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Duane Arnold Energy Center

2009 Annual Radiological Environmental Operating Report

106 Pages to follow

2009

Annual Radiological Environmental Operating Report

Duane Arnold Energy Center

Cedar Rapids, Iowa

Docket No. 50-331

January 1, 2009 through December 31, 2009

2009
Annual Radiological Environmental Operating Report

Duane Arnold Energy Center

Prepared By: _____ Date: 4/23/2010

Reviewed By: _____ Date: 4/26/2010

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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, 2009

Prepared by

ENVIRONMENTAL, Inc.
Midwest Laboratory

Project No. 8001

Approved : _____

Bronia Grob, M.S.
Laboratory Manager

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, 2009. 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 2009 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.

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

Charcoal filter samples are analyzed weekly for iodine-131.

Ambient gamma radiation is monitored at a total of 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 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-118). Grain, hay and broad leaf (green leafy) vegetation samples are analyzed for gamma-emitting isotopes and at least two broad leaf vegetation samples are analyzed for iodine-131. An alternative site for broadleaf vegetation (D-15, indicator) may be sampled, if available.

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.

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 (or 7 pCi/liter), 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.

Program Description (continued)

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 Creek 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:

Air particulate / air iodine samples were collected later than scheduled for locations D-15 and D-16 for the weeks ending January 15, 2009. The stations were not accessible due to heavy snow accumulation. A collection was made on January 18, 2009.

A partial sample (176 m3) was collected from location D-15 for the week ending June 10, 2009, due to power loss.

(2) Surface Water:

Surface water could not be sampled for the January 27, 2009 collection, from locations D-49 and D-99.The water was frozen.

(3) Vegetation:

Strawberries were not available from location D-117. The crop was destroyed during the flooding of 2008 and not replanted in 2009.

Broadleaf vegetation samples were not available from location D-94 in 2009. An additional broadleaf vegetation sample was collected from location D-15 for 2009.

(4) Corrections to the 2008 Annual Report.

a. Table 21, Part II. Soil was collected from site D-15a, not at site D-15, as listed in the report.

b. Only one species of fish was collected from location D-49, June 27, 2008. The program description calls for two species.

c. Groundwater samples from locations MW-04A, MW-06A, MW-06B were collected on 11-19-2008 and not on 11-24-2008 as listed in the report.

Program Execution, Corrections to the 2008 Annual Report. (continued)

d. For 2008, Zn-65 was not listed with the gamma isotopic data for air particulate composites, hay, grain, and broadleaf vegetation samples. No Zn-65 was detected.

All air particulate composite samples measured below an LLD value of 0.0026 pCi/m^3.
All hay and grain samples measured below an LLD value of 0.061 pCi/g wet.
All broadleaf vegetation samples measured below an LLD value of 0.065 pCi/g wet.

e. Even though the required LLDs for iodine-131 were met, the October, 2008 milk samples were not analyzed within the required time frame (8 days).

3.4 Laboratory Procedures

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

Gamma-spectroscopic analyses is performed using a high-purity germanium (HPGe) detector. The gamma isotopic analysis provides a spectrum with an energy range from 80 to 2048 KeV. Levels of iodine-131 in vegetation and concentrations of airborne iodine-131 in charcoal samples are also determined by gamma spectroscopy.

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, 2009). The QA Program includes participation in Interlaboratory Comparison (crosscheck) Programs. Results obtained in crosscheck programs are presented in Appendix A.

3.5 Program Modifications

The sampling site D-117 (Vegetation, strawberries) was dropped from the program in 2009. A new location D-118 for broadleaf vegetation was added

A new air particulate / air iodine station (D-40, Toddville) was added to the program, starting in the fourth quarter, 2009.

A requirement to analyze for radiostrontium and gamma emitters in groundwater was added in the fourth quarter, 2009. Samples will be analyzed for gamma isotopic, strontium-89 and strontium-90 if the gross beta activity exceeds ten times the yearly mean of the control samples, or 7 pCi/liter.

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 2009 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 2009.

4.2 Program Findings

Results obtained show background levels of radioactivity in the environmental samples collected outside of the Site Protected Area in 2009.

Trace levels of cesium-137 are still detected in soil and sediment.

Strontium-90 is still measurable in soil and sediment samples.

The Sr-90 and Cs-137 activity is generally attributed to deposition of fallout from previous decades.

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

Airborne Particulates

The average annual gross beta concentrations in airborne particulates were similar at indicator and control locations (0.031 and 0.030 pCi/m^3, respectively) and similar to levels observed from 1993 through 2008. The results are tabulated below.

Year	Indicators	Controls		Year	Indicators	Controls
Concentration (pCi/m^3)				Concentration (pCi/m^3)		
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
2001	0.026	0.026		2009	0.031	0.030

Average annual gross beta concentrations in airborne particulates.

4.2 Program Findings, Airborne Particulates (continued)

Gamma spectroscopic analysis of quarterly composites of air particulate filters yielded similar results for indicator and control locations. Beryllium-7, which is produced continuously in the upper atmosphere by cosmic radiation (Arnold and Al-Salih, 1955) was detected in all samples, with an average activity of 0.087 pCi/m^3 for all locations. All other gamma-emitting isotopes were below their respective LLD limits.

Airborne Iodine

Weekly levels of airborne iodine-131 were below the lower limit of detection (LLD) of 0.030 pCi/m^3 in all samples.

Ambient Radiation (TLDs)

At ten control locations, TLD readings averaged 18.2 mR/quarter. At locations within a half mile, one mile and stack, measurements averaged 20.2 mR/quarter, 19.3 mR/quarter and 18.2 mR/quarter, respectively. The two on-site locations D-15 and D-16 averaged 18.3 mR/quarter. The average for all locations was 19.0 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.

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 160 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 2009 show no radiological effects of plant operation.

4.2 Program Findings (continued)

Ground Water (potable)

The annual mean for gross beta activity 5.1 pCi/L, similar to levels observed from 1991 through 2008. The location with the highest mean was D-58, a farm 1.0 mile distant from the plant.

Tritium activity measured below the LLD of 161 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 2009 and analyzed for gross beta and tritium.

The annual mean for gross beta activity in six intermediate depth wells measured 4.0 pCi/liter. Measurements for the shallow wells averaged 5.0 pCi/liter. The highest mean (6.7 pCi/L) was observed at shallow well MW-6A. The same pattern of concentration was observed in 2008. 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 170 pCi/L in all twenty four samples collected from the intermediate depth wells. Activity was identified in seven of the twenty-four samples taken from the shallow wells and ranged from 180 to 3905 pCi/L. The highest mean (1360 pCi/L) was observed at shallow well MW-1A. The lower concentrations observed in 2008 may have been due to a dilutive effect from heavy flooding in the area. The activity has been attributed to "washout" from gaseous effluents.

Vegetation

Iodine-131 concentrations in broadleaf vegetation were below the LLD level of 0.039 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 0.022 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 2008, these levels are generally attributable to deposition of fallout from previous decades.

Naturally-occurring potassium-40 averaged 12.66 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 189 pCi/L.

Program Findings (continued)

Surface Water

Surface water was tested for tritium and gamma emitting isotopes in seventy samples from six locations. No measurable tritium activity was detected above an LLD of 168 pCi/L. Gamma-emitting isotopes were below detection limits.

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

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

No plant effect on surface water is indicated.

Fish

Fish were collected in June and September, 2009, 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 (2.98 and 3.17 pCi/g wet, respectively). No plant effect on the fish population is indicated.

River Sediments

River sediments were collected in June and September, 2009, and analyzed for gamma-emitting isotopes. Potassium-40 activity ranged from 6.95 – 11.79 pCi/g dry weight and averaged 9.12 pCi/g dry weight.

Cs-137 activity was detected in one of two samples from the control location D-51 at a level of 0.12 pCi/g dry. Cesium-137 activities are similar or less than levels observed from 1991 through 2008, these levels are generally attributable to deposition of fallout from previous decades.

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

4.3 Supplementary Groundwater Testing

There were no additional/ancillary samples collected in 2009 in support of the Nuclear Industry Ground Water Protection Initiative.

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

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	1.26×10^9 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 [a] Sample Point	Description	Sampling and Collection Frequency	Type and Frequency of Analysis [b]
Airborne Particulates	3 5 6 7 11 13 15 16 40	Hiawatha Palo Center Point Shellsburg Toddville Alburnett (C) On-site North On-site South Toddville	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.
Airborne Iodine	3 5 6 7 11 13 15 16 40	Hiawatha Palo Center Point Shellsburg Toddville Alburnett (C) On-site North On-site South Toddville	Continuous operation of sampler with sample collection at least once per week.	Analyze each cartridge for iodine-131.
Ambient Radiation	1-3, 5-8, 10, 11, 13	Controls	One dosimeter continuously at each location.	Read gamma radiation dose quarterly .
	15, 16	Indicators	Dosimeters are changed at least quarterly.	
	17-23, 28-32,	≤ 0.5 mi. of Stack		
	43-48 82-86, 91	≤ 1.0 mi. of Stack		
	33-42	≤ 3.0 mi. of Stack		
Surface Water	49 50 51 61 99 107	Lewis Acess (C) Plant Intake Plant Discharge 0.5 mi. downstream Pleasant Creek Lake Plant Sewage Dischange	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.

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

Exposure Pathway and/or Sample Type	Sampling Location [a] Sample Point	Description	Sampling and Collection Frequency	Type and Frequency of Analysis [b]
Ground Water (potable)	53 54	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 measures greater than ten times the annual mean of the control samples, or 7 pCi/L, perform gamma isotopic and Sr-89 and Sr-90 analyses.
	55	On-site well		
	57, 58 72 (C)	Wells off-site and within 4 km of DAEC		
On-site Ground Water (Monitoring Wells)		On-site wells:		
	111	MW-01A, B (SSE)		
	112	MW-02A, B (ESE)		
	113	MW-03A, B (NW)		
	114	MW-04A, B (S)		
	115	MW-05A, B (SSW)		
	116	MW-06A, B (NE)		
River Sediment	50	Plant Intake (C)	At least once every six months.	Gamma isotopic analysis of each sample.
	51	Plant Discharge		
	107a	North Drainage Ditch (on-site)		
Vegetation	16, 57, 58, 72, 94, 96, 109, 118	Farms that raise food crops.	Annually at harvest time. One sample of each: grain, green leafy, and forage. At least one sample should be broadleaf vegetation.	Gamma isotopic analysis of edible portions. I-131 analysis on broadleaf vegetation.
	108 (C)			
Fish	49	Cedar River upstream of DAEC not influenced by effluent (C)	One sample per 6 months (once during January through June and once during July through December).	Gamma isotopic analysis on edible portions.
	61	Downstream of DAEC in influence of effluent		
Milk [c]	108 (C)	Control Farm near Watkins, Iowa	At least once per two weeks during the grazing season.	Gamma isotopic and iodine-131 analyses of each sample.
	110	Dairy Farm 7.8 mi. SW	At least once per month during the non-grazing season.	

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

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

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

[b] Gamma isotopic analysis and analysis for gamma-emitting nuclides refer to high resolution gamma ray spectrum analysis. Any radionuclide detected at a concentration greater than the lower limit of detection (LLD) should be reported quantitatively; conversely, any radionuclide concentration less than the LLD should not be reported.

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

[d] Only sampled when meat is butchered for home use.

Table 5.3 Sampling locations, Duane Arnold Energy Center.

	Sampling Location	
Code	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).

	Sampling Location	
Code	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)	0.55 mi W
D-58	Farm (Off-site Well)	0.55 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-118	Farm	1.45 mi. NW

Table 5.4 Type and Frequency of collection.

Location	Weekly	Monthly	Quarterly	Semiannually	Annually
D-1			TLD		
D-2			TLD		
D-3	AP, AI		TLD		
D-5	AP, AI		TLD		
D-6	AP, AI		TLD		
D-7	AP, AI		TLD		
D-8			TLD		
D-10			TLD		
D-11	AP, AI		TLD		
D-13	AP, AI		TLD		
D-15	AP, AI		TLD		
D-15A					SO
D-16	AP, AI	P	TLD		SO, G
D-17 to D-23			TLD		
D-28 to D-39			TLD		
D-40	AP, AI		TLD		
D-41 to D-48			TLD		
D-49		SW		F	
D-50		SW		BS	
D-51		SW		BS	
D-53			WW		
D-54			WW		
D-55			WW		
D-57			WW		G
D-58			WW		G
D-61		SW		F	
D-72			WW		G
D-82 to D-86			TLD		
D-91			TLD		
D-94					G
D-96					G
D-99		SW			
D-107		SW			
D-107A				BS	
D-108		MI*			G
D-109					G
D-110		MI*			
D-111 to D-116			WW		
D-118					G
On-site					ME

* Biweekly during the grazing season.

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

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

Table 5.6. Program Deviations, Duane Arnold Energy Center.

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
AP / AI	Gross Beta, I-131	D-15	01-15-09	Late collection due to heavy snow accumulation.
AP / AI	Gross Beta, I-131	D-16	01-15-09	Late collection due to heavy snow accumulation.
AP / AI	Gross Beta, I-131	D-15	06-10-09	Partial sample (176 m^3) due to power loss.
SW	Gross Beta, H-3 Gamma, I-131	D-49	01-27-09	No sample available, water frozen.
SW	Gross Beta, Gamma H-3	D-99	01-27-09	No sample available, water frozen.
VE	Gamma	D-94	2009	Samples not available.
VE	Gamma	D-117	2009	Crop not replanted, location has been dropped from the program

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

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility: Duane Arnold Energy Center | Docket No.: 50-331
Location of Facility: Linn, Iowa (County, State) | Reporting Period: January-December, 2009

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] Range [c]	Location with Highest Annual Mean: Location [d]	Location with Highest Annual Mean: Mean (F) [c] Range [c]	Control Locations Mean (F) [c] Range [c]	Number Non-Routine Results [e]
Airborne Particulates (pCi/m^3)	GB 427	0.004	0.031 (374/375) (0.006-0.068)	D-40,Toddville 3.0 mi. SSE	0.036 (11/11) (0.019-0.065)	0.030 (52/52) (0.013-0.063)	0
	GS 33						
	Be-7	0.020	0.086 (29/29) (0.050-0.115)	D-3, Hiawatha 7 mi. SE	0.096 (4/4) (0.077-0.108)	0.094 (4/4) (0.067-0.110)	0
	Mn-54	0.0010	< LLD			< LLD	0
	Fe-59	0.0025	< LLD			< LLD	0
	Co-58	0.0010	< LLD			< LLD	0
	Co-60	0.0011	< LLD			< LLD	0
	Zn-65	0.0019	< LLD			< LLD	0
	Nb-95	0.0017	< LLD			< LLD	0
	Zr-95	0.0022	< LLD			< LLD	0
	Ru-103	0.0015	< LLD			< LLD	0
	Ru-106	0.0101	< LLD			< LLD	0
	Cs-134	0.0010	< LLD			< LLD	0
	Cs-137	0.0013	< LLD			< LLD	0
	Ce-141	0.0025	< LLD			< LLD	0
	Ce-144	0.0060	< LLD			< LLD	0
Airborne Iodine (pCi/m^3)	I-131 427	0.030	< LLD	-	-	< LLD	0
TLD, AP Locations (mR/quarter)	Gamma 48	1.0	18.3 (8/8) (15.9-20.4)	D-8,Urbana 10 mi. NW	22.5 (4/4) (20.8-23.6)	18.2 (40/40) (13.1-23.6)	0
TLD, within 0.5 mi. of Stack (mR/quarter)	Gamma 48	1.0	20.2 (48/48) (15.0-26.3)	D-29,On-site 0.5 mi. W	23.5 (4/4) (22.3-24.7)	None	0
TLD, within 1.0 mi. of Stack (mR/quarter)	Gamma 48	1.0	19.3 (48/48) (13.8-24.3)	D-48 1 mi. NNW	23.1 (4/4) (21.2-24.3)	None	0
TLD, within 3.0 mi. of Stack (mR/quarter)	Gamma 40	1.0	18.2 (40/40) (15.4-22.9)	D-37, 3 mi. E	22 (4/4) (20.0-22.9)	None	0
Precipitation (pCi/L)	H-3 4	160	< LLD	-	-	< LLD	0
	GS 12						
	Mn-54	5.0	< LLD	-	-	< LLD	0
	Fe-59	9.2	< LLD	-	-	< LLD	0
	Co-58	5.4	< LLD	-	-	< LLD	0
	Co-60	5.7	< LLD	-	-	< LLD	0
	Zn-65	11.6	< LLD	-	-	< LLD	0
	Nb-95	6.3	< LLD	-	-	< LLD	0
	Zr-95	12.8	< LLD	-	-	< LLD	0
	I-131	14.6	< LLD	-	-	< LLD	0
	Cs-134	7.2	< LLD	-	-	< LLD	0
	Cs-137	6.6	< LLD	-	-	< LLD	0
	Ba-140	34.7	< LLD	-	-	< LLD	0
	La-140	5.2	< LLD	-	-	< LLD	0

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	Duane Arnold Energy Center	Docket No.	50-331
Location of Facility	Linn, Iowa (County, State)	Reporting Period	January-December, 2009

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] Range [c]	Location with Highest Annual Mean Location [d]	Location with Highest Annual Mean Mean (F) [c] Range [c]	Control Locations Mean (F) [c] Range [c]	Number Non-Routine Results [e]
Milk (pCi/L)	I-131 36	0.5	< LLD	-	-	< LLD	0
	GS 36						
	K-40	100	1365 (18/18) (1246-1461)	D-108, Farm 17.3 mi. SW	1457 (18/18) (1302-1653)	1457 (18/18) (1302-1653)	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	3.3	5.1 (3/20) (3.3-8.3)	D-58, Farm 1 mi. WSW-SW	5.1 (3/4) (3.3-8.3)	< LLD	0
	H-3 24	161	< LLD	-	-	< LLD	0
Monitoring wells (pCi/L)	GB 48	4.0	5.3 (12/48) (4.0-10.5)	MW-6A, shallow Onsite, NE	6.7 (4/4) (4.7-10.5)	None	0
	H-3 48	170	870 (7/48) (180-3905)	MW-01A (shallow) Onsite, 210m SSE	1360 (4/4) (290-3905)	None	1
Broadleaf Vegetation (pCi/g wet)	I-131 5	0.039	< LLD	-	-	< LLD	0
	GS 5						
	K-40	0.5	3.18 (5/5) (2.01-3.89)	D-15, On-site 0.5 mi. NNW	3.89 (1/1)	3.31 (1/1)	0
	Mn-54	0.033	< LLD	-	-	< LLD	0
	Co-58	0.032	< LLD	-	-	< LLD	0
	Co-60	0.026	< LLD	-	-	< LLD	0
	Zn-65	0.033	< LLD	-	-	< LLD	0
	Nb-95	0.033	< LLD	-	-	< LLD	0
	Zr-95	0.047	< LLD	-	-	< LLD	0
	Ru-103	0.031	< LLD	-	-	< LLD	0
	Ru-106	0.22	< LLD	-	-	< LLD	0
	Cs-134	0.028	< LLD	-	-	< LLD	0
	Cs-137	0.036	< LLD	-	-	< LLD	0
	Ce-141	0.035	< LLD	-	-	< LLD	0
	Ce-144	0.21	< LLD	-	-	< LLD	0

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	Duane Arnold Energy Center	Docket No.	50-331
Location of Facility	Linn, Iowa (County, State)	Reporting Period	January-December, 2009

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] Range [c]	Location with Highest Annual Mean Location [d]	Location with Highest Annual Mean Mean (F) [c] Range [c]	Control Locations Mean (F) [c] Range [c]	Number Non-Routine Results [e]
Vegetation	GS 10						
(Grain and Forage) (pCi/g wet)	K-40	0.5	8.19 (8/8) (2.71-26.78)	D-57, Farm 1 mi. WSW	15.08 (2/2) (3.38-26.78)	13.40 (2/2) (2.02-24.78)	0
	Mn-54	0.038	< LLD	-	-	< LLD	0
	Co-58	0.042	< LLD	-	-	< LLD	0
	Co-60	0.045	< LLD	-	-	< LLD	0
	Zn-65	0.081	< LLD	-	-	< LLD	0
	Nb-95	0.038	< LLD	-	-	< LLD	0
	Zr-95	0.085	< LLD	-	-	< LLD	0
	Ru-103	0.041	< LLD	-	-	< LLD	0
	Ru-106	0.30	< LLD	-	-	< LLD	0
	Cs-134	0.033	< LLD	-	-	< LLD	0
	Cs-137	0.051	< LLD	-	-	< LLD	0
	Ce-141	0.064	< LLD	-	-	< LLD	0
	Ce-144	0.23	< LLD	-	-	< LLD	0
Soil (pCi/gwet)	Sr-90 2	0.018	0.022 (1/2)	D-16, On-site 0.5 mi. SSE	0.022 (1/1)	None	0
	H-3 (pCi/L) 2	189	< LLD	-	-	None	0
	GS 2						
	K-40	0.5	12.66 (2/2) (8.99-16.32)	D-16, On-site 0.5 mi. SSE	16.32 (1/1)	None	0
	Mn-54	0.037	< LLD	-	-	None	0
	Fe-59	0.073	< LLD	-	-	None	0
	Co-58	0.043	< LLD	-	-	None	0
	Co-60	0.032	< LLD	-	-	None	0
	Zn-65	0.062	< LLD	-	-	None	0
	Nb-95	0.028	< LLD	-	-	None	0
	Zr-95	0.080	< LLD	-	-	None	0
	Ru-103	0.033	< LLD	-	-	None	0
	Ru-106	0.225	< LLD	-	-	None	0
	Cs-134	0.038	< LLD	-	-	None	0
	Cs-137	0.060	0.15 (2/2) (0.14-0.15)	D-15, On-site 0.5 mi. NW	0.15 (1/1)	None	0
	Ce-141	0.15	< LLD	-	-	None	0
	Ce-144	0.096	< LLD	-	-	None	0

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	Duane Arnold Energy Center	Docket No.	50-331
Location of Facility	Linn, Iowa (County, State)	Reporting Period	January-December, 2009

Sample Type (Units)	Type and Number of Analyses [a]		LLD [b]	Indicator Locations Mean (F) [c] Range [c]	Location with Highest Annual Mean Location [d]	Location with Highest Annual Mean Mean (F) [c] Range [c]	Control Locations Mean (F) [c] Range [c]	Number Non-Routine Results [e]
Surface Water	H-3	70	168	< LLD	-	-	< LLD	0
(pCi/L)	I-131	23	0.7	< LLD	-	-	< LLD	0
	Sr-89	8	0.9	< LLD	-	-	< LLD	0
	Sr-90	8	0.6	< LLD	-	-	< LLD	0
	GS	70						
	Mn-54		5.7	< LLD	-	-	< LLD	0
	Fe-59		11.6	< LLD	-	-	< LLD	0
	Co-58		5.0	< LLD	-	-	< LLD	0
	Co-60		5.1	< LLD	-	-	< LLD	0
	Zn-65		14.4	< LLD	-	-	< LLD	0
	Nb-95		4.6	< LLD	-	-	< LLD	0
	Zr-95		8.9	< LLD	-	-	< LLD	0
	I-131		9.1	< LLD	-	-	< LLD	0
	Cs-134		4.9	< LLD	-	-	< LLD	0
	Cs-137		5.2	< LLD	-	-	< LLD	0
	Ba-140		24.7	< LLD	-	-	< LLD	0
	La-140		5.6	< LLD	-	-	< LLD	0
Sediments	GS	6						
(pCi/g dry)	K-40		1.0	7.91 (4/4) (6.95-9.02)	D-50, Plant Intake	11.54 (2/2) (11.30-11.79)	11.54 (2/2) (11.30-11.79)	0
	Mn-54		0.073	< LLD	-	-	< LLD	0
	Fe-59		0.15	< LLD	-	-	< LLD	0
	Co-58		0.063	< LLD	-	-	< LLD	0
	Co-60		0.054	< LLD	-	-	< LLD	0
	Zn-65		0.13	< LLD	-	-	< LLD	0
	Nb-95		0.098	< LLD	-	-	< LLD	0
	Zr-95		0.075	< LLD	-	-	< LLD	0
	Ru-103		0.040	< LLD	-	-	< LLD	0
	Ru-106		0.45	< LLD	-	-	< LLD	0
	Cs-134		0.054	< LLD	-	-	< LLD	0
	Cs-137		0.063	< LLD	D-50, Plant Intake	0.12 (1/2)	0.12 (1/2)	0
	Ce-141		0.13	< LLD	-	-	< LLD	0
	Ce-144		0.40	< LLD	-	-	< LLD	0

Table 5.7 Radiological Environmental Monitoring Program Summary.

Name of Facility	Duane Arnold Energy Center	Docket No.	50-331
Location of Facility	Linn, Iowa (County, State)	Reporting Period	January-December, 2009

Sample Type (Units)	Type and Number of Analyses [a]	LLD [b]	Indicator Locations Mean (F) [c] Range [c]	Location with Highest Annual Mean Location [d]	Mean (F) [c] Range [c]	Control Locations Mean (F) [c] Range [c]	Number Non-Routine Results [e]
Fish	GS 8						
(pCi/g wet)	K-40	1.0	2.98 (4/4) (2.65-3.57)	D-49, Upstream, 4.0 mi. NNW	3.17 (4/4) (2.92-3.29)	3.17 (4/4) (2.92-3.29)	0
	Mn-54	0.016	< LLD	-	-	< LLD	0
	Fe-59	0.044	< LLD	-	-	< LLD	0
	Co-58	0.013	< LLD	-	-	< LLD	0
	Co-60	0.013	< LLD	-	-	< LLD	0
	Zn-65	0.038	< LLD	-	-	< LLD	0
	Nb-95	0.018	< LLD	-	-	< LLD	0
	Zr-95	0.036	< LLD	-	-	< LLD	0
	Ru-103	0.020	< LLD	-	-	< LLD	0
	Ru-106	0.11	< LLD	-	-	< LLD	0
	Cs-134	0.018	< LLD	-	-	< LLD	0
	Cs-137	0.017	< LLD	-	-	< LLD	0
	Ce-141	0.040	< LLD	-	-	< LLD	0
	Ce-144	0.134	< LLD	-	-	< LLD	0

[a] GB = Gross beta; GS = Gamma spectroscopy

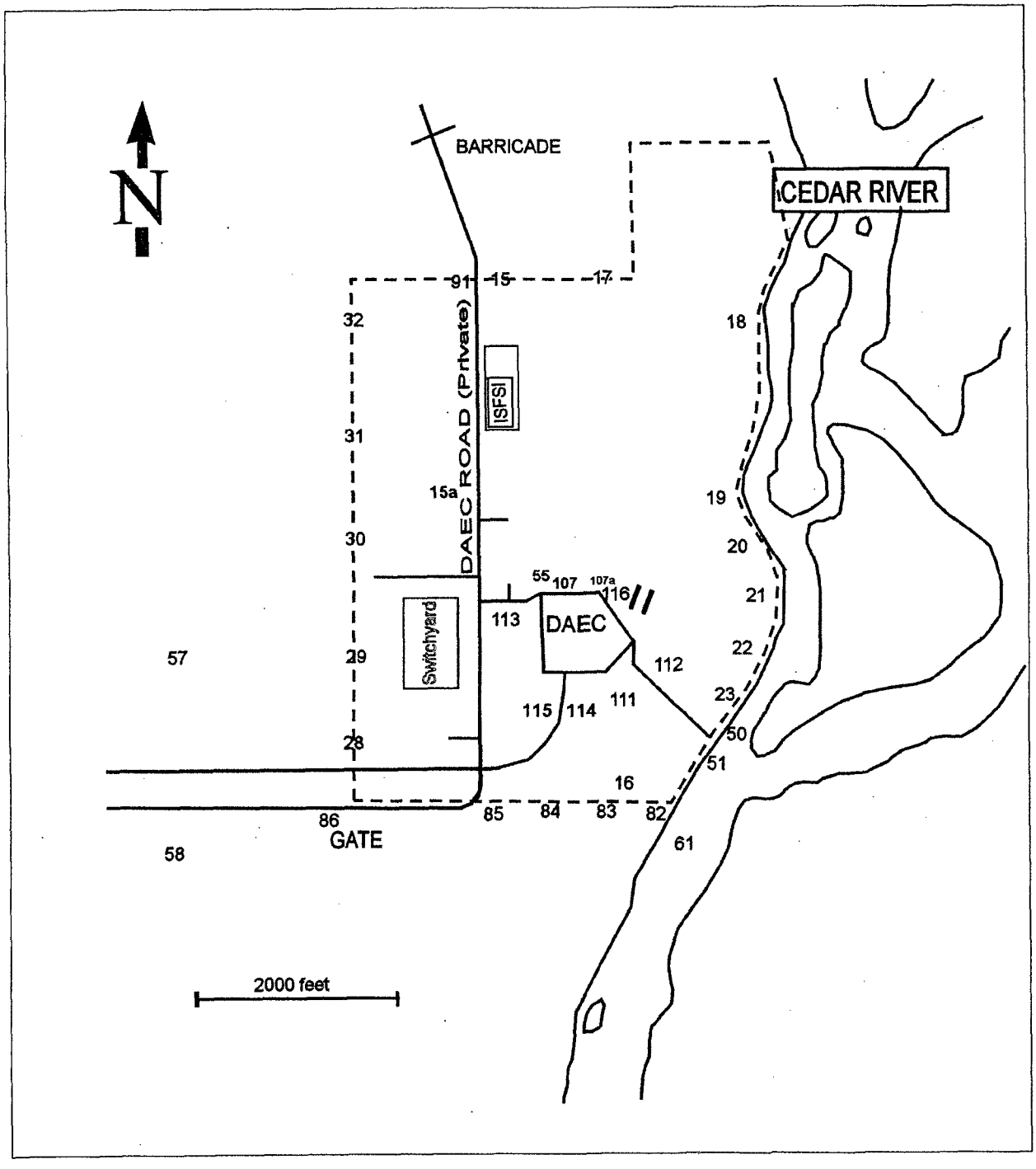
[b] LLD = Nominal lower limit of detection based on 4.66 sigma counting error for the background sample.

[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.

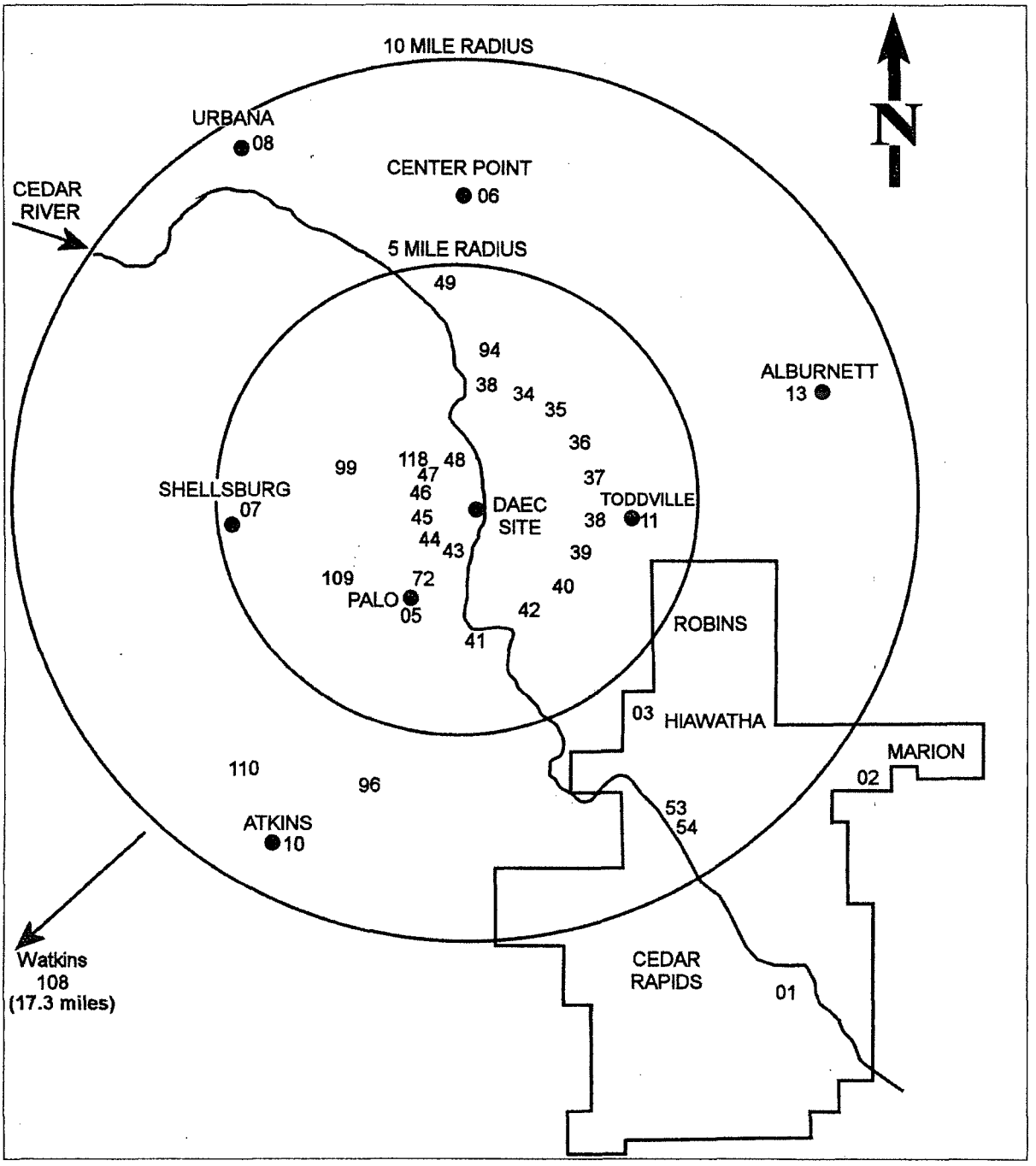
[e] Non-routine results are those which exceed ten times the control station value for the location. If a control station value is not available, the result is considered non-routine if it exceeds ten times the preoperational value for the location.

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, 2009 through December, 2009

Appendix A

Interlaboratory Comparison Program Results

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

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

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

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

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

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

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

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

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

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

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

Attachment A

ACCEPTANCE CRITERIA FOR "SPIKED" SAMPLES

LABORATORY PRECISION: ONE STANDARD DEVIATION VALUES FOR VARIOUS ANALYSES[a]

Analysis	Level	One standard deviation for single determination
Gamma Emitters	5 to 100 pCi/liter or kg > 100 pCi/liter or kg	5.0 pCi/liter 5% of known value
Strontium-89[b]	5 to 50 pCi/liter or kg > 50 pCi/liter or kg	5.0 pCi/liter 10% of known value
Strontium-90[b]	2 to 30 pCi/liter or kg > 30 pCi/liter or kg	5.0 pCi/liter 10% of known value
Potassium-40	≥ 0.1 g/liter or kg	5% of known value
Gross alpha	≤ 20 pCi/liter > 20 pCi/liter	5.0 pCi/liter 25% of known value
Gross beta	≤ 100 pCi/liter > 100 pCi/liter	5.0 pCi/liter 5% of known value
Tritium	≤ 4,000 pCi/liter > 4,000 pCi/liter	$\pm 1\sigma$ = $169.85 \times (\text{known})^{0.0933}$ 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) Laboratory Result[b]	ERA Result[c]	Control Limits	Acceptance
STW-1181	04/06/09	Sr-89	41.0 ± 5.8	48.3	37.8 - 55.7	Pass
STW-1181	04/06/09	Sr-90	32.4 ± 2.4	31.4	22.9 - 36.4	Pass
STW-1182	04/06/09	Ba-133	44.6 ± 3.1	52.7	43.4 - 58.3	Pass
STW-1182	04/06/09	Co-60	81.0 ± 3.1	88.9	80.0 - 100.0	Pass
STW-1182	04/06/09	Cs-134	65.6 ± 5.2	72.9	59.5 - 80.2	Pass
STW-1182 [d]	04/06/09	Cs-137	147.7 ± 5.3	168.0	151.0 - 187.0	Fail
STW-1182	04/06/09	Zn-65	79.8 ± 7.5	84.4	76.0 - 101.0	Pass
STW-1183	04/06/09	Gr. Alpha	47.6 ± 2.1	54.2	28.3 - 67.7	Pass
STW-1183	04/06/09	Gr. Beta	38.5 ± 1.3	43.5	29.1 - 50.8	Pass
STW-1184	04/06/09	I-131	24.4 ± 2.5	26.1	21.7 - 30.8	Pass
STW-1185	04/06/09	Ra-226	14.0 ± 0.7	15.1	11.2 - 17.3	Pass
STW-1185	04/06/09	Ra-228	14.3 ± 2.1	13.6	9.0 - 16.6	Pass
STW-1185	04/06/09	Uranium	25.0 ± 0.2	25.7	20.6 - 28.8	Pass
STW-1186 [e]	04/06/09	H-3	22819.0 ± 453.0	20300.0	17800.0 - 22300.0	Fail
STW-1193	10/05/09	Sr-89	53.0 ± 6.0	62.2	50.2 - 70.1	Pass
STW-1193	10/05/09	Sr-90	31.1 ± 2.2	30.7	22.4 - 35.6	Pass
STW-1194	10/05/09	Ba-133	82.5 ± 3.5	92.9	78.3 - 102.0	Pass
STW-1194	10/05/09	Co-60	116.8 ± 3.3	117.0	105.0 - 131.0	Pass
STW-1194	10/05/09	Cs-134	78.8 ± 5.7	78.8	65.0 - 87.3	Pass
STW-1194	10/05/09	Cs-137	54.2 ± 3.7	54.6	49.1 - 62.9	Pass
STW-1194	10/05/09	Zn-65	102.5 ± 6.2	99.5	89.6 - 119.0	Pass
STW-1195	10/05/09	Gr. Alpha	20.3 ± 2.0	23.2	11.6 - 31.1	Pass
STW-1195	10/05/09	Gr. Beta	23.7 ± 1.4	26.0	16.2 - 33.9	Pass
STW-1196	10/05/09	I-131	22.4 ± 1.4	22.2	18.4 - 26.5	Pass
STW-1197	10/05/09	Ra-226	15.0 ± 0.7	13.9	10.4 - 16.0	Pass
STW-1197	10/05/09	Ra-228	17.4 ± 2.0	14.9	10.0 - 18.0	Pass
STW-1197	10/05/09	Uranium	32.5 ± 0.4	33.8	27.3 - 37.8	Pass
STW-1198	10/05/09	H-3	17228.0 ± 694.0	16400.0	14300.0 - 18000.0	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.

[d] All gamma -emitters showed a low bias. A large plastic burr found on the base of the Marinelli kept the beaker from sitting directly on the detector. Result of recount in a different beaker, Cs-137, 155.33 ± 14.55 pCi/L.

[e] Samples were recounted and also reanalyzed. A recount of the original vials averaged 23,009 pCi/L. Reanalysis results were acceptable, 19,170 pCi/L.

TABLE A-2. Crosscheck program results; Thermoluminescent Dosimetry, (TLD, $CaSO_4$: Dy Cards).

Lab Code	Date	Description	mR Known Value	mR Lab Result ± 2 sigma	Control Limits	Acceptance
Environmental, Inc.						
2009-1	7/6/2009	40 cm.	41.82	45.43 ± 3.66	29.27 - 54.37	Pass
2009-1	7/6/2009	50 cm.	26.76	32.17 ± 1.52	18.73 - 34.79	Pass
2009-1	7/6/2009	60 cm.	18.58	20.23 ± 1.60	13.01 - 24.15	Pass
2009-1	7/6/2009	70 cm.	13.65	15.28 ± 0.79	9.56 - 17.75	Pass
2009-1	7/6/2009	90 cm.	8.26	7.97 ± 0.40	5.78 - 10.74	Pass
2009-1	7/6/2009	90 cm.	8.26	7.37 ± 0.49	5.78 - 10.74	Pass
2009-1	7/6/2009	100 cm.	6.69	6.16 ± 0.64	4.68 - 8.70	Pass
2009-1	7/6/2009	110 cm.	5.53	4.38 ± 0.24	3.87 - 7.19	Pass
2009-1	7/6/2009	120 cm.	4.65	4.34 ± 0.23	3.26 - 6.05	Pass
2009-1	7/6/2009	150 cm.	2.97	2.92 ± 0.25	2.08 - 3.86	Pass
Environmental, Inc.						
2009-2	12/27/2009	40 cm.	44.83	51.38 ± 2.69	31.38 - 58.28	Pass
2009-2	12/27/2009	50 cm.	28.69	31.65 ± 2.81	20.08 - 37.30	Pass
2009-2	12/27/2009	60 cm.	19.92	21.38 ± 1.19	13.94 - 25.90	Pass
2009-2	12/27/2009	60 cm.	19.92	22.30 ± 0.50	13.94 - 25.90	Pass
2009-2	12/27/2009	75 cm.	12.75	13.48 ± 1.02	8.93 - 16.58	Pass
2009-2	12/27/2009	90 cm.	8.85	9.62 ± 0.74	6.20 - 11.51	Pass
2009-2	12/27/2009	90 cm.	8.85	8.39 ± 0.86	6.20 - 11.51	Pass
2009-2	12/27/2009	100 cm.	7.17	6.65 ± 0.96	5.02 - 9.32	Pass
2009-2	12/27/2009	120 cm.	4.98	4.89 ± 0.53	3.49 - 6.47	Pass
2009-2	12/27/2009	120 cm.	4.98	4.92 ± 0.58	3.49 - 6.47	Pass
2009-2	12/27/2009	150 cm.	3.19	2.74 ± 0.39	2.23 - 4.15	Pass
2009-2	12/27/2009	180 cm.	2.21	1.65 ± 0.33	1.55 - 2.87	Pass
2009-2	12/27/2009	180 cm.	2.21	2.12 ± 0.69	1.55 - 2.87	Pass

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

Lab Code [b]	Date	Analysis	Concentration (pCi/L)[a] Laboratory results 2s, n=1 [c]	Known Activity	Control Limits [d]	Acceptance
W-12009	1/20/2009	Ra-226	12.88 ± 0.41	12.69	8.88 - 16.50	Pass
W-12009	1/27/2009	Gr. Alpha	20.20 ± 0.40	20.08	10.04 - 30.12	Pass
W-12709	1/27/2009	Gr. Beta	46.26 ± 0.42	45.60	35.60 - 55.60	Pass
SPW-5553	1/27/2009	Ra-228	29.11 ± 2.53	28.66	20.06 - 37.26	Pass
SPW-217	1/29/2009	U-238	44.98 ± 2.30	41.70	29.19 - 54.21	Pass
SPW-539	2/24/2009	Ni-63	167.93 ± 3.79	211.00	147.70 - 274.30	Pass
SPW-718	3/6/2009	C-14	4893.50 ± 21.69	4740.20	2844.12 - 6636.28	Pass
SPMI-814	3/16/2009	Cs-134	34.91 ± 3.85	35.70	25.70 - 45.70	Pass
SPMI-814	3/16/2009	Cs-137	59.17 ± 6.70	55.60	45.60 - 65.60	Pass
SPMI-814	3/16/2009	Sr-90	40.82 ± 1.59	44.07	35.26 - 52.88	Pass
SPMI-815	3/16/2009	I-131	70.99 ± 0.62	69.60	55.68 - 83.52	Pass
SPMI-815	3/16/2009	I-131(G)	63.08 ± 7.12	69.60	59.60 - 79.60	Pass
SPW-817	3/16/2009	I-131	62.11 ± 0.59	69.60	55.68 - 83.52	Pass
SPW-817	3/16/2009	I-131(G)	64.55 ± 8.32	69.60	59.60 - 79.60	Pass
SPW-818	3/16/2009	Co-60	50.84 ± 4.70	51.99	41.99 - 61.99	Pass
SPW-818	3/16/2009	Cs-134	33.78 ± 3.42	35.70	25.70 - 45.70	Pass
SPW-818	3/16/2009	Cs-137	61.27 ± 7.18	55.64	45.64 - 65.64	Pass
SPW-818	3/16/2009	Sr-90	47.26 ± 1.89	44.07	35.26 - 52.88	Pass
SPAP-903	3/23/2009	Cs-134	13.29 ± 2.89	14.19	4.19 - 24.19	Pass
SPAP-903	3/23/2009	Cs-137	103.24 ± 7.54	111.23	100.11 - 122.35	Pass
SPCH-916	3/24/2009	I-131(G)	0.22 ± 0.02	0.22	0.13 - 0.31	Pass
SPVE-888	4/1/2009	I-131(G)	0.40 ± 0.08	0.35	0.21 - 0.49	Pass
SPF-820	4/7/2009	Cs-134	0.58 ± 0.02	0.56	0.34 - 0.78	Pass
W-40909	4/9/2009	Gr. Alpha	19.26 ± 0.40	20.08	10.04 - 30.12	Pass
W-40909	4/9/2009	Gr. Beta	48.04 ± 0.42	45.60	35.60 - 55.60	Pass
SPW-12641	4/10/2009	Ra-228	40.06 ± 2.79	40.54	28.38 - 52.70	Pass
SPW-1267	4/10/2009	U-238	41.71 ± 2.25	41.70	29.19 - 54.21	Pass
TWW-2124	4/21/2009	H-3	7932.00 ± 279.00	7063.00	5650.40 - 8475.60	Pass
W-42809	4/28/2009	Ra-226	14.49 ± 0.53	16.78	11.75 - 21.81	Pass
SPMI-2186	5/12/2009	Cs-134	32.55 ± 1.26	33.89	23.89 - 43.89	Pass
SPMI-2186	5/12/2009	Cs-137	54.27 ± 2.60	55.60	45.60 - 65.60	Pass
SPMI-2186	5/12/2009	I-131	60.81 ± 0.63	52.40	40.40 - 64.40	Pass
SPMI-2186	5/12/2009	I-131(G)	56.89 ± 2.56	52.40	42.40 - 62.40	Pass
SPMI-2186	5/12/2009	Sr-90	43.88 ± 1.68	52.40	41.92 - 62.88	Pass
SPW-2497	5/27/2009	Fe-55	2472.37 ± 10.76	2106.35	1685.08 - 2527.62	Pass
SPW-3448	7/14/2009	Cs-137	171.06 ± 9.21	166.10	149.49 - 182.71	Pass
SPW-3497	7/15/2009	Ni-63	179.99 ± 3.06	210.40	147.28 - 273.52	Pass
SPW-3499	7/15/2009	Tc-99	29.61 ± 0.81	32.34	20.34 - 44.34	Pass
SPMI-3582	7/17/2009	Cs-134	32.86 ± 3.72	31.89	21.89 - 41.89	Pass
SPMI-3582	7/17/2009	Cs-137	182.49 ± 10.54	166.10	149.49 - 182.71	Pass
SPAP-3595	7/17/2009	Cs-134	13.01 ± 3.00	12.75	2.75 - 22.75	Pass
SPAP-3595	7/17/2009	Cs-137	110.63 ± 6.58	110.73	99.66 - 121.80	Pass

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

Lab Code [b]	Date	Concentration (pCi/L)[a] Analysis	Laboratory results 2s, n=1	Known Activity	Control Limits[c]	Acceptance
SPF-3597	7/17/2009	Cs-134	0.53 ± 0.03	0.51	0.31 - 0.71	Pass
SPF-3597	7/17/2009	Cs-137	2.43 ± 0.05	2.22	1.33 - 3.10	Pass
SPW-3599	7/17/2009	H-3	63246.00 ± 725.00	62495.00	49996.00 - 74994.00	Pass
SPW-12643	8/3/2009	Ra-228	38.18 ± 2.72	40.54	28.38 - 52.70	Pass
W-80709	8/7/2009	Ra-226	16.28 ± 0.41	16.77	11.74 - 21.80	Pass
W-81009	8/10/2009	Gr. Alpha	20.58 ± 0.44	20.08	10.04 - 30.12	Pass
W-81009	8/10/2009	Gr. Beta	44.44 ± 0.40	45.60	35.60 - 55.60	Pass
W-100109	10/1/2009	Ra-226	15.68 ± 0.41	16.77	11.74 - 21.80	Pass
W-102709	10/27/2009	Gr. Alpha	21.50 ± 0.43	20.08	10.04 - 30.12	Pass
W-102709	10/27/2009	Gr. Beta	44.83 ± 0.40	45.60	35.60 - 55.60	Pass
SPW-5964	10/28/2009	U-238	40.20 ± 1.87	41.70	29.19 - 54.21	Pass
SPW-12647	11/6/2009	Ra-228	44.49 ± 3.33	40.54	28.38 - 52.70	Pass
SPAP-6769	12/14/2009	Gr. Beta	45.43 ± 0.11	49.48	29.69 - 69.27	Pass
SPAP-6774	12/14/2009	Cs-134	10.32 ± 0.83	11.11	1.11 - 21.11	Pass
SPAP-6774	12/14/2009	Cs-137	106.58 ± 2.51	109.70	98.73 - 120.67	Pass
SPF-6776	12/14/2009	Cs-134	0.43 ± 0.02	0.44	0.26 - 0.62	Pass
SPF-6776	12/14/2009	Cs-137	2.33 ± 0.05	2.19	1.31 - 3.07	Pass
SPW-6780	12/14/2009	Tc-99	30.71 ± 1.09	32.34	20.34 - 44.34	Pass
SPMI-6782	12/14/2009	Co-60	74.30 ± 5.41	72.81	62.81 - 82.81	Pass
SPMI-6782	12/14/2009	Cs-134	58.82 ± 3.75	55.54	45.54 - 65.54	Pass
SPMI-6782	12/14/2009	Cs-137	178.18 ± 9.68	164.55	148.10 - 181.01	Pass
SPW-6784	12/14/2009	Co-60	74.03 ± 4.64	72.81	62.81 - 82.81	Pass
SPW-6784	12/14/2009	Cs-134	54.84 ± 3.83	55.54	45.54 - 65.54	Pass
SPW-6784	12/14/2009	Cs-137	180.06 ± 8.81	164.55	148.10 - 181.01	Pass

[a] Liquid sample results are reported in pCi/Liter, air filters(pCi/filter), charcoal (pCi/m^3), 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 ± 2σ.

[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
				LLD	Activity[c]	Criteria (4.66 σ)
W-12009	Water	1/20/2009	Ra-226	0.05	0.06 ± 0.04	1
SPW-5554	Water	1/27/2009	Ra-228	0.08	0.17 ± 0.40	2
W-12709	Water	1/27/2009	Gr. Alpha	0.35	0.22 ± 0.27	1
W-12709	Water	1/27/2009	Gr. Beta	0.74	-0.08 ± 0.51	3.2
SPW-218	Water	1/29/2009	U-238	0.19	-0.06 ± 0.09	1
SPW-538	Water	2/24/2009	Ni-63	7.91	4.96 ± 4.93	20
SPW-717	Water	3/6/2009	C-14	7.66	3.03 ± 4.71	200
SPMI-816	Milk	3/16/2009	Cs-134	3.24	-	10
SPMI-816	Milk	3/16/2009	Cs-137	3.38	-	10
SPMI-816	Milk	3/16/2009	I-131	0.31	0.04 ± 0.17	0.5
SPMI-816	Milk	3/16/2009	I-131(G)	3.65	-	20
SPMI-816	Milk	3/16/2009	Sr-90	0.48	0.41 ± 0.27	1
SPW-819	Water	3/16/2009	Co-60	3.02	-	10
SPW-819	Water	3/16/2009	Cs-134	2.25	-	10
SPW-819	Water	3/16/2009	Cs-137	2.03	-	10
SPW-819	Water	3/16/2009	I-131	0.42	-0.06 ± 0.19	0.5
SPW-819	Water	3/16/2009	I-131(G)	3.02	-	20
SPW-819	Water	3/16/2009	Sr-90	1.10	-0.63 ± 0.44	1
SPAP-902	Air Filter	3/23/2009	Gr. Beta	0.003	0.006 ± 0.002	3.2
SPAP-904	Air Filter	3/23/2009	Cs-134	1.68	-	100
SPAP-904	Air Filter	3/23/2009	Cs-137	2.62	-	100
SPW-32709	Water	3/23/2009	Ni-63	2.84	1.37 ± 1.75	20
SPF-821	Fish	4/7/2009	Cs-134	3.12	-	100
SPF-821	Fish	4/7/2009	Cs-137	3.93	-	100
W-40909	Water	4/9/2009	Gr. Alpha	0.40	-0.25 ± 0.26	1
W-40909	Water	4/9/2009	Gr. Beta	0.77	-0.30 ± 0.53	3.2
SPW-12651	Water	4/10/2009	Ra-228	0.77	0.77 ± 0.45	2
SPW-1268	Water	4/10/2009	U-238	0.11	0.24 ± 0.17	1
W-42809	Water	4/28/2009	Ra-226	0.04	0.09 ± 0.04	1
SPMI-2186	Milk	5/12/2009	Sr-90	0.43	0.52 ± 0.26	1
SPMI-2187	Milk	5/12/2009	Cs-134	3.61	-	10
SPMI-2187	Milk	5/12/2009	Cs-137	3.13	-	10
SPMI-2187	Milk	5/12/2009	I-131	0.15	-0.02 ± 0.10	0.5
SPMI-2187	Milk	5/12/2009	I-131(G)	3.77	-	20
SPW-2498	Water	5/27/2009	Ni-63	1.60	0.00 ± 0.97	20

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

Lab Code	Sample Type	Date	Analysis[b]	Concentration (pCi/L)[a]		
				Laboratory results (4.66σ)		Acceptance
				LLD	Activity[c]	Criteria (4.66 σ)
SPW-3497	Water	7/15/2009	Ni-63	1.55	-0.24 ± 0.94	20
SPW-3500	Water	7/15/2009	Tc-99	0.90	-1.71 ± 0.53	10
SPMI-3589	Milk	7/17/2009	I-131(G)	5.75	-	20
SPAP-3594	Air Filter	7/17/2009	Cs-134	1.14	-	100
SPAP-3594	Air Filter	7/17/2009	Cs-137	2.47	-	100
SPF-3596	Fish	7/17/2009	Co-60	5.00	-	100
SPF-3596	Fish	7/17/2009	Cs-134	8.00	-	100
SPF-3596	Fish	7/17/2009	Cs-137	11.50	-	100
SPW-3598	Water	7/17/2009	H-3	148.40	0.69 ± 73.60	200
SPW-12653	Water	8/3/2009	Ra-228	0.76	1.46 ± 0.51	2
W-80709	Water	8/7/2009	Ra-226	0.04	0.08 ± 0.03	1
W-81009	Water	8/10/2009	Gr. Alpha	0.44	0.08 ± 0.31	1
W-81009	Water	8/10/2009	Gr. Beta	0.75	-0.31 ± 0.52	3.2
W-100109	Water	10/1/2009	Ra-226	0.04	0.09 ± 0.03	1
W-102709	Water	10/27/2009	Gr. Alpha	0.38	0.33 ± 0.30	1
W-102709	Water	10/27/2009	Gr. Beta	0.81	-0.59 ± 0.55	3.2
SPW-5965	Water	10/28/2009	U-238	0.15	0.09 ± 0.13	1
SPW-12657	Water	11/6/2009	Ra-228	0.86	0.80 ± 0.50	2
SPAP-6769	Air Filter	12/14/2009	Gr. Beta	0.003	0.010 ± 0.002	3.2
SPAP-6773	Air Filter	12/14/2009	Cs-137	1.31	-	100
SPF-6775	Fish	12/14/2009	Cs-134	5.70	-	100
SPF-6775	Fish	12/14/2009	Cs-137	4.18	-	100
SPW-6777	Water	12/14/2009	Ni-63	2.29	0.25 ± 1.38	20
SPW-6779	Water	12/14/2009	Tc-99	1.16	-0.98 ± 0.69	10
SPMI-6781	Milk	12/14/2009	Cs-134	2.62	-	10
SPMI-6781	Milk	12/14/2009	Cs-137	3.29	-	10
SPMI-6781	Milk	12/14/2009	I-131(G)	2.65	-	20
SPW-6783	Water	12/14/2009	Cs-134	2.18	-	10
SPW-6783	Water	12/14/2009	Cs-137	2.90	-	10
SPW-6783	Water	12/14/2009	I-131(G)	2.30	-	20

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

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

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

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

			Concentration (pCi/L)[a]			
Lab Code	Date	Analysis	First Result	Second Result	Averaged Result	Acceptance
AP-7464, 7465	1/1/2009	Be-7	0.063 ± 0.012	0.065 ± 0.010	0.064 ± 0.008	Pass
E-20, 21	1/5/2009	K-40	1.34 ± 0.21	1.13 ± 0.13	1.24 ± 0.12	Pass
CF-67, 68	1/5/2009	Be-7	0.34 ± 0.12	0.39 ± 0.08	0.37 ± 0.07	Pass
CF-67, 68	1/5/2009	Gr. Beta	4.34 ± 0.11	4.38 ± 0.12	4.36 ± 0.08	Pass
CF-67, 68	1/5/2009	K-40	3.16 ± 0.26	3.00 ± 0.16	3.08 ± 0.15	Pass
DW-90010, 90011	1/9/2009	Ra-226	2.97 ± 0.22	2.76 ± 0.21	2.87 ± 0.15	Pass
DW-90010, 90011	1/9/2009	Ra-228	3.13 ± 0.71	3.55 ± 0.81	3.34 ± 0.54	Pass
SG-198, 199	1/23/2009	Gr. Alpha	101.90 ± 6.50	101.70 ± 6.10	101.80 ± 4.46	Pass
SG-198, 199	1/23/2009	Gr. Beta	97.80 ± 3.50	94.00 ± 3.20	95.90 ± 2.37	Pass
SW-308, 309	1/27/2009	Gr. Beta	1.43 ± 0.58	1.41 ± 0.54	1.42 ± 0.40	Pass
LW-330, 331	1/27/2009	Gr. Beta	2.09 ± 0.58	2.33 ± 0.63	2.21 ± 0.43	Pass
SW-308, 309	1/29/2009	Gr. Beta	1.51 ± 0.56	1.61 ± 0.57	1.56 ± 0.40	Pass
DW-375, 376	2/4/2009	Gr. Beta	2.72 ± 0.65	3.06 ± 0.69	2.89 ± 0.47	Pass
SWU-606, 607	2/24/2009	Gr. Beta	2.66 ± 0.68	2.16 ± 0.67	2.41 ± 0.48	Pass
U-651, 652	2/27/2009	Beta-K40	3.90 ± 2.30	1.70 ± 2.50	2.80 ± 1.70	Pass
U-651, 652	2/27/2009	H-3	597.00 ± 292.00	507.00 ± 288.00	552.00 ± 205.07	Pass
SG-739, 740	3/2/2009	Ra-226	8.20 ± 0.20	8.30 ± 0.20	8.25 ± 0.14	Pass
MI-875, 876	3/17/2009	K-40	1286.50 ± 111.60	1471.70 ± 111.50	1379.10 ± 78.88	Pass
MI-875, 876	3/17/2009	Sr-90	0.67 ± 0.31	0.36 ± 0.36	0.52 ± 0.24	Pass
WW-970, 971	3/24/2009	Gr. Beta	13.59 ± 2.32	17.33 ± 2.69	15.46 ± 1.78	Pass
XWW-980, 981	3/24/2009	H-3	7143.00 ± 262.00	7262.00 ± 264.00	7202.50 ± 185.97	Pass
AP-1441, 1442	3/30/2009	Be-7	0.076 ± 0.012	0.075 ± 0.014	0.076 ± 0.009	Pass
SWT-1123, 1124	3/31/2009	Gr. Beta	1.40 ± 0.55	1.86 ± 0.62	1.63 ± 0.41	Pass
WW-1102, 1103	4/1/2009	Gr. Beta	2.13 ± 1.34	2.30 ± 1.32	2.22 ± 0.94	Pass
XWW-1174, 1175	4/1/2009	H-3	2814 ± 176	2787 ± 176	2801 ± 124	Pass
AP-1462, 1463	4/2/2009	Be-7	0.085 ± 0.014	0.10 ± 0.016	0.091 ± 0.011	Pass
SL-2024, 2025	5/4/2009	Be-7	0.80 ± 0.18	0.82 ± 0.13	0.81 ± 0.11	Pass
SL-2024, 2025	5/4/2009	Gr. Beta	2.41 ± 0.19	2.68 ± 0.21	2.55 ± 0.14	Pass
SL-2024, 2025	5/4/2009	K-40	1.20 ± 0.21	1.30 ± 0.15	1.25 ± 0.13	Pass
SO-2045, 2046	5/4/2009	Gr. Alpha	6.22 ± 2.87	6.50 ± 3.26	6.36 ± 2.17	Pass
SO-2045, 2046	5/4/2009	Gr. Beta	28.85 ± 3.15	30.39 ± 3.34	29.62 ± 2.30	Pass
SO-2045, 2046	5/4/2009	Sr-90	0.036 ± 0.010	0.024 ± 0.010	0.030 ± 0.007	Pass
mi-2251, 2252	5/14/2009	K-40	1220.60 ± 155.10	1455.50 ± 118.20	1338.05 ± 97.50	Pass
mi-2381, 2382	5/19/2009	K-40	1472.50 ± 122.90	1412.80 ± 117.40	1442.65 ± 84.98	Pass
SWT-2534, 2535	5/26/2009	Gr. Beta	1.12 ± 0.57	1.66 ± 0.58	1.39 ± 0.41	Pass
G-2626, 2627	5/28/2009	Gr. Beta	6.32 ± 0.19	6.18 ± 0.19	6.25 ± 0.13	Pass
G-2626, 2627	5/28/2009	K-40	4.13 ± 0.35	4.05 ± 0.34	4.09 ± 0.24	Pass
WW-2732, 2733	6/1/2009	H-3	240.73 ± 93.21	190.39 ± 90.81	215.56 ± 65.07	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
SO-3141, 3142	6/22/2009	Ac-228	1.07 ± 0.06	1.06 ± 0.05	1.07 ± 0.04	Pass
SO-3141, 3142	6/22/2009	Be-7	0.55 ± 0.14	0.62 ± 0.08	0.59 ± 0.08	Pass
SO-3141, 3142	6/22/2009	Bi-212	1.16 ± 0.17	1.14 ± 0.16	1.15 ± 0.12	Pass
SO-3141, 3142	6/22/2009	Bi-214	0.96 ± 0.03	1.01 ± 0.03	0.99 ± 0.02	Pass
SO-3141, 3142	6/22/2009	Cs-137	0.72 ± 0.07	0.76 ± 0.08	0.74 ± 0.05	Pass
SO-3141, 3142	6/22/2009	Pb-212	1.00 ± 0.02	1.03 ± 0.02	1.02 ± 0.01	Pass
SO-3141, 3142	6/22/2009	Pb-214	1.01 ± 0.03	1.04 ± 0.03	1.03 ± 0.02	Pass
SO-3141, 3142	6/22/2009	Pu-239/40	0.022 ± 0.008	0.030 ± 0.009	0.026 ± 0.006	Pass
SO-3141, 3142	6/22/2009	Th-232	0.51 ± 0.04	0.48 ± 0.05	0.50 ± 0.03	Pass
SO-3141, 3142	6/22/2009	Tl-208	0.35 ± 0.02	0.36 ± 0.02	0.36 ± 0.01	Pass
SO-3141, 3142	6/22/2009	U-233/4	0.16 ± 0.02	0.18 ± 0.02	0.17 ± 0.01	Pass
SO-3141, 3142	6/22/2009	U-238	0.14 ± 0.02	0.18 ± 0.03	0.16 ± 0.02	Pass
SG-3187, 3188	6/25/2009	Ac-228	11.07 ± 0.33	10.88 ± 0.33	10.97 ± 0.24	Pass
SG-3187, 3188	6/25/2009	Pb-214	26.54 ± 0.23	26.17 ± 0.25	26.36 ± 0.17	Pass
SL-3297, 3298	7/1/2009	Be-7	1.15 ± 0.13	1.15 ± 0.12	1.15 ± 0.09	Pass
SL-3297, 3298	7/1/2009	Gr. Beta	3.38 ± 0.23	3.37 ± 0.12	3.38 ± 0.13	Pass
SL-3297, 3298	7/1/2009	K-40	1.43 ± 0.18	1.50 ± 0.19	1.47 ± 0.13	Pass
AP-3944, 3945	7/1/2009	Be-7	0.064 ± 0.009	0.068 ± 0.010	0.066 ± 0.007	Pass
DW-90222, 90223	7/15/2009	Ra-226	5.36 ± 0.60	4.62 ± 0.51	4.99 ± 0.39	Pass
DW-90222, 90223	7/15/2009	Ra-228	2.91 ± 0.73	2.80 ± 0.70	2.86 ± 0.51	Pass
DW-90237, 90238	7/17/2009	Gr. Alpha	3.54 ± 0.99	4.22 ± 1.09	3.88 ± 0.74	Pass
F-3790, 3791	7/21/2009	K-40	1.10 ± 0.35	1.41 ± 0.44	1.26 ± 0.28	Pass
DW-90250, 90251	7/22/2009	Ra-226	14.58 ± 0.39	15.13 ± 0.40	14.86 ± 0.28	Pass
DW-90250, 90251	7/22/2009	Ra-228	6.71 ± 1.05	6.10 ± 1.01	6.41 ± 0.73	Pass
VE-3965, 3966	7/28/2009	K-40	1.48 ± 0.16	1.56 ± 0.19	1.52 ± 0.13	Pass
VE-4098, 4099	8/3/2009	Be-7	0.54 ± 0.16	0.58 ± 0.16	0.56 ± 0.11	Pass
VE-4098, 4099	8/3/2009	Gr. Beta	5.15 ± 0.17	5.07 ± 0.18	5.11 ± 0.12	Pass
VE-4098, 4099	8/3/2009	K-40	4.91 ± 0.49	5.17 ± 0.15	5.04 ± 0.26	Pass
SO-4325, 4326	8/14/2009	Be-7	0.59 ± 0.21	0.68 ± 0.28	0.64 ± 0.18	Pass
SO-4325, 4326	8/14/2009	Cs-137	0.29 ± 0.05	0.28 ± 0.05	0.28 ± 0.03	Pass
SO-4325, 4326	8/14/2009	K-40	13.41 ± 0.77	13.46 ± 0.80	13.43 ± 0.56	Pass
SG-4283, 4284	8/17/2009	Ac-228	7.16 ± 0.28	7.10 ± 0.26	7.13 ± 0.19	Pass
SG-4283, 4284	8/17/2009	Pb-214	6.27 ± 0.13	6.21 ± 0.13	6.24 ± 0.09	Pass
VE-4436, 4437	8/25/2009	K-40	2.28 ± 0.28	2.67 ± 0.26	2.48 ± 0.19	Pass
SL-4589, 4590	9/1/2009	Be-7	1.25 ± 0.22	1.25 ± 0.16	1.25 ± 0.14	Pass
SL-4589, 4590	9/1/2009	K-40	2.96 ± 0.30	2.70 ± 0.27	2.83 ± 0.20	Pass
AV-4882, 4883	9/8/2009	Be-7	0.93 ± 0.18	0.95 ± 0.17	0.94 ± 0.12	Pass
AV-4882, 4883	9/8/2009	K-40	2.50 ± 0.26	2.47 ± 0.29	2.49 ± 0.20	Pass

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

Lab Code	Date	Analysis	Concentration (pCi/L)[a] First Result	Second Result	Averaged Result	Acceptance
WW-4721, 4722	9/9/2009	H-3	19191.00 ± 404.00	18677.00 ± 399.00	18934.00 ± 283.91	Pass
WW-4903, 4904	9/11/2009	H-3	1075.00 ± 130.00	1281.00 ± 136.00	1178.00 ± 94.07	Pass
BS-5119, 5120	9/16/2009	Be-7	2067.50 ± 327.90	2225.40 ± 371.10	2146.45 ± 247.61	Pass
BS-5119, 5120	9/16/2009	Cs-137	86.24 ± 35.40	145.10 ± 31.54	115.67 ± 23.71	Pass
BS-5119, 5120	9/16/2009	K-40	16.85 ± 0.90	17.27 ± 0.79	17.06 ± 0.60	Pass
SS-5188, 5189	9/23/2009	Be-7	1.02 ± 0.31	1.04 ± 0.43	1.03 ± 0.26	Pass
SS-5188, 5189	9/23/2009	K-40	10.21 ± 0.65	9.94 ± 0.93	10.07 ± 0.57	Pass
AP-3944, 3945	9/29/2009	Be-7	0.09 ± 0.02	0.09 ± 0.02	0.09 ± 0.01	Pass
E-5251, 5252	10/1/2009	Gr. Beta	2.30 ± 0.10	2.10 ± 0.10	2.20 ± 0.07	Pass
E-5251, 5252	10/1/2009	K-40	1.18 ± 0.24	1.15 ± 0.18	1.17 ± 0.15	Pass
G-5272, 5273	10/1/2009	Be-7	3.31 ± 0.29	3.60 ± 0.26	3.46 ± 0.19	Pass
G-5272, 5273	10/1/2009	Gr. Alpha	19.81 ± 0.80	21.10 ± 0.74	20.46 ± 0.54	Pass
G-5272, 5273	10/1/2009	K-40	16.47 ± 0.75	17.00 ± 0.74	16.74 ± 0.53	Pass
F-5690, 5691	10/15/2009	H-3	8895.00 ± 250.00	9051.00 ± 252.00	8973.00 ± 177.49	Pass
F-5690, 5691	10/15/2009	K-40	3.62 ± 0.40	3.09 ± 0.48	3.36 ± 0.31	Pass
DW-90396, 90397	10/16/2009	Ra-226	0.54 ± 0.09	0.42 ± 0.08	0.48 ± 0.06	Pass
DW-90396, 90397	10/16/2009	Ra-228	1.44 ± 0.56	0.94 ± 0.51	1.19 ± 0.38	Pass
DW-90408, 90409	10/19/2009	Ra-226	0.99 ± 0.12	1.10 ± 0.14	1.05 ± 0.09	Pass
DW-90408, 90409	10/19/2009	Ra-228	2.76 ± 0.66	1.38 ± 0.92	2.07 ± 0.57	Pass
DW-90420, 90421	10/21/2009	Ra-226	1.95 ± 0.17	1.77 ± 0.15	1.86 ± 0.11	Pass
DW-90420, 90421	10/21/2009	Ra-228	3.10 ± 0.73	3.32 ± 0.80	3.21 ± 0.54	Pass
SG-5962, 5963	10/22/2009	Ac-228	16.39 ± 0.79	16.51 ± 0.63	16.45 ± 0.51	Pass
SG-5962, 5963	10/22/2009	Pb-214	18.03 ± 0.41	17.74 ± 0.42	17.89 ± 0.29	Pass
DW-90423, 90424	10/27/2009	Gr. Alpha	12.04 ± 1.68	15.28 ± 1.97	13.66 ± 1.29	Pass
ME-6116, 6117	11/3/2009	Gr. Beta	0.86 ± 0.03	0.83 ± 0.03	0.85 ± 0.02	Pass
ME-6116, 6117	11/3/2009	K-40	2.57 ± 0.08	2.65 ± 0.08	2.61 ± 0.06	Pass
F-6567, 6568	11/6/2009	Gr. Beta	2.72 ± 1.05	3.04 ± 0.92	2.88 ± 0.70	Pass
F-6567, 6568	11/6/2009	Sr-90	0.09 ± 0.03	0.12 ± 0.04	0.11 ± 0.02	Pass
W-6495, 6496	11/8/2009	H-3	2638.00 ± 173.00	2451.00 ± 168.00	2544.50 ± 120.57	Pass
WW-6313, 6314	11/9/2009	H-3	1514.00 ± 137.00	1483.00 ± 136.00	1498.50 ± 96.52	Pass
SWU-6611, 6612	11/24/2009	Gr. Beta	1.88 ± 0.60	1.67 ± 0.59	1.78 ± 0.42	Pass
DW-90446, 90447	12/30/2009	Ra-226	0.30 ± 0.10	0.54 ± 0.14	0.42 ± 0.09	Pass
DW-90446, 90447	12/30/2009	Ra-228	2.60 ± 0.64	2.65 ± 0.65	2.63 ± 0.46	Pass

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

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

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

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory result	Known Activity	Control Limits [d]	Acceptance
STW-1170 [f]	01/01/09	Am-241	1.15 ± 0.06	0.64	0.45 - 0.83	Fail
STW-1170	01/01/09	Co-57	19.60 ± 0.40	18.90	13.20 - 24.60	Pass
STW-1170	01/01/09	Co-60	16.60 ± 0.30	17.21	12.05 - 22.37	Pass
STW-1170	01/01/09	Cs-134	20.40 ± 0.50	22.50	15.80 - 29.30	Pass
STW-1170 [e]	01/01/09	Cs-137	0.10 ± 0.20	0.00	0.00 - 1.00	Pass
STW-1170	01/01/09	Fe-55	51.60 ± 20.60	48.20	33.70 - 62.70	Pass
STW-1170	01/01/09	H-3	359.90 ± 33.90	330.90	231.60 - 430.20	Pass
STW-1170	01/01/09	Mn-54	15.00 ± 0.40	14.66	10.26 - 19.06	Pass
STW-1170	01/01/09	Ni-63	50.50 ± 3.25	53.50	37.45 - 69.55	Pass
STW-1170	01/01/09	Pu-238	1.17 ± 0.04	1.18	0.83 - 1.53	Pass
STW-1170	01/01/09	Pu-239/40	0.74 ± 0.03	0.85	0.60 - 1.11	Pass
STW-1170	01/01/09	Sr-90	7.87 ± 1.39	7.21	5.05 - 9.37	Pass
STW-1170	01/01/09	Tc-99	12.70 ± 0.80	14.46	10.12 - 18.80	Pass
STW-1170	01/01/09	U-233/4	2.78 ± 0.07	2.77	1.94 - 3.60	Pass
STW-1170	01/01/09	U-238	2.87 ± 0.07	2.88	2.02 - 3.74	Pass
STW-1170	01/01/09	Zn-65	14.00 ± 0.70	13.60	9.50 - 17.70	Pass
STW-1171	01/01/09	Gr. Alpha	0.56 ± 0.06	0.64	0.00 - 1.27	Pass
STW-1171	01/01/09	Gr. Beta	1.29 ± 0.05	1.27	0.64 - 1.91	Pass
STSO-1172 [e]	01/01/09	Co-57	0.00 ± 0.00	0.00	0.00 - 1.00	Pass
STSO-1172	01/01/09	Cs-134	458.60 ± 7.40	467.00	327.00 - 607.00	Pass
STSO-1172	01/01/09	Cs-137	652.30 ± 3.50	605.00	424.00 - 787.00	Pass
STSO-1172	01/01/09	K-40	636.40 ± 9.50	570.00	360.40 - 669.40	Pass
STSO-1172	01/01/09	Mn-54	346.40 ± 3.10	307.00	215.00 - 399.00	Pass
STSO-1172	01/01/09	Pu-238	28.60 ± 2.20	25.30	17.70 - 32.90	Pass
STSO-1172 [e]	01/01/09	Pu-239/40	0.50 ± 0.40	0.00	0.00 - 1.00	Pass
STSO-1172	01/01/09	Sr-90	180.60 ± 12.10	257.00	180.00 - 334.00	Pass
STSO-1172	01/01/09	U-233/4	152.20 ± 4.30	149.00	104.00 - 194.00	Pass
STSO-1172	01/01/09	U-238	154.90 ± 4.40	155.00	109.00 - 202.00	Pass
STSO-1172	01/01/09	Zn-65	268.30 ± 4.00	242.00	169.00 - 315.00	Pass
STVE-1173	01/01/09	Co-57	2.75 ± 0.11	2.36	1.65 - 3.07	Pass
STVE-1173 [e]	01/01/09	Co-60	0.06 ± 0.09	0.00	0.00 - 1.00	Pass
STVE-1173	01/01/09	Cs-134	3.49 ± 0.22	3.40	2.38 - 4.42	Pass
STVE-1173	01/01/09	Cs-137	1.01 ± 0.11	0.93	0.65 - 1.21	Pass
STVE-1173	01/01/09	Mn-54	2.52 ± 0.14	2.30	1.61 - 2.99	Pass
STVE-1173	01/01/09	Zn-65	1.52 ± 0.18	1.35	0.95 - 1.76	Pass

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

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory result	Known Activity	Control Limits [d]	Acceptance
STAP-1174 [g]	01/01/09	Am-241	0.29 ± 0.03	0.21	0.14 - 0.27	Fail
STAP-1174	01/01/09	Co-57	1.25 ± 0.05	1.30	0.91 - 1.69	Pass
STAP-1174	01/01/09	Co-60	1.17 ± 0.06	1.22	0.85 - 1.59	Pass
STAP-1174	01/01/09	Cs-134	2.67 ± 0.14	2.93	2.05 - 3.81	Pass
STAP-1174	01/01/09	Cs-137	1.53 ± 0.08	1.52	1.06 - 1.98	Pass
STAP-1174	01/01/09	Mn-54	2.34 ± 0.09	2.27	1.59 - 2.95	Pass
STAP-1174 [h]	01/01/09	Sr-90	0.93 ± 0.14	0.64	0.45 - 0.83	Fail
STAP-1174	01/01/09	Zn-65	1.44 ± 0.14	1.36	0.95 - 1.77	Pass
STAP-1175	01/01/09	Gr. Alpha	0.22 ± 0.03	0.35	0.00 - 0.70	Pass
STAP-1175	01/01/09	Gr. Beta	0.36 ± 0.04	0.28	0.14 - 0.42	Pass
STSO-1188	07/01/09	Co-57	674.60 ± 9.00	586.00	410.00 - 762.00	Pass
STSO-1188	07/01/09	Co-60	356.40 ± 6.30	327.00	229.00 - 425.00	Pass
STSO-1188	07/01/09	Cs-134	0.20 ± 1.90	0.00	0.00 - 1.00	Pass
STSO-1188	07/01/09	Cs-137	767.50 ± 12.00	669.00	468.00 - 870.00	Pass
STSO-1188	07/01/09	K-40	433.00 ± 37.20	375.00	263.00 - 488.00	Pass
STSO-1188	07/01/09	Mn-54	931.60 ± 14.10	796.00	557.00 - 1035.00	Pass
STSO-1188	07/01/09	Pu-238	53.10 ± 9.00	63.20	44.20 - 82.20	Pass
STSO-1188	07/01/09	Pu-239/40	107.10 ± 12.60	116.30	81.40 - 151.20	Pass
STSO-1188 [i]	07/01/09	Sr-90	310.50 ± 12.20	455.00	319.00 - 592.00	Fail
STSO-1188	07/01/09	U-233/4	188.20 ± 11.90	209.00	146.00 - 272.00	Pass
STSO-1188	07/01/09	U-238	197.40 ± 12.20	217.00	152.00 - 282.00	Pass
STSO-1188	07/01/09	Zn-65	1433.90 ± 25.20	1178.00	825.00 - 1531.00	Pass
STAP-1189	07/01/09	Gr. Alpha	0.33 ± 0.04	0.66	0.00 - 1.32	Pass
STAP-1189	07/01/09	Gr. Beta	1.57 ± 0.07	1.32	0.66 - 1.98	Pass
STAP-1190	07/01/09	Am-241	0.01 ± 0.02	0.00	0.01 - 0.05	Pass
STAP-1190	07/01/09	Co-57	6.78 ± 0.27	6.48	4.54 - 8.42	Pass
STAP-1190	07/01/09	Co-60	1.06 ± 0.18	1.03	0.72 - 1.34	Pass
STAP-1190	07/01/09	Cs-134	0.01 ± 0.06	0.00	0.01 - 0.05	Pass
STAP-1190	07/01/09	Cs-137	1.49 ± 0.27	1.40	0.98 - 1.82	Pass
STAP-1190	07/01/09	Mn-54	6.00 ± 0.45	5.49	3.84 - 7.14	Pass
STAP-1190	07/01/09	Sr-90	0.79 ± 0.13	0.84	0.59 - 1.09	Pass
STAP-1190	07/01/09	Zn-65	4.55 ± 0.66	3.93	2.75 - 5.11	Pass
STVE-1190	07/01/09	Co-57	8.90 ± 0.60	8.00	5.60 - 10.40	Pass
STVE-1190	07/01/09	Co-60	2.50 ± 0.36	2.57	1.80 - 3.34	Pass
STVE-1190	07/01/09	Cs-134	0.01 ± 0.11	0.00	0.00 - 0.10	Pass
STVE-1190	07/01/09	Cs-137	2.42 ± 0.16	2.43	1.70 - 3.16	Pass
STVE-1190	07/01/09	Mn-54	8.35 ± 0.70	7.90	5.50 - 10.30	Pass
STVE-1190	07/01/09	Zn-65	0.01 ± 0.26	0.00	0.00 - 0.10	Pass

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

			Concentration [b]			
Lab Code [c]	Date	Analysis	Laboratory result	Known Activity	Control Limits [d]	Acceptance
STW-1191	07/01/09	Gr. Alpha	0.88 ± 0.07	1.05	0.00 - 2.09	Pass
STW-1191	07/01/09	Gr. Beta	7.29 ± 0.10	7.53	3.77 - 11.30	Pass
STW-1192	07/01/09	Am-241	0.88 ± 0.08	1.04	0.73 - 1.35	Pass
STW-1192	07/01/09	Co-57	37.20 ± 1.50	36.60	25.60 - 47.60	Pass
STW-1192	07/01/09	Co-60	15.10 ± 0.90	15.40	10.80 - 20.00	Pass
STW-1192	07/01/09	Cs-134	30.30 ± 2.10	32.20	22.50 - 41.90	Pass
STW-1192	07/01/09	Cs-137	41.90 ± 1.80	41.20	28.80 - 53.60	Pass
STW-1192	07/01/09	Fe-55	54.50 ± 15.50	60.80	42.60 - 79.00	Pass
STW-1192	07/01/09	H-3	680.30 ± 33.60	634.10	443.90 - 824.30	Pass
STW-1192 [e]	07/01/09	Mn-54	0.01 ± 0.26	0.00	0.00 - 1.00	Pass
STW-1192	07/01/09	Ni-63	38.70 ± 2.60	44.20	30.90 - 57.50	Pass
STW-1192	07/01/09	Pu-238	0.02 ± 0.01	0.02	0.00 - 0.05	Pass
STW-1192	07/01/09	Pu-239/40	1.70 ± 0.10	1.64	1.15 - 2.13	Pass
STW-1192	07/01/09	Sr-90	12.90 ± 1.70	12.99	9.09 - 16.89	Pass
STW-1192	07/01/09	Tc-99	7.60 ± 0.40	10.00	7.00 - 13.00	Pass
STW-1192	07/01/09	Tc-99	7.60 ± 0.40	10.00	7.00 - 13.00	Pass
STW-1192	07/01/09	U-233/4	2.90 ± 0.10	2.96	2.07 - 3.85	Pass
STW-1192	07/01/09	U-238	3.00 ± 0.10	3.03	2.12 - 3.94	Pass
STW-1192	07/01/09	Zn-65	28.50 ± 2.40	26.90	18.80 - 35.00	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] Included in the testing series as a "false positive".

[f] No errors were found in procedure or calculation. There was not enough sample for a reanalysis. Americium-241 in water was included in the ERA studies (Tbl. A-7) and also in the second round of MAPEP testing. Both analysis results were acceptable.

[g] One determination was eliminated from the average, due to poor recovery. Average of three determinations, 0.25 ± 0.03 pCi/filter.

[h] No reason was determined for the initial high results. The analysis was repeated; result of reanalysis; 0.54 ± 0.12 Bq/filter.

[i] Incomplete separation of strontium from calcium could result in a higher recovery percentage and consequently lower reported activity. The analysis was repeated; result of reanalysis 363.3 ± 28.6 Bq/kg.

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

Lab Code [b]	Date	Analysis	Concentration (pCi/L) Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
STAP-1176	03/23/09	Am-241	47.20 ± 3.10	55.4	32.4 - 76.0	Pass
STAP-1176	03/23/09	Co-60	543.60 ± 8.90	490.0	379.0 - 612.0	Pass
STAP-1176	03/23/09	Cs-134	941.30 ± 30.70	865.0	563.0 - 1070.0	Pass
STAP-1176	03/23/09	Cs-137	850.60 ± 19.40	724.0	544.0 - 951.0	Pass
STAP-1176 [e]	03/23/09	Mn-54	0.00 ± 0.00	0.0	0.0 - 0.0	Pass
STAP-1176	03/23/09	Pu-238	64.50 ± 3.60	57.4	39.4 - 75.5	Pass
STAP-1176	03/23/09	Pu-239/40	88.50 ± 4.20	78.2	56.7 - 101.0	Pass
STAP-1176	03/23/09	Sr-90	93.90 ± 10.00	95.3	41.9 - 148.0	Pass
STAP-1176	03/23/09	U-233/4	50.00 ± 2.47	53.5	33.7 - 79.3	Pass
STAP-1176	03/23/09	U-238	50.40 ± 2.48	53.1	34.0 - 75.4	Pass
STAP-1176	03/23/09	Uranium	101.60 ± 5.30	109.0	55.7 - 173.0	Pass
STAP-1176	03/23/09	Zn-65	237.30 ± 23.70	185.0	128.0 - 256.0	Pass
STAP-1177	03/23/09	Gr. Alpha	76.30 ± 3.47	63.8	33.1 - 96.0	Pass
STAP-1177	03/23/09	Gr. Beta	98.50 ± 3.04	80.7	49.7 - 118.0	Pass
STSO-1178	03/23/09	Ac-228	1370.00 ± 121.00	1330.0	860.0 - 1880.0	Pass
STSO-1178	03/23/09	Am-241	1853.00 ± 185.50	1660.0	992.0 - 2130.0	Pass
STSO-1178	03/23/09	Bi-212	1449.00 ± 308.80	1550.0	406.0 - 2310.0	Pass
STSO-1178	03/23/09	Bi-214	1355.00 ± 66.20	1420.0	872.0 - 2050.0	Pass
STSO-1178	03/23/09	Co-60	7475.00 ± 46.40	7520.0	5470.0 - 10100.0	Pass
STSO-1178	03/23/09	Cs-134	5073.00 ± 74.70	5170.0	3330.0 - 6220.0	Pass
STSO-1178	03/23/09	Cs-137	5040.00 ± 49.70	4970.0	3800.0 - 6460.0	Pass
STSO-1178	03/23/09	K-40	10884.00 ± 292.70	11200.0	8060.0 - 15100.0	Pass
STSO-1178	03/23/09	Mn-54	0.00 ± 0.00	0.0	0.0 - 20.0	Pass
STSO-1178	03/23/09	Pb-212	1259.00 ± 28.40	1260.0	820.0 - 1780.0	Pass
STSO-1178	03/23/09	Pb-214	1464.00 ± 56.80	1510.0	902.0 - 2260.0	Pass
STSO-1178	03/23/09	Pu-238	1853.00 ± 185.50	1590.0	910.0 - 2240.0	Pass
STSO-1178	03/23/09	Pu-239/40	1516.50 ± 168.30	1360.0	928.0 - 1800.0	Pass
STSO-1178	03/23/09	Sr-90	5270.90 ± 290.20	5750.0	2080.0 - 9380.0	Pass
STSO-1178	03/23/09	U-233/4	1452.30 ± 114.40	1600.0	1010.0 - 1990.0	Pass
STSO-1178	03/23/09	Uranium	3013.70 ± 131.10	3270.0	1860.0 - 4410.0	Pass
STSO-1178	03/23/09	Zn-65	2083.00 ± 59.00	1940.0	1540.0 - 2600.0	Pass

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

Lab Code [b]	Date	Analysis	Concentration (pCi/L) Laboratory Result [c]	ERA Result [d]	Control Limits	Acceptance
STVE-1179	03/23/09	Am-241	2849.70 ± 237.60	3660.0	2090.0 - 5030.0	Pass
STVE-1179	03/23/09	Cm-244	808.00 ± 85.70	954.0	470.0 - 1480.0	Pass
STVE-1179	03/23/09	Co-60	1546.80 ± 31.60	1710.0	1160.0 - 2460.0	Pass
STVE-1179	03/23/09	Cs-134	1706.00 ± 59.20	1880.0	1080.0 - 2600.0	Pass
STVE-1179	03/23/09	Cs-137	1940.50 ± 44.80	1800.0	1320.0 - 2500.0	Pass
STVE-1179	03/23/09	K-40	30107.30 ± 598.00	30800.0	22300.0 - 43700.0	Pass
STVE-1179	03/23/09	Mn-54	0.00 ± 0.00	0.0	0.0 - 0.0	Pass
STVE-1179	03/23/09	Sr-90	6604.80 ± 440.10	8860.0	4950.0 - 11800.0	Pass
STVE-1179	03/23/09	U-233/4	1718.00 ± 128.90	2040.0	1400.0 - 2710.0	Pass
STVE-1179	03/23/09	U-238	1718.30 ± 128.80	2020.0	1420.0 - 2550.0	Pass
STVE-1179	03/23/09	Uranium	3499.40 ± 371.00	4150.0	2850.0 - 5360.0	Pass
STVE-1179	03/23/09	Zn-65	869.40 ± 63.60	878.0	634.0 - 1200.0	Pass
STW-1180	03/23/09	Am-241	127.50 ± 5.10	132.0	90.4 - 178.0	Pass
STW-1180	03/23/09	Co-60	1174.10 ± 11.70	1230.0	1070.0 - 1450.0	Pass
STW-1180	03/23/09	Cs-134	742.20 ± 18.30	790.0	584.0 - 907.0	Pass
STW-1180	03/23/09	Cs-137	887.50 ± 14.00	913.0	776.0 - 1090.0	Pass
STW-1180	03/23/09	Fe-55	323.00 ± 362.00	492.0	286.0 - 657.0	Pass
STW-1180	03/23/09	Mn-54	0.00 ± 0.00	0.0	0.0 - 0.0	Pass
STW-1180	03/23/09	Pu-238	96.60 ± 2.20	108.0	81.7 - 134.0	Pass
STW-1180	03/23/09	Pu-239/40	89.50 ± 2.10	86.3	66.8 - 107.0	Pass
STW-1180	03/23/09	Sr-90	763.20 ± 12.90	834.0	530.0 - 1120.0	Pass
STW-1180	03/23/09	U-233/4	95.00 ± 1.80	96.6	72.8 - 124.0	Pass
STW-1180	03/23/09	U-238	97.40 ± 1.80	95.8	73.2 - 119.0	Pass
STW-1180	03/23/09	Uranium	195.50 ± 3.70	197.0	142.0 - 262.0	Pass
STW-1180	03/23/09	Zn-65	653.10 ± 24.10	631.0	535.0 - 786.0	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 = 2σ counting uncertainty (corresponding to the 95% confidence level).

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

3.0. Duplicate analyses

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

3.1 Individual results: For two analysis results; $x_1 \pm s_1$ and $x_2 \pm s_2$

Reported result: $x \pm s$; where $x = (1/2)(x_1 + x_2)$ and $s = (1/2)\sqrt{s_1^2 + s_2^2}$

3.2. Individual results: $< L_1$, $< L_2$ Reported result: < L, where L = lower of L_1 and L_2

3.3. Individual results: $x \pm s$, < L Reported result: $x \pm s$ if $x \geq L$; < L otherwise.

4.0. Computation of Averages and Standard Deviations

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

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

4.2 Values below the highest lower limit of detection are not included in the average.

4.3 If all values in the averaging group are less than the highest LLD, the highest LLD is reported.

4.4 If all but one of the values are less than the highest LLD, the single value x and associated two sigma error is reported.

4.5 In rounding off, the following rules are followed:

4.5.1. If the number following those to be retained is less than 5, the number is dropped, and the retained numbers are kept unchanged. As an example, 11.443 is rounded off to 11.44.

4.5.2. If the number following those to be retained is equal to or greater than 5, the number is dropped and the last retained number is raised by 1. As an example, 11.445 is rounded off to 11.45.

APPENDIX C

Maximum Permissible Concentrations

of Radioactivity in Air and Water

Above Background in Unrestricted Areas

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

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

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

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

[c] A natural radionuclide.

APPENDIX D

SUMMARY OF THE LAND USE CENSUS

Appendix D

Summary of the Land Use Census

The Duane Arnold Energy Land Use Census for 2008 was completed during September and of 2009. All milk animals, residences and gardens greater than 500 square feet were identified within three miles for each of the 16 meteorological sectors. If none were identified within the three mile range, additional surveys were performed out to a distance of five miles.

The Cedar River was surveyed by boat on July 22nd, 2009 for water use downstream of the DAEC to Cedar Rapids. This survey identified no new usages of river water from previous surveys. Irrigation at the strawberry farm in Palo has been discontinues. Recreational fishing is the only identified food pathway use of Cedar River water between the DAEC and the City of Cedar Rapids eight miles down-river.

There were 77 vegetable gardens identified during the performance of the 2009 Census. This number is less than the number of gardens found in the 2008 survey by 7. The location of the nearest vegetable receptor changed in 2009. The garden in sector towards the SW at 4318 Power Plant Road was not planted in 2009. The closest vegetable receptor for 2009 is located 1.1 miles towards the SSW at 4370 Comp Road.

There was one change in the observed milk animal locations within the 3 mile radius of the plant in the past year. A farm at 3426 StandLea Road discontinued goats in 2009.

The locations of the nearest residence for each sector remained the same as 2008. In 2009, only two new homes were constructed within three miles of the DAEC.

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.

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

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

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 2009 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 ODAM. 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 0.00000456 mrem.

2.) The whole body dose equivalent to the hypothetical maximally exposed individual due to liquid effluents was 0.00000456 mrem.

3.) The maximum dose to air at the site boundary from noble gases released was 0.00381 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 0.00186 mrad beta radiation at 936 meters towards the Northwest.

5.) The whole body dose equivalent to the hypothetical maximally exposed individual from noble gases was 0.0019 mrem, at 805 meters towards the West.

6.) The skin dose equivalent to the hypothetical maximally exposed individual from noble gases was 0.0031 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 1620 meters to the North Northwest, with an estimated dose equivalent of 0.00605 mrem.

Conclusion:

No measurable dose due to the operation of the DAEC was detected by environmental TLDs in 2009. 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 2009

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	0.00000456 mrem	3 mrem
Organ Dose	Child - Liver		S	0.00000456 mrem	10 mrem
Noble Gas					
Gamma Air Dose		936	NW	0.00381 mrad	10 mrad
Beta Air Dose		936	NW	0.00186 mrad	20 mrad
Whole Body	All	805	W	0.0019 mrem	5 mrem
Skin	Child	805	W	0.0031 mrem	15 mrem
Particulates & Iodines					
Organ Dose	Child – Thyroid	1620	NNW	0.00605 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

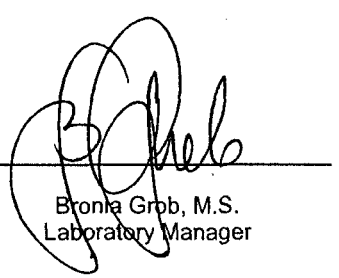
January 1 to December 31, 2009

Prepared by

ENVIRONMENTAL, Inc.
Midwest Laboratory

Project No. 8001

Reviewed and Approved



Bronia Grob, M.S.
Laboratory Manager

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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 2009. Results of completed analyses are presented in the attached tables.

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

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

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

2.0 PROGRAM DEVIATIONS

Sample Type	Analysis	Location(s)	Collection Date or Period	Comments
AP / AI	Gross Beta, I-131	D-15	01-15-09	Late collection due to heavy snow accumulation.
AP / AI	Gross Beta, I-131	D-16	01-15-09	Late collection due to heavy snow accumulation.
AP / AI	Gross Beta, I-131	D-15	06-10-09	Partial sample (176 m^3) due to power loss.
SW	Gross Beta, H-3 Gamma, I-131	D-49	01-27-09	No sample available, water frozen.
SW	Gross Beta, Gamma H-3	D-99	01-27-09	No sample available, water frozen.
VE	Gamma	D-94	2009	Samples not available.
VE	Gamma	D-117	2009	Crop not replanted, location has been dropped from program

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

3.0 DATA TABLES

Table 1. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].
Location: D-3 (Hiawatha)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-08-09	312	0.045 ± 0.004	07-09-09	284	0.024 ± 0.003
01-15-09	274	0.011 ± 0.003	07-15-09	215	0.031 ± 0.005
01-22-09	275	0.043 ± 0.004	07-23-09	337	0.018 ± 0.003
01-29-09	275	0.035 ± 0.004	07-30-09	297	0.023 ± 0.003
02-05-09	272	0.028 ± 0.004	08-06-09	276	0.031 ± 0.004
02-12-09	271	0.035 ± 0.004	08-13-09	278	0.029 ± 0.004
02-19-09	269	0.028 ± 0.004	08-20-09	276	0.032 ± 0.004
02-26-09	289	0.044 ± 0.004	08-27-09	277	0.026 ± 0.004
			09-03-09	276	0.030 ± 0.004
03-05-09	300	0.028 ± 0.003			
03-12-09	283	0.029 ± 0.004	09-10-09	278	0.044 ± 0.004
03-19-09	291	0.038 ± 0.004	09-17-09	278	0.039 ± 0.005
03-26-09	287	0.027 ± 0.004	09-23-09	236	0.035 ± 0.004
04-02-09	287	0.022 ± 0.003	10-01-09	316	0.025 ± 0.003
1st Quarter Mean ± s.d.		0.032 ± 0.010	3rd Quarter Mean ± s.d.		0.030 ± 0.007
04-09-09	290	0.021 ± 0.003	10-08-09	282	0.015 ± 0.003
04-16-09	289	0.031 ± 0.004	10-15-09	272	0.023 ± 0.003
04-23-09	286	0.019 ± 0.003	10-21-09	237	0.025 ± 0.004
04-30-09	289	0.017 ± 0.003	10-29-09	318	0.020 ± 0.003
05-07-09	288	0.028 ± 0.004	11-05-09	277	0.023 ± 0.003
05-14-09	289	0.016 ± 0.003	11-12-09	268	0.043 ± 0.004
05-20-09	247	0.024 ± 0.004	11-19-09	300	0.029 ± 0.003
05-28-09	338	0.027 ± 0.003	11-25-09	262	0.039 ± 0.004
			12-03-09	335	0.029 ± 0.003
06-04-09	296	0.024 ± 0.003			
06-10-09	257	0.019 ± 0.004	12-10-09	288	0.037 ± 0.004
06-17-09	297	0.025 ± 0.003	12-17-09	307	0.059 ± 0.005
06-25-09	338	0.027 ± 0.003	12-23-09	259	0.052 ± 0.005
07-02-09	296	0.016 ± 0.003	12-30-09	299	0.034 ± 0.004
2nd Quarter Mean ± s.d.		0.023 ± 0.005	4th Quarter Mean ± s.d.		0.033 ± 0.013
			Cumulative Average		0.029
			Previous Annual Average		0.028

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

Table 2. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].
Location: D-5 (Palo)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-08-09	346	0.045 ± 0.004	07-09-09	282	0.024 ± 0.003
01-15-09	302	0.043 ± 0.004	07-15-09	244	0.020 ± 0.004
01-22-09	304	0.040 ± 0.004	07-23-09	321	0.017 ± 0.003
01-29-09	302	0.056 ± 0.004	07-30-09	283	0.025 ± 0.003
02-05-09	303	0.033 ± 0.004	08-06-09	281	0.028 ± 0.004
02-12-09	302	0.038 ± 0.004	08-13-09	287	0.029 ± 0.004
02-19-09	300	0.029 ± 0.003	08-20-09	282	0.036 ± 0.004
02-26-09	300	0.048 ± 0.004	08-27-09	286	0.033 ± 0.004
			09-03-09	284	0.030 ± 0.004
03-05-09	297	0.030 ± 0.004			
03-12-09	302	0.030 ± 0.004	09-10-09	287	0.054 ± 0.004
03-19-09	300	0.035 ± 0.004	09-17-09	286	0.049 ± 0.005
03-26-09	298	0.028 ± 0.003	09-23-09	244	0.039 ± 0.004
04-02-09	300	0.022 ± 0.003	10-01-09	327	0.027 ± 0.003
1st Quarter Mean ± s.d.		0.037 ± 0.009	3rd Quarter Mean ± s.d.		0.032 ± 0.011
04-09-09	302	0.023 ± 0.003	10-08-09	290	0.015 ± 0.003
04-16-09	299	0.038 ± 0.004	10-15-09	280	0.023 ± 0.003
04-23-09	298	0.023 ± 0.003	10-21-09	245	0.030 ± 0.004
04-30-09	298	0.013 ± 0.003	10-29-09	323	0.021 ± 0.003
05-07-09	299	0.026 ± 0.003	11-05-09	285	0.023 ± 0.003
05-14-09	300	0.014 ± 0.003	11-12-09	287	0.033 ± 0.004
05-20-09	242	0.020 ± 0.004	11-19-09	286	0.027 ± 0.004
05-28-09	323	0.025 ± 0.003	11-25-09	246	0.040 ± 0.004
			12-03-09	340	0.028 ± 0.003
06-04-09	282	0.025 ± 0.003			
06-10-09	245	0.040 ± 0.005	12-10-09	271	0.032 ± 0.004
06-17-09	282	0.025 ± 0.003	12-17-09	284	0.059 ± 0.005
06-25-09	323	0.026 ± 0.003	12-23-09	244	0.064 ± 0.005
07-02-09	282	0.013 ± 0.003	12-30-09	284	0.038 ± 0.004
2nd Quarter Mean ± s.d.		0.024 ± 0.008	4th Quarter Mean ± s.d.		0.033 ± 0.014
			Cumulative Average		0.031
			Previous Annual Average		0.028

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

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

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-08-09	333	0.047 ± 0.004	07-09-09	285	0.022 ± 0.003
01-15-09	291	0.043 ± 0.004	07-15-09	247	0.019 ± 0.004
01-22-09	293	0.045 ± 0.004	07-23-09	324	0.018 ± 0.003
01-29-09	290	0.056 ± 0.005	07-30-09	281	0.023 ± 0.003
02-05-09	291	0.032 ± 0.004	08-06-09	284	0.022 ± 0.003
02-12-09	291	0.039 ± 0.004	08-13-09	286	0.027 ± 0.003
02-19-09	297	0.032 ± 0.004	08-20-09	289	0.031 ± 0.004
02-26-09	297	0.052 ± 0.004	08-27-09	289	0.032 ± 0.004
			09-03-09	287	0.026 ± 0.003
03-05-09	283	0.030 ± 0.004			
03-12-09	290	0.029 ± 0.004	09-10-09	290	0.044 ± 0.004
03-19-09	297	0.034 ± 0.004	09-17-09	289	0.040 ± 0.004
03-26-09	296	0.027 ± 0.003	09-23-09	246	0.038 ± 0.004
04-02-09	297	0.022 ± 0.003	10-01-09	330	0.023 ± 0.003
1st Quarter Mean ± s.d.		0.038 ± 0.010	3rd Quarter Mean ± s.d.		0.028 ± 0.008
04-09-09	299	0.021 ± 0.003	10-08-09	294	0.014 ± 0.003
04-16-09	296	0.033 ± 0.004	10-15-09	282	0.015 ± 0.003
04-23-09	295	0.021 ± 0.003	10-21-09	247	0.027 ± 0.004
04-30-09	298	0.014 ± 0.003	10-29-09	331	0.018 ± 0.003
05-07-09	297	0.026 ± 0.003	11-05-09	286	0.021 ± 0.003
05-14-09	296	0.013 ± 0.003	11-12-09	288	0.032 ± 0.004
05-20-09	245	0.024 ± 0.004	11-19-09	285	0.029 ± 0.004
05-28-09	326	0.026 ± 0.003	11-25-09	245	0.039 ± 0.004
			12-03-09	311	0.033 ± 0.004
06-04-09	285	0.020 ± 0.003			
06-10-09	247	0.037 ± 0.004	12-10-09	283	0.029 ± 0.003
06-17-09	285	0.026 ± 0.003	12-17-09	255	0.067 ± 0.005
06-25-09	321	0.024 ± 0.003	12-23-09	244	0.054 ± 0.005
07-02-09	286	0.011 ± 0.003	12-30-09	285	0.044 ± 0.004
2nd Quarter Mean ± s.d.		0.023 ± 0.007	4th Quarter Mean ± s.d.		0.032 ± 0.015
			Cumulative Average		0.030
			Previous Annual Average		0.030

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

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

Location: D-7 (Shellsburg)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-08-09	326	0.041 ± 0.004	07-09-09	281	0.025 ± 0.003
01-15-09	274	0.041 ± 0.004	07-15-09	244	0.024 ± 0.004
01-22-09	287	0.043 ± 0.004	07-23-09	321	0.017 ± 0.003
01-29-09	273	0.053 ± 0.005	07-30-09	283	0.023 ± 0.003
02-05-09	284	0.031 ± 0.004	08-06-09	287	0.037 ± 0.004
02-12-09	276	0.037 ± 0.004	08-13-09	289	0.029 ± 0.004
02-19-09	274	0.028 ± 0.004	08-20-09	279	0.033 ± 0.004
02-26-09	288	0.045 ± 0.004	08-27-09	280	0.022 ± 0.003
			09-03-09	278	0.023 ± 0.003
03-05-09	288	0.030 ± 0.004			
03-12-09	291	0.026 ± 0.003	09-10-09	281	0.044 ± 0.004
03-19-09	289	0.027 ± 0.004	09-17-09	280	0.037 ± 0.004
03-26-09	287	0.023 ± 0.003	09-23-09	239	0.033 ± 0.004
04-02-09	289	0.019 ± 0.003	10-01-09	320	0.023 ± 0.003
1st Quarter Mean ± s.d.		0.034 ± 0.010	3rd Quarter Mean ± s.d.		0.028 ± 0.008
04-09-09	290	0.018 ± 0.003	10-08-09	284	0.012 ± 0.003
04-16-09	288	0.029 ± 0.004	10-15-09	274	0.018 ± 0.003
04-23-09	287	0.024 ± 0.003	10-21-09	240	0.020 ± 0.003
04-30-09	290	0.014 ± 0.003	10-29-09	318	0.019 ± 0.003
05-07-09	288	0.028 ± 0.004	11-05-09	279	0.019 ± 0.003
05-14-09	288	0.018 ± 0.003	11-12-09	287	0.026 ± 0.003
05-20-09	247	0.022 ± 0.004	11-19-09	286	0.016 ± 0.003
05-28-09	323	0.026 ± 0.003	11-25-09	246	0.034 ± 0.004
			12-03-09	323	0.027 ± 0.003
06-04-09	278	0.023 ± 0.003			
06-10-09	239	0.020 ± 0.004	12-10-09	288	0.028 ± 0.003
06-17-09	254	0.027 ± 0.004	12-17-09	284	0.058 ± 0.005
06-25-09	312	0.027 ± 0.003	12-23-09	244	0.050 ± 0.005
07-02-09	281	0.015 ± 0.003	12-30-09	284	0.037 ± 0.004
2nd Quarter Mean ± s.d.		0.022 ± 0.005	4th Quarter Mean ± s.d.		0.028 ± 0.014
			Cumulative Average		0.028
			Previous Annual Average		0.028

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

Table 5. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].
Location: D-11 (Toddville)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-08-09	330	0.050 ± 0.004	07-09-09	285	0.027 ± 0.003
01-15-09	283	0.047 ± 0.004	07-15-09	247	0.027 ± 0.004
01-22-09	295	0.043 ± 0.004	07-23-09	324	0.015 ± 0.003
01-29-09	288	0.049 ± 0.004	07-30-09	286	0.023 ± 0.003
02-05-09	289	0.033 ± 0.004	08-06-09	284	0.031 ± 0.004
02-12-09	289	0.043 ± 0.004	08-13-09	287	0.029 ± 0.004
02-19-09	290	0.041 ± 0.004	08-20-09	282	0.030 ± 0.004
02-26-09	287	0.048 ± 0.004	08-27-09	283	0.023 ± 0.003
			09-03-09	282	0.020 ± 0.003
03-05-09	287	0.031 ± 0.004			
03-12-09	287	0.030 ± 0.004	09-10-09	284	0.041 ± 0.004
03-19-09	294	0.046 ± 0.004	09-17-09	283	0.051 ± 0.004
03-26-09	287	0.028 ± 0.004	09-23-09	241	0.040 ± 0.005
04-02-09	291	0.017 ± 0.003	10-01-09	323	0.030 ± 0.003
1st Quarter Mean ± s.d.		0.039 ± 0.010	3rd Quarter Mean ± s.d.		0.030 ± 0.010
04-09-09	293	0.023 ± 0.003	10-08-09	288	0.014 ± 0.003
04-16-09	292	0.031 ± 0.004	10-15-09	277	0.022 ± 0.003
04-23-09	289	0.021 ± 0.003	10-21-09	242	0.028 ± 0.004
04-30-09	292	0.011 ± 0.003	10-29-09	324	0.021 ± 0.003
05-07-09	291	0.028 ± 0.004	11-05-09	282	0.022 ± 0.003
05-14-09	287	0.012 ± 0.003	11-12-09	283	0.035 ± 0.004
05-20-09	249	0.022 ± 0.004	11-19-09	279	0.028 ± 0.004
05-28-09	326	0.024 ± 0.003	11-25-09	224	0.039 ± 0.005
			12-03-09	316	0.031 ± 0.003
06-04-09	284	0.021 ± 0.003			
06-10-09	247	0.019 ± 0.004	12-10-09	283	0.034 ± 0.004
06-17-09	285	0.023 ± 0.003	12-17-09	278	0.058 ± 0.005
06-25-09	325	0.026 ± 0.003	12-23-09	240	0.064 ± 0.005
07-02-09	285	0.013 ± 0.003	12-30-09	278	0.038 ± 0.004
2nd Quarter Mean ± s.d.		0.021 ± 0.006	4th Quarter Mean ± s.d.		0.033 ± 0.014
			Cumulative Average		0.031
			Previous Annual Average		0.029

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

Table 6. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].
Location: D-13 (Alburnett)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-08-09	326	0.042 ± 0.004	07-09-09	285	0.023 ± 0.003
01-15-09	285	0.042 ± 0.004	07-15-09	247	0.027 ± 0.004
01-22-09	287	0.048 ± 0.004	07-23-09	324	0.020 ± 0.003
01-29-09	284	0.052 ± 0.005	07-30-09	286	0.028 ± 0.004
02-05-09	285	0.038 ± 0.004	08-06-09	284	0.024 ± 0.003
02-12-09	286	0.035 ± 0.004	08-13-09	287	0.032 ± 0.004
02-19-09	286	0.030 ± 0.004	08-20-09	285	0.033 ± 0.004
02-26-09	288	0.050 ± 0.004	08-27-09	286	0.022 ± 0.003
			09-03-09	285	0.023 ± 0.003
03-05-09	288	0.026 ± 0.003			
03-12-09	284	0.030 ± 0.004	09-10-09	287	0.049 ± 0.004
03-19-09	288	0.036 ± 0.004	09-17-09	286	0.044 ± 0.005
03-26-09	287	0.026 ± 0.004	09-23-09	244	0.041 ± 0.005
04-02-09	288	0.018 ± 0.003	10-01-09	326	0.023 ± 0.003
1st Quarter Mean ± s.d.		0.036 ± 0.010	3rd Quarter Mean ± s.d.		0.030 ± 0.009
04-09-09	290	0.020 ± 0.003	10-08-09	291	0.014 ± 0.003
04-16-09	287	0.030 ± 0.004	10-15-09	280	0.022 ± 0.003
04-23-09	287	0.019 ± 0.003	10-21-09	245	0.028 ± 0.004
04-30-09	290	0.014 ± 0.003	10-29-09	327	0.020 ± 0.003
05-07-09	288	0.027 ± 0.004	11-05-09	285	0.020 ± 0.003
05-14-09	288	0.013 ± 0.003	11-12-09	287	0.034 ± 0.004
05-20-09	247	0.021 ± 0.004	11-19-09	292	0.025 ± 0.003
05-28-09	326	0.028 ± 0.003	11-25-09	247	0.040 ± 0.004
			12-03-09	327	0.029 ± 0.003
06-04-09	285	0.026 ± 0.003			
06-10-09	247	0.022 ± 0.004	12-10-09	288	0.030 ± 0.003
06-17-09	285	0.023 ± 0.003	12-17-09	284	0.056 ± 0.005
06-25-09	324	0.027 ± 0.003	12-23-09	244	0.063 ± 0.005
07-02-09	285	0.015 ± 0.003	12-30-09	285	0.039 ± 0.004
2nd Quarter Mean ± s.d.		0.022 ± 0.006	2nd Quarter Mean ± s.d.		0.032 ± 0.014
			Cumulative Average		0.030
			Previous Annual Average		0.029

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

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

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

Units: pCi/m^3

Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
01-08-09	330	0.051 ± 0.004	07-09-09	277	0.024 ± 0.003
01-18-09	416 [b]	0.047 ± 0.003	07-15-09	239	0.025 ± 0.004
01-22-09	161	0.054 ± 0.007	07-23-09	312	0.015 ± 0.003
01-29-09	288	0.056 ± 0.005	07-30-09	276	0.023 ± 0.003
02-05-09	289	0.041 ± 0.004	08-06-09	275	0.025 ± 0.003
02-12-09	288	0.040 ± 0.004	08-13-09	278	0.030 ± 0.004
02-19-09	290	0.031 ± 0.004	08-20-09	277	0.030 ± 0.004
02-26-09	291	0.051 ± 0.004	08-27-09	277	0.019 ± 0.003
			09-03-09	271	0.021 ± 0.003
03-05-09	288	0.031 ± 0.004			
03-12-09	288	0.030 ± 0.004	09-10-09	275	0.048 ± 0.004
03-19-09	291	0.037 ± 0.004	09-17-09	274	0.049 ± 0.005
03-26-09	290	0.029 ± 0.004	09-23-09	234	0.038 ± 0.005
04-02-09	291	0.023 ± 0.003	10-01-09	314	0.022 ± 0.003
1st Quarter Mean ± s.d.		0.040 ± 0.011	3rd Quarter Mean ± s.d.		0.028 ± 0.010
04-09-09	293	0.023 ± 0.003	10-08-09	278	0.012 ± 0.003
04-16-09	290	0.035 ± 0.004	10-15-09	270	0.020 ± 0.003
04-23-09	290	0.023 ± 0.003	10-21-09	235	0.029 ± 0.004
04-30-09	292	0.017 ± 0.003	10-29-09	310	0.022 ± 0.003
05-07-09	288	0.029 ± 0.004	11-05-09	274	0.021 ± 0.003
05-14-09	291	0.015 ± 0.003	11-12-09	275	0.033 ± 0.004
05-20-09	250	0.020 ± 0.003	11-19-09	274	0.025 ± 0.004
05-28-09	317	0.027 ± 0.003	11-25-09	235	0.039 ± 0.005
			12-03-09	325	0.030 ± 0.003
06-04-09	276	0.054 ± 0.005			
06-10-09	176 [c]	0.025 ± 0.005	12-10-09	288	0.033 ± 0.004
06-17-09	270	0.028 ± 0.004	12-17-09	284	0.063 ± 0.005
06-25-09	316	0.027 ± 0.003	12-23-09	244	0.068 ± 0.006
07-02-09	275	0.017 ± 0.003	12-30-09	284	0.039 ± 0.004
2nd Quarter Mean ± s.d.		0.026 ± 0.010	4th Quarter Mean ± s.d.		0.033 ± 0.016
			Cumulative Average		0.032
			Previous Annual Average		0.030

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.

[b] See Table 2.0, Program Deviations

[c] Low volume due to power outage.

Table 8. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].
Location: D-16 (On-site)
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)		Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD			0.010	Required LLD		0.010
01-08-09	337		0.044 ± 0.004	07-09-09	288	0.010 ± 0.002
01-18-09	438	[b]	0.043 ± 0.003	07-15-09	249	0.010 ± 0.003
01-22-09	164		0.044 ± 0.006	07-23-09	312	0.011 ± 0.003
01-29-09	293		0.045 ± 0.004	07-30-09	279	0.015 ± 0.003
02-05-09	294		0.034 ± 0.004	08-06-09	287	0.007 ± 0.002
02-12-09	294		0.042 ± 0.004	08-13-09	290	0.026 ± 0.003
02-19-09	284		0.030 ± 0.004	08-20-09	285	0.013 ± 0.003
02-26-09	281		0.043 ± 0.004	08-27-09	286	0.023 ± 0.003
				09-03-09	284	0.025 ± 0.003
03-05-09	294		0.026 ± 0.003			
03-12-09	294		0.027 ± 0.003	09-10-09	287	0.046 ± 0.004
03-19-09	286		0.032 ± 0.004	09-17-09	286	0.044 ± 0.005
03-26-09	284		0.027 ± 0.004	09-23-09	244	0.040 ± 0.004
04-02-09	285		0.018 ± 0.003	10-01-09	327	0.025 ± 0.003
1st Quarter Mean ± s.d.			0.035 ± 0.009	3rd Quarter Mean ± s.d.		0.023 ± 0.013
04-09-09	288		0.021 ± 0.003	10-08-09	290	0.014 ± 0.003
04-16-09	285		0.029 ± 0.004	10-15-09	280	0.023 ± 0.003
04-23-09	284		0.018 ± 0.003	10-21-09	245	0.030 ± 0.004
04-30-09	286		0.013 ± 0.003	10-29-09	327	0.020 ± 0.003
05-07-09	285		0.029 ± 0.004	11-05-09	286	0.022 ± 0.003
05-14-09	285		0.013 ± 0.003	11-12-09	287	0.034 ± 0.004
05-20-09	247	[c]	0.006 ± 0.003	11-19-09	285	0.026 ± 0.004
05-28-09	330		0.024 ± 0.003	11-25-09	246	0.038 ± 0.004
				12-03-09	324	0.031 ± 0.003
06-04-09	288		0.023 ± 0.003			
06-10-09	248	[c]	< 0.004	12-10-09	302	0.030 ± 0.003
06-17-09	289		0.021 ± 0.003	12-17-09	299	0.057 ± 0.005
06-25-09	329		0.017 ± 0.003	12-23-09	257	0.067 ± 0.005
07-02-09	287		0.015 ± 0.003	12-30-09	301	0.043 ± 0.004
2nd Quarter Mean ± s.d.			0.019 ± 0.007	4th Quarter Mean ± s.d.		0.033 ± 0.015
				Cumulative Average		0.028
				Previous Annual Average		0.031

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.
[b] See Table 2.0, Program Deviations
[c] Filter light.

Table 9. Airborne particulates and charcoal canisters, analyses for gross beta and iodine-131[a].
Location: D-40 [b]
Units: pCi/m^3
Collection: Continuous, weekly exchange.

Date Collected	Volume (m^3)	Gross Beta	Date Collected	Volume (m^3)	Gross Beta
Required LLD		0.010	Required LLD		0.010
1st Quarter Mean ± s.d.			3rd Quarter Mean ± s.d.		
			10-21-09	204	0.033 ± 0.005
			10-29-09	324	0.020 ± 0.003
			11-05-09	282	0.019 ± 0.003
			11-12-09	270	0.033 ± 0.004
			11-19-09	269	0.026 ± 0.004
			11-25-09	234	0.042 ± 0.005
			12-03-09	300	0.031 ± 0.004
			12-10-09	271	0.030 ± 0.004
			12-17-09	267	0.059 ± 0.005
			12-23-09	230	0.065 ± 0.006
			12-30-09	268	0.039 ± 0.004
2nd Quarter Mean ± s.d.			4th Quarter Mean ± s.d.		0.036 ± 0.015
			Cumulative Average		0.036
			Previous Annual Average		-

[a] Iodine-131 concentrations are < 0.03 pCi/m^3 unless noted otherwise.
[b] New location as of October, 2009.

Table 10. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite Units: pCi/m^3

Location	D-3			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 1456	DAP- 3946	DAP- 5499	DAP- 7181
Volume (m^3)	3684	3801	3625	3703
Be-7	0.095 ± 0.016	0.106 ± 0.020	0.108 ± 0.015	0.077 ± 0.016
Mn-54	< 0.0004	< 0.0008	< 0.0006	< 0.0007
Fe-59	< 0.0008	< 0.0011	< 0.0018	< 0.0024
Co-58	< 0.0006	< 0.0009	< 0.0006	< 0.0008
Co-60	< 0.0007	< 0.0007	< 0.0006	< 0.0007
Zn-65	< 0.0007	< 0.0014	< 0.0011	< 0.0013
Nb-95	< 0.0008	< 0.0008	< 0.0005	< 0.0017
Zr-95	< 0.0010	< 0.0015	< 0.0012	< 0.0011
Ru-103	< 0.0004	< 0.0015	< 0.0011	< 0.0008
Ru-106	< 0.0030	< 0.0062	< 0.0072	< 0.0044
Cs-134	< 0.0004	< 0.0007	< 0.0006	< 0.0009
Cs-137	< 0.0007	< 0.0011	< 0.0006	< 0.0007
Ce-141	< 0.0008	< 0.0025	< 0.0013	< 0.0015
Ce-144	< 0.0045	< 0.0054	< 0.0042	< 0.0046
Location	D-5			
Lab Code	DAP- 1457	DAP- 3947	DAP- 5500	DAP- 7182
Volume (m^3)	3955	3775	3694	3665
Be-7	0.090 ± 0.016	0.105 ± 0.018	0.110 ± 0.016	0.058 ± 0.015
Mn-54	< 0.0003	< 0.0006	< 0.0005	< 0.0006
Fe-59	< 0.0015	< 0.0009	< 0.0013	< 0.0006
Co-58	< 0.0005	< 0.0010	< 0.0005	< 0.0010
Co-60	< 0.0007	< 0.0008	< 0.0007	< 0.0006
Zn-65	< 0.0009	< 0.0007	< 0.0007	< 0.0008
Nb-95	< 0.0008	< 0.0013	< 0.0006	< 0.0008
Zr-95	< 0.0011	< 0.0020	< 0.0011	< 0.0013
Ru-103	< 0.0004	< 0.0013	< 0.0007	< 0.0011
Ru-106	< 0.0048	< 0.0096	< 0.0047	< 0.0078
Cs-134	< 0.0005	< 0.0008	< 0.0003	< 0.0006
Cs-137	< 0.0004	< 0.0010	< 0.0006	< 0.0006
Ce-141	< 0.0011	< 0.0020	< 0.0011	< 0.0012
Ce-144	< 0.0046	< 0.0039	< 0.0030	< 0.0045
Location	D-6			
Lab Code	DAP- 1458	DAP- 3948	DAP- 5501	DAP- 7183
Volume (m^3)	3845	3777	3726	3636
Be-7	0.086 ± 0.013	0.105 ± 0.014	0.098 ± 0.015	0.069 ± 0.014
Mn-54	< 0.0004	< 0.0005	< 0.0008	< 0.0010
Fe-59	< 0.0008	< 0.0010	< 0.0023	< 0.0020
Co-58	< 0.0003	< 0.0009	< 0.0006	< 0.0006
Co-60	< 0.0007	< 0.0007	< 0.0006	< 0.0011
Zn-65	< 0.0007	< 0.0014	< 0.0011	< 0.0012
Nb-95	< 0.0004	< 0.0008	< 0.0010	< 0.0010
Zr-95	< 0.0009	< 0.0007	< 0.0019	< 0.0022
Ru-103	< 0.0007	< 0.0009	< 0.0010	< 0.0011
Ru-106	< 0.0038	< 0.0056	< 0.0051	< 0.0057
Cs-134	< 0.0006	< 0.0005	< 0.0009	< 0.0009
Cs-137	< 0.0005	< 0.0004	< 0.0009	< 0.0008
Ce-141	< 0.0013	< 0.0016	< 0.0015	< 0.0023
Ce-144	< 0.0026	< 0.0034	< 0.0031	< 0.0034

Table 10. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite Units: pCi/m^3

Location	D-7			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 1459	DAP- 3949	DAP- 5502	DAP- 7184
Volume (m^3)	3725	3665	3662	3639
Be-7	0.069 ± 0.013	0.112 ± 0.019	0.103 ± 0.015	0.050 ± 0.010
Mn-54	< 0.0006	< 0.0007	< 0.0008	< 0.0006
Fe-59	< 0.0008	< 0.0009	< 0.0014	< 0.0008
Co-58	< 0.0006	< 0.0006	< 0.0007	< 0.0007
Co-60	< 0.0008	< 0.0007	< 0.0006	< 0.0003
Zn-65	< 0.0007	< 0.0009	< 0.0007	< 0.0008
Nb-95	< 0.0003	< 0.0010	< 0.0009	< 0.0009
Zr-95	< 0.0014	< 0.0015	< 0.0013	< 0.0014
Ru-103	< 0.0005	< 0.0006	< 0.0006	< 0.0008
Ru-106	< 0.0071	< 0.0045	< 0.0044	< 0.0038
Cs-134	< 0.0007	< 0.0007	< 0.0008	< 0.0004
Cs-137	< 0.0004	< 0.0006	< 0.0006	< 0.0005
Ce-141	< 0.0011	< 0.0018	< 0.0012	< 0.0010
Ce-144	< 0.0044	< 0.0044	< 0.0048	< 0.0028
Location	D-11			
Lab Code	DAP- 1460	DAP- 3950	DAP- 5503	DAP- 7185
Volume (m^3)	3797	3747	3691	3596
Be-7	0.097 ± 0.015	0.115 ± 0.018	0.098 ± 0.016	0.065 ± 0.014
Mn-54	< 0.0003	< 0.0009	< 0.0010	< 0.0009
Fe-59	< 0.0008	< 0.0012	< 0.0014	< 0.0022
Co-58	< 0.0004	< 0.0010	< 0.0007	< 0.0009
Co-60	< 0.0008	< 0.0005	< 0.0010	< 0.0006
Zn-65	< 0.0007	< 0.0010	< 0.0017	< 0.0011
Nb-95	< 0.0008	< 0.0012	< 0.0008	< 0.0017
Zr-95	< 0.0011	< 0.0012	< 0.0016	< 0.0014
Ru-103	< 0.0007	< 0.0009	< 0.0013	< 0.0012
Ru-106	< 0.0051	< 0.0074	< 0.0064	< 0.0045
Cs-134	< 0.0004	< 0.0008	< 0.0009	< 0.0010
Cs-137	< 0.0007	< 0.0008	< 0.0013	< 0.0005
Ce-141	< 0.0016	< 0.0022	< 0.0022	< 0.0015
Ce-144	< 0.0028	< 0.0035	< 0.0060	< 0.0035
Location	D-13			
Lab Code	DAP- 1461	DAP- 3951	DAP- 5504	DAP- 7186
Volume (m^3)	3764	3731	3711	3682
Be-7	0.096 ± 0.015	0.110 ± 0.020	0.103 ± 0.016	0.067 ± 0.013
Mn-54	< 0.0005	< 0.0007	< 0.0006	< 0.0008
Fe-59	< 0.0008	< 0.0020	< 0.0017	< 0.0016
Co-58	< 0.0006	< 0.0009	< 0.0007	< 0.0007
Co-60	< 0.0008	< 0.0007	< 0.0007	< 0.0008
Zn-65	< 0.0012	< 0.0014	< 0.0007	< 0.0019
Nb-95	< 0.0007	< 0.0013	< 0.0007	< 0.0011
Zr-95	< 0.0014	< 0.0017	< 0.0008	< 0.0012
Ru-103	< 0.0010	< 0.0012	< 0.0005	< 0.0004
Ru-106	< 0.0060	< 0.0061	< 0.0055	< 0.0067
Cs-134	< 0.0004	< 0.0009	< 0.0004	< 0.0006
Cs-137	< 0.0005	< 0.0011	< 0.0008	< 0.0006
Ce-141	< 0.0011	< 0.0016	< 0.0014	< 0.0010
Ce-144	< 0.0043	< 0.0049	< 0.0044	< 0.0042

Table 10. Airborne particulates, analyses for gamma-emitting isotopes.
Collection: Quarterly Composite Units: pCi/m^3

Location	D-15			
Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
Lab Code	DAP- 1462	DAP- 3952	DAP- 5505	DAP- 7187
Volume (m^3)	3801	3624	3579	3575
Be-7	0.085 ± 0.014	0.111 ± 0.015	0.089 ± 0.016	0.070 ± 0.012
Mn-54	< 0.0007	< 0.0007	< 0.0005	< 0.0004
Fe-59	< 0.0025	< 0.0013	< 0.0014	< 0.0017
Co-58	< 0.0008	< 0.0004	< 0.0005	< 0.0003
Co-60	< 0.0007	< 0.0006	< 0.0008	< 0.0004
Zn-65	< 0.0015	< 0.0008	< 0.0007	< 0.0014
Nb-95	< 0.0012	< 0.0007	< 0.0006	< 0.0007
Zr-95	< 0.0019	< 0.0006	< 0.0012	< 0.0019
Ru-103	< 0.0012	< 0.0014	< 0.0007	< 0.0006
Ru-106	< 0.0060	< 0.0079	< 0.0056	< 0.0068
Cs-134	< 0.0010	< 0.0005	< 0.0003	< 0.0008
Cs-137	< 0.0010	< 0.0006	< 0.0005	< 0.0006
Ce-141	< 0.0014	< 0.0009	< 0.0012	< 0.0012
Ce-144	< 0.0055	< 0.0028	< 0.0025	< 0.0036
Location	D-16			
Lab Code	DAP- 1464	DAP- 3953	DAP- 5506	DAP- 7189
Volume (m^3)	3826	3732	3703	3729
Be-7	0.092 ± 0.018	0.087 ± 0.014	0.087 ± 0.017	0.059 ± 0.011
Mn-54	< 0.0003	< 0.0006	< 0.0010	< 0.0006
Fe-59	< 0.0008	< 0.0014	< 0.0016	< 0.0006
Co-58	< 0.0006	< 0.0009	< 0.0009	< 0.0007
Co-60	< 0.0007	< 0.0008	< 0.0007	< 0.0003
Zn-65	< 0.0007	< 0.0018	< 0.0011	< 0.0013
Nb-95	< 0.0006	< 0.0010	< 0.0011	< 0.0010
Zr-95	< 0.0016	< 0.0009	< 0.0016	< 0.0013
Ru-103	< 0.0007	< 0.0005	< 0.0007	< 0.0009
Ru-106	< 0.0058	< 0.0101	< 0.0053	< 0.0047
Cs-134	< 0.0006	< 0.0009	< 0.0006	< 0.0006
Cs-137	< 0.0008	< 0.0006	< 0.0006	< 0.0006
Ce-141	< 0.0014	< 0.0020	< 0.0016	< 0.0009
Ce-144	< 0.0026	< 0.0034	< 0.0030	< 0.0022
Location	D-40[a]			
Lab Code				DAP- 7190
Volume (m^3)				2920
Be-7				0.065 ± 0.018
Mn-54				< 0.0007
Fe-59				< 0.0011
Co-58				< 0.0006
Co-60				< 0.0005
Zn-65				< 0.0008
Nb-95				< 0.0010
Zr-95				< 0.0010
Ru-103				< 0.0008
Ru-106				< 0.0079
Cs-134				< 0.0006
Cs-137				< 0.0008
Ce-141				< 0.0012
Ce-144				< 0.0059

[a] Location added October, 2009.

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Table 11. Area monitors (TLD), Quarterly
Units: mR/91 days

Air Stations	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
D-1	19.6 ± 1.3	17.6 ± 1.6	18.4 ± 1.0	14.5 ± 1.0
D-2	17.8 ± 1.3	14.1 ± 1.5	16.8 ± 1.0	13.1 ± 0.9
D-3	20.0 ± 1.5	15.4 ± 1.1	17.8 ± 1.0	15.3 ± 0.5
D-5	22.3 ± 2.9	19.8 ± 1.0	16.6 ± 0.8	21.3 ± 0.5
D-6	20.7 ± 1.2	19.4 ± 1.3	18.0 ± 0.8	18.3 ± 0.6
D-7	19.4 ± 1.2	17.7 ± 0.9	18.0 ± 1.0	17.4 ± 0.8
D-8	23.6 ± 1.2	23.0 ± 1.4	20.8 ± 0.8	22.6 ± 1.0
D-10	18.4 ± 1.0	15.6 ± 1.0	19.1 ± 0.7	15.0 ± 0.7
D-11	19.3 ± 1.1	15.9 ± 1.8	16.6 ± 0.9	16.7 ± 1.6
D-13	20.0 ± 1.7	17.7 ± 0.8	17.7 ± 0.7	15.9 ± 1.1
D-15	20.1 ± 1.5	15.9 ± 1.0	17.5 ± 1.1	16.7 ± 0.7
D-16	20.4 ± 1.2	18.4 ± 2.2	19.3 ± 0.9	18.1 ± 1.8
Mean ± s.d.	20.1 ± 1.6	17.6 ± 2.4	18.1 ± 1.2	17.1 ± 2.7
Within 0.5 mi. of Stack				
D-17	19.7 ± 1.4	19.8 ± 1.3	20.0 ± 1.0	20.4 ± 1.1
D-18	17.0 ± 1.6	17.2 ± 0.8	17.0 ± 0.9	16.8 ± 0.6
D-19	15.0 ± 1.3	17.5 ± 0.8	16.6 ± 0.8	16.9 ± 0.8
D-20	18.4 ± 1.3	20.9 ± 1.3	18.9 ± 0.9	21.6 ± 1.1
D-21	18.8 ± 1.3	18.6 ± 0.8	19.1 ± 0.8	18.4 ± 0.6
D-22	17.2 ± 1.2	18.0 ± 1.2	16.8 ± 0.9	18.9 ± 0.7
D-23	16.7 ± 1.2	18.7 ± 1.2	16.5 ± 0.8	19.1 ± 0.9
D-28	19.2 ± 1.2	24.2 ± 1.3	19.7 ± 1.0	24.8 ± 1.7
D-29	22.3 ± 1.2	24.6 ± 1.0	22.3 ± 0.8	24.7 ± 1.3
D-30	21.5 ± 1.4	24.4 ± 2.1	22.6 ± 1.2	23.7 ± 1.7
D-31	20.5 ± 1.5	26.3 ± 1.3	21.3 ± 1.1	24.7 ± 1.4
D-32	22.5 ± 1.0	21.8 ± 1.4	21.6 ± 0.8	24.1 ± 1.1
Mean ± s.d.	19.1 ± 2.4	21.0 ± 3.2	19.4 ± 2.3	21.2 ± 3.1

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Table 11. Area monitors (TLD), Quarterly
Units: mR/91 days

Within 1.0 mi. of Stack	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
D-43	17.4 ± 1.0	18.9 ± 1.7	17.4 ± 0.8	20.3 ± 1.7
D-44	21.7 ± 1.6	22.4 ± 0.8	21.2 ± 0.9	24.0 ± 0.7
D-45	17.5 ± 1.1	19.0 ± 1.4	16.8 ± 0.8	18.7 ± 0.8
D-46	21.0 ± 1.5	24.0 ± 1.3	20.8 ± 1.1	23.3 ± 0.9
D-47	21.3 ± 1.1	22.4 ± 1.0	19.8 ± 1.0	21.6 ± 0.8
D-48	22.7 ± 1.2	24.3 ± 1.5	21.2 ± 0.7	24.0 ± 1.3
D-82	16.7 ± 1.3	13.8 ± 0.9	15.4 ± 0.7	14.5 ± 0.8
D-83	18.2 ± 1.2	18.7 ± 0.9	17.2 ± 0.9	19.0 ± 0.6
D-84	18.5 ± 1.2	18.8 ± 0.9	16.9 ± 1.0	18.6 ± 1.0
D-85	17.7 ± 1.0	18.9 ± 1.1	17.6 ± 0.8	18.4 ± 0.8
D-86	20.9 ± 1.4	20.1 ± 1.6	19.5 ± 1.3	19.2 ± 1.0
D-91	17.9 ± 1.0	15.6 ± 1.2	17.5 ± 1.0	16.3 ± 1.0
Mean ± s.d.	19.3 ± 2.1	19.7 ± 3.1	18.5 ± 2.0	19.8 ± 3.0
Within 3.0 mi. of Stack				
D-33	17.3 ± 1.1	17.5 ± 0.8	15.4 ± 0.8	17.7 ± 0.5
D-34	16.5 ± 1.2	16.8 ± 1.7	16.1 ± 1.6	16.8 ± 0.8
D-35	16.8 ± 1.0	17.8 ± 0.9	16.0 ± 0.8	17.2 ± 0.6
D-36	21.4 ± 1.1	15.4 ± 0.9	17.9 ± 0.8	18.9 ± 1.1
D-37	22.7 ± 1.6	22.5 ± 2.5	20.0 ± 1.0	22.9 ± 2.1
D-38	18.5 ± 1.2	19.7 ± 1.1	18.0 ± 1.0	21.0 ± 1.2
D-39	18.4 ± 1.2	19.9 ± 0.8	17.7 ± 0.8	20.3 ± 0.8
D-40	15.7 ± 1.1	19.6 ± 1.0	15.6 ± 0.9	19.2 ± 1.2
D-41	16.7 ± 1.1	17.4 ± 1.2	17.1 ± 0.9	18.8 ± 1.0
D-42	16.8 ± 1.1	18.0 ± 2.0	16.1 ± 0.8	18.9 ± 1.3
Mean ± s.d.	18.1 ± 2.3	18.5 ± 2.0	17.0 ± 1.4	19.2 ± 1.8

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

Location		D-108					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-06-09	DMI- 35	< 0.3	1400 ± 116	< 3.3	< 3.6	< 16.1	< 1.7
02-03-09	DMI- 356	< 0.3	1331 ± 110	< 3.7	< 4.2	< 11.6	< 2.2
03-03-09	DMI- 704	< 0.3	1432 ± 120	< 4.0	< 4.2	< 17.6	< 2.0
04-07-09	DMI- 1231	< 0.4	1504 ± 118	< 3.4	< 3.1	< 14.4	< 2.6
05-05-09	DMI- 2082	< 0.4	1360 ± 117	< 2.4	< 4.1	< 10.3	< 3.0
05-19-09	DMI- 2376	< 0.4	1616 ± 127	< 3.8	< 2.7	< 12.3	< 2.2
06-02-09	DMI- 2722	< 0.4	1570 ± 116	< 5.0	< 4.0	< 9.4	< 2.7
06-16-09	DMI- 2948	< 0.2	1519 ± 113	< 3.2	< 3.4	< 9.2	< 1.6
06-30-09	DMI- 3267	< 0.5	1637 ± 126	< 3.2	< 3.9	< 11.9	< 1.3
07-14-09	DMI- 3545	< 0.3	1317 ± 107	< 3.2	< 3.9	< 11.4	< 1.8
07-28-09	DMI- 3979	< 0.3	1302 ± 117	< 3.5	< 3.3	< 14.6	< 1.3
08-11-09	DMI- 4220	< 0.2	1418 ± 101	< 2.2	< 3.3	< 9.7	< 1.3
08-25-09	DMI- 4434	< 0.3	1441 ± 116	< 3.3	< 3.4	< 11.5	< 1.4
09-09-09	DMI- 4724	< 0.5	1471 ± 109	< 2.7	< 2.6	< 10.4	< 2.1
09-22-09	DMI- 5052	< 0.3	1321 ± 110	< 3.1	< 3.0	< 15.1	< 2.9
10-06-09	DMI- 5386	< 0.4	1402 ± 112	< 2.7	< 3.3	< 9.9	< 1.7
11-03-09	DMI- 6134	< 0.3	1532 ± 116	< 2.8	< 3.9	< 16.0	< 2.1
12-01-09	DMI- 6586	< 0.2	1653 ± 123	< 3.0	< 4.1	< 17.2	< 1.2

Location		D-110					
Date	Lab	Concentration (pCi/L)					
Collected	Code	I-131	K-40	Cs-134	Cs-137	Ba-140	La-140
01-06-09	DMI- 36	< 0.2	1306 ± 107	< 3.1	< 3.1	< 15.7	< 2.0
02-03-09	DMI- 357	< 0.3	1310 ± 115	< 3.5	< 4.9	< 16.0	< 3.9
03-03-09	DMI- 705	< 0.3	1312 ± 111	< 2.8	< 3.5	< 10.2	< 1.3
04-07-09	DMI- 1232	< 0.3	1326 ± 114	< 2.7	< 3.5	< 8.1	< 2.7
05-05-09	DMI- 2083	< 0.3	1295 ± 124	< 3.5	< 4.1	< 8.5	< 3.4
05-19-09	DMI- 2377	< 0.5	1381 ± 111	< 3.2	< 3.5	< 12.7	< 1.2
06-02-09	DMI- 2723	< 0.4	1461 ± 114	< 4.0	< 3.5	< 12.7	< 2.7
06-16-09	DMI- 2949	< 0.2	1246 ± 100	< 2.9	< 3.2	< 12.8	< 2.3
06-30-09	DMI- 3268	< 0.5	1402 ± 112	< 2.6	< 3.9	< 11.7	< 2.5
07-14-09	DMI- 3546	< 0.3	1411 ± 105	< 2.9	< 3.7	< 13.0	< 1.5
07-28-09	DMI- 3980	< 0.3	1439 ± 116	< 2.7	< 4.5	< 8.3	< 3.9
08-11-09	DMI- 4221	< 0.2	1317 ± 104	< 2.9	< 2.7	< 11.3	< 2.2
08-25-09	DMI- 4435	< 0.3	1376 ± 111	< 2.9	< 3.0	< 14.5	< 2.4
09-09-09	DMI- 4725	< 0.3	1404 ± 108	< 2.2	< 3.7	< 8.6	< 1.9
09-22-09	DMI- 5053	< 0.3	1397 ± 106	< 2.3	< 3.6	< 13.2	< 2.4
10-06-09	DMI- 5387	< 0.3	1403 ± 121	< 2.9	< 2.3	< 16.0	< 3.0
11-03-09	DMI- 6135	< 0.3	1428 ± 113	< 2.8	< 2.6	< 18.6	< 1.8
12-01-09	DMI- 6587	< 0.3	1363 ± 119	< 2.9	< 3.0	< 16.5	< 2.3

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Table 13.1. Well water samples, analyses for gross beta and tritium.
Collection: Quarterly
Units: pCi/L

Location	D-53 Treated Municipal Water			
Collection Date	03-20-09	06-11-09	09-22-09	12-14-09
Lab Code	DWW-920	DWW-2887	DWW-5066	DWW-6822
Gross Beta	2.7 ± 0.8	1.0 ± 0.6	< 1.7	1.1 ± 0.6
H-3	< 161	< 146	< 158	< 153

Location	D-54 Inlet to Municipal Water			
Collection Date	03-20-09	06-11-09	09-22-09	12-14-09
Lab Code	DWW-921	DWW-2888	DWW-5067	DWW-6823
Gross Beta	2.7 ± 0.8	1.3 ± 0.6	< 1.7	< 0.9
H-3	< 161	< 146	< 158	< 153

Location	D-55 On-site Well			
Collection Date	03-18-09	06-11-09	09-21-09	12-14-09
Lab Code	DWW-922	DWW-2889	DWW-5068	DWW-6824
Gross Beta	< 1.4	< 0.9	< 1.8	< 0.9
H-3	< 161	< 146	< 158	< 153

Location	D-57 Bull Farm			
Collection Date	03-18-09	06-11-09	09-21-09	12-14-09
Lab Code	DWW-923	DWW-2890	DWW-5069	DWW-6825
Gross Beta	< 2.3	< 0.9	< 1.7	< 0.8
H-3	< 161	< 146	< 158	< 153

Location	D-58 Franz Farm			
Collection Date	03-18-09	06-11-09	09-21-09	12-14-09
Lab Code	DWW-925[a]	DWW-2892	DWW-5070	DWW-6826
Gross Beta	8.3 ± 1.1	3.8 ± 0.7	3.3 ± 1.1	2.9 ± 0.7
H-3	< 161	< 146	< 158	< 153

Location	D-72 Van Note Farm			
Collection Date	03-18-09	06-11-09	09-21-09	12-14-09
Lab Code	DWW-926	DWW-2893	DWW-5071	DWW-6827
Gross Beta	< 1.2	< 3.3	< 1.8	1.0 ± 0.6
H-3	< 161	< 146	< 158	< 154

[a] Gross beta repeated with a result of 6.9±0.8 pCi/L.

Table 13.2. Ground water, Monitoring wells, analyses for gross beta and tritium [a].
Collection: Quarterly
Units: pCi/L

Location	MW-01A (shallow)			
Collection Date	03-25-09	06-12-09	09-30-09	12-17-09
Lab Code	DWW-1021	DWW-2930	DWW-5332	DWW-6937
Gross Beta	3.9 ± 0.8	< 3.9	4.8 ± 1.2	< 3.3
H-3	307 ± 88[b]	290 ± 104	3905 ± 187[c]	938 ± 118
Location	**MW-01B (intermediate)**			
Collection Date	03-25-09	06-12-09	09-30-09	12-17-09
Lab Code	DWW-1022	DWW-2931	DWW-5333	DWW-6938
Gross Beta	3.3 ± 1.2	< 3.4	3.7 ± 1.2	< 3.7
H-3	< 148	< 152	< 170	< 147
Location	**MW-02A (shallow)**			
Collection Date	03-25-09	06-12-09	09-30-09	12-17-09
Lab Code	DWW-1023	DWW-2932	DWW-5334	DWW-6939
Gross Beta	2.5 ± 1.1	4.3 ± 2.2	4.0 ± 1.2	< 3.5
H-3	< 153	< 152	< 151	< 147
Location	**MW-02B (intermediate)**			
Collection Date	03-25-09	06-12-09	09-30-09	12-17-09
Lab Code	DWW-1024	DWW-2933	DWW-5335	DWW-6940
Gross Beta	3.0 ± 1.0	< 3.9	3.4 ± 1.3	< 3.7
H-3	< 148	< 152	< 170	< 147
Location	**MW-03A (shallow)**			
Collection Date	03-25-09	06-12-09	09-29-09	12-18-09
Lab Code	DWW-1025	DWW-2934	DWW-5336	DWW-6941
Gross Beta	5.6 ± 1.1	5.3 ± 2.1	2.8 ± 0.8	< 4.0
H-3	< 148	< 152	< 170	< 147
Location	**MW-03B (intermediate)**			
Collection Date	03-25-09	06-12-09	09-29-09	12-18-09
Lab Code	DWW-1026	DWW-2935	DWW-5337	DWW-6942
Gross Beta	2.6 ± 0.9	4.0 ± 2.2	1.1 ± 0.6	< 3.3
H-3	< 148	< 152	< 170	< 147

[a] Analyses for strontium-89, strontium-90 and gamma emitting isotopes will be performed if the gross beta activity exceeds ten times the yearly mean of the potable water well control.

[b] Tritium repeated with a result of 370±95 pCi/L.

[c] Tritium recounted with a result of 3696±190 pCi/L.

Table 13.2. Ground water, Monitoring wells, analyses for gross beta and tritium.
Collection: Quarterly
Units: pCi/L

Location	MW-04A (shallow)			
Collection Date	03-25-09	06-16-09	09-29-09	12-17-09
Lab Code	DWW-1027	DWW-2995	DWW-5338	DWW-6943
Gross Beta	2.4 ± 0.8	< 3.3	1.9 ± 0.7	4.0 ± 2.0
H-3	242 ± 85[a]	229 ± 97	180 ± 82	< 153
Location	MW-04B (intermediate)			
Collection Date	03-25-09	06-16-09	09-29-09	12-17-09
Lab Code	DWW-1028	DWW-2996	DWW-5339	DWW-6944
Gross Beta	1.0 ± 0.4	< 3.7	1.6 ± 0.6	< 3.3
H-3	< 148	< 144	< 170	< 147
Location	MW-05A (shallow)			
Collection Date	03-25-09	06-16-09	09-29-09	12-18-09
Lab Code	DWW-1029	DWW-2997	DWW-5340	DWW-6945
Gross Beta	2.3 ± 0.5	< 2.0	2.7 ± 0.7	4.6 ± 2.0
H-3	< 148	169 ± 95	< 151	< 147
Location	MW-05B (intermediate)			
Collection Date	03-25-09	06-16-09	09-29-09	12-18-09
Lab Code	DWW-1030	DWW-2998	DWW-5341	DWW-6946
Gross Beta	1.6 ± 0.8	< 1.7	< 0.9	< 3.8
H-3	< 148	< 144	< 151	< 147
Location	MW-06A (shallow)			
Collection Date	03-27-09	06-16-09	09-30-09	12-17-09
Lab Code	DWW-1031	DWW-2999	DWW-5343	DWW-6947
Gross Beta	5.7 ± 0.7	5.9 ± 1.4	4.7 ± 1.3	10.5 ± 2.2[b]
H-3	< 148	< 144	< 151	< 153
Location	MW-06B (intermediate)			
Collection Date	03-27-09	06-16-09	09-30-09	12-17-09
Lab Code	DWW-1032	DWW-3000	DWW-5344	DWW-6948
Gross Beta	1.2 ± 0.6	< 1.7	< 1.8	< 3.6
H-3	< 148	< 144	< 170	< 147

[a] Tritium repeated with a result of 306 ± 92 pCi/L.

[b] Gross beta repeated with results of 8.1±0.8 and 9.1±0.5 pCi/L. Results of analyses for gamma emitting isotopes and strontium-89 and strontium-90 are listed in Appendix A.

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Table 14. Vegetation (broadleaf), analyses for iodine-131 and other gamma-emitting isotopes.
Collection: Annually
Units: pCi/g wet

Location	D-15	D-57	D-94
Lab Code	DVE- 3339	DVE- 3341	
Date Collected	07-02-09	07-02-09	
Sample Type	Broadleaf	Broadleaf	NS [a]
K-40	3.89 ± 0.60	3.52 ± 0.42	
Mn-54	< 0.020	< 0.012	
Fe-59	< 0.052	< 0.026	
Co-58	< 0.026	< 0.011	
Co-60	< 0.025	< 0.014	
Zn-65	< 0.033	< 0.017	
Nb-95	< 0.033	< 0.018	
Zr-95	< 0.047	< 0.028	
Ru-103	< 0.025	< 0.019	
Ru-106	< 0.22	< 0.12	
I-131	< 0.039	< 0.021	
Cs-134	< 0.028	< 0.012	
Cs-137	< 0.033	< 0.013	
Ce-141	< 0.029	< 0.032	
Ce-144	< 0.15	< 0.13	

Location	D-109	D-108 (C)	D-118
Lab Code	DVE- 3342	DVE- 3543	DVE- 4545
Date Collected	07-02-09	07-14-09	08-31-09
Sample Type	Broadleaf	Rhubarb	Cabbage
K-40	3.16 ± 0.63	3.31 ± 0.40	2.01 ± 0.18
Mn-54	< 0.033	< 0.017	< 0.005
Fe-59	< 0.043	< 0.022	< 0.017
Co-58	< 0.032	< 0.012	< 0.004
Co-60	< 0.026	< 0.012	< 0.006
Zn-65	< 0.030	< 0.020	< 0.016
Nb-95	< 0.031	< 0.015	< 0.006
Zr-95	< 0.039	< 0.024	< 0.007
Ru-103	< 0.031	< 0.019	< 0.004
Ru-106	< 0.20	< 0.14	< 0.052
I-131	< 0.032	< 0.025	< 0.006
Cs-134	< 0.020	< 0.018	< 0.006
Cs-137	< 0.036	< 0.015	< 0.007
Ce-141	< 0.035	< 0.033	< 0.008
Ce-144	< 0.21	< 0.10	< 0.044

[a] No Sample; refer to Table 2.0, Program Deviations.

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Table 15. Vegetation (hay and grain), analyses for gamma-emitting isotopes.
Collection: Annually
Units: pCi/g wet

Location	D-16	D-57	D-57
Lab Code	DVE- 3870	DVE- 3343	DVE- 6136
Date Collected	07-23-09	07-02-09	11-03-09
Sample Type	Winter Wheat	Hay	Corn
K-40	3.53 ± 0.68	26.78 ± 1.28	3.38 ± 0.29
Mn-54	< 0.036	< 0.032	< 0.009
Fe-59	< 0.048	< 0.070	< 0.022
Co-58	< 0.033	< 0.042	< 0.009
Co-60	< 0.033	< 0.037	< 0.011
Zn-65	< 0.056	< 0.049	< 0.022
Nb-95	< 0.031	< 0.033	< 0.010
Zr-95	< 0.085	< 0.037	< 0.020
Ru-103	< 0.030	< 0.020	< 0.010
Ru-106	< 0.28	< 0.25	< 0.060
Cs-134	< 0.032	< 0.033	< 0.008
Cs-137	< 0.051	< 0.025	< 0.009
Ce-141	< 0.060	< 0.064	< 0.019
Ce-144	< 0.22	< 0.23	< 0.069

Location	D-58	D-72	D-72	D-96
Lab Code	DVE- 6137	DVE- 3871	DVE- 6139	DVE- 6140
Date Collected	11-03-09	07-23-09	11-03-09	11-03-09
Sample Type	Corn	Forage / Hay	Beans	Corn
K-40	2.71 ± 0.24	9.15 ± 0.72	13.68 ± 0.52	2.85 ± 0.31
Mn-54	< 0.006	< 0.027	< 0.017	< 0.009
Fe-59	< 0.015	< 0.057	< 0.033	< 0.015
Co-58	< 0.004	< 0.025	< 0.020	< 0.009
Co-60	< 0.006	< 0.017	< 0.019	< 0.007
Zn-65	< 0.013	< 0.056	< 0.021	< 0.011
Nb-95	< 0.005	< 0.020	< 0.020	< 0.011
Zr-95	< 0.012	< 0.035	< 0.029	< 0.007
Ru-103	< 0.005	< 0.021	< 0.014	< 0.011
Ru-106	< 0.084	< 0.16	< 0.11	< 0.067
Cs-134	< 0.003	< 0.022	< 0.016	< 0.009
Cs-137	< 0.007	< 0.033	< 0.016	< 0.011
Ce-141	< 0.016	< 0.035	< 0.016	< 0.023
Ce-144	< 0.030	< 0.16	< 0.057	< 0.077

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Table 15. Vegetation (hay and grain), analyses for gamma-emitting isotopes.
Collection: Annually
Units: pCi/g wet

	Control		
Location	D-108	D-108	D-109
Lab Code	DVE- 3981	DVE- 6141	DVE- 6142
Date Collected	07-27-09	11-03-09	11-03-09
Sample Type	Forage	Corn	Corn
K-40	24.78 ± 1.41	2.02 ± 0.26	3.46 ± 0.30
Mn-54	< 0.038	< 0.007	< 0.009
Fe-59	< 0.076	< 0.018	< 0.015
Co-58	< 0.030	< 0.009	< 0.011
Co-60	< 0.045	< 0.008	< 0.006
Zn-65	< 0.081	< 0.012	< 0.013
Nb-95	< 0.038	< 0.010	< 0.009
Zr-95	< 0.059	< 0.013	< 0.019
Ru-103	< 0.041	< 0.012	< 0.010
Ru-106	< 0.30	< 0.077	< 0.095
Cs-134	< 0.025	< 0.007	< 0.013
Cs-137	< 0.049	< 0.010	< 0.010
Ce-141	< 0.042	< 0.017	< 0.018
Ce-144	< 0.19	< 0.067	< 0.094

Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-49

Lab Code	NS[a]	DSW- 475	DSW- 927	DSW- 1734	DSW- 2563	DSW- 3205
Date Collected	01-27-09	02-11-09	03-17-09	04-17-09	05-27-09	06-26-09
H-3	-	< 140	< 161	< 153	< 162	< 148
I-131(Chemistry)	-	< 0.5	< 0.4	< 0.3	< 0.3	< 0.3
Mn-54	-	< 2.3	< 1.7	< 2.2	< 3.5	< 4.2
Fe-59	-	< 3.9	< 3.8	< 4.3	< 7.5	< 5.0
Co-58	-	< 3.1	< 2.3	< 2.3	< 5.0	< 2.9
Co-60	-	< 2.6	< 2.1	< 3.4	< 4.3	< 2.2
Zn-65	-	< 2.7	< 4.1	< 3.7	< 5.8	< 5.8
Nb-95	-	< 2.1	< 2.1	< 3.8	< 2.6	< 2.8
Zr-95	-	< 5.4	< 4.7	< 4.6	< 3.8	< 5.6
I-131	-	< 7.3	< 4.7	< 5.6	< 6.5	< 3.5
Cs-134	-	< 3.7	< 2.0	< 3.1	< 3.6	< 3.1
Cs-137	-	< 2.2	< 3.1	< 2.3	< 2.5	< 3.5
Ba-140	-	< 12.7	< 10.5	< 9.6	< 9.8	< 12.8
La-140	-	< 1.9	< 3.2	< 2.2	< 2.2	< 3.3

Lab Code	DSW- 3872	DSW- 4428	DSW- 5060	DSW- 6073	DSW- 6380	DSW- 6731
Date Collected	07-24-09	08-24-09	09-21-09	10-27-09	11-16-09	12-07-09
H-3	< 161	< 146	< 168	< 151	< 150	< 165
I-131(Chemistry)	< 0.2	< 0.3	< 0.4	< 0.3	< 0.2	< 0.2
Mn-54	< 2.0	< 2.0	< 5.4	< 3.0	< 2.8	< 2.7
Fe-59	< 4.6	< 5.1	< 6.6	< 4.1	< 4.7	< 4.2
Co-58	< 2.5	< 1.1	< 5.0	< 2.1	< 2.7	< 2.8
Co-60	< 2.1	< 2.0	< 3.9	< 2.9	< 2.6	< 2.6
Zn-65	< 1.4	< 3.6	< 3.2	< 3.5	< 3.8	< 5.0
Nb-95	< 1.8	< 2.7	< 4.0	< 3.5	< 1.6	< 2.6
Zr-95	< 3.8	< 2.5	< 7.3	< 4.1	< 3.8	< 5.9
I-131	< 4.0	< 4.0	< 7.1	< 7.6	< 3.7	< 5.0
Cs-134	< 2.1	< 2.3	< 4.9	< 3.1	< 2.3	< 3.0
Cs-137	< 2.6	< 2.8	< 4.3	< 4.4	< 3.8	< 4.2
Ba-140	< 11.8	< 10.3	< 13.0	< 18.2	< 13.1	< 17.4
La-140	< 2.6	< 1.4	< 3.9	< 1.9	< 1.2	< 1.6

[a] No sample; see Table 2.0, Program Deviations.

Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-50

Lab Code	DSW- 268	DSW- 476	DSW- 928	DSW- 1735	DSW- 2564	DSW- 3206
Date Collected	01-27-09	02-11-09	03-17-09	04-17-09	05-27-09	06-26-09
H-3	< 159	< 140	< 161	< 153	< 162	< 148
Mn-54	< 1.3	< 3.9	< 2.9	< 2.0	< 4.2	< 3.6
Fe-59	< 4.4	< 6.4	< 5.6	< 5.5	< 4.2	< 6.6
Co-58	< 1.6	< 2.8	< 2.8	< 2.1	< 3.4	< 1.3
Co-60	< 1.9	< 2.0	< 2.4	< 3.2	< 2.5	< 2.1
Zn-65	< 3.9	< 5.9	< 2.8	< 4.9	< 4.3	< 3.1
Nb-95	< 3.4	< 2.9	< 2.1	< 3.2	< 2.6	< 2.3
Zr-95	< 5.6	< 5.8	< 4.2	< 3.4	< 5.2	< 4.9
I-131	< 7.9	< 8.7	< 5.1	< 9.1	< 6.1	< 5.7
Cs-134	< 2.8	< 3.2	< 3.3	< 2.5	< 2.4	< 2.9
Cs-137	< 2.4	< 4.4	< 3.2	< 3.8	< 3.2	< 2.8
Ba-140	< 18.9	< 13.6	< 19.3	< 11.0	< 11.1	< 13.1
La-140	< 3.5	< 5.0	< 3.3	< 3.0	< 2.5	< 3.2

Lab Code	DSW- 3873	DSW- 4429	DSW- 5061	DSW- 6074	DSW- 6381	DSW- 6732
Date Collected	07-24-09	08-24-09	09-21-09	10-27-09	11-16-09	12-07-09
H-3	< 161	< 146	< 168	< 151	< 150	< 165
Mn-54	< 2.1	< 1.9	< 3.5	< 2.3	< 2.9	< 3.0
Fe-59	< 1.7	< 6.1	< 7.0	< 6.6	< 3.8	< 4.0
Co-58	< 1.9	< 3.3	< 2.6	< 3.0	< 2.7	< 2.4
Co-60	< 0.8	< 1.9	< 3.4	< 2.0	< 1.7	< 1.7
Zn-65	< 2.3	< 4.2	< 3.8	< 3.6	< 3.6	< 4.4
Nb-95	< 2.4	< 2.0	< 2.5	< 1.5	< 2.2	< 3.6
Zr-95	< 2.9	< 2.8	< 7.0	< 4.7	< 4.1	< 6.1
I-131	< 4.3	< 4.0	< 5.2	< 4.7	< 4.4	< 4.4
Cs-134	< 2.5	< 2.5	< 3.8	< 2.6	< 2.8	< 2.6
Cs-137	< 2.3	< 3.0	< 3.4	< 2.9	< 3.0	< 3.1
Ba-140	< 13.3	< 10.9	< 14.3	< 14.5	< 8.2	< 12.8
La-140	< 2.3	< 1.7	< 2.6	< 2.3	< 1.7	< 3.5

Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-51

Lab Code	DSW- 269	DSW- 477	DSW- 929	DSW- 1736	DSW- 2565	DSW- 3207
Date Collected	01-27-09	02-11-09	03-17-09	04-17-09	05-27-09	06-26-09
H-3	< 159	< 140	< 161	< 153	< 162	< 148
Mn-54	< 4.6	< 2.9	< 1.6	< 2.0	< 4.6	< 1.7
Fe-59	< 11.6	< 5.4	< 4.2	< 4.3	< 4.6	< 3.6
Co-58	< 3.2	< 3.1	< 1.7	< 2.1	< 3.2	< 1.7
Co-60	< 5.1	< 2.0	< 3.2	< 2.2	< 3.2	< 2.7
Zn-65	< 9.3	< 2.7	< 2.6	< 2.8	< 4.8	< 3.9
Nb-95	< 2.5	< 3.2	< 3.5	< 2.9	< 4.6	< 1.6
Zr-95	< 8.9	< 5.1	< 3.9	< 3.9	< 5.6	< 5.4
I-131	< 8.2	< 5.9	< 4.6	< 5.1	< 6.9	< 4.4
Cs-134	< 3.9	< 3.5	< 3.4	< 2.8	< 2.5	< 2.4
Cs-137	< 2.9	< 2.1	< 2.3	< 2.9	< 1.9	< 2.7
Ba-140	< 24.7	< 14.9	< 14.5	< 13.5	< 15.0	< 9.0
La-140	< 4.0	< 2.8	< 4.0	< 1.5	< 5.4	< 2.6

Lab Code	DSW- 3874	DSW- 4430	DSW- 5062	DSW- 6076	DSW- 6382	DSW- 6733
Date Collected	07-24-09	08-24-09	09-21-09	10-27-09	11-16-09	12-07-09
H-3	< 161	< 146	< 168	< 151	< 150	< 165
Mn-54	< 2.3	< 2.7	< 1.2	< 3.3	< 2.8	< 1.4
Fe-59	< 4.3	< 3.2	< 4.9	< 3.4	< 4.0	< 3.1
Co-58	< 2.2	< 2.8	< 1.7	< 1.2	< 1.6	< 2.5
Co-60	< 1.4	< 2.8	< 1.1	< 3.0	< 2.4	< 1.8
Zn-65	< 3.5	< 3.2	< 2.7	< 2.1	< 3.7	< 5.7
Nb-95	< 3.3	< 1.5	< 1.5	< 3.2	< 3.2	< 3.0
Zr-95	< 2.9	< 3.9	< 3.9	< 5.4	< 3.2	< 5.9
I-131	< 3.7	< 3.1	< 5.0	< 5.6	< 4.1	< 4.0
Cs-134	< 2.7	< 2.8	< 2.5	< 1.8	< 1.8	< 3.4
Cs-137	< 2.3	< 2.2	< 1.9	< 2.6	< 3.0	< 3.8
Ba-140	< 11.3	< 7.8	< 8.5	< 16.8	< 10.6	< 10.2
La-140	< 2.3	< 2.1	< 2.3	< 2.2	< 1.4	< 1.3

Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-61

Lab Code	DSW- 270	DSW- 478	DSW- 930	DSW- 1737	DSW- 2566	DSW- 3208
Date Collected	01-27-09	02-11-09	03-17-09	04-17-09	05-27-09	06-26-09
H-3	< 159	< 140	< 161	< 153	< 162	< 148
I-131(Chemistry)	< 0.7	< 0.4	< 0.5	< 0.4	< 0.2	< 0.3
Mn-54	< 2.0	< 2.1	< 3.1	< 2.0	< 2.4	< 1.8
Fe-59	< 4.3	< 2.5	< 6.4	< 5.3	< 3.3	< 5.4
Co-58	< 2.8	< 2.2	< 3.1	< 1.6	< 2.6	< 1.7
Co-60	< 2.1	< 2.9	< 2.9	< 2.4	< 1.6	< 2.3
Zn-65	< 1.9	< 4.2	< 2.7	< 4.6	< 4.8	< 4.3
Nb-95	< 2.4	< 3.3	< 4.1	< 1.8	< 1.7	< 2.4
Zr-95	< 2.9	< 3.3	< 6.6	< 5.0	< 4.1	< 4.3
I-131	< 4.7	< 4.0	< 6.3	< 4.0	< 2.6	< 4.6
Cs-134	< 2.4	< 2.4	< 3.2	< 1.4	< 3.4	< 2.4
Cs-137	< 2.6	< 3.5	< 3.9	< 2.7	< 2.9	< 2.4
Ba-140	< 15.2	< 14.0	< 18.3	< 10.1	< 9.4	< 10.0
La-140	< 1.4	< 3.0	< 5.6	< 3.2	< 2.1	< 2.6

Lab Code	DSW- 3875	DSW- 4431	DSW- 5063	DSW- 6077	DSW- 6383	DSW- 6734
Date Collected	07-24-09	08-24-09	09-21-09	10-27-09	11-16-09	12-07-09
H-3	< 161	< 146	< 168	< 151	< 150	< 165
I-131(Chemistry)	< 0.2	< 0.3	< 0.3	< 0.3	< 0.3	< 0.2
Mn-54	< 5.7	< 2.3	< 3.6	< 3.6	< 2.8	< 2.6
Fe-59	< 5.3	< 2.9	< 6.1	< 4.8	< 3.2	< 1.4
Co-58	< 3.0	< 1.9	< 3.1	< 2.7	< 2.5	< 2.3
Co-60	< 4.2	< 2.3	< 2.9	< 2.9	< 2.4	< 2.6
Zn-65	< 14.4	< 3.2	< 3.3	< 3.6	< 7.1	< 2.6
Nb-95	< 4.0	< 1.2	< 4.6	< 2.0	< 3.4	< 1.7
Zr-95	< 6.5	< 2.8	< 5.1	< 8.2	< 7.5	< 3.8
I-131	< 6.1	< 3.0	< 5.5	< 6.1	< 5.2	< 3.5
Cs-134	< 3.7	< 1.7	< 2.8	< 3.4	< 3.2	< 2.2
Cs-137	< 4.2	< 2.7	< 2.7	< 3.1	< 5.2	< 3.3
Ba-140	< 21.1	< 10.9	< 14.3	< 22.7	< 15.8	< 10.2
La-140	< 3.8	< 2.4	< 3.8	< 2.6	< 2.3	< 1.1

Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-99

Lab Code	NS[a]	DSW- 479	DSW- 931	DSW- 1738	DSW- 2567	DSW- 3209
Date Collected	01-27-09	02-11-09	03-17-09	04-17-09	05-27-09	06-26-09
H-3	-	< 140	< 161	< 153	< 162	< 148
Mn-54	-	< 1.9	< 1.8	< 1.8	< 3.4	< 2.2
Fe-59	-	< 2.0	< 2.3	< 4.9	< 5.7	< 3.3
Co-58	-	< 2.6	< 2.2	< 3.1	< 3.5	< 1.8
Co-60	-	< 1.9	< 2.9	< 1.3	< 3.2	< 2.1
Zn-65	-	< 1.2	< 4.0	< 2.1	< 8.9	< 3.8
Nb-95	-	< 3.4	< 2.0	< 2.4	< 3.0	< 2.6
Zr-95	-	< 5.0	< 4.4	< 4.5	< 5.4	< 4.3
I-131	-	< 5.6	< 4.0	< 3.6	< 6.9	< 4.5
Cs-134	-	< 2.7	< 2.2	< 2.9	< 3.3	< 2.9
Cs-137	-	< 2.0	< 1.9	< 2.2	< 4.2	< 2.3
Ba-140	-	< 14.2	< 15.8	< 12.1	< 13.5	< 15.4
La-140	-	< 3.1	< 1.9	< 2.2	< 2.9	< 2.6

Lab Code	DSW- 3876	DSW- 4432	DSW- 5064	DSW- 6078	DSW- 6384	DSW- 6735
Date Collected	07-24-09	08-24-09	09-21-09	10-27-09	11-16-09	12-07-09
H-3	< 161	< 146	< 168	< 151	< 150	< 165
Mn-54	< 2.2	< 1.7	< 2.4	< 2.2	< 1.6	< 2.7
Fe-59	< 4.2	< 3.4	< 4.0	< 4.7	< 2.1	< 3.6
Co-58	< 3.2	< 1.8	< 1.7	< 1.8	< 2.0	< 1.5
Co-60	< 2.1	< 1.5	< 1.9	< 1.7	< 2.3	< 2.1
Zn-65	< 3.9	< 2.3	< 3.6	< 3.3	< 3.8	< 4.4
Nb-95	< 3.5	< 3.4	< 4.1	< 2.5	< 2.0	< 2.7
Zr-95	< 5.6	< 3.7	< 2.4	< 4.4	< 4.1	< 6.1
I-131	< 4.2	< 3.3	< 4.4	< 4.6	< 3.3	< 5.1
Cs-134	< 2.3	< 2.9	< 3.0	< 2.4	< 2.6	< 2.9
Cs-137	< 2.3	< 2.0	< 3.5	< 2.8	< 3.2	< 3.6
Ba-140	< 14.2	< 12.4	< 12.6	< 12.7	< 13.0	< 10.1
La-140	< 2.0	< 2.3	< 2.6	< 2.1	< 1.6	< 1.2

[a] No sample; see Table 2.0, Program Deviations.

Table 16. Surface water samples, analyses for iodine-131, tritium and gamma-emitting isotopes.
Collection: Monthly
Units: pCi/L
Location: D-107

Lab Code	DSW- 271	DSW- 480	DSW- 932	DSW- 1739	DSW- 2568	DSW- 3210
Date Collected	01-27-09	02-11-09	03-17-09	04-17-09	05-27-09	06-26-09
H-3	< 152	< 140	< 161	< 153	< 162	< 148
Mn-54	< 3.1	< 2.6	< 2.6	< 2.3	< 2.4	< 2.7
Fe-59	< 4.0	< 2.7	< 5.5	< 3.1	< 5.5	< 4.3
Co-58	< 2.9	< 2.2	< 2.4	< 2.1	< 2.4	< 1.8
Co-60	< 3.5	< 1.9	< 2.4	< 1.9	< 2.6	< 2.4
Zn-65	< 6.7	< 4.7	< 4.7	< 3.2	< 3.7	< 3.4
Nb-95	< 2.6	< 3.0	< 2.5	< 3.2	< 2.2	< 2.4
Zr-95	< 7.1	< 4.4	< 4.5	< 4.8	< 4.2	< 3.0
I-131	< 7.5	< 4.3	< 8.0	< 4.1	< 6.9	< 4.3
Cs-134	< 2.8	< 3.2	< 3.1	< 2.1	< 2.2	< 3.8
Cs-137	< 3.1	< 2.2	< 2.6	< 3.0	< 3.8	< 2.1
Ba-140	< 9.5	< 13.4	< 16.2	< 16.3	< 16.4	< 15.0
La-140	< 3.3	< 3.3	< 4.6	< 3.1	< 2.7	< 3.2

Lab Code	DSW- 3877	DSW- 4433	DSW- 5065	DSW- 6079	DSW- 6386	DSW- 6736
Date Collected	07-24-09	08-24-09	09-18-09	10-27-09	11-16-09	12-07-09
H-3	< 161	< 146	< 168	< 151	< 150	< 165
Mn-54	< 3.1	< 2.8	< 2.4	< 2.7	< 3.0	< 2.8
Fe-59	< 5.3	< 4.1	< 5.1	< 5.0	< 2.7	< 1.9
Co-58	< 2.7	< 1.5	< 2.5	< 2.2	< 2.8	< 1.7
Co-60	< 2.4	< 2.2	< 2.3	< 1.5	< 2.2	< 1.9
Zn-65	< 3.1	< 4.0	< 3.5	< 6.8	< 2.6	< 2.3
Nb-95	< 2.5	< 3.3	< 2.0	< 1.6	< 2.7	< 3.5
Zr-95	< 2.7	< 2.5	< 4.5	< 5.7	< 5.4	< 4.6
I-131	< 3.9	< 4.0	< 6.6	< 5.6	< 2.7	< 3.9
Cs-134	< 2.3	< 1.9	< 2.1	< 2.8	< 2.7	< 2.8
Cs-137	< 3.3	< 2.3	< 2.4	< 3.2	< 4.0	< 2.6
Ba-140	< 14.7	< 11.6	< 12.6	< 13.2	< 11.9	< 12.4
La-140	< 2.5	< 1.2	< 1.3	< 4.1	< 2.0	< 2.2

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

Location	D-49			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-934	DSW-3245	DSW-5133	DSW-6753
Sr-89	< 0.71	< 0.58	< 0.68	< 0.88
Sr-90	< 0.58	< 0.45	< 0.59	< 0.54
Location	D-61			
Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DSW-935	DSW-3246	DSW-5134	DSW-6754
Sr-89	< 0.74	< 0.57	< 0.81	< 0.70
Sr-90	< 0.53	< 0.50	< 0.66	< 0.68

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Table 18. Fish, analyses of edible portion for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g wet

Location	Upstream, D-49			
Lab Code	DF- 2942	DF- 2943	DF- 4726	DF- 4727
Date Collected	06-11-09	06-11-09	09-08-09	09-08-09
Sample Type	Carpiodies sp.	Moxostoma sp.	Moxostoma Sp.	Carpiodes Sp.
K-40	3.20 ± 0.37	3.27 ± 0.40	3.29 ± 0.38	2.92 ± 0.35
Mn-54	< 0.009	< 0.015	< 0.015	< 0.011
Fe-59	< 0.032	< 0.031	< 0.022	< 0.019
Co-58	< 0.011	< 0.009	< 0.011	< 0.011
Co-60	< 0.013	< 0.011	< 0.013	< 0.012
Zn-65	< 0.017	< 0.038	< 0.024	< 0.024
Nb-95	< 0.016	< 0.013	< 0.012	< 0.016
Zr-95	< 0.018	< 0.026	< 0.023	< 0.020
Ru-103	< 0.017	< 0.017	< 0.018	< 0.014
Ru-106	< 0.092	< 0.100	< 0.081	< 0.113
Cs-134	< 0.013	< 0.011	< 0.013	< 0.008
Cs-137	< 0.014	< 0.017	< 0.014	< 0.014
Ce-141	< 0.031	< 0.037	< 0.034	< 0.023
Ce-144	< 0.122	< 0.134	< 0.106	< 0.065

Location	Downstream, D-61			
Lab Code	DF- 2944	DF- 2945	DF- 4728	DF- 4729
Date Collected	06-11-09	06-11-09	09-08-09	09-08-09
Sample Type	Carpiodies sp.	Moxostoma sp.	Moxostoma Sp.	Carpiodes Sp.
K-40	2.66 ± 0.37	3.03 ± 0.36	3.57 ± 0.41	2.65 ± 0.37
Mn-54	< 0.010	< 0.006	< 0.008	< 0.016
Fe-59	< 0.029	< 0.016	< 0.044	< 0.032
Co-58	< 0.006	< 0.006	< 0.010	< 0.013
Co-60	< 0.008	< 0.007	< 0.010	< 0.008
Zn-65	< 0.013	< 0.012	< 0.018	< 0.013
Nb-95	< 0.010	< 0.009	< 0.015	< 0.018
Zr-95	< 0.016	< 0.020	< 0.013	< 0.036
Ru-103	< 0.014	< 0.010	< 0.020	< 0.019
Ru-106	< 0.085	< 0.040	< 0.082	< 0.108
Cs-134	< 0.008	< 0.007	< 0.016	< 0.018
Cs-137	< 0.010	< 0.009	< 0.017	< 0.017
Ce-141	< 0.019	< 0.014	< 0.021	< 0.040
Ce-144	< 0.064	< 0.087	< 0.089	< 0.077

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Table 19. River sediment, analysis for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g dry

Location	D-50 (Plant Intake, Control)	
Lab Code	DBS- 3118	DBS- 5072
Date Collected	06-23-09	09-21-09
K-40	11.79 ± 1.16	11.30 ± 1.46
Mn-54	< 0.046	< 0.073
Fe-59	< 0.071	< 0.146
Co-58	< 0.045	< 0.063
Co-60	< 0.037	< 0.054
Zn-65	< 0.090	< 0.129
Nb-95	< 0.057	< 0.098
Zr-95	< 0.075	< 0.064
Ru-103	< 0.029	< 0.040
Ru-106	< 0.326	< 0.447
Cs-134	< 0.039	< 0.054
Cs-137	0.12 ± 0.062	< 0.063
Ce-141	< 0.077	< 0.130
Ce-144	< 0.210	< 0.401

Location	D-51 (Discharge)	
Lab Code	DBS- 3119	DBS- 5073
Date Collected	06-23-09	09-21-09
K-40	9.02 ± 0.58	8.03 ± 0.49
Mn-54	< 0.016	< 0.013
Fe-59	< 0.020	< 0.016
Co-58	< 0.015	< 0.010
Co-60	< 0.010	< 0.008
Zn-65	< 0.036	< 0.026
Nb-95	< 0.011	< 0.011
Zr-95	< 0.015	< 0.021
Ru-103	< 0.010	< 0.014
Ru-106	< 0.165	< 0.094
Cs-134	< 0.016	< 0.012
Cs-137	< 0.022	< 0.013
Ce-141	< 0.022	< 0.023
Ce-144	< 0.058	< 0.064

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Table 19. River sediment, analysis for gamma-emitting isotopes.
Collection: Semiannually
Units: pCi/g dry

Location	D-107 (North Drainage Ditch)	
Lab Code	DBS- 3121	DBS- 5074
Date Collected	06-23-09	09-21-09
K-40	7.63 ± 0.67	6.95 ± 0.48
Mn-54	< 0.023	< 0.017
Fe-59	< 0.027	< 0.016
Co-58	< 0.014	< 0.008
Co-60	< 0.011	< 0.011
Zn-65	< 0.049	< 0.025
Nb-95	< 0.021	< 0.017
Zr-95	< 0.024	< 0.023
Ru-103	< 0.014	< 0.008
Ru-106	< 0.113	< 0.127
Cs-134	< 0.015	< 0.013
Cs-137	< 0.017	< 0.014
Ce-141	< 0.027	< 0.029
Ce-144	< 0.073	< 0.081

Table 20.1 Precipitation, monthly collections, analyses for gamma emitting isotopes.
Units: pCi/L
Location: DAEC

Date Collected	01-27-09	02-12-09	03-19-09	04-16-09	05-14-09	06-25-09
Lab Code	DP- 272	DP- 481	DP- 933	DP- 1714	DP- 2337	DP- 3211
Mn-54	< 4.6	< 4.2	< 2.7	< 3.5	< 2.3	< 3.7
Fe-59	< 8.0	< 9.1	< 9.2	< 4.7	< 3.4	< 3.4
Co-58	< 4.9	< 4.1	< 2.4	< 4.0	< 2.6	< 5.4
Co-60	< 5.7	< 4.5	< 4.0	< 2.7	< 3.0	< 4.5
Zn-65	< 11.6	< 4.0	< 5.7	< 5.3	< 4.5	< 8.2
Nb-95	< 4.7	< 3.6	< 5.3	< 4.0	< 2.2	< 5.8
Zr-95	< 5.5	< 12.8	< 7.1	< 3.9	< 4.2	< 4.8
I-131	< 14.6	< 6.7	< 6.5	< 7.8	< 7.7	< 9.0
Cs-134	< 7.2	< 3.7	< 4.9	< 3.3	< 2.4	< 5.7
Cs-137	< 6.5	< 4.4	< 4.1	< 4.1	< 3.7	< 6.6
Ba-140	< 34.7	< 12.8	< 21.8	< 19.2	< 13.4	< 28.7
La-140	< 3.5	< 2.5	< 3.5	< 5.2	< 2.7	< 4.8

Date Collected	07-15-09	08-20-09	09-23-09	10-29-09	11-19-09	12-10-09
Lab Code	DP- 3628	DP- 4395	DP- 5101	DP- 6080	DP- 6466	DP- 6706
Mn-54	< 3.8	< 3.8	< 4.3	< 3.0	< 5.0	< 2.1
Fe-59	< 9.2	< 6.2	< 3.6	< 6.5	< 7.5	< 4.7
Co-58	< 2.3	< 5.2	< 1.6	< 2.8	< 3.0	< 1.8
Co-60	< 2.9	< 4.2	< 3.4	< 4.2	< 4.7	< 1.9
Zn-65	< 6.1	< 6.5	< 4.0	< 4.5	< 8.7	< 5.0
Nb-95	< 3.9	< 5.5	< 3.6	< 4.2	< 6.3	< 3.1
Zr-95	< 2.7	< 6.2	< 5.9	< 5.3	< 7.6	< 3.1
I-131	< 8.6	< 6.0	< 7.5	< 11.3	< 10.2	< 4.8
Cs-134	< 3.2	< 4.6	< 3.7	< 4.2	< 5.4	< 2.4
Cs-137	< 2.7	< 5.5	< 2.6	< 4.2	< 4.9	< 2.4
Ba-140	< 22.5	< 26.3	< 13.5	< 26.9	< 27.3	< 8.9
La-140	< 3.0	< 3.9	< 1.7	< 3.0	< 5.1	< 3.4

Table 20.2. Precipitation, quarterly composites of monthly samples, analysis for tritium.
Units: pCi/L
Location: DAEC

Period	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Lab Code	DP-1158	DP-3237	DP-5129	DP-6820
H-3	< 160	< 144	< 158	< 153

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

Location	D-15a	D-16
Lab Code	DSO- 5075	DSO- 5076
Date Collected	09-21-09	09-21-09
Sr-90	< 0.018	0.022 ± 0.010
H-3 (pCi/L)	< 155	< 189
K-40	8.99 ± 1.03	16.32 ± 0.84
Mn-54	< 0.037	< 0.028
Fe-59	< 0.073	< 0.054
Co-58	< 0.043	< 0.020
Co-60	< 0.032	< 0.017
Zn-65	< 0.062	< 0.057
Nb-95	< 0.028	< 0.027
Zr-95	< 0.080	< 0.031
Ru-103	< 0.033	< 0.024
Ru-106	< 0.225	< 0.092
Cs-134	< 0.038	< 0.023
Cs-137	0.15 ± 0.061	0.14 ± 0.039
Ce-141	< 0.096	< 0.047
Ce-144	< 0.264	< 0.107

APPENDIX A

SUPPLEMENTAL ANALYSES

A-1. Supplemental analyses.

Location	MW-06A
Lab Code	DWW- 6947 [a]
Date Collected	12-17-09
Sr-89	< 1.1
Sr-90	< 0.8
Mn-54	< 1.8
Fe-59	< 5.8
Co-58	< 2.8
Co-60	< 1.8
Zn-65	< 4.0
Zr-Nb-95	< 4.5
Cs-134	< 2.0
Cs-137	< 2.1
Ba-La-140	< 12.6

[a] Additional analyses required for ground water when gross beta activity exceeds 10x the yearly mean of control samples, or 7 pCi/liter.