	1.8 +/- 0.1	2.0 +/- 0.3	1.6 +/- 0.1
5/9/2011	5/16/2011	1.1 +/- 0.1	1.0 +/- 0.1	1.0 +/- 0.3	0.9 +/- 0.1
5/16/2011	5/23/2011	1.5 +/- 0.1	1.4 +/- 0.1	2.3 +/- 0.4	1.2 +/- 0.1
5/23/2011	5/30/2011	2.6 +/- 0.1	2.1 +/- 0.1	4.3 +/- 0.4	2.3 +/- 0.1
5/30/2011	6/6/2011	2.4 +/- 0.2	ND[2]	3.8 +/- 0.5	2.3 +/- 0.2
6/6/2011	6/13/2011	3.3 +/- 0.2	3.0 +/- 0.2	6.0 +/- 0.5	3.0 +/- 0.2
6/13/2011	6/20/2011	1.9 +/- 0.1	1.6 +/- 0.1	ND[3]	1.8 +/- 0.1
6/20/2011	6/27/2011	1.6 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1	1.6 +/- 0.1
6/27/2011	7/4/2011	2.1 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1
7/4/2011	7/11/2011	2.8 +/- 0.2	2.4 +/- 0.2	2.5 +/- 0.2	2.3 +/- 0.1
7/11/2011	7/18/2011	1.6 +/- 0.1	1.5 +/- 0.1	1.7 +/- 0.1	1.6 +/- 0.1
7/18/2011	7/25/2011	3.7 +/- 0.2	3.0 +/- 0.2	3.3 +/- 0.2	3.1 +/- 0.2
7/25/2011	8/1/2011	3.0 +/- 0.1	2.6 +/- 0.1	2.8 +/- 0.1	2.6 +/- 0.1

[1] Control Location
[2] Power outage
[3] Sampler malfunction/low flow
ND = No Data

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 MET Station	SFA2[1] Visitors Center	SFA3 NNW of ISFSI	SFA4 SSE of ISFSI
8/1/2011	8/8/2011	2.5 +/- 0.1	2.3 +/- 0.1	2.3 +/- 0.1	2.2 +/- 0.1
8/8/2011	8/15/2011	2.2 +/- 0.1	1.9 +/- 0.1	2.1 +/- 0.1	1.8 +/- 0.1
8/15/2011	8/22/2011	2.1 +/- 0.1	1.8 +/- 0.1	2.0 +/- 0.1	1.9 +/- 0.1
8/22/2011	8/29/2011	1.5 +/- 0.1	1.4 +/- 0.2	1.7 +/- 0.1	1.0 +/- 0.1
8/29/2011	9/5/2011	2.3 +/- 0.1	2.0 +/- 0.2	1.0 +/- 0.1	2.0 +/- 0.1
9/5/2011	9/12/2011	ND[2]	ND[2]	ND[2]	2.5 +/- 0.3
9/12/2011	9/19/2011	ND[2]	2.1 +/- 0.2	2.3 +/- 0.2	2.3 +/- 0.2
9/19/2011	9/26/2011	0.9 +/- 0.1	1.0 +/- 0.1	0.8 +/- 0.1	0.8 +/- 0.1
9/26/2011	10/3/2011	1.5 +/- 0.1	1.5 +/- 0.1	1.4 +/- 0.1	1.3 +/- 0.1
10/3/2011	10/10/2011	3.6 +/- 0.2	2.4 +/- 0.2	2.7 +/- 0.2	2.5 +/- 0.2
10/10/2011	10/17/2011	3.8 +/- 0.2	3.0 +/- 0.2	3.2 +/- 0.2	2.9 +/- 0.2
10/17/2011	10/24/2011	2.4 +/- 0.1	2.4 +/- 0.1	2.5 +/- 0.1	2.4 +/- 0.1
10/24/2011	10/31/2011	2.6 +/- 0.2	2.7 +/- 0.2	2.3 +/- 0.2	2.5 +/- 0.2
10/31/2011	11/7/2011	1.8 +/- 0.1	1.7 +/- 0.1	1.7 +/- 0.1	1.9 +/- 0.1
11/7/2011	11/14/2011	2.8 +/- 0.2	2.9 +/- 0.2	2.6 +/- 0.2	2.7 +/- 0.2
11/14/2011	11/21/2011	2.4 +/- 0.1	2.4 +/- 0.1	2.3 +/- 0.1	2.4 +/- 0.1
11/21/2011	11/28/2011	2.4 +/- 0.1	2.4 +/- 0.1	2.3 +/- 0.1	2.3 +/- 0.1
11/28/2011	12/5/2011	1.6 +/- 0.1	1.5 +/- 0.1	1.4 +/- 0.1	1.6 +/- 0.1
12/5/2011	12/12/2011	2.1 +/- 0.1	1.9 +/- 0.1	2.0 +/- 0.1	2.0 +/- 0.1
12/12/2011	12/19/2011	4.2 +/- 0.2	4.6 +/- 0.2	4.3 +/- 0.2	4.2 +/- 0.2
12/19/2011	12/26/2011	2.4 +/- 0.1	2.2 +/- 0.1	2.5 +/- 0.1	2.3 +/- 0.1
12/26/2011	1/2/2012	2.2 +/- 0.1	2.2 +/- 0.1	2.1 +/- 0.1	2.2 +/- 0.1

[1] Control Location
[2] Power outage
[3] Sampler malfunction/low flow
ND=No Data

Table B-7

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

Sample Date	A1 Entrance to Camp Conoy	A2 Camp Conoy Siren	A3 Bay Breeze Rd	A4 Route 765 at Lusby	A5[1] EOF
1/31/2011	*	*	*	*	*
3/1/2011	*	*	*	*	*
3/29/2011	*	*	*	*	1.7 ± 0.7 [2]
5/2/2011	1.5 ± 0.7 [2]	*	*	*	1.2 ± 0.6 [2]
5/30/2011	*	*	*	*	*
6/27/2011	*	*	*	*	*
8/1/2011	*	*	*	*	*
8/29/2011	*	*	*	*	*
10/3/2011	*	*	*	*	*
10/31/2011	*	*	*	*	*
11/28/2011	*	*	*	*	*
1/2/2012	*	*	*	*	*

Sample Date	SFA1 MET Station	SFA2[1] Visitors Center	SFA3 NNW of ISFSI	SFA4 SSE of ISFSI
1/31/2011	*	*	*	*
3/1/2011	*	*	*	2.8 ± 1.6 [3]
3/29/2011	*	*	*	*
5/2/2011	*	*	*	*
5/30/2011	*	*	*	*
6/27/2011	*	*	*	*
8/1/2011	*	*	*	*
8/29/2011	*	*	*	*
10/3/2011	*	*	*	*
10/31/2011	*	*	*	*
11/28/2011	*	*	*	*
1/2/2012	*	*	*	*

[1] Control Location
[2] Positive Result for Cs137 directly attributable to Fukushima Dai-Ichi releases
[3] Positive Result for Cs-137 was possibly from nearby land disturbance activities.
* 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
IB1	6/27/2011	Squash	*
Bay Breeze Rd	7/25/2011	Eggplant Leaves	*
	8/30/2011	Greens	*
	9/27/2011	Green Peppers	*
IB2	6/27/2011	Eggplant Leaves	*
Bay Breeze Rd	7/25/2011	Squash	*
	8/30/2011	Green Peppers	*
	9/27/2011	Eggplant Leaves	*
IB3	6/27/2011	Cabbage	*
Bay Breeze Rd	7/25/2011	Cabbage	*
	8/30/2011	Cabbage	*
	9/27/2011	Cabbage	*
IB4	6/27/2011	Squash	*
Camp Conoy	7/25/2011	Eggplant Leaves	*
Entrance	8/30/2011	Mint	*
	9/27/2011	Green Peppers	*
IB5	6/27/2011	Eggplant Leaves	*
Camp Conoy	7/25/2011	Squash	*
Entrance	8/30/2011	Greens	*
	9/27/2011	Eggplant Leaves	*
IB6	6/27/2011	Cabbage	*
Camp Conoy	7/25/2011	Mint	*
Entrance	8/30/2011	Green Peppers	*
	9/27/2011	Mint	*

Table B-8a - Continued

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

Sample Code	Sample Date	Sample Type	Gamma Emitters
IB7[1]	6/27/2011	Squash	*
EOF	7/25/2011	Eggplant Leaves	*
	8/30/2011	Mint	*
	9/27/2011	Cabbage	*
IB8[1]	6/27/2011	Eggplant Leaves	*
EOF	7/25/2011	Okra	*
	8/30/2011	Eggplant Leaves	*
	9/27/2011	Eggplant Leaves	*
IB9[1]	6/27/2011	Cabbage	*
EOF	8/30/2011	Cabbage	*
	7/25/2011	Cabbage	*
	9/27/2011	Mint	*

[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	I-131 [2]
SFB1			
MET Station	3/22/2011	*	
	6/13/2011	*	
	9/19/2011	*	
	11/21/2011	*	
SFB2[1]			
Visitor's Center	3/22/2011	*	71 +/- 42
	6/13/2011	*	
	9/19/2011	*	
	11/21/2011	*	
SFB3			
NNW of ISFSI	3/22/2011	*	180 +/- 33
	6/13/2011	*	
	9/19/2011	*	
	11/21/2011	*	
SFB4			
SSE of ISFSI	3/22/2011	*	225 +/- 133
	6/13/2011	*	
	9/19/2011	*	
	11/21/2011	*	
SFB5			
On Site Before Entrance to			
Camp Conoy	3/22/2011	*	80 +/- 44
	6/13/2011	*	
	9/19/2011	*	
	11/21/2011	*	

[1] Control Location
[2] Positive results directly attributable to Fukushima Dai-Ichi releases
* 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	3/22/2011	#	*
	6/13/2011	#	*
	9/19/2011	#	*
	11/21/2011	#	*
SFS2[1]			
Visitors Center	3/22/2011	#	*
	6/13/2011	61 +/- 28	*
	9/19/2011	61 +/- 26	*
	11/21/2011	91 +/- 30	*
SFS3			
NNW of ISFSI	3/22/2011	#	*
	6/13/2011	69 +/- 31	*
	9/19/2011	48 +/- 23	*
	11/21/2011	56 +/- 30	*
SFS4			
SSE of ISFSI	3/22/2011	#	*
	6/13/2011	#	*
	9/19/2011	#	*
	11/21/2011	#	*
SFS5			
Entrance to Camp			
Conoy	3/22/2011	233 +/- 31	*
	6/13/2011	213 +/- 45	*
	9/19/2011	224 +/- 43	*
	11/21/2011	189 +/- 47	*

[1] Control Location
#This isotope <MDA
* 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)Wet	Shoreline Sediment (pCi/kg)Dry	Soil (pCi/kg)Dry	Vegetation (pCi/Kg)Wet
Na-22	0 - 0	2.9 - 6.9	18.8 - 46.8	3.8 - 9.7	5 - 9.1	5.7 - 36.3	12.1 - 49.6	26.7 - 79	0.9 - 40
K-40	0 - 0	31.1 - 68.3	170.9 - 340	40.8 - 82.2	41.6 - 74.4	87.1 - 325	130 - 438.2	346 - 770	13 - 323
Cr-51	0 - 0.1	21.7 - 44.2	133 - 351	25.5 - 52.7	27.6 - 49.6	38.2 - 219	97.2 - 377	200 - 594	15- 363
Mn-54	0 - 0	2.6 - 5.9	16.3 - 32.1	3.5 - 7.5	3.7 - 6.9	5.6 - 29.2	11.3 - 38.5	23 - 66.2	0.4 - 32.8
Co-58	0 - 0	2.6 - 6	20 - 38.1	3.3 - 7.6	3.7 - 6.8	5.1 - 28.6	11.8 - 41.5	24.3 - 70.6	0 - 70.3
Fe-59	0 - 0	5.7 - 13.4	55 - 110	7 - 16.5	9.2 - 16.8	15.8 - 63.4	28.1 - 116	56.3 - 170	21-363
Co-60	0 - 0	2.7 - 6.7	19.7 - 39.6	3.5 - 8.3	4.5 - 8.4	5.8 - 34.2	12.2 - 44.2	24.6 - 72.2	0.6 - 37.5
Zn-65	0 - 0	5.8 - 13.5	43 - 94.1	9 - 18.6	9.7 - 17.9	14 - 71.5	36.4 - 120	62.7 - 191	1.2 - 82.5
Nb-95	0 - 0	2.8 - 6.3	19.6 - 50.4	3.6 - 8.3	3.9 - 7	5.8 - 30	14.3 - 56.4	28.6 - 90.3	8.9-69
Zr-95	0 - 0	4.6 - 10.5	29.2 - 66.9	5.8 - 13.7	6.4 - 12	8.6 - 49.1	21.1 - 75.5	42.7 - 128	16-131
Ru-106	0 - 0	22 - 51	114 - 264	27.9 - 64.9	29 - 58.3	35 - 232	87.1 - 299	182 - 530	0 - 277
Ag-110m	0 - 0	2.5 - 5.5	13.6 - 30.4	3.2 - 7	3.3 - 6.5	4.4 - 26.8	9.4 - 35.1	24.6 - 72.9	0 - 30.9
I-131 *	0-1.1	0 - 6	0 - 470.3	3.2 - 9.4	0.1 - 1.4	0 - 80.2	0 - 326	63.4 - 248	9.0 - 57
Cs-134	0 - 0	2.5 - 5.6	13.9 - 26.6	3.2 - 7.6	3.1 - 6.4	11.1 - 34.1	22.5 - 42.5	40.2 - 70.3	0.6 - 31.4
Cs-137	0 - 0	2.5 - 5.9	13.9 - 30.7	3.5 - 7.9	3.4 - 7.1	12.9 - 36.1	21.4 - 43.5	35.9 - 68.6	0.6 - 32.4
Ba-140	0 - 0.1	5.2 - 10.7	33 - 198	5.4 - 11.6	5.3 - 9.9	6.1 - 67.3	13.5 - 216	70.9 - 238	14-120
La-140	0 - 0.1	5.0 - 10.7	33 - 198	5.4 - 11.6	5.3 - 9.9	6.1 - 67.3	13.4 - 216	70.9 - 238	14-120
Ce-144	0 - 0	13.4 - 28.5	50.4 - 115	17.9 - 37.4	17.5 - 32.9	19.1 - 108	41.8 - 139	84.5 - 244	0 - 132

*This MDA range for I-131 on a silver zeolite or charcoal cartridge is typically 4.16×10^{-3} to 3.40×10^{-2}

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

* The LLD for I-131 measured on a silver zeolite or charcoal cartridge is 2.0×10^{-3} pCi/m^3

Table B-12

Direct Radiation
(Results in Units of mR/90 days +/- 2σ)

Site Code	Location	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
DR01	On Site, along Cliffs	ND[1]	15.86 +/- 1.70	13.15 +/- 3.05	13.55 +/- 1.32
DR02	Route 765, Auto Dump	9.34 +/- 1.01	13.03 +/- 0.79	13.28 +/- 0.81	11.27 +/- 1.23
DR03	Route 765, Giovanni's Tavern	10.56 +/- 0.68	13.17 +/- 1.64	ND[3]	11.49 +/- 1.04
DR04	Route 765, across from Vera's Beach Club	11.93 +/- 1.30	15.30 +/- 2.18	15.19 +/- 1.79	12.76 +/- 1.29
DR05	Route 765, John's Creek	12.04 +/- 1.49	14.94 +/- 0.70	14.35 +/- 1.21	13.05 +/- 1.33
DR06	Route 765 at Lusby	10.02 +/- 0.93	12.84 +/- 1.10	12.25 +/- 0.21	11.03 +/- 0.81
DR07	Entrance to Camp Conoy	10.19 +/- 0.19	12.98 +/- 1.41	12.96 +/- 1.71	11.24 +/- 0.81
DR08	Camp Conoy Rd at Emergency Siren	14.85 +/- 1.60	18.71 +/- 1.42	17.82 +/- 1.73	15.45 +/- 1.56
DR09	Bay Breeze Rd	11.47 +/- 0.48	13.68 +/- 1.01	12.64 +/- 3.88	11.58 +/- 1.51
DR10	Calvert Beach Rd and Decatur Street	10.69 +/- 0.64	12.75 +/- 1.13	ND[3]	11.11 +/- 0.66
DR11	Dirt road off Mackall & Parren Rd	11.16 +/- 0.79	13.38 +/- 2.07	11.45 +/- 1.64	12.05 +/- 0.56
DR12	Mackall & Bowen Rds	10.31 +/- 1.32	13.18 +/- 0.49	11.23 +/- 1.25	11.46 +/- 0.59

[1] TLD missing
[2] Control Location
[3] TLD missing after Hurricane Irene
ND = No Data

Table B-12 - Continued

Direct Radiation
(Results in Units of mR/90 days +/- 2σ)

Site Code	Location	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
DR13	Mackall Rd, near Wallville	11.78 +/- 1.43	14.51 +/- 0.74	12.32 +/- 0.98	12.71 +/- 0.94
DR14	Rodney Point	13.04 +/- 1.17	16.57 +/- 1.05	13.64 +/- 1.07	14.28 +/- 0.83
DR15	Mill Bridge & Turner Rds	11.85 +/- 1.63	14.12 +/- 0.64	12.27 +/- 1.32	12.17 +/- 0.79
DR16	Across from Appeal School	10.55 +/- 0.62	13.50 +/- 1.54	10.65 +/- 1.37	11.17 +/- 1.26
DR17	Cove Point & Little Cove Point Rds	11.98 +/- 1.32	15.33 +/- 1.63	12.77 +/- 0.72	13.34 +/- 1.46
DR18	Cove Point	10.50 +/- 0.96	12.06 +/- 0.75	9.78 +/- 0.76	10.42 +/- 0.61
DR19	Long Beach	10.76 +/- 0.84	13.60 +/- 1.35	10.84 +/- 0.59	11.48 +/- 1.04
DR20	On site, near shore	13.17 +/- 1.28	16.27 +/- 2.27	13.74 +/- 1.19	13.95 +/- 1.39
DR21[2]	EOF	12.38 +/- 0.88	14.90 +/- 1.08	12.29 +/- 0.99	13.03 +/- 1.57
DR22[2]	Solomons Island	11.18 +/- 1.03	13.66 +/- 0.95	11.37 +/- 0.88	12.12 +/- 1.16
DR23[2]	Taylors Island	15.00 +/- 0.23	20.13 +/- 2.01	16.26 +/- 0.21	15.64 +/- 1.08
DR30	MET Station	11.99 +/- 0.41	14.54 +/- 1.29	11.97 +/- 2.46	12.36 +/- 1.41
SFDR01	SW of ISFSI	16.76 +/- 2.72	20.99 +/- 2.29	17.01 +/- 0.78	18.37 +/- 2.69
SFDR02	NNW of ISFSI	19.49 +/- 1.22	23.10 +/- 1.72	20.62 +/- 3.44	20.50 +/- 3.31
SFDR03	North of ISFSI	35.79 +/- 3.89	43.62 +/- 10.09	36.89 +/- 7.18	38.62 +/- 5.87

[1] TLD missing
[2] Control Location

Table B-12 - Continued

Direct Radiation
(Results in Units of mR/90 days +/- 2σ)

Site Code	Location	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
SFDR04	NE of ISFSI	30.40 +/- 3.67	41.02 +/- 6.86	32.89 +/- 6.45	33.51 +/- 4.88
SFDR05	East of ISFSI	17.36 +/- 2.81	24.17 +/- 3.72	19.90 +/- 1.55	20.06 +/- 4.18
SFDR06	ESE of ISFSI	16.12 +/- 0.75	20.63 +/- 2.02	15.57 +/- 1.36	17.10 +/- 2.07
SFDR07[2]	Visitor's Center	12.93 +/- 1.52	15.65 +/- 2.40	12.11 +/- 0.76	12.52 +/- 1.01
SFDR08	NNW of ISFSI	27.20 +/- 5.82	34.63 +/- 4.64	28.19 +/- 4.19	28.77 +/- 6.90
SFDR09	SSE of ISFSI	14.38 +/- 0.65	17.78 +/- 1.85	15.42 +/- 1.54	16.10 +/- 2.21
SFDR10	NW of ISFSI	32.05 +/- 10.61	40.97 +/- 8.64	34.31 +/- 8.41	34.96 +/- 7.13
SFDR11	WNW ISFSI	29.74 +/- 4.62	36.47 +/- 9.49	29.64 +/- 5.65	34.09 +/- 4.94
SFDR12	WSW of ISFSI	42.90 +/- 9.75	49.23 +/- 9.24	44.18 +/- 5.79	45.34 +/- 8.42
SFDR13	South of ISFSI	22.72 +/- 4.28	30.77 +/- 4.57	22.35 +/- 5.49	21.75 +/- 4.22
SFDR14	SE of ISFSI	16.07 +/- 2.97	21.01 +/- 3.64	17.39 +/- 3.94	18.46 +/- 1.55
SFDR15	ENE of ISFSI	21.87 +/- 2.51	24.54 +/- 5.67	22.69 +/- 3.45	22.90 +/- 4.43
SFDR16	SSW of ISFSI	34.53 +/- 3.50	42.07 +/- 6.23	36.35 +/- 5.11	37.44 +/- 5.36
SFDR17	NNE of ISFSI	38.78 +/- 4.42	48.27 +/- 10.88	34.53 +/- 4.65	41.00 +/- 7.31
SFDR18	West of ISFSI	42.00 +/- 5.16	57.49 +/- 9.07	47.67 +/- 9.37	47.51 +/- 7.15

[1] TLD missing
[2] Control Location

APPENDIX C

Quality Assurance Program

Appendix C is a summary of Constellation Energy laboratory's quality assurance program. It consists of Table C-1 which is a compilation of the results of the Constellation Energy Laboratory's participation in an intercomparison program with Environmental Resource Associates (ERA) located in Arvada, Colorado and Analytics, Inc. located in Atlanta, Georgia. It also includes Table C-2 which is a compilation of the results of the Constellation Energy 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 Constellation Energy Laboratories' results contained in Table C-1 generally agree with the intercomparison laboratory results within the range of ±2 σ 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 Constellation Energy Laboratory's results and Analytics' results are ±2σ while the ERA laboratory's uncertainty is based on USEPA guidelines[2].

All the Constellation Energy Laboratories' results contained in Table C-1 generally agree with the intercomparison laboratory results within the range of ±2 σ of each other with the exception of a beta result for the water sample type on 6/16/11 from Analytics. Investigation into the matter yielded no apparent cause for this discrepancy. A new calibration standard was used to calibrate the instrument prior to analyzing this sample. Results for samples run prior to and after this calibration were in agreement within ±2 σ. Repeat analysis of the sample in question yielded results consistent with the initial reported value. All other intercomparisons for beta filters and water samples analyzed on the instrument, prior to and after this sample, were in full agreement. One feasible explanation for this anomalous result is an error in sample preparation. The error could occur either when it was initially prepared at Analytics or later when it was being prepared for counting in the Laboratory. The more probable of the two possibilities is the former one, since there would more likely be a dilution error than concentration error made by Laboratory in the latter instance. A dilution error would lead to lower, not higher, result for the Laboratory, which is not the case for this analysis and thus, would tend to preclude the latter possibility.

With this one exception, all other sets of intercomparison results listed in the table are in full agreement when they were further evaluated using the NRC Resolution Test Criteria[1]. The uncertainties for the Constellation Energy Laboratories' results and Analytics' results are ±2σ while the ERA laboratory's uncertainty is based on USEPA guidelines[2].

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

All the results contained in Table C-2 agree within the range of ±2 σ of each other with their respective Constellation Energy Laboratory original, replicate, and/or Teledyne Brown Engineering's split laboratory samples, except for the comparisons of six samples involving Cs-137 and I-131 results in: a soil sample collected at SFS2 on 3/22/11, two vegetation samples collected at SFb2 and SFb3 on 03/22/11, a cabbage sample collected at IB9 on 07/25/11, and two soil samples collected at SFS2 and SFS3 on 9/19/11. In all cases, low levels of Cs-137 or I-131 were observed in one or more of the results of the comparison set and not observed in all three. These minor discrepancies, occurring very close to or below the analyses MDA's, are most likely due to counting statistical fluctuations, the non-homogeneous nature of the sample-splitting process, and, in the case of I-131, a short decay time.

Weekly air iodine samples were collected at A4 and A5 on 4/11/11 and found to contain low levels of I-131. This is consistent with the results from other sites in the REMP program during this timeframe and with similar results from other observers around the country. The results are attributable to the March Fukushima releases. Unfortunately, the low levels and short decay time of I-131 observed in these samples precluded them from being split with an outside laboratory. Replicate analyses of these samples yielded results comparable to the initial analyses within range of ±2 σ.

Other samples listed in Table C-2, whose nature generally precludes sample splitting, are marked "**" in the Split Analysis column.

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
03/17/11	Air Iodine – pCi	I-131	115.0 +/- 6.0	96.9 +/- 1.6
03/17/11	Milk – pCi/L	Fe-59	164.0 +/- 27.0	175.0 +/- 2.9
		Co-58	106.0 +/- 17.0	113.0 +/- 1.9
		Co-60	157.0 +/- 14.0	172.0 +/- 2.9
		Zn-65	264.0 +/- 39.0	261.0 +/- 4.4
		Cs-134	104.0 +/- 11.0	130.0 +/- 2.2
		Cs-137	214.0 +/- 20.0	205.0 +/- 3.4
		Cr-51	263.0 +/- 104.0	298.0 +/- 5.0
		Mn-54	254.0 +/- 22.0	266.0 +/- 4.5
		I-131	98.0 +/- 31.0	96.9 +/- 1.6
03/17/11	Water – pCi/L	Gross Beta	199.0 +/- 3.0	205.0 +/- 3.4
04/04/11	Water– pCi/L	Ba-133	69.7 +/- 5.0	75.3
		Cs-137	73.3 +/- 6.0	77.0
		Co-60	87.0 +/- 5.0	88.0
		Zn-65	108.0 +/- 14.0	98.9
		Cs-134	63.5 +/- 4.0	72.9
06/16/11	Air particulates on filter – pCi	Cr-51	162.0 +/- 30.0	142.0 +/- 2.4
		Ce-141	68.0 +/- 5.0	55.2 +/- 0.9
		Cs-137	116.0 +/- 9.0	95.3 +/- 1.6
		Cs-134	116.0 +/- 6.0	131.0 +/- 2.2
		Zn-65	213.0 +/- 19.0	180.0 +/- 3.0
		Co-60	157.0 +/- 8.0	134.0 +/- 2.2
		Co-58	122.0 +/- 8.0	105.0 +/- 1.8
		Fe-59	99.0 +/- 10.0	85.2 +/- 1.4
		Mn-54	104.0 +/- 8.0	95.2 +/- 1.6
06/16/11	Water – pCi/L	H-3	34.3	37.2

Table C-1 - Continued

Results of Participation in Cross Check Programs

Sample Date	Sample Type and Units	Isotope Observed	Reported Laboratory's Results	Cross Check Lab Results
06/16/11	Water – pCi/L	Co-58	184.0 +/- 17.0	177.0 +/- 3.0
		Zn-65	344.0 +/- 30.0	305.0 +/- 5.1
		Co-60	243.0 +/- 10.0	228.0 +/- 3.8
		Cs-134	205.0 +/- 7.0	222.0 +/- 3.7
		Cs-137	179.0 +/- 12.0	161.0 +/- 2.7
		Fe-59	162.0 +/- 28.0	144.0 +/- 2.4
		Mn-54	168.0 +/- 14.0	161.0 +/- 2.7
		Ce-141	77.0 +/- 28.0	93.5 +/- 1.6
06/16/11	Water –pCi/L	Gross Beta[1]	171.0 +/- 3.0	123.0 +/- 2.1
07/05/11	Water – pCi/L	I-131	23.0 +/- 5.6	26.0
07/05/11	Water –pCi/L	Gross Beta	44.1 +/- 2.3	63.4
09/15/11	Filter –pCi	Gross Beta	59.8 +/- 1.6	54.6 +/- 0.9
09/19/11	Particulate Filter pCi	Cs-137	533.0 +/- 11.8	486.0
		Co-60	596.0 +/- 15.0	524.0
		Zn-65	601.0 +/- 34.0	464.0
		Cs-134	416.0 +/- 11.0	429.0
10/07/11	Water – pCi/L	I-131	28.0 +/- 11.0	27.5
12/08/11	Charcoal – pCi	I-131	85.0 +/- 7.0	89.5 +/- 1.5

Table C-1 - Continued

Results of Participation in Cross Check Programs

Sample Date	Sample Type and Units	Isotope Observed	Reported Laboratory's Results	Cross Check Lab Results
[1] See Appendix C Discussion				
12/08/11	Particulates filter	Cr-51	354.0 +/- 43.0	339.0 +/- 5.7
	pCi	Cs-137	131.0 +/- 9.0	126.0 +/- 2.1
		Cs-134	90.0 +/- 5.0	103.0 +/- 1.7
		Zn-65	193.0 +/- 17.0	174.0 +/- 2.9
		Co-58	134.0 +/- 9.0	132.0 +/- 2.2
		Fe-59	124.0 +/- 11.0	110.0 +/- 1.8
		Mn-54	149.0 +/- 10.0	144.0 +/- 2.4
		Co-60	169.0 +/- 8.0	162.0 +/- 2.7
12/08/11	Water – pCi/L	H-3	25.1	25.2
12/08/11	Milk – pCi/L	Cs-134	148.0 +/- 7.0	171.0 +/- 2.9
		I-131	97.0 +/- 20.0	90.2 +/- 1.5
		Zn-65	288.0 +/- 26.0	291.0 +/- 4.9
		Co-60	255.0 +/- 11.0	270.0 +/- 4.5
		Cr-51	523.0 +/- 80.0	566.0 +/- 9.5
		Fe-59	175.0 +/- 16.0	183.0 +/- 3.1
		Mn-54	232.0 +/- 15.0	241.0 +/- 4.0
		Cs-137	203.0 +/- 13.0	210.0 +/- 3.5
		Co-58	194.0 +/- 14.0	221.0 +/- 3.7
12/08/11	Water –pCi/L	Gross Beta	292.0 +/- 3.0	281.0 +/- 4.7

[1] See Appendix C Discussion

Table C-2

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Original Analysis	Replicate Analysis	Split Analysis
Air Iodine - A1	01/17/11	I-131	#	#	**
Air Iodine - A2	01/17/11	I-131	#	#	**
Air Filter - A1	01/24/11	Gross Beta	3.2 +/- 0.2	3.4 +/- 0.2	**
Air Filter - A2	01/24/11	Gross Beta	2.9 +/- 0.3	2.9 +/- 0.3	**
Air Filter - A3	01/24/11	Gross Beta	2.7 +/- 0.4	2.9 +/- 0.4	**
Air Filter - A4	01/24/11	Gross Beta	2.6 +/- 0.3	2.8 +/- 0.3	**
Air Filter - A5	01/24/11	Gross Beta	2.9 +/- 0.2	3.1 +/- 0.2	**
Air Filter - SFA1	01/24/11	Gross Beta	3.6 +/- 0.2	3.5 +/- 0.2	**
Air Filter - SFA2	01/24/11	Gross Beta	3.2 +/- 0.2	3.2 +/- 0.2	**
Air Filter - SFA3	01/24/11	Gross Beta	2.9 +/- 0.3	2.8 +/- 0.3	**
Air Filter - SFA4	01/24/11	Gross Beta	2.6 +/- 0.3	2.4 +/- 0.3	**
Air Filter - A1	02/07/11	Gross Beta	2.1 +/- 0.1	2.1 +/- 0.1	**
Air Filter - A2	02/07/11	Gross Beta	1.6 +/- 0.3	1.6 +/- 0.2	**
Air Filter - A3	02/07/11	Gross Beta	1.6 +/- 0.3	1.8 +/- 0.3	**
Air Filter - A4	02/07/11	Gross Beta	1.3 +/- 0.2	1.5 +/- 0.2	**
Air Filter - A5	02/07/11	Gross Beta	1.8 +/- 0.1	1.9 +/- 0.1	**
Air Filter - SFA1	02/07/11	Gross Beta	2.3 +/- 0.1	2.2 +/- 0.1	**
Air Filter - SFA2	02/07/11	Gross Beta	1.8 +/- 0.1	1.8 +/- 0.1	**
Air Filter - SFA3	02/07/11	Gross Beta	2.0 +/- 0.2	1.9 +/- 0.2	**
Air Filter - SFA4	02/07/11	Gross Beta	1.4 +/- 0.2	1.5 +/- 0.2	**
Air Iodine - A4	02/14/11	I-131	#	#	**
Air Iodine - A5	02/14/11	I-131	#	#	**
Air Iodine - CA	03/14/11	I-131	#	#	**
Air Iodine - LB	03/14/11	I-131	#	#	**

Table C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Original Analysis	Replicate Analysis	Split Analysis
Oysters - IA3	03/15/11	Gamma	#	#	#
Oysters - IA6	03/15/11	Gamma	#	#	#
Misc ground coverage - SFB2	03/22/11	I-131 [(1)]	71.5 +/- 41.7	#	#
Misc ground coverage - SFB3	03/22/11	I-131[(1)]	180.1 +/- 33.0	173.6 +/- 32.8	#
Soil - SFS2	03/22/11	Cs-137	#	59.0 +/- 29.1	78.6 +/- 57.6
Soil - SFS3	03/22/11	Cs-137	37.2 +/- 26.9	62.3 +/- 30.2	81.4 +/- 57.2
Shoreline Sediment - WB1	03/30/11	Gamma	#	#	#
Bay Water - WA2	03/31/11	Gamma	#	#	#
Air Iodine - A4	04/11/11	I-131 [(1)]	0.47 +/- 0.25	0.31 +/- 0.1	**
Air Iodine - A5	04/11/11	I-131 [(1)]	0.34 +/- 0.27	0.38 +/- 0.1	**
Air Filter - A1	04/11/11	Gross Beta	2.4 +/- 0.2	2.5 +/- 0.2	**
Air Filter - A2	04/11/11	Gross Beta	1.6 +/- 0.2	1.7 +/- 0.2	**
Air Filter - A3	04/11/11	Gross Beta	1.4 +/- 0.2	1.8 +/- 0.2	**
Air Filter - A4	04/11/11	Gross Beta	2.5 +/- 0.3	2.7 +/- 0.3	**
Air Filter - A5	04/11/11	Gross Beta	2.0 +/- 0.2	2.1 +/- 0.2	**
Air Filter - SFA1	04/11/11	Gross Beta	2.0 +/- 0.2	2.3 +/- 0.2	**
Air Filter - SFA2	04/11/11	Gross Beta	2.0 +/- 0.2	2.1 +/- 0.2	**
Air Filter - SFA3	04/11/11	Gross Beta	2.3 +/- 0.3	2.3 +/- 0.3	**
Air Filter - SFA4	04/11/11	Gross Beta	1.9 +/- 0.1	2.0 +/- 0.1	**
Air Iodine - A3	05/16/11	I-131	#	#	**
Air Iodine - A4	05/16/11	I-131	#	#	**
Air Filter - A1	05/16/11	Gross Beta	1.0 +/- 0.1	1.0 +/- 0.1	**
Air Filter - A2	05/16/11	Gross Beta	0.8 +/- 0.2	0.8 +/- 0.2	**
Air Filter - A3	05/16/11	Gross Beta	0.9 +/- 0.2	0.8 +/- 0.2	**
Air Filter - A4	05/16/11	Gross Beta	1.2 +/- 0.2	1.1 +/- 0.2	**
Air Filter - A5	05/16/11	Gross Beta	1.1 +/- 0.1	1.2 +/- 0.1	**
Air Filter - SFA1	05/16/11	Gross Beta	1.2 +/- 0.1	1.1 +/- 0.1	**
Air Filter - SFA2	05/16/11	Gross Beta	1.0 +/- 0.1	0.9 +/- 0.1	**

Table C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - SFA3	05/16/11	Gross Beta	1.0 +/- 0.3	0.8 +/- 0.3	**
Air Filter - SFA4	05/16/11	Gross Beta	0.9 +/- 0.1	0.9 +/- 0.1	**
Air Filter - A1	05/30/11	Gamma	#	#	#
Air Filter - A2	05/30/11	Gamma	#	#	#
Air Filter - A3	05/30/11	Gamma	#	#	#
Air Filter - A4	05/30/11	Gamma	#	#	#
Air Filter - A5	05/30/11	Gamma	#	#	#
Air Filter - SFA1	05/30/11	Gamma	#	#	#
Air Filter - SFA2	05/30/11	Gamma	#	#	#
Air Filter - SFA3	05/30/11	Gamma	#	#	#
Air Filter - SFA4	05/30/11	Gamma	#	#	#
Air Filter - A1	06/06/11	Gross Beta	2.4 +/- 0.2	2.5 +/- 0.2	**
Air Filter - A2	06/06/11	Gross Beta	1.9 +/- 0.3	2.0 +/- 0.3	**
Air Filter - A3	06/06/11	Gross Beta	2.1 +/- 0.3	2.1 +/- 0.3	**
Air Filter - A4	06/06/11	Gross Beta	2.4 +/- 0.3	2.3 +/- 0.3	**
Air Filter - A5	06/06/11	Gross Beta	2.5 +/- 0.2	2.4 +/- 0.2	**
Air Filter - SFA1	06/06/11	Gross Beta	2.7 +/- 0.2	3.0 +/- 0.2	**
Air Filter - SFA2	06/06/11	Gross Beta	2.5 +/- 0.6	2.7 +/- 0.6	**
Air Filter - SFA3	06/06/11	Gross Beta	3.8 +/- 0.5	4.2 +/- 0.5	**
Air Filter - SFA4	06/06/11	Gross Beta	2.3 +/- 0.2	2.4 +/- 0.2	**
Soil - SFS3	06/13/11	Cs-137	69.2 +/- 30.5	78.2 +/- 29.0	160.0 +/- 86.5
Soil - SFS5	06/13/11	Cs-137	212.7 +/- 44.6	240.3 +/- 39.3	333.0 +/- 84.2
Air Iodine - A2	06/20/11	I-131	#	#	**
Air Iodine - A3	06/20/11	I-131	#	#	**
Oysters - IA3	06/22/11	Gamma	#	#	#
Oysters - IA6	06/22/11	Gamma	#	#	#
Eggplant- IB2	06/27/11	Gamma	#	#	#
Cabbage- IB3	06/27/11	Gamma	#	#	#

Table C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Original Analysis	Replicate Analysis	Split Analysis
Eggplant- IB5	06/27/11	Gamma	#	#	#
Cabbage- IB6	06/27/11	Gamma	#	#	#
Squash - IB7	06/27/11	Gamma	#	#	#
Eggplant- IB9	06/27/11	Gamma	#	#	#
Air Filter - A1	07/04/11	Gross Beta	2.0 +/- 0.1	2.0 +/- 0.1	**
Air Filter - A2	07/04/11	Gross Beta	1.9 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A3	07/04/11	Gross Beta	1.6 +/- 0.2	1.7 +/- 0.2	**
Air Filter - A4	07/04/11	Gross Beta	1.3 +/- 0.2	1.5 +/- 0.2	**
Air Filter - A5	07/04/11	Gross Beta	2.2 +/- 0.1	2.2 +/- 0.1	**
Air Filter - SFA1	07/04/11	Gross Beta	2.4 +/- 0.1	2.4 +/- 0.1	**
Air Filter - SFA2	07/04/11	Gross Beta	2.0 +/- 0.1	1.8 +/- 0.1	**
Air Filter - SFA3	07/04/11	Gross Beta	2.0 +/- 0.1	2.2 +/- 0.1	**
Air Filter - SFA4	07/04/11	Gross Beta	2.0 +/- 0.1	2.0 +/- 0.1	**
DR05	07/06/11	TLD	16.6 +/- 0.8	17.4 +/- 1.8	**
DR06	07/06/11	TLD	14.3 +/- 1.2	15.2 +/- 1.3	**
DR07	07/06/11	TLD	14.4 +/- 1.6	15.4 +/- 1.3	**
DR08	07/06/11	TLD	20.8 +/- 1.6	20.9 +/- 2.8	**
DR09	07/06/11	TLD	15.2 +/- 1.1	16.9 +/- 0.9	**
DR10	07/06/11	TLD	14.9 +/- 2.3	15.5 +/- 1.1	**
DR11	07/06/11	TLD	14.9 +/- 2.3	16.3 +/- 0.7	**
DR29	07/06/11	TLD	21.2 +/- 3.4	20.7 +/- 1.2	**
DR31	07/06/11	TLD	22.7 +/- 3.9	23.3 +/- 4.6	**
SFDR14	07/06/11	TLD	23.2 +/- 4.3	25.1 +/- 6.3	**
SFDR15	07/06/11	TLD	26.1 +/- 5.3	30.6 +/- 5.6	**
Shoreline Sediment - WB1	07/06/11	Gamma	#	**	#
Cabbage - IB3	07/25/11	Gamma	#	#	#
Cabbage - IB9	07/25/11	Cs-137[(1)]	12.2 +/- 7.7	#	#

Table C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Original Analysis	Replicate Analysis	Split Analysis
Bay Water - WA2	08/01/11	Gamma	#	#	#
Spot - IA4	08/25/11	Gamma	#	#	#
Air Iodine - A2	08/29/11	I-131	#	#	**
Air Iodine - A5	08/29/11	I-131	#	#	**
Air Filter - A2	08/29/11	Gross Beta	1.7 +/- 0.2	1.6 +/- 0.1	**
Air Filter - A3	08/29/11	Gross Beta	2.6 +/- 0.4	2.6 +/- 0.4	**
Air Filter - A4	08/29/11	Gross Beta	1.4 +/- 0.3	1.7 +/- 0.3	**
Air Filter - A5	08/29/11	Gross Beta	1.8 +/- 0.1	1.8 +/- 0.1	**
Air Filter - SFA1	08/29/11	Gross Beta	1.7 +/- 0.1	1.5 +/- 0.1	**
Air Filter - SFA2	08/29/11	Gross Beta	1.4 +/- 0.2	1.4 +/- 0.2	**
Air Filter - SFA3	08/29/11	Gross Beta	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA4	08/29/11	Gross Beta	1.0 +/- 0.1	1.1 +/- 0.1	**
Peppers- IB6	08/30/11	Gamma	#	#	#
Mint- IB7	08/30/11	Gamma	#	#	#
Bay Water - WA2	08/31/11	Gamma	#	#	#
Misc ground coverage - SFB2	09/19/11	Gamma	#	#	#
Misc ground coverage - SFB3	09/19/11	Gamma	#	#	#
Soil - SFS2	09/19/11	Cs-137	60.5 +/- 25.6	**	91.9 +/- 43.2
Soil - SFS3	09/19/11	Cs-137	47.6 +/- 23.5	**	**
DR05	09/27/11	TLD	13.5 +/- 1.2	13.6 +/- 1.2	**
DR06	09/27/11	TLD	11.7 +/- 0.9	12.5 +/- 0.8	**
DR07	09/27/11	TLD	12.2 +/- 1.6	12.5 +/- 0.8	**
DR08	09/27/11	TLD	16.8 +/- 1.6	17.3 +/- 1.2	**
DR09	09/27/11	TLD	13.0 +/- 1.6	13.5 +/- 1.1	**
DR11	09/27/11	TLD	13.1 +/- 1.6	13.0 +/- 0.6	**

Table C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Original Analysis	Replicate Analysis	Split Analysis
DR29	09/27/11	TLD	16.4 +/- 1.3	17.6 +/- 1.8	**
DR31	09/27/11	TLD	18.5 +/- 2.3	18.5 +/- 1.9	**
SFDR14	09/27/11	TLD	19.1 +/- 2.9	21.0 +/- 3.3	**
SFDR15	09/27/11	TLD	24.9 +/- 3.0	25.8 +/- 5.9	**
Air Iodine - A1	10/03/11	I-131	#	#	**
Air Iodine - A2	10/03/11	I-131	#	#	**
Air Filter - A1	10/03/11	Gross Beta	1.7 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A2	10/03/11	Gross Beta	1.2 +/- 0.1	1.4 +/- 0.1	**
Air Filter - A3	10/03/11	Gross Beta	1.2 +/- 0.2	1.3 +/- 0.2	**
Air Filter - A4	10/03/11	Gross Beta	1.4 +/- 0.2	1.6 +/- 0.2	**
Air Filter - A5	10/03/11	Gross Beta	1.3 +/- 0.1	1.3 +/- 0.1	**
Air Filter - SFA1	10/03/11	Gross Beta	1.6 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA2	10/03/11	Gross Beta	1.5 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA3	10/03/11	Gross Beta	1.3 +/- 0.1	1.5 +/- 0.1	**
Air Filter - SFA4	10/03/11	Gross Beta	1.3 +/- 0.1	1.5 +/- 0.1	**
Air Iodine - A4	10/10/11	I-131	#	#	**
Air Iodine - A5	10/10/11	I-131	#	#	**
Air Filter - A1	10/10/11	Gross Beta	3.0 +/- 0.2	3.0 +/- 0.2	**
Air Filter - A2	10/10/11	Gross Beta	2.3 +/- 0.2	2.5 +/- 0.2	**
Air Filter - A3	10/10/11	Gross Beta	2.3 +/- 0.2	2.5 +/- 0.2	**
Air Filter - A4	10/10/11	Gross Beta	2.5 +/- 0.2	2.7 +/- 0.2	**
Air Filter - A5	10/10/11	Gross Beta	2.6 +/- 0.2	2.7 +/- 0.2	**
Air Filter - SFA1	10/10/11	Gross Beta	4.0 +/- 0.2	4.1 +/- 0.2	**
Air Filter - SFA2	10/10/11	Gross Beta	2.4 +/- 0.2	2.6 +/- 0.2	**
Air Filter - SFA3	10/10/11	Gross Beta	2.7 +/- 0.2	2.6 +/- 0.2	**
Air Filter - SFA4	10/10/11	Gross Beta	2.5 +/- 0.2	2.6 +/- 0.2	**
Oysters - IA3	10/13/11	Gamma	#	#	#
Air Filter - A1	11/07/11	Gross Beta	1.9 +/- 0.1	1.8 +/- 0.1	**

Table C-2 - Continued

Results of Quality Assurance Program

Sample Type and Location [2]	Sample Date	Type of Analysis	Original Analysis	Replicate Analysis	Split Analysis
Air Filter - A2	11/07/11	Gross Beta	1.9 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A3	11/07/11	Gross Beta	1.7 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A4	11/07/11	Gross Beta	2.0 +/- 0.1	2.0 +/- 0.1	**
Air Filter - A5	11/07/11	Gross Beta	2.0 +/- 0.1	2.0 +/- 0.1	**
Air Filter - SFA1	11/07/11	Gross Beta	1.8 +/- 0.1	2.0 +/- 0.1	**
Air Filter - SFA2	11/07/11	Gross Beta	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA3	11/07/11	Gross Beta	1.7 +/- 0.1	1.7 +/- 0.1	**
Air Filter - SFA4	11/07/11	Gross Beta	1.9 +/- 0.1	1.9 +/- 0.1	**
Air Iodine - A1	11/14/11	I-131	#	#	**
Air Iodine - A5	11/14/11	I-131	#	#	**
Air Iodine - A1	12/05/11	I-131	#	#	**
Air Iodine - A3	12/05/11	I-131	#	#	**
Air Filter - A1	12/05/11	Gross Beta	1.5 +/- 0.1	1.7 +/- 0.1	**
Air Filter - A2	12/05/11	Gross Beta	1.5 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A3	12/05/11	Gross Beta	1.5 +/- 0.1	1.6 +/- 0.1	**
Air Filter - A4	12/05/11	Gross Beta	1.7 +/- 0.1	1.8 +/- 0.1	**
Air Filter - A5	12/05/11	Gross Beta	1.7 +/- 0.1	1.8 +/- 0.1	**
Air Filter - SFA1	12/05/11	Gross Beta	1.6 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA2	12/05/11	Gross Beta	1.5 +/- 0.1	1.6 +/- 0.1	**
Air Filter - SFA3	12/05/11	Gross Beta	1.4 +/- 0.1	1.4 +/- 0.1	**
Air Filter - SFA4	12/05/11	Gross Beta	1.6 +/- 0.1	1.7 +/- 0.1	**

[1] See discussion at the beginning of the Appendix

[2] Results reported for Air samples I-131 and Beta are in 10^{-2} pCi/m^3. All Vegetation and Soil, Oysters and Fish are in pCi/Kg. All water and milk are in pCi/L, TLD are in mR/90 Day

** The nature of these samples precluded splitting them with an independent laboratory.

All Non natural Gamma Emitters are <MDA

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. There are no animals producing milk for human consumption within the 5 mile radius. The nearest garden/ resident location within the 5-mile radius is in the SW sector; however, its distance from the plant is the same as that reported for the closest residence in that sector in 2010.

Table D-1
Land Use Survey

	Distance From Plant (miles)	
Sector	Residence	Garden
SE	1.5	1.5
SSE	1.3	1.3*
S	1.6	1.9*
SSW	1.5	1.6*
SW	1.1	1.1
WSW	1.3	1.4
W	1.3	1.5*
WNW	2.7	2.7
NW	2.0	2.1*

The closest residence is situated in the SW sector and the nearest garden is also in the SW sector, which is one of the least prevalent wind directions. In the S, SSE, and SE sectors, there is the highest probability of wind blowing from the direction of the plant. The two gardens used for vegetable samples by the REMP have been placed in the sectors with the highest X/Q. One sampling garden is located in the S sector at a distance of 0.4 miles, and another is situated near the site boundary in the SSE sector at a distance of 1.6 miles from the plant. These two sampling sites are considered good indicator locations for radioactive depositions around the plant.

The dose assessment using this operating period meteorological data was performed, and no significant impact from the plant was found.

* GPS was used to determine distances from the centerline of containment.

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. Additionally, these results include the PICs which were being phased out in April and ending August 2011 due to unreliability of this type of monitoring.

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-11 shows the direct radiation readings from TLDs placed at the perimeter of the Resin Storage Area which is 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.

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.

In 2010 a deer population control program was initiated on the Calvert Cliffs site. Deer were harvested by Calvert Cliffs employees for consumption. Venison samples were collected from deer harvested on-site and deer harvested outside of the 10 mile radius. Subsequent samples of 2011 harvested deer analysis results were similar, thus it was concluded that this meat consumption pathway is not a significant source of dose.

Groundwater samples were collected from nine on-site piezometer tubes in 2011. A piezometer tube is a shallow monitoring well which allows access to groundwater at a depth of approximately 40 feet beneath the site. Three additional wells were installed in December of 2010 and are included in 2011 monitoring. Of the piezometer tubes sampled, only # 11 piezometer tube showed any plant-related activity. This activity was previously identified and evaluated in December of 2005. The activity consists of tritium originating from normal rad 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 2011 analysis results for Tritium are shown in Table E-12 and analysis results for gamma emitting radionuclides are shown in Table E-13.

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
PIC1	Taylors Island, Anderson's Property	12.6	7.8	ENE
PIC2	On Site Before Entrance to Camp Conoy	0.7	0.4	S
PIC3	Meteorological Station	0.8	0.5	WSW
PIC4	NNW of ISFSI	0.6	0.4	SW
PIC5	SSE of ISFSI	0.6	0.4	SSW
PIC8	CCNPP Visitor's Center	0.3	0.2	NW
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 2011 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	SA	2	4	Gamma	SA	4
Atmospheric Environment						
Air Iodine[2]	W	7	354	I-131	W	354
Air Particulates[3]	W	3	155	Gross Beta Gamma	W MC	155 36
Direct Radiation						
Pressurized Ion Chamber	M	6	32[4]	Gamma	M	32
Ambient Radiation	Q	20	472	TLD	Q	472
Terrestrial Environment						
Ground water	M	1	12	Gamma H-3	M M	12 12

[1] W=weekly, M=monthly, Q=quarterly, SA=semiannual, A=annual, C=composite
[2] The collection device contains silver Zeolite or Charcoal
[3] Beta counting is performed after >72 hour decay, Gamma spectroscopy performed on monthly composites of weekly samples
[4] PIC monitoring discontinued; half sites ended April, remaining sites ended August 2011.

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
Aquatic Environment						
Bottom Sediment (pCi/kg)	Gamma (4) Cs-137	17	132 (2/2) (128-136)	Discharge Area WBS2 0.3 km N	132 (2/2) (128-136)	94 (2/2) (92-95)
Atmospheric Environment						
Air Iodine (10^{-3}pCi/m^3)	I-131 (354)	1.5	6.7 (18/252) (0.8- 17.6)	Visitors Center SFA2 0.7 km NNE	8.7 (4/52) (2.7-14.4)	7.8 (7/102) (2.7-14.4)
Air Particulates (10^{-2} pCi/m^3)	Gamma (36) Cs-137	1.8	1.6 (5/24) (1.4-3.4)	LONG BEACH LB 4.4 km NW	3.4 (4/24) (0.6-3.4)	1.3 (1/12) (1.3)
Air Particulates (10^{-2} pCi/m^3)	Gross Beta (155)	0.5	2.1 (103/103) (0.7 - 4.6)	TAYLOR'S ISLAND TI 12.6 km ENE	2.3 (52/52) (0.8-4.6)	2.3 (52/52) (0.8-4.6)
Direct Radiation						
Pressurized Ion Chamber (mR/30 days)	Ionization Chamber (32)	--	6.79 (28/28) (4.37-11.17)	NNW of ISFSI PIC4 0.6 km SW	10.62 (7/7) (10.20-11.17)	5.84 (4/4) (5.74-6.05)
Ambient Radiation (mR/90 days)	TLD (468)	--	22.34 (480/480) (1.79-74.16)	South Fence Lower RPDR10 km	49.51 (24/24) (1.79-74.16)	-- --

[1] Mean and range based upon detectable measurements only. Fraction (F) of detectable measurements at specified location is indicated in parentheses
[2] From the centerpoint of the ISFSI facility

Table E-4

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

Sample Code	Sample Date	Cs-137	Gamma Emitters
WBS2			
Discharge Area	6/24/2011	128 +/- 43	*
	10/13/2011	136 +/- 39	*
WBS4[1]			
Camp Conoy/ Rocky Point	6/24/2011	92 +/- 35	*
	10/13/2011	95 +/- 43	*

[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
1/3/2011	1/10/2011	*	*	*	*	*	*	*
1/10/2011	1/17/2011	*	*	*	*	*	*	*
1/17/2011	1/24/2011	*	*	*	*	*	*	*
1/24/2011	1/31/2011	*	*	*	*	*	*	*
1/31/2011	2/7/2011	*	*	*	*	*	*	*
2/7/2011	2/14/2011	*	*	*	*	*	*	*
2/14/2011	2/21/2011	*	*	*	*	*	*	*
2/21/2011	2/28/2011	*	*	*	*	*	*	*
2/28/2011	3/7/2011	*	*	*	*	*	*	*
3/7/2011	3/14/2011	*	*	*	*	*	*	*
3/14/2011	3/21/2011	*	*	ND[2]	3.5 +/- 3.9	1.3 +/- 0.5	3.8 +/- 0.9	*
3/21/2011	3/28/2011	10.5 +/- 1.4	10.4 +/- 4.8	ND[2]	14.4 +/- 2.3	8.7 +/- 2.9	12.8 +/- 1.8	8.3 +/- 1.4
3/28/2011	4/4/2011	10.1 +/- 1.3	6.6 +/- 0.8	17.6 +/- 1.9	14.0 +/- 2.1	5.0 +/- 2.3	12.7 +/- 1.0	7.6 +/- 4.2
4/4/2011	4/11/2011	2.6 +/- 2.7	3.6 +/- 0.6	5.4 +/- 0.7	2.7 +/- 0.8	3.8 +/- 2.7	4.7 +/- 0.7	4.1 +/- 2.7
4/11/2011	4/18/2011	*	*	0.9 +/- 0.2	*	*	0.8 +/- 0.4	*
4/18/2011	4/25/2011	*	*	*	*	ND[3]	*	*
4/25/2011	5/2/2011	*	*	*	*	*	*	*
5/2/2011	5/9/2011	*	*	*	*	*	*	*
5/9/2011	5/16/2011	*	*	*	*	*	*	*
5/16/2011	5/23/2011	*	*	*	*	*	*	*
5/23/2011	5/30/2011	*	*	*	*	*	*	*
5/30/2011	6/6/2011	*	*	*	ND[2]	*	*	*
6/6/2011	6/13/2011	*	*	*	*	*	*	*
6/13/2011	6/20/2011	*	*	*	*	ND[2]	*	*
6/20/2011	6/27/2011	*	*	*	*	*	*	*
6/27/2011	7/4/2011	*	*	*	*	*	*	*
7/4/2011	7/11/2011	*	*	*	*	*	*	*
7/11/2011	7/18/2011	*	*	*	*	*	*	*

Table E-5 - Continued

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
7/18/2011	7/25/2011	*	*	*	*	*	*	*
7/25/2011	8/1/2011	*	*	*	*	*	*	*
8/1/2011	8/8/2011	*	*	*	*	*	*	*
8/8/2011	8/15/2011	*	*	*	*	*	*	*
8/15/2011	8/22/2011	*	*	*	*	*	*	*
8/22/2011	8/29/2011	*	*	*	*	*	*	*
8/29/2011	9/5/2011	*	ND[2]	*	*	*	*	*
9/5/2011	9/12/2011	*	*	ND[2]	ND[2]	ND[2]	*	*
9/12/2011	9/19/2011	*	*	ND[2]	*	*	*	*
9/19/2011	9/26/2011	*	*	*	*	*	*	*
9/26/2011	10/3/2011	*	*	*	*	*	*	*
10/3/2011	10/10/2011	*	*	*	*	*	*	*
10/10/2011	10/17/2011	*	*	*	*	*	*	*
10/17/2011	10/24/2011	*	*	*	*	*	*	*
10/24/2011	10/31/2011	*	*	*	*	*	*	*
10/31/2011	11/7/2011	*	*	*	*	*	*	*
11/7/2011	11/14/2011	*	*	*	*	*	*	*
11/14/2011	11/21/2011	*	*	*	*	*	*	*
11/21/2011	11/28/2011	*	*	*	*	*	*	*
11/28/2011	12/5/2011	*	*	*	*	*	*	*
12/5/2011	12/12/2011	*	*	*	*	*	*	*
12/12/2011	12/19/2011	*	*	*	*	*	*	*
12/19/2011	12/26/2011	*	*	*	*	*	*	*
12/26/2011	1/2/2012	*	*	*	*	*	*	*

[1] Control Location
[2] Power outage
[3] Sampler malfunction/low flow
* <MDA
ND = No Data

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
1/3/2011	1/10/2011	3.6 +/- 0.3	3.0 +/- 0.3	3.2 +/- 0.3
1/10/2011	1/17/2011	2.2 +/- 0.3	1.9 +/- 0.2	2.0 +/- 0.3
1/17/2011	1/24/2011	1.9 +/- 0.3	2.8 +/- 0.4	2.9 +/- 0.3
1/24/2011	1/31/2011	2.6 +/- 0.2	2.3 +/- 0.3	3.0 +/- 0.3
1/31/2011	2/7/2011	1.6 +/- 0.3	1.6 +/- 0.2	1.7 +/- 0.3
2/7/2011	2/14/2011	2.2 +/- 0.3	2.0 +/- 0.3	2.5 +/- 0.3
2/14/2011	2/21/2011	2.0 +/- 0.2	1.6 +/- 0.2	2.2 +/- 0.2
2/21/2011	2/28/2011	1.3 +/- 0.3	1.4 +/- 0.2	1.9 +/- 0.3
2/28/2011	3/7/2011	1.3 +/- 0.2	1.5 +/- 0.3	1.8 +/- 0.2
3/7/2011	3/14/2011	1.7 +/- 0.3	1.6 +/- 0.2	2.0 +/- 0.3
3/14/2011	3/21/2011	1.9 +/- 0.2	2.2 +/- 0.2	2.0 +/- 0.2
3/21/2011	3/28/2011	3.7 +/- 0.3	4.6 +/- 0.3	4.6 +/- 0.3
3/28/2011	4/4/2011	2.0 +/- 0.3	3.0 +/- 0.2	4.1 +/- 0.4
4/4/2011	4/11/2011	1.7 +/- 0.2	1.7 +/- 0.2	2.5 +/- 0.3
4/11/2011	4/18/2011	1.2 +/- 0.1	1.7 +/- 0.2	1.3 +/- 0.2
4/18/2011	4/25/2011	1.5 +/- 0.2	1.6 +/- 0.2	2.3 +/- 0.3
4/25/2011	5/2/2011	0.7 +/- 0.1	0.9 +/- 0.2	1.0 +/- 0.2
5/2/2011	5/9/2011	1.6 +/- 0.1	1.2 +/- 0.2	1.7 +/- 0.1
5/9/2011	5/16/2011	1.1 +/- 0.1	0.9 +/- 0.2	1.0 +/- 0.1
5/16/2011	5/23/2011	1.3 +/- 0.1	1.3 +/- 0.2	1.5 +/- 0.1
5/23/2011	5/30/2011	2.2 +/- 0.1	2.1 +/- 0.2	2.5 +/- 0.1
5/30/2011	6/6/2011	2.5 +/- 0.1	2.2 +/- 0.3	2.2 +/- 0.1
6/6/2011	6/13/2011	2.9 +/- 0.2	2.3 +/- 0.2	3.0 +/- 0.2
6/13/2011	6/20/2011	1.8 +/- 0.1	1.4 +/- 0.2	1.9 +/- 0.1
6/20/2011	6/27/2011	1.6 +/- 0.1	1.5 +/- 0.2	1.5 +/- 0.1
6/27/2011	7/4/2011	2.4 +/- 0.1	1.5 +/- 0.2	2.2 +/- 0.1
7/4/2011	7/11/2011	2.7 +/- 0.2	2.2 +/- 0.3	2.6 +/- 0.2
7/11/2011	7/18/2011	1.7 +/- 0.1	1.7 +/- 0.3	1.6 +/- 0.1
7/18/2011	7/25/2011	3.0 +/- 0.2	2.6 +/- 0.3	3.7 +/- 0.2
7/25/2011	8/1/2011	2.8 +/- 0.2	2.1 +/- 0.2	2.6 +/- 0.2
8/1/2011	8/8/2011	2.3 +/- 0.1	1.6 +/- 0.2	2.4 +/- 0.1
8/8/2011	8/15/2011	2.3 +/- 0.1	1.5 +/- 0.2	2.3 +/- 0.1
8/15/2011	8/22/2011	2.3 +/- 0.1	2.1 +/- 0.2	2.1 +/- 0.1
8/22/2011	8/29/2011	1.6 +/- 0.1	2.3 +/- 0.4	1.6 +/- 0.1
8/29/2011	9/5/2011	2.2 +/- 0.1	ND[2]	2.3 +/- 0.1
9/5/2011	9/12/2011	1.3 +/- 0.1	1.4 +/- 0.3	1.1 +/- 0.1
9/12/2011	9/19/2011	2.4 +/- 0.1	1.9 +/- 0.3	2.2 +/- 0.1
9/19/2011	9/26/2011	0.8 +/- 0.1	0.7 +/- 0.2	0.8 +/- 0.1
9/26/2011	10/3/2011	1.4 +/- 0.1	1.3 +/- 0.1	1.5 +/- 0.1

Table E-6 - Continued

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
10/3/2011	10/10/2011	2.8 +/- 0.1	2.5 +/- 0.2	2.6 +/- 0.1
10/10/2011	10/17/2011	2.6 +/- 0.1	3.3 +/- 0.2	2.9 +/- 0.2
10/17/2011	10/24/2011	1.9 +/- 0.1	2.2 +/- 0.1	1.7 +/- 0.1
10/24/2011	10/31/2011	2.8 +/- 0.1	2.4 +/- 0.2	2.8 +/- 0.1
10/31/2011	11/7/2011	1.6 +/- 0.1	1.7 +/- 0.1	1.8 +/- 0.1
11/7/2011	11/14/2011	2.8 +/- 0.2	2.8 +/- 0.2	2.8 +/- 0.2
11/14/2011	11/21/2011	2.6 +/- 0.1	2.4 +/- 0.1	2.6 +/- 0.1
11/21/2011	11/28/2011	1.9 +/- 0.1	2.2 +/- 0.1	2.0 +/- 0.1
11/28/2011	12/5/2011	1.7 +/- 0.1	1.4 +/- 0.1	1.5 +/- 0.1
12/5/2011	12/12/2011	2.1 +/- 0.1	2.0 +/- 0.1	2.4 +/- 0.1
12/12/2011	12/19/2011	4.4 +/- 0.2	4.1 +/- 0.2	4.4 +/- 0.2
12/19/2011	12/26/2011	2.0 +/- 0.1	2.3 +/- 0.1	2.2 +/- 0.1
12/26/2011	1/2/2012	2.2 +/- 0.1	2.2 +/- 0.1	2.1 +/- 0.1

[1] Control Location
[2] Power outage after Hurricane Irene
ND = No Data

Table E-7

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

Sample Date	CA Cambridge	LB LONG BEACH	TI[1] TAYLOR'S ISLAND
1/31/2011	*	*	*
3/1/2011	*	*	*
3/29/2011	*	*	*
5/2/2011	*	3.4 ± 1.1 [2]	*
5/30/2011	*	*	*
6/27/2011	*	*	*
8/1/2011	*	*	*
8/29/2011	*	*	*
10/3/2011	*	*	*
10/31/2011	*	*	1.3 ± 0.8 [3]
11/28/2011	*	*	*
1/2/2012	*	*	*

[1] Control Location
[2] Positive result for Cs-137 directly attributable to Fukushima Dai-Ichi releases
[3] Positive result for Cs-137 was possibly from nearby land disturbance activities
* All Non-Natural Gamma Emitters <MDA

Table E-8

Concentration of Tritium and Gamma Emitters in Taylors Island Well Water (Results in units of 10^{-3} pCi/m^3 +/- 2σ)

Sample Date	Gamma Emitters	H-3
1/23/2011	*	<294
2/27/2011	*	<298
3/21/2011	*	<298
4/19/2011	*	<301
5/23/2011	*	<299
6/21/2011	*	<301
7/19/2011	*	<305
8/29/2011	*	<303
9/20/2011	*	<310
10/18/2011	*	<287
11/22/2011	*	<287
12/13/2011	*	<292

* All Non-Natural Gamma Emitters <MDA

Table E-9

Direct Radiation as Measured in Pressurized Ion Chamber
(Results in units of mR/30 days +/- 10%)

Sample Code	Month		Month	
PIC1[1]				
Taylor's Island	JAN	5.82 +/- 5.70	FEB	5.77 +/- 5.40
	MAR	6.05 +/- 5.90	APR	5.81 +/- 5.70
PIC2				
Entrance to Camp Conoy	JAN	4.43 +/- 29.00	FEB	ND[2]
	MAR	4.47 +/- 34.00	APR	4.63 +/- 195.00
	MAY	4.43 +/- 28.20	JUN	4.37 +/- 4.20
	JUL	5.73 +/- 6.40	AUG	4.44 +/- 54.80
PIC3				
MET Station	JAN	5.47 +/- 16.40	FEB	6.20 +/- 5.60
	MAR	ND[3]	APR	5.00 +/- 4.50
PIC4				
NNW of ISFSI	JAN	11.06 +/- 36.90	FEB	ND[2]
	MAR	10.79 +/- 12.00	APR	11.17 +/- 187.00
	MAY	10.68 +/- 46.00	JUN	10.26 +/- 5.10
	JUL	10.21 +/- 5.50	AUG	10.20 +/- 33.30
PIC5				
SSE of ISFSI	JAN	6.77 +/- 7.80	FEB	7.31 +/- 11.70
	MAR	7.36 +/- 7.70	APR	7.28 +/- 112.20
	MAY	6.72 +/- 83.10	JUN	6.40 +/- 4.60
	JUL	ND[4]	AUG	6.29 +/- 7.60
PIC8				
Visitor's Center	JAN	5.42 +/- 54.20	FEB	5.95 +/- 33.50
	MAR	5.28 +/- 32.50	APR	5.25 +/- 28.60

[1] Control Location
[2] NCR, Reject Data
[3] Power outage
[4] Instrument being serviced
ND = No Data

Table E-10

Direct Radiation
(Results in units of mR/90 days +/- 2σ)

Site Code	Location	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
DR24	Rt. 4 and Parran Rd.	11.65 +/- 0.87	14.60 +/- 0.56	12.08 +/- 1.73	12.60 +/- 0.40
DR25	Camp Conoy Guard House	12.88 +/- 0.42	15.62 +/- 1.32	13.02 +/- 0.81	13.73 +/- 0.90
DR26	Rt. 235 and Clark's Landing Road	10.69 +/- 0.52	13.81 +/- 0.58	11.28 +/- 1.45	11.47 +/- 1.15
DR27	Rt. 231 and Rt. 4	10.96 +/- 0.99	13.92 +/- 1.87	11.04 +/- 1.50	11.66 +/- 1.47
DR28	Taylors Is. Siren #35	13.05 +/- 0.62	17.65 +/- 1.47	13.61 +/- 1.09	13.69 +/- 1.42
DR29	Taylors Is. Siren #38	14.41 +/- 0.74	18.78 +/- 2.35	14.21 +/- 1.74	14.89 +/- 0.79
DR31	Cambridge	14.95 +/- 1.54	20.59 +/- 1.58	16.36 +/- 1.08	16.04 +/- 1.29
DR32	Twining Property, Taylors Island	14.05 +/- 1.50	19.00 +/- 2.29	15.48 +/- 1.36	14.44 +/- 1.57
DR33	P. A. Ransome Property	14.44 +/- 0.79	19.73 +/- 1.53	15.74 +/- 1.09	15.82 +/- 2.17
DR34	Shoreline at Barge Rd.	9.43 +/- 0.34	11.69 +/- 1.04	10.06 +/- 1.29	10.29 +/- 0.59
OSG1	North of Old Steam Generator Storage Facility	17.77 +/- 0.87	23.83 +/- 1.91	18.07 +/- 1.80	18.45 +/- 2.24
OSG2	West of Old Steam Generator Storage Facility	15.80 +/- 1.96	21.30 +/- 1.94	15.26 +/- 2.48	16.39 +/- 1.57

Table E-11

Direct Radiation from Resin Storage Area
(Results in units of mR/90 days +/- 2σ)

Site Code	Location	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
RPDR05	North Fence Lower	69.55 +/- 7.93	34.46 +/- 2.94	22.38 +/- 4.42	64.84 +/- 5.98
RPDR06	North Fence Upper	25.50 +/- 1.83	22.79 +/- 2.52	18.20 +/- 1.88	17.00 +/- 1.97
RPDR07	West Fence Right	29.40 +/- 3.35	38.13 +/- 2.29	28.02 +/- 4.39	27.38 +/- 3.00
RPDR08	West Fence Left	23.44 +/- 1.44	29.17 +/- 1.19	18.32 +/- 2.02	18.69 +/- 1.88
RPDR09	South Fence Upper	27.00 +/- 2.27	28.66 +/- 1.98	20.90 +/- 1.47	17.81 +/- 2.29
RPDR10	South Fence Lower	62.67 +/- 4.96	74.16 +/- 6.17	ND[1]	59.42 +/- 5.77
RPDR11	East Fence Left	33.44 +/- 4.15	37.37 +/- 5.11	46.36 +/- 6.33	57.25 +/- 4.46
RPDR12	East Fence Right	29.27 +/- 3.67	38.62 +/- 2.36	27.48 +/- 1.10	31.79 +/- 2.69

[1] TLD missing after Hurricane Irene
ND = No Data

Table E-12
Concentration of Tritium in Groundwater
(Results in units of pCi/L +/- 2σ)

Sample Date	Piezometer Tube #s								
	11	12	13	15	18	19	20	21	22
01/30/2011	757 +/- 186	*	*	*	*	*	*	*	*
05/25/2011	*	*	*	*	ND	ND	*	*	*
06/13/2011	ND	ND	ND	ND	*	*	ND	ND	ND
09/26/2011	1280 +/- 194	ND	ND	ND	*	*	*	*	*
09/30/2011	ND	*	*	*	ND	ND	ND	ND	ND
11/7/2011	859 +/-181	*	*	*	*	*	*	*	*

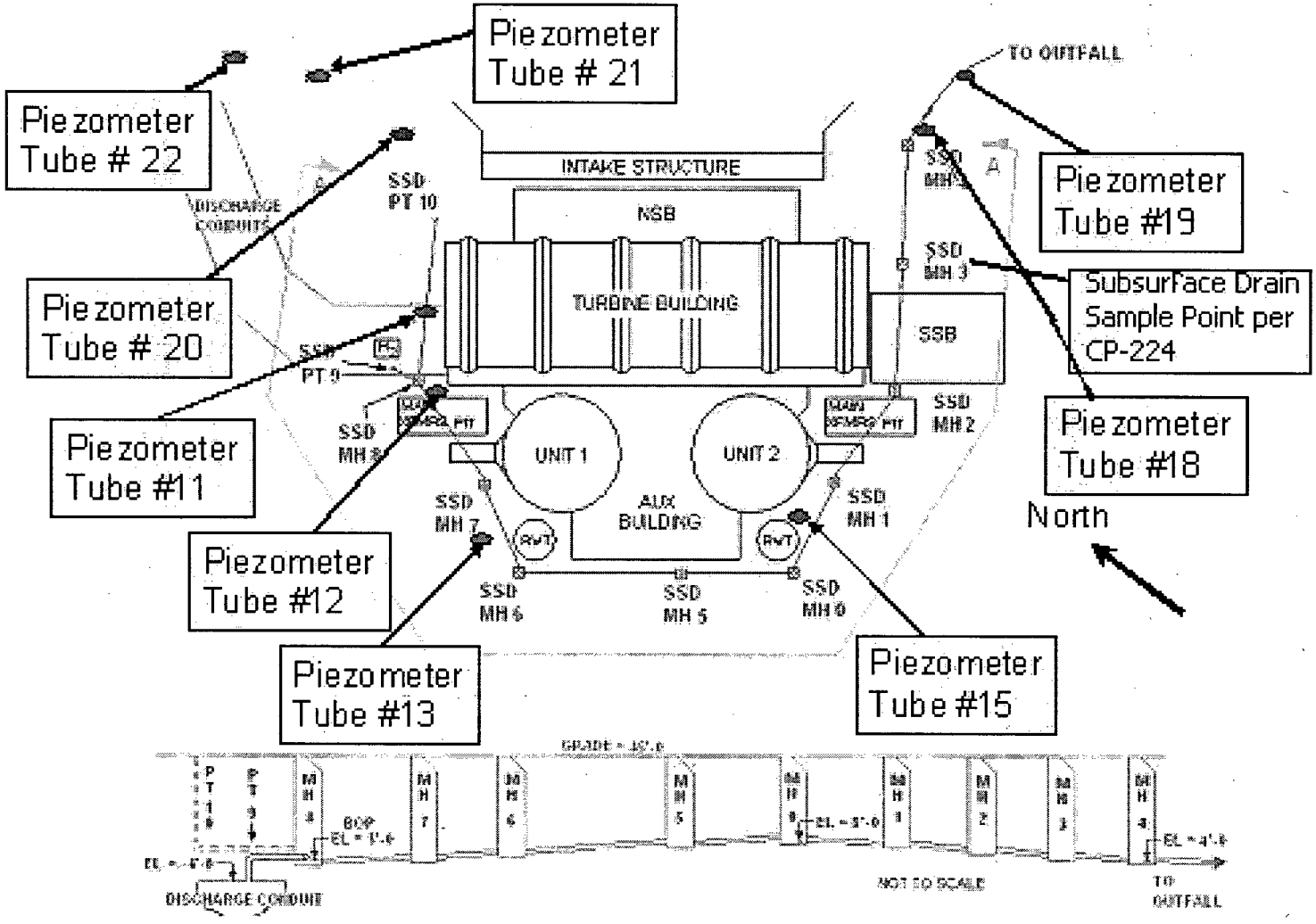
* Less than Minimum Detectable Activity (<MDA)
ND = No Data – Quarterly sample obtained as required.

Table E-13
Gross Concentration of Gamma Emitters
(Results in units of pCi/L +/- 2σ)

Sample Date	Piezometer Tube #s								
	11	12	13	15	18	19	20	21	22
01/30/2011	*	*	*	*	*	*	*	*	*
05/25/2011	*	*	*	*	*	*	*	*	*
09/26/2011	*	ND	*	*	*	*	*	*	*
09/30/2011	ND	*	ND	ND	ND	ND	ND	ND	ND
11/7/2011	*	*	*	*	*	*	*	*	*

* All Non-Natural Gamma Emitters <MDA
ND = No Data – Quarterly sample obtained as required.

Figure E-1
Site Map Groundwater Monitoring Wells



Original drawing by J. Gines
Modified by R. Cornatser