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Duane Arnold Energy Center
2008 Annual Radiological Environmental Operating Report

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2008

Annual Radiological Environmental
Operating Report

Duane Arnold Energy Center
Cedar Rapids, Iowa
Docket No. 50-331

January 1, 2008 through December 31, 2008

2008 Annual Radiological Environmental Operating Report

Duane Arnold Energy Center

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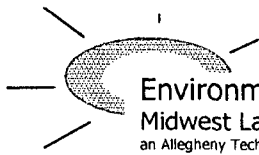
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**DUANE ARNOLD ENERGY CENTER
CEDAR RAPIDS, IOWA
DOCKET NO. 50-331**

REPORT

to the

**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

Annual Radiological Environmental Operating Report

January 1 to December 31, 2008

Prepared by

ENVIRONMENTAL, Inc.
Midwest Laboratory

Project No. 8001

Approved :

Bronia Grob, M.S.
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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, 2008. 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.

Tabulation of the 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 2008 are summarized and discussed.

Program findings show background levels of radioactivity in the environmental samples collected in the vicinity of the Duane Arnold Energy Center. 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

The sampling and analysis schedule for the environmental radiological monitoring program 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 type (indicator or control) and 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 eight locations. Airborne iodine is collected by continuous pumping through charcoal filters. Seven of the eight 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 46 locations. A TLD is placed at each location and is exchanged and analyzed quarterly. The TLD locations are distributed as follows:

- Eight at active air sampling stations.
- Four at de-activated air sampling stations greater than 3 miles from the DAEC stack.
- 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.

Precipitation is collected monthly from one location and analyzed for gamma-emitting isotopes. Quarterly composites are analyzed for tritium.

Milk samples are 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, strawberries 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-94, D-96, D-109 and D-117). Grain, hay, strawberries 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.

Program Description (continued)

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). Non-potable water is collected from six on-site monitoring wells (MW-01 to MW-06). Two wells at each site, shallow (A) and intermediate (B) depths, have been made part of the permanent program. The samples are analyzed for gross beta and tritium. If gross beta activity exceeds ten times the yearly mean of the control samples, gamma isotopic, strontium-89 and strontium-90 analyses are performed.

Soil samples are collected once per year at two indicator locations (D-15a and D-16). The samples are analyzed for strontium-90, tritium and gamma-emitting isotopes.

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 (1/2 mi. downstream of discharge). In addition, Pleasant Lake (D-99) surface water and sewage effluent from location (D-107) is also monitored. 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.

3.3 Program Execution

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

(1) Airborne Particulates / Airborne Iodine:

No air particulate / air iodine samples were available from locations D-15 and D-16 for the weeks ending February 7 and February 14, 2008. The stations were not accessible due to heavy snow accumulation.

No air particulate / air iodine sample was collected from location D-5 for the week ending June 19, 2008, due to severe flooding.

A partial sample (74 m³) was collected from location D-5 for the week ending June 26, 2008, due to power loss.

No air particulate / air iodine samples were collected from location D-16 for the weeks ending June 19, June 26 and July 3, 2008, due to severe flooding.

No air particulate / air iodine sample was collected from location D-7 for the week ending July 23, 2008. There was no power to the sampler station.

A partial sample (156 m³) was collected from location D-3 for the week ending July 31, 2008.

Partial samples were collected from location D-5 for the weeks ending August 7, 2008 (62 m³) and August 14, 2008 (62 m³), due to power loss.

A partial sample (186 m³) was collected from location D-6 for the week ending August 28, 2008, due to power loss.

3.3 Program Execution (continued)

(2) Thermoluminescent Dosimeters:

Second Quarter, 2008: The TLD at location D-10 was lost due to vandalism. TLDs for locations D-18, D-19, D-21 and D-82 were lost in the flooding.

Third Quarter, 2008: TLDs for locations D-18, D-19 and D-36 were missing. Locations D-18 and D-19 could not be reinstalled due to flooding. Location D-36 was lost in the field.

(3) Vegetation:

No vegetable samples were collected at locations D-94 and D-96. No crops were harvested. Strawberries could not be collected at D-117 due to severe flooding in June.

(4) Corrections to the 2007 Annual Report.

a. Accompanying data for soil analyses was not included in the 2007 report. The data is presented below:

Table 21. Soil, analysis for strontium-90 and gamma-emitting isotopes.
Collection: Annually Units: pCi/g dry

Location	D-15	D-16
Lab Code	DSO- 7912	DSO- 7913
Date Collected	11-15-07	11-15-07
Sr-90	0.032 ± 0.017	< 0.030
K-40	16.53 ± 0.82	9.70 ± 0.46
Mn-54	< 0.026	< 0.013
Fe-59	< 0.058	< 0.024
Co-58	< 0.029	< 0.011
Co-60	< 0.018	< 0.005
Zn-65	< 0.052	< 0.025
Nb-95	< 0.025	< 0.011
Zr-95	< 0.027	< 0.030
Ru-103	< 0.027	< 0.006
Ru-106	< 0.181	< 0.049
Cs-134	< 0.019	< 0.009
Cs-137	0.15 ± 0.023	0.095 ± 0.017
Ce-141	< 0.065	< 0.028
Ce-144	< 0.100	< 0.050

b. Strawberries were collected in 2007 at D-117 and analyzed for gamma-emitting isotopes. No gamma-emitting isotopes, with the exception of naturally-occurring potassium-40 could be detected above their respective LLDs.

c. The collection date for vegetation samples, locations D-108 and D-109, should read 09/18/07 instead of 10/02/07 as reported.

3.3 Program Execution (continued)

(4) Corrections to the 2007 Annual Report.

- d. Distance of the Shellsburg sample point, (D-7, Table 5.3) from the site stack should read 5 mi W. instead of 6 mi W.

3.4 Laboratory Procedures

The iodine-131 analyses in milk and water were made using a sensitive radiochemical procedure involving separation of the 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 were performed using high-purity germanium (HPGe) detectors. The gamma isotopic analysis provides a spectrum with an energy range of 80 to 2048 KeV. Specific isotopes included 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 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, 2003). The QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in crosscheck programs are presented in Appendix A.

3.5 Program Modifications

Additional analytical requirements were added to the program in 2008:

Quarterly composites of monthly surface water samples from locations D-49 and D-61 were prepared and analyzed for strontium-89 and strontium-90.

Soil samples from locations D-15a and D-16 were distilled and analyzed for tritium.

A new dairy supplier (D-110) was added to the program in 2008. The farm is located approximately 7.8 miles southwest of the Plant.

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 2008 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

There were no reported atmospheric nuclear tests in 2008.

4.2 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected outside of the Site Protected Area in 2008.

Low concentrations of tritium were identified in some groundwater samples collected within the site Protected Area. In no instances were the REMP threshold reporting levels exceeded. (ODAM, Table 6.3-3)

Airborne Particulates

The average annual gross beta concentrations in airborne particulates were identical at the indicator and control locations (0.029 pCi/m³) and similar to levels observed from 1992 through 2007. 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)		
1993	0.022	0.023		2001	0.026	0.026
1994	0.023	0.024		2002	0.027	0.027
1995	0.025	0.024		2003	0.029	0.029
1996	0.024	0.023		2004	0.028	0.028
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

Average annual gross beta concentrations in airborne particulates.

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 0.081 pCi/m³ for all locations. All other gamma-emitting isotopes were below their respective LLD limits.

Program Findings (continued)

Airborne Iodine

Weekly levels of airborne iodine-131 were below the lower limit of detection (LLD) of 0.03 pCi/m³ in all samples.

Ambient Radiation (TLDs)

At twelve* air sampling locations, the TLD readings averaged 18.0 and 17.8 mR/quarter for indicator and control locations, respectively. At locations within a half mile, one mile and three mile radius of the stack, measurements averaged 19.2 mR/quarter, 19.6 mR/quarter and 17.3 mR/quarter, respectively. The average for all locations was 18.5 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.

* There are currently eight active and four inactive air sampler stations.

Precipitation

Precipitation from the on-site location D-16 was analyzed for tritium and gamma-emitting isotopes. No tritium activity was measured above the LLD of 172 pCi/L. No gamma-emitting isotopes were detected.

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 2008 show no radiological effects of plant operation.

Ground Water (potable)

The annual mean for gross beta activity 3.3 pCi/L, similar to levels observed from 1991 through 2007. The location with the highest mean (3.7pCi/L) was D-58, a farm 1.0 mile distant from the plant.

Tritium activity measured below the LLD of 173 pCi/L in all samples. No effect from plant operation is indicated.

Ground Water (Site Monitoring Wells)

Twelve on-site monitoring wells (six shallow and six intermediate depth) were sampled in 2008 and analyzed for gross beta and tritium.

The annual mean for gross beta activity in six intermediate depth wells measured 2.6 pCi/liter. Measurements for the shallow wells averaged 3.9 pCi/liter. The highest mean (6.0 pCi/L) was observed at shallow well MW-6A. The same pattern of concentration was observed in 2007. The most likely cause of higher beta activity is contribution from naturally-occurring isotopes. No plant effect was indicated.

Tritium activity measured below the LLD of 173 pCi/L in all twenty four samples collected from the intermediate depth wells. Slight activity was identified in three of twenty-four samples taken from the shallow wells. An almost identical pattern of concentrations was observed in 2007, and was attributed to "washout" from gaseous effluents.

Vegetation

Iodine-131 concentrations in broadleaf vegetation were below the LLD level of 0.050 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.

Soil

Strontium-90 activity measured 0.059 pCi/g dry weight in one of the two on-site locations. Cesium-137 activity averaged 0.15 pCi/g dry weight for the two on-site locations. Strontium-90 and cesium-137 activities are similar or less than levels observed from 1991 through 2007, these levels are generally attributable to deposition of fallout from previous decades.

Naturally-occurring potassium-40 averaged 11.91 pCi/g dry weight. No effect from the plant operation is indicated.

The soil samples were distilled and analyzed for tritium. No tritium was detected above an LLD value of 162 pCi/L.

Program Findings (continued)

Surface Water

Surface water was tested for tritium and gamma emitting isotopes in seventy-two samples from six locations.

No measurable tritium activity was detected above an LLD of 179 pCi/L. Gamma-emitting isotopes were below detection limits.

Analyses for strontium-89 and strontium-90 were performed on composite samples from locations D-49 (control) and D-61 (0.5 mi. downstream, indicator). All samples tested below detection limits.

No plant effect on surface water is indicated.

Fish

Fish were collected in June and September, 2008, 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 (2.68 and 2.98 pCi/g wet, respectively). No plant effect on the fish population is indicated.

River Sediments

River sediments were collected in May and October, 2008, and analyzed for gamma-emitting isotopes. Potassium-40 activity ranged from 7.03 – 8.16 pCi/g dry weight and averaged 7.59 pCi/g dry weight.

No Cs-137 activity was detected in sediments in 2008, at either the control or discharge locations. Trace levels of cesium-137 had been consistently observed in past years.

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

5.0 TABLES AND FIGURES

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

Designation	Comment	Isotope	Half-life ^a
I. 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	8.04 d
		Ba-140	12.8 d
B. Other than Short-lived			
		Nb-95	35.15 d
		Zr-95	65 d
		Ru-103	39.35 d
		Ru-106	368.2 d
		Cs-134	2.061 y
		Cs-137	30.174 y
		Ce-141	32.5 d
		Ce-144	284.31 d
III. Activation Products			
Typically found in nuclear power plant effluents			
		Mn-54	312.5 d
		Fe-59	45.0 d
		Co-58	70.78 d
		Co-60	5.26 y
		Zn-65	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 5.2 Sample collection and analysis program.

Exposure Pathway and/or Sample Type	Sampling Location		Sampling and Collection Frequency	Type and Frequency of Analysis ^a
	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			
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			
Ambient Radiation	1-3, 5-8, 10, 11, 13	Air Part. Locations, Controls	One dosimeter continuously at each location.	Read gamma radiation dose quarterly.
	15, 16	Air Part. Locations, Indicators	Dosimeters are changed at least quarterly.	
	17-23, 28-32, 82-86, 91	≤ 0.5 mi. of Stack		
	43-48	≤ 1.0 mi. of Stack		
	33-42	≤ 3.0 mi. of Stack		
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		
107	Plant Sewage Discharge			

(C) Denotes control location. All other locations are indicators.

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

Exposure Pathway and/or Sample Type	Sampling Location		Sampling and Collection Frequency	Type and Frequency of Analysis ^a
	Sample Point	Description		
Ground Water (potable)	53	Treated Municipal Inlet to Municipal Water Treatment System	Grab sample at least once per quarter.	Gross beta and tritium activity analysis on quarterly sample. If gross beta is greater than ten times the yearly mean of control samples, perform gamma isotopic and Sr-89 and Sr-90 analyses.
	54			
	55	On-site well		
	57, 58 72 (C)	Wells off-site and within 4 km of DAEC		
On-site Ground Water (Monitoring Wells)	111	On-site wells: MW-01A, B (SSE) MW-02A, B (ESE) MW-03A, B (NW) MW-04A, B (S) MW-05A, B (SSW) MW-06A, B (NE)		
	112			
	113			
	114			
	115			
	116			
River Sediment	50	Plant Intake (C)	One sample per 6 months (once during January through June and once during July through December).	Gamma isotopic analysis of each sample.
	51	Plant Discharge		
	107a	North Drainage Ditch (on-site)		
Vegetation	16, 57, 58, 72, 94, 96, 109,	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.
	117	(Strawberries)		
	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 ^b	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.	

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

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

Exposure Pathway and/or Sample Type	Sampling Location		Sampling and Collection Frequency	Type and Frequency of Analysis ^a
	Sample Point	Description		
Precipitation	16	On-site	Monthly	Gamma isotopic on all samples. Tritium on quarterly composites.
Meat ^c		On-site	Annually	Gamma Isotopic
Soil	15a, 16	On-site	Annually	Gamma Isotopic, Sr-90 and tritium

^a Gamma isotopic analysis and analysis for gamma-emitting nuclides refer to high resolution gamma ray spectrum analysis. Any radionuclide detected at a concentration greater than the minimum detectable activity (MDA) should be reported quantitatively.

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

^c 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	11 mi SE
D-2	Marion	11 mi ESE
D-3	Hiawatha	7 mi SE
D-5	Palo	3 mi SSW
D-6	Center Point	7 mi N
D-7	Shellsburg	5 mi W
D-8	Urbana	10 mi NNW
D-10	Atkins	9 mi SSW
D-11	Toddville	4 mi E
D-13	Alburnett	9 mi ENE
D-15	On-site, North-Northwest	0.5 mi NNW
D-15a	On-site, North-Northwest	0.4 mi NNW
D-16	On-site, South-Southeast	0.5 mi SSE
D-17	On-site, N	0.5 mi N
D-18	On-site, NNE	0.5 mi NNE
D-19	On-site, NE	0.5 mi NE
D-20	On-site, ENE	0.5 mi ENE
D-21	On-site, ENE	0.5 mi ENE
D-22	On-site, E	0.5 mi E
D-23	On-site, ESE	0.5 mi ESE
D-28	On-site, WSW	0.5 mi WSW
D-29	On-site, W	0.5 mi W
D-30	On-site, WNW	0.5 mi WNW
D-31	On-site, NW	0.5 mi NW
D-32	On-site, NNW	0.5 mi NNW
D-33	3 miles N	3.0 mi N
D-34	3 miles NNE	3.0 mi NNE
D-35	3 miles NE	3.0 mi NE
D-36	3 miles ENE	3.0 mi ENE
D-37	3 miles E	3.0 mi E
D-38	3 miles ESE	3.0 mi ESE
D-39	3 miles SE	3.0 mi SE
D-40	3 miles SSE	3.0 mi SSE
D-41	3 miles S	3.0 mi S
D-42	3 miles SSE	3.0 mi SSE
D-43	1 mile SSW	1.0 mi SSW
D-44	1 mile WSW	1.0 mi WSW
D-45	1 mile W	1.0 mi W

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

Code	Sampling Location	
	Location Description	Distance and Direction from Site Stack
D-46	1 mile WNW	1.0 mi WNW
D-47	1 mile NW	1.0 mi NW
D-48	1 mile NNW	1.0 mi NNW
D-49	Lewis Access, upstream of DAEC	4.0 mi NNW
D-50	Plant Intake	
D-51	Plant Discharge	
D-53	Treated Municipal Water	
D-54	Inlet, Municipal Water Treatment System	
D-55	On-site Well	
D-57	Farm (Off-site Well)	1.0 mi WSW
D-58	Farm (Off-site Well)	1.0 mi WSW-SW
D-61	0.5 mi downstream of plant discharge	
D-72	Farm	2.0 mi SSW
D-82	On-site, SE	0.5 mi SE
D-83	On-site, SSE	0.5 mi SSE
D-84	On-site, S	0.5 mi S
D-85	On-site, SSW	0.5 mi SSW
D-86	On-site, SW	0.5 mi SW
D-91	On-site, NNW	0.5 mi NNW
D-94	Farm	2.7 mi N
D-96	Farm	8.0 mi SSW
D-99	Pleasant Creek Lake	2.5 mi WNW
D-107	Sewage Plant Effluent	On-site
D-107a	North Drainage Ditch	On-site
D-108	Farm	17.3 mi. SW
D-109	Farm	3.6 mi. SW
D-110	Farm	7.8 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-117	Palo Strawberry Farm	2.3 mi. SSW

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-42			TLD		
D-43 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-94					G
D-96					G
D-99		SW			
D-107		SW			
D-107A				BS	
D-108		MI*			G
D-109					G
D-110		MI*			
On-site					ME
D-111 to D-116			WW		
D-117					G

* 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. Missed collections and analyses, Duane Arnold Energy Center.

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
AP / AI	Gross Beta, I-131	D-15 D-16	02-07-08	Not accessible due to heavy snows
AP / AI	Gross Beta, I-131	D-15 D-16	02-14-08	Not accessible due to heavy snows
AP / AI	Gross Beta, I-131	D-5	06-19-08	Not collected due to severe flooding.
AP / AI	Gross Beta, I-131	D-5	06-26-08	Partial sample (74 m ³) due to power loss.
AP / AI	Gross Beta, I-131	D-16 D-16 D-16	06-19-08 06-26-08 07-03-08	Not collected due to severe flooding.
AP / AI	Gross Beta, I-131	D-7	07-23-08	No power to the sampler station.
AP / AI	Gross Beta, I-131	D-3	07-31-08	Partial sample (156 m ³).
AP / AI	Gross Beta, I-131	D-5	08-07-08	Partial sample (62 m ³) due to power loss.
AP / AI	Gross Beta, I-131	D-5	08-14-08	Partial sample (62 m ³) due to power loss.
AP / AI	Gross Beta, I-131	D-6	08-28-08	Partial sample (186 m ³) due to power loss.
TLD	Ambient Gamma	D-10	2nd Qtr, 2008	TLD lost due to vandalism.
TLD	Ambient Gamma	D-18, D-21 D-19, D-82	2nd Qtr, 2008	TLDs lost in the floods.
TLD	Ambient Gamma	D-18, D-19	3rd Qtr, 2008	TLDs not installed due to flooding.
TLD	Ambient Gamma	D-36	3rd Qtr, 2008	TLD lost in the field.
G	Gamma	D-117	July, 2008	No strawberries available.
G	Gamma	D-94, D-96	October, 2008	No crops available.

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

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center Docket No. 50-331
 Location of Facility Linn, Iowa Reporting Period January-December, 2008
 (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		
Airborne Particulates (pCi/m ³)	GB 407	0.004	0.029 (355/355) (0.010-0.064)	D-16, On-site 0.5 mi. SSE	0.031 (47/47) (0.011-0.060)	0.029 (52/52) (0.013-0.057)	0
	GS 32						
	Be-7	0.020	0.081 (28/28) (0.049-0.120)	D-15, On-site 0.5 mi. NW	0.088 (4/4) (0.076-0.120)	0.078 (4/4) (0.060-0.094)	0
	Nb-95	0.0019	< LLD			< LLD	0
	Zr-95	0.0023	< LLD			< LLD	0
	Ru-103	0.0016	< LLD			< LLD	0
	Ru-106	0.0087	< LLD			< LLD	0
	Cs-134	0.0010	< LLD			< LLD	0
	Cs-137	0.0014	< LLD			< LLD	0
	Ce-141	0.0025	< LLD			< LLD	0
Ce-144	0.0058	< LLD			< LLD	0	
Airborne Iodine (pCi/m ³)	I-131 407	0.030	< LLD	-	-	< LLD	0
TLD, AP Locations (mR/quarter)	Gamma 47	1.0	18.0 (8/8) (15.1-19.7)	D-8, Urbana 10 mi. NW	21.0 (4/4) (17.3-24.2)	17.8 (39/39) (13.7-24.2)	0
TLD, within 0.5 mi. of Stack (mR/quarter)	Gamma 66	1.0	19.2 (66/66) (13.7-27.3)	D-29, On-site 0.5 mi. W	23.2 (4/4) (18.1-28.0)	None	0
TLD, within 1.0 mi. of Stack (mR/quarter)	Gamma 24	1.0	19.6 (24/24) (14.2-24.2)	D-48, 1 mi. NW	21.6 (4/4) (17.7-24.2)	None	0
TLD, within 3.0 mi. of Stack (mR/quarter)	Gamma 39	1.0	17.3 (39/39) (14.1-25.2)	D-37, 3 mi. E	21.5 (4/4) (19.0-25.2)	None	0
Precipitation (pCi/L)	H-3 4	172	< LLD	-	-	< LLD	0
	GS 12						
	Mn-54	5.6	< LLD	-	-	< LLD	0
	Fe-59	11.0	< LLD	-	-	< LLD	0
	Co-58	4.9	< LLD	-	-	< LLD	0
	Co-60	6.5	< LLD	-	-	< LLD	0
	Zn-65	9.3	< LLD	-	-	< LLD	0
	Nb-95	6.9	< LLD	-	-	< LLD	0
	Zr-95	10.3	< LLD	-	-	< LLD	0
	I-131	15.5	< LLD	-	-	< LLD	0
	Cs-134	5.1	< LLD	-	-	< LLD	0
	Cs-137	6.5	< LLD	-	-	< LLD	0
	Ba-140	41.5	< LLD	-	-	< LLD	0
La-140	7.3	< LLD	-	-	< LLD	0	

Table 5.7 Radiological Environmental 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, 2008</u>
	(County, State)		

Sample Type (Units)	Type and Number of Analyses ^a		LLD ^b	Indicator Locations Mean (F) ^d Range ^c	Location with Highest Annual Mean		Control Locations Mean (F) ^e Range ^c	Number Non-Routine Results ^e
					Location ^a	Mean (F) ^d Range ^c		
Milk (pCi/L)	I-131	36	0.5	< LLD	-	-	< LLD	0
	GS	36						
	K-40		100	1392 (18/18) (1309-1510)	D-108, Farm 17.3 mi. SW	1401 (18/18) (980-1587)	1401 (18/18) (980-1587)	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
Ground Water, potable (pCi/L)	GB	24	1.8	3.3 (9/20) (2.1-4.8)	D-58, Farm 1 mi. WSW-SW	3.7 (4/4) (2.7-4.8)	< LLD	0
	H-3	24	173	< LLD	-	-	< LLD	0
Monitoring wells (pCi/L)	GB	48	1.9	3.7 (20/48) (2.0-8.7)	MW-6A, shallow Onsite, NE	6.0 (4/4) (3.2-8.7)	None	0
	H-3	48	173	291 (3/48) (194-433)	MW-6A, shallow Onsite, NE	340 (2/4) (246-433)	None	0
Broadleaf Vegetation (pCi/g wet)	I-131	4	0.050	< LLD	-	-	< LLD	0
	GS	4						
	K-40		0.5	3.62 (3/3) (2.78-4.26)	D-108, Farm 17.3 mi. SW	4.96 (1/1)	4.96 (1/1)	0
	Mn-54		0.025	< LLD	-	-	< LLD	0
	Co-58		0.036	< LLD	-	-	< LLD	0
	Co-60		0.019	< LLD	-	-	< LLD	0
	Nb-95		0.031	< LLD	-	-	< LLD	0
	Zr-95		0.029	< LLD	-	-	< LLD	0
	Ru-103		0.027	< LLD	-	-	< LLD	0
	Ru-106		0.26	< LLD	-	-	< LLD	0
	Cs-134		0.050	< LLD	-	-	< LLD	0
	Cs-137		0.024	< LLD	-	-	< LLD	0
	Ce-141		0.043	< LLD	-	-	< LLD	0
	Ce-144		0.10	< LLD	-	-	< LLD	0

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center Docket No. 50-331
 Location of Facility Linn, Iowa Reporting Period January-December, 2008
 (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 ^a	Mean (F) ^c Range ^c		
Vegetation (Grain) (pCi/g wet)	GS 8						
	K-40	0.5	7.76 (6/6) (1.99-17.48)	D-108, Farm 17.3 mi. SW	15.21 (2/2) (2.67-27.75)	15.21 (2/2) (2.67-27.75)	0
	Mn-54	0.025	< LLD	-	-	< LLD	0
	Co-58	0.022	< LLD	-	-	< LLD	0
	Co-60	0.025	< LLD	-	-	< LLD	0
	Nb-95	0.036	< LLD	-	-	< LLD	0
	Zr-95	0.042	< LLD	-	-	< LLD	0
	Ru-103	0.030	< LLD	-	-	< LLD	0
	Ru-106	0.22	< LLD	-	-	< LLD	0
	Cs-134	0.026	< LLD	-	-	< LLD	0
	Cs-137	0.025	< LLD	-	-	< LLD	0
	Ce-141	0.051	< LLD	-	-	< LLD	0
	Ce-144	0.18	< LLD	-	-	< LLD	0
Soil (pCi/gwet)	Sr-90 2	0.016	0.059 (1/2)	D-15, On-site 0.5 mi. NW	0.059 (1/1)	None	0
	GS 2						
	K-40	0.5	11.91 (2/2) (9.02-14.80)	D-15, On-site 0.5 mi. NW	14.80 (1/1)	None	0
	Mn-54	11.91	< LLD	-	-	None	0
	Fe-59	0.028	< LLD	-	-	None	0
	Co-58	0.044	< LLD	-	-	None	0
	Co-60	0.019	< LLD	-	-	None	0
	Zn-65	0.015	< LLD	-	-	None	0
	Nb-95	0.052	< LLD	-	-	None	0
	Zr-95	0.022	< LLD	-	-	None	0
	Ru-103	0.045	< LLD	-	-	None	0
	Ru-106	0.030	< LLD	-	-	None	0
	Cs-134	0.22	< LLD	-	-	None	0
	Cs-137	0.060	0.15 (2/2) (0.14-0.16)	D-16, On-site 0.5 mi. SSE	0.16 (1/1)	None	0
	Ce-141	0.15	< LLD	-	-	None	0
Ce-144	0.061	< LLD	-	-	None	0	

Table 5.7 Radiological Environmental 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, 2008</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			
Surface Water (pCi/L)	H-3	72	179	< LLD	-	-	< LLD	0
	I-131	24	0.6	< LLD	-	-	< LLD	0
	GS	72						
	Mn-54		6.0	< LLD	-	-	< LLD	0
	Fe-59		9.5	< LLD	-	-	< LLD	0
	Co-58		6.6	< LLD	-	-	< LLD	0
	Co-60		6.4	< LLD	-	-	< LLD	0
	Zn-65		12.2	< LLD	-	-	< LLD	0
	Nb-95		5.8	< LLD	-	-	< LLD	0
	Zr-95		11.6	< LLD	-	-	< LLD	0
	I-131		12.5	< LLD	-	-	< LLD	0
	Cs-134		5.7	< LLD	-	-	< LLD	0
	Cs-137		5.6	< LLD	-	-	< LLD	0
	Ba-140		28.3	< LLD	-	-	< LLD	0
	La-140		6.1	< LLD	-	-	< LLD	0
Sediments (pCi/g dry)	GS	6						
	K-40		1.0	7.68 (4/4) (7.03-8.16)	D-51, Plant Discharge	8.06 (2/2) (7.97-8.16)	7.42 (2/2) (7.40-7.44)	0
	Mn-54		0.017	< LLD	-	-	< LLD	0
	Fe-59		0.078	< LLD	-	-	< LLD	0
	Co-58		0.022	< LLD	-	-	< LLD	0
	Co-60		0.015	< LLD	-	-	< LLD	0
	Zn-65		0.059	< LLD	-	-	< LLD	0
	Nb-95		0.035	< LLD	-	-	< LLD	0
	Zr-95		0.032	< LLD	-	-	< LLD	0
	Ru-103		0.029	< LLD	-	-	< LLD	0
	Ru-106		0.15	< LLD	-	-	< LLD	0
	Cs-134		0.020	< LLD	-	-	< LLD	0
	Cs-137		0.018	< LLD	-	-	< LLD	0
	Ce-141		0.057	< LLD	-	-	< LLD	0
	Ce-144		0.10	< LLD	-	-	< LLD	0

Table 5.7 Radiological Environmental Program Summary.

Name of Facility Duane Arnold Energy Center Docket No. 50-331
 Location of Facility Linn, Iowa Reporting Period January-December, 2008
 (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 ^d
				Location ^e	Mean (F) ^c Range ^c		
Fish (pCi/g wet)	GS 8	1.0	2.68 (4/4) (1.18-3.61)	D-49, Upstream	2.98 (4/4) (2.57-3.34)	2.98 (4/4) (2.57-3.34)	0
	Mn-54	0.014	< LLD	-	-	< LLD	0
	Fe-59	0.040	< LLD	-	-	< LLD	0
	Co-58	0.012	< LLD	-	-	< LLD	0
	Co-60	0.014	< LLD	-	-	< LLD	0
	Zn-65	0.024	< LLD	-	-	< LLD	0
	Nb-95	0.023	< LLD	-	-	< LLD	0
	Zr-95	0.027	< LLD	-	-	< LLD	0
	Ru-103	0.025	< LLD	-	-	< LLD	0
	Ru-106	0.14	< LLD	-	-	< LLD	0
	Cs-134	0.011	< LLD	-	-	< LLD	0
	Cs-137	0.010	< LLD	-	-	< LLD	0
	Ce-141	0.042	< LLD	-	-	< LLD	0
	Ce-144	0.097	< LLD	-	-	< LLD	0

^a GB = Gross beta; GS = Gamma spectroscopy

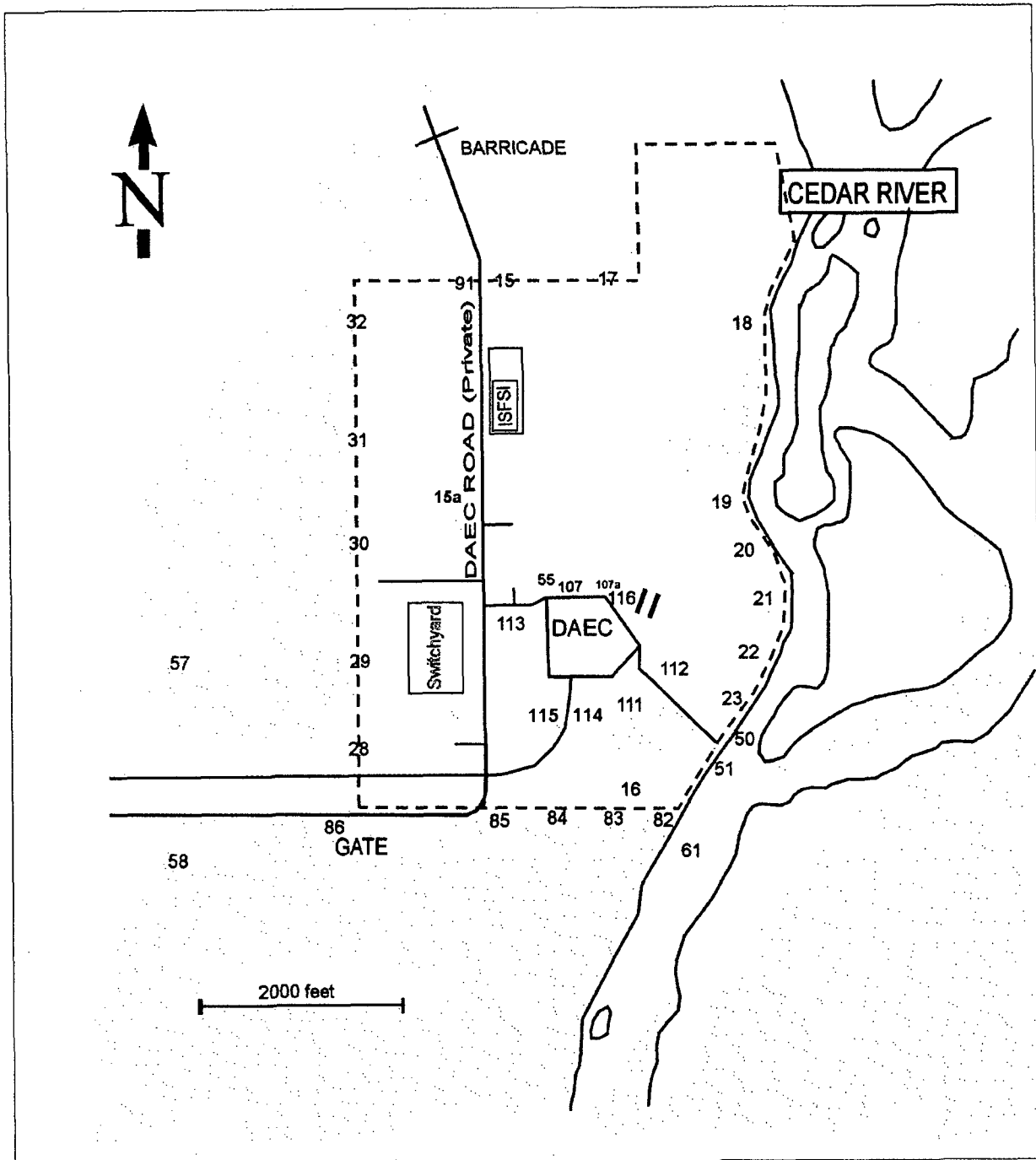
^b LLD = Nominal lower limit of detection based on 4.66 sigma counting error for the background sample.

^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.

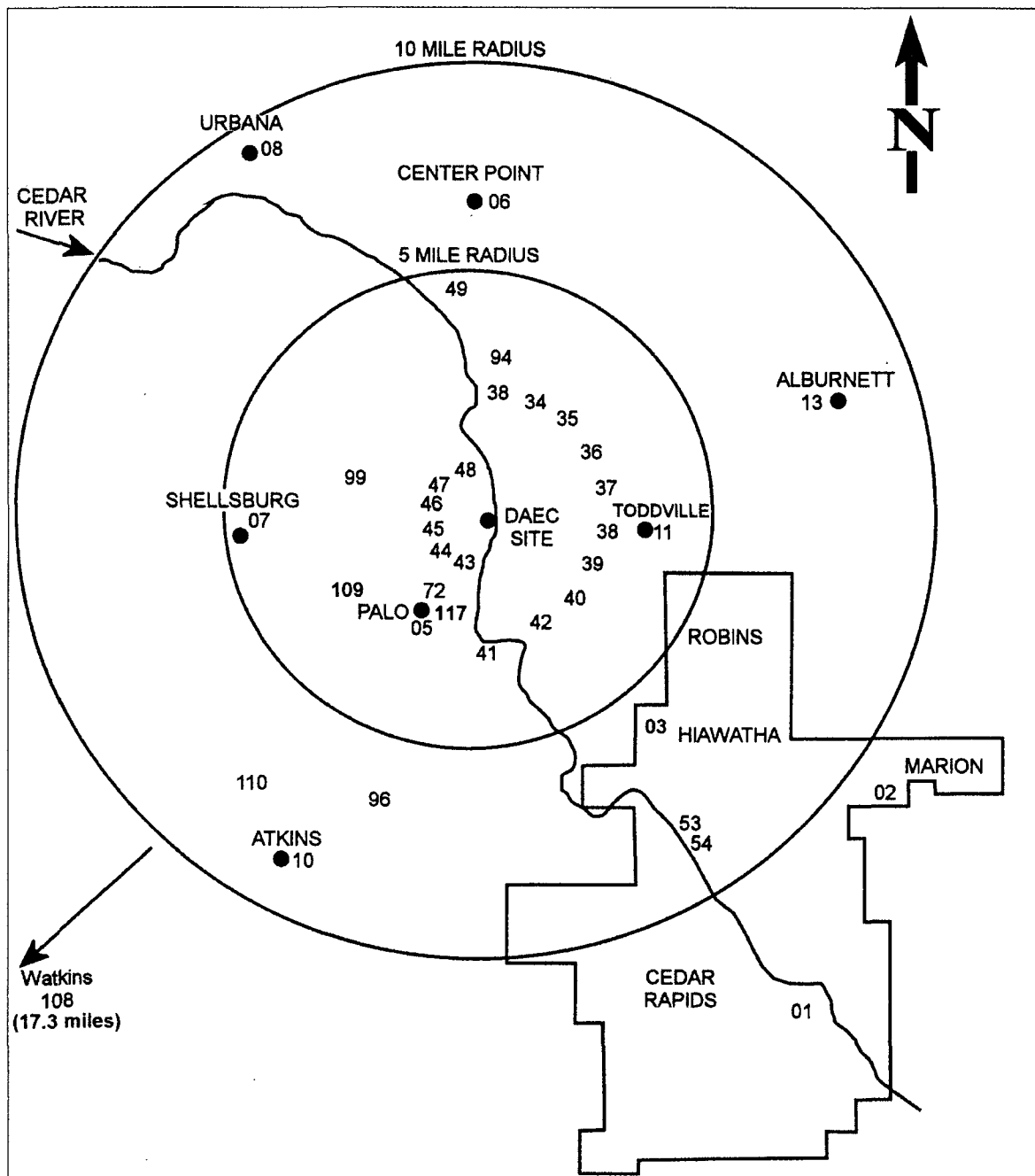
^e Non-routine results are those which exceed ten times the control station value for the location. If a control station value is not available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

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.

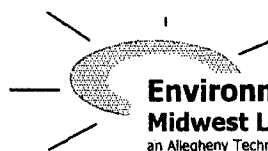
Figure 5.2 Radiological Environmental Monitoring Program Sampling Stations Outside 0.5 Miles.



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, 2008 through December, 2008

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.

The results in Table A-2 list 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-1148	03/24/08	Sr-89	50.6 ± 2.4	60.4	48.6 - 68.2	Pass
STW-1148	03/24/08	Sr-90	42.4 ± 1.4	39.2	28.8 - 45.1	Pass
STW-1149	03/24/08	Ba-133	56.9 ± 5.4	58.3	48.3 - 64.3	Pass
STW-1149	03/24/08	Co-60	73.9 ± 1.6	76.6	68.9 - 86.7	Pass
STW-1149	03/24/08	Cs-134	50.2 ± 1.9	46.6	37.4 - 51.3	Pass
STW-1149	03/24/08	Cs-137	97.7 ± 2.2	102.0	91.8 - 115.0	Pass
STW-1149	03/24/08	Zn-65	109.9 ± 5.8	106.0	95.4 - 126.0	Pass
STW-1150	03/24/08	Gr. Alpha	43.7 ± 7.5	50.8	26.5 - 63.7	Pass
STW-1150	03/24/08	Gr. Beta	36.4 ± 1.8	51.4	35.0 - 58.4	Pass
STW-1151	03/24/08	I-131	29.3 ± 1.4	28.7	23.9 - 33.6	Pass
STW-1152	03/24/08	Ra-226	15.0 ± 1.1	15.3	11.4 - 17.6	Pass
STW-1152	03/24/08	Ra-228	18.4 ± 1.8	17.0	11.4 - 20.4	Pass
STW-1152	03/24/08	Uranium	23.4 ± 1.3	24.6	19.8 - 27.6	Pass
STW-1153	03/24/08	H-3	12551.0 ± 207.0	12000.0	10400.0 - 13200.0	Pass
STW-1154	07/07/08	Sr-89	24.9 ± 3.5	28.7	20.4 - 35.3	Pass
STW-1154	07/07/08	Sr-90	39.7 ± 0.5	40.0	29.4 - 46.0	Pass
STW-1155	07/07/08	Ba-133	45.0 ± 1.2	46.6	38.1 - 51.8	Pass
STW-1155	07/07/08	Co-60	24.9 ± 3.0	25.7	22.3 - 31.0	Pass
STW-1155	07/07/08	Cs-134	90.4 ± 5.3	93.2	76.6 - 102.0	Pass
STW-1155	07/07/08	Cs-137	57.1 ± 2.8	54.6	49.1 - 62.9	Pass
STW-1155	07/07/08	Zn-65	102.9 ± 7.3	98.8	88.9 - 118.0	Pass
STW-1156	07/07/08	Gr. Alpha	24.8 ± 1.6	30.7	15.7 - 40.0	Pass
STW-1156	07/07/08	Gr. Beta	23.9 ± 0.9	25.8	16.1 - 33.7	Pass
STW-1157	07/07/08	Ra-226	8.0 ± 0.6	8.1	6.1 - 9.5	Pass
STW-1157	07/07/08	Ra-228	7.7 ± 0.8	7.4	4.7 - 9.5	Pass
STW-1157	07/07/08	Uranium	11.2 ± 0.3	11.3	8.9 - 13.0	Pass
STW-1164	10/06/08	Sr-89	42.2 ± 3.2	48.7	38.2 - 56.1	Pass
STW-1164	10/06/08	Sr-90	35.4 ± 1.2	33.6	24.6 - 38.8	Pass
STW-1165	10/06/08	Ba-133	56.9 ± 1.0	63.5	52.8 - 69.9	Pass
STW-1165	10/06/08	Co-60	47.6 ± 1.3	49.1	44.2 - 56.6	Pass
STW-1165	10/06/08	Cs-134	26.4 ± 4.0	25.6	19.7 - 28.4	Pass
STW-1165	10/06/08	Cs-137	24.3 ± 0.7	25.6	21.6 - 31.2	Pass
STW-1165	10/06/08	Zn-65	72.0 ± 2.9	68.6	61.2 - 83.0	Pass
STW-1166	10/06/08	Gr. Alpha	24.2 ± 4.8	26.9	13.6 - 35.5	Pass
STW-1166	10/06/08	Gr. Beta	32.6 ± 1.0	38.0	25.1 - 45.5	Pass
STW-1167	10/06/08	I-131	29.0 ± 0.3	28.1	23.4 - 33.0	Pass
STW-1168	10/06/08	Ra-226	15.0 ± 1.0	16.1	12.0 - 18.4	Pass
STW-1168	10/06/08	Ra-228	16.0 ± 1.0	14.1	9.4 - 17.1	Pass
STW-1168	10/06/08	Uranium	47.8 ± 2.0	50.3	40.8 - 55.9	Pass
STW-1169	10/06/08	H-3	2357.0 ± 66.0	2220.0	1830.0 - 2460.0	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.

TABLE A-2. Crosscheck program results; Thermoluminescent Dosimetry, (TLD, CaSO₄: Dy Cards).

Lab Code	Date	Description	Known Value	mR		Control Limits	Acceptance
				Lab Result	± 2 sigma		
<u>Environmental, Inc.</u>							
2008-1	6/16/2008	40 cm.	30.23	33.87 ± 1.17		21.16 - 39.30	Pass
2008-1	6/16/2008	50 cm.	19.35	23.13 ± 0.57		13.55 - 25.16	Pass
2008-1	6/16/2008	60 cm.	13.44	16.25 ± 1.10		9.41 - 17.47	Pass
2008-1	6/16/2008	70 cm.	9.87	10.39 ± 0.52		6.91 - 12.83	Pass
2008-1	6/16/2008	80 cm.	7.56	7.44 ± 0.51		5.29 - 9.83	Pass
2008-1	6/16/2008	90 cm.	5.97	5.80 ± 1.04		4.18 - 7.76	Pass
2008-1	6/16/2008	100 cm.	4.84	4.32 ± 0.43		3.39 - 6.29	Pass
2008-1	6/16/2008	120 cm.	3.36	2.69 ± 0.15		2.35 - 4.37	Pass
2008-1	6/16/2008	150 cm.	2.15	2.05 ± 0.69		1.51 - 2.80	Pass
2008-1	6/16/2008	180 cm.	1.49	1.23 ± 0.80		1.04 - 1.94	Pass
<u>Environmental, Inc.</u>							
2008-2	11/17/2008	30 cm.	63.05	73.10 ± 1.84		44.14 - 81.97	Pass
2008-2	11/17/2008	40 cm.	35.46	40.80 ± 2.30		24.82 - 46.10	Pass
2008-2	11/17/2008	50 cm.	22.7	24.10 ± 0.58		15.89 - 29.51	Pass
2008-2	11/17/2008	60 cm.	15.76	15.98 ± 0.55		11.03 - 20.49	Pass
2008-2	11/17/2008	60 cm.	15.76	19.49 ± 0.93		11.03 - 20.49	Pass
2008-2	11/17/2008	70 cm.	11.58	11.97 ± 0.54		8.11 - 15.05	Pass
2008-2	11/17/2008	75 cm.	10.09	9.45 ± 0.28		7.06 - 13.12	Pass
2008-2	11/17/2008	80 cm.	8.87	9.30 ± 0.18		6.21 - 11.53	Pass
2008-2	11/17/2008	90 cm.	7.01	7.19 ± 0.43		4.91 - 9.11	Pass
2008-2	11/17/2008	90 cm.	7.01	6.84 ± 0.42		4.91 - 9.11	Pass
2008-2	11/17/2008	100 cm.	5.67	5.47 ± 0.19		3.97 - 7.37	Pass
2008-2	11/17/2008	110 cm.	4.69	3.98 ± 0.27		3.28 - 6.10	Pass
2008-2	11/17/2008	120 cm.	3.94	3.09 ± 0.21		2.76 - 5.12	Pass
2008-2	11/17/2008	120 cm.	3.94	3.12 ± 0.34		2.76 - 5.12	Pass
2008-2	11/17/2008	150 cm.	2.52	2.55 ± 0.12		1.76 - 3.28	Pass
2008-2	11/17/2008	150 cm.	2.52	2.24 ± 0.08		1.76 - 3.28	Pass
2008-2	11/17/2008	180 cm.	1.75	1.36 ± 0.08		1.23 - 2.28	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-111	1/14/2008	Tc-99	32.20 ± 0.85	32.34	20.34 - 44.34	Pass
SPW-298	1/31/2008	Ni-63	213.55 ± 3.07	212.58	148.81 - 276.35	Pass
W-11708	1/17/2008	Ra-226	11.34 ± 0.43	12.69	8.88 - 16.50	Pass
SPW-711	2/25/2008	U-238	33.56 ± 1.74	41.70	29.19 - 54.21	Pass
SPAP-881	3/11/2008	Cs-134	19.29 ± 1.53	20.09	10.09 - 30.09	Pass
SPAP-881	3/11/2008	Cs-137	114.04 ± 3.03	113.90	102.51 - 125.29	Pass
SPAP-883	3/11/2008	Gr. Beta ^e	54.56 ± 0.12	51.64	30.98 - 72.30	Pass
SPMI-885	3/11/2008	Sr-90	45.93 ± 1.60	45.13	36.10 - 54.16	Pass
SPW-887	3/11/2008	Sr-90	38.82 ± 1.60	45.13	36.10 - 54.16	Pass
SPW-889	3/11/2008	H-3	67325.00 ± 725.00	67384.00	53907.20 - 80860.80	Pass
W-31808	3/18/2008	Gr. Alpha	19.51 ± 0.40	20.08	10.04 - 30.12	Pass
W-31808	3/18/2008	Gr. Beta	47.20 ± 0.42	45.67	35.67 - 55.67	Pass
SPMI-885	3/24/2008	Cs-134	40.93 ± 1.55	39.69	29.69 - 49.69	Pass
SPMI-885	3/24/2008	Cs-137	61.36 ± 2.82	56.91	46.91 - 66.91	Pass
SPW-887	3/24/2008	Cs-134	40.68 ± 1.44	39.69	29.69 - 49.69	Pass
SPW-887	3/24/2008	Cs-137	58.52 ± 2.93	56.91	46.91 - 66.91	Pass
SPW-1282	4/2/2008	U-238	41.30 ± 1.78	41.70	29.19 - 54.21	Pass
W-40308	4/3/2008	Ra-226	15.17 ± 0.50	12.69	8.88 - 16.50	Pass
SPW-5580	4/7/2008	H-3	211.02 ± 7.71	240.00	0.00 - 806.46	Pass
SPW-1562	4/8/2008	Ra-228	28.93 ± 2.09	30.51	21.36 - 39.66	Pass
SPW-1560	4/10/2008	Tc-99	29.74 ± 0.84	32.34	20.34 - 44.34	Pass
SPW-1621	4/16/2008	Fe-55	27205.80 ± 982.90	28370.00	22696.00 - 34044.00	Pass
W-51508	5/15/2008	Gr. Alpha	24.01 ± 0.41	20.08	10.04 - 30.12	Pass
W-51508	5/15/2008	Gr. Beta	47.97 ± 0.41	45.68	35.68 - 55.68	Pass
SPAP-2673	6/2/2008	Cs-134	17.39 ± 1.32	18.60	8.60 - 28.60	Pass
SPAP-2673	6/2/2008	Cs-137	106.82 ± 3.42	113.30	101.97 - 124.63	Pass
SPAP-2674	6/2/2008	Gr. Beta ^e	53.57 ± 0.13	51.40	30.84 - 71.96	Pass
SPF-2745	6/2/2008	Cs-134	0.34 ± 0.02	0.37	0.22 - 0.52	Pass
SPF-2745	6/2/2008	Cs-137	2.06 ± 0.04	2.27	1.36 - 3.18	Pass
SPMI-2677	6/3/2008	Cs-137	53.99 ± 6.15	56.66	46.66 - 66.66	Pass
SPMI-2677A	6/3/2008	I-131	26.64 ± 0.59	28.58	16.58 - 40.58	Pass
SPW-2677	6/3/2008	Cs-134	40.30 ± 3.35	37.21	27.21 - 47.21	Pass
SPW-2677	6/3/2008	I-131(G)	25.92 ± 4.48	28.58	18.58 - 38.58	Pass
SPMI-2679	6/3/2008	Cs-134	35.02 ± 2.93	37.21	27.21 - 47.21	Pass
SPMI-2679	6/3/2008	Cs-137	58.49 ± 6.05	56.66	46.66 - 66.66	Pass
SPMI-2679	6/3/2008	I-131(G)	25.30 ± 4.97	28.58	18.58 - 38.58	Pass
SPMI-2679A	6/3/2008	I-131	30.37 ± 0.50	28.58	16.58 - 40.58	Pass
SPVE-2681	6/3/2008	I-131(G)	1.11 ± 0.06	0.95	0.57 - 1.33	Pass
SPW-2683	6/2/2008	Ni-63	2151.70 ± 10.22	2119.30	1483.51 - 2755.09	Pass
SPW-2685	6/2/2008	H-3	64927.20 ± 704.80	66540.80	53232.64 - 79848.96	Pass
SPW-2689	6/2/2008	C-14	4405.40 ± 15.21	4742.00	2845.20 - 6638.80	Pass

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

Lab Code ^b	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			Laboratory results 2s, n=1	Known Activity	Control Limits ^c	
W-81408	8/14/2008	Ra-226	12.98 ± 0.35	12.69	8.88 - 16.50	Pass
SPW-1562	8/14/2008	Ra-228	29.09 ± 2.46	30.51	21.36 - 39.66	Pass
SPW-81808	8/18/2008	U-238	42.59 ± 1.96	41.70	29.19 - 54.21	Pass
W-81808	8/18/2008	Gr. Alpha	21.36 ± 0.42	20.08	10.04 - 30.12	Pass
W-81808	8/18/2008	Gr. Beta	49.33 ± 1.01	45.68	35.68 - 55.68	Pass
W-112008	11/20/2008	Gr. Alpha	20.13 ± 0.40	20.08	10.04 - 30.12	Pass
W-112008	11/20/2008	Gr. Beta	48.28 ± 0.42	45.60	35.60 - 55.60	Pass
SPAP-6839	12/5/2008	Cs-134	15.39 ± 2.72	15.68	5.68 - 25.68	Pass
SPAP-6839	12/5/2008	Cs-137	111.45 ± 9.85	112.00	100.80 - 123.20	Pass
SPAP-6841	12/5/2008	Gr. Beta ^e	49.26 ± 0.12	50.72	30.43 - 71.01	Pass
SPW-6843	12/5/2008	C-14	19377.50 ± 55.27	23708.00	14224.80 - 33191.20	Pass
SPW-6845	12/5/2008	Fe-55	7068.30 ± 692.30	6028.00	4822.40 - 7233.60	Pass
SPW-6847	12/5/2008	Tc-99	37.71 ± 1.33	32.34	20.34 - 44.34	Pass
SPW-6849	12/5/2008	Ni-63	232.56 ± 3.26	211.34	147.94 - 274.74	Pass
SPW-6851	12/5/2008	H-3	63664.00 ± 8745.00	64674.00	51739.20 - 77608.80	Pass
SPF-6859	12/5/2008	Cs-134	0.63 ± 0.02	0.63	0.38 - 0.88	Pass
SPF-6859	12/5/2008	Cs-137	2.35 ± 0.01	2.24	1.34 - 3.14	Pass
SPW-7059	12/19/2008	Sr-90	49.19 ± 2.62	44.33	35.46 - 53.20	Pass
SPMI-7061	12/19/2008	Sr-90	39.39 ± 2.19	44.33	35.46 - 53.20	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).

^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 $\pm 2\sigma$.

^e Control limits based on the laboratory limit, Attachment A ("Other Analyses").

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-17	Water	1/3/2008	U-238	0.09	0.01 ± 0.07	1
SPW-112	Water	1/14/2008	Tc-99	4.70	-0.06 ± 2.85	10
W-11408	Water	1/14/2008	Ra-226	0.05	0.05 ± 0.04	1
SPAP-880	Air Filter	3/11/2008	Cs-134	0.91	-	100
SPAP-880	Air Filter	3/11/2008	Cs-137	1.13	-	100
SPW-888	Water	3/11/2008	H-3	159.99	-78.90 ± 80.40	200
W-31808	Water	3/18/2008	Gr. Alpha	0.42	-0.05 ± 0.29	1
W-31808	Water	3/18/2008	Gr. Beta	0.72	0.09 ± 0.51	3.2
SPMI-884	Milk	3/24/2008	Cs-134	2.79	-	10
SPMI-884	Milk	3/24/2008	Cs-137	3.36	-	10
W-40308	Water	4/3/2008	Ra-226	0.04	0.05 ± 0.03	1
SPW-1563	Water	4/8/2008	Ra-228	0.57	0.31 ± 0.30	2
SPW-1561	Water	4/10/2008	Tc-99	4.77	-3.42 ± 2.85	10
SPW-1621	Water	4/16/2008	Fe-55	668.50	-170.70 ± 397.20	1000
SPW-2451	Water	5/22/2008	U-238	0.21	0.35 ± 0.24	1
SPW-2676	Water	6/2/2008	Cs-134	2.03	-	10
SPW-2676	Water	6/2/2008	Cs-134	3.60	-	10
SPW-2676	Water	6/2/2008	Cs-137	2.38	-	10
SPW-2677	Water	6/2/2008	Cs-134	2.78	-	10
SPW-2677	Water	6/2/2008	I-131(G)	3.49	-	20
SPW-2677	Water	6/2/2008	I-131(G)	5.25	-	20
SPF-2744	Fish	6/2/2008	Cs-134	5.48	-	100
SPF-2744	Fish	6/2/2008	Cs-137	4.83	-	100
SPW-2676	Water	6/3/2008	I-131	0.18	0.01 ± 0.11	0.5
SPMI-2678	Milk	6/3/2008	I-131	0.22	0.12 ± 0.15	0.5
SPVE-2680	Vegetation	6/3/2008	I-131(G)	0.01	-	20
SPW-3581	Water	7/14/2008	U-238	0.10	0.13 ± 0.12	1
W-80708	Water	8/7/2008	Gr. Alpha	0.63	-0.02 ± 0.44	1
W-80708	Water	8/7/2008	Gr. Beta	1.43	-0.47 ± 0.99	3.2
W-81408	Water	8/14/2008	Ra-226	0.06	0.14 ± 0.04	1
SPW-1563	Water	8/14/2008	Ra-228	0.79	0.89 ± 0.47	2
SPW-81808	Water	8/18/2008	U-238	0.18	0.04 ± 0.13	1

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	
W-112008	Water	11/20/2008	Gr. Alpha	0.40	0.02 ± 0.28	1
W-112008	Water	11/20/2008	Gr. Beta	0.75	-0.16 ± 0.52	3.2
SPAP-6838	Air Filter	12/5/2008	Cs-134	1.01	-	100
SPAP-6838	Air Filter	12/5/2008	Cs-137	0.95	-	100
SPAP-6840	Air Filter	12/5/2008	Gr. Beta	0.96	2.69 ± 0.64	3.2
SPW-6842	Water	12/5/2008	C-14	7.79	-3.04 ± 4.05	200
SPW-6844	Water	12/5/2008	Fe-55	715.10	21.70 ± 435.10	1000
SPW-6846	Water	12/5/2008	Tc-99	1.36	-0.47 ± 0.82	10
SPW-6848	Water	12/5/2008	Ni-63	1.94	3.08 ± 1.23	20
SPF-6858	Fish	12/5/2008	Cs-134	1.53	-	100
SPF-6858	Fish	12/5/2008	Cs-137	3.92	-	100
SPW-7058	Water	12/19/2008	Cs-134	2.62	-	10
SPW-7058	Water	12/19/2008	Cs-137	2.39	-	10
SPW-7058	Water	12/19/2008	Sr-90	0.65	-0.28 ± 0.26	1
SPMI-7060	Milk	12/19/2008	Cs-134	2.18	-	10
SPMI-7060	Milk	12/19/2008	Cs-137	3.87	-	10
SPMI-7060	Milk	12/19/2008	I-131(G)	2.80	-	20
SPMI-7060 ^d	Milk	12/19/2008	Sr-90	0.53	0.76 ± 0.34	1

^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.

^d Low levels of Sr-90 are still detected in the environment. A concentration of (1-5 pCi/L) in milk is not unusual.

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
AP-8809, 8810	1/2/2008	Be-7	0.06 ± 0.02	0.06 ± 0.01	0.06 ± 0.01	Pass
CF-42, 43	1/2/2008	Gr. Beta	8.88 ± 0.19	8.99 ± 0.19	8.94 ± 0.13	Pass
CF-42, 43	1/2/2008	K-40	5.08 ± 0.29	5.19 ± 0.30	5.14 ± 0.21	Pass
DW-80020, 80021	1/7/2008	Gr. Alpha	2.28 ± 0.84	1.98 ± 0.86	2.13 ± 0.60	Pass
U-169, 170	1/10/2008	Beta-K40	7.50 ± 5.50	11.70 ± 5.10	9.60 ± 3.75	Pass
SO-8836, 8837	1/14/2008	Cs-137	0.80 ± 0.05	0.75 ± 0.05	0.77 ± 0.03	Pass
SO-8836, 8837	1/14/2008	Gr. Alpha	13.30 ± 4.31	15.58 ± 4.10	14.44 ± 2.98	Pass
SO-8836, 8837	1/14/2008	Gr. Alpha	33.68 ± 3.73	29.21 ± 3.10	31.45 ± 2.43	Pass
SO-8836, 8837	1/14/2008	K-40	12.31 ± 0.74	12.96 ± 0.73	12.64 ± 0.52	Pass
DW-80045, 80046	1/15/2008	Gr. Alpha	2.94 ± 1.13	3.41 ± 1.04	3.17 ± 0.77	Pass
DW-80045, 80046	1/15/2008	Gr. Beta	1.86 ± 0.66	1.36 ± 0.63	1.61 ± 0.45	Pass
MI-138, 139	1/15/2008	K-40	1262.40 ± 81.70	1396.20 ± 154.20	1329.30 ± 87.25	Pass
LW-190, 191	1/16/2008	Gr. Beta	2.85 ± 1.07	1.64 ± 1.02	2.24 ± 0.74	Pass
DW-8008, 8009	1/16/2008	Ra-226	2.77 ± 0.20	3.11 ± 0.22	2.94 ± 0.15	Pass
DW-8008, 8009	1/16/2008	Ra-228	3.95 ± 0.74	3.96 ± 0.77	3.96 ± 0.53	Pass
DW-80057, 80058	1/21/2008	Gr. Alpha	6.77 ± 0.66	7.91 ± 1.73	7.34 ± 0.92	Pass
DW-80057, 80058	1/21/2008	Gr. Beta	13.83 ± 0.97	14.78 ± 1.01	14.31 ± 0.70	Pass
SWU-479, 480	1/29/2008	Gr. Beta	4.49 ± 1.13	3.13 ± 1.14	3.81 ± 0.80	Pass
W-920, 921	2/4/2008	Gr. Beta	4.20 ± 1.30	3.30 ± 1.30	3.75 ± 0.92	Pass
SW-540, 541	2/12/2008	Gr. Alpha	2.75 ± 1.16	4.01 ± 1.18	3.38 ± 0.83	Pass
SW-540, 541	2/12/2008	Gr. Beta	6.46 ± 1.11	6.71 ± 1.03	6.59 ± 0.76	Pass
DW-80155, 80156 ^b	2/12/2008	Ra-226	2.55 ± 0.22	2.01 ± 0.16	2.28 ± 0.14	Fail
DW-80155, 80156	2/12/2008	Ra-228	1.86 ± 0.70	1.53 ± 0.67	1.70 ± 0.48	Pass
DW-80165, 80166	2/20/2008	Gr. Alpha	1.51 ± 0.90	0.80 ± 1.05	1.16 ± 0.69	Pass
DW-80166, 80167	2/20/2008	Ra-226	0.40 ± 0.09	0.46 ± 0.09	0.43 ± 0.06	Pass
DW-80166, 80167	2/20/2008	Ra-228	1.44 ± 0.52	1.42 ± 0.57	1.43 ± 0.39	Pass
DW-80166, 80167	2/20/2008	Uranium	0.69 ± 0.25	0.69 ± 0.26	0.69 ± 0.18	Pass
W-1413, 1414	3/3/2008	Gr. Beta	7.50 ± 3.00	3.70 ± 2.60	5.60 ± 1.98	Pass
DW-80189, 80190	3/11/2008	Ra-226	4.41 ± 0.30	4.09 ± 0.25	4.25 ± 0.20	Pass
DW-80189, 80190	3/11/2008	Ra-228	1.99 ± 0.65	2.17 ± 0.66	2.08 ± 0.46	Pass
MI-1006, 1007	3/12/2008	K-40	1451.90 ± 112.80	1409.50 ± 111.40	1430.70 ± 79.27	Pass
MI-1006, 1007	3/12/2008	Sr-90	0.48 ± 0.31	0.97 ± 0.38	0.72 ± 0.24	Pass
DW-80205, 80206	3/14/2008	Gr. Alpha	3.64 ± 0.80	3.39 ± 0.82	3.52 ± 0.57	Pass
DW-80202, 80203	3/14/2008	Ra-226	3.16 ± 0.21	3.00 ± 0.19	3.08 ± 0.14	Pass
DW-80202, 80203	3/14/2008	Ra-228	2.40 ± 1.00	2.07 ± 0.69	2.24 ± 0.61	Pass
DW-80208, 80209	3/14/2008	U-233/4	1.32 ± 0.25	1.29 ± 0.36	1.31 ± 0.22	Pass
SG-1080, 1081	3/18/2008	Pb-214	3.99 ± 0.30	4.15 ± 0.29	4.07 ± 0.21	Pass
SO-1195, 1196	3/18/2008	U-233/4	0.14 ± 0.02	0.14 ± 0.02	0.14 ± 0.01	Pass
SO-1195, 1196	3/18/2008	U-238	0.13 ± 0.02	0.13 ± 0.02	0.13 ± 0.01	Pass
WW-1242, 1243	3/24/2008	Gr. Beta	10.36 ± 1.63	9.06 ± 1.55	9.71 ± 1.13	Pass
AP-1519, 1520	4/2/2008	Be-7	0.07 ± 0.01	0.08 ± 0.01	0.08 ± 0.01	Pass
W-1565, 1566	4/2/2008	Gr. Alpha	0.82 ± 0.64	1.58 ± 0.72	1.20 ± 0.48	Pass
W-1565, 1566	4/2/2008	Gr. Beta	3.73 ± 0.86	5.51 ± 1.09	4.62 ± 0.69	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
DW-80255, 80256	4/8/2008	Ra-226	0.19 ± 0.08	0.28 ± 0.11	0.24 ± 0.07	Pass
DW-80255, 80256	4/8/2008	Ra-228	1.79 ± 0.57	1.32 ± 0.55	1.56 ± 0.40	Pass
DW-80259, 80260	4/8/2008	Gr. Alpha	3.39 ± 0.82	3.62 ± 0.82	3.51 ± 0.58	Pass
DW-80301, 80302	4/11/2008	Ra-226	0.47 ± 0.09	0.47 ± 0.09	0.47 ± 0.06	Pass
DW-80301, 80302	4/11/2008	Ra-228	1.02 ± 0.42	0.82 ± 0.45	0.92 ± 0.31	Pass
SO-1913, 1914	4/15/2008	K-40	12.79 ± 0.73	13.88 ± 0.85	13.34 ± 0.56	Pass
DW-80313, 80314	4/16/2008	Ra-226	3.39 ± 0.22	3.28 ± 0.21	3.34 ± 0.15	Pass
DW-80313, 80314	4/16/2008	Ra-228	4.27 ± 0.72	5.14 ± 0.77	4.71 ± 0.53	Pass
SWU-2087, 2088	4/29/2008	Gr. Beta	2.20 ± 0.60	3.50 ± 0.90	2.85 ± 0.54	Pass
LW-2297, 2298	4/30/2008	Gr. Beta	1.41 ± 0.43	1.02 ± 0.40	1.22 ± 0.30	Pass
LW-2321, 2322	4/30/2008	Gr. Beta	1.33 ± 0.54	1.23 ± 0.54	1.28 ± 0.38	Pass
BS-2063, 2064	5/1/2008	Gr. Beta	13.71 ± 2.06	17.60 ± 2.49	15.66 ± 1.62	Pass
SG-2229, 2230	5/5/2008	Ac-228	26.25 ± 2.70	24.90 ± 2.55	25.58 ± 1.86	Pass
W-2792, 2793	5/5/2008	Gr. Beta	7.20 ± 2.30	7.00 ± 2.50	7.10 ± 1.70	Pass
SG-2229, 2230	5/5/2008	Pb-214	23.28 ± 0.30	23.54 ± 0.33	23.41 ± 0.22	Pass
F-2850, 2851	5/7/2008	Cs-137	3.37 ± 0.21	3.16 ± 0.19	3.27 ± 0.14	Pass
DW-80376, 80377	5/9/2008	Ra-226	0.94 ± 0.13	1.07 ± 0.13	1.01 ± 0.09	Pass
DW-80376, 80377	5/9/2008	Ra-228	2.05 ± 0.57	1.40 ± 0.51	1.73 ± 0.38	Pass
MI-2363, 2364	5/14/2008	K-40	1335.40 ± 111.20	1510.70 ± 124.30	1423.05 ± 83.39	Pass
SG-2752, 2753	5/14/2008	Be-7	264.60 ± 83.90	222.80 ± 93.10	243.70 ± 62.66	Pass
SG-2752, 2753	5/14/2008	Cs-137	64.80 ± 6.00	68.90 ± 5.80	66.85 ± 4.17	Pass
SG-2752, 2753	5/14/2008	Gr. Alpha	19.35 ± 3.48	22.88 ± 4.04	21.12 ± 2.67	Pass
SG-2752, 2753	5/14/2008	Gr. Beta	30.53 ± 2.40	33.31 ± 2.71	31.92 ± 1.81	Pass
SG-2752, 2753	5/14/2008	K-40	9121.90 ± 191.80	9183.70 ± 194.20	9152.80 ± 136.47	Pass
DW-80389, 80390	5/14/2008	Ra-226	2.99 ± 0.36	2.58 ± 0.31	2.79 ± 0.24	Pass
DW-80389, 80390	5/14/2008	Ra-228	2.87 ± 0.68	1.73 ± 0.57	2.30 ± 0.44	Pass
DW-80392, 80393	5/14/2008	Gr. Alpha	19.94 ± 1.30	17.89 ± 1.26	18.92 ± 0.91	Pass
DW-80394, 80395	5/14/2008	U-233/4	2.03 ± 0.27	2.54 ± 0.39	2.29 ± 0.24	Pass
BS-2490, 2491	5/16/2008	Cs-137	6.81 ± 1.20	6.76 ± 1.23	6.78 ± 0.86	Pass
WW-2462, 2463	5/19/2008	H-3	158.61 ± 80.90	205.63 ± 83.06	182.12 ± 57.97	Pass
W-2826, 2827	5/27/2008	Gr. Alpha	3.47 ± 2.23	4.22 ± 2.20	3.84 ± 1.57	Pass
W-2826, 2827	5/27/2008	Gr. Beta	10.67 ± 1.92	9.43 ± 1.76	10.05 ± 1.30	Pass
SG-3378, 3379	6/2/2008	Gr. Alpha	6.51 ± 1.15	7.83 ± 1.32	7.17 ± 0.88	Pass
SG-3378, 3379	6/2/2008	Gr. Beta	16.23 ± 0.95	15.76 ± 1.06	16.00 ± 0.71	Pass
SG-3393, 3394	6/4/2008	Be-7	0.82 ± 0.23	0.66 ± 0.33	0.74 ± 0.20	Pass
SG-3393, 3394	6/4/2008	Cs-137	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01	Pass
SG-3393, 3394	6/4/2008	Gr. Alpha	18.96 ± 3.49	16.96 ± 3.34	17.96 ± 2.42	Pass
SG-3393, 3394	6/4/2008	Gr. Beta	30.01 ± 2.49	30.17 ± 2.56	30.09 ± 1.79	Pass
SG-3393, 3394	6/4/2008	K-40	9.78 ± 0.30	10.00 ± 0.28	9.89 ± 0.21	Pass
LW-2939, 2940	6/12/2008	Gr. Beta	1.46 ± 0.59	1.74 ± 0.59	1.60 ± 0.42	Pass
WW-3053, 3054	6/17/2008	Gr. Beta	4.28 ± 0.83	5.27 ± 0.91	4.77 ± 0.61	Pass
SW-3154, 3155	6/24/2008	Gr. Beta	2.15 ± 1.01	2.79 ± 0.97	2.47 ± 0.70	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
BS-3245, 3246	6/27/2008	Co-60	108.84 ± 44.14	91.10 ± 22.32	99.97 ± 24.73	Pass
BS-3245, 3246	6/27/2008	Cs-137	952.18 ± 52.78	941.56 ± 13.61	946.87 ± 27.25	Pass
XW-1080, 1081	6/30/2008	Fe-55	2.96 ± 0.32	2.71 ± 0.30	2.84 ± 0.22	Pass
XW-3786, 3787	6/30/2008	Fe-55	2.96 ± 0.32	2.71 ± 0.30	2.84 ± 0.22	Pass
G-3274, 3275	7/1/2008	Gr. Beta	7.65 ± 0.24	7.44 ± 0.24	7.55 ± 0.17	Pass
SL-3295, 3296	7/1/2008	Gr. Beta	3.76 ± 0.24	3.64 ± 0.24	3.70 ± 0.17	Pass
AP-3531, 3532	7/1/2008	Be-7	0.10 ± 0.01	0.08 ± 0.01	0.09 ± 0.01	Pass
AP-3663, 3664	7/2/2008	Be-7	0.08 ± 0.01	0.08 ± 0.02	0.08 ± 0.01	Pass
AP-3690, 3691	7/2/2008	Be-7	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01	Pass
W-4333, 4334	7/7/2008	Gr. Beta	7.20 ± 1.90	7.70 ± 1.70	7.45 ± 1.27	Pass
W-4840, 4841	7/7/2008	Gr. Beta	6.70 ± 1.60	6.70 ± 1.80	6.70 ± 1.20	Pass
DW-80415, 80416	7/7/2008	Ra-226	2.81 ± 0.47	2.00 ± 0.34	2.41 ± 0.29	Pass
SG-3964, 3965	7/9/2008	Be-7	1.35 ± 0.23	1.51 ± 0.22	1.43 ± 0.16	Pass
SG-3964, 3965	7/9/2008	Cs-137	0.04 ± 0.01	0.04 ± 0.01	0.04 ± 0.00	Pass
SG-3964, 3965	7/9/2008	Gr. Alpha	23.17 ± 3.39	18.76 ± 3.24	20.97 ± 2.34	Pass
SG-3964, 3965	7/9/2008	Gr. Beta	28.99 ± 2.12	29.25 ± 2.31	29.12 ± 1.57	Pass
SG-3964, 3965	7/9/2008	K-40	6.86 ± 0.19	6.84 ± 0.17	6.85 ± 0.13	Pass
DW-80427, 80428	7/9/2008	Ra-226	3.25 ± 0.24	3.27 ± 0.20	3.26 ± 0.16	Pass
DW-80427, 80428	7/9/2008	Ra-228	2.65 ± 0.67	3.25 ± 0.72	2.95 ± 0.49	Pass
DW-80451, 80452	7/15/2008	Ra-226	1.02 ± 0.10	0.96 ± 0.12	0.99 ± 0.08	Pass
DW-80451, 80452	7/15/2008	Ra-228	1.09 ± 0.62	1.14 ± 0.60	1.12 ± 0.43	Pass
DW-80481, 80482	7/16/2008	Ra-226	1.20 ± 0.13	1.40 ± 0.14	1.30 ± 0.10	Pass
DW-80481, 80482	7/16/2008	Ra-228	1.69 ± 0.68	1.65 ± 0.77	1.67 ± 0.51	Pass
MI-3842, 3843	7/21/2008	K-40	1282.60 ± 108.30	1379.00 ± 111.40	1330.80 ± 77.68	Pass
MI-3892, 3893	7/28/2008	K-40	1371.50 ± 102.90	1501.20 ± 111.80	1436.35 ± 75.97	Pass
DW-4067, 4068	7/29/2008	Gr. Beta	10.46 ± 2.37	14.25 ± 2.78	12.36 ± 1.83	Pass
SWT-4158, 4159	7/29/2008	Gr. Beta	1.58 ± 0.45	1.80 ± 0.47	1.69 ± 0.33	Pass
LW-4221, 4222	7/31/2008	Gr. Beta	1.35 ± 0.56	0.91 ± 0.52	1.13 ± 0.38	Pass
LW-4242, 4243	7/31/2008	Gr. Beta	1.36 ± 0.56	1.18 ± 0.53	1.27 ± 0.38	Pass
VE-4046, 4047	8/4/2008	Be-7	0.77 ± 0.13	0.82 ± 0.19	0.80 ± 0.12	Pass
VE-4046, 4047	8/4/2008	Gr. Beta	8.81 ± 0.36	8.34 ± 0.31	8.58 ± 0.24	Pass
VE-4046, 4047	8/4/2008	K-40	5.17 ± 0.34	5.33 ± 0.42	5.25 ± 0.27	Pass
W-4821, 4822	8/4/2008	Gr. Alpha	1.70 ± 0.80	1.70 ± 0.90	1.70 ± 0.60	Pass
W-4821, 4822	8/4/2008	Gr. Beta	3.90 ± 0.80	3.70 ± 0.90	3.80 ± 0.60	Pass
W-4801, 4802	8/5/2008	Gr. Alpha	4.40 ± 2.40	4.80 ± 2.30	4.60 ± 1.66	Pass
W-4801, 4802	8/5/2008	Gr. Beta	13.20 ± 1.30	14.50 ± 1.40	13.85 ± 0.96	Pass
DW-80522, 80523	8/5/2008	Ra-226	0.50 ± 0.12	0.28 ± 0.12	0.39 ± 0.08	Pass
DW-80522, 80523	8/5/2008	Ra-228	1.23 ± 0.60	1.09 ± 0.57	1.16 ± 0.41	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a			Acceptance
			First Result	Second Result	Averaged Result	
DW-80531, 80532	8/5/2008	Gr. Alpha	18.90 ± 1.86	17.80 ± 1.96	18.35 ± 1.35	Pass
DW-80534, 80535	8/5/2008	Ra-226	3.01 ± 0.18	3.33 ± 0.18	3.17 ± 0.13	Pass
DW-80534, 80535	8/5/2008	Ra-228	2.24 ± 0.59	2.12 ± 0.59	2.18 ± 0.42	Pass
SG-4584, 4585	8/6/2008	Be-7	7.11 ± 0.20	7.44 ± 0.37	7.27 ± 0.21	Pass
SG-4584, 4585	8/6/2008	Cs-137	0.05 ± 0.01	0.04 ± 0.01	0.04 ± 0.00	Pass
SG-4584, 4585	8/6/2008	K-40	7.88 ± 10.18	8.02 ± 0.21	7.95 ± 5.09	Pass
SG-4584, 4585	8/6/2008	Ra-226	3.94 ± 0.18	3.74 ± 0.22	3.84 ± 0.14	Pass
SG-4573, 4574	8/13/2008	Gr. Alpha	240.72 ± 8.74	251.53 ± 9.56	246.13 ± 6.48	Pass
SG-4573, 4574	8/13/2008	Gr. Beta	201.60 ± 4.28	206.88 ± 4.71	204.24 ± 3.18	Pass
SG-4584, 4585	8/13/2008	Gr. Alpha	14.07 ± 3.10	12.97 ± 3.04	13.52 ± 2.17	Pass
SG-4584, 4585	8/13/2008	Gr. Beta	22.08 ± 2.36	23.02 ± 2.34	22.55 ± 1.66	Pass
DW-80547, 80548	8/13/2008	Gr. Alpha	3.33 ± 1.11	3.88 ± 1.07	3.61 ± 0.77	Pass
DW-80551, 80552	8/13/2008	U-233/4	2.57 ± 0.48	2.13 ± 0.46	2.35 ± 0.33	Pass
DW-80553, 80554	8/13/2008	Ra-226	0.92 ± 0.14	1.21 ± 0.17	1.07 ± 0.11	Pass
DW-80553, 80554	8/13/2008	Ra-228	2.20 ± 0.61	1.64 ± 0.56	1.92 ± 0.41	Pass
DW-80566, 80567	8/20/2008	Ra-226	1.10 ± 0.11	1.10 ± 0.10	1.10 ± 0.07	Pass
DW-80566, 80567	8/20/2008	Ra-228	2.01 ± 0.58	1.74 ± 0.58	1.88 ± 0.41	Pass
VE-4647, 4648	8/27/2008	K-40	1.97 ± 0.17	2.00 ± 0.21	1.99 ± 0.14	Pass
SL-4690, 4691	9/2/2008	Gr. Beta	2.28 ± 0.25	2.35 ± 0.24	2.32 ± 0.17	Pass
ME-4732, 4733	9/2/2008	Gr. Beta	2.86 ± 0.09	2.70 ± 0.09	2.78 ± 0.06	Pass
ME-4732, 4733	9/2/2008	K-40	2.44 ± 0.37	2.82 ± 0.51	2.63 ± 0.32	Pass
SG-5180, 5181	9/3/2008	Be-7	15.50 ± 0.43	15.54 ± 0.38	15.52 ± 0.29	Pass
SG-5180, 5181	9/3/2008	Cs-137	0.07 ± 0.01	0.07 ± 0.01	0.07 ± 0.01	Pass
SG-5180, 5181	9/3/2008	Gr. Alpha	18.74 ± 3.33	17.61 ± 3.15	18.18 ± 2.29	Pass
SG-5180, 5181	9/3/2008	Gr. Beta	29.19 ± 2.10	28.49 ± 2.15	28.84 ± 1.50	Pass
SG-5180, 5181	9/3/2008	K-40	8.55 ± 0.32	8.11 ± 0.27	8.33 ± 0.21	Pass
SG-5187, 5188	9/3/2008	Be-7	6.18 ± 0.54	5.90 ± 0.77	6.04 ± 0.47	Pass
SG-5187, 5188	9/3/2008	K-40	7.16 ± 0.60	7.29 ± 0.60	7.23 ± 0.42	Pass
SG-5193, 5194	9/3/2008	Gr. Alpha	5.80 ± 1.30	7.00 ± 1.50	6.40 ± 0.99	Pass
SG-5193, 5194	9/3/2008	Gr. Beta	15.60 ± 1.10	15.60 ± 1.10	15.60 ± 0.78	Pass
DW-4871, 4872	9/5/2008	I-131	1.15 ± 0.27	1.16 ± 0.31	1.16 ± 0.21	Pass
VE-5022, 5023	9/10/2008	K-40	1.27 ± 0.14	1.11 ± 0.06	1.19 ± 0.08	Pass
DW-5337, 5338	9/10/2008	Gr. Beta	3.00 ± 1.07	2.19 ± 1.05	2.60 ± 0.75	Pass
WW-4977, 4978	9/17/2008	Gr. Beta	3.71 ± 1.10	2.32 ± 1.11	3.01 ± 0.78	Pass
BS-5088, 5089	9/19/2008	K-40	10493 ± 607	10299 ± 470	10396 ± 384	Pass
DW-80584, 80585	9/19/2008	U-233/4	3.01 ± 0.52	2.44 ± 0.47	2.73 ± 0.35	Pass
DW-80584, 80585	9/19/2008	U-238	0.70 ± 0.25	0.27 ± 0.18	0.49 ± 0.15	Pass
DW-80579, 80580	9/25/2008	Gr. Alpha	10.69 ± 1.31	12.84 ± 1.51	11.77 ± 1.00	Pass
DW-80579, 80580	9/25/2008	Ra-226	3.13 ± 0.22	2.89 ± 0.21	3.01 ± 0.15	Pass
DW-80579, 80580	9/25/2008	Ra-228	3.03 ± 0.73	1.98 ± 0.69	2.51 ± 0.50	Pass
G-5389, 5390	10/1/2008	Be-7	1.49 ± 0.32	1.36 ± 0.28	1.43 ± 0.21	Pass
G-5389, 5390	10/1/2008	Gr. Beta	10.86 ± 0.24	11.18 ± 0.25	11.02 ± 0.17	Pass
G-5389, 5390	10/1/2008	K-40	7.42 ± 0.67	8.06 ± 0.63	7.74 ± 0.46	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L) ^a		Averaged Result	Acceptance
			First Result	Second Result		
AP-5814, 5815	10/1/2008	Be-7	0.08 ± 0.01	0.08 ± 0.01	0.08 ± 0.01	Pass
SG-6111, 6112	10/6/2008	Gr. Alpha	9.34 ± 1.82	8.95 ± 1.67	9.15 ± 1.24	Pass
SG-6111, 6112	10/6/2008	Gr. Beta	17.46 ± 1.46	18.86 ± 1.35	18.16 ± 0.99	Pass
DW-80592, 80593	10/7/2008	Gr. Alpha	2.30 ± 1.14	1.57 ± 0.88	1.94 ± 0.72	Pass
DW-80594, 80595	10/7/2008	Ra-228	1.41 ± 0.55	1.22 ± 0.50	1.32 ± 0.37	Pass
DW-80650, 80651	10/8/2008	Gr. Alpha	1.30 ± 0.86	0.12 ± 0.79	0.71 ± 0.58	Pass
DW-80650, 80651	10/8/2008	Gr. Beta	2.92 ± 0.69	3.03 ± 0.64	2.98 ± 0.47	Pass
DW-80629, 80630	10/13/2008	Ra-226	3.12 ± 0.18	2.87 ± 0.17	3.00 ± 0.12	Pass
DW-80629, 80630	10/13/2008	Ra-228	2.71 ± 0.80	3.28 ± 0.81	3.00 ± 0.57	Pass
DW-80663, 80664	10/13/2008	Gr. Alpha	5.91 ± 1.70	3.14 ± 1.44	4.53 ± 1.11	Pass
MI-5572, 5573	10/14/2008	K-40	1391.00 ± 97.39	1443.90 ± 110.60	1417.45 ± 73.68	Pass
MI-5603, 5604	10/14/2008	K-40	1412.80 ± 109.30	1413.80 ± 110.50	1413.30 ± 77.71	Pass
DW-80676, 80677	10/20/2008	Gr. Alpha	12.20 ± 1.48	11.87 ± 1.54	12.04 ± 1.07	Pass
DW-80676, 80677	10/20/2008	Ra-226	5.04 ± 0.25	5.10 ± 0.25	5.07 ± 0.18	Pass
DW-80676, 80677	10/20/2008	Ra-228	5.87 ± 0.86	6.98 ± 0.95	6.43 ± 0.64	Pass
SW-80687, 80688	10/22/2008	Gr. Alpha	3.42 ± 1.03	2.98 ± 1.01	3.20 ± 0.72	Pass
DW-80729, 80730	10/30/2008	Gr. Alpha	8.40 ± 1.45	7.76 ± 2.00	8.08 ± 1.24	Pass
DW-80729, 80730	10/30/2008	Gr. Beta	16.94 ± 1.45	15.41 ± 1.37	16.18 ± 1.00	Pass
DW-80738, 80739	10/31/2008	U-233/4	2.94 ± 0.50	3.06 ± 0.63	3.00 ± 0.40	Pass
DW-80747, 80748	10/31/2008	Ra-226	0.60 ± 0.09	0.50 ± 0.08	0.55 ± 0.06	Pass
DW-80747, 80748	10/31/2008	Ra-228	1.33 ± 0.59	1.38 ± 0.60	1.36 ± 0.42	Pass
BS-6271, 6272	11/3/2008	Gr. Beta	12.26 ± 1.69	13.78 ± 1.84	13.02 ± 1.25	Pass
SS-6593, 6594	11/19/2008	K-40	12.35 ± 0.57	13.10 ± 0.76	12.73 ± 0.48	Pass
MI-7046, 7047	12/16/2008	K-40	1380.10 ± 109.80	1477.30 ± 98.32	1428.70 ± 73.69	Pass
DW-80698, 80699	12/23/2008	Ra-226	3.13 ± 0.22	3.21 ± 0.23	3.17 ± 0.16	Pass
DW-80698, 80699	12/23/2008	Ra-228	5.48 ± 0.91	5.86 ± 0.93	5.67 ± 0.65	Pass
SW-7281, 7282	12/30/2008	Gr. Beta	0.87 ± 0.54	1.35 ± 0.54	1.11 ± 0.38	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).

^b A program deviation report is on file. The calculation, instrument background and performance test were satisfactory.

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

Lab Code ^c	Date	Analysis	Concentration ^b			Acceptance
			Laboratory result	Known Activity	Control Limits ^d	
STW-1137	01/01/08	Am-241	1.27 ± 0.06	1.23	0.86 - 1.60	Pass
STW-1137	01/01/08	Co-57	23.80 ± 0.60	22.80	16.00 - 29.60	Pass
STW-1137	01/01/08	Co-60	8.60 ± 0.50	8.40	5.88 - 10.92	Pass
STW-1137	01/01/08	Cs-134	-0.02 ± 0.10	0.00	-1.00 - 1.00	Pass
STW-1137	01/01/08	Cs-137	0.00 ± 0.10	0.00	-1.00 - 1.00	Pass
STW-1137	01/01/08	Fe-55	32.60 ± 11.60	36.50	25.60 - 47.50	Pass
STW-1137	01/01/08	H-3	515.10 ± 12.70	472.00	330.00 - 614.00	Pass
STW-1137	01/01/08	Mn-54	12.90 ± 0.80	12.10	8.50 - 15.70	Pass
STW-1137	01/01/08	Ni-63	29.50 ± 2.30	30.70	21.50 - 39.90	Pass
STW-1137	01/01/08	Pu-238	0.60 ± 0.06	0.73	0.51 - 0.95	Pass
STW-1137	01/01/08	Pu-239/40	0.019 ± 0.015	0.01	0.00 - 1.00	Pass
STW-1137	01/01/08	Sr-90	12.00 ± 1.50	11.40	7.98 - 14.82	Pass
STW-1137	01/01/08	Tc-99	9.40 ± 1.70	11.20	7.80 - 14.60	Pass
STW-1137	01/01/08	U-233/4	3.37 ± 0.20	3.63	2.54 - 4.72	Pass
STW-1137	01/01/08	U-238	3.63 ± 0.21	3.74	2.62 - 4.86	Pass
STW-1137	01/01/08	Zn-65	16.90 ± 1.40	16.30	11.40 - 21.20	Pass
STW-1138	01/01/08	Gr. Alpha	0.96 ± 0.14	1.40	0.00 - 2.80	Pass
STW-1138	01/01/08	Gr. Beta	2.30 ± 0.15	2.43	1.22 - 3.65	Pass
STAP-1139	01/01/08	Co-57	3.90 ± 0.07	3.55	2.49 - 4.62	Pass
STAP-1139	01/01/08	Co-60	1.43 ± 0.07	1.31	0.92 - 1.70	Pass
STAP-1139	01/01/08	Cs-134	2.59 ± 0.16	2.52	1.76 - 3.28	Pass
STAP-1139	01/01/08	Cs-137	3.05 ± 0.12	2.70	1.89 - 3.51	Pass
STAP-1139	01/01/08	Mn-54	0.43 ± 0.58	0.00	0.00 - 1.00	Pass
STAP-1139	01/01/08	Pu-238	0.080 ± 0.016	0.11	0.07 - 0.14	Pass
STAP-1139	01/01/08	Pu-239/40	0.12 ± 0.02	0.11	0.08 - 0.15	Pass
STAP-1139	01/01/08	Sr-90	1.30 ± 0.27	1.55	1.08 - 2.01	Pass
STAP-1139 ^e	01/01/08	U-233/4	0.43 ± 0.03	0.22	0.15 - 0.28	Fail
STAP-1139 ^e	01/01/08	U-238	0.44 ± 0.03	0.23	0.16 - 0.29	Fail
STAP-1139	01/01/08	Zn-65	2.36 ± 0.18	2.04	1.43 - 2.65	Pass
STAP-1140	01/01/08	Gr. Alpha	0.11 ± 0.03	0.35	0.00 - 0.70	Pass
STAP-1140	01/01/08	Gr. Beta	0.34 ± 0.04	0.29	0.14 - 0.43	Pass
STVE-1141	01/01/08	Co-57	8.30 ± 0.18	6.89	4.82 - 8.96	Pass
STVE-1141	01/01/08	Co-60	3.03 ± 0.13	2.77	1.94 - 3.60	Pass
STVE-1141	01/01/08	Cs-134	6.53 ± 0.29	6.28	4.40 - 8.16	Pass
STVE-1141	01/01/08	Cs-137	3.90 ± 0.19	3.41	2.39 - 4.43	Pass
STVE-1141	01/01/08	Mn-54	5.43 ± 0.21	4.74	3.32 - 6.16	Pass
STVE-1141	01/01/08	Zn-65	0.033 ± 0.10	0.00	0.00 - 1.00	Pass

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

Lab Code ^c	Date	Analysis	Concentration ^b		Control Limits ^d	Acceptance
			Laboratory result	Known Activity		
STSO-1142	01/01/08	Co-57	483.00 ± 3.00	421.00	295.00 - 547.00	Pass
STSO-1142	01/01/08	Co-60	3.00 ± 0.80	2.90	0.00 - 5.00	Pass
STSO-1142	01/01/08	Cs-134	896.50 ± 7.40	854.00	598.00 - 1110.00	Pass
STSO-1142	01/01/08	Cs-137	624.40 ± 4.10	545.00	382.00 - 709.00	Pass
STSO-1142	01/01/08	Mn-54	667.20 ± 3.80	570.00	399.00 - 741.00	Pass
STSO-1142	01/01/08	Ni-63	536.00 ± 15.50	640.00	448.00 - 832.00	Pass
STSO-1142	01/01/08	Pu-238	78.60 ± 4.80	72.80	51.00 - 94.60	Pass
STSO-1142	01/01/08	Pu-239/40	89.10 ± 4.50	90.10	63.10 - 117.10	Pass
STSO-1142	01/01/08	U-233/4	134.41 ± 5.40	142.00	99.00 - 185.00	Pass
STSO-1142	01/01/08	U-238	139.00 ± 5.50	148.00	104.00 - 192.00	Pass
STSO-1142	01/01/08	Zn-65	0.093 ± 0.91	0.00	0.00 - 1.00	Pass
STSO-1158	08/01/08	Am-241	57.73 ± 4.78	69.10	48.40 - 89.80	Pass
STSO-1158	08/01/08	Co-57	353.02 ± 2.01	333.00	233.00 - 433.00	Pass
STSO-1158	08/01/08	Co-60	151.99 ± 1.58	145.00	102.00 - 189.00	Pass
STSO-1158	08/01/08	Cs-134	499.72 ± 2.65	581.00	407.00 - 755.00	Pass
STSO-1158	08/01/08	Cs-137	2.54 ± 0.25	2.80	0.00 - 5.00	Pass
STSO-1158	08/01/08	K-40	643.94 ± 15.50	570.00	399.00 - 741.00	Pass
STSO-1158	08/01/08	Mn-54	452.14 ± 2.96	415.00	291.00 - 540.00	Pass
STSO-1158	08/01/08	Ni-63	803.09 ± 17.01	760.00	532.00 - 988.00	Pass
STSO-1158	08/01/08	Pu-238	0.12 ± 0.54	0.00	0.00 - 5.00	Pass
STSO-1158	08/01/08	Pu-239/40	60.88 ± 5.89	55.60	38.90 - 72.30	Pass
STSO-1158	08/01/08	Sr-90	1.95 ± 2.04	0.00	0.00 - 5.00	Pass
STSO-1158 ^f	08/01/08	Tc-99	337.00 ± 17.30	335.00	235.00 - 436.00	Pass
STSO-1158	08/01/08	U-238	315.67 ± 11.29	303.00	212.00 - 394.00	Pass
STSO-1158	08/01/08	Zn-65	0.10 ± 2.04	0.00	0.00 - 5.00	Pass
STVE-1159	08/01/08	Co-57	8.52 ± 0.23	7.10	5.00 - 9.20	Pass
STVE-1159	08/01/08	Co-60	5.08 ± 0.19	4.70	3.30 - 6.10	Pass
STVE-1159	08/01/08	Cs-134	5.26 ± 0.18	5.50	3.90 - 7.20	Pass
STVE-1159	08/01/08	Cs-137	0.01 ± 0.14	0.00	0.00 - 1.00	Pass
STVE-1159	08/01/08	Mn-54	6.39 ± 0.28	5.80	4.10 - 7.50	Pass
STVE-1159	08/01/08	Zn-65	7.73 ± 0.45	6.90	4.80 - 9.00	Pass

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

Lab Code ^c	Date	Analysis	Concentration ^b		Control Limits ^d	Acceptance
			Laboratory result	Known Activity		
STW-1162 ^g	08/01/08	Am-241	0.20 ± 0.06	0.00	0.00 - 0.10	Fail
STW-1162	08/01/08	Co-57	0.03 ± 0.16	0.00	0.00 - 5.00	Pass
STW-1162	08/01/08	Co-60	11.27 ± 0.23	11.60	8.10 - 15.10	Pass
STW-1162	08/01/08	Cs-134	17.93 ± 0.52	19.50	13.70 - 25.40	Pass
STW-1162	08/01/08	Cs-137	23.72 ± 0.43	23.60	16.50 - 30.70	Pass
STW-1162	08/01/08	Fe-55	43.36 ± 16.81	46.20	32.30 - 60.10	Pass
STW-1162	08/01/08	H-3	385.15 ± 8.93	341.00	239.00 - 443.00	Pass
STW-1162	08/01/08	Mn-54	13.87 ± 0.37	13.70	9.60 - 17.80	Pass
STW-1162 ^h	08/01/08	Ni-63	10.77 ± 2.01	0.00	0.00 - 5.00	Fail
STW-1162 ⁱ	08/01/08	Pu-238	0.33 ± 0.06	0.50	0.40 - 0.70	Fail
STW-1162	08/01/08	Pu-239/40	0.14 ± 0.15	0.00	0.00 - 0.20	Pass
STW-1162	08/01/08	Sr-90	6.49 ± 1.12	6.45	4.52 - 8.39	Pass
STW-1162 ^j	08/01/08	Tc-99	1.80 ± 0.62	3.76	2.63 - 4.89	Fail
STW-1162	08/01/08	U-233/4	3.33 ± 0.18	3.44	2.41 - 4.47	Pass
STW-1162	08/01/08	U-238	3.38 ± 0.18	3.55	2.49 - 4.62	Pass
STW-1162	08/01/08	Zn-65	17.64 ± 0.61	17.10	12.00 - 22.20	Pass
STW-1163	08/01/08	Gr. Alpha	0.08 ± 0.04	0.00	0.00 - 0.56	Pass
STW-1163	08/01/08	Gr. Beta	0.12 ± 0.05	0.00	0.00 - 1.85	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.

^e The results of a repeat analysis were still unacceptable. A spiked air filter was prepared (known activity 4.17 pCi/filter) to verify the methodology; results of the spike analysis were acceptable, 4.64 pCi/filter.

^f Corrected result. An error in calculation was found.

^g Included in the testing series as a "false positive". Result of reanalysis, 0.04 ± 0.01 Bq/L.

^h Included in the testing series as a "false positive". Result of reanalysis, 3.78 ± 2.03 Bq/L.

ⁱ The reason for the deviation is unknown. Result of the original sample recount: 0.47 ± 0.07 Bq/L. The analysis was then repeated from the beginning. Result of reanalysis: 0.51 ± 0.07 Bq/L.

^j The lower result was due to a higher than average background count used in the calculation. Average background result: 4.11 ± 0.6

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

Lab Code ^b	Date	Analysis	Concentration (pCi/L)		Control Limits	Acceptance
			Laboratory Result ^c	ERA Result ^d		
STAP-1143	03/24/08	Am-241	60.48 ± 3.52	50.1	29.3 - 68.7	Pass
STAP-1143	03/24/08	Co-60	650.72 ± 3.00	730.0	565.0 - 912.0	Pass
STAP-1143	03/24/08	Cs-134	467.50 ± 5.53	523.0	341.0 - 647.0	Pass
STAP-1143	03/24/08	Cs-137	1375.90 ± 25.41	1450.0	1090.0 - 1900.0	Pass
STAP-1143	03/24/08	Fe-55	145.60 ± 28.94	241.0	106.0 - 375.0	Pass
STAP-1143 ^e	03/24/08	Mn-54	0.00 ± 0.00	0.0	0.0 - 10.0	Pass
STAP-1143	03/24/08	Pu-238	53.65 ± 1.54	46.8	32.1 - 61.5	Pass
STAP-1143	03/24/08	Pu-239/40	70.44 ± 3.11	64.1	46.5 - 83.0	Pass
STAP-1143	03/24/08	Sr-90	157.60 ± 7.70	152.0	66.9 - 236.0	Pass
STAP-1143	03/24/08	U-233/4	62.15 ± 3.41	66.7	42.0 - 98.8	Pass
STAP-1143	03/24/08	U-238	64.11 ± 3.29	66.2	42.4 - 94.0	Pass
STAP-1143	03/24/08	Uranium	128.40 ± 3.29	136.0	69.5 - 216.0	Pass
STAP-1143	03/24/08	Zn-65	889.90 ± 15.90	872.0	604.0 - 1210.0	Pass
STAP-1144	03/24/08	Gr. Alpha	13.08 ± 1.09	8.8	4.56 - 13.2	Pass
STAP-1144	03/24/08	Gr. Beta	99.90 ± 3.09	92.2	56.80 - 135.0	Pass
STSO-1145	03/24/08	Ac-228	1269.02 ± 36.81	1180.0	757.0 - 1660.0	Pass
STSO-1145	03/24/08	Am-241	1268.50 ± 85.80	1230.0	735.0 - 1580.0	Pass
STSO-1145	03/24/08	Bi-212	1407.10 ± 56.64	1360.0	357.0 - 2030.0	Pass
STSO-1145	03/24/08	Bi-214	2145.50 ± 305.63	1790.0	1100.0 - 2570.0	Pass
STSO-1145	03/24/08	Co-60	5219.70 ± 90.30	5130.0	3730.0 - 6890.0	Pass
STSO-1145	03/24/08	Cs-134	5427.30 ± 102.94	5640.0	3630.0 - 6790.0	Pass
STSO-1145	03/24/08	Cs-137	6346.60 ± 201.80	6010.0	4600.0 - 7810.0	Pass
STSO-1145	03/24/08	K-40	11052.70 ± 181.80	11000.0	7980.0 - 14900.0	Pass
STSO-1145 ^e	03/24/08	Mn-54	0.00 ± 0.00	0.0	0.0 - 10.0	Pass
STSO-1145	03/24/08	Pb-212	1198.20 ± 96.58	1080.0	697.0 - 1520.0	Pass
STSO-1145	03/24/08	Pb-214	2253.30 ± 291.60	2020.0	1210.0 - 3010.0	Pass
STSO-1145	03/24/08	Sr-90	6407.00 ± 277.00	5360.0	1940.0 - 8750.0	Pass
STSO-1145	03/24/08	Th-234	2421.80 ± 321.00	2030.0	644.0 - 3870.0	Pass
STSO-1145 ^f	03/24/08	U-233/4	1227.93 ± 91.52	2050.0	1240.0 - 2580.0	Fail
STSO-1145	03/24/08	U-238	1319.90 ± 48.81	2030.0	1240.0 - 2580.0	Pass
STSO-1145	03/24/08	Uranium	2592.00 ± 140.50	4180.0	2380.0 - 5640.0	Pass
STSO-1145	03/24/08	Zn-65	2936.20 ± 73.50	2660.0	2110.0 - 3570.0	Pass

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

Lab Code ^b	Date	Analysis	Concentration (pCi/L)			Acceptance
			Laboratory Result ^c	ERA Result ^d	Control Limits	
STVE-1146	03/24/08	Am-241	1261.50 ± 73.90	1260.0	718.0 - 1730.0	Pass
STVE-1146	03/24/08	Cm-244	1152.50 ± 57.44	1200.0	591.0 - 1870.0	Pass
STVE-1146	03/24/08	Co-60	912.41 ± 13.59	888.0	600.0 - 1280.0	Pass
STVE-1146	03/24/08	Cs-134	1547.70 ± 38.81	1540.0	882.0 - 2130.0	Pass
STVE-1146	03/24/08	Cs-137	1163.80 ± 20.62	1100.0	807.0 - 1530.0	Pass
STVE-1146	03/24/08	K-40	22186.00 ± 339.40	24600.0	17700.0 - 34800.0	Pass
STVE-1146 ^e	03/24/08	Mn-54	0.00 ± 0.00	0.0	0.0 - 10.0	Pass
STVE-1146	03/24/08	Sr-90	3825.90 ± 140.66	4130.0	2310.0 - 5480.0	Pass
STVE-1146	03/24/08	U-233/4	2753.30 ± 227.90	3070.0	2110.0 - 4070.0	Pass
STVE-1146	03/24/08	U-238	2697.10 ± 143.20	3050.0	2140.0 - 3850.0	Pass
STVE-1146	03/24/08	Uranium	5586.10 ± 455.20	6260.0	4300.0 - 8080.0	Pass
STVE-1146	03/24/08	Zn-65	1676.80 ± 43.00	1430.0	1030.0 - 1960.0	Pass
STW-1147	03/24/08	Am-241	97.56 ± 1.02	90.9	62.0 - 124.0	Pass
STW-1147	03/24/08	Co-60	1430.00 ± 33.33	1420.0	1240.0 - 1680.0	Pass
STW-1147	03/24/08	Cs-134	730.18 ± 33.39	751.0	555.0 - 862.0	Pass
STW-1147	03/24/08	Cs-137	1947.80 ± 13.80	1990.0	1690.0 - 2380.0	Pass
STW-1147	03/24/08	Fe-55	1422.70 ± 172.16	2080.0	1210.0 - 2780.0	Pass
STW-1147 ^e	03/24/08	Mn-54	0.00 ± 0.00	0.0	0.0 - 10.0	Pass
STW-1147	03/24/08	Pu-238	144.16 ± 4.54	135.0	102.0 - 168.0	Pass
STW-1147	03/24/08	Pu-239/40	82.16 ± 2.50	80.7	62.4 - 99.8	Pass
STW-1147	03/24/08	Sr-90	512.03 ± 43.37	512.0	325.0 - 684.0	Pass
STW-1147	03/24/08	U-233/4	74.40 ± 1.20	81.0	61.0 - 104.0	Pass
STW-1147	03/24/08	U-238	75.10 ± 1.35	80.3	61.3 - 99.5	Pass
STW-1147	03/24/08	Uranium	152.10 ± 2.55	165.0	119.0 - 220.0	Pass
STW-1147	03/24/08	Zn-65	708.90 ± 29.00	694.0	588.0 - 865.0	Pass
STW-1120	03/19/07	Uranium	339.60 ± 10.66	391.0	282.0 - 521.0	Pass
STW-1120	03/19/07	Zn-65	2009.00 ± 36.40	1910.0	1600.0 - 2410.0	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).

^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.

^e Included in the testing series as a "false positive". No activity expected.

^f The analysis was repeated by leaching and total dissolution methods. Total dissolution yielded results within expected range. Results of the reanalysis: U-233,4, 1655 ± 95 pCi/kg. U-238 1805 ± 97 pCi/kg.

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;

$s = 2\sigma$ 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

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 number s 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 2008 was completed during September and October of 2008. 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 August 19th of 2008 for water use downstream of the DAEC to Cedar Rapids. This survey identified no new usages of river water from previous surveys. Irrigation of the strawberry farm in Palo and recreational fishing remain the only identified food pathway uses of Cedar River water between the DAEC and the City of Cedar Rapids eight miles down-river.

Significant flooding of the Cedar River in June of 2008 resulted in a noteworthy reduction in the number of gardens identified in this years census. It should also be noted that a large number of houses in Palo suffered major damage due to the flooding. At the time of this census, an assumption was made that all houses would be reoccupied. That assumption will be revisited during the 2009 census.

There were 84 vegetable gardens identified during the performance of the 2008 Census. This number is less than the number of gardens found in the 2007 survey by 82. There were no changes to the location of the nearest vegetable receptor which is located in the sector towards the SW at 4318 Power Plant Road.

There were no changes in the observed milk animal locations within the 3 mile radius of the plant in the past year. A number of farmers discontinued farming cattle and goats in 2008 in areas beyond 3 miles.

The locations of the nearest residence for each sector remained the same as 2007. In 2008, only one new home was constructed within three miles of the DAEC, compared to 21 new homes identified in 2007 and 16 new homes in 2006. The new house was built 1.9 miles to the East-North-East.

Since the last performance of the land use census, there have been no new drinking water wells drilled within a two mile radius of the 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.

FPL Energy 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 taken by the DAEC's Radiological Environmental Monitoring Program (REMP) above the threshold concentration levels for reporting.
- Both on-site and off-site ground water sampling/monitoring has been incorporated into the REMP. Consequently, all Ground Water Protection Program results are included as part of the Annual Radiological Environmental Operating Report.

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 2008 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, 1 mile and 3 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

- 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".
- 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.) The hypothetical maximally exposed organ due to liquid effluents was the liver of a child, with an estimated dose equivalent of 0.0000323 mrem.
 - 2.) The whole body dose equivalent to the hypothetical maximally exposed individual due to liquid effluents was 0.0000323 mrem.
 - 3.) The maximum dose to air at the site boundary from noble gases released was 0.000496 mrad from gamma radiation at 936 meters towards the Northwest.
 - 4.) The maximum dose to air at the site boundary from noble gases released was 0.000101 mrad beta radiation at 2416 meters towards the Northwest.
 - 5.) The whole body dose equivalent to the hypothetical maximally exposed individual from noble gases was 0.000630 mrem, at 805 meters towards the West.
 - 6.) The skin dose equivalent to the hypothetical maximally exposed individual from noble gases was 0.000660 mrem, at 805 meters towards the West.
 - 7.) 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 West, with an estimated dose equivalent of 0.0113 mrem.

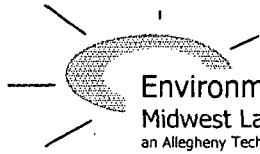
Conclusion:

No measurable dose due to the operation of the DAEC was detected by environmental TLDs in 2008. 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 2008

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	0.0000323 mrem	3 mrem
Organ Dose	Child - Liver		S	0.0000323 mrem	10 mrem
Noble Gas					
Gamma Air Dose		936	NW	0.000496 mrad	10 mrad
Beta Air Dose		2416	NW	0.000101 mrad	20 mrad
Whole Body	All	805	W	0.000630 mrem	5 mrem
Skin	All	805	W	0.000660 mrem	15 mrem
Particulates & Iodines					
Organ Dose	Child - Thyroid	805	W	0.0113 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.



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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**

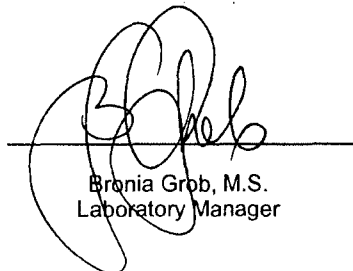
January 1 to December 31, 2008

Prepared by

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Project No. 8001

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Appendix A

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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 2007. 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 gamma isotopic analysis provides a spectrum with an energy range of 80 to 2048 keV. Specific isotopes included 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 K-40 and Ra daughters, are frequently detected but may not be listed.

2.0 LISTING OF MISSED SAMPLES

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
AP / AI	Gross Beta, I-131	D-15 D-16	02-07-08	Not accessible due to heavy snows
AP / AI	Gross Beta, I-131	D-15 D-16	02-14-08	Not accessible due to heavy snows
AP / AI	Gross Beta, I-131	D-5	06-19-08	Not collected due to severe flooding.
AP / AI	Gross Beta, I-131	D-5	06-26-08	Partial sample (74 m ³) due to power loss.
AP / AI	Gross Beta, I-131	D-16 D-16 D-16	06-19-08 06-26-08 07-03-08	Not collected due to severe flooding.
AP / AI	Gross Beta, I-131	D-7	07-23-08	No power to the sampler station.
AP / AI	Gross Beta, I-131	D-3	07-31-08	Partial sample (156 m ³).
AP / AI	Gross Beta, I-131	D-5	08-07-08	Partial sample (62 m ³) due to power loss.
AP / AI	Gross Beta, I-131	D-5	08-14-08	Partial sample (62 m ³) due to power loss.
AP / AI	Gross Beta, I-131	D-6	08-28-08	Partial sample (186 m ³) due to power loss.
TLD	Ambient Gamma	D-10	2nd Qtr, 2008	TLD lost due to vandalism.
TLD	Ambient Gamma	D-18, D-21 D-19, D-82	2nd Qtr, 2008	TLDs lost in the floods.
TLD	Ambient Gamma	D-18, D-19	3rd Qtr, 2008	TLDs not installed due to flooding.
TLD	Ambient Gamma	D-36	3rd Qtr, 2008	TLD lost in the field.
G	Gamma	D-117	July, 2008	No strawberries available.
G	Gamma	D-94, D-96	October, 2008	No crops available.

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>
01-10-08	290	0.039 ± 0.004	07-10-08	308	0.016 ± 0.003
01-17-08	288	0.052 ± 0.005	07-17-08	281	0.030 ± 0.004
01-24-08	290	0.037 ± 0.004	07-23-08	242	0.024 ± 0.004
01-31-08	291	0.047 ± 0.004	07-31-08	156 ^b	0.022 ± 0.005
02-07-08	290	0.022 ± 0.004	08-07-08	280	0.033 ± 0.004
02-14-08	290	0.046 ± 0.005	08-14-08	284	0.021 ± 0.003
02-21-08	293	0.032 ± 0.004	08-21-08	283	0.035 ± 0.004
02-28-08	290	0.023 ± 0.004	08-28-08	282	0.025 ± 0.003
03-06-08	290	0.029 ± 0.004	09-04-08	281	0.032 ± 0.004
03-13-08	288	0.037 ± 0.004	09-11-08	284	0.030 ± 0.004
03-20-08	288	0.020 ± 0.004	09-18-08	282	0.025 ± 0.003
03-27-08	281	0.025 ± 0.004	09-25-08	283	0.045 ± 0.004
04-03-08	285	0.019 ± 0.004	10-02-08	281	0.046 ± 0.004
<u>1st Quarter Mean ± s.d.</u>		<u>0.033 ± 0.011</u>	<u>3rd Quarter Mean ± s.d.</u>		<u>0.029 ± 0.009</u>
04-10-08	286	0.026 ± 0.004	10-09-08	292	0.033 ± 0.004
04-17-08	308	0.019 ± 0.003	10-16-08	291	0.027 ± 0.003
04-24-08	308	0.024 ± 0.004	10-23-08	291	0.028 ± 0.003
05-01-08	301	0.028 ± 0.004	10-30-08	254	0.031 ± 0.004
05-08-08	305	0.024 ± 0.004	11-06-08	289	0.053 ± 0.005
05-14-08	262	0.018 ± 0.004	11-13-08	294	0.016 ± 0.003
05-22-08	352	0.015 ± 0.003	11-20-08	292	0.030 ± 0.004
05-29-08	305	0.015 ± 0.003	11-26-08	254	0.037 ± 0.004
06-05-08	304	0.025 ± 0.004	12-04-08	310	0.031 ± 0.004
06-11-08	251	0.015 ± 0.004	12-11-08	275	0.031 ± 0.004
06-19-08	341	0.015 ± 0.003	12-17-08	236	0.042 ± 0.005
06-26-08	307	0.017 ± 0.003	12-23-08	231	0.012 ± 0.003
07-03-08	304	0.020 ± 0.004	12-31-08	310	0.013 ± 0.003
<u>2nd Quarter Mean ± s.d.</u>		<u>0.020 ± 0.005</u>	<u>4th Quarter Mean ± s.d.</u>		<u>0.030 ± 0.011</u>
<u>Cumulative Average</u>					<u>0.028</u>
<u>Previous Annual Average</u>					<u>0.031</u>

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

^b No explanation given for low volume.

DUANE ARNOLD

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>		<u>0.010</u>
01-10-08	284	0.047 ± 0.004	07-10-08	288	0.022 ± 0.004
01-17-08	287	0.059 ± 0.005	07-17-08	283	0.028 ± 0.004
01-24-08	284	0.042 ± 0.005	07-23-08	245	0.022 ± 0.004
01-31-08	286	0.057 ± 0.005	07-31-08	327	0.026 ± 0.003
02-07-08	284	0.021 ± 0.004	08-07-08	62 ^d	0.022 ± 0.011
02-14-08	285	0.040 ± 0.005	08-14-08	62 ^d	0.026 ± 0.011
02-21-08	287	0.036 ± 0.004	08-21-08	285	0.039 ± 0.004
02-28-08	285	0.029 ± 0.004	08-28-08	300	0.025 ± 0.003
03-06-08	284	0.024 ± 0.004	09-04-08	300	0.031 ± 0.004
03-13-08	286	0.035 ± 0.004	09-11-08	300	0.024 ± 0.003
03-20-08	288	0.019 ± 0.004	09-18-08	301	0.021 ± 0.003
03-27-08	280	0.020 ± 0.004	09-25-08	299	0.041 ± 0.004
04-03-08	286	0.012 ± 0.003	10-02-08	300	0.041 ± 0.004
1st Quarter Mean ± s.d.		0.034 ± 0.015	3rd Quarter Mean ± s.d.		0.028 ± 0.007
04-10-08	286	0.022 ± 0.004	10-09-08	300	0.033 ± 0.004
04-17-08	285	0.017 ± 0.003	10-16-08	299	0.021 ± 0.003
04-24-08	286	0.023 ± 0.004	10-23-08	299	0.023 ± 0.003
05-01-08	284	0.026 ± 0.004	10-30-08	302	0.023 ± 0.003
05-08-08	284	0.026 ± 0.004	11-06-08	298	0.047 ± 0.004
05-14-08	244	0.021 ± 0.004	11-13-08	302	0.014 ± 0.003
05-22-08	328	0.016 ± 0.003	11-20-08	302	0.029 ± 0.003
05-29-08	285	0.013 ± 0.003	11-26-08	260	0.030 ± 0.004
06-05-08	283	0.027 ± 0.004	12-04-08	344	0.031 ± 0.003
06-11-08	243	0.013 ± 0.004	12-11-08	304	0.024 ± 0.003
06-19-08		ND ^b	12-17-08	264	0.046 ± 0.004
06-26-08	74 ^c	0.024 ± 0.011	12-23-08	255	0.015 ± 0.003
07-03-08	285	0.020 ± 0.004	12-31-08	345	0.041 ± 0.004
2nd Quarter Mean ± s.d.		0.021 ± 0.005	4th Quarter Mean ± s.d.		0.029 ± 0.011
Cumulative Average					0.028
Previous Annual Average					0.032

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

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

^c Low volume; electric off due to flooding. I-131 results, < 0.072 pCi/m³.

^d Electric off.

DUANE ARNOLD

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>
01-10-08	276	0.046 ± 0.004	07-10-08	288	0.019 ± 0.003
01-17-08	278	0.060 ± 0.005	07-17-08	283	0.023 ± 0.004
01-24-08	276	0.055 ± 0.005	07-23-08	245	0.020 ± 0.004
01-31-08	277	0.056 ± 0.005	07-31-08	327	0.026 ± 0.003
02-07-08	278	0.028 ± 0.004	08-07-08	284	0.031 ± 0.004
02-14-08	276	0.053 ± 0.005	08-14-08	287	0.020 ± 0.003
02-21-08	279	0.039 ± 0.005	08-21-08	285	0.038 ± 0.004
02-28-08	297	0.030 ± 0.004	08-28-08	186 ^b	0.036 ± 0.005
03-06-08	295	0.035 ± 0.004	09-04-08	287	0.030 ± 0.004
03-13-08	286	0.039 ± 0.004	09-11-08	288	0.023 ± 0.003
03-20-08	288	0.020 ± 0.004	09-18-08	289	0.022 ± 0.003
03-27-08	292	0.018 ± 0.004	09-25-08	287	0.040 ± 0.004
04-03-08	297	0.017 ± 0.003	10-02-08	287	0.038 ± 0.004
1st Quarter Mean ± s.d.		0.038 ± 0.015	3rd Quarter Mean ± s.d.		0.028 ± 0.008
04-10-08	298	0.020 ± 0.003	10-09-08	289	0.033 ± 0.004
04-17-08	298	0.014 ± 0.003	10-16-08	286	0.013 ± 0.003
04-24-08	297	0.017 ± 0.003	10-23-08	281	0.026 ± 0.003
05-01-08	296	0.023 ± 0.004	10-30-08	284	0.027 ± 0.003
05-08-08	296	0.020 ± 0.004	11-06-08	287	0.048 ± 0.004
05-14-08	254	0.019 ± 0.004	11-13-08	289	0.016 ± 0.003
05-22-08	342	0.014 ± 0.003	11-20-08	291	0.028 ± 0.004
05-29-08	296	0.013 ± 0.003	11-26-08	251	0.033 ± 0.004
06-05-08	283	0.027 ± 0.004	12-04-08	331	0.031 ± 0.003
06-11-08	251	0.013 ± 0.004	12-11-08	292	0.033 ± 0.004
06-19-08	318	0.016 ± 0.003	12-17-08	254	0.043 ± 0.004
06-26-08	287	0.020 ± 0.004	12-23-08	246	0.049 ± 0.005
07-03-08	283	0.018 ± 0.004	12-31-08	331	0.064 ± 0.004
2nd Quarter Mean ± s.d.		0.018 ± 0.004	4th Quarter Mean ± s.d.		0.034 ± 0.014
Cumulative Average					0.030
Previous Annual Average					0.032

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

^b Electric off.

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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>
01-10-08	282	0.043 ± 0.004	07-10-08	285	0.021 ± 0.004
01-17-08	284	0.047 ± 0.005	07-17-08	281	0.028 ± 0.004
01-24-08	282	0.046 ± 0.005	07-23-08		ND ^b
01-31-08	282	0.048 ± 0.004	07-31-08	343	0.025 ± 0.003
02-07-08	282	0.024 ± 0.004	08-07-08	282	0.036 ± 0.004
02-14-08	273	0.052 ± 0.005	08-14-08	284	0.028 ± 0.004
02-21-08	290	0.034 ± 0.004	08-21-08	282	0.038 ± 0.004
02-28-08	288	0.032 ± 0.004	08-28-08	284	0.010 ± 0.003
03-06-08	287	0.033 ± 0.004	09-04-08	281	0.035 ± 0.004
03-13-08	286	0.034 ± 0.004	09-11-08	283	0.023 ± 0.003
03-20-08	288	0.017 ± 0.003	09-18-08	284	0.023 ± 0.003
03-27-08	283	0.017 ± 0.004	09-25-08	282	0.038 ± 0.004
04-03-08	282	0.019 ± 0.004	10-02-08	283	0.036 ± 0.004
1st Quarter Mean ± s.d.		0.034 ± 0.012	3rd Quarter Mean ± s.d.		0.028 ± 0.008
04-10-08	289	0.022 ± 0.004	10-09-08	283	0.032 ± 0.004
04-17-08	300	0.015 ± 0.003	10-16-08	285	0.020 ± 0.003
04-24-08	300	0.022 ± 0.004	10-23-08	285	0.028 ± 0.004
05-01-08	299	0.027 ± 0.004	10-30-08	285	0.025 ± 0.003
05-08-08	298	0.020 ± 0.004	11-06-08	284	0.023 ± 0.003
05-14-08	257	0.013 ± 0.004	11-13-08	288	0.015 ± 0.003
05-22-08	345	0.013 ± 0.003	11-20-08	285	0.025 ± 0.003
05-29-08	300	0.014 ± 0.003	11-26-08	246	0.028 ± 0.004
06-05-08	298	0.019 ± 0.004	12-04-08	312	0.031 ± 0.003
06-11-08	245	0.014 ± 0.004	12-11-08	258	0.035 ± 0.004
06-19-08	334	0.015 ± 0.003	12-17-08	239	0.042 ± 0.005
06-26-08	301	0.019 ± 0.003	12-23-08	231	0.049 ± 0.005
07-03-08	298	0.014 ± 0.003	12-31-08	312	0.058 ± 0.004
2nd Quarter Mean ± s.d.		0.017 ± 0.004	4th Quarter Mean ± s.d.		0.032 ± 0.012
					Cumulative Average
					0.028
					Previous Annual Average
					0.030

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

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

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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>
01-10-08	286	0.044 ± 0.004	07-10-08	289	0.018 ± 0.003
01-17-08	286	0.056 ± 0.005	07-17-08	281	0.030 ± 0.004
01-24-08	285	0.047 ± 0.005	07-23-08	243	0.024 ± 0.004
01-31-08	286	0.051 ± 0.005	07-31-08	334	0.025 ± 0.003
02-07-08	285	0.025 ± 0.004	08-07-08	282	0.027 ± 0.004
02-14-08	284	0.051 ± 0.005	08-14-08	293	0.021 ± 0.003
02-21-08	288	0.045 ± 0.005	08-21-08	283	0.039 ± 0.004
02-28-08	285	0.034 ± 0.004	08-28-08	253	0.021 ± 0.003
03-06-08	284	0.032 ± 0.004	09-04-08	290	0.029 ± 0.003
03-13-08	286	0.039 ± 0.005	09-11-08	292	0.022 ± 0.003
03-20-08	288	0.019 ± 0.004	09-18-08	291	0.020 ± 0.003
03-27-08	286	0.022 ± 0.004	09-25-08	292	0.038 ± 0.004
04-03-08	294	0.017 ± 0.003	10-02-08	290	0.035 ± 0.004
1st Quarter Mean ± s.d.		0.037 ± 0.013	3rd Quarter Mean ± s.d.		0.027 ± 0.007
04-10-08	292	0.022 ± 0.004	10-09-08	289	0.029 ± 0.004
04-17-08	292	0.017 ± 0.003	10-16-08	288	0.025 ± 0.003
04-24-08	292	0.020 ± 0.004	10-23-08	291	0.022 ± 0.003
05-01-08	290	0.024 ± 0.004	10-30-08	290	0.028 ± 0.003
05-08-08	290	0.018 ± 0.004	11-06-08	286	0.051 ± 0.004
05-14-08	248	0.016 ± 0.004	11-13-08	291	0.017 ± 0.003
05-22-08	334	0.016 ± 0.003	11-20-08	290	0.033 ± 0.004
05-29-08	290	0.013 ± 0.003	11-26-08	246	0.036 ± 0.004
06-05-08	284	0.021 ± 0.004	12-04-08	328	0.035 ± 0.004
06-11-08	251	0.014 ± 0.004	12-11-08	291	0.034 ± 0.004
06-19-08	326	0.013 ± 0.003	12-17-08	249	0.045 ± 0.005
06-26-08	293	0.018 ± 0.003	12-23-08	244	0.049 ± 0.005
07-03-08	288	0.014 ± 0.003	12-31-08	328	0.061 ± 0.004
2nd Quarter Mean ± s.d.		0.017 ± 0.004	4th Quarter Mean ± s.d.		0.036 ± 0.013
			Cumulative Average		0.029
			Previous Annual Average		0.031

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

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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>
01-10-08	276	0.046 ± 0.004	07-10-08	288	0.018 ± 0.003
01-17-08	278	0.057 ± 0.005	07-17-08	284	0.022 ± 0.004
01-24-08	276	0.054 ± 0.005	07-23-08	245	0.022 ± 0.004
01-31-08	277	0.052 ± 0.005	07-31-08	327	0.024 ± 0.003
02-07-08	276	0.026 ± 0.004	08-07-08	284	0.025 ± 0.003
02-14-08	276	0.049 ± 0.005	08-14-08	287	0.022 ± 0.003
02-21-08	279	0.035 ± 0.005	08-21-08	285	0.030 ± 0.004
02-28-08	277	0.028 ± 0.004	08-28-08	269	0.026 ± 0.004
03-06-08	275	0.032 ± 0.004	09-04-08	268	0.033 ± 0.004
03-13-08	286	0.044 ± 0.005	09-11-08	273	0.023 ± 0.003
03-20-08	288	0.017 ± 0.003	09-18-08	271	0.023 ± 0.003
03-27-08	286	0.016 ± 0.004	09-25-08	263	0.043 ± 0.005
04-03-08	278	0.019 ± 0.004	10-02-08	269	0.040 ± 0.004
1st Quarter Mean ± s.d.		0.036 ± 0.015	3rd Quarter Mean ± s.d.		0.027 ± 0.007
04-10-08	286	0.026 ± 0.004	10-09-08	267	0.035 ± 0.004
04-17-08	286	0.018 ± 0.003	10-16-08	266	0.026 ± 0.004
04-24-08	286	0.029 ± 0.004	10-23-08	270	0.024 ± 0.003
05-01-08	285	0.026 ± 0.004	10-30-08	273	0.026 ± 0.004
05-08-08	284	0.025 ± 0.004	11-06-08	254	0.048 ± 0.005
05-14-08	245	0.019 ± 0.004	11-13-08	274	0.016 ± 0.003
05-22-08	328	0.016 ± 0.003	11-20-08	285	0.029 ± 0.004
05-29-08	285	0.013 ± 0.003	11-26-08	246	0.029 ± 0.004
06-05-08	284	0.022 ± 0.004	12-04-08	325	0.026 ± 0.003
06-11-08	250	0.014 ± 0.004	12-11-08	286	0.031 ± 0.004
06-19-08	318	0.015 ± 0.003	12-17-08	249	0.043 ± 0.005
06-26-08	286	0.019 ± 0.004	12-23-08	241	0.046 ± 0.005
07-03-08	284	0.018 ± 0.004	12-31-08	325	0.056 ± 0.004
2nd Quarter Mean ± s.d.		0.020 ± 0.005	4th Quarter Mean ± s.d.		0.034 ± 0.011
Cumulative Average					0.029
Previous Annual Average					0.031

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

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

Location: D-15 (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>
01-10-08	279	0.043 ± 0.004	07-10-08	286	0.022 ± 0.004
01-17-08	281	0.063 ± 0.005	07-17-08	281	0.026 ± 0.004
01-24-08	279	0.052 ± 0.005	07-23-08	243	0.022 ± 0.004
01-31-08	280	0.054 ± 0.005	07-31-08	323	0.026 ± 0.003
02-07-08		ND ^b	08-07-08	282	0.029 ± 0.004
02-14-08		ND ^b	08-14-08	284	0.024 ± 0.003
02-21-08	303	0.036 ± 0.004	08-21-08	282	0.034 ± 0.004
02-28-08	280	0.023 ± 0.004	08-28-08	288	0.023 ± 0.003
03-06-08	272	0.032 ± 0.004	09-04-08	288	0.033 ± 0.004
03-13-08	286	0.033 ± 0.004	09-11-08	288	0.025 ± 0.003
03-20-08	284	0.015 ± 0.003	09-18-08	290	0.024 ± 0.003
03-27-08	273	0.018 ± 0.004	09-25-08	287	0.040 ± 0.004
04-03-08	275	0.020 ± 0.004	10-02-08	289	0.047 ± 0.004
1st Quarter Mean ± s.d.		0.035 ± 0.016	3rd Quarter Mean ± s.d.		0.029 ± 0.008
04-10-08	275	0.026 ± 0.004	10-09-08	288	0.036 ± 0.004
04-17-08	275	0.018 ± 0.004	10-16-08	288	0.024 ± 0.003
04-24-08	280	0.024 ± 0.004	10-23-08	282	0.027 ± 0.004
05-01-08	273	0.027 ± 0.004	10-30-08	290	0.028 ± 0.003
05-08-08	273	0.025 ± 0.004	11-06-08	284	0.055 ± 0.005
05-14-08	235	0.019 ± 0.004	11-13-08	291	0.015 ± 0.003
05-22-08	315	0.016 ± 0.003	11-20-08	288	0.027 ± 0.004
05-29-08	274	0.014 ± 0.003	11-26-08	249	0.037 ± 0.004
06-05-08	281	0.026 ± 0.004	12-04-08	328	0.039 ± 0.004
06-11-08	246	0.013 ± 0.004	12-11-08	289	0.035 ± 0.004
06-19-08	320	0.016 ± 0.003	12-17-08	251	0.046 ± 0.005
06-26-08	277	0.017 ± 0.004	12-23-08	243	0.050 ± 0.005
07-03-08	282	0.019 ± 0.004	12-31-08	328	0.064 ± 0.004
2nd Quarter Mean ± s.d.		0.020 ± 0.005	4th Quarter Mean ± s.d.		0.037 ± 0.014
Cumulative Average					0.030
Previous Annual Average					0.032

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

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

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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>
01-10-08	279	0.048 ± 0.004	07-10-08	306	0.016 ± 0.003
01-17-08	281	0.053 ± 0.005	07-17-08	281	0.029 ± 0.004
01-24-08	279	0.060 ± 0.005	07-23-08	243	0.023 ± 0.004
01-31-08	280	0.048 ± 0.004	07-31-08	346	0.024 ± 0.003
02-07-08		ND ^b	08-07-08	282	0.036 ± 0.004
02-14-08		ND ^b	08-14-08	284	0.022 ± 0.003
02-21-08	317	0.044 ± 0.004	08-21-08	282	0.024 ± 0.004
02-28-08	286	0.032 ± 0.004	08-28-08	282	0.024 ± 0.003
03-06-08	284	0.034 ± 0.004	09-04-08	282	0.035 ± 0.004
03-13-08	285	0.051 ± 0.005	09-11-08	283	0.034 ± 0.004
03-20-08	285	0.024 ± 0.004	09-18-08	283	0.023 ± 0.003
03-27-08	284	0.022 ± 0.004	09-25-08	281	0.046 ± 0.004
04-03-08	286	0.021 ± 0.004	10-02-08	276	0.045 ± 0.004
1st Quarter Mean ± s.d.		<u>0.040 ± 0.014</u>	3rd Quarter Mean ± s.d.		<u>0.029 ± 0.009</u>
04-10-08	286	0.023 ± 0.004	10-09-08	282	0.036 ± 0.004
04-17-08	286	0.018 ± 0.003	10-16-08	294	0.027 ± 0.003
04-24-08	304	0.020 ± 0.004	10-23-08	294	0.029 ± 0.004
05-01-08	302	0.024 ± 0.004	10-30-08	296	0.031 ± 0.004
05-08-08	302	0.021 ± 0.004	11-06-08	293	0.053 ± 0.004
05-14-08	258	0.015 ± 0.004	11-13-08	298	0.016 ± 0.003
05-22-08	347	0.013 ± 0.003	11-20-08	294	0.034 ± 0.004
05-29-08	300	0.012 ± 0.003	11-26-08	252	0.034 ± 0.004
06-05-08	301	0.022 ± 0.004	12-04-08	335	0.033 ± 0.003
06-11-08	215	0.011 ± 0.004	12-11-08	295	0.036 ± 0.004
06-19-08		ND ^b	12-17-08	256	0.044 ± 0.004
06-26-08		ND ^b	12-23-08	248	0.052 ± 0.005
07-03-08		ND ^b	12-31-08	335	0.049 ± 0.004
2nd Quarter Mean ± s.d.		<u>0.018 ± 0.005</u>	4th Quarter Mean ± s.d.		<u>0.037 ± 0.011</u>
Cumulative Average					0.031
Previous Annual Average					0.032

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

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

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Table 9. 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- 1748	DAP- 3681	DAP- 5935	DAP- 7514
Volume (m ³)	3755	3933	3527	3619
Be-7	0.063 ± 0.014	0.118 ± 0.017	0.078 ± 0.016	0.061 ± 0.016
Mn-54	< 0.0007	< 0.0007	< 0.0009	< 0.0006
Fe-59	< 0.0011	< 0.0016	< 0.0016	< 0.0019
Co-58	< 0.0004	< 0.0003	< 0.0008	< 0.0010
Co-60	< 0.0006	< 0.0006	< 0.0008	< 0.0008
Nb-95	< 0.0003	< 0.0007	< 0.0010	< 0.0015
Zr-95	< 0.0014	< 0.0010	< 0.0008	< 0.0007
Ru-103	< 0.0007	< 0.0005	< 0.0011	< 0.0007
Ru-106	< 0.0024	< 0.0052	< 0.0082	< 0.0070
Cs-134	< 0.0006	< 0.0004	< 0.0007	< 0.0005
Cs-137	< 0.0005	< 0.0004	< 0.0008	< 0.0007
Ce-141	< 0.0014	< 0.0009	< 0.0018	< 0.0010
Ce-144	< 0.0037	< 0.0043	< 0.0035	< 0.0043

Location				
D-5				
Lab Code	DAP- 1749	DAP- 3682	DAP- 5936	DAP- 7515
Volume (m ³)	3708	3170	3352	3875
Be-7	0.066 ± 0.016	0.089 ± 0.019	0.109 ± 0.022	0.049 ± 0.012
Mn-54	< 0.0008	< 0.0008	< 0.0005	< 0.0005
Fe-59	< 0.0010	< 0.0021	< 0.0017	< 0.0018
Co-58	< 0.0005	< 0.0005	< 0.0014	< 0.0010
Co-60	< 0.0006	< 0.0010	< 0.0010	< 0.0008
Nb-95	< 0.0007	< 0.0008	< 0.0018	< 0.0007
Zr-95	< 0.0020	< 0.0008	< 0.0023	< 0.0018
Ru-103	< 0.0009	< 0.0005	< 0.0013	< 0.0011
Ru-106	< 0.0038	< 0.0078	< 0.0059	< 0.0060
Cs-134	< 0.0005	< 0.0008	< 0.0006	< 0.0006
Cs-137	< 0.0005	< 0.0005	< 0.0014	< 0.0007
Ce-141	< 0.0013	< 0.0024	< 0.0015	< 0.0012
Ce-144	< 0.0044	< 0.0054	< 0.0040	< 0.0041

Location				
D-6				
Lab Code	DAP- 1750	DAP- 3683	DAP- 5937	DAP- 7516
Volume (m ³)	3695	3800	3625	3710
Be-7	0.077 ± 0.016	0.086 ± 0.016	0.085 ± 0.017	0.085 ± 0.017
Mn-54	< 0.0006	< 0.0006	< 0.0008	< 0.0006
Fe-59	< 0.0010	< 0.0015	< 0.0025	< 0.0019
Co-58	< 0.0007	< 0.0004	< 0.0009	< 0.0005
Co-60	< 0.0008	< 0.0006	< 0.0009	< 0.0008
Nb-95	< 0.0006	< 0.0005	< 0.0011	< 0.0007
Zr-95	< 0.0006	< 0.0013	< 0.0009	< 0.0012
Ru-103	< 0.0008	< 0.0007	< 0.0014	< 0.0011
Ru-106	< 0.0027	< 0.0057	< 0.0059	< 0.0064
Cs-134	< 0.0004	< 0.0007	< 0.0008	< 0.0005
Cs-137	< 0.0005	< 0.0009	< 0.0010	< 0.0006
Ce-141	< 0.0012	< 0.0012	< 0.0018	< 0.0013
Ce-144	< 0.0035	< 0.0044	< 0.0057	< 0.0044

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Table 9. 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- 1751	DAP- 3684	DAP- 5938	DAP- 7517
Volume (m ³)	3690	3864	3452	3592
Be-7	0.075 ± 0.013	0.087 ± 0.018	0.108 ± 0.019	0.069 ± 0.015
Mn-54	< 0.0008	< 0.0005	< 0.0008	< 0.0004
Fe-59	< 0.0011	< 0.0014	< 0.0024	< 0.0019
Co-58	< 0.0003	< 0.0003	< 0.0009	< 0.0010
Co-60	< 0.0006	< 0.0010	< 0.0012	< 0.0008
Nb-95	< 0.0007	< 0.0005	< 0.0019	< 0.0012
Zr-95	< 0.0007	< 0.0016	< 0.0022	< 0.0008
Ru-103	< 0.0007	< 0.0009	< 0.0013	< 0.0012
Ru-106	< 0.0040	< 0.0056	< 0.0083	< 0.0069
Cs-134	< 0.0007	< 0.0004	< 0.0010	< 0.0007
Cs-137	< 0.0008	< 0.0006	< 0.0011	< 0.0006
Ce-141	< 0.0015	< 0.0010	< 0.0016	< 0.0009
Ce-144	< 0.0029	< 0.0050	< 0.0041	< 0.0041

Location				
D-11				
Lab Code	DAP- 1752	DAP- 3685	DAP- 5939	DAP- 7518
Volume (m ³)	3721	3772	3712	3711
Be-7	0.067 ± 0.013	0.093 ± 0.019	0.094 ± 0.018	0.063 ± 0.012
Mn-54	< 0.0008	< 0.0006	< 0.0007	< 0.0008
Fe-59	< 0.0010	< 0.0015	< 0.0035	< 0.0020
Co-58	< 0.0007	< 0.0003	< 0.0012	< 0.0007
Co-60	< 0.0006	< 0.0007	< 0.0010	< 0.0007
Nb-95	< 0.0005	< 0.0006	< 0.0018	< 0.0006
Zr-95	< 0.0009	< 0.0017	< 0.0020	< 0.0012
Ru-103	< 0.0008	< 0.0006	< 0.0012	< 0.0008
Ru-106	< 0.0055	< 0.0050	< 0.0076	< 0.0079
Cs-134	< 0.0006	< 0.0007	< 0.0008	< 0.0004
Cs-137	< 0.0006	< 0.0004	< 0.0010	< 0.0006
Ce-141	< 0.0008	< 0.0016	< 0.0016	< 0.0017
Ce-144	< 0.0040	< 0.0042	< 0.0036	< 0.0038

Location				
D-13				
Lab Code	DAP- 1753	DAP- 3686	DAP- 5940	DAP- 7519
Volume (m ³)	3629	3707	3614	3561
Be-7	0.060 ± 0.016	0.094 ± 0.017	0.092 ± 0.018	0.067 ± 0.014
Mn-54	< 0.0008	< 0.0007	< 0.0008	< 0.0003
Fe-59	< 0.0011	< 0.0015	< 0.0021	< 0.0020
Co-58	< 0.0006	< 0.0006	< 0.0007	< 0.0006
Co-60	< 0.0006	< 0.0011	< 0.0009	< 0.0010
Nb-95	< 0.0004	< 0.0005	< 0.0012	< 0.0010
Zr-95	< 0.0011	< 0.0014	< 0.0020	< 0.0009
Ru-103	< 0.0007	< 0.0004	< 0.0014	< 0.0011
Ru-106	< 0.0043	< 0.0065	< 0.0071	< 0.0072
Cs-134	< 0.0006	< 0.0008	< 0.0010	< 0.0005
Cs-137	< 0.0005	< 0.0003	< 0.0009	< 0.0007
Ce-141	< 0.0008	< 0.0014	< 0.0013	< 0.0013
Ce-144	< 0.0030	< 0.0045	< 0.0045	< 0.0051

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Table 9. 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- 1754	DAP- 3687	DAP- 5941	DAP- 7520	
Volume (m ³)	3092	3605	3710	3699	
Be-7	0.076 ± 0.015	0.120 ± 0.019	0.082 ± 0.018	0.076 ± 0.017	
Mn-54	< 0.0008	< 0.0011	< 0.0008	< 0.0011	
Fe-59	< 0.0012	< 0.0018	< 0.0018	< 0.0016	
Co-58	< 0.0008	< 0.0005	< 0.0005	< 0.0009	
Co-60	< 0.0010	< 0.0006	< 0.0008	< 0.0009	
Nb-95	< 0.0004	< 0.0005	< 0.0013	< 0.0012	
Zr-95	< 0.0018	< 0.0013	< 0.0021	< 0.0010	
Ru-103	< 0.0013	< 0.0006	< 0.0016	< 0.0010	
Ru-106	< 0.0045	< 0.0072	< 0.0087	< 0.0048	
Cs-134	< 0.0008	< 0.0007	< 0.0009	< 0.0005	
Cs-137	< 0.0006	< 0.0006	< 0.0009	< 0.0006	
Ce-141	< 0.0016	< 0.0007	< 0.0025	< 0.0012	
Ce-144	< 0.0058	< 0.0039	< 0.0042	< 0.0048	

Location		D-16			
Lab Code	DAP- 1755	DAP- 3688	DAP- 5942	DAP- 7521	
Volume (m ³)	3146	2899	3711	3772	
Be-7	0.070 ± 0.015	0.074 ± 0.016	0.074 ± 0.019	0.077 ± 0.014	
Mn-54	< 0.0007	< 0.0009	< 0.0007	< 0.0007	
Fe-59	< 0.0013	< 0.0019	< 0.0018	< 0.0010	
Co-58	< 0.0008	< 0.0004	< 0.0012	< 0.0006	
Co-60	< 0.0007	< 0.0012	< 0.0008	< 0.0005	
Nb-95	< 0.0011	< 0.0006	< 0.0012	< 0.0015	
Zr-95	< 0.0010	< 0.0008	< 0.0006	< 0.0020	
Ru-103	< 0.0011	< 0.0010	< 0.0015	< 0.0011	
Ru-106	< 0.0049	< 0.0073	< 0.0067	< 0.0083	
Cs-134	< 0.0006	< 0.0007	< 0.0008	< 0.0006	
Cs-137	< 0.0007	< 0.0007	< 0.0007	< 0.0008	
Ce-141	< 0.0009	< 0.0013	< 0.0016	< 0.0020	
Ce-144	< 0.0052	< 0.0056	< 0.0040	< 0.0037	

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Table 10. Area monitors (TLD), Quarterly
Units: mR/91 days

<u>Air Stations</u>	<u>1st Qtr.</u>	<u>2nd Qtr.</u>	<u>3rd Qtr.</u>	<u>4th Qtr.</u>
D-1	17.9 ± 0.6	16.1 ± 0.9	19.5 ± 1.4	17.8 ± 1.1
D-2	15.7 ± 1.3	14.4 ± 1.5	17.5 ± 1.8	15.4 ± 1.6
D-3	15.6 ± 0.7	17.4 ± 0.7	15.9 ± 1.3	17.4 ± 0.7
D-5	15.5 ± 0.8	19.4 ± 0.6	20.3 ± 1.6	22.5 ± 1.3
D-6	15.1 ± 0.6	20.0 ± 0.6	17.3 ± 1.7	20.3 ± 0.6
D-7	13.7 ± 0.7	18.5 ± 1.1	18.4 ± 1.3	19.3 ± 1.0
D-8	17.3 ± 0.6	21.8 ± 1.3	20.8 ± 1.1	24.2 ± 0.9
D-10	14.9 ± 0.6	ND ^a	20.6 ± 1.0	16.0 ± 0.7
D-11	14.3 ± 0.6	18.3 ± 1.9	15.7 ± 1.1	18.4 ± 1.8
D-13	13.9 ± 0.5	18.3 ± 0.9	19.4 ± 1.2	19.6 ± 0.8
D-15	15.1 ± 0.8	18.0 ± 0.7	19.7 ± 1.3	17.7 ± 0.8
D-16	17.1 ± 0.5	17.2 ± 1.9	19.5 ± 1.3	19.6 ± 2.0
Mean ± s.d.	15.5 ± 1.3	18.1 ± 2.0	18.7 ± 1.7	19.0 ± 2.5
<u>Within 0.5 mi. of Stack</u>				
D-17	16.2 ± 0.7	19.1 ± 1.9	21.1 ± 1.3	21.0 ± 1.0
D-18	16.8 ± 0.9	ND ^a	ND ^a	20.2 ± 1.0
D-19	16.8 ± 0.7	ND ^a	ND ^a	19.7 ± 0.8
D-20	17.8 ± 0.6	19.4 ± 0.9	22.4 ± 1.2	21.8 ± 0.9
D-21	17.0 ± 0.8	ND ^a	20.8 ± 1.3	19.2 ± 0.7
D-22	15.9 ± 0.7	15.4 ± 0.9	18.6 ± 1.2	18.8 ± 0.7
D-23	16.2 ± 0.6	16.3 ± 0.9	20.3 ± 1.2	18.8 ± 1.1
D-28	15.3 ± 0.6	21.5 ± 0.9	23.0 ± 1.2	24.3 ± 0.9
D-29	18.1 ± 0.6	22.6 ± 1.2	26.0 ± 1.2	26.0 ± 1.7
D-30	17.5 ± 0.8	20.4 ± 1.5	27.3 ± 1.6	24.3 ± 1.7
D-31	18.9 ± 0.9	22.0 ± 1.2	24.2 ± 1.8	25.4 ± 1.2
D-32	19.6 ± 0.5	20.3 ± 1.3	26.3 ± 1.1	23.4 ± 1.4
D-82	15.0 ± 0.5	ND ^a	17.4 ± 1.0	15.0 ± 0.6
D-83	15.7 ± 0.6	16.9 ± 0.6	19.7 ± 1.2	18.6 ± 0.6
D-84	15.9 ± 0.7	16.2 ± 0.7	20.2 ± 1.3	18.9 ± 0.8
D-85	15.4 ± 0.4	15.8 ± 0.8	20.6 ± 1.1	18.5 ± 0.9
D-86	17.7 ± 1.0	17.2 ± 1.1	21.5 ± 1.4	20.5 ± 1.2
D-91	13.7 ± 0.6	16.9 ± 1.0	15.6 ± 1.1	16.7 ± 0.9
Mean ± s.d.	16.6 ± 1.5	18.6 ± 2.5	21.6 ± 3.2	20.6 ± 3.0

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

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Table 10. Area monitors (TLD), Quarterly
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	14.2 ± 0.7	18.0 ± 1.2	18.3 ± 1.7	18.5 ± 1.3
D-44	17.0 ± 0.5	22.1 ± 0.7	21.6 ± 1.1	22.7 ± 0.7
D-45	15.0 ± 0.6	17.4 ± 1.0	18.1 ± 1.0	18.3 ± 1.1
D-46	16.6 ± 0.7	21.3 ± 1.0	20.4 ± 1.4	23.2 ± 1.1
D-47	16.2 ± 0.7	21.3 ± 0.9	20.4 ± 1.2	22.7 ± 1.0
D-48	17.7 ± 0.6	23.0 ± 1.1	21.6 ± 1.0	24.2 ± 1.1
Mean ± s.d.	16.1 ± 1.3	20.5 ± 2.3	20.1 ± 1.5	21.6 ± 2.5
<u>Within 3.0 mi. of Stack</u>				
D-33	14.4 ± 0.5	17.4 ± 0.7	15.5 ± 1.0	17.6 ± 0.6
D-34	14.4 ± 0.5	16.2 ± 0.9	18.1 ± 1.4	16.8 ± 0.8
D-35	14.5 ± 0.7	16.3 ± 0.9	17.5 ± 1.0	16.6 ± 0.6
D-36	14.7 ± 0.8	16.6 ± 0.7	ND ^a	18.0 ± 0.9
D-37	19.0 ± 0.9	21.8 ± 2.4	20.0 ± 1.5	25.2 ± 1.0
D-38	15.3 ± 0.8	19.4 ± 0.9	18.4 ± 1.2	20.0 ± 0.8
D-39	15.8 ± 0.7	18.4 ± 0.8	19.4 ± 1.1	20.4 ± 0.6
D-40	14.1 ± 0.7	16.1 ± 0.9	15.5 ± 1.3	17.2 ± 0.9
D-41	14.7 ± 0.6	16.8 ± 1.2	17.2 ± 1.2	18.1 ± 0.7
D-42	14.9 ± 0.6	17.3 ± 1.4	16.1 ± 1.1	18.1 ± 1.3
Mean ± s.d.	15.2 ± 1.4	17.6 ± 1.8	17.5 ± 1.6	18.8 ± 2.6

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

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Table 11. 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
01-08-08	DMI- 76	< 0.3	1367 ± 86	< 2.1	< 2.2	< 10.4	< 2.5
02-05-08	DMI- 471	< 0.3	1326 ± 110	< 3.8	< 3.0	< 17.3	< 4.1
03-04-08	DMI- 843	< 0.3	1416 ± 105	< 3.7	< 4.9	< 13.1	< 1.7
04-01-08	DMI- 1321	< 0.3	1539 ± 108	< 3.4	< 3.7	< 17.7	< 1.9
05-06-08	DMI- 2213	< 0.2	1387 ± 105	< 3.2	< 3.5	< 9.5	< 1.3
05-20-08	DMI- 2438	< 0.4	1470 ± 110	< 3.0	< 3.0	< 11.6	< 2.1
06-03-08	DMI- 2699	< 0.4	1514 ± 122	< 3.7	< 3.8	< 12.4	< 1.3
06-17-08	DMI- 3031	< 0.3	1255 ± 102	< 2.8	< 2.8	< 12.2	< 1.4
07-01-08	DMI- 3314	< 0.2	1471 ± 107	< 2.0	< 3.3	< 13.8	< 2.9
07-15-08	DMI- 3649	< 0.3	1587 ± 122	< 3.9	< 4.0	< 15.2	< 3.4
07-29-08	DMI- 3907	< 0.3	1254 ± 117	< 3.3	< 3.9	< 9.5	< 2.5
08-12-08	DMI- 4237	< 0.4	980 ± 79	< 2.4	< 2.5	< 9.2	< 1.8
08-26-08	DMI- 4531	< 0.3	1381 ± 114	< 4.0	< 3.1	< 10.9	< 3.0
09-09-08	DMI- 4860	< 0.4	1485 ± 118	< 3.3	< 3.9	< 14.8	< 3.6
09-23-08	DMI- 5115	< 0.3	1391 ± 125	< 3.1	< 4.1	< 12.2	< 2.4
10-14-08	DMI- 5775	< 0.4	1579 ± 120	< 2.8	< 3.4	< 17.2	< 1.7
11-04-08	DMI- 6302	< 0.3	1284 ± 112	< 2.7	< 2.4	< 13.7	< 2.6
12-02-08	DMI- 6823	< 0.4	1528 ± 114	< 2.9	< 3.6	< 11.3	< 1.2

Location		D-110					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-08-08	DMI- 77	< 0.3	1309 ± 100	< 2.4	< 3.3	< 10.6	< 2.5
02-05-08	DMI- 472	< 0.4	1343 ± 116	< 3.2	< 2.6	< 14.5	< 3.8
03-04-08	DMI- 844	< 0.1	1314 ± 114	< 3.8	< 2.7	< 9.3	< 2.1
04-01-08	DMI- 1322	< 0.4	1376 ± 104	< 2.9	< 4.0	< 12.4	< 1.7
05-06-08	DMI- 2214	< 0.3	1424 ± 104	< 2.9	< 4.0	< 13.0	< 1.8
05-20-08	DMI- 2439	< 0.5	1397 ± 110	< 3.3	< 3.3	< 11.9	< 2.0
06-03-08	DMI- 2700	< 0.4	1510 ± 117	< 3.2	< 3.6	< 18.1	< 2.1
06-17-08	DMI- 3032	< 0.2	1362 ± 105	< 3.4	< 3.9	< 17.1	< 2.1
07-01-08	DMI- 3315	< 0.2	1371 ± 99	< 2.2	< 3.2	< 14.9	< 2.7
07-15-08	DMI- 3650	< 0.4	1424 ± 118	< 2.6	< 2.4	< 11.4	< 2.1
07-29-08	DMI- 3908	< 0.3	1491 ± 106	< 3.1	< 3.9	< 11.1	< 2.8
08-12-08	DMI- 4238	< 0.2	1324 ± 85	< 2.0	< 2.7	< 8.3	< 2.2
08-26-08	DMI- 4532	< 0.3	1359 ± 104	< 2.2	< 3.2	< 15.8	< 2.7
09-09-08	DMI- 4861	< 0.4	1389 ± 119	< 2.6	< 4.1	< 12.0	< 3.1
09-23-08	DMI- 5116	< 0.4	1422 ± 107	< 2.5	< 3.8	< 10.9	< 2.1
10-14-08	DMI- 5776	< 0.4	1385 ± 114	< 3.4	< 2.9	< 21.9	< 4.4
11-04-08	DMI- 6303	< 0.3	1419 ± 110	< 2.5	< 3.2	< 13.2	< 2.3
12-02-08	DMI- 6824	< 0.4	1438 ± 103	< 3.1	< 3.2	< 11.8	< 1.7

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Table 12.1. Well water samples, analyses for gross beta and tritium.

Collection: Quarterly

Units: pCi/L

Location		D-53 Treated Municipal Water			
Collection Date	03-18-08	06-23-08	09-17-08	11-25-08	
Lab Code	DWW-1160	DWW-3212	DWW-4976	DWW-6748	
Gross Beta	1.6 ± 0.6 ^a	2.3 ± 0.8	2.1 ± 1.0	1.2 ± 0.3	
H-3	< 173	< 169	< 157	< 152	
Location		D-54 Inlet to Municipal Water			
Collection Date	03-18-08	06-23-08	09-17-08	11-25-08	
Lab Code	DWW-1161	DWW-3213	DWW-4977	DWW-6749	
Gross Beta	3.8 ± 2.0	2.7 ± 0.8	3.7 ± 1.1	1.6 ± 0.3	
H-3	< 173	< 169	< 157	< 152	
Location		D-55 On-site Well			
Collection Date	03-17-08	06-23-08	09-16-08	11-24-08	
Lab Code	DWW-1162	DWW-3214	DWW-4979	DWW-6750	
Gross Beta	< 1.8	< 1.4	< 1.8	< 0.5	
H-3	< 173	< 169	< 157	< 152	
Location		D-57 Bull Farm			
Collection Date	03-17-08	06-23-08	09-16-08	11-24-08	
Lab Code	DWW-1163	DWW-3215	DWW-4980	DWW-6751	
Gross Beta	< 1.7	1.5 ± 0.7	< 1.0 ^b	< 0.4	
H-3	< 173	< 169	< 157	< 152	
Location		D-58 Franz Farm			
Collection Date	03-17-08	06-23-08	09-16-08	11-24-08	
Lab Code	DWW-1164	DWW-3216	DWW-4981	DWW-6752	
Gross Beta	2.7 ± 1.1	4.8 ± 0.9	4.2 ± 1.3 ^b	3.1 ± 0.4	
H-3	< 173	< 169	< 157	< 152	
Location		D-72 Van Note Farm			
Collection Date	03-17-08	06-23-08	09-16-08	11-24-08	
Lab Code	DWW-1165	DWW-3217	DWW-4982	DWW-6753	
Gross Beta	< 1.6	< 0.7	< 0.9	< 0.4	
H-3	< 173	< 169	< 157	< 152	

^a Result of longer sample recount.

^b Corrected, sample locations were mislabelled.

Table 12.2. Ground water, Monitoring wells, analyses for gross beta and tritium ^a.

Collection: Quarterly

Units: pCi/L

Location		MW-01A (shallow)			
Collection Date	03-19-08	06-24-08	09-16-08	11-19-08	
Lab Code	DWW-1166	DWW-3218	DWW-4983	DWW-6608	
Gross Beta	< 1.8	2.9 ± 0.6	3.0 ± 0.7	2.4 ± 0.6	^a
H-3	< 173	< 157	< 157	194 ± 81	

Location		MW-01B (intermediate)			
Collection Date	03-19-08	06-24-08	09-16-08	11-19-08	
Lab Code	DWW-1167	DWW-3219	DWW-4984	DWW-6609	
Gross Beta	< 1.8	< 0.6	0.9 ± 0.5	< 0.8	^a
H-3	< 173	< 169	< 157	< 145	

Location		MW-02A (shallow)			
Collection Date	03-19-08	06-24-08	09-16-08	11-19-08	
Lab Code	DWW-1168	DWW-3220	DWW-4985	DWW-6610	
Gross Beta	< 1.9	1.9 ± 0.5	2.6 ± 0.8	2.9 ± 1.2	
H-3	< 173	< 169	< 157	< 145	

Location		MW-02B (intermediate)			
Collection Date	03-19-08	06-24-08	09-16-08	11-19-08	
Lab Code	DWW-1169	DWW-3221	DWW-4986	DWW-6611	
Gross Beta	< 1.7	1.0 ± 0.4	1.1 ± 0.6	< 1.8	
H-3	< 173	< 169	< 157	< 145	

Location		MW-03A (shallow)			
Collection Date	03-19-08	06-24-08	09-10-08	11-19-08	
Lab Code	DWW-1170	DWW-3222	DWW-4937	DWW-6612	
Gross Beta	2.7 ± 1.2	6.6 ± 1.1	4.5 ± 0.7	6.3 ± 1.3	
H-3	< 173	< 169	< 163	< 145	

Location		MW-03B (intermediate)			
Collection Date	03-19-08	06-24-08	09-10-08	11-19-08	
Lab Code	DWW-1171	DWW-3223	DWW-4938	DWW-6613	
Gross Beta	< 1.6	2.6 ± 0.8	1.5 ± 0.5	1.7 ± 0.7	
H-3	< 173	< 169	< 163	< 145	

^a Result of reanalysis; sample counted longer to achieve lower LLD.

Table 12.2. Ground water, Monitoring wells, analyses for gross beta and tritium.
 Collection: Quarterly
 Units: pCi/L

Location		MW-04A (shallow)			
Collection Date	03-19-08	06-24-08	09-10-08	11-19-08	
Lab Code	DWW-1172	DWW-3224	DWW-4939	DWW-6737	
Gross Beta	3.8 ± 2.1	3.4 ± 0.9	2.0 ± 0.5	< 0.8	
H-3	< 173	< 157	172 ± 106 ^a	< 152	

Location		MW-04B (intermediate)			
Collection Date	03-19-08	06-24-08	09-10-08	12-01-08	
Lab Code	DWW-1174	DWW-3226	DWW-4940	DWW-6822	
Gross Beta	< 1.8	1.3 ± 0.5	1.3 ± 0.4	1.6 ± 0.4	
H-3	< 173	< 157	< 163	< 152	

Location		MW-05A (shallow)			
Collection Date	03-19-08	06-24-08	09-10-08	11-19-08	
Lab Code	DWW-1175	DWW-3227	DWW-4941	DWW-6655	
Gross Beta	1.9 ± 1.0	1.2 ± 0.5	1.2 ± 0.5	1.8 ± 1.0	
H-3	< 173	< 157	< 163	< 145	

Location		MW-05B (intermediate)			
Collection Date	03-19-08	06-24-08	09-10-08	11-19-08	
Lab Code	DWW-1176	DWW-3228	DWW-4942	DWW-6656	
Gross Beta	< 1.7	1.2 ± 0.6	2.2 ± 0.6	2.1 ± 0.7	
H-3	< 173	< 157	< 163	< 145	

Location		MW-06A (shallow)			
Collection Date	03-19-08	06-24-08	09-16-08	11-19-08	
Lab Code	DWW-1177	DWW-3229	DWW-4987	DWW-6738	
Gross Beta	5.5 ± 1.3	6.5 ± 0.9	8.7 ± 1.4	3.2 ± 0.6	
H-3	< 173	< 157	246 ± 90 ^b	433 ± 109	

Location		MW-06B (intermediate)			
Collection Date	03-19-08	06-24-08	09-16-08	11-19-08	
Lab Code	DWW-1178	DWW-3230	DWW-4988	DWW-6739	
Gross Beta	< 1.7	2.9 ± 0.9	3.1 ± 1.1	0.9 ± 0.6	
H-3	< 173	< 157	< 157	< 152	

^a Tritium repeated with a result of 193±102 pCi/L.

^b Tritium recounted with a result of 236±105 pCi/L.

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Table 13. Vegetation (broadleaf), analyses for iodine-131 and other gamma-emitting isotopes.

Collection: Annually

Units: pCi/g wet

Location	D-15	D-57	D-109
Lab Code	DVE- 2701	DVE- 2702	DVE- 2704
Date Collected	06-02-08	06-02-08	06-02-08
Sample Type	Broadleaf	Broadleaf	Broadleaf
K-40	3.83 ± 0.63	4.26 ± 0.52	2.78 ± 0.42
Mn-54	< 0.023	< 0.025	< 0.015
Fe-59	< 0.056	< 0.034	< 0.024
Co-58	< 0.024	< 0.016	< 0.014
Co-60	< 0.019	< 0.017	< 0.019
Nb-95	< 0.023	< 0.025	< 0.007
Zr-95	< 0.025	< 0.029	< 0.021
Ru-103	< 0.022	< 0.026	< 0.021
Ru-106	< 0.26	< 0.14	< 0.14
I-131	< 0.041	< 0.032	< 0.033
Cs-134	< 0.021	< 0.010	< 0.009
Cs-137	< 0.024	< 0.018	< 0.011
Ce-141	< 0.043	< 0.039	< 0.025
Ce-144	< 0.10	< 0.10	< 0.14

D-108 (C)

Lab Code	DVE- 2703
Date Collected	06-02-08
Sample Type	Broadleaf
K-40	4.96 ± 0.72
Mn-54	< 0.023
Fe-59	< 0.036
Co-58	< 0.015
Co-60	< 0.031
Nb-95	< 0.016
Zr-95	< 0.027
Ru-103	< 0.029
Ru-106	< 0.22
I-131	< 0.050
Cs-134	< 0.017
Cs-137	< 0.025
Ce-141	< 0.050
Ce-144	< 0.18

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Table 14. Vegetation (hay and grain), analyses for gamma-emitting isotopes.

Collection: Annually

Units: pCi/g wet

Location	D-16	D-57	D-57	D-58
Lab Code	DVE- 5894	DVE- 5562	DVE- 5895	DVE- 5896
Date Collected	10-20-08	10-06-08	10-20-08	10-20-08
Sample Type	Beans	Forage-Hay	Corn	Corn
K-40	5.47 ± 0.32	17.07 ± 0.63	2.28 ± 0.26	1.99 ± 0.27
Mn-54	< 0.013	< 0.023	< 0.007	< 0.015
Fe-59	< 0.018	< 0.058	< 0.014	< 0.027
Co-58	< 0.011	< 0.013	< 0.005	< 0.008
Co-60	< 0.011	< 0.021	< 0.006	< 0.011
Nb-95	< 0.018	< 0.031	< 0.005	< 0.010
Zr-95	< 0.016	< 0.024	< 0.013	< 0.014
Ru-103	< 0.013	< 0.026	< 0.007	< 0.018
Ru-106	< 0.094	< 0.22	< 0.05	< 0.107
Cs-134	< 0.011	< 0.017	< 0.006	< 0.009
Cs-137	< 0.015	< 0.025	< 0.006	< 0.012
Ce-141	< 0.022	< 0.043	< 0.011	< 0.021
Ce-144	< 0.064	< 0.17	< 0.06	< 0.093

Control				
Location	D-72	D-72	D-108	D-108
Lab Code	DVE- 5563	DVE- 5897	DVE- 5564	DVE- 5898
Date Collected	10-06-08	10-20-08	10-06-08	10-20-08
Sample Type	Forage-Hay	Corn	Forage-Hay	Corn
K-40	17.48 ± 0.72	2.25 ± 0.29	27.75 ± 0.73	2.67 ± 0.23
Mn-54	< 0.024	< 0.008	< 0.025	< 0.008
Fe-59	< 0.051	< 0.021	< 0.042	< 0.012
Co-58	< 0.022	< 0.009	< 0.017	< 0.004
Co-60	< 0.018	< 0.010	< 0.025	< 0.007
Nb-95	< 0.029	< 0.008	< 0.036	< 0.009
Zr-95	< 0.030	< 0.010	< 0.042	< 0.013
Ru-103	< 0.030	< 0.006	< 0.023	< 0.006
Ru-106	< 0.22	< 0.10	< 0.21	< 0.08
Cs-134	< 0.026	< 0.011	< 0.023	< 0.008
Cs-137	< 0.023	< 0.008	< 0.024	< 0.010
Ce-141	< 0.051	< 0.016	< 0.046	< 0.010
Ce-144	< 0.182	< 0.04	< 0.164	< 0.04

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Table 15. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

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

Lab Code	DSW- 126	DSW- 811	DSW- 1033	DSW- 2029	DSW- 2633	DSW- 3206
Date Collected	01-09-08	02-27-08	03-13-08	04-30-08	05-27-08	06-23-08
H-3	< 149	< 179	< 150	< 158	< 167	< 169
I-131(Chemistry)	< 0.2	< 0.4	< 0.3	< 0.3	< 0.4	< 0.3
Mn-54	< 3.3	< 1.8	< 2.2	< 2.2	< 3.8	< 2.7
Fe-59	< 5.2	< 4.7	< 4.9	< 5.6	< 4.3	< 5.8
Co-58	< 2.7	< 2.8	< 3.7	< 2.1	< 3.1	< 1.8
Co-60	< 3.1	< 2.9	< 2.3	< 2.2	< 2.3	< 2.4
Zn-65	< 3.2	< 4.6	< 2.0	< 3.2	< 3.0	< 7.3
Nb-95	< 4.0	< 3.0	< 3.4	< 3.3	< 2.8	< 2.7
Zr-95	< 4.8	< 4.4	< 4.7	< 5.9	< 5.8	< 5.9
I-131	< 4.6	< 7.7	< 5.5	< 7.5	< 6.5	< 5.8
Cs-134	< 3.7	< 3.2	< 3.3	< 3.7	< 3.0	< 2.5
Cs-137	< 1.9	< 3.3	< 3.4	< 3.0	< 4.4	< 4.2
Ba-140	< 11.0	< 16.0	< 15.9	< 13.4	< 19.9	< 20.6
La-140	< 2.4	< 2.7	< 2.8	< 2.5	< 2.4	< 3.8
	DSW- 3849	DSW- 4629	DSW- 5108	DSW- 5899	DSW- 6740	DSW- 7166
	07-22-08	08-28-08	09-21-08	10-22-08	11-24-08	12-29-08
H-3	< 145	< 152	< 147	< 155	< 152	< 168
I-131(Chemistry)	< 0.3	< 0.2	< 0.3	< 0.3	< 0.4	< 0.4
Mn-54	< 1.8	< 2.3	< 2.1	< 2.3	< 2.5	< 2.1
Fe-59	< 3.1	< 3.1	< 2.8	< 3.1	< 7.2	< 4.6
Co-58	< 1.7	< 1.8	< 1.5	< 2.0	< 3.1	< 2.3
Co-60	< 2.0	< 2.5	< 2.9	< 2.4	< 2.1	< 1.8
Zn-65	< 5.2	< 4.5	< 3.3	< 3.3	< 3.1	< 5.3
Nb-95	< 1.7	< 2.3	< 2.9	< 3.2	< 3.0	< 2.4
Zr-95	< 5.6	< 4.6	< 4.9	< 3.1	< 4.2	< 5.9
I-131	< 4.1	< 3.2	< 4.6	< 3.8	< 5.3	< 4.9
Cs-134	< 2.1	< 2.7	< 2.6	< 3.1	< 2.5	< 2.6
Cs-137	< 3.0	< 3.3	< 3.0	< 1.7	< 3.2	< 2.4
Ba-140	< 8.5	< 13.6	< 12.8	< 14.9	< 11.3	< 12.4
La-140	< 2.3	< 3.9	< 2.8	< 1.5	< 3.3	< 1.7

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Table 15. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

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

Lab Code	DSW- 127	DSW- 812	DSW- 1034	DSW- 2030	DSW- 2634	DSW- 3207
Date Collected	01-09-08	02-27-08	03-13-08	04-29-08	05-27-08	06-23-08
H-3	< 149	< 179	< 150	< 158	< 167	< 169
Mn-54	< 1.5	< 2.4	< 4.5	< 2.2	< 1.9	< 1.8
Fe-59	< 5.1	< 3.4	< 3.9	< 3.5	< 4.8	< 4.3
Co-58	< 2.8	< 3.1	< 3.9	< 2.4	< 2.1	< 3.8
Co-60	< 2.4	< 1.9	< 2.4	< 1.7	< 2.0	< 2.7
Zn-65	< 4.7	< 5.1	< 6.2	< 3.3	< 3.0	< 3.9
Nb-95	< 2.2	< 3.1	< 4.2	< 3.5	< 3.1	< 3.9
Zr-95	< 4.1	< 5.7	< 6.7	< 3.5	< 3.5	< 6.6
I-131	< 6.9	< 5.5	< 6.7	< 3.9	< 4.6	< 7.0
Cs-134	< 3.0	< 3.5	< 5.6	< 2.9	< 3.2	< 3.3
Cs-137	< 1.8	< 2.0	< 5.5	< 2.8	< 2.0	< 3.7
Ba-140	< 15.2	< 10.1	< 17.0	< 7.4	< 14.9	< 11.4
La-140	< 3.4	< 3.9	< 4.9	< 2.7	< 2.7	< 5.7
	DSW- 3850	DSW- 4508	DSW- 5109	DSW- 5900	DSW- 6741	DSW- 7167
	07-22-08	08-20-08	09-21-08	10-22-08	11-24-08	12-29-08
H-3	< 145	< 143	< 147	< 155	< 152	< 168
Mn-54	< 3.5	< 2.5	< 1.6	< 2.3	< 3.7	< 2.5
Fe-59	< 7.9	< 4.3	< 4.3	< 3.6	< 5.1	< 5.7
Co-58	< 3.4	< 2.6	< 1.8	< 1.3	< 4.2	< 2.4
Co-60	< 3.8	< 2.5	< 2.6	< 1.5	< 3.4	< 2.2
Zn-65	< 8.3	< 4.7	< 5.6	< 4.5	< 5.1	< 5.6
Nb-95	< 2.9	< 2.6	< 1.7	< 2.9	< 2.1	< 3.2
Zr-95	< 7.4	< 4.2	< 5.8	< 4.2	< 4.5	< 5.1
I-131	< 10.4	< 7.0	< 4.8	< 4.6	< 7.8	< 8.5
Cs-134	< 3.6	< 3.8	< 3.4	< 2.4	< 3.1	< 3.4
Cs-137	< 3.7	< 2.9	< 2.4	< 2.4	< 4.2	< 3.0
Ba-140	< 15.7	< 14.4	< 15.6	< 13.0	< 21.6	< 18.9
La-140	< 5.1	< 3.5	< 3.1	< 2.6	< 1.7	< 2.9

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Table 15. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

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

Lab Code	DSW- 128	DSW- 814	DSW- 1035	DSW- 2031	DSW- 2635	DSW- 3208
Date Collected	01-09-08	02-27-08	03-13-08	04-29-08	05-27-08	06-23-08
H-3	< 149	< 179	< 150	< 158	< 167	< 169
Mn-54	< 2.4	< 4.1	< 3.5	< 2.7	< 3.2	< 2.9
Fe-59	< 3.0	< 4.6	< 6.1	< 3.8	< 6.9	< 5.3
Co-58	< 2.1	< 6.6	< 1.7	< 1.3	< 2.5	< 2.6
Co-60	< 2.5	< 2.9	< 4.0	< 2.9	< 2.0	< 2.0
Zn-65	< 3.6	< 5.8	< 4.8	< 6.9	< 5.1	< 3.3
Nb-95	< 3.4	< 3.4	< 3.8	< 3.0	< 2.2	< 2.7
Zr-95	< 4.2	< 7.6	< 8.3	< 6.3	< 3.8	< 2.4
I-131	< 7.6	< 6.6	< 6.4	< 3.1	< 8.0	< 6.0
Cs-134	< 2.5	< 4.7	< 3.6	< 3.3	< 3.6	< 2.3
Cs-137	< 3.6	< 4.1	< 2.7	< 2.8	< 2.9	< 3.2
Ba-140	< 16.4	< 20.8	< 22.2	< 13.7	< 8.6	< 12.0
La-140	< 3.4	< 3.1	< 6.1	< 3.8	< 3.7	< 3.1
	DSW- 3851	DSW- 4509	DSW- 5111	DSW- 5901	DSW- 6742	DSW- 7168
	07-22-08	08-20-08	09-21-08	10-22-08	11-24-08	12-29-08
H-3	< 145	< 143	< 161	< 155	< 152	< 168
Mn-54	< 4.2	< 2.5	< 2.7	< 3.3	< 2.3	< 2.5
Fe-59	< 9.5	< 2.1	< 6.3	< 5.0	< 6.2	< 3.8
Co-58	< 3.1	< 1.7	< 2.1	< 2.2	< 2.6	< 2.8
Co-60	< 3.5	< 2.0	< 2.8	< 2.0	< 3.9	< 1.6
Zn-65	< 8.2	< 4.3	< 5.2	< 4.6	< 4.1	< 2.4
Nb-95	< 3.8	< 2.9	< 3.6	< 2.7	< 5.1	< 2.9
Zr-95	< 7.7	< 3.7	< 7.3	< 8.2	< 7.7	< 4.2
I-131	< 5.6	< 5.5	< 5.1	< 7.1	< 7.1	< 6.1
Cs-134	< 3.4	< 2.6	< 3.9	< 3.4	< 2.8	< 2.1
Cs-137	< 3.7	< 3.7	< 4.6	< 4.3	< 3.5	< 2.0
Ba-140	< 28.3	< 15.1	< 16.8	< 15.1	< 14.7	< 16.4
La-140	< 2.4	< 3.6	< 2.0	< 3.8	< 3.9	< 3.0

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Table 15. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

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

Lab Code	DSW- 129	DSW- 815	DSW- 1036	DSW- 2032	DSW- 2636	DSW- 3209
Date Collected	01-09-08	02-27-08	03-13-08	04-29-08	05-27-08	06-23-08
H-3	< 149	< 179	< 150	< 158	< 167	< 169
I-131(Chemistry)	< 0.2	< 0.4	< 0.3	< 0.3	< 0.2	< 0.3
Mn-54	< 2.5	< 3.5	< 3.7	< 3.1	< 2.4	< 3.5
Fe-59	< 3.7	< 5.1	< 7.1	< 7.5	< 2.3	< 4.9
Co-58	< 2.2	< 2.5	< 2.3	< 3.0	< 1.9	< 2.0
Co-60	< 2.3	< 2.2	< 1.6	< 3.5	< 1.0	< 3.0
Zn-65	< 6.7	< 2.1	< 7.5	< 1.9	< 2.9	< 6.8
Nb-95	< 2.8	< 2.9	< 3.0	< 2.6	< 1.5	< 5.0
Zr-95	< 3.4	< 5.2	< 4.9	< 4.0	< 3.9	< 5.5
I-131	< 6.7	< 4.0	< 7.8	< 3.2	< 5.9	< 7.3
Cs-134	< 2.5	< 2.4	< 3.5	< 2.8	< 3.0	< 3.9
Cs-137	< 3.7	< 2.2	< 2.7	< 3.1	< 3.4	< 2.6
Ba-140	< 15.5	< 13.3	< 15.1	< 10.6	< 15.4	< 20.0
La-140	< 3.9	< 2.6	< 2.5	< 1.5	< 3.1	< 3.1
	DSW- 3852	DSW- 4510	DSW- 5112	DSW- 5902	DSW- 6744	DSW- 7169
	07-22-08	08-20-08	09-21-08	10-22-08	11-24-08	12-29-08
H-3	< 145	< 143	< 161	< 155	< 152	< 168
I-131(Chemistry)	< 0.6	< 0.4	< 0.3	< 0.2	< 0.5	< 0.4
Mn-54	< 2.6	< 4.8	< 4.1	< 1.4	< 2.7	< 2.1
Fe-59	< 7.9	< 4.6	< 5.3	< 5.0	< 7.2	< 3.8
Co-58	< 2.1	< 5.4	< 3.1	< 2.0	< 3.6	< 1.9
Co-60	< 2.8	< 6.1	< 2.7	< 2.4	< 2.8	< 2.4
Zn-65	< 2.5	< 6.7	< 7.8	< 3.3	< 4.5	< 2.1
Nb-95	< 3.1	< 4.9	< 3.2	< 4.2	< 4.3	< 1.2
Zr-95	< 6.0	< 8.7	< 7.2	< 5.2	< 4.6	< 4.7
I-131	< 4.4	< 9.2	< 3.9	< 7.6	< 8.5	< 4.9
Cs-134	< 2.4	< 3.8	< 4.7	< 2.2	< 3.3	< 3.0
Cs-137	< 3.0	< 4.7	< 2.9	< 3.7	< 4.3	< 2.9
Ba-140	< 15.8	< 21.5	< 14.2	< 13.2	< 16.7	< 13.2
La-140	< 3.0	< 6.0	< 4.2	< 3.0	< 1.8	< 1.7

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Table 15. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

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

Lab Code	DSW- 130	DSW- 816	DSW- 1037	DSW- 2033	DSW- 2637	DSW- 3210
Date Collected	01-09-08	02-27-08	03-13-08	04-30-08	05-27-08	06-23-08
H-3	< 149	< 179	< 150	< 158	< 167	< 169
Mn-54	< 2.2	< 6.0	< 2.4	< 4.3	< 3.4	< 4.3
Fe-59	< 4.6	< 7.8	< 2.2	< 4.4	< 6.9	< 6.9
Co-58	< 2.4	< 4.0	< 1.6	< 3.5	< 2.0	< 3.6
Co-60	< 2.0	< 2.7	< 0.9	< 4.0	< 3.0	< 3.6
Zn-65	< 4.0	< 4.1	< 2.5	< 5.4	< 4.8	< 2.6
Nb-95	< 2.8	< 5.3	< 4.0	< 5.7	< 3.2	< 3.1
Zr-95	< 4.9	< 6.4	< 5.2	< 8.0	< 5.5	< 6.0
I-131	< 4.1	< 5.1	< 5.0	< 9.2	< 4.4	< 10.2
Cs-134	< 2.1	< 4.0	< 2.9	< 5.7	< 3.7	< 3.4
Cs-137	< 2.9	< 3.7	< 3.2	< 2.5	< 4.2	< 5.6
Ba-140	< 11.8	< 19.4	< 12.1	< 16.4	< 19.5	< 26.8
La-140	< 1.4	< 4.8	< 1.7	< 5.4	< 1.5	< 3.9
	DSW- 3853	DSW- 4630	DSW- 5113	DSW- 5903	DSW- 6745	DSW- 7170
	07-22-08	08-28-08	09-21-08	10-22-08	11-24-08	12-29-08
H-3	< 145	< 152	< 161	< 155	< 152	< 168
Mn-54	< 2.1	< 2.6	< 1.7	< 2.0	< 1.9	< 2.9
Fe-59	< 3.6	< 2.9	< 2.5	< 3.8	< 5.6	< 2.3
Co-58	< 2.7	< 1.4	< 1.9	< 2.1	< 2.7	< 3.1
Co-60	< 2.1	< 2.4	< 1.9	< 2.7	< 2.1	< 3.0
Zn-65	< 4.9	< 5.0	< 3.4	< 4.4	< 6.9	< 3.7
Nb-95	< 1.5	< 3.3	< 1.3	< 2.6	< 1.8	< 2.3
Zr-95	< 4.7	< 4.5	< 2.5	< 5.6	< 5.4	< 7.2
I-131	< 4.9	< 4.8	< 4.7	< 3.3	< 5.7	< 6.3
Cs-134	< 3.3	< 2.3	< 2.4	< 3.6	< 2.8	< 2.6
Cs-137	< 3.6	< 2.5	< 2.7	< 2.5	< 2.5	< 3.9
Ba-140	< 15.8	< 13.0	< 11.8	< 9.0	< 14.4	< 20.5
La-140	< 4.7	< 3.4	< 3.5	< 2.3	< 2.5	< 2.3

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Table 15. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: D-107

Lab Code	DSW- 131	DSW- 817	DSW- 1038	DSW- 2034	DSW- 2638	DSW- 3211
Date Collected	01-09-08	02-27-08	03-13-08	04-29-08	05-27-08	06-23-08
H-3	< 149	< 178	< 150	< 158	< 167	< 169
Mn-54	< 3.5	< 2.2	< 3.3	< 2.3	< 1.3	< 3.9
Fe-59	< 4.9	< 3.9	< 7.2	< 5.7	< 3.0	< 6.1
Co-58	< 3.2	< 2.1	< 2.8	< 2.5	< 2.0	< 5.2
Co-60	< 2.2	< 3.4	< 3.3	< 1.6	< 1.4	< 4.6
Zn-65	< 2.2	< 3.2	< 4.9	< 4.1	< 4.8	< 12.2
Nb-95	< 3.9	< 4.5	< 3.6	< 3.8	< 2.5	< 5.8
Zr-95	< 6.6	< 3.3	< 5.0	< 5.3	< 4.7	< 7.8
I-131	< 6.7	< 7.6	< 6.2	< 6.0	< 4.8	< 12.5
Cs-134	< 3.2	< 2.8	< 3.2	< 3.4	< 2.4	< 4.3
Cs-137	< 3.7	< 3.8	< 3.4	< 2.2	< 2.8	< 3.8
Ba-140	< 19.8	< 23.6	< 10.4	< 8.4	< 13.5	< 26.7
La-140	< 3.1	< 3.2	< 1.9	< 2.1	< 3.2	< 5.0
	DSW- 3854	DSW- 4511	DSW- 5114	DSW- 5904	DSW- 6746	DSW- 7171
	07-22-08	08-20-08	09-21-08	10-22-08	11-24-08	12-29-08
H-3	< 150	< 158	< 161	< 155	< 152	< 134 ^a
Mn-54	< 2.3	< 3.6	< 2.9	< 5.0	< 2.7	< 3.0
Fe-59	< 3.2	< 8.6	< 6.0	< 8.1	< 5.1	< 4.3
Co-58	< 2.8	< 3.4	< 2.1	< 2.7	< 3.3	< 2.5
Co-60	< 2.4	< 4.2	< 3.4	< 6.4	< 2.1	< 2.5
Zn-65	< 4.6	< 2.5	< 4.3	< 3.2	< 4.0	< 5.9
Nb-95	< 3.3	< 3.8	< 3.2	< 3.1	< 4.4	< 2.3
Zr-95	< 6.3	< 7.9	< 4.3	< 11.6	< 4.3	< 4.9
I-131	< 4.9	< 8.6	< 4.6	< 8.9	< 6.4	< 4.3
Cs-134	< 2.9	< 4.5	< 3.1	< 3.1	< 2.7	< 3.0
Cs-137	< 1.7	< 3.8	< 3.6	< 5.0	< 3.1	< 1.8
Ba-140	< 9.4	< 24.0	< 15.2	< 27.0	< 22.2	< 17.0
La-140	< 3.7	< 5.2	< 4.2	< 5.0	< 2.0	< 2.3

^a Result of reanalysis.

DUANE ARNOLD

Table 16. Surface water, analysis for strontium-89 and strontium-90.
Collection: Quarterly composites of monthly samples.
Units: pCi/L

Location		D-49			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	
Lab Code	DSW-2399	DSW-3255	DSW-5135	DSW-7249	
Sr-89	< 1.14	< 0.78	< 0.75	< 0.56	
Sr-90	< 0.48	< 0.73	< 0.57	< 0.54	

Location		D-61			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.	
Lab Code	DSW-2400	DSW-3256	DSW-5136	DSW-7250	
Sr-89	< 1.08	< 0.80	< 0.82	< 0.53	
Sr-90	< 0.50	< 0.49	< 0.51	< 0.49	

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Table 17. Fish, analyses of edible portion for gamma-emitting isotopes.

Collection: Semiannually

Units: pCi/g wet

Location		Upstream, D-49			
Lab Code	DF- 3410	DF- 3411	DF- 5007	DF- 5008	
Date Collected	06-27-08	06-27-08	09-09-08	09-09-08	
Sample Type	Buffalo	Buffalo	Carp sucker	Carp	
K-40	3.03 ± 0.34	3.34 ± 0.36	2.99 ± 0.35	2.57 ± 0.34	
Mn-54	< 0.010	< 0.014	< 0.011	< 0.012	
Fe-59	< 0.028	< 0.027	< 0.036	< 0.040	
Co-58	< 0.008	< 0.012	< 0.008	< 0.009	
Co-60	< 0.009	< 0.010	< 0.011	< 0.014	
Zn-65	< 0.021	< 0.009	< 0.008	< 0.008	
Nb-95	< 0.018	< 0.010	< 0.018	< 0.023	
Zr-95	< 0.015	< 0.019	< 0.016	< 0.027	
Ru-103	< 0.017	< 0.015	< 0.015	< 0.025	
Ru-106	< 0.118	< 0.139	< 0.132	< 0.112	
Cs-134	< 0.009	< 0.010	< 0.009	< 0.009	
Cs-137	< 0.006	< 0.009	< 0.010	< 0.007	
Ce-141	< 0.018	< 0.036	< 0.042	< 0.027	
Ce-144	< 0.045	< 0.076	< 0.051	< 0.096	

Location		Downstream, D-61			
Lab Code	DF- 3412	DF- 3413	DF- 5009	DF- 5010	
Date Collected	06-27-08	06-27-08	09-09-08	09-09-08	
Sample Type	Carp sucker	Carp	Carp sucker	Carp	
K-40	3.61 ± 0.35	1.18 ± 0.38	3.23 ± 0.40	2.71 ± 0.36	
Mn-54	< 0.009	< 0.013	< 0.012	< 0.014	
Fe-59	< 0.035	< 0.022	< 0.036	< 0.038	
Co-58	< 0.007	< 0.011	< 0.012	< 0.009	
Co-60	< 0.009	< 0.008	< 0.011	< 0.010	
Zn-65	< 0.012	< 0.020	< 0.024	< 0.024	
Nb-95	< 0.011	< 0.016	< 0.016	< 0.012	
Zr-95	< 0.018	< 0.024	< 0.024	< 0.026	
Ru-103	< 0.014	< 0.009	< 0.009	< 0.012	
Ru-106	< 0.094	< 0.051	< 0.084	< 0.107	
Cs-134	< 0.010	< 0.011	< 0.011	< 0.011	
Cs-137	< 0.009	< 0.009	< 0.006	< 0.008	
Ce-141	< 0.021	< 0.028	< 0.039	< 0.040	
Ce-144	< 0.097	< 0.075	< 0.088	< 0.093	

DUANE ARNOLD

Table 18. River sediment, analysis for gamma-emitting isotopes.

Collection: Semiannually

Units: pCi/g dry

Location		D-50	
Lab Code	DBS- 2386	DBS- 5771	
Date Collected	05-12-08	10-21-08	
K-40	7.44 ± 0.40	7.40 ± 0.59	
Mn-54	< 0.011	< 0.017	
Fe-59	< 0.014	< 0.059	
Co-58	< 0.010	< 0.020	
Co-60	< 0.009	< 0.015	
Zn-65	< 0.015	< 0.055	
Nb-95	< 0.004	< 0.023	
Zr-95	< 0.017	< 0.032	
Ru-103	< 0.004	< 0.023	
Ru-106	< 0.052	< 0.13	
Cs-134	< 0.008	< 0.013	
Cs-137	< 0.010	< 0.015	
Ce-141	< 0.017	< 0.039	
Ce-144	< 0.071	< 0.082	

Location		D-51	
Lab Code	DBS- 2387	DBS- 5772	
Date Collected	05-12-08	10-13-08	
K-40	8.16 ± 0.44	7.97 ± 0.64	
Mn-54	< 0.010	< 0.017	
Fe-59	< 0.026	< 0.078	
Co-58	< 0.010	< 0.022	
Co-60	< 0.009	< 0.015	
Zn-65	< 0.020	< 0.059	
Nb-95	< 0.008	< 0.035	
Zr-95	< 0.011	< 0.031	
Ru-103	< 0.008	< 0.029	
Ru-106	< 0.082	< 0.15	
Cs-134	< 0.010	< 0.020	
Cs-137	< 0.010	< 0.018	
Ce-141	< 0.019	< 0.057	
Ce-144	< 0.061	< 0.10	

DUANE ARNOLD

Table 18. River sediment, analysis for gamma-emitting isotopes.

Collection: Semiannually

Units: pCi/g dry

Location	D-107a	
Lab Code	DBS- 2388	DBS- 5774
Date Collected	05-12-08	10-13-08
K-40	7.03 ± 0.39	7.54 ± 0.43
Mn-54	< 0.007	< 0.012
Fe-59	< 0.022	< 0.037
Co-58	< 0.011	< 0.016
Co-60	< 0.009	< 0.009
Zn-65	< 0.019	< 0.029
Nb-95	< 0.009	< 0.017
Zr-95	< 0.010	< 0.026
Ru-103	< 0.010	< 0.009
Ru-106	< 0.047	< 0.10
Cs-134	< 0.009	< 0.005
Cs-137	< 0.012	< 0.011
Ce-141	< 0.018	< 0.036
Ce-144	< 0.059	< 0.089

DUANE ARNOLD

Table 19. Precipitation, analyses for gamma emitting isotopes.

Collection: Monthly
 Units: pCi/L
 Location: DAEC

Date Collected	01-10-08	02-28-08	03-13-08	04-24-08	05-22-08	06-30-08
Lab Code	DP- 132	DP- 818	DP- 1039	DP- 2005	DP- 2488	DP- 3321
Mn-54	< 5.6	< 5.6	< 4.1	< 2.6	< 4.0	< 4.4
Fe-59	< 10.4	< 6.8	< 7.3	< 6.8	< 8.4	< 11.0
Co-58	< 4.3	< 2.9	< 3.1	< 2.3	< 2.6	< 4.2
Co-60	< 4.8	< 6.5	< 3.8	< 2.9	< 3.5	< 6.4
Zn-65	< 8.6	< 4.2	< 5.1	< 6.9	< 3.8	< 4.9
Nb-95	< 6.5	< 3.2	< 2.6	< 2.7	< 6.5	< 5.9
Zr-95	< 10.1	< 5.0	< 7.1	< 5.1	< 5.8	< 10.1
I-131	< 7.9	< 4.9	< 6.3	< 6.1	< 8.6	< 15.5
Cs-134	< 4.3	< 4.4	< 1.9	< 3.7	< 4.2	< 5.1
Cs-137	< 5.8	< 4.1	< 3.0	< 3.6	< 5.1	< 6.1
Ba-140	< 24.2	< 14.9	< 8.2	< 11.4	< 32.9	< 41.5
La-140	< 3.2	< 6.9	< 2.7	< 3.9	< 5.6	< 4.4
	07-23-08	08-28-08	09-25-08	10-23-08	11-24-08	12-29-08
	DP- 3855	DP- 4631	DP- 5259	DP- 5906	DP- 6747	DP- 7172
Mn-54	< 2.9	< 4.2	< 4.1	< 4.3	< 5.2	< 2.8
Fe-59	< 8.6	< 5.6	< 9.6	< 10.2	< 5.7	< 7.0
Co-58	< 2.7	< 3.8	< 3.2	< 4.9	< 4.3	< 3.3
Co-60	< 3.9	< 2.2	< 3.6	< 2.8	< 3.1	< 3.6
Zn-65	< 5.0	< 5.8	< 4.4	< 9.3	< 4.6	< 2.7
Nb-95	< 3.3	< 4.0	< 3.1	< 6.9	< 4.3	< 2.1
Zr-95	< 6.4	< 7.1	< 6.6	< 8.0	< 10.3	< 6.1
I-131	< 5.0	< 7.3	< 6.9	< 9.9	< 13.9	< 6.6
Cs-134	< 1.8	< 3.8	< 5.0	< 4.5	< 4.0	< 3.7
Cs-137	< 3.1	< 3.7	< 4.0	< 6.5	< 5.4	< 3.6
Ba-140	< 16.5	< 18.9	< 16.3	< 29.2	< 40.8	< 22.3
La-140	< 2.8	< 4.3	< 2.0	< 7.3	< 6.1	< 5.9

DUANE ARNOLD

Table 20. Precipitation, analysis for tritium.
Collection: Quarterly composites of monthly samples.
Units: pCi/L

Location	Duane Arnold			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DP-1109	DP-3335	DP-5267	DP-7194
H-3	< 172	< 171	< 161	< 132

DUANE ARNOLD

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

Collection: Annually

Units: pCi/g dry

Location	D-15	D-16
Lab Code	DSO- 5907	DSO- 5908
Date Collected	10-20-08	10-20-08
Sr-90	0.059 ± 0.017	< 0.016
H-3 (pCi/L)	< 162	< 162
K-40	14.80 ± 0.83	9.02 ± 0.59
Mn-54	< 0.028	< 0.022
Fe-59	< 0.044	< 0.036
Co-58	< 0.018	< 0.019
Co-60	< 0.015	< 0.015
Zn-65	< 0.052	< 0.036
Nb-95	< 0.022	< 0.022
Zr-95	< 0.045	< 0.016
Ru-103	< 0.030	< 0.021
Ru-106	< 0.22	< 0.11
Cs-134	< 0.010	< 0.009
Cs-137	0.14 ± 0.035	0.16 ± 0.026
Ce-141	< 0.061	< 0.043
Ce-144	< 0.18	< 0.098

APPENDIX A

SUPPLEMENTAL ANALYSES

Appendix A, Supplemental Analyses

A-1.1 Airborne particulates, duplicate analyses for gross beta.

Collection: Continuous, weekly exchange.

Required LLD: 0.010

Location	Date Collected	Volume (m ³)	Gross Beta (pCi/m ³)
D-005	01-10-08	284	0.046 ± 0.004
D-003	01-17-08	288	0.054 ± 0.005
D-003	02-14-08	290	0.051 ± 0.005
D-016	02-21-08	317	0.044 ± 0.004
D-005	03-06-08	284	0.027 ± 0.004
D-013	03-13-08	286	0.041 ± 0.005
D-011	03-20-08	288	0.020 ± 0.004
D-011	04-24-08	292	0.021 ± 0.004
D-005	05-22-08	328	0.015 ± 0.003
D-007	06-05-08	298	0.018 ± 0.004
D-005	06-11-08	243	0.016 ± 0.004
D-013	06-26-08	286	0.020 ± 0.004
D-015	07-10-08	327	0.021 ± 0.004
D-007	07-31-08	343	0.024 ± 0.003
D-003	08-07-08	280	0.030 ± 0.004
D-007	08-21-08	282	0.040 ± 0.004
D-013	09-11-08	273	0.023 ± 0.003
D-015	10-02-08	289	0.041 ± 0.004
D-003	11-20-08	292	0.028 ± 0.004
D-003	12-23-08	231	0.014 ± 0.003
D-005	12-23-08	255	0.015 ± 0.003

A-1.2 Duplicate Analyses, Surface water.

Units: pCi/L

Location Lab Code Date Collected	D-50 DSW- 813 02-27-08	D-50 DSW- 5110 09-21-08	D-50 DSW- 5905 10-22-08	D-51 DSW- 6743 11-24-08
H-3	< 179	< 161	< 154	< 152
Mn-54	< 3.6	< 3.0	< 2.1	< 1.4
Fe-59	< 4.1	< 4.5	< 4.3	< 3.7
Co-58	< 1.5	< 2.2	< 1.5	< 2.2
Co-60	< 2.4	< 2.2	< 2.4	< 2.2
Zn-65	< 2.9	< 5.0	< 3.7	< 3.6
Nb-95	< 2.8	< 2.4	< 2.5	< 1.8
Zr-95	< 3.5	< 4.8	< 5.0	< 4.5
I-131	< 5.8	< 3.8	< 5.2	< 4.4
Cs-134	< 2.1	< 2.7	< 2.8	< 2.2
Cs-137	< 1.9	< 1.6	< 3.0	< 2.7
Ba-140	< 17.5	< 10.6	< 17.4	< 16.2
La-140	< 1.9	< 2.2	< 1.9	< 1.6

Appendix A, Supplemental Analyses

A-1.3 Duplicate Analyses, Precipitation, quarterly composite for tritium. Units: pCi/L

Period	1st Qtr.
Lab Code	DP-1110
H-3	< 172

A-1.4 Duplicate Analyses, Milk. Units: pCi/L

A-1.5 Duplicate Analyses, Well Water. Units: pCi/L

Location	MW-04A	MW-04A	D-54
Collection Date	03-19-08	06-24-08	09-17-08
Lab Code	DWW-1173	DWW-3225	DWW-4977
Gross Beta	3.6 ± 2.0	3.0 ± 0.8	2.3 ± 1.1
H-3	< 169	< 157	< 157

A-1.6 Duplicate Analyses, Air Particulates, Quarterly Composite Units: pCi/L

Location	D-7	
Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 7261	DAP- 8900
Volume (m3)	3452	3685
Be-7	0.091 ± 0.016	0.070 ± 0.015
Mn-54	< 0.0006	< 0.0006
Fe-59	< 0.0011	< 0.0009
Co-58	< 0.0004	< 0.0006
Co-60	< 0.0004	< 0.0008
Nb-95	< 0.0012	< 0.0007
Zr-95	< 0.0015	< 0.0006
Ru-103	< 0.0010	< 0.0005
Ru-106	< 0.0022	< 0.0040
Cs-134	< 0.0005	< 0.0005
Cs-137	< 0.0004	< 0.0005
Ce-141	< 0.0019	< 0.0017
Ce-144	< 0.0052	< 0.0044

Appendix A, Supplemental Analyses

A 1.7 Duplicate Analyses, Vegetation

Units: pCi/gwet

A 1.8 Duplicate Analyses, Sediment

Units: pCi/gdry

Location	D-16
Lab Code	DBS- 5773
Date Collected	10-13-08
K-40	7.68 ± 0.58
Mn-54	< 0.024
Fe-59	< 0.057
Co-58	< 0.027
Co-60	< 0.018
Zn-65	< 0.046
Nb-95	< 0.024
Zr-95	< 0.040
Ru-103	< 0.023
Ru-106	< 0.16
Cs-134	< 0.014
Cs-137	< 0.021
Ce-141	< 0.045
Ce-144	< 0.077
