



May 14, 2012

NG-12-0214
TS 5.6.2

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Duane Arnold Energy Center
Docket No. 50-331
Renewed Op. License No. DPR-49

Subject: 2011 Annual Radiological Environmental Operating Report

Please find as Enclosure 1 to this letter, a copy of NextEra Energy Duane Arnold, LLC's, (hereafter, NextEra Energy Duane Arnold) 2011 Annual Radiological Environmental Operating Report for the Duane Arnold Energy Center, pursuant to the requirements of ODAM Section 8.2.2 and Technical Specification Section 5.6.2.

This letter contains no new commitments nor does it revise any existing commitments.

Should you have any questions regarding this matter, please contact Mr. Steve Catron at (319) 851-7234.

Sincerely,

A handwritten signature in black ink, appearing to read "Peter Wells".

Peter Wells
Vice President, Duane Arnold Energy Center
NextEra Energy Duane Arnold, LLC

Enclosure

cc: Regional Administrator, USNRC, Region III
Resident Inspector, USNRC, Duane Arnold Energy Center
Project Manager, USNRC, Duane Arnold Energy Center

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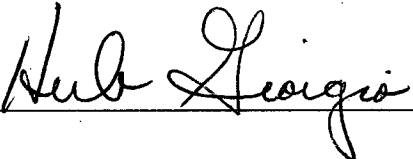
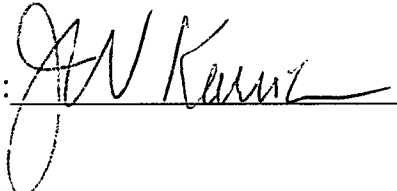
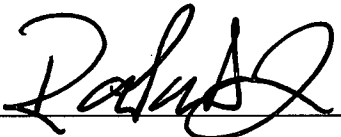
Enclosure 1 to
NG-12-0214

Duane Arnold Energy Center
2011 Annual Radiological Environmental Operating Report

2011

Annual Radiological Environmental Operating Report

Duane Arnold Energy Center

Primary Contributor:	<u></u>	Date:	<u>5/7/2012</u>
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DUANE ARNOLD ENERGY CENTER
CEDAR RAPIDS, IOWA
Docket No. 50-331

RADIOLOGICAL ENVIRONMENTAL
MONITORING PROGRAM (REMP)

ANNUAL REPORT - PART II
DATA TABULATIONS AND ANALYSES

January 1 to December 31, 2011

Prepared by

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Midwest Laboratory

Project No. 8001

Reviewed and
Approved

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Quality Assurance Mgr.

PREFACE

Staff members of the Environmental, Inc., Midwest Laboratory were responsible for the acquisition of data presented in this report, with the exception of Appendices D and E, which were completed by DAEC personnel. All environmental samples, with the exception of aquatic, were collected by personnel of DAEC. Aquatic samples were collected by the University of Iowa Hygienic Laboratory.

The report was prepared by Environmental, Inc., Midwest Laboratory, with the exception of Appendices D and E, which were prepared by DAEC personnel.

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1.0 INTRODUCTION

This report summarizes and interprets results of the Radiological Environmental Monitoring Program conducted by Environmental, Inc., Midwest Laboratory at the Duane Arnold Energy Center, Palo, Iowa, during the period January - December, 2011. This Program monitors the levels of radioactivity in the air, terrestrial, and aquatic environments in order to assess the impact of the plant on its surroundings.

Tabulations of individual analyses made during the year are included in Part II of this report.

The Duane Arnold Energy Center (DAEC) is a boiling water reactor, located in Linn County, Iowa, on the Cedar River, and owned and operated by NextEra Energy Resources. Initial criticality was attained on March 23, 1974. The reactor reached 100% power on August 12, 1974. Commercial operation began on February 1, 1975.

2.0 SUMMARY

The Radiological Environmental Monitoring Program, as required by the U.S. Nuclear Regulatory Commission (NRC) Technical Specifications for the Duane Arnold Energy Center, is herein described. Results for the year 2011 are summarized and discussed.

Trace levels of tritium in groundwater were reported from the sampling of monitoring wells within the Owner Controlled Area. REMP threshold reporting levels were not exceeded.

Program findings show only background levels of radioactivity in the environmental samples collected in the vicinity of the Duane Arnold Energy Center, with the exception of the period from March 24 through April 7, 2011. The detection of airborne iodine-131 is consistent with and attributable to radioactive elements released from the Fukushima Daiichi reactors or fuel pools in the aftermath of the March 11, 2011 Japanese earthquake and tsunami.

No effect on the environment is indicated in the areas surrounding the site of the Duane Arnold Energy Center.

3.0 RADIOLOGICAL ENVIRONMENTAL MONITORING PROGRAM

3.1 Program Design and Data Interpretation

The purpose of the Radiological Environmental Monitoring Program at the Duane Arnold Energy Center (DAEC) is to assess the impact of the plant on its environment. For this purpose, samples are collected from the air, terrestrial, and aquatic environments and analyzed for radioactive content. In addition, ambient gamma radiation levels are monitored by thermoluminescent dosimeters (TLDs).

Sources of environmental radiation include the following:

- (1) Natural background radiation arising from cosmic rays and primordial radionuclides;
- (2) Fallout from atmospheric nuclear detonations;
- (3) Releases from nuclear power plants; and
- (4) Industrial and medical radioactive waste.

In interpreting the data, effects due to the DAEC operation must be distinguished from those due to other sources.

A major interpretive aid in assessment of these effects is the design of the monitoring program at the DAEC which is based on the indicator-control concept. Most types of samples are collected both at indicator locations (nearby, downwind, or downstream) and at control locations (distant, upwind, or upstream). A station effect would be indicated if the radiation level at an indicator location was significantly larger than that at the control location. The difference would have to be greater than could be accounted for by typical fluctuations in radiation levels arising from other sources.

An additional interpretive technique involves analyses for specific radionuclides present in the environmental samples collected from the DAEC site. The DAEC's monitoring program includes analyses for strontium-90 and iodine-131, which are fission products, and tritium, which is produced by cosmic rays, atmospheric nuclear detonations, and also by nuclear power plants. Most samples are also analyzed for gamma-emitting isotopes with results for the following groups quantified: zirconium-95, cesium-137, and cerium-144. These three gamma-emitting isotopes were selected as radiological impact indicators because of the different characteristic proportions in which they appear in the fission product mix produced by a nuclear reactor and that produced by a nuclear detonation. Each of the three isotopes is produced in roughly equivalent amounts by a reactor: each constitutes about 10% of the total activity of fission products ten (10) days after reactor shutdown. On the other hand, ten (10) days after a nuclear explosion, the contributions of zirconium-95, cerium-144, and cesium-137 to the activity of the resulting debris are in the approximate ratio 4:1:0.03 (Eisenbud, 1963). The other group quantified consists of niobium-95, ruthenium-103 and -106, cesium-134, barium-lanthanum-140, and cerium-141. These isotopes are released in small quantities by nuclear power plants, but to date their major source of injection into the general environment has been atmospheric nuclear testing. Nuclides of the next group, manganese-54, cobalt-58 and -60, and zinc-65, are activation products and arise from activation of corrosion products. They are typical components of nuclear power plant effluents, but are not produced in significant quantities by nuclear detonations. Nuclides of the final group, beryllium-7, which is of cosmogenic origin, and potassium-40, a naturally-occurring isotope, were chosen as calibration monitors and provide a comparison between levels of naturally occurring radionuclides and radionuclides that could be attributed to the operation of the plant.

Program Design and Data Interpretation (continued)

Characteristic properties of isotopes quantified in gamma-spectroscopic analysis are presented in Table 5.1. Other means of distinguishing sources of environmental radiation can be employed in interpreting the data. Current radiation levels can be compared with previous levels, including those measured before the Plant became operational. Results of the DAEC's Monitoring Program can be related to those obtained in other parts of the world. Finally, results can be related to events known to cause elevated levels of radiation in the environment, e.g., atmospheric nuclear detonations.

3.2 Program Description

3.2.1 Environmental Monitoring

The sampling and analysis schedule for the Radiological Environmental Monitoring Program (REMP) at the DAEC is summarized in Table 5.2 and is briefly reviewed below. Table 5.3 defines the sampling location codes used in Table 5.2 and specifies for each location its distance, direction, and sector relative to the reactor site. The types of samples collected at each location and the frequency of collections are presented in Table 5.4 using codes defined in Table 5.5.

To monitor the air environment, airborne particulates are collected on membrane filters by continuous pumping at nine locations. Airborne iodine is collected by continuous pumping through charcoal filters. Eight of the nine locations are indicators and one is a control (D-13). Filters are changed and counted weekly. Particulate filters are analyzed for gross beta activity. If gross beta activity exceeds ten times the yearly mean of the control samples, gamma isotopic analysis is performed. Quarterly composites of airborne particulates from each location are analyzed for gamma emitting isotopes. Charcoal filter samples are analyzed weekly for iodine-131.

Ambient gamma radiation is monitored at a total of 50 locations. A TLD is placed at each location and exchanged and analyzed quarterly. The TLD locations are distributed as follows:

- Two on-site locations
- Eighteen in a circle within a 0.5 mi. radius from the DAEC stack.
- Six in 22.5° sectors within 1 mi. from the DAEC stack.
- Ten in 22.5° sectors between 1 and 3 miles from the DAEC stack.
- Ten control locations greater than 3 miles from the DAEC stack.
- Four along sections of the Independent Spent Fuel Storage Installation (ISFSI) fence line.

Surface water is collected monthly from four river locations, D-49 (Lewis Access, Control, 4 mi. upstream), D-50 (Inlet), D-51 (Discharge) and D-61 (downstream of Discharge) and also from Pleasant Creek Lake (D-99). The monthly samples are analyzed for tritium and gamma-emitting isotopes. Additional analyses are performed on samples collected from the control and indicator locations, D-49 and D-61. Analyses for low-level iodine-131 are performed on monthly collections and quarterly composites are prepared and analyzed for strontium-89 and strontium-90.

The aquatic environment is also monitored by upstream and downstream (D-49 and D-61) semiannual collections of fish. River bottom sediment is collected semiannually at the plant's intake and discharge (D-50 and D-51) and downstream of the sewage plant (D-107a). The samples are analyzed for gamma-emitting isotopes.

Potable ground water is collected quarterly from a treated municipal water system (D-53), the inlet to the municipal water treatment system (D-54), three indicator locations (D-55, D-57, D-58) and one control location (D-72). The samples are analyzed for gross beta and tritium. If gross beta measures greater than 3 pCi/L, or positive tritium is detected, an analysis for gamma emitters is performed. If a gross beta measurement is greater than 7 pCi/L, or reactor by-product gamma emitters are detected, analyses for Fe-55, Sr-89, Sr-90, Ni-63 and alpha emitters are performed.

Program Description (continued)

Milk is collected monthly from one indicator and one control location during the non-grazing season, October through April, and biweekly during the grazing season, May 1 through September 30. The samples are analyzed for iodine-131 and gamma-emitting isotopes.

For additional monitoring of the terrestrial environment, grain, hay and broad leaf vegetation samples are collected annually, as available, from nine locations: one control (D-108) and eight indicators (D-16, D-57, D-58, D-72, D-96, D-109 and D-118). Grain, hay and broad leaf (green leafy) vegetation samples are analyzed for gamma-emitting isotopes and at least two broad leaf vegetation samples are analyzed for iodine-131.

If cattle are slaughtered for home use, a meat sample is collected annually, during or immediately following a grazing period from animals grazing on-site. The sample is analyzed for gamma-emitting isotopes.

3.2.2 Groundwater Protection

Non-potable water is collected from twelve on-site locations (MW-01 to MW-12). Two monitoring wells are sampled from each site, at shallow (A) and intermediate (B) depths, and analyzed for tritium. If the tritium concentration is greater than 1000 pCi/L, additional analyses for Sr-89, Sr-90, Fe-55, Ni-63, gross alpha and gamma-emitting isotopes are performed.

Precipitation is collected monthly from six on-site locations and analyzed for gamma-emitting isotopes. A quarterly composite is analyzed for tritium.

Soil samples are collected annually at the two on-site locations, D-15a and D-16. The samples are analyzed for strontium-90, tritium and gamma-emitting isotopes.

3.3 Program Execution

The program was executed as described in the preceding section with the following exceptions.

(1) Airborne Particulates / Airborne Iodine:

A partial air particulate / air iodine sample (133 m³) was collected at location D-7, for the week ending 01/13/11. Sampler run-time reported for 80 hours.

Partial air particulate / air iodine samples were collected at locations D-6, D-11 and D-13, for the week ending 05/12/11. Storms in the area caused power outages.

A partial air particulate / air iodine sample (268 m³) was collected at location D-6, for the week ending 06/09/11. Power shut off during electrical storms. No air particulate / air iodine sample was available from location D-6 for the week ending 06/16/11. There was still no power to the station.

Air particulate / air iodine samples were not available at location D-40, for the week ending 07/07/11. The sampler was out of service due to voltage supply problems.

A partial air particulate / air iodine sample (164 m³) was collected at location D-3, for the week ending 08/04/11. Run-time was reduced due to construction in area.

(2) Surface Water:

Surface water from location D-99 could not be sampled for the January 18, 2011 collection. The lake was frozen.

(3) Thermoluminescent Dosimetry

The second quarter, 2011 TLD at location D-37 was missing in the field. The TLD was replaced.

The third quarter TLD for location D-48 was not collected until the fourth quarter, 2011. The total exposure was 181 days, the data was prorated to a standard quarter.

(4) Well Water

Samples from wells MW-01A, MW-03A, MW-05A, collected on July 30, 2011 and samples from wells MW-03A, MW-03B, MW-05A and MW-05B, collected on August 15, 2011 were lost in transit.

3.4 Laboratory Procedures

The Iodine-131 analyses in milk and water were made using a sensitive radiochemical procedure involving separation of iodine using an ion-exchange method, solvent extraction and subsequent beta counting. Levels of iodine-131 in vegetation and concentrations of airborne iodine-131 in charcoal samples were determined by gamma spectroscopy.

Gamma-spectroscopic analyses are performed using high-purity germanium (HPGe) detectors. The gamma isotopic analysis provides a spectrum with an energy range from 80 to 2048 KeV. Specific isotopes included in the gamma library are Mn-54, Fe-59, Co-58, Co-60, Zn-65, Zr-95, Nb-95, Ru-103, Ru-106, I-131, Ba-La-140, Cs-134, Cs-137, Ce-141, and Ce-144. Naturally occurring gamma-emitters, such as Be-7, K-40 and Ra daughters, are frequently detected but may not be listed.

Tritium was measured by liquid scintillation.

Analytical Procedures used by Environmental, Inc. are on file and are available for inspection. Procedures are based on those prescribed by the Health and Safety Laboratory of the U.S. Dep't of Energy, Edition 28, 1997, U.S. Environmental Protection Agency for Measurement of Radioactivity in Drinking Water, 1980, and the U.S. Environmental Protection Agency, EERF, Radiochemical Procedures Manual, 1984.

Environmental, Inc., Midwest Laboratory has a comprehensive quality control/quality assurance program designed to assure the reliability of data obtained. Details of the QA Program are presented elsewhere (Environmental, Inc., Midwest Laboratory, 2011). The QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in crosscheck programs are presented in Appendix A.

3.5 Program Modifications

Soil and precipitation sampling from onsite locations D-15a and D-16 was added to the Groundwater Protection Program. In addition, precipitation from five of the monitoring well locations (D-111, D-112, D-114, D-115 and D-116) are collected. The samples are analyzed for tritium and gamma emitting isotopes.

Six new pairs of on-site monitoring wells were added to the Ground Water Protection Program in 2011. The samples were analyzed for tritium. If the tritium concentration is greater than 1000 pCi/L, conditional analyses for gross alpha, gamma emitting isotopes, Fe-55, Ni-63, Sr-89 and Sr-90 are performed.

TLDs were placed along sections of the Independent Spent Fuel Storage Installation (ISFSI) fence line. Four additional TLDS were added to the program in the second quarter of 2011.

4.0 RESULTS AND DISCUSSION

All collections and analyses were made as scheduled, except for those listed in Table 5.6.

Results are summarized in Table 5.7 as recommended by the Nuclear Regulatory Commission. For each type of analysis and sample medium, the table lists the mean and range of all indicator and control locations, as well as that location with the highest mean and range.

Tabulated results of measurements are not included in this section, although reference to these results will be made in discussion. A complete tabulation of results for 2011 is contained in Part II of the Annual Report on the Radiological Environmental Monitoring Program for the Duane Arnold Energy Center.

4.1 Atmospheric Nuclear Detonations and Nuclear Accidents

The Fukushima Daiichi nuclear accident occurred on March 11, 2011, releasing large amounts of radioactive isotopes into the atmosphere and Pacific Ocean. Positive iodine-131, cesium-134 and cesium-137 activities were detected in environmental background samples from March through May. The accident, rated seven on the International Nuclear Event Scale (INES) compares with Chernobyl, rated level seven, and Three Mile Island rated level five.

4.2 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected outside of the Owner Controlled Area in 2011. The trace levels of strontium-90 and cesium-137, still measurable in soil and sediments are attributed to deposition of fallout from previous decades.

Tritium was identified in some groundwater samples collected within the Owner Controlled Area. In no instances were REMP threshold reporting levels exceeded. (ODAM, Table 6.3-3)

Airborne Particulates

The average annual gross beta concentrations in airborne particulates were almost identical at indicator and control locations (0.030 and 0.029 pCi/m³, respectively) and similar to levels observed from 1995 through 2011. The results are tabulated below.

<u>Year</u>	<u>Indicators</u>	<u>Controls</u>		<u>Year</u>	<u>Indicators</u>	<u>Controls</u>
Concentration (pCi/m ³)				Concentration (pCi/m ³)		
1997	0.023	0.023		2005	0.031	0.031
1998	0.024	0.024		2006	0.029	0.027
1999	0.026	0.027		2007	0.031	0.031
2000	0.026	0.027		2008	0.029	0.029
2001	0.026	0.026		2009	0.031	0.030
2002	0.027	0.027		2010	0.028	0.028
2003	0.029	0.029		2011	0.030	0.029
2004	0.028	0.028		2012	0.030	0.029

Average annual gross beta concentrations in airborne particulates.

4.2 Program Findings, Airborne Particulates (continued)

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955) was detected in all samples, with an average activity of 0.071 pCi/m³ for all locations. All other gamma-emitting isotopes were below their respective LLD limits.

Airborne Iodine

Following the Fukushima Daiichi accident, measurable radioiodine was detected in weekly collections of activated charcoal cartridges. For the weeks ending March 24, March 31 and April 7, 2011, activity for all locations averaged 0.14, 0.076 and 0.082 pCi/m³, respectively. Measurements for the rest of the year were below the required limit of detection of 0.070 pCi/m³.

Ambient Radiation (TLDs)

At ten control locations, TLD readings averaged 16.5 mR/quarter. At locations within a half mile, one mile and three mile radius of the stack, the measurements averaged 18.1, 19.0 and 16.2 mR/quarter, respectively. The two on-site locations D-15 and D-16 averaged 16.9 mR/quarter. Four TLDs were added to the program in the second quarter of 2011. The TLDs, placed directionally along the ISFSI fenceline, averaged 15.0 mR/quarter. The average for all locations was 17.3 mR/quarter. This is lower than the estimated average natural background radiation for Middle America, 19.5 mR/quarter, which is based on data on Pages 71 and 108 of the report, "Natural Background Radiation in the United States" (National Council on Radiation Protection and Measurements, 1975). The terrestrial absorbed dose (uncorrected for structural and body shielding) ranges from 8.8 to 18.8 mrad/quarter and averages 11.5 mrad/quarter for Middle America. Cosmic radiation and cosmogenic radionuclides contribute 8.0 mrad/quarter for a total average of 19.5 mrad/quarter. No plant effect is indicated.

Milk

Iodine-131 results were below the detection limit of 0.5 pCi/L in all samples.

No gamma-emitting isotopes, except naturally occurring potassium-40, were detected in any milk samples. This is consistent with the finding of the National Center for Radiological Health that most radiocontaminants in feed do not find their way into milk due to the selective metabolism of the cow. The common exceptions are radioisotopes of potassium, cesium, strontium, barium, and iodine (National Center for Radiological Health, 1968).

In summary, milk data for 2011 show no radiological effects of plant operation.

Ground Water (potable)

The annual mean for gross beta activity 2.6 pCi/L, similar to levels observed from 1991 through 2010. The location with the highest mean was D-58, a farm 1.0 mile distant from the plant. Tritium activity measured below the LLD of 151 pCi/L in all samples.

No effect from plant operation is indicated.

4.2 Program Findings (continued)

Vegetation

Iodine-131 concentrations in broadleaf vegetation were below the LLD level of 0.037 pCi/g wet weight in all samples.

With the exception of potassium-40, which was observed in all vegetation samples (broadleaf, grain, and forage), all other gamma-emitting isotopes were below detection limits. No effect from plant operation is indicated.

Surface Water

Surface water was tested for tritium and gamma emitting isotopes in fifty-nine samples from five locations. No measurable tritium activity was detected above an LLD of 163 pCi/L. Gamma-emitting isotopes were below detection limits.

An analysis for I-131 was performed on samples from locations D-49 (control) and D-61 (0.5 mi. downstream, indicator). All samples tested below detection limits.

Quarterly composites were also prepared from the samples collected at locations D-49 and D-61 and tested for strontium-89 and strontium-90. All samples tested below detection limits.

No plant effect on surface water is indicated.

Fish

Fish were collected in May and August, 2011, and analyzed for gamma-emitting isotopes. With the exception of naturally-occurring potassium-40 no gamma-emitting isotopes were identified in edible portions of fish. The potassium-40 level was similar at both the indicator and control locations (3.21 and 3.34 pCi/g wet, respectively). No plant effect on the fish population is indicated.

River Sediments

River sediments were collected in June and November, 2011, and analyzed for gamma-emitting isotopes. Potassium-40 activity ranged from 5.43–10.74 pCi/g dry weight and averaged 8.33 pCi/g dry weight.

Cs-137 was detected at both indicator and control locations and averaged 0.037 and 0.10 pCi/g dry, respectively. The measurements are similar to levels observed from 1991 through 2010, trace cesium activity is generally attributable to deposition of fallout from previous decades.

All other gamma-emitting isotopes were below detection limits. There is no indication of a plant effect.

4.3 Ground Water Protection Program

There were no sample analyses results that warranted communications to State and Local Stakeholders.

Refer to Part II, Appendix A for results of additional/ancillary samples collected in support of the Nuclear Industry Ground Water Protection Initiative.

Soil

Strontium-90 was detected at both indicator locations and averaged 0.033 pCi/g dry. Cesium-137 activity averaged 0.12 pCi/g dry weight. Strontium-90 and cesium-137 activities are similar or less than levels observed from 1991 through 2010, these levels are generally attributable to deposition of fallout from previous decades.

Naturally-occurring potassium-40 averaged 12.28 pCi/g dry weight. No effect from the plant operation is indicated.

The soil was distilled and analyzed for tritium. No tritium was detected above a background level of 150 pCi/L.

Ground Water (Site Monitoring Wells)

Twelve on-site monitoring wells (six shallow and six intermediate depth) were sampled in 2011 and analyzed for tritium. Twelve additional wells (six shallow and six intermediate depth) were added to the Ground Water Protection Program in 2011.

Tritium was detected in twenty-five of eighty-six samples tested, most activity was observed in samples taken from shallow wells. Measurements ranged from 2087 pCi/L to less than LLD. The highest average activity (1915 pCi/L) was measured in samples collected from the intermediate depth well, MW-08B.

Precipitation

Precipitation from the on-site location D-16 and five monitoring well locations (D-111, D-112, D-114, D-115 and D-116) were collected. The samples were analyzed for tritium and gamma emitting isotopes.

Low levels of tritium were detected in fourteen of sixty-nine samples tested. The mean activity was 475 pCi/L, ranging from 186 to 1549 pCi/L.

Composite samples were prepared for locations D-111, 112, 114, 115 and D-116 and monthly samples from D-16 were analyzed by gamma spectroscopy. No gamma-emitting isotopes were detected.

5.0 TABLES AND FIGURES

Table 5.1 Characteristic properties of isotopes quantified in gamma-spectroscopic analyses.

Designation	Comment	Isotope	Half-life ^a
Naturally Occurring			
A. Cosmogenic	Produced by interaction of cosmic rays with atmosphere	Be-7	53.2 d
B. Terrestrial	Primordial	K-40	1.26 x 10 ⁹ y
II. Fission Products ^b			
Nuclear accidents and detonations constitute the major environmental source.			
A. Short-lived		I-131 Ba-140	8.04 d 12.8 d
B. Other than Short-lived		Nb-95 Zr-95 Ru-103 Ru-106 Cs-134 Cs-137 Ce-141 Ce-144	35.15 d 65 d 39.35 d 368.2 d 2.061 y 30.174 y 32.5 d 284.31 d
III. Activation Products	Typically found in nuclear power plant effluents	Mn-54 Fe-59 Co-58 Co-60 Zn-65	312.5 d 45.0 d 70.78 d 5.26 y 245 d

^a Half-lives are taken from Appendix E of Environmental Quarterly, 1 January 1978, EML-334 (U. S. Department of Energy, 1978).

^b Includes fission-product daughters.

Table 5.2a Sample collection and analysis program (REMP).

Exposure Pathway and/or Sample Type	Sampling Location ^a		Sampling and Collection Frequency	Type and Frequency of Analysis ^b
	Sample Point	Description		
Airborne Particulates	3	Hiawatha	Continuous operation of sampler with sample collection at least once per week or as required by dust loading.	Analyze for gross beta activity more than 24 hours after filter change. Perform gamma isotopic analysis on each sample having gross beta activity greater than ten times the yearly mean of the control samples. Composite weekly samples to form a quarterly composite (by location). Analyze quarterly composite for gamma isotopic.
	5	Palo		
	6	Center Point		
	7	Shellsburg		
	11	Toddville		
	13	Alburnett (C)		
	15	On-site North		
	16	On-site South		
40	Wickiup Hill			
Airborne Iodine	3	Hiawatha	Continuous operation of sampler with sample collection at least once per week.	Analyze each cartridge for iodine-131.
	5	Palo		
	6	Center Point		
	7	Shellsburg		
	11	Toddville		
	13	Alburnett (C)		
	15	On-site North		
	16	On-site South		
40	Wickiup Hill			
Ambient Radiation	1-3, 5-8, 10, 11, 13	Controls	One dosimeter continuously at each location.	Read gamma radiation dose quarterly.
		Indicators	Dosimeters are changed at least quarterly.	
	15-23, 28-32, 82-86, 91	≤ 0.5 mi. of Stack		
	43-48	≤ 1.0 mi. of Stack		
	33-42	≤ 3.0 mi. of Stack		
	161-164	ISFSI Fenceline		
Surface Water	49	Lewis Access (C)	Once per month.	Tritium and gamma isotopic analyses for each sample (by location). Locations 49 and 61, analyses for low level I-131. Quarterly Composites for Sr-89, Sr-90.
	50	Plant Intake		
	51	Plant Discharge		
	61	0.5 mi. downstream		
	99	Pleasant Creek Lake		

Table 5.2a Sample collection and analysis program, (continued).

Exposure Pathway and/or Sample Type	Sampling Location ^a		Sampling and Collection Frequency	Type and Frequency of Analysis ^b
	Sample Point	Description		
Ground Water (potable)	53	Treated Municipal Inlet to Municipal Water Treatment System	Grab sample at least once per quarter.	Analysis for gross beta and tritium on quarterly samples. If gross beta measures > 3 pCi/L, OR tritium concentration measures > MDA, perform gamma isotopic analyses.
	54			
	55	On-site well		
	57, 58 72 (C)	Wells off-site and within 4 km of DAEC		
Vegetation	16, 57, 58, 72, 96, 109, 118	Farms that raise food crops.	Annually at harvest time. One sample of each: grain, green leafy, and forage. At least one sample should be broadleaf vegetation.	Gamma isotopic analysis of edible portions. I-131 analysis on broadleaf vegetation.
	108 (C)			
Fish	49	Cedar River upstream of DAEC not influenced by effluent (C)	One sample per 6 months (once during January through June and once during July through December).	Gamma isotopic analysis on edible portions.
	61	Downstream of DAEC in influence of effluent		
Milk ^c	108 (C)	Control Farm near Watkins, Iowa	At least once per two weeks during the grazing season.	Gamma isotopic and iodine-131 analyses of each sample.
	110	Dairy Farm 7.8 mi. SW	At least once per month during the non-grazing season.	
River Sediment	50 51 107a	Plant Intake (C) Plant Discharge North Drainage Ditch (on-site)	At least once every six months.	Gamma isotopic analysis of each sample.
Meat ^d		On-site	Annually	Gamma Isotopic

Table 5.2b Sample collection and analysis program, (GWPP).

Exposure Pathway and/or Sample Type	Sampling Location ^a		Sampling and Collection Frequency	Type and Frequency of Analysis ^b
	Sample Point	Description		
On-site Ground Water (Monitoring Wells)	111	On-site wells: MW-01A, B (SSE)	Grab sample at least once per quarter.	Each sample is analyzed for tritium. If the tritium concentration is greater than 1000 pCi/L, conditional analyses for Fe-55, Ni-63, Sr-89, Sr-90, gross alpha and gamma emitters are performed. Conditional analyses may also be performed at the request of the DAEC
	112	MW-02A, B (ESE)		
	113	MW-03A, B (NW)		
	114	MW-04A, B (S)		
	115	MW-05A, B (SSW)		
	116	MW-06A, B (NE)		
	127	MW-07A, B Prot. Area		
	128	MW-08A, B Prot. Area		
	129	MW-09A, B Prot. Area		
	130	MW-10A, B Prot. Area		
	131	MW-11A, B (S)		
	132	MW-12A, B (SE)		
	Precipitation	16		
Soil	15a, 16	On-site	Annually	Gamma Isotopic, Sr-90 and tritium

^a (C) denotes control location. All other locations are indicators.

^b Gamma isotopic analysis and analysis for gamma-emitting nuclides refer to high resolution gamma ray spectrum analysis.

^c The grazing season is considered to be May 1 through September 30.

^d Only sampled when meat is butchered for home use.

Table 5.3 Sampling locations, Duane Arnold Energy Center.

Code	Sampling Location	
	Location Description	Distance and Direction from Site Stack
D-1	Cedar Rapids	12.9 mi SE
D-2	Marion	10.5 mi ESE
D-3	Hiawatha	6.7 mi SE
D-5	Palo	2.8 mi SSW
D-6	Center Point	6.0 mi N
D-7	Shellsburg	4.9 mi W
D-8	Urbana	9.3 mi NNW
D-10	Atkins	8.5 mi SSW
D-11	Toddville	3.1 mi E
D-13	Alburnett	9.0 mi ENE
D-15	On-site, North-Northwest	0.7 mi NNW
D-15a	On-site, North-Northwest	0.3 mi NNW
D-16	On-site, South-Southeast	0.3 mi SSE
D-17	On-site, N	0.7 mi N
D-18	On-site, NNE	0.4 mi NNE
D-19	On-site, NE	0.4 mi NE
D-20	On-site, ENE	0.3 mi ENE
D-21	On-site, ENE	0.3 mi ENE
D-22	On-site, ESE	0.3 mi ESE
D-23	On-site, SE	0.3 mi SE
D-28	On-site, WSW	0.5 mi WSW
D-29	On-site, W	0.4 mi W
D-30	On-site, WNW	0.4 mi WNW
D-31	On-site, NW	0.5 mi NW
D-32	On-site, NNW	0.7 mi NNW
D-33	3 mile ring N	2.7 mi N
D-34	3 mile ring NNE	2.4 mi NNE
D-35	3 mile ring NE	1.7 mi NE
D-36	3 mile ring ENE	2.2 mi ENE
D-37	3 mile ring E	1.8 mi E
D-38	3 mile ring ESE	2.0 mi ESE
D-39	3 mile ring SE	1.6 mi SE
D-40	3 mile ring SSE	1.5 mi SSE
D-41	3 mile ring S	3.5 mi S
D-42	3 mile ring SSE	2.7 mi SSE
D-43	1 mile ring SSW	1.0 mi SSW
D-44	1 mile ring WSW	1.0 mi WSW
D-45	1 mile ring W	0.9 mi W
D-46	1 mile ring WNW	1.0 mi WNW
D-47	1 mile ring NW	1.1 mi NW
D-48	1 mile ring NNW	1.0 mi NNW
D-49	Lewis Access, upstream of DAEC	4.2 mi NNW

Table 5.3 Sampling locations, Duane Arnold Energy Center (continued).

Code	Sampling Location	
	Location Description	Distance and Direction from Site Stack
D-50	Plant Intake	0.4 mi SE
D-51	Plant Discharge	0.4 mi SE
D-53	Treated Municipal Water	8.6 mi SE
D-54	Inlet, Municipal Water Treatment System	8.6 mi SE
D-55	Production Well	On-site
D-57	Farm (Off-site Well)	1.0 mi W
D-58	Farm (Off-site Well)	1.0 mi WSW-SW
D-61	Downstream of plant discharge	0.4 mi SSE
D-72	Farm	2.0 mi SSW
D-82	On-site, SSE	0.4 mi SSE
D-83	On-site, SSE	0.4 mi SSE
D-84	On-site, S	0.4 mi S
D-85	On-site, SSW	0.4 mi SSW
D-86	On-site, SW	0.5 mi SW
D-91	On-site, NNW	0.7 mi NNW
D-96	Farm	7.1 mi SSW
D-99	Pleasant Creek Lake	2.4 mi WNW
D-107	Sewage Plant Effluent	On-site
D-107a	North Drainage Ditch	On-site
D-108	Farm	16.0 mi. SW
D-109	Farm	3.7 mi. SW
D-110	Farm	7.9 mi. SW
D-111	Monitoring wells, MW-01A, B	On-site, SSE
D-112	Monitoring wells, MW-02A, B	On-site, ESE
D-113	Monitoring wells, MW-03A, B	On-site, NW
D-114	Monitoring wells, MW-04A, B	On-site, S
D-115	Monitoring wells, MW-05A, B	On-site, SSW
D-116	Monitoring wells, MW-06A, B	On-site, NE
D-118	Farm	1.45 mi. NW
D-127	Monitoring wells, MW-07A, B	On-site, N of CST Pit
D-128	Monitoring wells, MW-08A, B	On-site, CAD Shack
D-129	Monitoring wells, MW-09A, B	On-site, SE corner CST Pit
D-130	Monitoring wells, MW-10A, B	On-site, SW corner CST Pit
D-131	Monitoring wells, MW-11A, B	On-site, SE
D-132	Monitoring wells, MW-12A, B	On-site, S
D-161	ISFSI Fence East	On-site
D-162	ISFSI Fence South	On-site
D-163	ISFSI Fence West	On-site
D-164	ISFSI Fence North	On-site

Table 5.4 Type and Frequency of collection.

Location	Weekly	Monthly	Quarterly	Semiannually	Annually
D-1			TLD		
D-2			TLD		
D-3	AP, AI		TLD		
D-5	AP, AI		TLD		
D-6	AP, AI		TLD		
D-7	AP, AI		TLD		
D-8			TLD		
D-10			TLD		
D-11	AP, AI		TLD		
D-13	AP, AI		TLD		
D-15	AP, AI		TLD		
D-15A					SO
D-16	AP, AI	P	TLD		SO, G
D-17 to D-23			TLD		
D-28 to D-39			TLD		
D-40	AP, Ai		TLD		
D-41 to D-48			TLD		
D-49		SW		F	
D-50		SW		BS	
D-51		SW		BS	
D-53			WW		
D-54			WW		
D-55			WW		
D-57			WW		G
D-58			WW		G
D-61		SW		F	
D-72			WW		G
D-82 to D-86			TLD		
D-91			TLD		
D-96					G
D-99		SW			
D-107		SW			
D-107A				BS	
D-108		MI*			G
D-109					G
D-110		MI*			
D-111 to D-116			WW		
D-111, 112, 114, 115, 116		P			
D-118					G
D-127 to D-132			WW		
D-161 to D-164			TLD		
On-site					ME

* Biweekly during the grazing season.

Table 5.5. Sample codes used in Table 5.4 and Table 5.6.

Code	Description
AP	Airborne Particulates
AI	Airborne Iodine
TLD	Thermoluminescent Dosimeter
P	Precipitation
MI	Milk
WW	Well Water
G	Vegetation
ME	Meat
SO	Soil
SW	Surface Water
F	Fish
BS	River Sediment

Table 5.6. Program Deviations, Duane Arnold Energy Center.

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
AP/AI	Gross Beta / Gamma	D-7	1-13-11	Low volume, sampler run-time 80 hours.
AP/AI	Gross Beta / Gamma	D-6, 13	5-12-11	Reduced run-times due to electrical storms.
AP/AI	Gross Beta / Gamma	D-6	6-9-11	Reduced run-time due to electrical storms.
AP/AI	Gross Beta / Gamma	D-6	6-16-11	Power out due to electrical storms.
AP/AI	Gross Beta / Gamma	D-40	7-7-11	Out of service, voltage supply problems.
AP/AI	Gross Beta / Gamma	D-3	8-4-11	Reduced run-time due to construction in area.
SW	H-3 / Gamma	D-99	1-18-11	No sample; water frozen.
TLD	Ambient Gamma	D-37	2 nd Qtr. 2011	TLD missing in the field.
TLD	Ambient Gamma	D-48	3 rd Qtr. 2011	Not collected until 4 th Qtr., 2011.
WW	H3	D-111, D-113 D-115	7-30-11	MW-01A, MW-03A, MW-05A Samples Lost in Transit
WW	H3	D-113, D-115	8-15-11	MW-03A, MW-03B, MW-05A, MW-05B Samples Lost in Transit

In no instance did missed analyses affect minimum sampling requirements as specified in the ODAM.

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	Duane Arnold Energy Center	Docket No.	50-331
Location of Facility	Linn, Iowa	Reporting Period	January-December, 2011
	(County, State)		

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e	
				Location ^d	Mean (F) ^c Range ^c			
Airborne Pathway								
Airborne Particulates (pCi/m ³)	GB	466	0.003	0.030 (413/414) (0.008-0.067)	D-16, On-site 0.5 mi. SSE	0.031 (52/52) (0.011-0.065)	0.029 (52/52) (0.011-0.049)	0
	GS	36						
	Be-7		0.020	0.070 (32/32) (0.040-0.104)	D-3, Hiawatha 7 mi. SE	0.077 (4/4) (0.071-0.088)	0.072 (4/4) (0.049-0.089)	0
	Mn-54		0.0010	< LLD			< LLD	0
	Fe-59		0.0030	< LLD			< LLD	0
	Co-58		0.0012	< LLD			< LLD	0
	Co-60		0.0012	< LLD			< LLD	0
	Zn-65		0.0022	< LLD			< LLD	0
	Nb-95		0.0020	< LLD			< LLD	0
	Zr-95		0.0023	< LLD			< LLD	0
	Ru-103		0.0016	< LLD			< LLD	0
	Ru-106		0.0096	< LLD			< LLD	0
	Cs-134		0.0014	< LLD			< LLD	0
	Cs-137		0.0012	< LLD			< LLD	0
Ce-141		0.0036	< LLD			< LLD	0	
Ce-144		0.0056	< LLD			< LLD	0	
Airborne Iodine (pCi/m ³)	I-131	466	0.030	0.099 (24/414) (0.059-0.16)	D-11, Toddville	0.107 (3/3) (0.080-0.14)	0.091 (3/52) (0.066-0.13)	0
Direct Radiation								
TLDs (mR/quarter)								
Control Locations	Gamma	40	1.0	None	D-8, Urbana 10 mi. NW	20.3 (4/4) (17.8-22.0)	16.5 (40/40) (13.0-22.0)	0
Within 0.5 mi. of Stack	Gamma	80	1.0	18.1 (80/80) (14.1-23.7)	D-29, On-site 0.5 mi. W	21.9 (4/4) (19.7-23.7)	None	0
Within 1.0 mi. of Stack	Gamma	23	1.0	19.0 (23/23) (14.4-22.4)	D-48 1 mi. NNW	20.5 (3/3) (18.8-22.2)	None	0
Within 3.0 mi. of Stack	Gamma	39	1.0	16.2 (39/39) (14.0-18.4)	D-39 3 mi. SE	17.4 (4/4) (16.2-17.8)	None	0
ISFSI border	Gamma	12	1.0	15.0 (12/12) (12.6-17.2)	D-162 ISFSI Fence	16.6 (3/4) (15.8-17.2)	None	0

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	<u>Duane Arnold Energy Center</u>	Docket No.	<u>50-331</u>
Location of Facility	<u>Linn, Iowa</u>	Reporting Period	<u>January-December, 2011</u>
	(County, State)		

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^o	
				Location ^d	Mean (F) ^c Range ^c			
Waterborne Pathway								
Ground Water, potable (pCi/L)	GB	24	1.4	2.6 (8/20) (1.4-4.6)	D-58, Farm 1 mi. WSW-SW	3.7 (4/4) (3.2-4.6)	< LLD	0
	H-3	24	151	< LLD	-	-	< LLD	0
Surface Water (pCi/L)	H-3	59	163	< LLD	-	-	< LLD	0
	I-131	24	0.4	< LLD	-	-	< LLD	0
	Sr-89	8	0.8	< LLD	-	-	< LLD	0
	Sr-90	8	0.6	< LLD	-	-	< LLD	0
	GS	59						
	Mn-54		5.5	< LLD	-	-	< LLD	0
	Fe-59		8.8	< LLD	-	-	< LLD	0
	Co-58		4.7	< LLD	-	-	< LLD	0
	Co-60		5.8	< LLD	-	-	< LLD	0
	Zn-65		11.7	< LLD	-	-	< LLD	0
	Nb-95		9.6	< LLD	-	-	< LLD	0
	Zr-95		9.1	< LLD	-	-	< LLD	0
	I-131		11.6	< LLD	-	-	< LLD	0
	Cs-134		5.1	< LLD	-	-	< LLD	0
	Cs-137		6.4	< LLD	-	-	< LLD	0
Ba-140		26.4	< LLD	-	-	< LLD	0	
La-140		6.6	< LLD	-	-	< LLD	0	
Sediments (pCi/g dry)	GS	6						
	K-40		1.0	7.89 (4/4) (5.43-9.36)	D-50, Plant Intake	9.20 (2/2) (7.66-10.74)	9.20 (2/2) (7.66-10.74)	0
	Mn-54		0.024	< LLD	-	-	< LLD	0
	Fe-59		0.047	< LLD	-	-	< LLD	0
	Co-58		0.026	< LLD	-	-	< LLD	0
	Co-60		0.018	< LLD	-	-	< LLD	0
	Zn-65		0.056	< LLD	-	-	< LLD	0
	Nb-95		0.038	< LLD	-	-	< LLD	0
	Zr-95		0.050	< LLD	-	-	< LLD	0
	Ru-103		0.025	< LLD	-	-	< LLD	0
	Ru-106		0.18	< LLD	-	-	< LLD	0
	Cs-134		0.022	< LLD	-	-	< LLD	0
	Cs-137		0.016	0.037 (2/4) (0.030-0.044)	D-50, Plant Intake	0.10 (1/2)	0.10 (1/2)	0
Ce-141		0.072	< LLD	-	-	< LLD	0	
Ce-144		0.19	< LLD	-	-	< LLD	0	

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	(County, State)		

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e	
				Location ^d	Mean (F) ^c Range ^c			
Ingestion Pathway								
Milk (pCi/L)	I-131	42	0.5	< LLD	-	-	< LLD	0
	GS	42						
	K-40		100	1364 (21/21) (1307-1426)	D-108, Farm 17.3 mi. SW	1428 (21/21) (1284-1591)	1428 (21/21) (1284-1591)	0
	Cs-134		5	< LLD	-	-	< LLD	0
	Cs-137		5	< LLD	-	-	< LLD	0
	Ba-140		60	< LLD	-	-	< LLD	0
	La-140		5	< LLD	-	-	< LLD	0
Broadleaf Vegetation (pCi/g wet)	I-131	4	0.037	< LLD	-	-	< LLD	0
	GS	4						
	K-40		0.5	4.02 (4/4) (2.60-5.00)	D-108, Farm 17.3 mi. SW	5.00 (1/1)	5.00 (1/1)	0
	Mn-54		0.024	< LLD	-	-	< LLD	0
	Co-58		0.021	< LLD	-	-	< LLD	0
	Co-60		0.020	< LLD	-	-	< LLD	0
	Zn-65		0.032	< LLD	-	-	< LLD	0
	Nb-95		0.022	< LLD	-	-	< LLD	0
	Zr-95		0.031	< LLD	-	-	< LLD	0
	Ru-103		0.021	< LLD	-	-	< LLD	0
	Ru-106		0.23	< LLD	-	-	< LLD	0
	Cs-134		0.022	< LLD	-	-	< LLD	0
	Cs-137		0.019	< LLD	-	-	< LLD	0
	Ce-141		0.042	< LLD	-	-	< LLD	0
	Ce-144		0.16	< LLD	-	-	< LLD	0
Vegetation (Grain and Forage) (pCi/g wet)	GS	12						
	K-40		0.5	5.56 (8/8) (2.08-14.17)	D-108, Farm 17.3 mi. SW	13.75 (3/3) (3.16-23.80)	13.75 (3/3) (3.16-23.80)	0
	Mn-54		0.021	< LLD	-	-	< LLD	0
	Co-58		0.026	< LLD	-	-	< LLD	0
	Co-60		0.025	< LLD	-	-	< LLD	0
	Zn-65		0.094	< LLD	-	-	< LLD	0
	Nb-95		0.031	< LLD	-	-	< LLD	0
	Zr-95		0.058	< LLD	-	-	< LLD	0
	Ru-103		0.018	< LLD	-	-	< LLD	0
	Ru-106		0.20	< LLD	-	-	< LLD	0
	Cs-134		0.025	< LLD	-	-	< LLD	0
	Cs-137		0.031	< LLD	-	-	< LLD	0
	Ce-141		0.056	< LLD	-	-	< LLD	0
	Ce-144		0.23	< LLD	-	-	< LLD	0

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	<u>Duane Arnold Energy Center</u>	Docket No.	<u>50-331</u>
Location of Facility	<u>Linn, Iowa</u>	Reporting Period	<u>January-December, 2011</u>
	(County, State)		

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^a	
				Location ^d	Mean (F) ^c Range ^c			
Ingestion Pathway (cont.)								
Fish (pCi/g wet)	GS K-40	8	1.0	3.21 (4/4) (2.73-3.76)	D-49, Upstream, 4.0 mi. NNW	3.34 (4/4) (2.90-3.64)	3.34 (4/4) (2.90-3.64)	0
	Mn-54		0.015	< LLD	-	-	< LLD	0
	Fe-59		0.040	< LLD	-	-	< LLD	0
	Co-58		0.016	< LLD	-	-	< LLD	0
	Co-60		0.012	< LLD	-	-	< LLD	0
	Zn-65		0.021	< LLD	-	-	< LLD	0
	Nb-95		0.025	< LLD	-	-	< LLD	0
	Zr-95		0.033	< LLD	-	-	< LLD	0
	Ru-103		0.019	< LLD	-	-	< LLD	0
	Ru-106		0.10	< LLD	-	-	< LLD	0
	Cs-134		0.017	< LLD	-	-	< LLD	0
	Cs-137		0.014	< LLD	-	-	< LLD	0
	Ce-141		0.031	< LLD	-	-	< LLD	0
	Ce-144		0.093	< LLD	-	-	< LLD	0
Groundwater Protection Program								
Soil (pCi/gwet)	Sr-90	2	0.023	0.033 (2/2) (0.026-0.039)	D-15a, On-site 0.5 mi. NW	0.039 (1/1)	None	0
	H-3 (pCi/L)	2	150	< LLD	-	-	None	0
	GS K-40	2	0.5	12.28 (2/2) (9.49-15.08)	D-15a, On-site 0.5 mi. NW	15.08 (1/1)	None	0
	Mn-54		0.032	< LLD	-	-	None	0
	Fe-59		0.034	< LLD	-	-	None	0
	Co-58		0.018	< LLD	-	-	None	0
	Co-60		0.014	< LLD	-	-	None	0
	Zn-65		0.048	< LLD	-	-	None	0
	Nb-95		0.023	< LLD	-	-	None	0
	Zr-95		0.039	< LLD	-	-	None	0
	Ru-103		0.030	< LLD	-	-	None	0
	Ru-106		0.149	< LLD	-	-	None	0
	Cs-134		0.021	< LLD	-	-	None	0
	Cs-137		0.060	0.12 (2/2) (0.09-0.14)	D-15a, On-site 0.5 mi. NW	0.14 (1/1)	None	0
	Ce-141		0.064	< LLD	-	-	None	0
	Ce-144		0.17	< LLD	-	-	None	0

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	<u>Duane Arnold Energy Center</u>	Docket No.	<u>50-331</u>
Location of Facility	<u>Linn, Iowa</u>	Reporting Period	<u>January-December, 2011</u>
	(County, State)		

Sample Type (Units)	Type and Number of Analyses ^a	LLD ^b	Indicator Locations Mean (F) ^c Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^c Range ^c	Number Non-Routine Results ^e	
				Location ^d	Mean (F) ^c Range ^c			
Groundwater Protection Program (cont.)								
Ground Water Monitoring Wells (pCi/L)	GB	12	2.1	2.9 (5/12) (2.2-4.2)	MW-06A, Onsite, NE	4.2 (1/1)	None	0
	H-3	86	174	947 (25/86) (175-2087)	MW-08B, Onsite	1915 (5/5) (1773-2087)	None	0
	Gr. Alpha	4	7.1	14.5 (1/4)	MW-12A, Onsite	14.5 (1/4)	None	
	Sr-89	11	13.4	< LLD	-	-	None	
	Sr-90	11	7.9	< LLD	-	-	None	
	Fe-55	11	940	< LLD	-	-	None	
	Ni-63	11	137	< LLD	-	-	None	
Precipitation (pCi/L)	H-3	69	163	475 (14/69) (186-1549)	D-114, On-site	635 (1/11)	None	0
	GS	12						
	Mn-54		7.5	< LLD	-	-	None	0
	Fe-59		13.2	< LLD	-	-	None	0
	Co-58		7.6	< LLD	-	-	None	0
	Co-60		6.9	< LLD	-	-	None	0
	Zn-65		11.8	< LLD	-	-	None	0
	Nb-95		8.8	< LLD	-	-	None	0
	Zr-95		12.9	< LLD	-	-	None	0
	I-131		15.4	< LLD	-	-	None	0
	Cs-134		7.5	< LLD	-	-	None	0
	Cs-137		7.5	< LLD	-	-	None	0
	Ba-140		54.3	< LLD	-	-	None	0
La-140		10.0	< LLD	-	-	None	0	

^a GB = Gross beta; GS = Gamma spectroscopy

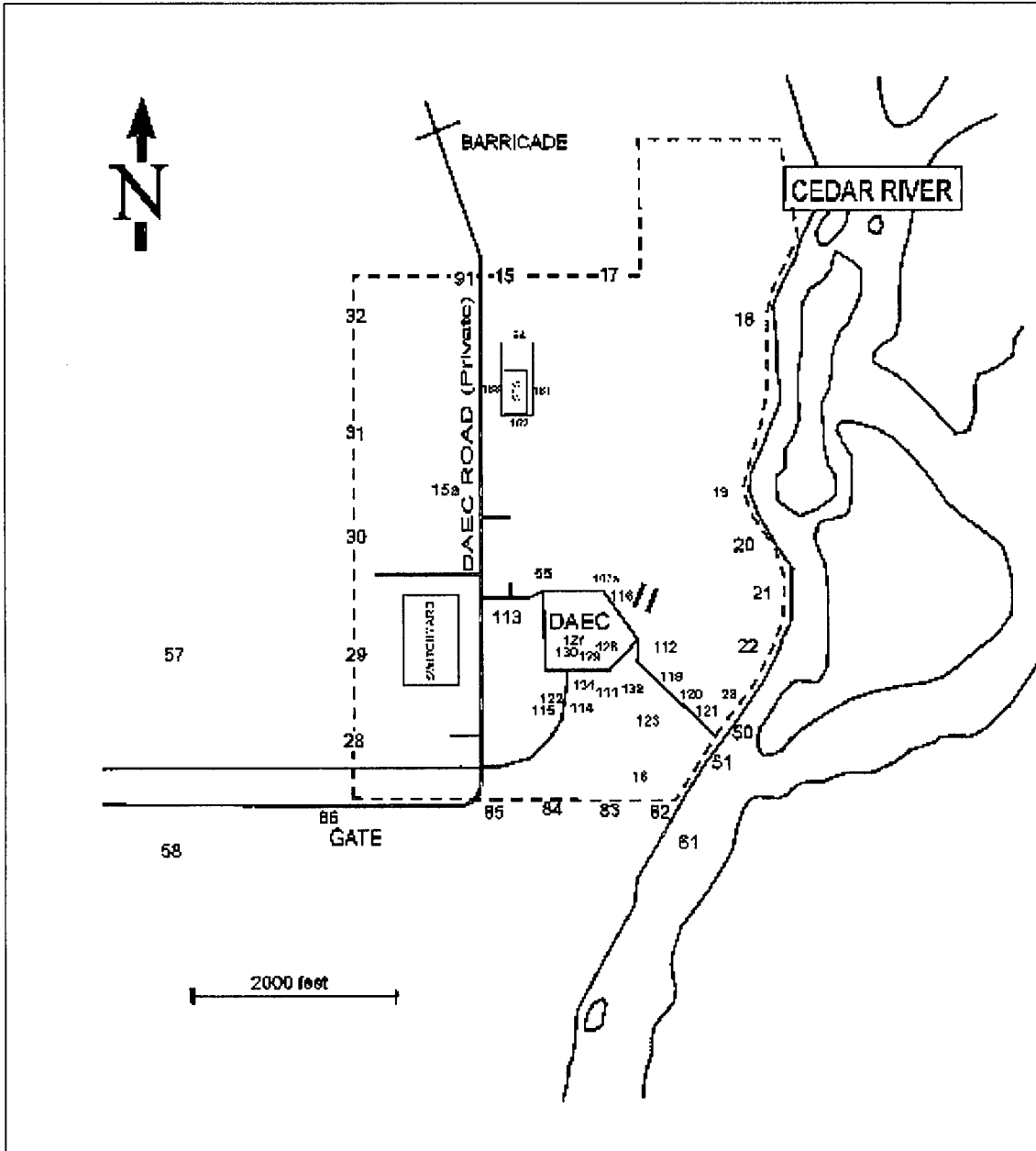
^b LLD = Nominal lower limit of detection based on 4.66 sigma counting error for the background sample.

^c Mean and range based upon detectable measurements only. Fraction of detectable measurements at specified locations is indicated in parentheses (F).

^d Locations are specified by: (1) Name and code (Table 5.3); and (2) distance, direction and sector relative to reactor site.

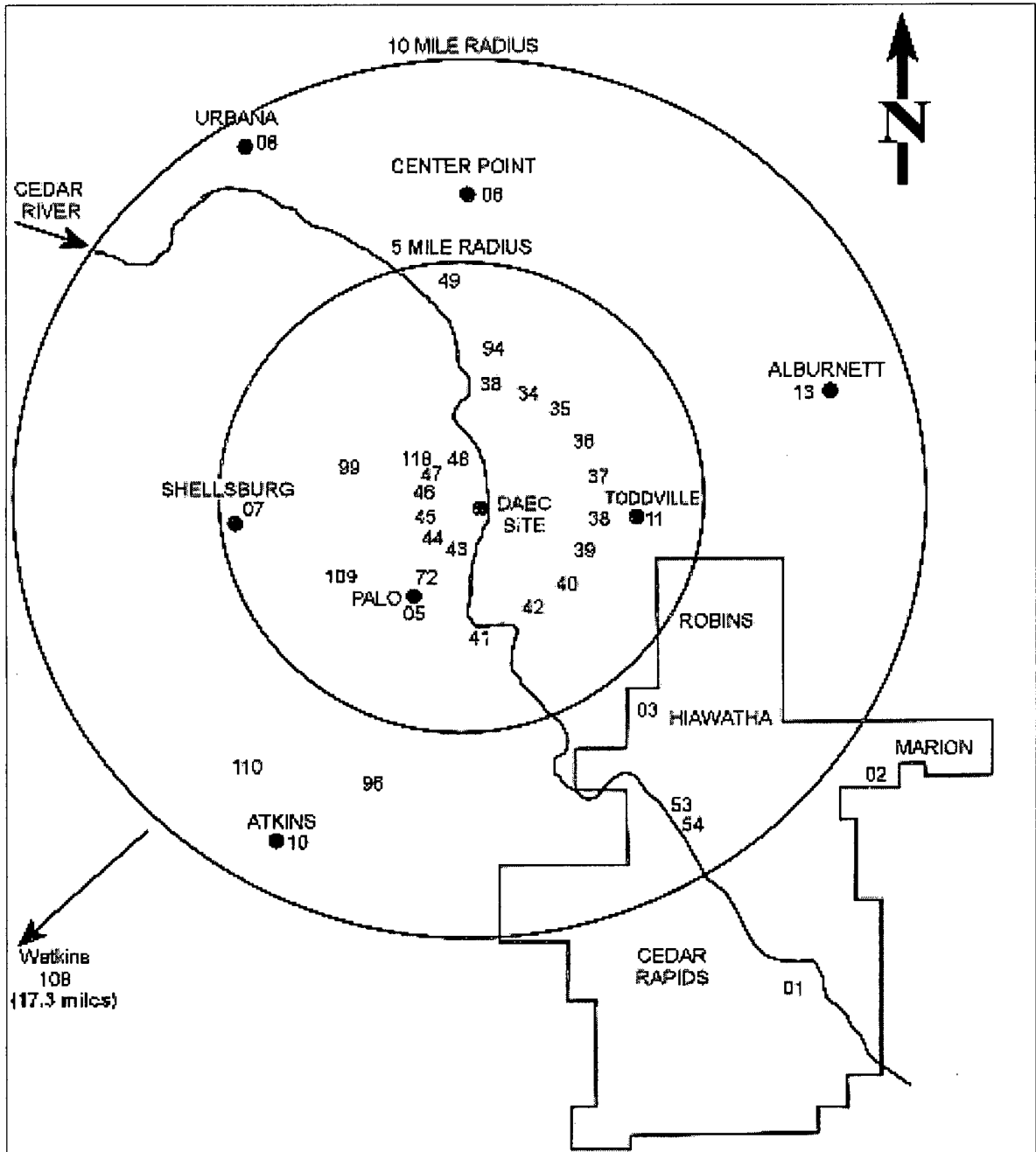
^e Non-routine results are those which exceed ten times the control station value for the location. If a control station value is not available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

Figure 5.1 Radiological Environmental Monitoring Program
 Sampling Stations near the Duane Arnold Energy Center.



See Table 5.3 for sampling locations and Table 5.4 for Type and Frequency of collection.

Figure 5.2. Radiological Environmental Monitoring Program Sampling Stations Outside 0.5 Miles.



See Table 5.3 for sampling locations and Table 5.4 for Type and Frequency of collection.

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APPENDIX A

INTERLABORATORY COMPARISON PROGRAM RESULTS

NOTE: Environmental Inc., Midwest Laboratory participates in intercomparison studies administered by Environmental Resources Associates, and serves as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada. Results are reported in Appendix A. TLD Intercomparison results, in-house spikes, blanks, duplicates and mixed analyte performance evaluation program results are also reported. Appendix A is updated four times a year; the complete Appendix is included in March, June, September and December monthly progress reports only.

January through December, 2011

Appendix A

Interlaboratory Comparison Program Results

Environmental, Inc., Midwest Laboratory has participated in interlaboratory comparison (crosscheck) programs since the formulation of its quality control program in December 1971. These programs are operated by agencies which supply environmental type samples containing concentrations of radionuclides known to the issuing agency but not to participant laboratories. The purpose of such a program is to provide an independent check on a laboratory's analytical procedures and to alert it of any possible problems.

Participant laboratories measure the concentration of specified radionuclides and report them to the issuing agency. Several months later, the agency reports the known values to the participant laboratories and specifies control limits. Results consistently higher or lower than the known values or outside the control limits indicate a need to check the instruments or procedures used.

Results in Table A-1 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the U.S. EPA Environmental Monitoring Systems Laboratory, Las Vegas, Nevada.

Table A-2 lists results for thermoluminescent dosimeters (TLDs), via International Intercomparison of Environmental Dosimeters, when available, and internal laboratory testing.

Table A-3 lists results of the analyses on in-house "spiked" samples for the past twelve months. All samples are prepared using NIST traceable sources. Data for previous years available upon request.

Table A-4 lists results of the analyses on in-house "blank" samples for the past twelve months. Data for previous years available upon request.

Table A-5 lists REMP specific analytical results from the in-house "duplicate" program for the past twelve months. Acceptance is based on the difference of the results being less than the sum of the errors. Complete analytical data for duplicate analyses is available upon request.

The results in Table A-6 were obtained through participation in the Mixed Analyte Performance Evaluation Program.

Results in Table A-7 were obtained through participation in the environmental sample crosscheck program administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurement Laboratory Quality Assessment Program (EML).

Attachment A lists the laboratory precision at the 1 sigma level for various analyses. The acceptance criteria in Table A-3 is set at ± 2 sigma.

Out-of-limit results are explained directly below the result.

Attachment A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES^a

Analysis	Level	One standard deviation for single determination
Gamma Emitters	5 to 100 pCi/liter or kg > 100 pCi/liter or kg	5.0 pCi/liter 5% of known value
Strontium-89 ^b	5 to 50 pCi/liter or kg > 50 pCi/liter or kg	5.0 pCi/liter 10% of known value
Strontium-90 ^b	2 to 30 pCi/liter or kg > 30 pCi/liter or kg	5.0 pCi/liter 10% of known value
Potassium-40	≥ 0.1 g/liter or kg	5% of known value
Gross alpha	≤ 20 pCi/liter > 20 pCi/liter	5.0 pCi/liter 25% of known value
Gross beta	≤ 100 pCi/liter > 100 pCi/liter	5.0 pCi/liter 5% of known value
Tritium	≤ 4,000 pCi/liter > 4,000 pCi/liter	± 1σ = 169.85 x (known) ^{0.0933} 10% of known value
Radium-226,-228	≥ 0.1 pCi/liter	15% of known value
Plutonium	≥ 0.1 pCi/liter, gram, or sample	10% of known value
Iodine-131, Iodine-129 ^b	≤ 55 pCi/liter > 55 pCi/liter	6 pCi/liter 10% of known value
Uranium-238, Nickel-63 ^b Technetium-99 ^b	≤ 35 pCi/liter > 35 pCi/liter	6 pCi/liter 15% of known value
Iron-55 ^b	50 to 100 pCi/liter > 100 pCi/liter	10 pCi/liter 10% of known value
Other Analyses ^b	---	20% of known value

^a From EPA publication, "Environmental Radioactivity Laboratory Intercomparison Studies Program, Fiscal Year, 1981-1982, EPA-600/4-81-004.

^b Laboratory limit.

TABLE A-1. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)^a.

Lab Code	Date	Analysis	Concentration (pCi/L)			Acceptance
			Laboratory Result ^b	ERA Result ^c	Control Limits	
STW-1243	04/04/11	Sr-89	68.2 ± 5.8	63.2	51.1 - 71.2	Pass
STW-1243	04/04/11	Sr-90	44.3 ± 2.4	42.5	31.3 - 48.8	Pass
STW-1244	04/04/11	Ba-133	69.8 ± 3.9	75.3	63.0 - 82.8	Pass
STW-1244	04/04/11	Co-60	87.9 ± 3.8	88.8	79.9 - 100.0	Pass
STW-1244	04/04/11	Cs-134	69.5 ± 3.7	72.9	59.5 - 80.2	Pass
STW-1244	04/04/11	Cs-137	77.9 ± 5.3	77.0	69.3 - 87.4	Pass
STW-1244	04/04/11	Zn-65	105.2 ± 8.4	98.9	89.0 - 118.0	Pass
STW-1245	04/04/11	Gr. Alpha	41.5 ± 2.3	50.1	26.1 - 62.9	Pass
STW-1245	04/04/11	Gr. Beta	48.9 ± 1.8	49.8	33.8 - 56.9	Pass
STW-1246	04/04/11	I-131	26.6 ± 1.7	27.5	22.9 - 32.3	Pass
STW-1247	04/04/11	Ra-226	13.2 ± 0.6	12.1	9.0 - 14.0	Pass
STW-1247	04/04/11	Ra-228	11.2 ± 0.6	11.6	7.6 - 14.3	Pass
STW-1247	04/04/11	Uranium	36.4 ± 0.6	39.8	32.2 - 44.4	Pass
STW-1248	04/04/11	H-3	10322 ± 285	10200.0	8870 - 11200	Pass
STW-1256	10/07/11	Sr-89	68.7 ± 6.0	69.7	56.9 - 77.9	Pass
STW-1256	10/07/11	Sr-90	36.9 ± 2.4	41.1	30.2 - 47.2	Pass
STW-1257	10/07/11	Ba-133	88.2 ± 7.8	96.9	81.8 - 106.0	Pass
STW-1257	10/07/11	Co-60	116.5 ± 7.1	119.0	107.0 - 133.0	Pass
STW-1257 ^d	10/07/11	Cs-134	38.8 ± 8.0	33.4	26.3 - 36.7	Fail
STW-1257	10/07/11	Cs-137	45.6 ± 7.3	44.3	39.4 - 51.7	Pass
STW-1257	10/07/11	Zn-65	84.9 ± 15.4	76.8	68.9 - 92.5	Pass
STW-1258	10/07/11	Gr. Alpha	35.7 ± 3.8	53.2	27.8 - 66.6	Pass
STW-1258	10/07/11	Gr. Beta	36.1 ± 3.3	45.9	30.9 - 53.1	Pass
STW-1259	10/07/11	I-131	25.0 ± 1.1	27.5	22.9 - 32.3	Pass
STW-1260	10/07/11	Ra-226	12.2 ± 0.6	11.6	8.7 - 13.4	Pass
STW-1260	10/07/11	Ra-228	11.5 ± 1.7	10.3	6.7 - 12.8	Pass
STW-1260	10/07/11	Uranium	46.6 ± 0.5	48.6	39.4 - 54.0	Pass
STW-1261	10/07/11	H-3	17435 ± 382	17400	15200 - 19100	Pass

^a Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing in drinking water conducted by Environmental Resources Associates (ERA).

^b Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

^c Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA.

^d The sample was reanalyzed. Result of reanalysis was acceptable, 32.9 ± 7.4 pCi/L.

TABLE A-2. Thermoluminescent Dosimetry, (TLD, CaSO₄: Dy Cards).

Lab Code	Date	Description	mR			Acceptance
			Known Value	Lab Result ± 2 sigma	Control Limits	
<u>Environmental, Inc.</u>						
2010-2	12/13/2010	100 cm.	4.94	4.65 ± 0.57	3.46 - 6.42	Pass
2010-2	12/13/2010	110 cm.	4.09	3.50 ± 0.74	2.86 - 5.32	Pass
2010-2	12/13/2010	120 cm.	3.43	2.68 ± 0.36	2.40 - 4.46	Pass
2010-2	12/13/2010	150 cm.	2.2	1.75 ± 0.42	1.54 - 2.86	Pass
2010-2	12/13/2010	180 cm.	1.53	1.32 ± 0.52	1.07 - 1.99	Pass
2010-2	12/13/2010	40 cm.	30.89	38.56 ± 2.11	21.62 - 40.16	Pass
2010-2	12/13/2010	50 cm.	19.77	23.35 ± 1.82	13.84 - 25.70	Pass
2010-2	12/13/2010	60 cm.	13.73	14.53 ± 1.24	9.61 - 17.85	Pass
2010-2	12/13/2010	60 cm.	13.73	15.84 ± 1.53	9.61 - 17.85	Pass
2010-2	12/13/2010	80 cm.	7.72	8.33 ± 0.74	5.40 - 10.04	Pass
2010-2	12/13/2010	90 cm.	6.1	5.93 ± 0.73	4.27 - 7.93	Pass
<u>Environmental, Inc.</u>						
2011-1	7/6/2011	100 cm.	6.71	5.64 ± 0.30	4.70 - 8.72	Pass
2011-1	7/6/2011	110 cm.	5.54	4.60 ± 0.46	3.88 - 7.20	Pass
2011-1	7/6/2011	120 cm.	4.66	4.68 ± 0.29	3.26 - 6.06	Pass
2011-1	7/6/2011	150 cm.	2.98	2.93 ± 0.66	2.09 - 3.87	Pass
2011-1	7/6/2011	180 cm.	2.07	2.05 ± 0.18	1.45 - 2.69	Pass
2011-1	7/6/2011	40 cm.	41.92	52.36 ± 3.08	29.34 - 54.50	Pass
2011-1	7/6/2011	45 cm.	33.12	41.83 ± 3.46	23.18 - 43.06	Pass
2011-1	7/6/2011	50 cm.	26.83	28.61 ± 2.63	18.78 - 34.88	Pass
2011-1	7/6/2011	60 cm.	18.63	21.00 ± 1.15	13.04 - 24.22	Pass
2011-1	7/6/2011	70 cm.	13.69	13.24 ± 1.76	9.58 - 17.80	Pass
2011-1	7/6/2011	80 cm.	10.48	12.18 ± 0.65	7.34 - 13.62	Pass
2011-1	7/6/2011	90 cm.	8.28	7.95 ± 0.82	5.80 - 10.76	Pass

TABLE A-3. In-House "Spike" Samples

Lab Code ^b	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			Laboratory results 2s, n=1 ^c	Known Activity	Control Limits ^d	
SPW-202	1/17/2011	U-238	4.19 ± 0.19	4.17	0.00 - 16.17	Pass
W-20111	2/1/2011	Ra-226	16.32 ± 0.47	16.77	11.74 - 21.80	Pass
W-20711	2/7/2011	Gr. Alpha	23.02 ± 0.45	20.00	10.00 - 30.00	Pass
W-20711	2/7/2011	Gr. Beta	46.59 ± 0.41	45.20	35.20 - 55.20	Pass
XWW-331	2/11/2011	Ba-133	144.30 ± 8.50	144.40	129.96 - 158.84	Pass
XWW-331	2/11/2011	Cs-134	22.20 ± 3.70	21.50	11.50 - 31.50	Pass
XWW-331	2/11/2011	Cs-137	64.70 ± 7.40	61.00	51.00 - 71.00	Pass
XWW-331	2/11/2011	H-3	13399 ± 334	12538	10030 - 15046	Pass
SPAP-567	2/14/2011	Gr. Beta	46.90 ± 0.11	48.10	28.86 - 67.34	Pass
SPAP-569	2/14/2011	Cs-134	7.70 ± 1.70	7.49	0.00 - 17.49	Pass
SPAP-569	2/14/2011	Cs-137	102.47 ± 3.20	106.79	96.11 - 117.47	Pass
SPAP-571	2/14/2011	H-3	75815 ± 542	73230	58584 - 87876	Pass
SPW-581	2/15/2011	Cs-134	39.91 ± 1.38	37.45	27.45 - 47.45	Pass
SPW-581	2/15/2011	Cs-137	56.28 ± 2.28	53.39	43.39 - 63.39	Pass
SPW-581	2/15/2011	Sr-89	112.92 ± 5.61	121.42	97.14 - 145.70	Pass
SPW-581	2/15/2011	Sr-90	47.80 ± 2.02	42.07	33.66 - 50.48	Pass
SPMI-583	2/15/2011	Cs-137	57.04 ± 2.76	53.39	43.39 - 63.39	Pass
SPMI-583	2/15/2011	Sr-90	36.27 ± 1.47	42.07	33.66 - 50.48	Pass
SPW-602	2/17/2011	U-238	3.98 ± 0.19	4.17	0.00 - 16.17	Pass
SPW-686	2/25/2011	Ni-63	167.41 ± 3.05	208.11	145.68 - 270.54	Pass
SPF-1113	3/17/2011	Cs-137	2369 ± 22	2170	1953 - 2387	Pass
XWW-1602	3/21/2011	Ba-133	26.83 ± 6.35	28.58	18.58 - 38.58	Pass
XWW-1602	3/21/2011	Cs-134	18.90 ± 4.06	16.30	6.30 - 26.30	Pass
XWW-1602	3/21/2011	Cs-137	33.98 ± 5.88	30.50	20.50 - 40.50	Pass
XWW-1602	3/21/2011	H-3	7348 ± 248	7617	6094 - 9140	Pass
XWW-2537	4/4/2011	Ba-133	43.40 ± 4.26	42.70	32.70 - 52.70	Pass
XWW-2537	4/4/2011	Cs-134	13.50 ± 2.40	11.90	1.90 - 21.90	Pass
XWW-2537	4/4/2011	Cs-137	68.30 ± 5.90	60.70	50.70 - 70.70	Pass
XWW-2537	4/4/2011	H-3	7134 ± 257	7234	5787 - 8681	Pass
SPW-2877	5/3/2011	Ra-228	25.23 ± 2.48	31.62	22.13 - 41.11	Pass
SPMI-3167	5/24/2011	Cs-134	33.04 ± 8.25	34.19	24.19 - 44.19	Pass
SPMI-3167	5/24/2011	Cs-137	51.53 ± 8.63	53.06	43.06 - 63.06	Pass
SPMI-3167	5/24/2011	Sr-89	90.89 ± 4.30	93.47	74.78 - 112.16	Pass
SPMI-3167	5/24/2011	Sr-90	41.17 ± 1.53	41.80	33.44 - 50.16	Pass
W-52411	5/24/2011	Ra-226	17.90 ± 0.42	16.80	11.76 - 21.84	Pass
W-60711	6/7/2011	Gr. Alpha	23.00 ± 0.49	20.00	10.00 - 30.00	Pass
W-60711	6/7/2011	Gr. Beta	43.27 ± 0.42	45.20	35.20 - 55.20	Pass
SPAP-4167	7/7/2011	Cs-134	6.92 ± 1.45	6.57	0.00 - 16.57	Pass
SPAP-4167	7/7/2011	Cs-137	108.02 ± 2.84	105.80	95.22 - 116.38	Pass
SPW-4169	7/7/2011	Cs-134	34.52 ± 4.79	32.84	22.84 - 42.84	Pass
SPW-4169	7/7/2011	Cs-137	58.29 ± 6.19	52.92	42.92 - 62.92	Pass

TABLE A-3. In-House "Spike" Samples

Lab Code ^b	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			Laboratory results 2s, n=1 ^c	Known Activity	Control Limits ^d	
SPW-4169	7/7/2011	Sr-89	66.12 ± 4.18	69.64	55.71 - 83.57	Pass
SPW-4169	7/7/2011	Sr-90	41.72 ± 1.79	41.68	33.34 - 50.02	Pass
SPW-4171	7/7/2011	H-3	70582 ± 767	71646	57317 - 85975	Pass
SPW-4180	7/7/2011	Tc-99	95.69 ± 1.65	97.02	67.91 - 126.13	Pass
SPW-41821	7/7/2011	Ra-228	32.57 ± 2.63	30.63	21.44 - 39.82	Pass
SPW-4241	7/7/2011	Ni-63	403.01 ± 4.66	415.20	290.64 - 539.76	Pass
SPW-4180	7/8/2011	Tc-99	100.30 ± 1.75	97.02	67.91 - 126.13	Pass
SPW-5029	7/29/2011	C-14	3991 ± 17	4739	2843 - 6634	Pass
SPW-5031	7/29/2011	Fe-55	13801 ± 331	14895	11916 - 17874	Pass
W-91411	9/14/2011	Gr. Alpha	21.58 ± 0.44	20.00	10.00 - 30.00	Pass
W-91411	9/14/2011	Gr. Beta	43.02 ± 0.40	45.20	35.20 - 55.20	Pass
SPW-91511	9/15/2011	Tc-99	29.92 ± 1.07	32.34	20.34 - 44.34	Pass
W-91911	9/19/2011	Ra-226	17.06 ± 0.42	16.80	11.76 - 21.84	Pass
W-100711	10/7/2011	Gr. Alpha	22.05 ± 0.45	20.00	10.00 - 30.00	Pass
W-100711	10/7/2011	Gr. Beta	45.51 ± 0.41	45.20	35.20 - 55.20	Pass
W-101111	10/11/2011	Ra-226	16.02 ± 0.40	16.80	11.76 - 21.84	Pass
XWW-7220	11/17/2011	Ba-133	25.11 ± 4.36	27.47	17.47 - 37.47	Pass
XWW-7220	11/17/2011	Cs-134	14.09 ± 3.11	16.60	6.60 - 26.60	Pass
XWW-7220	11/17/2011	Cs-137	35.59 ± 4.28	29.98	19.98 - 39.98	Pass
W-113011	11/30/2011	Ra-226	16.12 ± 0.39	16.80	11.76 - 21.84	Pass
W-120111	12/1/2011	Gr. Alpha	21.34 ± 0.43	20.00	10.00 - 30.00	Pass
W-120111	12/1/2011	Gr. Beta	45.55 ± 0.41	45.20	35.20 - 55.20	Pass
SPW-41823	12/9/2011	Ra-228	26.98 ± 2.38	29.40	20.58 - 38.22	Pass
SPMI-8906	12/22/2011	Cs-134	29.11 ± 3.52	28.14	18.14 - 38.14	Pass
SPMI-8906	12/22/2011	Cs-137	58.27 ± 7.62	52.36	42.36 - 62.36	Pass
SPW-8916	12/22/2011	Cs-134	31.74 ± 3.63	28.14	18.14 - 38.14	Pass
SPW-8916	12/22/2011	Cs-137	56.48 ± 6.12	52.36	42.36 - 62.36	Pass
SPAP-8902	12/23/2011	Gr. Beta	45.72 ± 0.11	47.11	28.27 - 65.95	Pass
SPAP-8904	12/23/2011	Cs-134	5.19 ± 0.63	5.63	0.00 - 15.63	Pass
SPAP-8904	12/23/2011	Cs-137	101.21 ± 2.55	104.71	94.24 - 115.18	Pass
SPW-8918	12/23/2011	H-3	136759 ± 1056	137638	110110 - 165166	Pass
SPW-8922	12/23/2011	Ni-63	202.21 ± 3.75	206.88	144.82 - 268.94	Pass
SPW-8924	12/23/2011	Tc-99	126.10 ± 1.86	129.36	90.55 - 168.17	Pass
SPF-8926	12/23/2011	Cs-134	0.34 ± 0.01	0.33	0.20 - 0.47	Pass
SPF-8926	12/23/2011	Cs-137	2.34 ± 0.02	2.09	1.25 - 2.93	Pass

^a Liquid sample results are reported in pCi/Liter, air filters(pCi/filter), charcoal (pCi/m³), and solid samples (pCi/g).

^b Laboratory codes as follows: W (water), MI (milk), AP (air filter), SO (soil), VE (vegetation), CH (charcoal canister), F (fish), U (urine).

^c Results are based on single determinations.

^d Control limits are established from the precision values listed in Attachment A of this report, adjusted to ± 2 σ.

NOTE: For fish, Jello is used for the Spike matrix. For Vegetation, cabbage is used for the Spike matrix.

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis ^b	Concentration (pCi/L) ^a		
				Laboratory results (4.66σ)		Acceptance Criteria (4.66 σ)
				LLD	Activity ^c	
SPW-202	Water	1/17/2011	U-238	0.10	0.12 ± 0.12	1
W-20111	Water	2/1/2011	Ra-226	0.04	0.05 ± 0.03	1
W-20711	Water	2/7/2011	Gr. Alpha	0.44	-0.02 ± 0.29	1
W-20711	Water	2/7/2011	Gr. Beta	0.75	-0.03 ± 0.53	3.2
SPAP-566	Air Filter	2/14/2011	Gr. Beta	0.64	2.24 ± 0.61	3.2
SPAP-568	Air Filter	2/14/2011	Cs-134	2.34	-	100
SPAP-568	Air Filter	2/14/2011	Cs-137	1.56	-	100
SPAP-570	Air Filter	2/14/2011	H-3	103.20	-49.40 ± 52.50	200
SPW-580	Water	2/15/2011	Cs-134	2.68	-	10
SPW-580	Water	2/15/2011	Cs-137	2.84	-	10
SPW-580	Water	2/15/2011	Sr-89	0.73	0.24 ± 0.57	5
SPW-580	Water	2/15/2011	Sr-90	0.57	0.02 ± 0.27	1
SPMI-582	Milk	2/15/2011	Cs-134	3.49	-	10
SPMI-582	Milk	2/15/2011	Cs-137	3.54	-	10
SPMI-582	Milk	2/15/2011	I-131(G)	4.14	-	20
SPMI-582	Milk	2/15/2011	Sr-89	0.71	0.16 ± 0.67	5
SPMI-582	Milk	2/15/2011	Sr-90	0.55	0.59 ± 0.32	1
SPW-601	Water	2/17/2011	U-238	0.20	0.09 ± 0.17	1
SPW-685	Water	2/25/2011	Ni-63	1.61	0.05 ± 0.98	20
SPF-1112	Fish	3/17/2011	Cs-134	6.74	-	100
SPF-1112	Fish	3/17/2011	Cs-137	5.45	-	100
BKW-40111	Water	4/1/2011	I-131	4.16	-	10
BKW-40111	Water	4/1/2011	Co-60	3.11	-	10
BKW-40111	Water	4/1/2011	Cs-134	4.73	-	10
BKW-40111	Water	4/1/2011	Cs-137	5.04	-	10
SPW-2887	Water	5/3/2011	Ra-228	0.72	0.46 ± 0.39	2
W-52411	Water	5/24/2011	Ra-226	0.04	0.05 ± 0.03	1
W-60711	Water	6/7/2011	Gr. Alpha	0.51	0.00 ± 0.36	1
W-60711	Water	6/7/2011	Gr. Beta	1.58	0.38 ± 1.12	3.2
SPAP-4164	Air Filter	7/7/2011	Gr. Beta	0.72	1.04 ± 0.48	3.2
SPW-4168	Water	7/7/2011	Cs-134	3.41	-	10
SPW-4168	Water	7/7/2011	Cs-137	2.45	-	10
SPW-4168	Water	7/7/2011	Sr-89	0.72	0.40 ± 0.50	5
SPW-4168	Water	7/7/2011	Sr-90	0.51	-0.19 ± 0.21	1
SPW-4171	Water	7/7/2011	H-3	152.00	37.10 ± 81.80	200
SPW-41811	Water	7/7/2011	Ra-228	0.77	0.51 ± 0.42	2

TABLE A-4. In-House "Blank" Samples

Lab Code	Sample Type	Date	Analysis ^b	Concentration (pCi/L) ^a		
				Laboratory results (4.66σ)		Acceptance Criteria (4.66 σ)
				LLD	Activity ^c	
SPW-4241	Water	7/7/2011	Ni-63	1.70	0.09 ± 1.03	20
SPW-4179	Water	7/8/2011	Tc-99	1.20	-0.96 ± 0.71	10
SPW-5028	Water	7/29/2011	C-14	109.80	61.90 ± 59.20	200
SPW-5031	Water	7/29/2011	Fe-55	140.60	0.00 ± 85.30	1000
W-91411	Water	9/14/2011	Gr. Alpha	0.48	-0.06 ± 0.33	1
W-91411	Water	9/14/2011	Gr. Beta	0.78	-0.43 ± 0.53	3.2
SPW-91511	Water	9/15/2011	Tc-99	1.11	-0.62 ± 0.66	10
W-91911	Water	9/19/2011	Ra-226	0.03	0.04 ± 0.02	1
W-100711	Water	10/7/2011	Gr. Alpha	0.44	-0.26 ± 0.28	1
W-100711	Water	10/7/2011	Gr. Beta	0.76	-0.43 ± 0.52	3.2
W-101111	Water	10/11/2011	Ra-226	0.04	0.05 ± 0.03	1
W-113011	Water	11/30/2011	Ra-226	0.03	0.04 ± 0.02	1
W-120111	Water	12/1/2011	Gr. Alpha	0.41	-0.20 ± 0.27	1
W-120111	Water	12/1/2011	Gr. Beta	0.75	-0.10 ± 0.53	3.2
SPW-41813	Water	12/9/2011	Ra-228	0.71	0.17 ± 0.35	2
SPMI-8905	Milk	12/22/2011	Cs-134	3.27	-	10
SPMI-8905	Milk	12/22/2011	Cs-137	3.38	-	10
SPMI-8905	Milk	12/22/2011	I-131(G)	2.17	-	20
SPW-8915	Water	12/22/2011	Cs-134	3.37	-	10
SPW-8915	Water	12/22/2011	Cs-137	3.45	-	10
SPW-8915	Water	12/22/2011	I-131(G)	3.38	-	20
SPAP-8901	Air Filter	12/23/2011	Gr. Beta	0.78	0.50 ± 0.46	3.2
SPAP-8903	Air Filter	12/23/2011	Cs-134	1.65	-	100
SPAP-8903	Air Filter	12/23/2011	Cs-137	2.41	-	100
SPW-8917	Water	12/23/2011	H-3	150.20	-3.04 ± 78.80	200
SPW-8921	Water	12/23/2011	Ni-63	16.92	-4.60 ± 10.16	20
SPW-8923	Water	12/23/2011	Tc-99	5.66	-5.45 ± 3.34	10
SPF-8925	Fish	12/23/2011	Cs-134	7.15	-	100
SPF-8925	Fish	12/23/2011	Cs-137	9.73	-	100

^a Liquid sample results are reported in pCi/Liter, air filters(pCi/filter), charcoal (pCi/charcoal canister), and solid samples (pCi/kg).

^b I-131(G); iodine-131 as analyzed by gamma spectroscopy.

^c Activity reported is a net activity result. For gamma spectroscopic analysis, activity detected below the LLD value is not reported.

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
CF-20, 21	1/3/2011	Be-7	0.24 ± 0.14	0.34 ± 0.17	0.29 ± 0.11	Pass
CF-20, 21	1/3/2011	K-40	10.37 ± 0.43	9.76 ± 0.68	10.07 ± 0.40	Pass
CF-20, 21	1/3/2011	Sr-90	0.01 ± 0.01	0.01 ± 0.01	0.01 ± 0.00	Pass
WW-65, 66	1/6/2011	H-3	321.91 ± 97.19	345.76 ± 98.16	333.83 ± 69.06	Pass
BS-165, 166	1/11/2011	Cs-137	0.13 ± 0.02	0.15 ± 0.02	0.14 ± 0.01	Pass
BS-165, 166	1/11/2011	H-3	286.00 ± 80.00	284.00 ± 80.00	285.00 ± 56.57	Pass
BS-165, 166	1/11/2011	K-40	14.11 ± 0.52	13.79 ± 0.60	13.95 ± 0.40	Pass
BS-176, 177	1/11/2011	H-3	391.00 ± 92.00	332.00 ± 89.00	361.50 ± 64.00	Pass
BS-176, 177	1/11/2011	K-40	9.06 ± 0.44	8.28 ± 0.81	8.67 ± 0.46	Pass
BS-197, 198	1/11/2011	Cs-137	0.14 ± 0.03	0.15 ± 0.04	0.15 ± 0.03	Pass
BS-197, 198	1/11/2011	H-3	459.00 ± 103.00	283.00 ± 95.00	371.00 ± 70.06	Pass
BS-197, 198	1/11/2011	K-40	14.40 ± 0.77	14.16 ± 1.23	14.28 ± 0.73	Pass
WW-358, 359	1/17/2011	H-3	331.44 ± 93.05	407.65 ± 95.91	369.55 ± 66.81	Pass
DW-20009, 20010	1/19/2011	Ra-226	3.66 ± 0.57	2.74 ± 0.43	3.20 ± 0.36	Pass
DW-20009, 20010	1/19/2011	Ra-228	1.51 ± 0.64	1.36 ± 0.60	1.44 ± 0.44	Pass
WW-337, 338	1/25/2011	H-3	21986 ± 402	21896 ± 401	21941 ± 284	Pass
W-491, 492	1/27/2011	Ra-226	6.70 ± 0.50	6.10 ± 0.50	6.40 ± 0.35	Pass
W-491, 492	1/27/2011	Ra-228	6.60 ± 1.30	8.40 ± 1.40	7.50 ± 0.96	Pass
DW-20014, 20015	1/28/2011	Gr. Alpha	1.91 ± 0.71	2.34 ± 0.80	2.13 ± 0.53	Pass
SWU-447, 448	1/31/2011	Gr. Beta	7.42 ± 1.17	6.85 ± 1.11	7.14 ± 0.81	Pass
W-694, 695	2/7/2011	H-3	628.26 ± 104.30	692.37 ± 106.89	660.32 ± 74.67	Pass
DW-20022, 20023	2/9/2011	Ra-228	0.71 ± 0.47	1.13 ± 0.54	0.92 ± 0.36	Pass
SW-626, 627	2/16/2011	H-3	1268.17 ± 129.52	1144.65 ± 125.39	1206.41 ± 90.14	Pass
LW-825, 826	2/24/2011	Gr. Beta	2.65 ± 0.82	2.45 ± 0.74	2.55 ± 0.55	Pass
SWT-845, 846	3/1/2011	Gr. Beta	1.11 ± 0.39	0.80 ± 0.37	0.96 ± 0.27	Pass
MI-998, 999	3/7/2011	K-40	1760.10 ± 127.50	1708.50 ± 131.60	1734.30 ± 91.62	Pass
W-1024, 1025	3/7/2011	H-3	489.83 ± 101.09	581.39 ± 105.06	535.61 ± 72.90	Pass
WW-1156, 1157	3/16/2011	Gr. Beta	1.79 ± 0.78	0.47 ± 0.66	1.13 ± 0.51	Pass
P-1198, 1199	3/17/2011	H-3	504.00 ± 133.00	597.00 ± 136.00	550.50 ± 95.11	Pass
SW-1434, 1435	3/28/2011	H-3	15523 ± 359	15968 ± 364	15746 ± 256	Pass
WW-1588, 1589	3/28/2011	Gr. Beta	1.81 ± 1.23	2.81 ± 1.38	2.31 ± 0.92	Pass
SG-1714, 1715	3/28/2011	Gr. Alpha	8.82 ± 0.81	8.58 ± 0.74	8.70 ± 0.55	Pass
SG-1714, 1715	3/28/2011	Gr. Beta	13.78 ± 0.65	12.76 ± 0.58	13.27 ± 0.44	Pass
AP-1862, 1863	3/28/2011	Be-7	0.09 ± 0.02	0.08 ± 0.02	0.08 ± 0.01	Pass
W-2143, 2144	3/28/2011	H-3	536.40 ± 99.37	466.79 ± 96.46	501.59 ± 69.25	Pass
AP-2269, 2270	3/28/2011	Be-7	0.07 ± 0.01	0.08 ± 0.01	0.07 ± 0.01	Pass
DW-20061, 20062	3/28/2011	Gr. Alpha	2.82 ± 1.33	3.89 ± 1.26	3.36 ± 0.92	Pass
SWU-1455, 1456	3/29/2011	Gr. Beta	2.50 ± 0.75	2.75 ± 0.83	2.62 ± 0.56	Pass
SWU-1522, 1523	3/29/2011	Gr. Beta	1.36 ± 0.87	2.14 ± 0.96	1.75 ± 0.65	Pass
PM-1543, 1544	3/29/2011	Gr. Beta	13.81 ± 0.26	13.67 ± 0.27	13.74 ± 0.19	Pass
PM-1543, 1544	3/29/2011	Sr-90	8.12 ± 3.20	7.71 ± 3.25	7.91 ± 2.28	Pass

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
SWT-5885, 5886	3/29/2011	Gr. Beta	1.21 ± 0.54	0.77 ± 0.54	0.99 ± 0.38	Pass
AP-1883, 1884	3/30/2011	Be-7	0.07 ± 0.01	0.09 ± 0.02	0.08 ± 0.01	Pass
AP-2248, 2249	3/30/2011	Be-7	0.06 ± 0.01	0.06 ± 0.01	0.06 ± 0.01	Pass
DW-20066, 20067	3/30/2011	Ra-226	2.14 ± 0.16	2.10 ± 0.16	2.12 ± 0.11	Pass
DW-20066, 20067	3/30/2011	Ra-228	2.55 ± 0.65	1.78 ± 0.62	2.17 ± 0.45	Pass
P-1567, 1568	4/1/2011	H-3	289.00 ± 103.00	296.00 ± 103.00	292.50 ± 72.83	Pass
MI-1609, 1610	4/4/2011	I-131	0.85 ± 0.17	0.91 ± 0.18	0.88 ± 0.13	Pass
MI-1609, 1610	4/4/2011	K-40	1323.80 ± 112.00	1323.20 ± 96.22	1323.50 ± 73.83	Pass
MI-1609, 1610	4/4/2011	Sr-90	0.85 ± 0.33	0.97 ± 0.34	0.91 ± 0.24	Pass
S-1651, 1652	4/4/2011	Ac-228	0.88 ± 0.08	1.03 ± 0.22	0.96 ± 0.12	Pass
S-1651, 1652	4/4/2011	Pb-214	1.09 ± 0.12	0.84 ± 0.16	0.97 ± 0.10	Pass
AP-1841, 1842	4/7/2011	Be-7	0.12 ± 0.02	0.12 ± 0.01	0.12 ± 0.01	Pass
AP-1841, 1842	4/7/2011	Cs-137	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	Pass
AP-1841, 1842	4/7/2011	I-131(G)	0.02 ± 0.00	0.03 ± 0.00	0.03 ± 0.00	Pass
S-1990, 1991	4/7/2011	Ac-228	15.83 ± 0.39	16.12 ± 0.64	15.98 ± 0.37	Pass
S-1990, 1991	4/7/2011	Pb-214	11.21 ± 0.23	11.81 ± 1.22	11.51 ± 0.62	Pass
WW-2552, 2553	4/7/2011	H-3	761.09 ± 116.48	759.04 ± 116.41	760.07 ± 82.34	Pass
PM-1904, 1905	4/11/2011	K-40	13585 ± 611	14278 ± 648	13932 ± 445	Pass
PM-1904, 1905	4/11/2011	Sr-90	9.94 ± 3.05	5.62 ± 2.52	7.78 ± 1.98	Pass
P-2011, 2012	4/11/2011	H-3	670.00 ± 108.00	619.00 ± 106.00	644.50 ± 75.66	Pass
WW-2053, 2054	4/13/2011	H-3	220.20 ± 86.50	246.80 ± 87.80	233.50 ± 61.63	Pass
BS-2095, 2096	4/13/2011	K-40	12.88 ± 0.72	13.56 ± 1.08	13.22 ± 0.65	Pass
DW-20099, 20100	4/13/2011	U-233/4	1.64 ± 0.40	1.31 ± 0.34	1.48 ± 0.26	Pass
DW-20099, 20100	4/13/2011	U-238	1.49 ± 0.39	1.28 ± 0.33	1.39 ± 0.26	Pass
WW-2416, 2417	4/19/2011	H-3	217.10 ± 97.00	184.90 ± 95.60	201.00 ± 68.10	Pass
P-2185, 2186	4/20/2011	H-3	405.00 ± 93.00	504.00 ± 98.00	454.50 ± 67.55	Pass
WW-2353, 2354	4/20/2011	H-3	525.54 ± 119.74	399.41 ± 115.99	462.48 ± 83.35	Pass
DW-20115, 20116	4/26/2011	U-233/4	11.94 ± 2.34	10.71 ± 1.19	11.33 ± 1.31	Pass
DW-20115, 20116	4/26/2011	U-238	2.70 ± 1.15	3.89 ± 0.72	3.30 ± 0.68	Pass
SO-2960, 2961	4/27/2011	K-40	22.53 ± 1.36	22.90 ± 0.03	22.77 ± 0.68	Pass
MI-2657, 2658	5/2/2011	K-40	1319.30 ± 101.30	1403.20 ± 131.60	1361.25 ± 83.04	Pass
DW-20130, 20131	5/2/2011	U-233/4	7.59 ± 0.90	7.62 ± 0.83	7.61 ± 0.61	Pass
DW-20130, 20131	5/2/2011	U-238	4.67 ± 0.72	4.84 ± 0.66	4.76 ± 0.49	Pass
DW-20148, 20149	5/3/2011	U-233/4	6.64 ± 0.83	6.35 ± 0.81	6.50 ± 0.58	Pass
DW-20148, 20149	5/3/2011	U-238	6.11 ± 0.83	5.18 ± 0.73	5.65 ± 0.55	Pass
PM-2810, 2811	5/4/2011	Cs-134	18.64 ± 12.16	33.33 ± 11.86	25.99 ± 8.49	Pass
PM-2810, 2811	5/4/2011	Cs-137	28.99 ± 14.92	21.17 ± 12.16	25.08 ± 9.62	Pass
PM-2810, 2811	5/4/2011	K-40	14368 ± 720	14309 ± 638	14339 ± 481	Pass
WW-3065, 3066	5/16/2011	H-3	280.51 ± 86.98	179.46 ± 82.83	229.98 ± 60.05	Pass
WW-3086, 3087	5/16/2011	H-3	341.14 ± 85.94	377.97 ± 87.43	359.56 ± 61.30	Pass

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
SG-3134, 3135	5/16/2011	Ac-228	11.19 ± 0.82	12.50 ± 0.84	11.85 ± 0.59	Pass
SG-3134, 3135	5/16/2011	Pb-214	9.12 ± 0.17	9.37 ± 0.42	9.25 ± 0.23	Pass
F-3221, 3222	5/23/2011	K-40	2.73 ± 0.39	2.81 ± 0.42	2.77 ± 0.29	Pass
SS-3434, 3435	5/25/2011	K-40	11533.00 ± 563.70	11236.00 ± 566.10	11384.50 ± 399.45	Pass
AP-3329, 3330	5/26/2011	Be-7	0.24 ± 0.11	0.23 ± 0.13	0.24 ± 0.08	Pass
WW-3350, 3351	6/1/2011	H-3	235.37 ± 83.98	173.12 ± 81.05	204.25 ± 58.36	Pass
G-3413, 3414	6/1/2011	Be-7	0.28 ± 0.10	0.25 ± 0.09	0.27 ± 0.07	Pass
G-3413, 3414	6/1/2011	Gr. Beta	11.04 ± 0.31	10.85 ± 0.31	10.95 ± 0.22	Pass
G-3413, 3414	6/1/2011	K-40	6.80 ± 0.33	6.71 ± 0.38	6.76 ± 0.25	Pass
AP-3602, 3603	6/3/2011	Be-7	0.20 ± 0.08	0.25 ± 0.10	0.22 ± 0.07	Pass
SO-3797, 3798	6/8/2011	Ac-228	0.99 ± 0.05	1.00 ± 0.06	1.00 ± 0.04	Pass
SO-3797, 3798	6/8/2011	Bi-212	1.10 ± 0.12	1.08 ± 0.17	1.09 ± 0.10	Pass
SO-3797, 3798	6/8/2011	Bi-214	0.87 ± 0.02	0.86 ± 0.02	0.87 ± 0.01	Pass
SO-3797, 3798	6/8/2011	Cs-137	0.41 ± 0.01	0.39 ± 0.01	0.40 ± 0.01	Pass
SO-3797, 3798	6/8/2011	K-40	16.08 ± 0.26	16.27 ± 0.29	16.18 ± 0.19	Pass
SO-3797, 3798	6/8/2011	Pb-212	0.98 ± 0.10	0.93 ± 0.02	0.96 ± 0.05	Pass
SO-3797, 3798	6/8/2011	Pb-214	0.95 ± 0.02	0.91 ± 0.02	0.93 ± 0.01	Pass
SO-3797, 3798	6/8/2011	Th-232	0.47 ± 0.05	0.49 ± 0.04	0.48 ± 0.03	Pass
SO-3797, 3798	6/8/2011	U-233/4	0.16 ± 0.02	0.15 ± 0.02	0.16 ± 0.01	Pass
SO-3797, 3798	6/8/2011	U-238	0.16 ± 0.02	0.13 ± 0.02	0.15 ± 0.01	Pass
MI-3935, 3936	6/20/2011	K-40	1764.60 ± 119.40	1843.10 ± 136.50	1803.85 ± 90.68	Pass
BS-4172, 4173	6/21/2011	Cs-137	51.50 ± 23.78	48.57 ± 17.06	50.04 ± 14.63	Pass
BS-4172, 4173	6/21/2011	K-40	11730.00 ± 679.60	11120.00 ± 512.30	11425.00 ± 425.53	Pass
DW-20183, 20184	6/21/2011	U-233/4	10.00 ± 1.00	8.40 ± 0.90	9.20 ± 0.67	Pass
DW-20183, 20184	6/21/2011	U-238	6.70 ± 0.80	6.10 ± 0.80	6.40 ± 0.57	Pass
WW-4019, 4020	6/24/2011	Gr. Beta	3.56 ± 1.20	3.16 ± 1.21	3.36 ± 0.85	Pass
PM-4193, 4194	6/30/2011	K-40	14795.00 ± 759.00	14660.00 ± 750.00	14727.50 ± 533.52	Pass
LW-4235, 4236	6/30/2011	Gr. Beta	2.70 ± 0.72	2.11 ± 0.78	2.41 ± 0.53	Pass
AP-4367, 4368	7/7/2011	Be-7	0.17 ± 0.10	0.19 ± 0.11	0.18 ± 0.07	Pass
MI-4416, 4417	7/11/2011	K-40	1342.40 ± 91.49	1447.00 ± 114.80	1394.70 ± 73.40	Pass
W-4914, 4915	7/11/2011	H-3	576.36 ± 110.35	584.67 ± 110.67	580.52 ± 78.14	Pass
MI-4438, 4439	7/12/2011	K-40	1280.60 ± 107.50	1381.20 ± 112.70	1330.90 ± 77.87	Pass
VE-4481, 4482	7/13/2011	K-40	4452.60 ± 332.40	4767.90 ± 349.70	4610.25 ± 241.24	Pass
AP-4677, 4678	7/15/2011	Be-7	0.18 ± 0.08	0.23 ± 0.09	0.20 ± 0.06	Pass
W-5537, 5538	7/18/2011	H-3	650.13 ± 105.19	695.39 ± 106.94	672.76 ± 75.00	Pass
P-4764, 4765	7/19/2011	H-3	179.82 ± 84.81	138.72 ± 82.79	159.27 ± 59.26	Pass
WW-5211, 5212	7/24/2011	H-3	191.94 ± 85.50	136.22 ± 82.76	164.08 ± 59.50	Pass

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
VE-4998, 4999	7/25/2011	Be-7	543.90 ± 158.20	488.30 ± 163.80	516.10 ± 113.86	Pass
VE-4998, 4999	7/25/2011	K-40	2562.20 ± 319.80	2414.00 ± 350.00	2488.10 ± 237.05	Pass
DW-20258, 20259	7/25/2011	U-233/4	21.34 ± 1.52	24.93 ± 2.93	23.14 ± 1.65	Pass
DW-20258, 20259	7/25/2011	U-235	0.57 ± 0.26	0.69 ± 0.26	0.63 ± 0.18	Pass
DW-20258, 20259	7/25/2011	U-238	14.11 ± 1.24	15.81 ± 1.23	14.96 ± 0.87	Pass
DW-20269, 20270	7/25/2011	U-233/4	4.93 ± 0.73	4.65 ± 0.68	4.79 ± 0.50	Pass
DW-20269, 20270	7/25/2011	U-238	3.26 ± 0.60	2.53 ± 0.50	2.90 ± 0.39	Pass
DW-20280, 20281	7/25/2011	U-233/4	3.58 ± 0.58	3.33 ± 0.56	3.46 ± 0.40	Pass
DW-20280, 20281	7/25/2011	U-238	1.64 ± 0.40	2.11 ± 0.45	1.88 ± 0.30	Pass
MI-5019, 5020	7/26/2011	K-40	1348.50 ± 101.00	1347.40 ± 109.70	1347.95 ± 74.56	Pass
W-5447, 5448	7/26/2011	H-3	246.31 ± 99.19	241.99 ± 99.02	244.15 ± 70.08	Pass
G-5124, 5125	7/28/2011	Gr. Beta	7.48 ± 0.20	7.17 ± 0.19	7.33 ± 0.14	Pass
AP-5232, 5233	7/28/2011	Be-7	0.15 ± 0.08	0.22 ± 0.13	0.19 ± 0.08	Pass
SL-5169, 5170	8/1/2011	Be-7	2.37 ± 0.16	2.17 ± 0.17	2.27 ± 0.12	Pass
SL-5169, 5170	8/1/2011	Gr. Beta	4.74 ± 0.45	3.94 ± 0.39	4.34 ± 0.30	Pass
SL-5169, 5170	8/1/2011	K-40	3.12 ± 0.16	2.96 ± 0.21	3.04 ± 0.13	Pass
G-5190, 5191	8/1/2011	Be-7	3.14 ± 0.30	3.44 ± 0.27	3.29 ± 0.20	Pass
G-5190, 5191	8/1/2011	Gr. Beta	8.07 ± 0.28	7.86 ± 0.27	7.97 ± 0.19	Pass
G-5190, 5191	8/1/2011	K-40	5.51 ± 0.46	5.57 ± 0.44	5.54 ± 0.32	Pass
DW-20291, 20292	8/2/2011	U-233/4	3.24 ± 0.54	2.60 ± 0.50	2.92 ± 0.37	Pass
DW-20291, 20292	8/2/2011	U-238	1.59 ± 0.38	2.00 ± 0.43	1.80 ± 0.29	Pass
SG-5342, 5343	8/5/2011	Ac-228	14.41 ± 0.36	14.13 ± 0.48	14.27 ± 0.30	Pass
SG-5342, 5343	8/5/2011	Bi-212	4.14 ± 0.65	4.73 ± 1.21	4.44 ± 0.69	Pass
SG-5342, 5343	8/5/2011	K-40	7.67 ± 0.92	7.95 ± 1.21	7.81 ± 0.76	Pass
SG-5342, 5343	8/5/2011	Pb-214	10.72 ± 0.21	10.67 ± 0.28	10.70 ± 0.18	Pass
SG-5342, 5343	8/5/2011	Tl-208	0.96 ± 0.06	1.00 ± 0.06	0.98 ± 0.04	Pass
MI-5405, 5406	8/8/2011	K-40	1545.30 ± 116.00	1388.00 ± 98.20	1466.65 ± 75.99	Pass
DW-20301, 20302	8/9/2011	Gr. Alpha	6.36 ± 1.09	5.30 ± 1.08	5.83 ± 0.77	Pass
DW-20301, 20302	8/9/2011	Gr. Beta	14.36 ± 0.92	13.51 ± 0.89	13.94 ± 0.64	Pass
DW-5603, 5604	8/16/2011	Ra-228	1.68 ± 0.88	2.26 ± 0.91	1.97 ± 0.63	Pass
VE-5753, 5754	8/22/2011	Be-7	0.78 ± 0.20	0.75 ± 0.23	0.77 ± 0.15	Pass
VE-5753, 5754	8/22/2011	K-40	6.16 ± 0.51	6.63 ± 0.57	6.40 ± 0.38	Pass
S-5801, 5802	8/29/2011	Ac-228	0.43 ± 0.09	0.38 ± 0.07	0.41 ± 0.06	Pass
S-5801, 5802	8/29/2011	K-40	6.54 ± 0.51	5.96 ± 0.49	6.25 ± 0.35	Pass
S-5801, 5802	8/29/2011	Pb-212	0.31 ± 0.03	0.36 ± 0.03	0.34 ± 0.02	Pass
S-5801, 5802	8/29/2011	Pb-214	0.28 ± 0.04	0.25 ± 0.04	0.27 ± 0.03	Pass
S-5801, 5802	8/29/2011	Tl-208	0.14 ± 0.02	0.12 ± 0.02	0.13 ± 0.01	Pass
S-5801, 5802	8/29/2011	U-235	0.05 ± 0.02	0.04 ± 0.01	0.05 ± 0.01	Pass
ME-5996, 5997	9/1/2011	Gr. Alpha	0.03 ± 0.02	0.03 ± 0.02	0.03 ± 0.01	Pass
ME-5996, 5997	9/1/2011	Gr. Beta	2.55 ± 0.07	2.62 ± 0.07	2.58 ± 0.05	Pass
ME-5996, 5997	9/1/2011	K-40	2.66 ± 0.35	2.24 ± 0.58	2.45 ± 0.34	Pass

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
SL-6017, 6018	9/6/2011	Be-7	0.47 ± 0.17	0.51 ± 0.19	0.49 ± 0.13	Pass
SL-6017, 6018	9/6/2011	Gr. Beta	4.23 ± 0.16	3.94 ± 0.15	4.09 ± 0.11	Pass
SL-6017, 6018	9/6/2011	K-40	4.43 ± 0.55	4.24 ± 0.53	4.34 ± 0.38	Pass
VE-6038, 6039	9/7/2011	Sr-90	1.86 ± 0.98	2.30 ± 0.92	2.08 ± 0.67	Pass
SW-6059, 6060	9/8/2011	H-3	219.75 ± 97.52	177.41 ± 95.76	198.58 ± 68.34	Pass
VE-6302, 6303	9/13/2011	Be-7	0.76 ± 0.24	0.85 ± 0.20	0.81 ± 0.16	Pass
VE-6302, 6303	9/13/2011	Gr. Beta	27.00 ± 1.02	25.50 ± 0.95	26.25 ± 0.70	Pass
VE-6302, 6303	9/13/2011	H-3	6966.00 ± 249.00	6947.00 ± 249.00	6956.50 ± 176.07	Pass
VE-6302, 6303	9/13/2011	K-40	20.62 ± 0.68	20.63 ± 0.64	20.63 ± 0.47	Pass
W-7098, 7099	9/19/2011	H-3	586.61 ± 103.06	525.71 ± 100.63	556.16 ± 72.02	Pass
W-6407, 6408	9/20/2011	Ra-228	1.61 ± 0.94	0.79 ± 0.81	1.20 ± 0.62	Pass
MI-6479, 6480	9/27/2011	K-40	1384.10 ± 111.10	1411.40 ± 105.00	1397.75 ± 76.43	Pass
W-6579, 6580	9/27/2011	H-3	287.97 ± 99.68	285.95 ± 99.60	286.96 ± 70.45	Pass
AP-7015, 7016	9/27/2011	Be-7	0.08 ± 0.02	0.09 ± 0.02	0.08 ± 0.01	Pass
AP-6105, 6106	9/28/2011	Be-7	0.11 ± 0.02	0.09 ± 0.02	0.10 ± 0.01	Pass
LW-6603, 6604	9/28/2011	Gr. Beta	2.15 ± 1.04	1.65 ± 0.90	1.90 ± 0.69	Pass
AP-7056, 7057	9/29/2011	Be-7	0.08 ± 0.02	0.06 ± 0.01	0.07 ± 0.01	Pass
G-6730, 6731	10/3/2011	Be-7	4.24 ± 0.36	4.47 ± 0.37	4.36 ± 0.26	Pass
G-6730, 6731	10/3/2011	Gr. Beta	8.27 ± 0.33	7.93 ± 0.31	8.10 ± 0.23	Pass
G-6730, 6731	10/3/2011	K-40	6.46 ± 0.56	5.41 ± 0.50	5.94 ± 0.38	Pass
AP-7077, 7078	10/3/2011	Be-7	0.08 ± 0.01	0.07 ± 0.01	0.07 ± 0.01	Pass
AP-7077, 7078	10/3/2011	Be-7	0.08 ± 0.01	0.07 ± 0.01	0.07 ± 0.01	Pass
VE-6798, 6799	10/4/2011	K-40	11.76 ± 0.65	11.91 ± 0.62	11.84 ± 0.45	Pass
AP-6820, 6821	10/6/2011	Be-7	0.22 ± 0.08	0.18 ± 0.10	0.20 ± 0.06	Pass
W-7755, 7756	10/9/2011	H-3	261.92 ± 96.52	221.92 ± 94.80	241.92 ± 67.65	Pass
BS-7944, 7945	10/10/2011	Cs-137	291.17 ± 34.00	330.68 ± 36.40	310.93 ± 24.90	Pass
BS-7944, 7945	10/10/2011	K-40	14237.00 ± 686.40	15359.00 ± 703.80	14798.00 ± 491.55	Pass
BS-7140, 7141	10/13/2011	K-40	2.59 ± 0.35	2.58 ± 0.52	2.59 ± 0.31	Pass
AP-7168, 7169	10/13/2011	Be-7	0.25 ± 0.09	0.25 ± 0.11	0.25 ± 0.07	Pass
DW-20349, 20350	10/13/2011	U-233/4	1.77 ± 0.41	2.25 ± 0.77	2.01 ± 0.44	Pass
DW-20349, 20350	10/13/2011	U-238	0.28 ± 0.19	0.31 ± 0.33	0.30 ± 0.19	Pass
WW-7667, 7668	10/19/2011	H-3	1049.11 ± 116.32	1071.39 ± 117.10	1060.25 ± 82.53	Pass
WW-7381, 7382	10/21/2011	H-3	1904.40 ± 145.45	1813.62 ± 142.91	1859.01 ± 101.95	Pass
SS-7495, 7496	10/26/2011	K-40	10.16 ± 0.55	9.56 ± 0.49	9.86 ± 0.37	Pass
W-7516, 7517	10/27/2011	H-3	191.46 ± 84.47	224.05 ± 86.03	207.76 ± 60.28	Pass
VE-7537, 7538	10/28/2011	K-40	2.08 ± 0.23	2.41 ± 0.21	2.24 ± 0.16	Pass
MI-7622, 7623	10/31/2011	K-40	1386.20 ± 116.80	1407.90 ± 116.50	1397.05 ± 82.48	Pass
DW-20399, 20400	10/31/2011	U-233/4	5.70 ± 0.70	5.70 ± 0.70	5.70 ± 0.49	Pass
DW-20399, 20400	10/31/2011	U-238	3.10 ± 0.50	3.70 ± 0.70	3.40 ± 0.43	Pass
BS-7600, 7601	11/1/2011	Gr. Beta	6.83 ± 1.44	5.31 ± 1.35	6.07 ± 0.98	Pass

TABLE A-5. In-House "Duplicate" Samples

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
SG-8471, 8472	11/1/2011	Gr. Alpha	13.63 ± 2.32	11.13 ± 2.00	12.38 ± 1.53	Pass
SG-8471, 8472	11/1/2011	Gr. Beta	20.30 ± 1.43	17.65 ± 1.42	18.98 ± 1.01	Pass
DW-20424, 20425	11/7/2011	U-233/4	5.90 ± 0.80	6.10 ± 0.80	6.00 ± 0.57	Pass
DW-20424, 20425	11/7/2011	U-235	0.10 ± 0.10	0.30 ± 0.20	0.20 ± 0.11	Pass
DW-20424, 20425	11/7/2011	U-238	4.30 ± 0.70	3.70 ± 0.60	4.00 ± 0.46	Pass
DW-20424, 20425	11/7/2011	U-238	10.30 ± 1.00	10.10 ± 1.00	10.20 ± 0.71	Pass
DW-20435, 20436	11/8/2011	U-233/4	11.00 ± 1.10	10.60 ± 0.80	10.80 ± 0.68	Pass
DW-20435, 20436	11/8/2011	U-238	5.90 ± 0.80	4.90 ± 0.60	5.40 ± 0.50	Pass
SG-7902, 7903	11/10/2011	Ac-228	21.38 ± 0.47	20.48 ± 0.52	20.93 ± 0.35	Pass
SG-7902, 7903	11/10/2011	K-40	9.72 ± 1.04	9.53 ± 0.92	9.63 ± 0.69	Pass
SG-7902, 7903	11/10/2011	Pb-212	3.99 ± 0.10	3.99 ± 0.10	3.99 ± 0.07	Pass
SG-7902, 7903	11/10/2011	Pb-214	9.15 ± 0.23	9.14 ± 0.21	9.15 ± 0.16	Pass
BS-8033, 8034	11/11/2011	Cs-137	0.03 ± 0.02	0.03 ± 0.02	0.03 ± 0.01	Pass
LW-8075, 8076	11/16/2011	Gr. Beta	1.93 ± 0.62	2.55 ± 0.64	2.24 ± 0.44	Pass
AP-8193, 8194	11/17/2011	Be-7	0.21 ± 0.11	0.26 ± 0.13	0.24 ± 0.08	Pass
F-8663, 8664	11/19/2011	Cs-137	0.03 ± 0.02	0.03 ± 0.02	0.03 ± 0.01	Pass
F-8663, 8664	11/19/2011	Gr. Beta	3.55 ± 0.10	3.71 ± 0.10	3.63 ± 0.07	Pass
F-8663, 8664	11/19/2011	K-40	3.04 ± 0.42	3.05 ± 0.35	3.05 ± 0.27	Pass
DW-20449, 20450	11/28/2011	U-233/4	0.70 ± 0.20	0.80 ± 0.20	0.75 ± 0.14	Pass
DW-20449, 20450	11/28/2011	U-238	0.60 ± 0.20	0.60 ± 0.20	0.60 ± 0.14	Pass
SWU-8388, 8389	11/29/2011	Gr. Beta	1.66 ± 0.57	1.65 ± 0.59	1.66 ± 0.41	Pass
AP-8841, 8842	12/15/2011	Be-7	0.23 ± 0.12	0.19 ± 0.09	0.21 ± 0.07	Pass
W-8886, 8887	12/15/2011	Gr. Alpha	0.83 ± 0.81	1.58 ± 0.99	1.21 ± 0.64	Pass
W-8886, 8887	12/15/2011	Gr. Beta	6.80 ± 1.25	5.94 ± 1.22	6.37 ± 0.87	Pass
W-8886, 8887	12/15/2011	Ra-226	0.23 ± 0.15	0.41 ± 0.16	0.32 ± 0.11	Pass
SO-8958, 8959	12/21/2011	K-40	14.58 ± 0.86	15.07 ± 0.87	14.83 ± 0.61	Pass
AP-8907, 8908	12/22/2011	Be-7	0.15 ± 0.06	0.11 ± 0.07	0.13 ± 0.05	Pass
AP-9196, 9197	12/28/2011	Be-7	0.06 ± 0.01	0.07 ± 0.01	0.06 ± 0.01	Pass
LW-9091, 9092	12/29/2011	Gr. Beta	1.97 ± 0.63	1.74 ± 0.60	1.86 ± 0.44	Pass

Note: Duplicate analyses are performed on every twentieth sample received in-house. Results are not listed for those analyses with activities that measure below the LLD.

^a Results are reported in units of pCi/L, except for air filters (pCi/Filter), food products, vegetation, soil, sediment (pCi/g).

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP)^a.

Lab Code ^c	Date	Analysis	Laboratory result	Concentration ^b		Acceptance
				Known Activity	Control Limits ^d	
STW-1237 ^e	02/01/11	Am-241	0.35 ± 0.10	0.53	0.37 - 0.69	Fail
STW-1237	02/01/11	Co-57	< 0.2	0.00	-	Pass
STW-1237	02/01/11	Co-60	24.10 ± 0.40	24.60	17.20 - 32.00	Pass
STW-1237	02/01/11	Cs-134	19.80 ± 0.40	21.50	15.10 - 28.00	Pass
STW-1237	02/01/11	Cs-137	29.40 ± 0.50	29.40	20.60 - 38.20	Pass
STW-1237	02/01/11	H-3	238.90 ± 8.80	243.00	170.00 - 316.00	Pass
STW-1237	02/01/11	K-40	95.40 ± 3.10	91.00	64.00 - 118.00	Pass
STW-1237	02/01/11	Mn-54	32.50 ± 0.60	31.60	22.10 - 41.10	Pass
STW-1237	02/01/11	Ni-63	16.30 ± 0.60	18.60	13.00 - 24.20	Pass
STW-1237	02/01/11	Pu-238	1.11 ± 0.12	1.06	0.75 - 1.38	Pass
STW-1237	02/01/11	Pu-239/40	0.88 ± 0.12	0.81	0.57 - 1.05	Pass
STW-1237	02/01/11	Sr-90	8.70 ± 0.70	8.72	6.10 - 11.34	Pass
STW-1237	02/01/11	Tc-99	7.60 ± 0.60	8.99	6.29 - 11.69	Pass
STW-1237	02/01/11	Zn-65	< 0.5	0.00	-	Pass
STW-1238	02/01/11	Gr. Alpha	0.82 ± 0.07	1.14	0.34 - 1.93	Pass
STW-1238	02/01/11	Gr. Beta	2.82 ± 0.07	2.96	1.48 - 4.44	Pass
STVE-1239	02/01/11	Co-57	11.27 ± 0.21	9.94	6.96 - 12.92	Pass
STVE-1239	02/01/11	Co-60	4.95 ± 0.16	4.91	3.44 - 6.38	Pass
STVE-1239	02/01/11	Cs-134	5.18 ± 0.19	5.50	3.85 - 7.15	Pass
STVE-1239	02/01/11	Cs-137	< 0.09	0.00	-	Pass
STVE-1239	02/01/11	Mn-54	6.91 ± 0.25	6.40	4.48 - 8.32	Pass
STVE-1239	02/01/11	Zn-65	3.10 ± 0.32	2.99	2.09 - 3.89	Pass
STSO-1240	02/01/11	Co-57	984.10 ± 4.10	927.00	649.00 - 1205.00	Pass
STSO-1240	02/01/11	Co-60	540.70 ± 3.00	482.00	337.00 - 627.00	Pass
STSO-1240	02/01/11	Cs-134	726.70 ± 5.92	680.00	476.00 - 884.00	Pass
STSO-1240	02/01/11	Cs-137	883.10 ± 4.70	758.00	531.00 - 985.00	Pass
STSO-1240	02/01/11	K-40	622.70 ± 16.70	540.00	378.00 - 702.00	Pass
STSO-1240	02/01/11	Mn-54	-0.30 ± 1.00	0.00	-	Pass
STSO-1240 ^t	02/01/11	Ni-63	384.00 ± 16.90	582.00	407.00 - 757.00	Fail
STSO-1240	02/01/11	U-233/4	166.60 ± 7.30	176.00	123.00 - 229.00	Pass
STSO-1240	02/01/11	U-238	172.00 ± 7.40	184.00	129.00 - 239.00	Pass
STSO-1240	02/01/11	Zn-65	1671.00 ± 13.10	1359.00	951.00 - 1767.00	Pass
STAP-1241	02/01/11	Am-241	0.00 ± 0.01	0.00	-0.10 - 0.10	Pass
STAP-1241	02/01/11	Co-57	3.48 ± 0.06	3.33	2.33 - 4.33	Pass
STAP-1241	02/01/11	Co-60	0.00 ± 0.02	0.00	-0.10 - 0.10	Pass
STAP-1241	02/01/11	Cs-134	3.44 ± 0.27	3.49	2.44 - 4.54	Pass
STAP-1241	02/01/11	Cs-137	2.46 ± 0.27	2.28	1.60 - 2.96	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP)^a.

Lab Code ^c	Date	Analysis	Laboratory result	Concentration ^b		Acceptance
				Known Activity	Control Limits ^d	
STAP-1241	02/01/11	Gr. Alpha	0.39 ± 0.05	0.66	0.20 - 1.12	Pass
STAP-1241	02/01/11	Gr. Beta	1.54 ± 0.07	1.32	0.66 - 1.99	Pass
STAP-1241	02/01/11	Mn-54	2.90 ± 0.10	2.64	1.85 - 3.43	Pass
STAP-1241	02/01/11	Pu-238	0.07 ± 0.02	0.10	0.07 - 0.13	Pass
STAP-1241	02/01/11	Pu-239/40	0.06 ± 0.02	0.08	0.05 - 0.10	Pass
STAP-1241 ^g	02/01/11	Sr-90	1.89 ± 0.15	1.36	0.95 - 1.77	Fail
STAP-1241	02/01/11	U-233/4	0.13 ± 0.02	0.18	0.13 - 0.23	Pass
STAP-1241	02/01/11	U-238	0.14 ± 0.02	0.19	0.13 - 0.24	Pass
STAP-1241	02/01/11	Zn-65	3.80 ± 0.18	3.18	2.23 - 4.13	Pass
STW-1249	08/01/11	I-129	7.32 ± 0.30	9.50	6.70 - 12.40	Pass
STVE-1250	08/01/11	Co-57	0.01 ± 0.02	0.00	-	Pass
STVE-1250	08/01/11	Co-60	3.57 ± 0.13	3.38	2.37 - 4.39	Pass
STVE-1250	08/01/11	Cs-134	-0.02 ± 0.04	0.00	-0.10 - 0.10	Pass
STVE-1250	08/01/11	Cs-137	5.28 ± 0.20	4.71	3.30 - 6.12	Pass
STVE-1250	08/01/11	Mn-54	6.48 ± 0.22	5.71	4.00 - 7.42	Pass
STVE-1250	08/01/11	Zn-65	7.35 ± 0.34	6.39	4.47 - 8.31	Pass
STSO-1251	08/01/11	Co-57	1333.90 ± 4.20	1180.00	826.00 - 1534.00	Pass
STSO-1251	08/01/11	Co-60	701.30 ± 3.40	644.00	451.00 - 837.00	Pass
STSO-1251	08/01/11	Cs-134	0.71 ± 1.05	0.00	-	Pass
STSO-1251	08/01/11	Cs-137	1106.00 ± 5.60	979.00	685.00 - 1273.00	Pass
STSO-1251	08/01/11	K-40	749.20 ± 19.00	625.00	438.00 - 813.00	Pass
STSO-1251	08/01/11	Mn-54	984.30 ± 5.40	848.00	594.00 - 1102.00	Pass
STSO-1251	08/01/11	Ni-63	0.1 ± 1.21	0.00	-	Pass
STSO-1251	08/01/11	Pu-238	97.90 ± 7.40	93.60	65.50 - 121.70	Pass
STSO-1251	08/01/11	Pu-239/40	78.80 ± 6.40	77.40	54.20 - 100.60	Pass
STSO-1251 ^h	08/01/11	Sr-90	219.40 ± 16.70	320.00	224.00 - 416.00	Fail
STSO-1251 ⁱ	08/01/11	Tc-99	110.00 ± 8.00	182.00	127.00 - 237.00	Fail
STSO-1251	08/01/11	U-233/4	267.00 ± 10.20	263.00	184.00 - 342.00	Pass
STSO-1251	08/01/11	U-238	280.30 ± 10.40	274.00	192.00 - 356.00	Pass
STSO-1251	08/01/11	Zn-65	1639.90 ± 11.40	1560.00	1092.00 - 2028.00	Pass
STAP-1252	08/01/11	Co-57	5.06 ± 0.08	5.09	3.56 - 6.62	Pass
STAP-1252	08/01/11	Co-60	3.13 ± 0.09	3.20	2.24 - 4.16	Pass
STAP-1252	08/01/11	Cs-134	0.01 ± 0.03	0.00	-0.10 - 0.10	Pass
STAP-1252	08/01/11	Cs-137	2.61 ± 0.09	2.60	1.82 - 3.38	Pass
STAP-1252	08/01/11	Mn-54	0.01 ± 0.03	0.00	-0.10 - 0.10	Pass
STAP-1252	08/01/11	Pu-238	0.13 ± 0.02	0.12	0.08 - 0.15	Pass
STAP-1252	08/01/11	Pu-239/40	0.15 ± 0.02	0.14	0.10 - 0.18	Pass
STAP-1252	08/01/11	Sr-90	1.65 ± 0.16	1.67	1.17 - 2.17	Pass

TABLE A-6. Department of Energy's Mixed Analyte Performance Evaluation Program (MAPEP)^a.

Lab Code ^c	Date	Analysis	Laboratory result	Concentration ^b		Acceptance
				Known Activity	Control Limits ^d	
STAP-1252	08/01/11	U-233/4	0.17 ± 0.02	0.16	0.11 - 0.21	Pass
STAP-1252	08/01/11	U-238	0.17 ± 0.02	0.17	0.12 - 0.22	Pass
STAP-1252	08/01/11	Zn-65	4.46 ± 0.23	4.11	2.88 - 5.34	Pass
STW-1254	08/01/11	Co-57	37.20 ± 0.50	36.60	25.60 - 47.60	Pass
STW-1254	08/01/11	Co-60	28.80 ± 0.40	29.30	20.50 - 38.10	Pass
STW-1254	08/01/11	Cs-134	18.00 ± 0.60	19.10	13.40 - 24.80	Pass
STW-1254	08/01/11	Cs-137	0.06 ± 0.13	0.00	-	Pass
STW-1254	08/01/11	H-3	1039.90 ± 17.90	1014.00	710.00 - 1318.00	Pass
STW-1254	08/01/11	K-40	161.40 ± 4.10	156.00	109.00 - 203.00	Pass
STW-1254	08/01/11	Mn-54	25.70 ± 0.50	25.00	17.50 - 32.50	Pass
STW-1254	08/01/11	Ni-63	0.60 ± 2.00	0.00	-	Pass
STW-1254	08/01/11	Pu-238	0.04 ± 0.02	0.02	0.00 - 1.00	Pass
STW-1254	08/01/11	Pu-239/40	2.27 ± 0.14	2.40	1.68 - 3.12	Pass
STW-1254	08/01/11	Sr-90	15.60 ± 1.80	14.20	9.90 - 18.50	Pass
STW-1254	08/01/11	Tc-99	-0.30 ± 0.50	0.00	-	Pass
STW-1254	08/01/11	U-233/4	2.78 ± 0.20	2.78	1.95 - 3.61	Pass
STW-1254	08/01/11	U-238	2.86 ± 0.21	2.89	2.02 - 3.76	Pass
STW-1254	08/01/11	Zn-65	30.20 ± 0.90	28.50	20.00 - 37.10	Pass
STW-1255	08/01/11	Gr. Alpha	0.72 ± 0.12	0.87	0.26 - 1.47	Pass
STW-1255	08/01/11	Gr. Beta	4.71 ± 0.15	4.81	2.41 - 7.22	Pass

^a Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the Department of Energy's Mixed Analyte Performance Evaluation Program, Idaho Operations office, Idaho Falls, Idaho

^b Results are reported in units of Bq/kg (soil), Bq/L (water) or Bq/total sample (filters, vegetation).

^c Laboratory codes as follows: STW (water), STAP (air filter), STSO (soil), STVE (vegetation).

^d MAPEP results are presented as the known values and expected laboratory precision (1 sigma, 1 determination) and control limits as defined by the MAPEP. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". MAPEP does not provide control limits.

^e Result of a repeat analysis was still unacceptable. ERA crosschecks for Am-241 were acceptable, but biased low. Matrix spikes were prepared, (5.17 and 51.7 pCi/L), to verify method; results were acceptable, 4.4 and 47.5 pCi/L. Am-241 has been added to the internal spike and blank program for 2012.

^f An error in percent recovery was found, result of recalculation, 427.3 ± 18.8 Bq/kg dry.

^g No errors found in calculation or procedure, results of reanalysis; 1.73 Bq/filter.

^h The analyses were repeated through a strontium column; mean result of triplicate analyses, 304.2 Bq/kg.

ⁱ The lab does not currently analyze soil for Tc-99, but is evaluating the procedure. After consultation with Eichrom, the analysis was repeated using a matrix spike correction. Mean result of triplicate reanalyses; 183.3 Bq/kg.

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)^a.

Lab Code ^b	Date	Analysis	Concentration (pCi/L) ^b			
			Laboratory Result ^c	ERA Result ^d	Control Limits	Acceptance
STAP-1230	03/21/11	Am-241	46.0 ± 1.8	62.5	36.6 - 85.7	Pass
STAP-1230	03/21/11	Co-60	401.2 ± 12.1	390.0	302.0 - 487.0	Pass
STAP-1230	03/21/11	Cs-134	268.2 ± 24.8	279.0	182.0 - 345.0	Pass
STAP-1230	03/21/11	Cs-137	345.3 ± 24.9	312.0	234.0 - 410.0	Pass
STAP-1230	03/21/11	Mn-54	< 1.9	0.0	-	Pass
STAP-1230	03/21/11	Pu-238	76.1 ± 3.2	69.0	47.4 - 90.7	Pass
STAP-1230	03/21/11	Pu-239/40	70.50 ± 3.10	65.5	47.5 - 85	Pass
STAP-1230	03/21/11	Sr-90	208.40 ± 18.70	185.0	81.4 - 288	Pass
STAP-1230	03/21/11	U-233/4	56.10 ± 2.10	61.5	38.7 - 91	Pass
STAP-1230	03/21/11	U-238	58.90 ± 2.60	61.0	39.0 - 87	Pass
STAP-1230	03/21/11	Uranium	118.50 ± 5.52	125.0	63.9 - 199	Pass
STAP-1230	03/21/11	Zn-65	312.60 ± 23.40	279.0	193.0 - 386	Pass
STAP-1231	03/21/11	Gr. Alpha	88.40 ± 3.70	74.3	38.5 - 112	Pass
STAP-1231	03/21/11	Gr. Beta	85.10 ± 2.80	69.5	42.8 - 102	Pass
STSO-1232	03/21/11	Ac-228	1327.8 ± 97.5	1490.0	958.0 - 2100.0	Pass
STSO-1232	03/21/11	Am-241	662.8 ± 88.1	914.0	546.0 - 1170.0	Pass
STSO-1232	03/21/11	Bi-212	1396.2 ± 185.3	1400.0	368.0 - 2090.0	Pass
STSO-1232	03/21/11	Bi-214	841.1 ± 33.2	725.0	445.0 - 1040.0	Pass
STSO-1232	03/21/11	Co-60	2423.7 ± 27.1	2220.0	1620.0 - 2980.0	Pass
STSO-1232	03/21/11	Cs-134	2481.3 ± 42.2	2450.0	1580.0 - 2950.0	Pass
STSO-1232	03/21/11	Cs-137	2108.2 ± 30.2	1920.0	1470.0 - 2490.0	Pass
STSO-1232	03/21/11	K-40	11497.3 ± 276.6	11500.0	8320.0 - 15600.0	Pass
STSO-1232	03/21/11	Mn-54	< 17.4	0.0	-	Pass
STSO-1232	03/21/11	Pb-212	994.7 ± 30.0	1440.0	931.0 - 2030.0	Pass
STSO-1232	03/21/11	Pb-214	918.3 ± 42.6	805.0	482.0 - 1200.0	Pass
STSO-1232	03/21/11	Pu-238	1593.6 ± 156.7	1420.0	813.0 - 2000.0	Pass
STSO-1232	03/21/11	Pu-239/40	1428.9 ± 143.4	1400.0	956.0 - 1860.0	Pass
STSO-1232	03/21/11	Sr-90	8638.0 ± 442.8	7590.0	2740.0 - 12400.0	Pass
STSO-1232	03/21/11	Th-234	1350.1 ± 180.0	962.0	305.0 - 1830.0	Pass
STSO-1232	03/21/11	U-233/4	748.0 ± 94.4	972.0	616.0 - 1210.0	Pass
STSO-1232	03/21/11	U-238	909.0 ± 104.9	962.0	588.0 - 1220.0	Pass
STSO-1232	03/21/11	Uranium	1690.8 ± 104.9	1980.0	1130.0 - 2670.0	Pass
STSO-1232	03/21/11	Zn-65	2356.2 ± 57.1	1990.0	1580.0 - 2670.0	Pass

TABLE A-7. Interlaboratory Comparison Crosscheck program, Environmental Resource Associates (ERA)^a.

Lab Code ^b	Date	Analysis	Concentration (pCi/L) ^b		Control Limits	Acceptance
			Laboratory Result ^c	ERA Result ^d		
STVE-1233	03/21/11	Am-241	2377.5 ± 83.2	3200.0	1820.0 - 4400.0	Pass
STVE-1233	03/21/11	Cm-244	602.9 ± 38.4	812.0	400.0 - 1260.0	Pass
STVE-1233	03/21/11	Co-60	810.2 ± 32.4	733.0	496.0 - 1050.0	Pass
STVE-1233	03/21/11	Cs-134	849.4 ± 54.5	770.0	441.0 - 1070.0	Pass
STVE-1233	03/21/11	Cs-137	889.9 ± 36.3	829.0	608.0 - 1150.0	Pass
STVE-1233	03/21/11	K-40	28146.70 ± 698.80	25800.0	18500.0 - 36500	Pass
STVE-1233	03/21/11	Mn-54	< 19.3	0.0	-	Pass
STVE-1233	03/21/11	Pu-238	3068.10 ± 170.70	2990.0	1610.0 - 4380	Pass
STVE-1233	03/21/11	Pu-239/40	3180.00 ± 88.90	3100.0	1920.0 - 4230	Pass
STVE-1233	03/21/11	Sr-90	8549.20 ± 675.00	7890.0	4410.0 - 10500	Pass
STVE-1233	03/21/11	U-233/4	2418.60 ± 142.50	2610.0	1790.0 - 3460	Pass
STVE-1233	03/21/11	U-238	2417.00 ± 142.50	2590.0	1820.0 - 3270	Pass
STVE-1233	03/21/11	Uranium	4929.80 ± 142.50	5320.0	3660.0 - 6860	Pass
STVE-1233	03/21/11	Zn-65	962.40 ± 62.50	799.0	577.0 - 1090	Pass
STW-1234	03/21/11	Am-241	100.0 ± 6.4	135.0	92.5 - 182.0	Pass
STW-1234	03/21/11	Co-60	401.6 ± 7.2	411.0	358.0 - 486.0	Pass
STW-1234	03/21/11	Cs-134	222.7 ± 12.3	231.0	171.0 - 265.0	Pass
STW-1234	03/21/11	Cs-137	410.3 ± 9.5	417.0	354.0 - 500.0	Pass
STW-1234	03/21/11	Mn-54	< 3.0	0.0	-	Pass
STW-1234	03/21/11	Pu-238	130.9 ± 5.5	131.0	99.1 - 162.0	Pass
STW-1234	03/21/11	Pu-239/40	113.0 ± 5.0	119.0	92.1 - 147.0	Pass
STW-1234	03/21/11	Sr-90	739.6 ± 13.0	773.0	491.0 - 1030.0	Pass
STW-1234	03/21/11	U-233/4	83.4 ± 3.8	94.3	71.1 - 122.0	Pass
STW-1234	03/21/11	U-238	85.5 ± 3.9	93.5	71.4 - 116.0	Pass
STW-1234	03/21/11	Uranium	172.0 ± 8.5	192.0	138.0 - 256.0	Pass
STW-1234	03/21/11	Zn-65	114.5 ± 10.8	111.0	94.1 - 138.0	Pass
STW-1235	03/21/11	Gr. Alpha	97.6 ± 2.9	112.0	49.7 - 166.0	Pass
STW-1235	03/21/11	Gr. Beta	99.6 ± 2.0	99.8	58.4 - 146.0	Pass
STW-1236	03/21/11	H-3	16307.0 ± 377.0	15200.0	9900.0 - 22500.0	Pass

^a Results obtained by Environmental, Inc., Midwest Laboratory as a participant in the crosscheck program for proficiency testing administered by Environmental Resources Associates, serving as a replacement for studies conducted previously by the Environmental Measurements Laboratory Quality Assessment Program (EML).

^b Laboratory codes as follows: STW (water), STAP (air filter), STSO (soil), STVE (vegetation). Results are reported in units of pCi/L, except for air filters (pCi/Filter), vegetation and soil (pCi/kg).

^c Unless otherwise indicated, the laboratory result is given as the mean ± standard deviation for three determinations.

^d Results are presented as the known values, expected laboratory precision (1 sigma, 1 determination) and control limits as provided by ERA. A known value of "zero" indicates an analysis was included in the testing series as a "false positive". Control limits are not provided.

APPENDIX B

DATA REPORTING CONVENTIONS

Data Reporting Conventions

1.0. All activities, except gross alpha and gross beta, are decay corrected to collection time or the end of the collection period.

2.0. Single Measurements

Each single measurement is reported as follows: $x \pm s$
where: x = value of the measurement;
 s = 2σ counting uncertainty (corresponding to the 95% confidence level).

In cases where the activity is less than the lower limit of detection L , it is reported as: $< L$,
where L = the lower limit of detection based on 4.66σ uncertainty for a background sample.

3.0. Duplicate analyses

If duplicate analyses are reported, the convention is as follows. :

- 3.1. Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$
Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$
- 3.2. Individual results: $< L_1, < L_2$ Reported result: $< L$, where L = lower of L_1 and L_2
- 3.3. Individual results: $x \pm s, < L$ Reported result: $x \pm s$ if $x \geq L$; $< L$ otherwise.

4.0. Computation of Averages and Standard Deviations

4.1 Averages and standard deviations listed in the tables are computed from all of the individual measurements over the period averaged; for example, an annual standard deviation would not be the average of quarterly standard deviations. The average \bar{x} and standard deviation "s" of a set of n numbers x_1, x_2, \dots, x_n are defined as follows:

$$\bar{x} = \frac{1}{n} \sum x \qquad s = \sqrt{\frac{\sum (x - \bar{x})^2}{n-1}}$$

- 4.2 Values below the highest lower limit of detection are not included in the average.
- 4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.
- 4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.
- 4.5 In rounding off, the following rules are followed:
- 4.5.1. If the number following those to be retained is less than 5, the number is dropped, and the retained numbers are kept unchanged. As an example, 11.443 is rounded off to 11.44.
- 4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

Maximum Permissible Concentrations
of Radioactivity in Air and Water
Above Background in Unrestricted Areas

Table C-1. Maximum permissible concentrations of radioactivity in air and water above natural background in unrestricted areas^a.

Air (pCi/m ³)		Water (pCi/L)	
Gross alpha	1×10^{-3}	Strontium-89	8,000
Gross beta	1	Strontium-90	500
Iodine-131 ^b	2.8×10^{-1}	Cesium-137	1,000
		Barium-140	8,000
		Iodine-131	1,000
		Potassium-40 ^c	4,000
		Gross alpha	2
		Gross beta	10
		Tritium	1×10^6

^a Taken from Table 2 of Appendix B to Code of Federal Regulations Title 10, Part 20, and appropriate footnotes. Concentrations may be averaged over a period not greater than one year.

^b Value adjusted by a factor of 700 to reduce the dose resulting from the air-grass-cow-milk-child pathway.

^c A natural radionuclide.

APPENDIX D

SUMMARY OF THE LAND USE CENSUS

Appendix D

Summary of the Land Use Census

The Duane Arnold Energy Land Use Census for 2011 was completed during September and October of 2011. All milk animals, residences and gardens greater than 500 square feet were identified within three miles for each of the 16 meteorological sectors. If none were identified within the three mile range, additional surveys were performed out to a distance of five miles.

The Cedar River was surveyed by boat on September 9th, 2011 for water use downstream of the DAEC to Cedar Rapids. This survey identified no new usages of river water from previous surveys. Recreational fishing is the only identified food pathway use of Cedar River water between the DAEC and the City of Cedar Rapids eight miles down-river.

There were 114 vegetable gardens identified during the performance of the 2011 Census. This number is more than the number of gardens found in the 2010 survey by 39. The distance to the nearest vegetation receptor changed in one sector. In the sector towards the east-north-east, a new garden was identified at 2470 meters. This compares to a distance of 2790 meters in that sector in 2010. There were no other changes to the locations of the nearest vegetable receptors.

There were five new cattle herds observed and in one location, cattle were discontinued. Cattle were replaced by goats at another location. There was one other new goat herd detected. There were no observed changes in milk cow locations.

There were 2 instances where there was a change in the location of the nearest resident in each sector.

- In the sector towards the south, a house heavily damaged by the 2008 flood was demolished. The distance to the nearest resident in the sector changed from 2200 meters to 3800 meters.
- In the sector towards the south-south-east, a house heavily damaged by the 2008 flood was demolished. The distance to the nearest resident changed from 2380 meters to 3020 meters.

Since the last performance of the land use census, a new drinking water well has been identified within a two mile radius of the site. The well is located 3,200 meters

towards the South East. The well is on the opposite side of the Cedar River and not hydrologically relevant to our site. There were no other new land use or water use activities that could affect the Site Hydrogeological Conceptual Model.

In accordance with the DAEC's Environmental Sampling Procedure ESP 4.4, "Land Use Census", no changes in land use were identified that would adversely affect the safe operation of the DAEC, or that would warrant an update of the DAEC Updated Final Safety Analysis Report (UFSAR). Examples of land use that would warrant an UFSAR update include new hazards near the DAEC such as new gas pipelines or new installations utilizing toxic gases.

NextEra Energy Resources, Duane Arnold has committed to compliance with NEI 07-07, "Nuclear Energy Institute's Industry Ground Water Protection Initiative". Per NEI 07-07, the following information is presented:

- Per Objectives 2.2 and 2.4, there were no on-site leaks or spills that warranted notification of state or local officials or other local stakeholders.
- No radioactive reactor by-product material was identified in samples collected by the DAEC's Radiological Environmental Monitoring Program (REMP) or the site Ground Water Protection Program (GWPP) above the threshold concentration levels for reporting.

Errata to the 2009 Report

The opening paragraph of Appendix D of the 2009 Annual Radiological Environmental Operating Report was incorrect, referencing 2008 rather than 2009. The opening paragraph should have been:

The Duane Arnold Energy Land Use Census for 2009 was completed during September and October of 2009. All milk animals, residences and gardens greater than 500 square feet were identified within three miles for each of the 16 meteorological sectors. If none were identified within the three mile range, additional surveys were performed out to a distance of five miles.

APPENDIX E

ANNUAL RADIATION DOSE ASSESSMENT

Appendix E

Annual Radiation Dose Assessment

The annual offsite radiation dose to a member of the public was determined by assessment of environmental dosimetry results and by calculations based on monitored effluent releases.

Section A. Dose Contribution from Direct Radiation

Direct radiation dose from the operation of the DAEC was reported by TLDs placed at locations in the surrounding environment as described in the Offsite Dose Assessment Manual (ODAM).

1. Pre-operational and 2011 TLD results were evaluated with a paired difference statistical test. The evaluation concluded that there were no significant differences in the TLD populations for the 0.5 mile and 1 mile TLD populations.
2. As stated in Part 1 of this report, no plant effect was indicated by the TLDs when dose results were compared to the estimated average natural background for Middle America.

Section B. Estimated Offsite Dose from Effluent Releases

1. The contribution of dose to a member of the public most likely to be exposed from liquid and gaseous effluent releases was calculated using the Meteorological Information and Dose Assessment System (MIDAS) computer program in accordance with the ODA. The calculation methods follow those prescribed by Regulatory Guide 1.109, "Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I".
2. Following calculation of offsite doses, the appropriateness of REMP sampling station types and locations was reviewed. The current sampling scheme was determined to be more than adequate for the identified receptors.

Results of the MIDAS dose calculations are displayed below.

1. There were no releases of radioactive material to liquid effluents in 2011.
2. The maximum dose to air at the site boundary from noble gases released was 0.000225 mrad from gamma radiation at 481 meters towards the South-South-East.
3. The maximum dose to air at the site boundary from noble gases released was 0.000041 mrad beta radiation at 2416 meters towards the East-North-East.
4. The whole body dose equivalent to the hypothetical maximally exposed individual from noble gases was 0.000260 mrem, at 805 meters towards the West.
5. The skin dose equivalent to the hypothetical maximally exposed individual from noble gases was 0.000270 mrem, at 805 meters towards the West.
6. The hypothetical maximally exposed organ due to airborne iodines and particulates with half-lives greater than eight days was the thyroid of a child at 805 meters to the West, with an estimated dose equivalent of 0.00736 mrem.
7. The hypothetical maximally exposed organ due to airborne carbon-14 was the bone of a child located 2.9 miles to the West-North-West of the site. The dose is 0.11 mrem.

Carbon14

The estimate of gaseous carbon-14 (C-14) released from the Duane Arnold Energy Center was derived using guidance from the EPRI document, "Estimation of Carbon-14 in Nuclear Power Plant Gaseous Effluents", Report 1021106, issued December 2010. The total amount of C-14 released in 2011 was estimated to be 9.50 Curies.

Using the dose calculation methodology from Regulatory Guide 1.109, the resultant maximally exposed receptor organ from C-14 is the bone of a child, located 2.9 miles to the West-North-West of the site. The dose is 1.01E-01 mrem. (0.11 mrem).

Conclusion:

No measurable dose due to the operation of the DAEC was detected by environmental TLDs in 2011. The calculated doses are below the regulatory limits stated in Appendix I to 10 CFR 50 and in 40 CFR 190.

Estimated Maximum Offsite Individual Doses for 2011

Type	Age Group	Distance (meters)	Direction	Dose or Dose Equivalent (mrem)	Annual 10 CFR 50, Appendix I "Limit"
Direct Radiation (as measured by TLDs)				None	*
Liquid Releases					
Whole Body Dose	Child		S	None	3 mrem
Organ Dose	Child - Liver		S	None	10 mrem
Noble Gas					
Gamma Air Dose		481	SSE	0.000225 mrad	10 mrad
Beta Air Dose		2416	ENE	0.000041 mrad	20 mrad
Whole Body	All	805	W	0.000260 mrem	5 mrem
Skin	Child	805	W	0.000270 mrem	15 mrem
Particulates & Iodines					
Organ Dose	Child - Thyroid	805	W	0.00736 mrem	15 mrem
Carbon 14					
Organ Dose	Child - Bone	4700	WNW	0.11 mrem	15 mrem

* There is no Appendix I limit for direct radiation. It is listed here to demonstrate compliance with 40 CFR 190 limits of 25 mrem whole body and 75 mrem thyroid.




DUANE ARNOLD ENERGY CENTER
CEDAR RAPIDS, IOWA
Docket No. 50-331

RADIOLOGICAL ENVIRONMENTAL
MONITORING PROGRAM (REMP)

ANNUAL REPORT - PART II
DATA TABULATIONS AND ANALYSES


January 1 to December 31, 2011


Prepared by

ATI ENVIRONMENTAL, Inc.
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Project No. 8001

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A-6	Airborne Iodine-131 detected in charcoal cartridges	A-6

1.0 INTRODUCTION

The following constitutes a supplement to the Annual Report for the Radiological Environmental Monitoring Program conducted at the Duane Arnold Energy Center, Palo, Iowa in 2011. Results of completed analyses are presented in the attached tables.

For information regarding sampling locations, type and frequency of collection, and sample codes, please refer to Part I, Tables 5.3 - 5.5 and Figures 5.1 and 5.2.

All concentrations, except gross beta and airborne iodine, are decay corrected to the time of collection. Airborne I-131 is decayed to the midpoint of the collection period.

The required values for lower limits of detection (LLD) for gamma emitting isotopes are established through the Offsite Dose Assessment Manual (ODAM). Naturally occurring radioisotopes, such as Be-7, K-40 and Ra daughters, are frequently detected, but may not be listed for every sample medium.

2.0 PROGRAM DEVIATIONS

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
AP/AI	Gross Beta / Gamma	D-7	1-13-11	Low volume, sampler run-time 80 hours.
AP/AI	Gross Beta / Gamma	D-6, 13	5-12-11	Reduced run-times due to electrical storms.
AP/AI	Gross Beta / Gamma	D-6	6-9-11	Reduced run-time due to electrical storms.
AP/AI	Gross Beta / Gamma	D-6	6-16-11	Power out due to electrical storms.
AP/AI	Gross Beta / Gamma	D-40	7-7-11	Out of service, voltage supply problems.
AP/AI	Gross Beta / Gamma	D-3	8-4-11	Reduced run-time due to construction in area.
SW	H-3 / Gamma	D-99	1-18-11	No sample; water frozen.
TLD	Ambient Gamma	D-37	2nd Qtr. 2011	TLD missing in the field.
TLD	Ambient Gamma	D-48	3rd Qtr. 2011	Not collected until 4th Qtr., 2011.
WW	H3	D-111, D-113 D-115	7-30-11	MW-01A, MW-03A, MW-05A Samples Lost in Transit
WW	H3	D-113, D-115	8-15-11	MW-03A, MW-03B, MW-05A, MW-05B Samples Lost in Transit

In no instance did missed analyses affect minimum sampling requirements as specified in the ODAM.

3.0 DATA TABLES

DUANE ARNOLD

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-3 (Hiawatha)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-06-11	273	0.060 ± 0.005	07-07-11	268 ^c	0.032 ± 0.004
01-13-11	238	0.034 ± 0.004	07-14-11	269	0.031 ± 0.004
01-20-11	247	0.050 ± 0.005	07-21-11	265	0.040 ± 0.004
01-27-11	215	0.064 ± 0.006	07-28-11	262	0.028 ± 0.004
02-03-11	293	0.028 ± 0.004			
			08-04-11	164	0.056 ± 0.006 ^d
02-10-11	292	0.035 ± 0.004	08-12-11	263	0.033 ± 0.004
02-17-11	291	0.031 ± 0.004	08-18-11	237	0.029 ± 0.004
02-24-11	290	0.020 ± 0.003	08-25-11	285	0.029 ± 0.003
03-03-11	292	0.029 ± 0.004	09-01-11	295	0.027 ± 0.003
03-10-11	291	0.020 ± 0.003	09-08-11	286	0.026 ± 0.003
03-17-11	290	0.021 ± 0.003	09-16-11	325	0.025 ± 0.003
03-24-11	289	0.028 ± 0.004 ^b	09-22-11	243	0.023 ± 0.004
03-31-11	293	0.055 ± 0.005 ^b	09-29-11	285	0.019 ± 0.003
<u>1st Quarter Mean ± s.d.</u>		<u>0.037 ± 0.015</u>	<u>3rd Quarter Mean ± s.d.</u>		<u>0.031 ± 0.009</u>
04-07-11	288	0.028 ± 0.004 ^b	10-06-11	283	0.027 ± 0.004
04-14-11	292	0.022 ± 0.003	10-13-11	286	0.036 ± 0.004
04-21-11	287	0.020 ± 0.003	10-20-11	284	0.015 ± 0.003
04-28-11	291	0.013 ± 0.003	10-27-11	288	0.032 ± 0.004
			11-03-11	292	0.027 ± 0.003
05-05-11	267	0.016 ± 0.003			
05-12-11	262	0.020 ± 0.004	11-10-11	293	0.030 ± 0.004
05-18-11	229	0.013 ± 0.003	11-17-11	290	0.028 ± 0.004
05-26-11	307	0.018 ± 0.003	11-23-11	250	0.024 ± 0.004
06-02-11	265	0.019 ± 0.003	12-01-11	329	0.034 ± 0.003
06-09-11	267	0.033 ± 0.004	12-08-11	293	0.039 ± 0.004
06-16-11	262	0.014 ± 0.003	12-15-11	295	0.033 ± 0.004
06-23-11	263	0.017 ± 0.003	12-21-11	246	0.047 ± 0.005
06-30-11	265	0.019 ± 0.003	12-29-11	333	0.026 ± 0.003
<u>2nd Quarter Mean ± s.d.</u>		<u>0.019 ± 0.006</u>	<u>4th Quarter Mean ± s.d.</u>		<u>0.031 ± 0.008</u>
					<u>Cumulative Average</u>
					0.029
					<u>Previous Annual Average</u>
					0.029

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Air iodine activity detected; noted in Appendix A.

^c Corrected volume.

^d Low volume due to construction at air sampler site.

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Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-5 (Palo)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		0.010
01-06-11	326	0.050 ± 0.004	07-07-11	286	0.033 ± 0.004
01-13-11	275	0.030 ± 0.004	07-14-11	288	0.028 ± 0.003
01-20-11	278	0.047 ± 0.004	07-21-11	287	0.034 ± 0.004
01-27-11	277	0.046 ± 0.004	07-28-11	282	0.028 ± 0.004
02-03-11	282	0.030 ± 0.004			
			08-04-11	283	0.041 ± 0.004
02-10-11	280	0.032 ± 0.004	08-12-11	336	0.025 ± 0.003
02-17-11	277	0.030 ± 0.004	08-18-11	243	0.036 ± 0.004
02-24-11	277	0.018 ± 0.003	08-25-11	295	0.030 ± 0.003
03-03-11	295	0.029 ± 0.004	09-01-11	284	0.014 ± 0.003
03-10-11	294	0.025 ± 0.003	09-08-11	292	0.025 ± 0.003
03-17-11	294	0.022 ± 0.003	09-16-11	330	0.027 ± 0.003
03-24-11	290	0.040 ± 0.004 ^b	09-22-11	250	0.024 ± 0.004
03-31-11	295	0.056 ± 0.005 ^b	09-29-11	290	0.021 ± 0.003
1st Quarter Mean ± s.d.		0.035 ± 0.011	3rd Quarter Mean ± s.d.		0.028 ± 0.007
04-07-11	294	0.032 ± 0.004 ^b	10-06-11	290	0.027 ± 0.004
04-14-11	293	0.025 ± 0.003	10-13-11	292	0.041 ± 0.004
04-21-11	292	0.019 ± 0.003	10-20-11	290	0.017 ± 0.003
04-28-11	266	0.011 ± 0.003	10-27-11	294	0.036 ± 0.004
			11-03-11	293	0.028 ± 0.004
05-05-11	233	0.020 ± 0.004			
05-12-11	294	0.020 ± 0.003 ^c	11-10-11	287	< 0.003 ^d
05-18-11	245	0.014 ± 0.003	11-17-11	281	0.042 ± 0.004
05-26-11	330	0.016 ± 0.003	11-23-11	238	0.028 ± 0.004
06-02-11	284	0.021 ± 0.003	12-01-11	315	0.038 ± 0.004
06-09-11	280	0.031 ± 0.004	12-08-11	288	0.037 ± 0.004
06-16-11	284	0.013 ± 0.003	12-15-11	279	0.053 ± 0.005
06-23-11	284	0.019 ± 0.003	12-21-11	240	0.043 ± 0.005
06-30-11	284	0.017 ± 0.003	12-29-11	324	0.030 ± 0.003
2nd Quarter Mean ± s.d.		0.020 ± 0.006	4th Quarter Mean ± s.d.		0.035 ± 0.010
			Cumulative Average		0.030
			Previous Annual Average		0.030

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Air iodine activity detected; noted in Appendix A.

^c Run time estimated; timer bad.

^d Filter light.

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Table 3. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.
 Location: D-6 (Center Point)
 Units: pCi/m³
 Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-06-11	342	0.050 ± 0.004	07-07-11	293	0.030 ± 0.004
01-13-11	290	0.038 ± 0.004	07-14-11	288	0.031 ± 0.004
01-20-11	293	0.054 ± 0.005	07-21-11	298	0.042 ± 0.004
01-27-11	293	0.056 ± 0.005	07-28-11	279	0.028 ± 0.004
02-03-11	299	0.036 ± 0.004	08-04-11	293	0.040 ± 0.004
02-10-11	294	0.039 ± 0.004	08-12-11	341	0.024 ± 0.003
02-17-11	294	0.033 ± 0.004	08-18-11	244	0.030 ± 0.004
02-24-11	299	0.019 ± 0.003	08-25-11	286	0.030 ± 0.004
03-03-11	300	0.027 ± 0.003	09-01-11	291	0.008 ± 0.002
03-10-11	300	0.018 ± 0.003	09-08-11	283	0.028 ± 0.004
03-17-11	300	0.024 ± 0.003	09-16-11	310	0.024 ± 0.003
03-24-11	248	0.026 ± 0.004 ^b	09-22-11	233	0.026 ± 0.004
03-31-11	293	0.053 ± 0.004 ^b	09-29-11	260	0.014 ± 0.003
1st Quarter Mean ± s.d.		0.036 ± 0.013	3rd Quarter Mean ± s.d.		0.027 ± 0.009
04-07-11	289	0.027 ± 0.004 ^b	10-06-11	277	0.023 ± 0.004
04-14-11	291 ^c	0.021 ± 0.003	10-13-11	279	0.038 ± 0.004
04-21-11	291 ^c	0.022 ± 0.003	10-20-11	288	0.018 ± 0.003
04-28-11	292 ^c	0.012 ± 0.003	10-27-11	288	0.032 ± 0.004
05-05-11	292 ^c	0.011 ± 0.003	11-03-11	283	0.027 ± 0.004
05-12-11	228 ^c	0.024 ± 0.004 ^d	11-10-11	284	0.031 ± 0.004
05-18-11	229	0.015 ± 0.004	11-17-11	281	0.029 ± 0.004
05-26-11	338	0.014 ± 0.003	11-23-11	243	0.024 ± 0.004
06-02-11	297	0.021 ± 0.003	12-01-11	320	0.026 ± 0.003
06-09-11	268	0.034 ± 0.004 ^d	12-08-11	285	0.041 ± 0.004
06-16-11		ND ^e	12-15-11	285	0.044 ± 0.004
06-23-11	257 ^c	0.018 ± 0.003 ^f	12-21-11	240	0.049 ± 0.005
06-30-11	301	0.018 ± 0.003	12-29-11	324	0.024 ± 0.003
2nd Quarter Mean ± s.d.		0.020 ± 0.007	4th Quarter Mean ± s.d.		0.031 ± 0.009
Cumulative Average					0.029
Previous Annual Average					0.030

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Air iodine activity detected; noted in Appendix A.

^c Corrected volume.

^d Low volume due to power outage from storms.

^e ND = No data; see Table 2.0, Listing of Missed Samples.

^f Low volume due to recent power restoration.

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Table 4. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-7 (Shellsburg)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-06-11	207	0.067 ± 0.006	07-07-11	303	0.028 ± 0.004
01-13-11	133	0.065 ± 0.008 ^b	07-14-11	285	0.029 ± 0.004
01-20-11	257	0.052 ± 0.005	07-21-11	291	0.034 ± 0.004
01-27-11	296	0.050 ± 0.004	07-28-11	299	0.024 ± 0.003
02-03-11	298	0.032 ± 0.004			
			08-04-11	299	0.035 ± 0.004
02-10-11	297	0.034 ± 0.004	08-12-11	349	0.027 ± 0.003
02-17-11	296	0.031 ± 0.004	08-18-11	258	0.037 ± 0.004
02-24-11	295	0.021 ± 0.003	08-25-11	306	0.033 ± 0.004
03-03-11	297	0.033 ± 0.004	09-01-11	302	0.036 ± 0.004
03-10-11	297	0.025 ± 0.003	09-08-11	303	0.013 ± 0.003
03-17-11	291	0.029 ± 0.003	09-16-11	343	0.020 ± 0.003
03-24-11	294	0.042 ± 0.004 ^c	09-22-11	260	0.025 ± 0.004
03-31-11	297	0.057 ± 0.005 ^c	09-29-11	298	0.021 ± 0.003
<u>1st Quarter Mean ± s.d.</u>		<u>0.041 ± 0.016</u>	<u>3rd Quarter Mean ± s.d.</u>		<u>0.028 ± 0.007</u>
04-07-11	281	0.032 ± 0.004 ^c	10-06-11	302	0.035 ± 0.004
04-14-11	297	0.025 ± 0.003	10-13-11	304	0.037 ± 0.004
04-21-11	296	0.017 ± 0.003	10-20-11	301	0.020 ± 0.003
04-28-11	305	0.011 ± 0.003	10-27-11	305	0.036 ± 0.004
			11-03-11	301	0.026 ± 0.003
05-05-11	304	0.015 ± 0.003			
05-12-11	298	0.017 ± 0.003	11-10-11	300	0.030 ± 0.004
05-18-11	261	0.011 ± 0.003	11-17-11	278	0.037 ± 0.004
05-26-11	318	0.011 ± 0.003	11-23-11	258	0.022 ± 0.004
06-02-11	301	0.017 ± 0.003	12-01-11	334	0.038 ± 0.004
06-09-11	303	0.028 ± 0.003	12-08-11	302	0.038 ± 0.004
06-16-11	301	0.012 ± 0.003	12-15-11	278	0.047 ± 0.004
06-23-11	301	0.017 ± 0.003	12-21-11	246	0.047 ± 0.005
06-30-11	303	0.013 ± 0.003	12-29-11	341	0.027 ± 0.003
<u>2nd Quarter Mean ± s.d.</u>		<u>0.017 ± 0.007</u>	<u>4th Quarter Mean ± s.d.</u>		<u>0.034 ± 0.008</u>
<u>Cumulative Average</u>					<u>0.030</u>
<u>Previous Annual Average</u>					<u>0.030</u>

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Low volume due to low run time of 79.5 hours.

^c Air iodine activity detected; noted in Appendix A.

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Table 5. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-11 (Toddville)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-06-11	322	0.051 ± 0.004	07-07-11	301	0.025 ± 0.003
01-13-11	273	0.031 ± 0.004	07-14-11	304	0.024 ± 0.003
01-20-11	276	0.054 ± 0.005	07-21-11	300	0.034 ± 0.004
01-27-11	276	0.058 ± 0.005	07-28-11	285	0.024 ± 0.003
02-03-11	279	0.031 ± 0.004			
			08-04-11	287	0.031 ± 0.004
02-10-11	277	0.040 ± 0.004	08-12-11	337	0.026 ± 0.003
02-17-11	277	0.034 ± 0.004	08-18-11	246	0.033 ± 0.004
02-24-11	287	0.018 ± 0.003	08-25-11	289	0.033 ± 0.004
03-03-11	288	0.032 ± 0.004	09-01-11	295	0.028 ± 0.003
03-10-11	289	0.023 ± 0.003	09-08-11	291	0.028 ± 0.004
03-17-11	287	0.027 ± 0.003	09-16-11	333	0.026 ± 0.003
03-24-11	288	0.037 ± 0.004 ^b	09-22-11	248	0.016 ± 0.003
03-31-11	290	0.052 ± 0.004 ^b	09-29-11	289	0.020 ± 0.003
<u>1st Quarter Mean ± s.d.</u>		<u>0.038 ± 0.013</u>	<u>3rd Quarter Mean ± s.d.</u>		<u>0.027 ± 0.005</u>
04-07-11	223	0.040 ± 0.005 ^b	10-06-11	291	0.026 ± 0.004
04-14-11	213	0.033 ± 0.004	10-13-11	292	0.040 ± 0.004
04-21-11	255	0.018 ± 0.003	10-20-11	290	0.017 ± 0.003
04-28-11	232	0.012 ± 0.003	10-27-11	294	0.037 ± 0.004
			11-03-11	292	0.030 ± 0.004
05-05-11	247	0.018 ± 0.003			
05-12-11	247	0.021 ± 0.004	11-10-11	275	0.034 ± 0.004
05-18-11	259	0.015 ± 0.003	11-17-11	273	0.037 ± 0.004
05-26-11	347	0.018 ± 0.003	11-23-11	236	0.026 ± 0.004
06-02-11	297	0.018 ± 0.003	12-01-11	310	0.031 ± 0.003
06-09-11	305	0.031 ± 0.004	12-08-11	276	0.025 ± 0.004
06-16-11	294	0.013 ± 0.003	12-15-11	276	0.037 ± 0.004
06-23-11	297	0.017 ± 0.003	12-21-11	232	0.050 ± 0.005
06-30-11	297	0.015 ± 0.003	12-29-11	314	0.023 ± 0.003
<u>2nd Quarter Mean ± s.d.</u>		<u>0.021 ± 0.009</u>	<u>4th Quarter Mean ± s.d.</u>		<u>0.032 ± 0.009</u>
			<u>Cumulative Average</u>		<u>0.029</u>
			<u>Previous Annual Average</u>		<u>0.025</u>

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Air iodine activity detected; noted in Appendix A.

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Table 6. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-13 (Alburnett)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-06-11	287	0.049 ± 0.004	07-07-11	286	0.031 ± 0.004
01-13-11	248	0.034 ± 0.004	07-14-11	285	0.034 ± 0.004
01-20-11	256	0.049 ± 0.005	07-21-11	286	0.040 ± 0.004
01-27-11	237	0.041 ± 0.005	07-28-11	278	0.025 ± 0.003
02-03-11	252	0.030 ± 0.004			
			08-04-11	284	0.040 ± 0.004
02-10-11	262	0.034 ± 0.004	08-12-11	328	0.026 ± 0.003
02-17-11	262	0.036 ± 0.004	08-18-11	246	0.028 ± 0.004
02-24-11	290	0.020 ± 0.003	08-25-11	286	0.027 ± 0.003
03-03-11	291	0.035 ± 0.004	09-01-11	292	0.024 ± 0.003
03-10-11	291	0.026 ± 0.003	09-08-11	289	0.025 ± 0.003
03-17-11	291	0.027 ± 0.003	09-16-11	329	0.022 ± 0.003
03-24-11	289	0.037 ± 0.004 ^b	09-22-11	245	0.013 ± 0.003
03-31-11	293	0.049 ± 0.004 ^b	09-29-11	287	0.021 ± 0.003
1st Quarter Mean ± s.d.		0.036 ± 0.009	3rd Quarter Mean ± s.d.		0.027 ± 0.007
04-07-11	289	0.035 ± 0.004 ^b	10-06-11	288	0.026 ± 0.004
04-14-11	286	0.023 ± 0.003	10-13-11	289	0.040 ± 0.004
04-21-11	293	0.022 ± 0.003	10-20-11	286	0.018 ± 0.003
04-28-11	293	0.011 ± 0.003	10-27-11	291	0.031 ± 0.004
			11-03-11	287	0.027 ± 0.004
05-05-11	292	0.017 ± 0.003			
05-12-11	194	0.035 ± 0.005 ^c	11-10-11	288	0.034 ± 0.004
05-18-11	250	0.017 ± 0.003	11-17-11	286	0.036 ± 0.004
05-26-11	330	0.017 ± 0.003	11-23-11	245	0.021 ± 0.004
06-02-11	285	0.021 ± 0.003	12-01-11	336	0.034 ± 0.003
06-09-11	285	0.025 ± 0.003	12-08-11	299	0.040 ± 0.004
06-16-11	284	0.015 ± 0.003	12-15-11	300	0.041 ± 0.004
06-23-11	284	0.021 ± 0.003	12-21-11	252	0.049 ± 0.005
06-30-11	286	0.016 ± 0.003	12-29-11	341	0.029 ± 0.003
2nd Quarter Mean ± s.d.		0.021 ± 0.007	4th Quarter Mean ± s.d.		0.033 ± 0.009
			Cumulative Average		0.029
			Previous Annual Average		0.028

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Air iodine activity detected; noted in Appendix A.

^c Low volume due to power outage from storms.

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Table 7. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-15 (On-site, north)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-06-11	319	0.050 ± 0.004	07-07-11	274	0.028 ± 0.004
01-13-11	272	0.030 ± 0.004	07-14-11	277	0.030 ± 0.004
01-20-11	273	0.049 ± 0.005	07-21-11	275	0.040 ± 0.004
01-27-11	273	0.049 ± 0.005	07-28-11	271	0.025 ± 0.003
02-03-11	276	0.036 ± 0.004			
			08-04-11	271	0.036 ± 0.004
02-10-11	274	0.040 ± 0.004	08-12-11	316	0.024 ± 0.003
02-17-11	272	0.030 ± 0.004	08-18-11	233	0.032 ± 0.004
02-24-11	275	0.024 ± 0.003	08-25-11	292	0.025 ± 0.003
03-03-11	297	0.030 ± 0.004	09-01-11	288	0.026 ± 0.003
03-10-11	297	0.022 ± 0.003	09-08-11	289	0.029 ± 0.004
03-17-11	297	0.030 ± 0.003	09-16-11	327	0.023 ± 0.003
03-24-11	294	0.033 ± 0.004 ^b	09-22-11	246	0.024 ± 0.004
03-31-11	297	0.054 ± 0.004 ^b	09-29-11	289	0.018 ± 0.003
1st Quarter Mean ± s.d.		0.037 ± 0.011	3rd Quarter Mean ± s.d.		0.028 ± 0.006
04-07-11	297	0.030 ± 0.004 ^b	10-06-11	288	0.021 ± 0.003
04-14-11	297	0.026 ± 0.003	10-13-11	289	0.029 ± 0.004
04-21-11	296	0.021 ± 0.003	10-20-11	293	0.014 ± 0.003
04-28-11	299	0.012 ± 0.003	10-27-11	286	0.030 ± 0.004
			11-03-11	294	0.026 ± 0.003
05-05-11	298	0.014 ± 0.003			
05-12-11	292 ^c	0.018 ± 0.003	11-10-11	283	0.031 ± 0.004
05-18-11	256	0.013 ± 0.003	11-17-11	286	0.031 ± 0.004
05-26-11	341	0.016 ± 0.003	11-23-11	238	0.024 ± 0.004
06-02-11	275	0.020 ± 0.003	12-01-11	314	0.035 ± 0.004
06-09-11	275	0.031 ± 0.004	12-08-11	278	0.039 ± 0.004
06-16-11	272	0.016 ± 0.003	12-15-11	280	0.042 ± 0.004
06-23-11	273	0.018 ± 0.003	12-21-11	235	0.051 ± 0.005
06-30-11	274	0.014 ± 0.003	12-29-11	318	0.025 ± 0.003
2nd Quarter Mean ± s.d.		0.019 ± 0.006	4th Quarter Mean ± s.d.		0.031 ± 0.010
			Cumulative Average		0.028
			Previous Annual Average		0.028

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Air iodine activity detected; noted in Appendix A.

^c Corrected volume.

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Table 8. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-16 (On-site)

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-06-11	332	0.045 ± 0.004	07-07-11	303	0.052 ± 0.004
01-13-11	223	0.041 ± 0.005	07-14-11	304	0.029 ± 0.003
01-20-11	223	0.064 ± 0.006	07-21-11	296	0.038 ± 0.004
01-27-11	211	0.065 ± 0.006	07-28-11	293	0.026 ± 0.003
02-03-11	218	0.036 ± 0.005			
			08-04-11	302	0.037 ± 0.004
02-10-11	219	0.041 ± 0.005	08-12-11	335	0.025 ± 0.003
02-17-11	298	0.031 ± 0.004	08-18-11	248	0.032 ± 0.004
02-24-11	300	0.020 ± 0.003	08-25-11	295	0.026 ± 0.003
03-03-11	300	0.035 ± 0.004	09-01-11	291	0.029 ± 0.004
03-10-11	300	0.027 ± 0.003	09-08-11	291	0.025 ± 0.003
03-17-11	300	0.031 ± 0.003	09-16-11	331	0.026 ± 0.003
03-24-11	297	0.037 ± 0.004 ^b	09-22-11	249	0.021 ± 0.004
03-31-11	300	0.051 ± 0.004 ^b	09-29-11	285	0.021 ± 0.003
1st Quarter Mean ± s.d.		0.040 ± 0.013	3rd Quarter Mean ± s.d.		0.030 ± 0.008
04-07-11	300	0.031 ± 0.004 ^b	10-06-11	290	0.021 ± 0.004
04-14-11	300	0.024 ± 0.003	10-13-11	292	0.035 ± 0.004
04-21-11	298	0.019 ± 0.003	10-20-11	297	0.016 ± 0.003
04-28-11	302	0.011 ± 0.003	10-27-11	287	0.032 ± 0.004
			11-03-11	298	0.030 ± 0.004
05-06-11	341	0.018 ± 0.003			
05-12-11	256	0.022 ± 0.004	11-10-11	289	0.037 ± 0.004
05-18-11	260	0.014 ± 0.003	11-17-11	293	0.037 ± 0.004
05-26-11	348	0.014 ± 0.003	11-23-11	253	0.030 ± 0.004
06-02-11	304	0.021 ± 0.003	12-01-11	333	0.038 ± 0.004
06-09-11	303	0.033 ± 0.004	12-08-11	296	0.039 ± 0.004
06-16-11	300	0.014 ± 0.003	12-15-11	297	0.045 ± 0.004
06-23-11	301	0.017 ± 0.003	12-21-11	249	0.060 ± 0.005
06-30-11	303	0.018 ± 0.003	12-29-11	338	0.032 ± 0.003
2nd Quarter Mean ± s.d.		0.020 ± 0.006	4th Quarter Mean ± s.d.		0.035 ± 0.011
			Cumulative Average		0.031
			Previous Annual Average		0.028

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Air iodine activity detected; noted in Appendix A.

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Table 9. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131^a.

Location: D-40

Units: pCi/m³

Collection: Continuous, weekly exchange.

Date Collected	Volume (m ³)	Gross Beta	Date Collected	Volume (m ³)	Gross Beta
<u>Required LLD</u>		<u>0.010</u>	<u>Required LLD</u>		<u>0.010</u>
01-06-11	323	0.052 ± 0.004	07-07-11		ND ^e
01-13-11	273	0.036 ± 0.004	07-14-11	269	0.024 ± 0.003
01-20-11	275	0.049 ± 0.005	07-21-11	305	0.038 ± 0.004
01-27-11	276	0.056 ± 0.005	07-28-11	303	0.023 ± 0.003
02-03-11	280	0.028 ± 0.004			
			08-04-11	302	0.028 ± 0.003
02-10-11	275	0.037 ± 0.004	08-12-11	354	0.027 ± 0.003
02-17-11	275 ^b	0.033 ± 0.004	08-18-11	259	0.032 ± 0.004
02-24-11	276	0.026 ± 0.004	08-25-11	302	0.033 ± 0.004
03-03-11	277	0.034 ± 0.004	09-01-11	311	0.026 ± 0.003
03-10-11	308	0.027 ± 0.003	09-08-11	304	0.022 ± 0.003
03-17-11	305	0.028 ± 0.003	09-16-11	349	0.022 ± 0.003
03-24-11	303	0.041 ± 0.004 ^c	09-22-11	260	0.022 ± 0.004
03-31-11	312	0.055 ± 0.004 ^c	09-29-11	303	0.018 ± 0.003
1st Quarter Mean ± s.d.		0.039 ± 0.011	3rd Quarter Mean ± s.d.		0.026 ± 0.005
04-07-11	299	0.030 ± 0.004 ^c	10-06-11	306	0.023 ± 0.004
04-14-11	307	0.022 ± 0.003	10-13-11	284	0.042 ± 0.004
04-21-11	301	0.018 ± 0.003	10-20-11	280	0.020 ± 0.003
04-28-11	311	0.009 ± 0.002	10-27-11	287	0.033 ± 0.004
			11-03-11	282	0.032 ± 0.004
05-05-11	305	0.016 ± 0.003			
05-12-11	303	0.019 ± 0.003	11-10-11	281	0.034 ± 0.004
05-18-11	264	0.012 ± 0.003	11-17-11	286	0.033 ± 0.004
05-26-11	352	0.014 ± 0.003	11-23-11	242	0.027 ± 0.004
06-02-11	300	0.019 ± 0.003	12-01-11	320	0.037 ± 0.004
06-10-11	292	0.019 ± 0.003	12-08-11	285	0.044 ± 0.004
06-16-11	239	0.014 ± 0.003	12-15-11	284	0.053 ± 0.005
06-23-11	304	0.011 ± 0.003 ^d	12-21-11	241	0.056 ± 0.005
06-30-11	303	0.012 ± 0.003 ^d	12-29-11	325	0.037 ± 0.004
2nd Quarter Mean ± s.d.		0.017 ± 0.006	4th Quarter Mean ± s.d.		0.036 ± 0.011
Cumulative Average					0.030
Previous Annual Average					0.027

^a Iodine-131 concentrations are < 0.03 pCi/m³ unless noted otherwise.

^b Corrected volume.

^c Air iodine activity detected; noted in Appendix A.

^d Data may be impacted by voltage problems at location due to possible lightning strike week of June 19.

^e ND = No data; see Table 2.0, Listing of Missed Samples.

Table 10. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite

Units: pCi/m³

Location D-3				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 2253	DAP- 4875	DAP- 7054	DAP- 9185
Volume (m ³)	3593	3545	3448	3765
Be-7	0.071 ± 0.020	0.088 ± 0.013	0.077 ± 0.020	0.071 ± 0.015
Mn-54	< 0.0010	< 0.0003	< 0.0007	< 0.0005
Fe-59	< 0.0016	< 0.0011	< 0.0018	< 0.0007
Co-58	< 0.0007	< 0.0006	< 0.0009	< 0.0007
Co-60	< 0.0006	< 0.0005	< 0.0009	< 0.0005
Zn-65	< 0.0008	< 0.0012	< 0.0015	< 0.0006
Nb-95	< 0.0016	< 0.0010	< 0.0017	< 0.0008
Zr-95	< 0.0017	< 0.0009	< 0.0023	< 0.0018
Ru-103	< 0.0009	< 0.0012	< 0.0007	< 0.0010
Ru-106	< 0.0071	< 0.0058	< 0.0071	< 0.0055
Cs-134	< 0.0006	< 0.0008	< 0.0014	< 0.0007
Cs-137	< 0.0005	< 0.0006	< 0.0011	< 0.0005
Ce-141	< 0.0024	< 0.0014	< 0.0018	< 0.0011
Ce-144	< 0.0046	< 0.0038	< 0.0054	< 0.0028

Location D-5				
Lab Code	DAP- 2254	DAP- 4876	DAP- 7055	DAP- 9186
Volume (m ³)	3740	3664	3745	3711
Be-7	0.064 ± 0.016	0.072 ± 0.013	0.078 ± 0.014	0.040 ± 0.011
Mn-54	< 0.0010	< 0.0005	< 0.0008	< 0.0006
Fe-59	< 0.0015	< 0.0014	< 0.0008	< 0.0014
Co-58	< 0.0007	< 0.0006	< 0.0005	< 0.0007
Co-60	< 0.0007	< 0.0005	< 0.0007	< 0.0005
Zn-65	< 0.0011	< 0.0005	< 0.0014	< 0.0013
Nb-95	< 0.0010	< 0.0009	< 0.0010	< 0.0010
Zr-95	< 0.0016	< 0.0009	< 0.0017	< 0.0011
Ru-103	< 0.0009	< 0.0007	< 0.0013	< 0.0006
Ru-106	< 0.0054	< 0.0053	< 0.0067	< 0.0054
Cs-134	< 0.0006	< 0.0005	< 0.0010	< 0.0006
Cs-137	< 0.0008	< 0.0006	< 0.0007	< 0.0005
Ce-141	< 0.0013	< 0.0013	< 0.0018	< 0.0009
Ce-144	< 0.0050	< 0.0039	< 0.0053	< 0.0028

Location D-6				
Lab Code	DAP- 2255	DAP- 4877	DAP- 7056	DAP- 9187
Volume (m ³)	3844	3374	3699	3679
Be-7	0.068 ± 0.018	0.087 ± 0.020	0.083 ± 0.017	0.052 ± 0.012
Mn-54	< 0.0008	< 0.0009	< 0.0008	< 0.0008
Fe-59	< 0.0015	< 0.0019	< 0.0022	< 0.0030
Co-58	< 0.0006	< 0.0006	< 0.0007	< 0.0007
Co-60	< 0.0006	< 0.0008	< 0.0010	< 0.0009
Zn-65	< 0.0007	< 0.0009	< 0.0018	< 0.0014
Nb-95	< 0.0008	< 0.0011	< 0.0009	< 0.0013
Zr-95	< 0.0015	< 0.0008	< 0.0011	< 0.0014
Ru-103	< 0.0009	< 0.0014	< 0.0013	< 0.0014
Ru-106	< 0.0064	< 0.0053	< 0.0065	< 0.0059
Cs-134	< 0.0004	< 0.0008	< 0.0007	< 0.0011
Cs-137	< 0.0005	< 0.0007	< 0.0007	< 0.0009
Ce-141	< 0.0018	< 0.0020	< 0.0014	< 0.0018
Ce-144	< 0.0034	< 0.0040	< 0.0047	< 0.0056

Table 10. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite

Units: pCi/m³

Location				
D-7				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 2256	DAP- 4878	DAP- 7058	DAP- 9188
Volume (m ³)	3556	3869	3897	3851
Be-7	0.081 ± 0.020	0.071 ± 0.014	0.062 ± 0.013	0.058 ± 0.014
Mn-54	< 0.0010	< 0.0009	< 0.0007	< 0.0009
Fe-59	< 0.0016	< 0.0017	< 0.0016	< 0.0016
Co-58	< 0.0007	< 0.0007	< 0.0005	< 0.0007
Co-60	< 0.0006	< 0.0007	< 0.0007	< 0.0009
Zn-65	< 0.0010	< 0.0006	< 0.0022	< 0.0007
Nb-95	< 0.0011	< 0.0015	< 0.0007	< 0.0009
Zr-95	< 0.0018	< 0.0021	< 0.0017	< 0.0017
Ru-103	< 0.0012	< 0.0006	< 0.0009	< 0.0007
Ru-106	< 0.0056	< 0.0057	< 0.0083	< 0.0076
Cs-134	< 0.0008	< 0.0007	< 0.0008	< 0.0006
Cs-137	< 0.0006	< 0.0009	< 0.0005	< 0.0005
Ce-141	< 0.0011	< 0.0019	< 0.0010	< 0.0009
Ce-144	< 0.0038	< 0.0051	< 0.0041	< 0.0029

Location				
D-11				
Lab Code	DAP- 2257	DAP- 4879	DAP- 7059	DAP- 9189
Volume (m ³)	3708	3514	3806	3650
Be-7	0.070 ± 0.018	0.104 ± 0.016	0.070 ± 0.014	0.057 ± 0.011
Mn-54	< 0.0007	< 0.0008	< 0.0009	< 0.0010
Fe-59	< 0.0026	< 0.0022	< 0.0023	< 0.0012
Co-58	< 0.0010	< 0.0006	< 0.0011	< 0.0009
Co-60	< 0.0007	< 0.0006	< 0.0008	< 0.0006
Zn-65	< 0.0010	< 0.0008	< 0.0012	< 0.0014
Nb-95	< 0.0018	< 0.0010	< 0.0013	< 0.0009
Zr-95	< 0.0016	< 0.0009	< 0.0015	< 0.0010
Ru-103	< 0.0008	< 0.0007	< 0.0010	< 0.0010
Ru-106	< 0.0059	< 0.0048	< 0.0073	< 0.0070
Cs-134	< 0.0009	< 0.0008	< 0.0008	< 0.0005
Cs-137	< 0.0010	< 0.0008	< 0.0008	< 0.0008
Ce-141	< 0.0027	< 0.0012	< 0.0017	< 0.0012
Ce-144	< 0.0052	< 0.0038	< 0.0046	< 0.0040

Location				
D-13				
Lab Code	DAP- 2258	DAP- 4880	DAP- 7060	DAP- 9190
Volume (m ³)	3550	3651	3721	3787
Be-7	0.074 ± 0.016	0.089 ± 0.015	0.075 ± 0.013	0.049 ± 0.009
Mn-54	< 0.0009	< 0.0005	< 0.0005	< 0.0005
Fe-59	< 0.0018	< 0.0009	< 0.0011	< 0.0011
Co-58	< 0.0006	< 0.0008	< 0.0009	< 0.0006
Co-60	< 0.0008	< 0.0008	< 0.0008	< 0.0004
Zn-65	< 0.0008	< 0.0014	< 0.0007	< 0.0014
Nb-95	< 0.0014	< 0.0018	< 0.0008	< 0.0009
Zr-95	< 0.0013	< 0.0014	< 0.0012	< 0.0007
Ru-103	< 0.0014	< 0.0012	< 0.0006	< 0.0007
Ru-106	< 0.0069	< 0.0063	< 0.0050	< 0.0056
Cs-134	< 0.0008	< 0.0007	< 0.0005	< 0.0005
Cs-137	< 0.0005	< 0.0008	< 0.0004	< 0.0007
Ce-141	< 0.0021	< 0.0012	< 0.0011	< 0.0009
Ce-144	< 0.0031	< 0.0056	< 0.0035	< 0.0033

Table 10. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite

Units: pCi/m³

Location				
D-15				
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 2259	DAP- 4881	DAP- 7061	DAP- 9191
Volume (m ³)	3714	3745	3647	3681
Be-7	0.071 ± 0.017	0.069 ± 0.018	0.073 ± 0.012	0.047 ± 0.011
Mn-54	< 0.0005	< 0.0007	< 0.0004	< 0.0010
Fe-59	< 0.0019	< 0.0016	< 0.0013	< 0.0018
Co-58	< 0.0006	< 0.0004	< 0.0007	< 0.0007
Co-60	< 0.0007	< 0.0006	< 0.0003	< 0.0006
Zn-65	< 0.0013	< 0.0011	< 0.0007	< 0.0008
Nb-95	< 0.0019	< 0.0012	< 0.0008	< 0.0006
Zr-95	< 0.0019	< 0.0007	< 0.0015	< 0.0016
Ru-103	< 0.0009	< 0.0010	< 0.0007	< 0.0016
Ru-106	< 0.0067	< 0.0033	< 0.0031	< 0.0096
Cs-134	< 0.0010	< 0.0005	< 0.0007	< 0.0007
Cs-137	< 0.0011	< 0.0010	< 0.0006	< 0.0008
Ce-141	< 0.0018	< 0.0016	< 0.0010	< 0.0017
Ce-144	< 0.0055	< 0.0050	< 0.0025	< 0.0046

Location				
D-16				
Lab Code	DAP- 2260	DAP- 4882	DAP- 7062	DAP- 9192
Volume (m ³)	3520	3917	3823	3813
Be-7	0.075 ± 0.016	0.072 ± 0.014	0.061 ± 0.017	0.058 ± 0.016
Mn-54	< 0.0010	< 0.0005	< 0.0006	< 0.0005
Fe-59	< 0.0024	< 0.0012	< 0.0008	< 0.0014
Co-58	< 0.0012	< 0.0005	< 0.0006	< 0.0010
Co-60	< 0.0006	< 0.0003	< 0.0007	< 0.0010
Zn-65	< 0.0008	< 0.0008	< 0.0015	< 0.0011
Nb-95	< 0.0009	< 0.0012	< 0.0011	< 0.0016
Zr-95	< 0.0019	< 0.0018	< 0.0018	< 0.0009
Ru-103	< 0.0009	< 0.0008	< 0.0010	< 0.0007
Ru-106	< 0.0065	< 0.0052	< 0.0043	< 0.0087
Cs-134	< 0.0007	< 0.0008	< 0.0008	< 0.0005
Cs-137	< 0.0008	< 0.0009	< 0.0008	< 0.0006
Ce-141	< 0.0020	< 0.0016	< 0.0018	< 0.0014
Ce-144	< 0.0052	< 0.0038	< 0.0051	< 0.0031

Location				
D-40				
Lab Code	DAP- 2261	DAP- 4883	DAP- 7063	DAP- 9193
Volume (m ³)	3759	3882	3621	3703
Be-7	0.067 ± 0.016	0.070 ± 0.016	0.070 ± 0.015	0.094 ± 0.020
Mn-54	< 0.0008	< 0.0010	< 0.0007	< 0.0008
Fe-59	< 0.0015	< 0.0015	< 0.0010	< 0.0026
Co-58	< 0.0006	< 0.0006	< 0.0007	< 0.0008
Co-60	< 0.0007	< 0.0012	< 0.0009	< 0.0008
Zn-65	< 0.0007	< 0.0010	< 0.0011	< 0.0011
Nb-95	< 0.0009	< 0.0011	< 0.0008	< 0.0020
Zr-95	< 0.0015	< 0.0011	< 0.0012	< 0.0022
Ru-103	< 0.0008	< 0.0015	< 0.0007	< 0.0015
Ru-106	< 0.0042	< 0.0094	< 0.0060	< 0.0067
Cs-134	< 0.0009	< 0.0008	< 0.0007	< 0.0007
Cs-137	< 0.0008	< 0.0012	< 0.0007	< 0.0009
Ce-141	< 0.0016	< 0.0017	< 0.0015	< 0.0036
Ce-144	< 0.0042	< 0.0054	< 0.0031	< 0.0046

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Table 11. Ambient gamma radiation as measured by thermoluminescent dosimeters (TLD).
 Quarterly collection. Units: mR/91 days

<u>Control Locations</u>	<u>1st Qtr.</u>	<u>2nd Qtr.</u>	<u>3rd Qtr.</u>	<u>4th Qtr.</u>
D-1	15.1 ± 0.9	13.7 ± 1.7	16.1 ± 0.6	14.3 ± 1.3
D-2	15.4 ± 0.9	14.3 ± 1.9	15.7 ± 0.8	13.0 ± 0.7
D-3	14.8 ± 0.8	14.8 ± 0.9	15.6 ± 1.0	16.0 ± 0.6
D-5	16.6 ± 0.8	19.1 ± 0.8	18.4 ± 1.3	19.5 ± 0.5
D-6	14.9 ± 0.9	17.0 ± 0.9	16.0 ± 0.7	17.8 ± 0.7
D-7	15.2 ± 0.8	17.7 ± 1.1	16.4 ± 0.9	17.7 ± 0.7
D-8	17.8 ± 0.8	22.0 ± 1.3	20.1 ± 0.8	21.4 ± 1.0
D-10	17.0 ± 0.6	16.1 ± 1.0	19.0 ± 0.9	16.0 ± 0.8
D-11	14.0 ± 0.5	16.0 ± 1.5	15.1 ± 0.7	16.8 ± 1.3
D-13	13.9 ± 0.6	16.6 ± 1.0	16.4 ± 0.7	16.9 ± 1.0
Mean ± s.d.	15.5 ± 1.3	16.7 ± 2.5	16.9 ± 1.7	16.9 ± 2.4
<u>Within 0.5 mi. of Stack</u>				
D-15	15.7 ± 1.0	16.5 ± 1.0	16.8 ± 1.2	16.6 ± 0.6
D-16	16.4 ± 0.7	18.2 ± 1.6	17.4 ± 1.0	17.2 ± 2.0
D-17	17.8 ± 0.8	16.2 ± 1.4	20.5 ± 1.2	19.2 ± 1.1
D-18	16.0 ± 1.2	14.9 ± 1.1	16.5 ± 1.1	15.2 ± 0.6
D-19	15.0 ± 0.8	14.1 ± 1.1	15.3 ± 1.1	14.7 ± 0.8
D-20	16.6 ± 0.6	18.9 ± 1.2	17.5 ± 0.7	18.7 ± 0.9
D-21	17.3 ± 0.8	17.0 ± 1.0	19.2 ± 1.2	17.4 ± 0.8
D-22	16.9 ± 0.8	18.2 ± 1.0	17.7 ± 0.9	17.7 ± 0.7
D-23	15.4 ± 0.8	16.8 ± 1.4	16.3 ± 1.0	16.5 ± 0.7
D-28	18.7 ± 1.1	22.6 ± 1.3	20.4 ± 1.2	21.8 ± 0.8
D-29	19.7 ± 0.6	23.7 ± 1.2	22.3 ± 1.0	22.1 ± 1.0
D-30	19.1 ± 0.6	22.3 ± 2.0	21.3 ± 0.8	21.2 ± 1.0
D-31	18.9 ± 0.9	23.0 ± 1.6	20.9 ± 1.4	21.9 ± 1.1
D-32	20.7 ± 0.7	21.7 ± 1.2	22.3 ± 0.8	21.0 ± 1.0
Mean ± s.d.	17.4 ± 1.8	18.9 ± 3.2	18.9 ± 2.4	18.7 ± 2.5

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Table 11. Ambient gamma radiation as measured by thermoluminescent dosimeters (TLD).
 Quarterly collection. Units: mR/91 days

<u>Within 1.0 mi. of Stack</u>	<u>1st Qtr.</u>	<u>2nd Qtr.</u>	<u>3rd Qtr.</u>	<u>4th Qtr.</u>
D-43	14.4 ± 0.7	17.7 ± 1.7	16.7 ± 0.8	17.7 ± 1.1
D-44	18.1 ± 0.6	21.7 ± 1.0	20.1 ± 0.8	21.0 ± 0.6
D-45	15.4 ± 0.6	17.3 ± 1.5	16.8 ± 0.6	16.3 ± 1.0
D-46	18.2 ± 0.8	22.4 ± 1.6	20.6 ± 0.8	20.6 ± 0.9
D-47	18.2 ± 0.7	20.8 ± 1.3	20.2 ± 0.8	19.6 ± 0.9
D-48	18.8 ± 0.7	22.2 ± 1.4	ND ^a	20.6 ± 0.4
D-82	14.2 ± 0.6	14.1 ± 1.3	17.2 ± 0.8	14.4 ± 0.8
D-83	15.4 ± 0.6	17.1 ± 1.2	17.6 ± 1.0	16.6 ± 0.5
D-84	15.8 ± 0.8	17.2 ± 1.2	17.7 ± 0.8	16.3 ± 0.8
D-85	15.7 ± 0.6	18.8 ± 1.3	18.9 ± 0.7	18.0 ± 0.9
D-86	18.0 ± 1.2	18.8 ± 1.5	19.4 ± 1.2	18.0 ± 1.0
D-91	16.5 ± 0.8	19.1 ± 1.3	18.3 ± 1.1	18.1 ± 0.9
Mean ± s.d.	16.6 ± 1.6	18.9 ± 2.5	18.5 ± 1.4	18.1 ± 2.0
<u>Within 3.0 mi. of Stack</u>				
D-33	14.2 ± 0.6	16.2 ± 0.8	15.7 ± 0.6	15.3 ± 0.6
D-34	14.0 ± 0.7	15.3 ± 1.3	15.5 ± 0.8	14.8 ± 1.0
D-35	14.4 ± 0.5	15.3 ± 1.0	15.4 ± 0.7	14.7 ± 0.6
D-36	15.5 ± 0.8	16.3 ± 1.3	17.3 ± 0.8	16.4 ± 1.0
D-37	17.8 ± 0.9	ND ^a	18.4 ± 1.2	14.8 ± 0.6
D-38	15.6 ± 0.8	18.2 ± 1.5	17.5 ± 0.9	17.4 ± 0.9
D-39	16.2 ± 0.6	17.8 ± 1.2	17.8 ± 0.7	17.8 ± 0.7
D-40	14.2 ± 0.7	16.7 ± 1.1	15.5 ± 0.7	16.8 ± 0.8
D-41	15.6 ± 0.7	16.6 ± 1.3	16.5 ± 0.8	17.0 ± 0.9
D-42	15.2 ± 0.7	17.1 ± 1.7	15.7 ± 0.7	17.1 ± 1.1
Mean ± s.d.	15.3 ± 1.2	16.6 ± 1.0	16.5 ± 1.1	16.2 ± 1.2
<u>ISFSI Fenceline</u>				
D-161		15.0 ± 1.8 ^b	15.9 ± 0.7	14.6 ± 1.5
D-162		16.7 ± 1.3 ^b	17.2 ± 1.0	15.8 ± 1.1
D-163		14.9 ± 1.1 ^b	13.6 ± 0.7	15.1 ± 0.9
D-164		13.4 ± 1.0 ^b	15.3 ± 0.7	12.6 ± 0.6
Mean ± s.d.		15.0 ± 1.4	15.5 ± 1.5	14.5 ± 1.4

^a ND = No data; see Table 2.0, Listing of Missed Samples. The TLD was exposed for two quarters, the fourth quarter value is prorated for 91 days.

^b Added 2nd quarter.

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Table 12. Milk samples, analyses for iodine-131 and gamma emitting isotopes.
 Collection: Monthly during non-grazing season (October 1 through April 30); biweekly during grazing season (May 1 through September 30)

Location		D-108					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-04-11	DMI- 44	< 0.3	1440 ± 111	< 2.7	< 4.3	< 7.0	< 1.3
02-08-11	DMI- 541	< 0.3	1567 ± 110	< 3.0	< 4.1	< 13.0	< 2.4
03-08-11	DMI- 993	< 0.4	1591 ± 121	< 3.8	< 4.1	< 13.2	< 1.3
03-25-11	DMI- 1357	< 0.4	1396 ± 117	< 4.4	< 3.0	< 21.4	< 2.5
04-01-11	DMI- 1577	< 0.2	1464 ± 111	< 2.9	< 3.0	< 15.0	< 1.2
04-05-11	DMI- 1663	< 0.3	1507 ± 122	< 2.9	< 2.3	< 18.8	< 2.4
04-19-11	DMI- 2225	< 0.4	1372 ± 108	< 2.4	< 3.6	< 12.8	< 1.3
05-03-11	DMI- 2666	< 0.3	1284 ± 108	< 3.0	< 3.3	< 10.0	< 2.1
05-17-11	DMI- 3078	< 0.3	1374 ± 104	< 2.2	< 3.5	< 8.2	< 2.3
06-01-11	DMI- 3384	< 0.3	1468 ± 114	< 2.9	< 2.9	< 18.1	< 3.2
06-14-11	DMI- 3782	< 0.3	1517 ± 115	< 3.7	< 3.9	< 13.3	< 1.7
06-28-11	DMI- 4033	< 0.2	1370 ± 107	< 3.4	< 3.9	< 6.9	< 3.0
07-12-11	DMI- 4421	< 0.3	1315 ± 108	< 2.6	< 3.3	< 9.6	< 2.1
07-26-11	DMI- 4990	< 0.3	1453 ± 114	< 3.9	< 3.9	< 16.9	< 1.2
08-09-11	DMI- 5372	< 0.2	1419 ± 117	< 2.9	< 4.1	< 15.0	< 1.7
08-23-11	DMI- 5746	< 0.4	1289 ± 114	< 3.7	< 3.4	< 13.6	< 3.1
09-07-11	DMI- 6055	< 0.3	1515 ± 109	< 2.7	< 3.8	< 13.3	< 1.7
09-20-11	DMI- 6393	< 0.2	1453 ± 114	< 2.5	< 3.5	< 8.7	< 2.4
10-04-11	DMI- 6675	< 0.3	1298 ± 95	< 2.9	< 3.2	< 10.2	< 1.3
11-08-11	DMI- 7897	< 0.4	1432 ± 102	< 2.8	< 3.2	< 15.8	< 2.2
12-13-11	DMI- 8660	< 0.2	1471 ± 109	< 3.7	< 2.9	< 12.8	< 2.3

Location		D-110					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-04-11	DMI- 45	< 0.4	1309 ± 118	< 3.4	< 3.9	< 8.4	< 2.3
02-08-11	DMI- 542	< 0.3	1426 ± 100	< 3.0	< 3.6	< 7.2	< 1.9
03-08-11	DMI- 994	< 0.3	1398 ± 120	< 3.7	< 4.1	< 15.6	< 1.8
03-25-11	DMI- 1358	< 0.5	1381 ± 118	< 3.3	< 4.0	< 17.3	< 2.3
04-01-11	DMI- 1578	< 0.3	1311 ± 117	< 3.4	< 4.4	< 11.8	< 2.7
04-05-11	DMI- 1664	< 0.3	1390 ± 119	< 3.5	< 2.4	< 14.7	< 1.4
04-19-11	DMI- 2226	< 0.2	1394 ± 109	< 2.9	< 4.4	< 12.8	< 3.2
05-03-11	DMI- 2667	< 0.4	1328 ± 105	< 2.8	< 3.6	< 13.1	< 2.1
05-17-11	DMI- 3079	< 0.3	1386 ± 125	< 3.6	< 4.1	< 16.9	< 2.6
06-01-11	DMI- 3385	< 0.3	1307 ± 120	< 3.6	< 3.4	< 17.8	< 2.1
06-14-11	DMI- 3783	< 0.3	1360 ± 109	< 3.4	< 2.8	< 11.0	< 3.1
06-28-11	DMI- 4034	< 0.2	1360 ± 111	< 2.5	< 4.3	< 7.8	< 1.8
07-12-11	DMI- 4422	< 0.4	1389 ± 111	< 3.3	< 4.3	< 9.8	< 1.3
07-26-11	DMI- 4991	< 0.3	1399 ± 107	< 2.7	< 3.0	< 13.9	< 2.0
08-10-11	DMI- 5505	< 0.3	1343 ± 99	< 2.5	< 3.4	< 14.8	< 4.5
08-23-11	DMI- 5747	< 0.2	1351 ± 111	< 2.7	< 3.5	< 9.5	< 3.5
09-07-11	DMI- 6056	< 0.3	1386 ± 109	< 3.0	< 4.0	< 10.0	< 2.3
09-20-11	DMI- 6394	< 0.3	1319 ± 101	< 2.2	< 3.6	< 12.2	< 2.4
10-04-11	DMI- 6676	< 0.2	1415 ± 119	< 3.0	< 3.3	< 9.3	< 1.3
11-08-11	DMI- 7898	< 0.4	1346 ± 103	< 2.9	< 3.4	< 15.5	< 1.5
12-13-11	DMI- 8661	< 0.2	1339 ± 101	< 2.6	< 3.6	< 13.7	< 1.8

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Table 13.1. Well water samples, analyses for gross beta and tritium.

Collection: Quarterly

Units: pCi/L

Location		D-53 Treated Municipal Water			
Collection Date	03-16-11	06-08-11	09-02-11	11-15-11	
Lab Code	DWW- 1156	DWW- 3647	DWW- 5965	DWW- 8069	
Gross Beta	1.8 ± 0.8	1.5 ± 0.8	1.1 ± 0.4	1.3 ± 0.6	
H-3	< 151	< 142	< 144	< 142	

Location		D-54 Inlet to Municipal Water			
Collection Date	03-16-11	06-08-11	09-02-11	11-15-11	
Lab Code	DWW- 1158	DWW- 3648	DWW- 5966	DWW- 8070	
Gross Beta	1.4 ± 0.8	< 1.2	1.2 ± 0.4	1.4 ± 0.6	
H-3	< 151	< 142	< 144	< 142	

Location		D-55 On-site Well			
Collection Date	03-16-11	06-08-11	09-02-11	11-15-11	
Lab Code	DWW- 1159	DWW- 3649	DWW- 5967	DWW- 8071	
Gross Beta	< 1.2	< 1.3	< 0.7	< 0.9	
H-3	< 151	< 142	< 144	< 142	

Location		D-57 Bull Farm			
Collection Date	03-16-11	06-08-11	09-02-11	11-15-11	
Lab Code	DWW- 1160	DWW- 3650	DWW- 5968	DWW- 8072	
Gross Beta	< 1.2	< 1.2	0.8 ± 0.4	< 0.8	
H-3	< 151	< 142	< 144	< 142	

Location		D-58 Franz Farm			
Collection Date	03-16-11	06-08-11	09-02-11	11-15-11	
Lab Code	DWW- 1161	DWW- 3651	DWW- 5969	DWW- 8073	
Gross Beta	3.5 ± 0.9	4.6 ± 1.0	3.2 ± 0.5	3.6 ± 0.7	
H-3	< 151	< 142	< 144	< 142	

Location		D-72 Van Note Farm			
Collection Date	03-16-11	06-08-11	09-02-11	11-15-11	
Lab Code	DWW- 1162	DWW- 3652	DWW- 5970	DWW- 8074	
Gross Beta	< 1.1	< 1.4	< 0.7	< 0.9	
H-3	< 151	< 142	< 144	< 142	

^a Gamma isotopic analysis will be performed if gross beta activity is greater than 3 pCi/L and/or H3 activity exceeds MDA.

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Table 13.2. Ground water, Monitoring wells, analyses for gross beta and tritium^{a,b}.

Collection: Quarterly

Lab Code	Date	H-3 (pCi/L)	Gross Beta	Lab Code	Date	H-3 (pCi/L)	Gross Beta
D-111A				D-111B			
DWW- 803	02/23/11	274 ± 99	-	DWW- 1366	03/24/11	< 174	1.9 ± 0.8
DWW- 1365	03/24/11	195 ± 114	2.2 ± 0.8	DWW- 3589	06/03/11	< 139	-
DWW- 3588	06/03/11	195 ± 93	-	DWW- 5676	08/19/11	< 144	-
DWW- 4094	06/24/11	187 ± 83	-	DWW- 8267	11/19/11	< 167	-
DWW- 5675	08/19/11	< 151	-				
DWW- 8266	11/19/11	977 ± 125 ^c	-				
D-112A				D-112B			
DWW- 1367	03/24/11	< 174	2.4 ± 0.9	DWW- 1368	03/24/11	< 174	1.2 ± 0.7
DWW- 3590	06/03/11	< 139	-	DWW- 3591	06/03/11	< 139	-
DWW- 5677	08/19/11	< 144	-	DWW- 5678	08/22/11	< 144	-
DWW- 8268	11/19/11	< 167	-	DWW- 8269	11/19/11	< 167	-
D-113A				D-113B			
DWW- 1587	03/28/11	189 ± 111	2.9 ± 1.5	DWW- 1588	03/28/11	< 171	< 1.9
DWW- 3592	06/03/11	< 139	-	DWW- 3593	06/03/11	< 139	-
DWW- 4095	06/24/11	< 147	-				
DWW- 8270	11/19/11	< 167	-	DWW- 8271	11/19/11	< 167	-
D-114A				D-114B			
DWW- 804	02/23/11	< 162	-	DWW- 1370	03/24/11	< 174	< 1.3
DWW- 1369	03/24/11	204 ± 114	1.3 ± 0.8	DWW- 3595	06/03/11	< 139	-
DWW- 3594	06/03/11	< 139	-				
DWW- 4096	06/24/11	191 ± 83	-	DWW- 5680	08/17/11	< 144	-
DWW- 5295	07/30/11	< 149	-	DWW- 8273	11/19/11	< 137	-
DWW- 5679	08/17/11	< 144	-				
DWW- 8272	11/19/11	< 167	-				
D-115A				D-115B			
DWW- 1590	03/28/11	305 ± 116	2.7 ± 1.3	DWW- 1591	03/28/11	< 171	< 2.1
DWW- 3596	06/03/11	< 139	-	DWW- 3597	06/03/11	< 139	-
DWW- 4097	06/24/11	< 147	-				
DWW- 8274	11/19/11	< 137	-	DWW- 8275	11/19/11	< 137	-
D-116A				D-116B			
DWW- 1592	03/30/11	182 ± 111	4.2 ± 0.7	DWW- 1593	03/30/11	175 ± 111	0.9 ± 0.6
DWW- 3598	06/03/11	< 139	-	DWW- 3599	06/03/11	< 139	-
DWW- 4098	06/24/11	< 147	-	DWW- 4099	06/24/11	< 147	-
DWW- 5293	07/29/11	< 149	-	DWW- 5294	07/29/11	< 149	-
DWW- 5681	08/17/11	< 144	-	DWW- 5682	08/17/11	< 144	-
DWW- 8276	11/19/11	< 146	-	DWW- 8277	11/19/11	< 146	-

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Table 13.2. Ground water, Monitoring wells, analyses for tritium ^a.
Collection: Quarterly

Lab Code	Date	H-3 (pCi/L)	Lab Code	Date	H-3 (pCi/L)
D-127A			D-127B		
DWW- 5945	08/31/11	< 153	DWW- 5946	08/31/11	< 153
DWW- 8279	11/17/11	420 ± 93	DWW- 8280	11/17/11	< 137
D-128A			D-128B		
DWW- 5947	09/01/11	2087 ± 161	DWW- 5948	09/01/11	2087 ± 161
DWW- 6391	09/19/11	1718 ± 140	DWW- 6392	09/19/11	1773 ± 142
DWW- 7380	10/21/11	1184 ± 124	DWW- 7381	10/21/11	1904 ± 145
DWW- 8281	11/16/11	887 ± 112	DWW- 9024	11/16/11	1936 ± 153
DWW- 8988	12/21/11	770 ± 112	DWW- 9026	12/21/11	1872 ± 150
D-129A			D-129B		
DWW- 5949	08/30/11	167 ± 100	DWW- 5950	08/30/11	< 153
DWW- 8282	11/17/11	< 151	DWW- 8283	11/17/11	< 137
D-130A			D-130B		
DWW- 5951	08/30/11	< 144	DWW- 5952	08/30/11	< 144
DWW- 8284	11/17/11	< 151	DWW- 8285	11/17/11	< 137
D-131A			D-131B		
DWW- 5683	08/19/11	< 151	DWW- 5684	08/19/11	< 144
DWW- 8286	11/19/11	< 151	DWW- 8287	11/19/11	< 137
D-132A			D-132B		
DWW- 5685	08/19/11	792 ± 110	DWW- 5686	08/19/11	< 144
DWW- 8288	11/19/11	1698 ± 138	DWW- 8289	11/19/11	< 151
DWW- 9025	12/21/11	951 ± 123			

^a Analyses for Sr-89, Sr-90, Fe-55 and Ni-63 will be performed if tritium activity > 1K pCi/L.

^b Gross beta analysis as requested. Not required by technical specifications.

^c Tritium repeated with a result of 864 ± 125 pCi/L.

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Table 14. Vegetation (broadleaf), analyses for iodine-131 and other gamma-emitting isotopes.

Collection: Annually

Units: pCi/g wet

Location	D-57		
Lab Code	DVE- 4035		
Date Collected	06-28-11		
Sample Type	Broadleaf		
K-40	4.59 ± 0.42		
Mn-54	< 0.011		
Fe-59	< 0.036		
Co-58	< 0.009		
Co-60	< 0.016		
Zn-65	< 0.032		
Nb-95	< 0.014		
Zr-95	< 0.014		
Ru-103	< 0.008		
Ru-106	< 0.13		
I-131	< 0.016		
Cs-134	< 0.012		
Cs-137	< 0.012		
Ce-141	< 0.033		
Ce-144	< 0.089		

Location	D-109	D-108 (C)	D-118
Lab Code	DVE- 4037	DVE- 4036	DVE- 4038
Date Collected	06-28-11	06-28-11	06-28-11
Sample Type	Broadleaf	Broadleaf	Broadleaf
K-40	2.60 ± 0.39	5.00 ± 0.54	3.88 ± 0.27
Mn-54	< 0.020	< 0.024	< 0.006
Fe-59	< 0.042	< 0.028	< 0.023
Co-58	< 0.021	< 0.011	< 0.006
Co-60	< 0.020	< 0.013	< 0.008
Zn-65	< 0.029	< 0.021	< 0.010
Nb-95	< 0.017	< 0.022	< 0.009
Zr-95	< 0.022	< 0.031	< 0.015
Ru-103	< 0.021	< 0.019	< 0.009
Ru-106	< 0.13	< 0.23	< 0.098
I-131	< 0.037	< 0.034	< 0.012
Cs-134	< 0.015	< 0.022	< 0.008
Cs-137	< 0.019	< 0.019	< 0.007
Ce-141	< 0.034	< 0.042	< 0.017
Ce-144	< 0.13	< 0.16	< 0.051

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Table 15. Vegetation (hay and grain), analyses for gamma-emitting isotopes.

Collection: Annually

Units: pCi/g wet

Location	D-16	D-57	D-57	D-57
Lab Code	DVE- 4039	DVE- 4040	DVE- 7533	DVE- 7534
Date Collected	06-28-11	06-28-11	10-25-11	10-25-11
Sample Type	Grain	Forage	Beans	Corn
K-40	3.37 ± 0.32	3.94 ± 0.43	13.30 ± 0.45	2.44 ± 0.22
Mn-54	< 0.010	< 0.015	< 0.010	< 0.007
Fe-59	< 0.022	< 0.018	< 0.026	< 0.020
Co-58	< 0.009	< 0.013	< 0.008	< 0.010
Co-60	< 0.007	< 0.016	< 0.010	< 0.007
Zn-65	< 0.017	< 0.030	< 0.018	< 0.015
Nb-95	< 0.013	< 0.011	< 0.007	< 0.008
Zr-95	< 0.009	< 0.011	< 0.013	< 0.008
Ru-103	< 0.012	< 0.010	< 0.007	< 0.008
Ru-106	< 0.11	< 0.15	< 0.048	< 0.056
Cs-134	< 0.012	< 0.014	< 0.008	< 0.008
Cs-137	< 0.012	< 0.012	< 0.006	< 0.008
Ce-141	< 0.016	< 0.021	< 0.010	< 0.013
Ce-144	< 0.087	< 0.17	< 0.057	< 0.042

Location	D-58	D-72	D-96	D-96
Lab Code	DVE- 7537	DVE- 7539	DVE- 7535	DVE- 7536
Date Collected	10-28-11	10-28-11	10-25-11	10-25-11
Sample Type	Corn	Corn	Beans	Corn
K-40	2.08 ± 0.23	2.89 ± 0.25	14.17 ± 0.50	2.33 ± 0.22
Mn-54	< 0.009	< 0.008	< 0.013	< 0.005
Fe-59	< 0.019	< 0.009	< 0.016	< 0.012
Co-58	< 0.012	< 0.007	< 0.010	< 0.004
Co-60	< 0.007	< 0.008	< 0.008	< 0.005
Zn-65	< 0.023	< 0.016	< 0.034	< 0.015
Nb-95	< 0.011	< 0.007	< 0.012	< 0.008
Zr-95	< 0.016	< 0.015	< 0.019	< 0.009
Ru-103	< 0.013	< 0.009	< 0.009	< 0.008
Ru-106	< 0.068	< 0.082	< 0.091	< 0.063
Cs-134	< 0.005	< 0.007	< 0.009	< 0.006
Cs-137	< 0.011	< 0.006	< 0.013	< 0.009
Ce-141	< 0.019	< 0.010	< 0.021	< 0.013
Ce-144	< 0.072	< 0.056	< 0.054	< 0.047

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Table 15. Vegetation (hay and grain), analyses for gamma-emitting isotopes.

Collection: Annually

Units: pCi/g wet

Location	Control		
	D-108	D-108	D-108
Lab Code	DVE- 7899	DVE- 4042	DVE- 7900
Date Collected	11-08-11	06-28-11	11-08-11
Sample Type	Corn	Forage	Soybeans
K-40	3.16 ± 0.22	23.80 ± 1.32	14.28 ± 0.47
Mn-54	< 0.006	< 0.021	< 0.008
Fe-59	< 0.013	< 0.061	< 0.027
Co-58	< 0.006	< 0.026	< 0.012
Co-60	< 0.005	< 0.025	< 0.009
Zn-65	< 0.013	< 0.094	< 0.016
Nb-95	< 0.007	< 0.031	< 0.006
Zr-95	< 0.010	< 0.058	< 0.019
Ru-103	< 0.007	< 0.018	< 0.012
Ru-106	< 0.062	< 0.20	< 0.084
Cs-134	< 0.005	< 0.025	< 0.009
Cs-137	< 0.008	< 0.031	< 0.014
Ce-141	< 0.015	< 0.056	< 0.014
Ce-144	< 0.041	< 0.23	< 0.070

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Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-49

Lab Code	DSW- 292	DSW- 639	DSW- 1054	DSW- 2132	DSW- 2722	DSW- 3890
Date Collected	01-18-11	02-15-11	03-11-11	04-13-11	05-04-11	06-17-11
H-3	< 163	< 145	< 153	< 141	< 143	< 148
I-131(Chemistry)	< 0.4	< 0.4	< 0.3	< 0.3	< 0.3	< 0.3
Mn-54	< 2.5	< 1.9	< 3.6	< 1.7	< 2.6	< 2.5
Fe-59	< 3.6	< 4.4	< 5.9	< 3.1	< 4.6	< 3.3
Co-58	< 1.3	< 3.2	< 2.7	< 2.6	< 2.9	< 2.5
Co-60	< 2.5	< 2.6	< 3.1	< 3.2	< 3.4	< 1.8
Zn-65	< 4.8	< 2.7	< 6.2	< 5.0	< 6.1	< 4.3
Nb-95	< 2.4	< 2.5	< 2.7	< 2.2	< 3.3	< 3.4
Zr-95	< 4.5	< 3.6	< 4.7	< 3.8	< 3.0	< 4.2
I-131	< 3.4	< 5.9	< 4.5	< 5.6	< 4.9	< 3.8
Cs-134	< 1.9	< 2.2	< 2.9	< 2.9	< 2.8	< 2.6
Cs-137	< 2.7	< 3.5	< 4.0	< 3.0	< 2.6	< 3.5
Ba-140	< 9.7	< 14.8	< 16.2	< 16.6	< 15.9	< 13.1
La-140	< 1.7	< 5.2	< 2.6	< 3.0	< 3.1	< 3.1

Lab Code	DSW- 4341	DSW- 5288	DSW- 6073	DSW- 6805	DSW- 7830	DSW- 8565
Date Collected	07-08-11	08-03-11	09-07-11	10-05-11	11-04-11	12-09-11
H-3	< 139	< 149	< 145	< 145	< 148	< 147
I-131(Chemistry)	< 0.4	< 0.3	< 0.3	< 0.3	< 0.3	< 0.2
Mn-54	< 2.1	< 2.1	< 2.9	< 4.0	< 2.5	< 3.2
Fe-59	< 3.8	< 3.5	< 3.1	< 8.8	< 4.9	< 4.7
Co-58	< 1.5	< 2.5	< 2.4	< 4.2	< 1.9	< 2.8
Co-60	< 2.5	< 1.9	< 2.3	< 1.7	< 2.1	< 1.0
Zn-65	< 2.6	< 3.0	< 3.3	< 3.9	< 3.7	< 4.1
Nb-95	< 2.8	< 2.0	< 2.6	< 4.4	< 2.6	< 3.3
Zr-95	< 4.3	< 3.7	< 2.8	< 7.7	< 2.6	< 4.9
I-131	< 3.8	< 3.7	< 3.0	< 7.5	< 3.7	< 6.3
Cs-134	< 2.3	< 2.8	< 1.8	< 4.0	< 1.8	< 4.1
Cs-137	< 3.2	< 2.4	< 2.0	< 3.3	< 2.5	< 3.5
Ba-140	< 11.5	< 12.6	< 15.6	< 25.8	< 11.6	< 19.5
La-140	< 1.8	< 3.2	< 2.8	< 3.0	< 2.5	< 3.0

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Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-50

Lab Code	DSW- 293	DSW- 640	DSW- 1055	DSW- 2133	DSW- 2723	DSW- 3891
Date Collected	01-19-11	02-15-11	03-11-11	04-13-11	05-04-11	06-17-11
H-3	< 163	< 145	< 153	< 141	< 143	< 148
Mn-54	< 2.6	< 3.1	< 2.7	< 2.3	< 3.4	< 1.6
Fe-59	< 4.7	< 4.4	< 3.7	< 4.7	< 5.0	< 3.9
Co-58	< 2.3	< 1.9	< 2.5	< 2.0	< 3.3	< 2.0
Co-60	< 2.6	< 2.7	< 2.4	< 2.2	< 2.3	< 1.4
Zn-65	< 3.0	< 7.2	< 5.3	< 2.3	< 2.9	< 4.1
Nb-95	< 3.2	< 3.3	< 3.7	< 2.0	< 3.2	< 2.2
Zr-95	< 5.5	< 6.3	< 4.4	< 3.1	< 7.6	< 5.3
I-131	< 4.0	< 8.1	< 2.8	< 6.3	< 7.4	< 5.4
Cs-134	< 2.4	< 2.4	< 2.0	< 2.1	< 4.4	< 2.0
Cs-137	< 2.8	< 3.0	< 2.4	< 3.3	< 3.7	< 3.3
Ba-140	< 13.8	< 19.1	< 10.8	< 13.9	< 15.7	< 14.2
La-140	< 3.1	< 4.2	< 1.4	< 1.7	< 5.3	< 1.9

Lab Code	DSW- 4342	DSW- 5289	DSW- 6074	DSW- 6806	DSW- 7831	DSW- 8566
Date Collected	07-08-11	08-02-11	09-07-11	10-05-11	11-04-11	12-09-11
H-3	< 139	< 149	< 145	< 145	< 148	< 147
Mn-54	< 3.5	< 2.0	< 2.5	< 2.0	< 3.6	< 3.2
Fe-59	< 4.1	< 6.5	< 4.5	< 3.8	< 3.6	< 4.5
Co-58	< 3.2	< 1.3	< 1.7	< 2.2	< 1.4	< 2.5
Co-60	< 1.4	< 2.6	< 2.4	< 2.4	< 3.3	< 0.9
Zn-65	< 5.0	< 4.6	< 2.5	< 5.6	< 7.3	< 2.7
Nb-95	< 3.2	< 3.2	< 3.3	< 3.2	< 3.5	< 3.6
Zr-95	< 3.8	< 5.5	< 5.1	< 2.4	< 4.5	< 4.4
I-131	< 4.1	< 6.7	< 6.4	< 6.6	< 5.4	< 3.6
Cs-134	< 3.4	< 2.8	< 2.4	< 2.4	< 2.5	< 2.8
Cs-137	< 3.7	< 1.9	< 2.7	< 3.9	< 2.4	< 3.2
Ba-140	< 18.6	< 17.9	< 11.8	< 13.5	< 13.9	< 9.1
La-140	< 3.2	< 2.5	< 2.7	< 3.5	< 1.6	< 1.2

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Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-51

Lab Code	DSW- 294	DSW- 641	DSW- 1056	DSW- 2134	DSW- 2724	DSW- 3892
Date Collected	01-18-11	02-15-11	03-11-11	04-13-11	05-04-11	06-17-11
H-3	< 163	< 145	< 153	< 141	< 143	< 148
Mn-54	< 2.6	< 1.8	< 2.0	< 2.5	< 5.0	< 1.7
Fe-59	< 3.8	< 5.0	< 4.4	< 2.0	< 7.6	< 4.6
Co-58	< 2.6	< 1.7	< 2.6	< 3.3	< 3.1	< 2.4
Co-60	< 3.3	< 1.7	< 1.0	< 1.7	< 5.5	< 1.4
Zn-65	< 6.0	< 4.5	< 3.1	< 3.6	< 7.9	< 3.5
Nb-95	< 1.9	< 3.0	< 2.5	< 2.0	< 3.7	< 2.6
Zr-95	< 3.9	< 5.4	< 4.9	< 3.7	< 6.9	< 2.6
I-131	< 4.0	< 6.1	< 3.5	< 5.8	< 11.6	< 3.9
Cs-134	< 2.0	< 2.4	< 2.1	< 2.1	< 5.0	< 2.0
Cs-137	< 2.8	< 3.4	< 2.5	< 2.4	< 4.4	< 3.1
Ba-140	< 19.4	< 15.6	< 9.5	< 11.2	< 20.4	< 14.4
La-140	< 4.2	< 2.9	< 1.3	< 4.2	< 6.6	< 2.5
Lab Code	DSW- 4343	DSW- 5290	DSW- 6075	DSW- 6807	DSW- 7832	DSW- 8567
Date Collected	07-08-11	08-02-11	09-07-11	10-05-11	11-04-11	12-09-11
H-3	< 139	< 149	< 145	< 145	< 148	< 147
Mn-54	< 2.1	< 3.0	< 2.7	< 3.1	< 2.2	< 4.6
Fe-59	< 2.5	< 4.0	< 3.2	< 3.0	< 6.3	< 8.6
Co-58	< 1.8	< 2.7	< 2.5	< 1.1	< 2.0	< 2.5
Co-60	< 1.6	< 3.5	< 1.9	< 2.1	< 2.7	< 5.6
Zn-65	< 4.9	< 4.8	< 3.5	< 2.5	< 5.2	< 7.6
Nb-95	< 3.6	< 2.4	< 2.7	< 3.7	< 2.2	< 3.9
Zr-95	< 5.7	< 5.9	< 2.9	< 4.4	< 3.5	< 6.7
I-131	< 5.5	< 6.7	< 5.3	< 4.0	< 4.8	< 6.5
Cs-134	< 2.7	< 2.9	< 2.6	< 2.3	< 2.4	< 4.5
Cs-137	< 3.7	< 3.8	< 2.8	< 3.3	< 1.8	< 3.0
Ba-140	< 17.3	< 13.1	< 14.8	< 15.7	< 9.6	< 26.4
La-140	< 5.1	< 2.7	< 3.0	< 1.5	< 2.7	< 2.2

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Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-61

Lab Code	DSW- 295	DSW- 642	DSW- 1057	DSW- 2135	DSW- 2725	DSW- 3893
Date Collected	01-18-11	02-15-11	03-11-11	04-13-11	05-04-11	06-17-11
H-3	< 163	< 145	< 153	< 141	< 143	< 148
I-131(Chemistry)	< 0.2	< 0.4	< 0.4	< 0.3	< 0.3	< 0.3
Mn-54	< 1.8	< 2.5	< 2.5	< 2.2	< 4.4	< 2.3
Fe-59	< 3.7	< 3.8	< 6.6	< 1.8	< 6.3	< 3.2
Co-58	< 1.1	< 1.2	< 2.7	< 1.7	< 3.3	< 1.7
Co-60	< 1.9	< 2.5	< 3.2	< 1.9	< 2.2	< 2.9
Zn-65	< 3.2	< 2.7	< 4.5	< 1.8	< 4.6	< 2.1
Nb-95	< 2.4	< 1.6	< 4.0	< 3.4	< 4.0	< 3.2
Zr-95	< 4.0	< 3.5	< 4.9	< 4.6	< 3.3	< 4.4
I-131	< 3.2	< 6.1	< 3.9	< 5.9	< 5.2	< 5.3
Cs-134	< 2.6	< 3.0	< 3.0	< 2.3	< 3.6	< 2.4
Cs-137	< 2.8	< 3.4	< 2.5	< 1.8	< 3.2	< 2.8
Ba-140	< 10.5	< 13.4	< 19.7	< 14.0	< 21.4	< 11.9
La-140	< 2.4	< 2.6	< 2.2	< 1.7	< 3.9	< 1.9
Lab Code	DSW- 4344	DSW- 5291	DSW- 6076	DSW- 6808	DSW- 7833	DSW- 8568
Date Collected	07-08-11	08-02-11	09-07-11	10-05-11	11-04-11	12-09-11
H-3	< 139	< 149	< 145	< 145	< 148	< 147
I-131(Chemistry)	< 0.2	< 0.3	< 0.4	< 0.3	< 0.3	< 0.3
Mn-54	< 3.5	< 1.5	< 2.9	< 2.4	< 2.0	< 3.5
Fe-59	< 4.9	< 4.5	< 4.6	< 3.8	< 3.8	< 5.9
Co-58	< 3.2	< 1.6	< 2.9	< 2.1	< 2.1	< 1.6
Co-60	< 2.1	< 2.1	< 2.3	< 2.5	< 1.9	< 5.7
Zn-65	< 3.5	< 3.0	< 1.9	< 3.7	< 4.4	< 4.9
Nb-95	< 3.4	< 1.6	< 2.8	< 3.1	< 2.3	< 5.9
Zr-95	< 3.3	< 3.2	< 3.9	< 3.4	< 3.7	< 9.1
I-131	< 5.4	< 3.1	< 4.1	< 5.4	< 2.7	< 6.9
Cs-134	< 2.9	< 2.4	< 2.9	< 2.6	< 1.8	< 3.9
Cs-137	< 3.5	< 2.2	< 3.0	< 2.1	< 3.0	< 5.7
Ba-140	< 15.9	< 8.8	< 9.3	< 12.4	< 10.7	< 18.5
La-140	< 1.5	< 2.3	< 2.4	< 4.5	< 1.4	< 3.7

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Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-99

Lab Code	ND ^a	DSW- 643	DSW- 1058	DSW- 2136	DSW- 2726	DSW- 3894
Date Collected	01-18-11	02-15-11	03-11-11	04-13-11	05-04-11	06-17-11
H-3	-	< 145	< 153	< 141	< 143	< 148
Mn-54	-	< 2.8	< 2.1	< 2.1	< 5.5	< 1.6
Fe-59	-	< 5.6	< 3.2	< 3.1	< 5.5	< 4.2
Co-58	-	< 2.1	< 2.3	< 1.8	< 3.2	< 2.5
Co-60	-	< 2.7	< 1.3	< 2.9	< 5.8	< 2.0
Zn-65	-	< 1.7	< 4.1	< 2.6	< 8.2	< 4.9
Nb-95	-	< 2.3	< 3.1	< 3.1	< 3.3	< 2.9
Zr-95	-	< 6.8	< 4.0	< 2.3	< 7.1	< 4.8
I-131	-	< 6.0	< 3.4	< 4.8	< 6.7	< 5.8
Cs-134	-	< 1.9	< 2.1	< 1.9	< 5.1	< 2.0
Cs-137	-	< 2.2	< 3.5	< 3.0	< 6.4	< 3.4
Ba-140	-	< 17.5	< 9.3	< 17.8	< 14.4	< 15.4
La-140	-	< 2.3	< 2.2	< 4.0	< 6.2	< 2.9

Lab Code	DSW- 4345	DSW- 5292	DSW- 6077	DSW- 6809	DSW- 7834	DSW- 8569
Date Collected	07-08-11	08-03-11	09-07-11	10-05-11	11-04-11	12-09-11
H-3	< 139	< 149	< 145	< 145	< 148	< 147
Mn-54	< 3.8	< 2.1	< 2.9	< 2.2	< 4.3	< 2.9
Fe-59	< 6.3	< 5.5	< 5.7	< 4.3	< 6.2	< 6.2
Co-58	< 4.7	< 1.4	< 1.1	< 2.3	< 3.2	< 1.9
Co-60	< 2.4	< 0.9	< 1.8	< 2.0	< 4.2	< 2.1
Zn-65	< 7.8	< 4.2	< 3.9	< 2.8	< 11.7	< 4.2
Nb-95	< 3.8	< 3.2	< 2.5	< 3.7	< 9.6	< 4.9
Zr-95	< 6.6	< 3.9	< 3.7	< 3.4	< 7.9	< 3.4
I-131	< 8.5	< 6.1	< 4.7	< 5.5	< 6.1	< 5.8
Cs-134	< 4.3	< 2.5	< 2.8	< 2.9	< 3.9	< 2.9
Cs-137	< 4.1	< 2.0	< 3.4	< 3.2	< 3.8	< 4.1
Ba-140	< 16.4	< 15.1	< 17.5	< 14.0	< 19.3	< 15.3
La-140	< 3.7	< 1.7	< 3.8	< 1.7	< 4.6	< 3.1

^a ND = No data; see Table 2.0, Listing of Missed Samples.

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Table 17. Surface water, analysis for strontium.
Collection: Quarterly composites of monthly samples.
Units: pCi/L

Location		D-49			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	
Lab Code	DSW-1144	DSW-3903	DSW-6275	DSW-8681	
Sr-89	< 0.58	< 0.60	< 0.73	< 0.79	
Sr-90	< 0.51	< 0.48	< 0.53	< 0.44	

Location		D-61			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	
Lab Code	DSW-1145	DSW-3904	DSW-6276	DSW-8682	
Sr-89	< 0.67	< 0.62	< 0.75	< 0.72	
Sr-90	< 0.56	< 0.54	< 0.50	< 0.40	

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Table 18. Fish, analyses of edible portion for gamma-emitting isotopes.

Collection: Semiannually

Units: pCi/g wet

Location		Upstream, D-49			
Lab Code	DF- 3219	DF- 3220	DF- 5977	DF- 5978	
Date Collected	05-23-11	05-23-11	08-26-11	08-26-11	
Sample Type	Cyprinus Carpio	Carpoides Spp.	Cyprinus Carpio	Moxostoma Sp.	
K-40	3.64 ± 0.40	3.34 ± 0.42	2.90 ± 0.36	3.48 ± 0.40	
Mn-54	< 0.014	< 0.014	< 0.009	< 0.014	
Fe-59	< 0.017	< 0.027	< 0.033	< 0.029	
Co-58	< 0.008	< 0.009	< 0.007	< 0.016	
Co-60	< 0.009	< 0.012	< 0.012	< 0.011	
Zn-65	< 0.021	< 0.013	< 0.010	< 0.015	
Nb-95	< 0.012	< 0.014	< 0.020	< 0.025	
Zr-95	< 0.016	< 0.032	< 0.019	< 0.031	
Ru-103	< 0.011	< 0.019	< 0.016	< 0.017	
Ru-106	< 0.099	< 0.100	< 0.102	< 0.071	
Cs-134	< 0.011	< 0.009	< 0.012	< 0.012	
Cs-137	< 0.013	< 0.006	< 0.011	< 0.013	
Ce-141	< 0.014	< 0.027	< 0.028	< 0.026	
Ce-144	< 0.076	< 0.067	< 0.087	< 0.081	

Location		Downstream, D-61			
Lab Code	DF- 3221	DF- 3223	DF- 5979	DF- 5980	
Date Collected	05-23-11	05-23-11	08-26-11	08-26-11	
Sample Type	Cyprinus Carpio	Carpoides Spp.	Cyprinus Carpio	Moxostoma Sp.	
K-40	2.73 ± 0.39	3.76 ± 0.43	3.06 ± 0.35	3.31 ± 0.38	
Mn-54	< 0.013	< 0.015	< 0.007	< 0.012	
Fe-59	< 0.023	< 0.018	< 0.025	< 0.040	
Co-58	< 0.007	< 0.010	< 0.007	< 0.012	
Co-60	< 0.010	< 0.012	< 0.008	< 0.012	
Zn-65	< 0.011	< 0.017	< 0.007	< 0.017	
Nb-95	< 0.013	< 0.005	< 0.016	< 0.018	
Zr-95	< 0.022	< 0.017	< 0.033	< 0.023	
Ru-103	< 0.007	< 0.017	< 0.014	< 0.010	
Ru-106	< 0.094	< 0.088	< 0.086	< 0.089	
Cs-134	< 0.009	< 0.017	< 0.005	< 0.011	
Cs-137	< 0.014	< 0.007	< 0.013	< 0.012	
Ce-141	< 0.017	< 0.025	< 0.031	< 0.023	
Ce-144	< 0.077	< 0.052	< 0.093	< 0.053	

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Table 19. River sediment, analysis for gamma-emitting isotopes.

Collection: Semiannually

Units: pCi/g dry

Location	D-50 (Plant Intake, Control)	
Lab Code	DBS- 3895	DBS- 8031
Date Collected	06-17-11	11-11-11
K-40	10.74 ± 0.74	7.66 ± 0.47
Mn-54	< 0.024	< 0.014
Fe-59	< 0.042	< 0.047
Co-58	< 0.026	< 0.015
Co-60	< 0.018	< 0.012
Zn-65	< 0.048	< 0.039
Nb-95	< 0.020	< 0.019
Zr-95	< 0.050	< 0.029
Ru-103	< 0.025	< 0.019
Ru-106	< 0.18	< 0.10
Cs-134	< 0.022	< 0.011
Cs-137	0.10 ± 0.037	< 0.012
Ce-141	< 0.072	< 0.046
Ce-144	< 0.19	< 0.10

Location	D-51 (Discharge)	
Lab Code	DBS- 3896	DBS- 8032
Date Collected	06-17-11	11-11-11
K-40	9.36 ± 0.63	7.51 ± 0.47
Mn-54	< 0.018	< 0.018
Fe-59	< 0.045	< 0.029
Co-58	< 0.021	< 0.016
Co-60	< 0.009	< 0.012
Zn-65	< 0.035	< 0.035
Nb-95	< 0.028	< 0.026
Zr-95	< 0.034	< 0.041
Ru-103	< 0.019	< 0.016
Ru-106	< 0.10	< 0.15
Cs-134	< 0.018	< 0.011
Cs-137	0.044 ± 0.022	< 0.016
Ce-141	< 0.053	< 0.047
Ce-144	< 0.14	< 0.11

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Table 19. River sediment, analysis for gamma-emitting isotopes.

Collection: Semiannually

Units: pCi/g dry

Location	D-107A (North Drainage Ditch)	
Lab Code	DBS- 3897	DBS- 8033
Date Collected	06-17-11	11-11-11
K-40	5.43 ± 0.41	9.27 ± 0.54
Mn-54	< 0.015	< 0.021
Fe-59	< 0.024	< 0.044
Co-58	< 0.014	< 0.019
Co-60	< 0.008	< 0.011
Zn-65	< 0.026	< 0.056
Nb-95	< 0.018	< 0.038
Zr-95	< 0.023	< 0.045
Ru-103	< 0.014	< 0.021
Ru-106	< 0.093	< 0.17
Cs-134	< 0.010	< 0.016
Cs-137	< 0.012	0.030 ± 0.016
Ce-141	< 0.039	< 0.061
Ce-144	< 0.083	< 0.15

DUANE ARNOLD

Table 20.1 Precipitation, monthly collections, analyses for gamma emitting isotopes.

Units: pCi/L
Location: DAEC

Date Collected	01-20-11	02-24-11	03-10-11	04-28-11	05-16-11	06-23-11
Lab Code	DP- 299	DP- 741	DP- 1059	DP- 2728	DP- 3061	DP- 4087
Mn-54	< 3.4	< 5.6	< 5.0	< 2.1	< 3.3	< 1.7
Fe-59	< 6.6	< 9.4	< 12.3	< 3.1	< 4.9	< 3.6
Co-58	< 3.5	< 5.8	< 6.3	< 2.6	< 2.6	< 1.4
Co-60	< 3.6	< 6.9	< 6.7	< 1.9	< 2.3	< 1.7
Zn-65	< 7.5	< 10.8	< 11.0	< 3.5	< 4.7	< 2.3
Nb-95	< 3.9	< 7.0	< 6.0	< 2.6	< 3.5	< 2.8
Zr-95	< 7.7	< 9.3	< 10.5	< 4.1	< 4.5	< 4.4
I-131	< 7.6	< 9.6	< 11.6	< 10.8	< 4.1	< 5.4
Cs-134	< 3.4	< 5.9	< 4.2	< 2.4	< 2.1	< 2.3
Cs-137	< 4.5	< 7.0	< 5.4	< 3.0	< 2.6	< 2.6
Ba-140	< 13.8	< 29.7	< 25.1	< 13.4	< 12.8	< 21.7
La-140	< 3.5	< 10.0	< 4.7	< 5.0	< 1.9	< 4.4

Date Collected	07-19-11	08-23-11	09-19-11	10-19-11	11-23-11	12-20-11
Lab Code	DP- 4761	DP- 5756	DP- 6384	DP- 7323	DP- 8290	DP- 8927
Mn-54	< 7.5	< 1.5	< 3.3	< 2.8	< 3.6	< 4.8
Fe-59	< 13.2	< 5.6	< 4.8	< 7.0	< 7.4	< 8.9
Co-58	< 7.6	< 2.3	< 2.6	< 2.0	< 2.4	< 3.9
Co-60	< 6.9	< 2.2	< 3.1	< 3.0	< 4.6	< 5.9
Zn-65	< 11.8	< 2.9	< 6.1	< 4.1	< 6.7	< 8.0
Nb-95	< 8.8	< 2.1	< 2.3	< 2.9	< 5.4	< 3.9
Zr-95	< 12.9	< 4.6	< 7.3	< 3.7	< 7.6	< 12.0
I-131	< 15.4 ^a	< 2.9	< 4.1	< 4.8	< 7.3	< 9.0
Cs-134	< 7.5	< 2.6	< 2.1	< 3.0	< 3.5	< 5.5
Cs-137	< 7.5	< 3.6	< 2.4	< 3.3	< 5.0	< 6.1
Ba-140	< 54.3	< 11.9	< 14.7	< 16.2	< 16.7	< 17.4
La-140	< 8.5	< 1.9	< 1.3	< 3.8	< 2.9	< 2.7

Table 20.2. Precipitation, quarterly composites of monthly samples, analysis for tritium.

Units: pCi/L
Location: DAEC

Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DP-1128	DP-4153	DP-6431	DP-9223
H-3	< 157	< 168	< 145	< 145

^a Sample counted for 60,000 seconds; LLD of 15 pCi/L not reached due to small sample size (0.2 L).

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Table 21. Soil, analysis for strontium-90 and gamma-emitting isotopes.

Collection: Annually

Units: pCi/g dry

Location	D-15a	D-16
Lab Code	DSO- 4043	DSO- 4044
Date Collected	06-28-11	06-28-11
Sr-90	0.039 ± 0.019	0.026 ± 0.014
H-3 (pCi/L)	< 150	< 150
K-40	15.08 ± 0.84	9.49 ± 0.60
Mn-54	< 0.032	< 0.017
Fe-59	< 0.033	< 0.034
Co-58	< 0.018	< 0.018
Co-60	< 0.014	< 0.012
Zn-65	< 0.048	< 0.035
Nb-95	< 0.023	< 0.023
Zr-95	< 0.028	< 0.039
Ru-103	< 0.030	< 0.019
Ru-106	< 0.15	< 0.13
Cs-134	< 0.021	< 0.014
Cs-137	0.14 ± 0.039	0.090 ± 0.022
Ce-141	< 0.064	< 0.038
Ce-144	< 0.17	< 0.10

APPENDIX A
SUPPLEMENTAL ANALYSES

Table A-1. Precipitation samples for tritium analysis (GWPP).

Lab Code	Location	Date Collected	H-3 (pCi/L)	Lab Code	Location	Date Collected	H-3 (pCi/L)
DP- 300	D-111	1/19/2011	526 ± 108	DP- 303	D-115	1/19/2011	< 163
DP- 742	D-111	2/23/2011	< 148	DP- 745	D-115	2/23/2011	< 148
DP- 1060	D-111 ^a	3/10/2011	252 ± 104	DP- 1063	D-115	3/10/2011	< 152
DP- 2593	D-111	4/29/2011	186 ± 82	DP- 2597	D-115	4/29/2011	< 80
DP- 3062	D-111 ^c	5/16/2011	1549 ± 128	DP- 3065	D-115	5/16/2011	281 ± 87
DP- 4088	D-111	6/23/2011	< 147	DP- 4092	D-115	6/23/2011	< 147
DP- 4762	D-111	7/18/2011	< 144	DP- 4766	D-115	7/18/2011	< 144
DP- 5757	D-111	8/23/2011	< 146	DP- 5760	D-115	8/23/2011	< 146
DP- 6385	D-111	9/19/2011	< 145	DP- 6389	D-115	9/19/2011	< 145
DP- 7324	D-111	10/19/2011	< 149	DP- 7327	D-115	10/19/2011	< 149
DP- 8291	D-111	11/23/2011	395 ± 95	DP- 8294	D-115	11/23/2011	304 ± 91
DP- 8928	D-111	12/20/2011	< 151	DP- 8932	D-115	12/20/2011	< 151
DP- 301	D-112	1/19/2011	262 ± 97	DP- 304	D-116	1/19/2011	< 163
DP- 743	D-112	2/23/2011	< 148	DP- 746	D-116	2/23/2011	< 148
DP- 1061	D-112 ^b	3/10/2011	437 ± 111	DP- 1064	D-116	3/10/2011	< 153
DP- 2594	D-112	4/29/2011	494 ± 96	DP- 2598	D-116	4/29/2011	< 137
DP- 3064	D-112	5/16/2011	556 ± 97	DP- 3067	D-116	5/16/2011	< 123
DP- 4090	D-112	6/23/2011	220 ± 84	DP- 4093	D-116	6/23/2011	< 147
DP- 4763	D-112	7/18/2011	< 144	DP- 4767	D-116	7/18/2011	< 144
DP- 5758	D-112	8/23/2011	< 146	DP- 5761	D-116	8/23/2011	< 146
DP- 6386	D-112	9/19/2011	< 145	DP- 6390	D-116	9/19/2011	< 145
DP- 7325	D-112	10/19/2011	< 149	DP- 7328	D-116	10/19/2011	< 149
DP- 8292	D-112	11/23/2011	< 146	DP- 8295	D-116	11/23/2011	< 149
DP- 8930	D-112	12/20/2011	< 151	DP- 8933	D-116	12/20/2011	< 151
DP- 1062	D-113	3/10/2011	< 153				
DP- 302	D-114	1/19/2011	< 163				
DP- 744	D-114	2/23/2011	< 148	DP- 741	D-16	2/24/2011	< 152
DP- 2596	D-114	4/29/2011	< 137	DP- 1059	D-16	3/10/2011	< 152
DP- 3063	D-114	5/16/2011	< 123	DP- 3061	D-16 ^d	5/16/2011	559 ± 101
DP- 4091	D-114	6/23/2011	< 147	DP- 4087	D-16	6/23/2011	< 150
DP- 4764	D-114	7/18/2011	< 137	DP- 4761	D-16	7/19/2011	< 149
DP- 5759	D-114	8/23/2011	< 146				
DP- 6388	D-114	9/19/2011	< 145	DP- 6384	D-16	9/19/2011	< 148
DP- 7326	D-114	10/19/2011	< 149	DP- 7323	D-16	10/19/2011	< 147
DP- 8293	D-114	11/23/2011	635 ± 105	DP- 8290	D-16	11/23/2011	< 146
DP- 8931	D-114	12/20/2011	< 151	DP- 8927	D-16	12/20/2011	< 151

^a Analysis was repeated; result of reanalysis: 358 ± 97 pCi/L.

^b Analysis was repeated; result of reanalysis: 499 ± 104 pCi/L.

^c Analysis was repeated; result of reanalysis: 1525 ± 141 pCi/L.

^d Analysis was repeated; result of reanalysis: 591 ± 103 pCi/L.

Table A-2. Composite precipitation samples (GWPP), analysis for gamma emitting isotopes.

	Units (pCi/L)		
Location	January	February	March
Lab Code	DP- 3898	DP- 3899	DP- 3900
Date Collected	1/19/2011	1/19/2011	3/10/2011
Mn-54	< 8.6	< 4.5	< 4.5
Co-58	< 25.3	< 10.0	< 4.6
Co-60	< 5.6	< 4.1	< 3.0
Zn-65	< 14.9	< 8.2	< 9.5
Cs-134	< 4.5	< 3.9	< 3.3
Cs-137	< 5.7	< 4.1	< 3.4
Location	April	May	June
Lab Code	DP- 3901	DP- 3902	DP- 9313
Date Collected	4/29/2011	5/16/2011	6/23/2011
Mn-54	< 1.5	< 5.5	< 1.4
Co-58	< 2.5	< 4.8	< 9.4
Co-60	< 1.5	< 5.1	< 1.0
Zn-65	< 2.8	< 6.7	< 4.5
Cs-134	< 1.7	< 3.6	< 1.1
Cs-137	< 2.7	< 4.4	< 1.3
Location	July ^a	August	September
Lab Code	DP- 9314	DP- 9315	DP- 9316
Date Collected	7/19/2011	8/23/2011	9/19/2011
Mn-54	< 8.4	< 1.7	< 2.7
Co-58	< 48.1	< 7.0	< 7.9
Co-60	< 6.6	< 1.0	< 1.6
Zn-65	< 21.4	< 3.0	< 5.6
Cs-134	< 7.1	< 1.0	< 1.8
Cs-137	< 4.0	< 1.0	< 2.4
Location	October	November	December
Lab Code	DP- 9317	DP- 9318	DP- 9319
Date Collected	10/19/2011	11/23/2011	12/20/2011
Mn-54	< 2.9	< 1.3	< 1.1
Co-58	< 7.3	< 2.3	< 2.3
Co-60	< 1.9	< 1.1	< 1.2
Zn-65	< 4.5	< 2.3	< 2.8
Cs-134	< 1.7	< 0.9	< 1.4
Cs-137	< 2.1	< 1.2	< 1.4

^a Elevated detection limits due to small sample volume (0.25 L).

Table A-3. Ground water (REMP), analyses for gamma emitting isotopes.

		Units (pCi/L)		
Location		D-55	D-55	D-55
Lab Code		DWW- 3649	DWW- 5967	DWW- 8071
Date Collected		6/8/2011	9/2/2011	11/15/2011
Mn-54		< 2.6	< 1.9	< 2.8
Co-58		< 3.2	< 2.1	< 1.9
Co-60		< 2.2	< 1.6	< 2.8
Zn-65		< 4.0	< 3.1	< 4.0
Cs-134		< 3.7	< 2.5	< 2.6
Cs-137		< 3.3	< 2.2	< 2.0
Location		D-58	D-58	D-58
Lab Code		DWW- 1161	DWW- 3651	DWW- 8073
Date Collected		3/11/2011	6/8/2011	11/16/2011
Mn-54		< 2.1	< 1.1	< 1.0
Co-58		< 15.9	< 7.7	< 1.5
Co-60		< 1.2	< 1.0	< 1.1
Zn-65		< 5.2	< 3.8	< 2.4
Cs-134		< 1.3	< 1.3	< 1.1
Cs-137		< 1.1	< 1.4	< 1.0

Table A-4. Ground water (GWPP), analyses for hard to detect isotopes.

	Units (pCi/L)			
Lab Code	DWW- 5947	DWW- 5948	DWW- 6391	DWW- 6392
Date Collected	9/1/2011	9/1/2011	9/19/2011	9/19/2011
Location	MW-08A	MW-08B	MW-08A	MW-08B
Gross Alpha	< 1.3	< 1.0	< 1.4	1.6 ± 0.8
Sr-89	< 0.7	< 0.6	< 0.5	< 0.6
Sr-90	< 0.4	< 0.4	< 0.4	< 0.6
Fe-55	< 768	< 759	< 899	< 894
Ni-63	< 121	< 128	< 96	< 110
Lab Code	DWW- 6794	DWW- 7380	DWW- 7381	DWW- 8288
Date Collected	8/2/2011	10/21/2011	10/21/2011	11/19/2011
Location	MW-08A	MW-08A	MW-08B	MW-12A
Gross Alpha	< 1.3	< 2.2	< 1.5	< 1.0
Sr-89	< 2.0	< 1.7	< 2.3	< 0.6
Sr-90	< 0.5	< 0.5	< 0.7	< 0.6
Fe-55	< 174	< 866	< 935	< 940
Ni-63	< 137	< 121	< 99	< 115
Lab Code	DWW- 9024	DWW- 9025	DWW- 9026	
Date Collected	11/16/2011	12/21/2011	12/21/2011	
Location	MW-08B	MW-12A	MW-08B	
Gross Alpha	< 6.8	14.5 ± 6	< 7.1	
Sr-89	< 13.4	< 9.7	< 7.3	
Sr-90	< 6.6	< 7.9	< 5.8	
Fe-55	< 902	< 885	< 902	
Ni-63	< 93	< 92	< 95	

Table A-5. Surface water (GWPP), analyses for hard to detect isotopes.

	Units (pCi/L)
Lab Code	DXW- 802
Date Collected	2/17/2011
Location	MH-209 (Drainage from electrical vaults)
Sr-89	< 1.2
Sr-90	< 0.9
Fe-55	< 728
Ni-63	< 99

Table A-6. Airborne I-131 activity detected in charcoal cartridges.

Lab Code	Location	Date Collected	I-131 (pCi/m ³)
DCH- 1743	D-03	3/24/2011	0.124 ± 0.024
DCH- 1873	D-03	3/31/2011	0.081 ± 0.027
DCH- 2023	D-03	4/7/2011	0.077 ± 0.021
DCH- 1745	D-05	3/24/2011	0.150 ± 0.029
DCH- 1875	D-05	3/31/2011	0.059 ± 0.033
DCH- 2025	D-05	4/7/2011	0.088 ± 0.023
DCH- 1736	D-06	3/24/2011	0.098 ± 0.021
DCH- 1876	D-06	3/31/2011	0.081 ± 0.027
DCH- 2026	D-06	4/7/2011	0.081 ± 0.022
DCH- 1747	D-07	3/24/2011	0.143 ± 0.033
DCH- 1874	D-07	3/31/2011	0.085 ± 0.031
DCH- 2027	D-07	4/7/2011	0.080 ± 0.024
DCH- 1744	D-11	3/24/2011	0.140 ± 0.028
DCH- 18811	D-11	3/31/2011	0.080 ± 0.023
DCH- 20311	D-11	4/7/2011	0.100 ± 0.036
DCH- 17513	D-13	3/24/2011	0.127 ± 0.028
DCH- 18813	D-13	3/31/2011	0.066 ± 0.024
DCH- 20313	D-13	4/7/2011	0.080 ± 0.028
DCH- 17515	D-15	3/24/2011	0.146 ± 0.028
DCH- 18815	D-15	3/31/2011	0.082 ± 0.026
DCH- 20315	D-15	4/7/2011	0.083 ± 0.027
DCH- 17516	D-16	3/24/2011	0.157 ± 0.037
DCH- 18816	D-16	3/31/2011	0.063 ± 0.019
DCH- 20316	D-16	4/7/2011	0.072 ± 0.018
DCH- 17540	D-40	3/24/2011	0.141 ± 0.038
DCH- 18840	D-40	3/31/2011	0.092 ± 0.025
DCH- 20340	D-40	4/7/2011	0.077 ± 0.022